



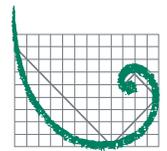
# Environmental Impact Assessment

Yellowtail Development Project

Esso Exploration and Production Guyana Limited



Volume III



**ERM**

*Stuart Koster*

March 2022

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# **ENVIRONMENTAL AND SOCIOECONOMIC MANAGEMENT PLAN**

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Esso Exploration and Production  
Guyana Limited

# **Environmental and Socioeconomic Management Plan**

Yellowtail Development Project

March 2022

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## Acronyms and Abbreviations

<b>Name</b>	<b>Description</b>
°C	degrees Celsius
AART	Americas Regional Response Team
CGM	Community Grievance Mechanism
CHS	Cultural Heritage Specialist
CO <sub>2</sub>	carbon dioxide
CWMP	Comprehensive Waste Management Plan
DP	dynamic positioning
EEPGL	Esso Exploration and Production Guyana Limited
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EPA	Guyana Environmental Protection Agency
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESG	Emergency Support Group
ESMP	Environmental and Socioeconomic Management Plan
FPSO	Floating Production, Storage, and Offloading (Vessel)
GGMC	Guyana Geology and Mines Commission
GHG	greenhouse gas
GPS	Global Positioning System
ICS	Incident Command System
ICZM	Integrated Coastal Zone Management
IFC	International Finance Corporation
IMO	International Maritime Organization
IMT	Incident Management Team
JNCC	Joint Nature Conservation Committee
MARAD	Maritime Administration Department
MARPOL 73/78	International Convention for the Prevention of Pollution by Ships, 1973, as modified by the Protocol of 1978
mg/L	milligrams per liter
NA	not applicable
NADF	non-aqueous drilling fluid
NOAA	U.S. National Oceanic and Atmospheric Administration
OIMS	Operations Integrity Management System
OSRP	Oil Spill Response Plan
PDA	Project Development Area
PPE	personal protective equipment
ROV	remotely operated vehicle
SEP	Stakeholder Engagement Plan for Guyana Operations
SMP	Socioeconomic Management Plan
SSHE	Safety, Security, Health, and Environmental
SURF	subsea, umbilicals, risers, and flowlines
TB	tuberculosis
UOG	Upstream Oil & Gas
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WHO	World Health Organization
WHRU	waste heat recovery unit

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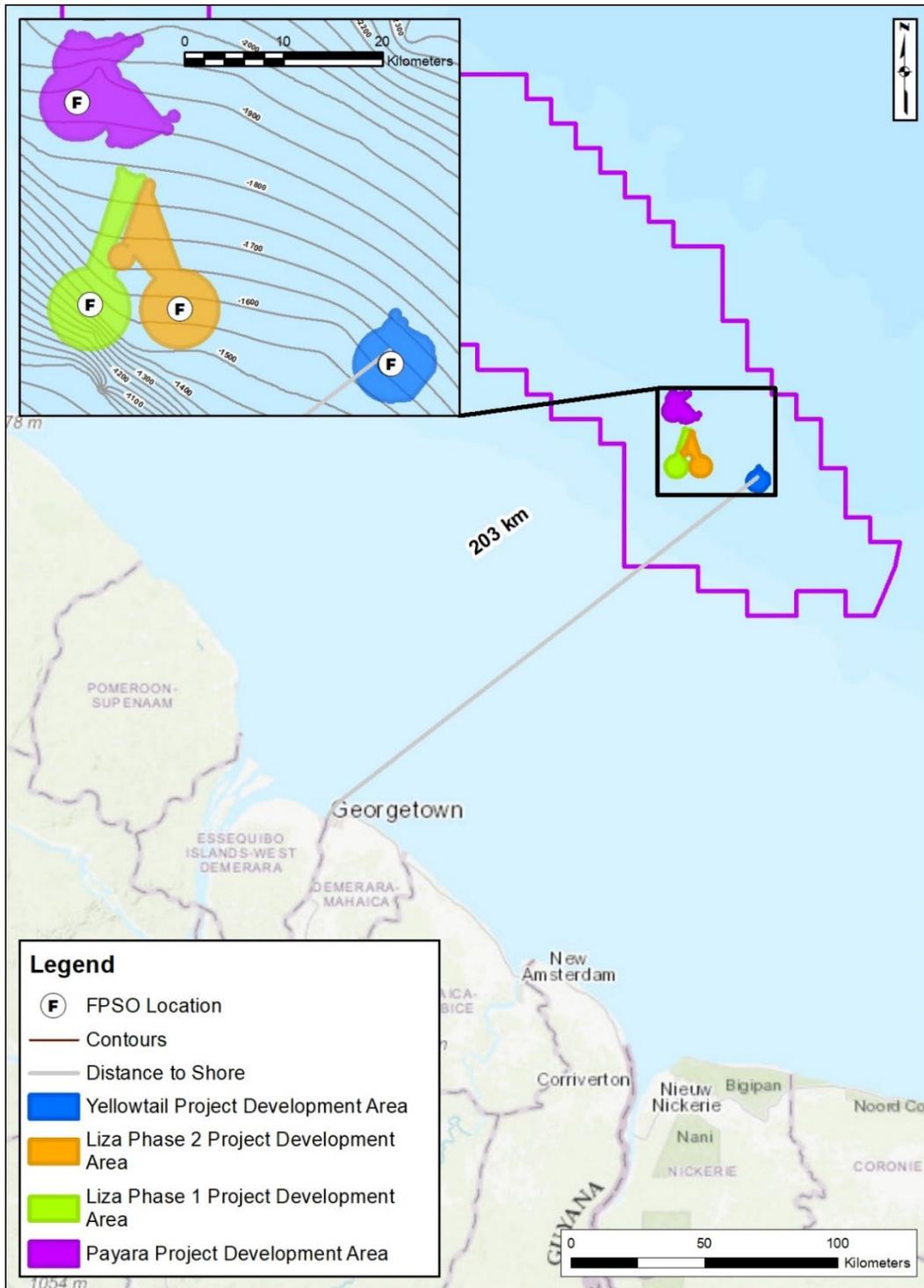
## 1. INTRODUCTION

Esso Exploration and Production Guyana Limited (EEPGL) is the designated Operator of the Stabroek Block, the largest petroleum prospecting license area offshore Guyana, on behalf of itself, Hess Guyana Exploration Limited, and CNOOC Petroleum Guyana Limited. In 2015, oil was discovered in the Liza Field within the Stabroek Block offshore Guyana, in waters approximately 1,500 to 1,900 meters deep. EEPGL and its co-venturers Hess Guyana Exploration Limited and CNOOC Petroleum Guyana Limited are parties to a Petroleum Agreement with the Government of Guyana. Under this agreement, and in light of the Liza field discovery, in 2017, EEPGL obtained a Petroleum Production Licence from the Ministry of Natural Resources and an environmental authorization (also commonly referred to as an Environmental Permit) from the Guyana Environmental Protection Agency (EPA) to construct and operate the first phase of development within the Liza Field (i.e., the Liza Phase 1 Development Project) located approximately 190 kilometers (118 miles) offshore from the Georgetown coastline. EEPGL subsequently applied for and received a second environmental authorization to construct and operate the second phase of development within the Liza Field (i.e., the Liza Phase 2 Development Project), which is planned to occur approximately 183 kilometers (114 miles) offshore from the Georgetown coastline. In 2020, EEPGL received approval to construct and operate the Payara Development Project, located approximately 207 kilometers (128 miles) northeast of the coastline of Georgetown, Guyana. Most recently, EEPGL has prepared an Environmental Impact Assessment (EIA) to secure approval from the EPA for a fourth development—the Yellowtail Development Project (referred to herein as “Yellowtail” or “the Project”).

The scope of this Environmental and Socioeconomic Management Plan (ESMP) is to cover the Yellowtail development, which will include:

- Between 45 and 67 development wells (consisting of a combination of production wells and injection wells);
- Installation and operation of subsea, umbilicals, risers, and flowlines (SURF); and
- Installation and operation of a Floating Production, Storage, and Offloading (FPSO) vessel to process the produced fluids from the production wells, store the processed crude oil until offloading, and offload the processed crude oil to conventional tankers for export.

The Project’s drilling and production operations activities will occur in what is referred to as the Project Development Area (PDA), which is comprised of a subsea area of approximately 3,534 hectares (8,733 acres) where work may be performed and a sea surface area of approximately 4,576 hectares (11,308 acres) where work may be performed. Figure 2.1-1 illustrates the location of the PDA. The Project will also involve shorebase facilities and marine/aviation services to support development drilling, FPSO and subsea equipment installation, and production operations.



**Figure 2.1-1: Location of the Yellowtail Project Development Area within the Stabroek Block**

EEPGL has prepared a separate EIA that:

- Describes the local and regional environmental and socioeconomic existing conditions within the Project's Area of Influence;
- Describes all components of the Project activities;
- Identifies the potential environmental and socioeconomic impacts associated with the Project activities; and
- Describes a strategy to manage the potential adverse impacts of the Project and explain why the Project activities should be considered environmentally and socioeconomically acceptable.

This ESMP covers regulatory compliance requirements as well as environmental and socioeconomic management requirements for the Project-related activities described in the EIA. It provides the basis for EEPGL's environmental and socioeconomic management program, which is the mechanism through which EEPGL will manage the environmental and socioeconomic impacts potentially resulting from the Project activities, including potential cumulative impacts. Where appropriate, it contains objectives and targets which EEPGL seeks to accomplish in order to avoid, reduce, or remedy potential negative impacts.

The following are not considered within the scope of this ESMP:

- Regulatory compliance associated with employment visas and taxes associated with the Project;
- Employment, commercial, and financial laws and regulations;
- Environmental and socioeconomic management and regulatory compliance activities for exploration-related activities in the Stabroek Block or other nearby blocks where no interfaces are required to be maintained with the Project; and
- Provisions for local content, which are addressed in the Project Development Plan and the associated Local Content Plan as covered in the Project's Petroleum Production Licence.

The ESMP will be used throughout the Project life cycle (at least 20 years). However, the document will be regularly updated in an effort to remain aligned with the Project as it progresses from drilling to installation to production operations. As production activities progress, it is envisioned that the ESMP will be periodically revised as appropriate during the planned 20-year production operations stage and through to decommissioning.

## **2. ENVIRONMENTAL AND SOCIOECONOMIC MANAGEMENT FRAMEWORK**

### **2.1. OBJECTIVES OF THE ESMP**

The objectives of this ESMP are to:

- Demonstrate commitment to compliance with applicable laws, regulations, and executed Project agreements through documented plans and procedures;
- Describe the process the Project will use to identify, evaluate, communicate, and comply with applicable regulatory requirements and obligations and EEPGL policies and procedures, and to maintain a current list of Project-applicable requirements and obligations;
- Establish clear roles and responsibilities and describe how the Project will interface in relation to environmental, socioeconomic, and regulatory matters;
- Utilize regulatory compliance management systems, processes, and procedures;
- List the types of reports that will be used to communicate environmental, socioeconomic, and regulatory compliance and overall status updates;
- Identify environmental, socioeconomic, and regulatory training and awareness requirements for the Project and contractors;
- Confirm that reasonably foreseeable actual and potential environmental aspects are identified and assessed and that significant aspects are addressed and controlled consistent with EEPGL policies and regulatory requirements;
- Characterize and understand the environmental, socioeconomics, regulatory, and non-regulatory setting;
- Confirm that work activities are undertaken in an appropriate manner, alternatives are considered, and that any impacts on the environment associated with those activities are minimized and monitored; and
- Facilitate orderly review and consideration of environmental improvement opportunities in the Asset Level Business Plan process.

### **2.2. ENVIRONMENTAL POLICY AND LEGAL FRAMEWORK**

The legal framework for this ESMP consists of the key general and resource-specific environmental and socioeconomic laws that have either a direct or indirect relevance to the management of potential impacts from the Project. Statutes described in this section may be relevant to the Project and include:

- The National Constitution of Guyana
- The Environmental Protection Act
- The Guyana Geology and Mines Commission Act
- The Protected Areas Act

- The Petroleum Act
- The Amerindian Act
- The Natural Resource Fund Act

### **2.2.1. National Constitution of Guyana**

Guyana is governed according to the Constitution of the Co-operative Republic of Guyana, as amended (the Constitution). The Constitution took effect in 1980 and expressly provides for protection of the environment. Article 25 establishes “improvement of the environment” as a general duty of the citizenry. In addition, Article 36 reads as follows:

“In the interests of the present and future generations, the State will protect and make rational use of its land, mineral and water resources, as well as its fauna and flora, and will take all appropriate measures to conserve and improve the environment.”

### **2.2.2. The Environmental Protection Act**

In 1996, the Environmental Protection Act Cap 20:05 1996 (hereinafter referred to as the Act) was enacted to implement the environmental provisions of the Constitution. The Act is Guyana’s single most significant piece of environmental legislation because it articulates national policy on important environmental topics such as pollution control and the requirements for environmental review of projects that could potentially impact the environment. It also provides for the establishment of an environmental trust fund. Most importantly, the Act authorized the formation of the EPA, and establishes the EPA as the lead agency on environmental matters in Guyana, including the issuance of environmental authorizations with appropriate conditions. The Act further mandates the EPA to oversee the effective management, conservation, protection, and improvement of the environment. It also requires the EPA to take the necessary measures to ensure the prevention and control of pollution, assessment of the impact of economic development on the environment, and sustainable use of natural resources.

### **2.2.3. The Guyana Geology and Mines Commission Act**

The Guyana Geology and Mines Commission Act was enacted in 1979, and authorized the government to establish the Guyana Geology and Mines Commission (GGMC), which is one of four agencies within the Ministry of Natural Resources. The GGMC promotes and regulates the exploration and development of the country’s mineral resources. The GGMC has a dedicated Petroleum Unit charged specifically with regulatory supervision of the oil and gas sector; however, regulation of petroleum-related activities also occurs in other divisions, such as the Geological Services division and the Environment Division. Prior to 2020, the GGMC worked closely with the Department of Energy on matters related to the oil and gas industry. After 2020, the Department of Energy was absorbed into the Ministry of Natural Resources where the Petroleum Management Program regulates, manages, and monitors the exploration, development, and use of Guyana’s petroleum resources.

## **2.2.4. Protected Areas Act**

The Protected Areas Act was enacted in 2011. It provides for protection and conservation of Guyana's natural heritage and natural capital through a national network of protected areas. This act also allowed for the creation of the Protected Areas Commission to oversee the management of this network. It highlights the importance of maintaining ecosystem services of national and global importance and public participation in the conservation of protected areas. It establishes a protected areas trust fund to ensure adequate financial support for maintenance of the network. Other functions of this act include promoting national pride in and encouraging stewardship of Guyana's natural heritage, recognizing the conservation efforts and achievements of Amerindian villages and Amerindian communities, and promoting the recovery and rehabilitation of vulnerable, threatened, and endangered species.

## **2.2.5. The Petroleum Act**

The Petroleum (Exploration and Production) Act was enacted in 1986 to regulate the prospecting for and production of petroleum in Guyana, covering the territorial sea, continental shelf, and exclusive economic zone. This act and the regulations promulgated thereunder identify persons allowed to hold prospecting licenses, establish the process for obtaining prospecting licenses, and specify requirements for further resource development in the event petroleum resources are discovered.

## **2.2.6. Amerindian Act**

The Amerindian Act was enacted in 2006. It provides for the recognition and protection of the collective rights of Amerindian villages and communities, the granting of lands to Amerindian villages and communities, and the promotion of good governance with Amerindian villages and communities. The Ministry of Indigenous Peoples' Affairs oversees implementation of this act. Key aspects of this act include the following:

- The act includes a process for the granting of land. A community can apply for land once they can prove that they have been living on it for at least 25 years.
- The Ministry is not required to approve leasing of titled Amerindian land. The communities are only required to seek the advice of the Minister.
- With respect to the use of scientific research related to Amerindian issues, the researcher must, among other things, submit to the Village Council a copy of any publication containing material derived from the research.
- This act supports the need for the communities to use their natural resources in a way that lends support to the concept of sustainability. Impact assessments are required in accordance with the Environmental Protection Act.
- Amerindians have a legal right to traditional mining with the consent of the Village Council, and they must comply with the relevant legislation. With regard to forestry, the Village Council plays an integral role in determining who is allowed to use their land and on what terms.

- The Village Council is empowered to establish rules for their communities and set fines within the legal confines of the law. Money received due to the non-adherence of the rules goes into the Village Council's account, not the government's account.

### **2.2.7. Natural Resource Fund Act**

The Natural Resource Fund Act was enacted in 2019 to establish the National Resource Fund (the Fund) to manage Guyana's natural resource wealth in an efficient and effective manner for the present and future benefit of the people and for financing national development priorities, including initiatives aimed at achieving an inclusive green economy. This act empowers the Minister of Finance with the overall management of the Fund, including preparing the Fund's Investment Mandate. The act establishes an Investment Committee, a Macroeconomic Committee, and a Senior Investment Adviser and Analyst to support the Minister in management of the Fund.

The Bank of Guyana is responsible for operational management of the Fund. A Public Accountability and Oversight Committee is established to ensure that the Fund is managed transparently and to provide an independent assessment of withdrawals from the Fund. Deposits into the Fund are intended to come from Guyana's petroleum revenues, including from royalties, the government's share of profits, and signature bonuses, among others. Revenues from the mining and forestry sectors may also be deposited into the Fund.

## **2.3. RESOURCE-SPECIFIC LEGAL REQUIREMENTS FOR THE PROJECT**

### **2.3.1. National Laws and Regulations**

In addition to the legal framework described in Section 2.2, several Guyanese environmental laws with more narrowly defined scopes are relevant with respect to the management of potential impacts on specific physical, biological, or socioeconomic resources. Other laws that are potentially relevant to the Project have a public health-related focus.

Guyana has several national laws that regulate impacts on the physical environment, biological resources including wildlife and fisheries, and socioeconomic aspects with the potential to be impacted by the Project. In addition to these laws, Guyana also has national laws governing waste management and noise. These laws and regulations are described in greater detail in Table 2.3-1.

**Table 2.3-1: Resource-Specific Environmental and Social Laws**

Title	Objective	Relevance to the Project
<i>Biological Resources-Legislation and Policies</i>		
Fisheries Act, 2002	Regulates fishing and related activities in Guyana territorial waters.	Section 33(1) of the Fisheries Act authorizes the prohibition and/or regulation of deposition or discharge of substances harmful to fish.
Protected Areas Act, 2011	Provides for protection and conservation of Guyana's natural heritage and natural capital through creation, management, and financing of a national system of protected areas. This act also allowed for the creation of the Protected Areas Commission to oversee the management of this network. It highlights the importance of maintaining ecosystem services of national and global importance and public participation in the conservation of protected areas. It establishes a protected-areas trust fund to ensure adequate financial support for maintenance of the network. Other functions of this act include promoting national pride in and encouraging stewardship of Guyana's natural heritage; recognizing the conservation efforts and achievements of Amerindian villages and Amerindian communities; and promoting the recovery and rehabilitation of vulnerable, threatened, and endangered species.	Shell Beach, which is a coastal area subject to potential impact from a Project unplanned event (i.e., oil spill), was identified as one of the five priority areas for establishment of protected areas in Guyana and was designated a protected area with the passage of the Protected Areas Act in 2011.  Under this Act, terrestrial and marine protected areas could be established. However, currently there are no known initiatives towards setting up marine protected areas.
Wildlife Management and Conservation Act, 2016 (replaces the Wildlife Management and Conservation Regulations, 2013; the Wild Birds Protection Act, 1987; and the Species Protection Regulations, 1999)	Provides for the protection, conservation, management, sustainable use, internal and external trade of Guyana's wildlife, and establishes and incorporates the Guyana Wildlife Conservation and Management Commission.	Provides a framework to address the national goals for wildlife protection, conservation, and management. The Act also provides recommendations on measures for the protection of threatened ecosystems and habitats, and advises on measures for conservation of biological diversity.
<i>Biological Resources-International Agreements Signed / Acceded by Guyana</i>		
The Cartagena Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Guyana acceded and ratified in 2010)	Provides a framework for international protection and development of the marine environment across the Caribbean region.	Sets general goals for protection for the marine environment, especially from possible pollution.

Title	Objective	Relevance to the Project
Protocol on Specially Protected Areas and Wildlife (Guyana acceded and ratified in 2010)	Protocol supplementing and supporting the Cartagena Convention. Requires signatories to adopt an ecosystem approach to conservation. Provides mechanism for compliance with the Convention on Biological Diversity.	Elaborates on the wildlife goals established in the Cartagena Convention and Convention on Biological Diversity.
Convention on Biological Diversity (Guyana signed in 1992 and ratified in 1994)	Promotes biological conservation within the framework of sustainable development and use of biological resources, and the fair and equitable sharing of benefits of genetic resources.	Encourages Project design and execution to protect and conserve biological diversity.
International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) (Guyana acceded in 1997)	Regulates various forms of marine pollution, including oil and fuel, noxious liquid, hazardous substances, sewage, garbage, air emissions, and ballast water.	Impacts the handling and disposition of regulated substances from Project drill ships, FPSO, and support vessels. Release of pollution from ships can change and/or compromise the functioning of ecosystems, potentially having implications for altering ecosystem services.
<i>Physical Resources-Legislation and Policies</i>		
Environmental Protection Water Quality Regulations, 2000	Enables the EPA to set effluent standards for discharges to inland or coastal waters or land of Guyana (none have been issued in final form to date), establishes authorization requirements for discharges to inland or coastal waters, and requires holders of such authorizations to establish effluent sampling points as required by the EPA.	Establishes a basis for regulating discharge of listed substances to inland or coastal waters, which could include substances used as part of the Project
Environmental Protection Air Quality Regulations, 2000	Requires environmental authorization for industrial facilities emitting air contaminants. Establishes that the EPA shall at any time after the commencement of the Regulations, establish limits for any of the contaminants specified in the regulation.	Applicable to Project sources of emissions to air (although no limits have yet been established by the EPA).
Guyana Standard, Guidelines for Noise Emission into the Environment, 2010	Establishes standard used for monitoring of noise emission into the environment; sets permissible noise levels for residential, commercial, industrial, institutional, educational, construction, transportation, and recreational receptors (day and night).	Relevant to Project-related noise levels that could be perceived by human receptors (onshore or nearshore activities)
MARPOL 73/78	See above.	See above.
International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004	Controls the release of ballast water in national waters for all vessels.	Applies to the management of ballast water from Project drill ships, FPSO, and support vessels.

<b>Title</b>	<b>Objective</b>	<b>Relevance to the Project</b>
Environmental Protection Noise Management Regulations, 2000	Establishes general provisions for noise avoidance and restrictions from multiple commercial and industrial sources, including sound-making devices, equipment, tools, and construction activities, and includes permitting and reporting requirements. Authorizes EPA to set specific permissible noise levels in the future.	Regulated facilities include any offshore installation and any other installation, whether floating or resting on the seabed.
<i>Physical Resources-International Agreements Signed / Acceded by Guyana</i>		
Paris Agreement (under the United Nations Framework Convention on Climate Change [UNFCCC])	Promotes international cooperation to limit average temperature increases and resulting changes in climate, and international cooperation to adapt to these impacts.	Provides a framework for possible future regulation of greenhouse gas (GHG) emissions within Guyana's territory (maritime and land) and for establishing national policy regarding adaptation to climate change.
Vienna Convention on the Protection of the Ozone Layer (Guyana acceded in 1993)	Provides a framework for the protection of the ozone layer.	Establishes measures for protecting the ozone layer.
Montreal Protocol on Substances that Deplete the Ozone Layer (Guyana acceded in 1993)	A protocol to the Vienna Convention designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion.	Prohibits the use of several groups of halogenated hydrocarbons that may deplete the ozone layer.
<i>Physical Resources-Guidance</i>		
Joint Nature Conservation Committee Guidelines for Minimising the Risk of Injury and Disturbance to Marine Mammals from Seismic Surveys (JNCC 2017)	Provides guidelines for procedures to reduce the risk of injury to marine mammals from geophysical survey activities.	Although the JNCC guidelines are voluntary, they are widely recognized as a global best practice in the oil and gas industry for managing the potential adverse effects of seismic surveys on marine mammals, and will be applicable to vertical seismic profiles conducted on any of the development wells.
<i>Socioeconomic Resources--Legislation and Policies</i>		
Occupational Safety and Health Act, 1997 Cap 99.06	Legally defines the responsibilities of workers and management with respect to keeping workplaces safe.	Generally applies to Project workers and Project-related activities.
Occupational Safety and Health Policy (GoG 2018)	Aims to promote and improve the quality of life of workers by preventing social and economic losses, work-related accidents, and injury to health by eliminating hazards, reducing the number of accidents, and injuries, and combating stresses and incidence of occupational diseases. The policy orients the Ministry of Social Protection	Applies to all categories of workers and workplaces, in all sectors, including the Project and Project workers.

Title	Objective	Relevance to the Project
	to modernize its policies and procedures. Implementation is supported by the International Labour Organization.	
Food & Drug Regulations (Food and Drug Act), 1971 Cap 34:03	Regulates the sale, advertisement, preparation, and handling of food products; regulates the manufacture, advertisement, trade, and administration of pharmaceuticals; provides the Ministry of Health authority to inspect facilities to establish compliance with sanitation standards.	Governs the preparation of food and provision of medications at Project facilities.
Natural Resource Fund Act (2019)	Establishes the National Resource Fund to manage the natural resource wealth of Guyana for the present and future benefit of the people and for the sustainable development of the country. The act also outlines governance and oversight mechanisms of the fund.	Provides for revenues from the Project to be deposited into the fund and used to finance national development, including initiatives aimed at achieving the government's vision of an inclusive green economy.
Health Facilities Licensing Act (2007) and Health Facilities Licensing Regulations (2008)	Under the act, all health facilities must be licensed by the Minister of Health. The act also provides for inspectors who are authorized to enter any facility and conduct inspections. Offenses are outlined with fines and imprisonment upon summary conviction. Importantly, the act also provides for the Minister to make regulations related to licenses, renewals, and standards for health facilities; record keeping; and prescribing and governing the construction, establishment, location, equipment, maintenance, repair of, additions and alterations to, and operations of health facilities. Licensing regulations address licensing and operation of health facilities including governance, health and safety, hygiene, staffing, policies and procedures, and oversight / quality assurance requirements.	Sets the requirements for health facilities at which services would be available to Project workers.
Health Vision 2020: National Health Strategy for Guyana (2013)	Creates an enabling framework for the integrated delivery of quality, effective, and responsive health services and prevention measures to improve the physical, mental, and social wellbeing of all people in Guyana.	Seeks to improve service delivery; managing communicable and non-communicable diseases; and improving health outcomes.
Guyana Shipping Act (1998) Cap. 49:01.	Establishes the framework for the regulation of vessels and sets out MARAD and its functions.	MARAD is the principal regulator for vessels operating in the marine environment and all vessels associated with the Project operating within Guyana

Title	Objective	Relevance to the Project
		waters will fall under the purview of MARAD.
Maritime Zones Act (2010) Cap. 63:01.	Incorporates certain provisions of the United Nations Convention on the Law of the Sea and the United Nations Educational, Scientific and Cultural Organization Convention on the Protection of the Underwater Cultural Heritage, to provide for marine scientific research, maritime cultural area, eco-tourism, marine parks and reserves and mariculture, the protection and preservation of the marine environment, and for related matters.	Provides for rights and regulation of activities within the various maritime zones, including the territorial sea and exclusive economic zone and addresses the protection and preservation of the marine environment, including pollution, as the discharge of harmful substances and hazardous waste, as physical movements and/or changes in water quality or ecological conditions could affect underwater and/or coastal cultural heritage.
Sea Defence Act (1953, 1988, 1992) Cap. 64:03.	Aims to make better provision for the maintenance and construction of sea defenses in Guyana.	Covers the protection of mangroves, which serve as a natural sea defense mechanism; there are fines and penalties for the unpermitted destruction of mangroves. Relevant to the Project in the unlikely event of an oil spill reaching the shore and causing mangrove damage.
Ministry of Health Act (2005)	Outlines the responsibilities and functions of the Ministry of Public Health, including responsibilities in relation to health care facilities.	Generally applies to health care services supplied to Project workers.
Environmental Protection Hazardous Waste Regulations, 2000	Establishes requirements for generating, handling, and disposing of hazardous waste as well as penalties for violations of these requirements.	Identifies wastes subject to regulation, including several types of waste that could be generated as part of the Project.
National Solid Waste Management Strategy (Under Development)	Guides the Government of Guyana's agenda on waste collection, transportation, and disposal; goals include improving the waste management infrastructure, enforcing existing legislation, and promoting waste-to-energy initiatives. Will inform the country's integrated efforts at converting waste material into useful resources and aims to ensure their full utilization and eventual exploitation as by-products. Currently under development.	Once the strategy is approved, it is expected to apply to the collection, transportation, and disposal of Project-generated waste.

Title	Objective	Relevance to the Project
National Trust Act, 1972	Stewardship of historic resources and places of cultural significance.	Governs the management of any building, structure, object, or other man-made or natural feature that is of historic or national cultural significance that could be impacted by the Project. Includes shipwrecks and other marine features. Would also apply to the Project in the event of a chance find, in which case the act would require EEPGL to work cooperatively with the National Trust of Guyana to manage any resources discovered.
Forests Act (2009) Act. No. 6 of 2009	Consolidates the law relating to forests and makes provisions for sustainable forest management and forest conservation.	Covers mangroves, which are classified as a forest type and subject to protection measures under the Act. Mangrove ecosystem makes up a significant portion of Guyana's coastal zone, and could potentially be affected in the unlikely event of an oil spill event which reaches the shore.
Protected Areas Act, 2011	See above	See above
Amerindian Act (2006) Cap. 29:01.	Provides for the recognition and protection of the collective rights of Amerindian villages and communities, the granting of lands to Amerindian villages and communities, and the promotion of good governance with Amerindian villages and communities.	Within the broad context of protection of the collective rights of Amerindian villages, this could include the right of use of coastal resources for traditional and subsistence activities, which could be affected in the unlikely event of an oil spill from the Project.
<i>Socioeconomic Resources—International Agreements Signed / Acceded by Guyana</i>		
International Convention for the Safety of Life at Sea (1974) (Guyana acceded in 1997)	Specifies minimum standards for the construction, equipment, and operation of vessels with respect to their safety; allows governments of participating states to inspect vessels flagged in other participating states to ensure compliance.	Affects construction, operation, and equipment on board the drill ships, FPSO, installation vessels, and support vessels.
Convention on the International Regulations for Preventing Collisions at Sea (1972) (Guyana acceded in 1997)	Officially recognizes the importance of traffic separation in the marine environment and codifies basic measures to accommodate traffic separation, including safe speed,	Governs maritime operation of drill ships, FPSO, installation vessels, and support vessels.

Title	Objective	Relevance to the Project
	signalling conventions, and general vessel conduct.	
International Convention on Standards of Training, Certification and Watchkeeping (1978) (Guyana acceded in 1997)	Obligates crews operating vessels flagged in signatory states to adhere to minimum standards relating to training, certification, and watchkeeping; requires signatory states to submit detailed information to the International Maritime Organization concerning administrative measures taken to ensure compliance with the convention.	Applies to required capabilities of crew on board the drill ships, FPSO, installation vessels, and support vessels, and provides for inspection by authorities to ensure compliance.
Convention on Facilitation of International Maritime Traffic (1965) (Guyana acceded in 1998)	Prevents unnecessary delays in maritime traffic arising from burdensome documentation requirements and establishes uniform formalities and other procedures to permit transboundary maritime commerce and travel.	Facilitates entry of drill ships, FPSO, installation vessels, and support vessels into Guyana.
IMO International Maritime Dangerous Goods Code (2018 edition)	Governs maritime transport of wastes worldwide; addresses classifications of dangerous goods, packing and tank provisions, consignment procedures, construction and testing of packaging, IBCs, portable tanks, and transport operations.	Applies to all marine vessels that will transport wastes generated as part of the Project.
Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal (1989)	Identifies conditions on the import and export of hazardous wastes, including requirements for notice, consent, and tracking for movement of wastes across international boundaries.	Would apply to the Project only if hazardous waste generated in Guyana is disposed outside Guyana. Currently, the convention is not relevant, as EEPGL does not import or export hazardous wastes. Guyana acceded in 2001.
United Nations Educational, Scientific and Cultural Organization Convention on the Protection of the Underwater Cultural Heritage (2001) (Guyana ratified in 2014)	Protects “all traces of human existence having a cultural, historical, or archaeological character” that have been underwater for over 100 years.	Would apply to any shipwrecks or other submerged cultural heritage in the Project AOI.
United Nations Convention on Biological Diversity (1992)	See above	See above
United Nations Declaration on the Rights of Indigenous Peoples (2007)	A comprehensive statement addressing the rights of indigenous peoples. It emphasizes the rights of indigenous peoples to maintain and strengthen their own institutions, cultures, and traditions and to pursue their development in keeping with their own needs and aspirations. Further, it addresses both individual and collective rights, cultural rights and identity, rights to education,	Guyana’s adoption of the Declaration creates an expectation for the Project to include engagements with indigenous peoples and take necessary measures to respect their rights.

Title	Objective	Relevance to the Project
	health, employment, and language, among others.	
American Declaration on the Rights of Indigenous Peoples (Organisation of American States) (2016)	Offers specific protection for indigenous peoples in North America, Mexico, Central and South America, and the Caribbean. Affirms the right of self-determination; rights to education, health, self-government, culture, lands, territories, and natural resources; and it includes provisions that address the particular situation of indigenous peoples in the Americas, including protections indigenous women and children, and those living in voluntary isolation, among others.	Guyana's adoption of the Declaration creates an expectation for the Project to include engagements with indigenous peoples and take necessary measures to respect their rights.

### 2.3.2. National Policy Framework

Guyana's government has articulated national policies on several environmental and social topics that are relevant to the Project. This section provides an overview of the key government policies applicable to the Project.

- The Low Carbon Development Strategy aims to protect and maintain the forests in an effort to reduce global carbon emissions and at the same time attract payments from developed countries for the climate services that the forests provide.
- The National Environmental Action Plan articulates the government's approach to managing the environment from the perspective of economic development.
- The Integrated Coastal Zone Management (ICZM) Action Plan establishes Guyana's ICZM process as an ongoing initiative to promote the wise use, development, and protection of coastal and marine resources; enhance collaboration among sectoral agencies; and promote economic development. In 2000, after two years of study, the ICZM committee produced an ICZM Action Plan, which was approved by the Cabinet in 2001. The ICZM Action Plan addresses policy development, analysis and planning, coordination, public awareness building and education, control and compliance, monitoring and measurement, and information management (EPA 2000).
- The National Biodiversity Strategy and Action Plan establishes the national vision for biodiversity, which is to sustainably utilize, manage, and mainstream biodiversity by 2030, thereby contributing to the advancement of Guyana's bio-security, and socioeconomic and low-carbon development. It is intended to guide national policy with respect to biodiversity through 2020.
- *Guyana Petroleum Sector: Realising Local Content Benefits and Value Retention from Guyana's Petroleum Resources Local Content Policy* was released in January 2020 (Ministry of the Presidency and Department of Energy 2020). It established local content policy as the most important driver of economic development from Guyana's petroleum

industry, and provides fair and adequate opportunity of Guyanese to support the oil and gas sector where capability exists. Although it provides for first considering Guyanese goods and services in some contexts, it also seeks to attract foreign investment. In February 2021, the Ministry of Natural Resources released a revised draft *Local Content Policy for the Development of Guyana's Petroleum Economy* (Ministry of Natural Resources 2021). It is anticipated that an updated draft policy, legislation, implementation mechanism, and monitoring and reporting guidance will be simultaneously released for further public consultation in the fourth quarter of 2021.

### **2.3.3. International Conventions and Protocols**

Guyana is signatory to a number of international and regional conventions and protocols that are relevant to environmental management aspects including air quality/climate change, pollution prevention, and conservation of biodiversity and wildlife habitat. These agreements include several prominent conventions concerning pollution control and waste management such as the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78), the Basel Convention on the Transboundary Movement of Hazardous Wastes and Their Disposal, and the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and reflect a particular focus on control of pollution and environmental contamination.

Guyana is also a signatory to several international and regional conventions and protocols that are relevant to environmental and socioeconomic aspects, although not all of these agreements have been translated into national legislation. Examples include climate change agreements such as the Kyoto Protocol and the United Nations Framework Convention on Climate Change, the United Nations Educational, Scientific and Cultural Organization Convention on the Protection of Underwater Cultural Heritage, and maritime safety conventions such as the International Convention for the Safety of Life at Sea. These international conventions and protocols are described in greater detail in the EIA.

## **2.4. SAFETY, SECURITY, HEALTH, AND ENVIRONMENTAL MANAGEMENT**

ExxonMobil (EEPGL's parent organization) and its affiliates (including EEPGL) are committed to conducting business in a manner that is compatible with the environmental and socioeconomic needs of the communities in which it operates, and that protects the safety, security, and health of its employees, those involved with its operations, its customers, and the public. These commitments are documented in its Safety, Security, Health, Environmental (SSHE), and Product Safety policies. These policies are put into practice through a disciplined management framework called the Operations Integrity Management System (OIMS).

ExxonMobil's OIMS Framework establishes common expectations used by ExxonMobil affiliates worldwide for addressing risks inherent in its business. The term "Operations Integrity" is used to address all aspects of its business that can impact personnel and process safety, occupational safety, security, occupational health, and environmental performance.

Application of the OIMS Framework is required across all ExxonMobil affiliates, with particular emphasis on design, construction, and operations. Management is responsible for ensuring that management systems satisfying the OIMS Framework are in place. Implementation is consistent with the risks associated with the business activities being planned and performed. Figure 2.4-1 provides a high level description of the OIMS Framework and its 11 essential elements.



Figure 2.4-1: The OIMS Framework

## 2.5. INTERNATIONAL ENVIRONMENTAL AND SOCIOECONOMIC PERFORMANCE CRITERIA

A number of environmental and socioeconomic performance criteria will be utilized by the Project. These performance criteria are consistent with good international industry oilfield practice. Table 2.5-1 presents a summary of key environmental and socioeconomic performance criteria the Project will utilize.

**Table 2.5-1: Summary of Key Environmental and Socioeconomic Performance Criteria to be used by the Project**

Aspect	Performance Criteria to be Applied	International Standard That References Applied Performance Criteria
Air Quality	Modeled concentrations of air pollutants at potential onshore receptor locations have been compared to guideline concentrations from the World Health Organization (WHO).	WHO Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide – Global Update 2005; WHO Air Quality Guidelines for Europe, 2 <sup>nd</sup> Edition, 2000; WHO Global Air Quality Guidelines (WHO 2021)
Ballast Water	Comply with requirements.	International Convention for the Control and Management of Ships' Ballast Water and Sediments
Bilge Water	Comply with requirements.	MARPOL 73/78
Cooling Water	Avoid increases in ambient water temperature of more than 3°C at 100 meters (~328 feet) from the point of discharge.	World Bank Group Environmental Health and Safety (EHS) Guidelines for Offshore Oil and Gas Development
Cooling Water	Although not technically applicable to a cooling water discharge, the modeled concentrations of residual chlorine in the receiving water at the edge of the mixing zone have been compared to the International Maritime Organization (IMO) recommended level of 0.5 milligrams per liter (mg/L).	IMO's 2012 Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants
Cumulative Impacts	The cumulative impact assessment for the Project has been conducted in general accordance with international best practice guidance of the International Finance Corporation (IFC).	IFC's Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for Private Sector in Emerging Markets
Deck Drainage	Comply with requirements.	MARPOL 73/78
Drill Cuttings	Modeled deposition of drill cuttings has been compared to the literature-based threshold rate for potential impact on benthic organisms from smothering (5 centimeters per month).	Ellis D. V. and C. Heim. 1985. Submersible surveys of benthos near a turbidity cloud. Mar Poll Bull, 16(5): 197–203.; MarLIN (Marine Life Information Network). 2011. Benchmarks for the Assessment of Sensitivity and Recoverability. The Marine Biological Association of the United Kingdom, Citadel Hill, Plymouth, Devon, United Kingdom. Retrieved from: <a href="http://www.marlin.ac.uk/habitats/SNC-B-benchmarks#toc_physical-pressure-other-">http://www.marlin.ac.uk/habitats/SNC-B-benchmarks#toc_physical-pressure-other-</a>
Drill Cuttings	Modeled total suspended solids concentrations from discharge of drill cuttings have been compared to the MARPOL recommended total suspended solids threshold of 35 mg/L.	MARPOL 73/78

Aspect	Performance Criteria to be Applied	International Standard That References Applied Performance Criteria
Drilling Fluids and Cuttings – Non-Aqueous Drilling Fluid (NADF)	Use low-toxicity International Oil and Gas Producers Group III NADF.	World Bank Group EHS Guidelines for Offshore Oil and Gas Development
Drilling Fluids and Cuttings – NADF	Use solids control and cuttings dryer systems to treat cuttings, such that, for discharged cuttings, end of well maximum weighted mass ratio averaged over all well sections drilled using non-aqueous base fluid does not exceed 6.9 percent wet weight base fluid retained on cuttings.	World Bank Group EHS Guidelines for Offshore Oil and Gas Development
Ecosystem Services	An ecosystem services baseline has been established in general accordance with the Millennium Ecosystem Assessment 2005 methodology. An ecosystem services prioritization has been conducted in general accordance with international best practice described in the 2012 IFC Performance Standards.	Millennium Ecosystem Assessment's Ecosystems and Human Well-being: A Framework for Assessment;  IFC Performance Standards 2012
Food Waste	Comminute to 25 millimeters diameter particle size or less and comply with requirements.	MARPOL 73/78
Flaring	Design construct, and operate facilities so as to avoid routine flaring.	World Bank Group EHS Guidelines for Offshore Oil and Gas Development
Fugitive Emissions	Consider and implement methods for controlling and reducing fugitive emissions in the design, operation, and maintenance of offshore facilities and implement leak detection and repair programs.	World Bank Group EHS Guidelines for Offshore Oil and Gas Development
Greenhouse Gas (GHG) Emissions	Evaluate options for energy efficiency.	World Bank General EHS General Guidelines (English)
GHG Emissions	Quantify GHG emissions annually in accordance with internationally recognized methodologies and good practice.	International Petroleum Industry Environmental Conservation Association's (IPIECA's) Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions
Produced Water	Treat to achieve an oil in water content of 29 mg/L (monthly average) and 42 mg/L (daily maximum).	World Bank Group EHS Guidelines for Offshore Oil and Gas Development
Sediment Quality	Existing concentrations of constituents in sediment samples have been compared to U.S. National Oceanic and Atmospheric Administration (NOAA) "Effects Ranges."	NOAA (Macdonald, D. D., R. S. Carr, and F. D. Calder. 1996. Development and evaluation of sediment quality guidelines for Florida coastal waters. <i>Ecotoxicology</i> , 5(1996): 253.)

Aspect	Performance Criteria to be Applied	International Standard That References Applied Performance Criteria
Sewage	Treat sewage with a marine sanitation device and comply with requirements.	MARPOL 73/78  IMO's 2012 Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants
Underwater Noise	Observations by Marine Mammal Observers and operational protocols (e.g., soft starts, initiate during daylight hours) to be conducted for certain noise producing activities (e.g., Vertical Seismic Profile).	Joint Nature Conservation Committee (2017) guidelines
Water Quality	Existing concentrations of constituents in water samples have been compared to guideline concentrations in the U.S. Environmental Protection Agency (USEPA) water quality guidelines.	USEPA Water Quality Guidelines (Burgess, R.M., W.J. Berry, D.R. Mount, and D.M. Ditoro. 2013. Mechanistic Sediment Quality Guidelines Based on Contaminant Bioavailability; Equilibrium Partitioning Sediment Benchmarks. Environmental Toxicology and Chemistry, 32, No. 1, pp. 102–114.); USEPA Saltwater Quality Standards

## 2.6. ORGANIZATIONAL STRUCTURE

As part of design and implementation for the Project Development, EEPGL established an organizational structure within the affiliate that is responsible for managing the Project activities over the life cycle of the Project (at least 20 years). A dedicated in-country organization will be in place throughout each Project stage. The organizational size and makeup will evolve over time to accommodate the business needs associated with drilling development wells, installation of FPSO and SURF components, production operations, logistical support, and ultimately decommissioning.

The in-country organization will be led by a Lead Country Manager, and supported by various discipline managers such as Operations, Engineering, Human Resources, Public & Government Affairs, Business Services (e.g., Procurement, Controllers, Information Technology), Law, and Security, Safety, Health and Environment (SSHE). The in-country organization will also be supported by a number of technical, business, and administrative specialists located inside and outside of Guyana. The in-country organization is responsible for all in-country Project activities, and will be the organization that interfaces with government and stakeholders.

The EEPGL management team will be supported by an SSHE team that provides technical expertise, training, and administrative support for OIMS implementation, which addresses disciplines such as safety, security, health, environmental, regulatory, and socioeconomics.

The in-country organization will also be supported by several teams that are responsible for managing certain types of Project activities. Examples of such teams include a Drilling Team that manages the drilling and completion of the development wells, a Logistics Team that

manages logistical support (e.g., shorebases, aviation, marine vessels), and a Project Team that manages the engineering, procurement, construction, and installation of the FPSO and SURF components. Each of these teams has a suite of discipline managers to support the planning and execution of the Project activities for which they are responsible, including SSHE. These teams interface with the EEPGL in-country organization in a seamless manner to deliver their scopes of work for the Project. EEPGL will ultimately manage production operations.

The EEPGL management team is accountable for managing the Project activities in alignment with OIMS and EEPGL's established SSHE policies, in compliance with the laws and regulations of Guyana, and in line with the commitments and obligations associated with the Project EIA and ESMP. The EEPGL management team will be supported by an Environmental & Regulatory team which provides technical expertise, training, and administrative support for OIMS implementation, which addresses various disciplines such as environmental, regulatory and socioeconomics.

Functional direction is provided primarily through the processes and procedures established in OIMS System 6-7. Both the 6-7 System Owner and System Administrator are resourced through the EEPGL SSHE staff. The EEPGL Environmental, Regulatory, and Socioeconomic organization chart is depicted in Figure 2.6-1.

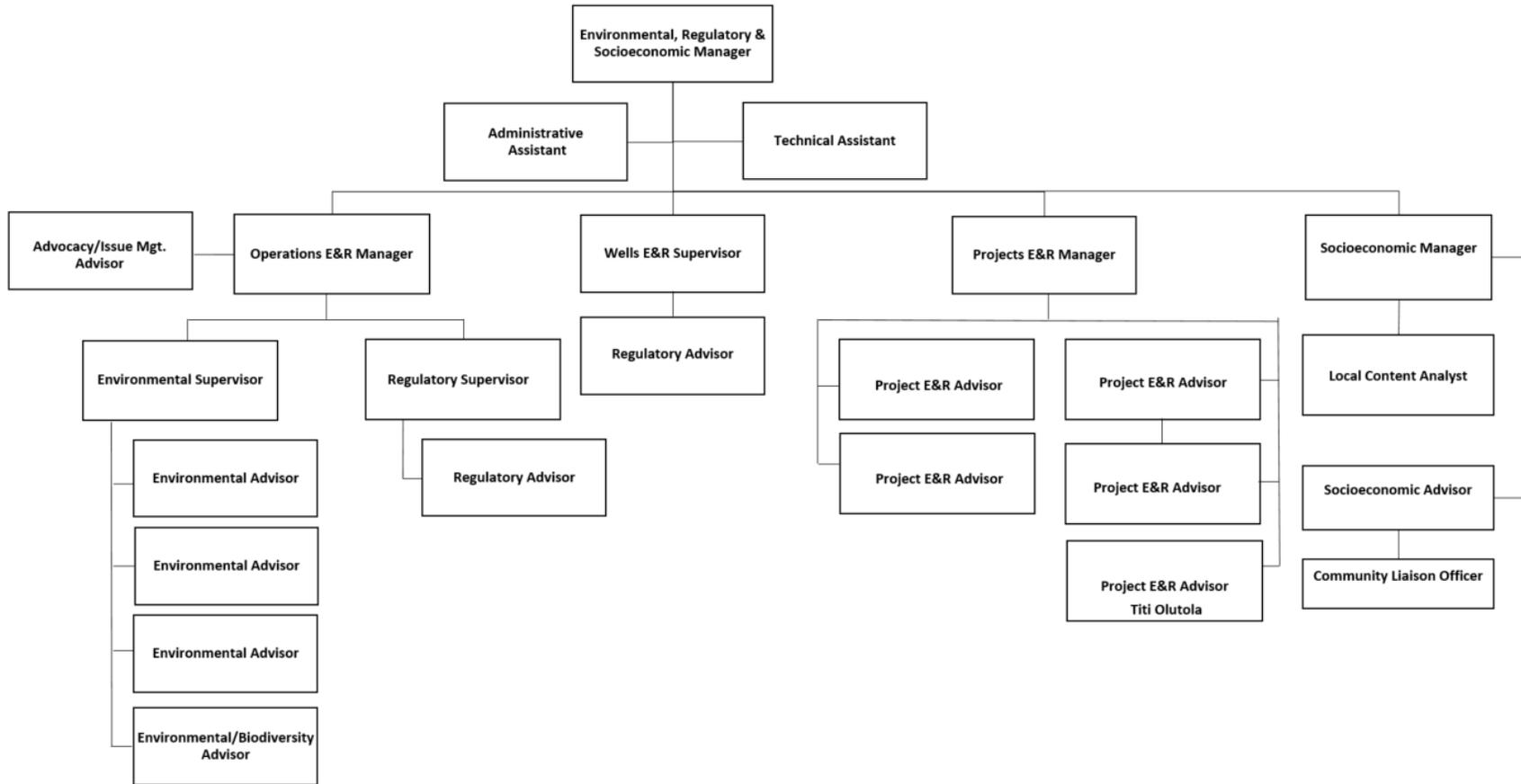


Figure 2.6-1: Environmental, Regulatory, and Socioeconomic Organization Chart

**Table 2.6-1: ESMP Roles and Responsibilities**

<b>Role</b>	<b>Responsibilities</b>
Lead Country Manager (LCM) & General Manager	<ul style="list-style-type: none"> <li>• Approves the ESMP</li> <li>• Sets the expectation for the Production Organization to comply with the requirements of the ESMP</li> </ul>
Production Manager	<ul style="list-style-type: none"> <li>• Maintains awareness of the requirements in the ESMP with the Operations Organizations</li> <li>• Accountable for implementing the operational requirements of the ESMP</li> <li>• Provides resources to implement the operational requirements of the ESMP</li> <li>• Verifies the Operations Organization complies with the ESMP</li> </ul>
E&R Manager	<ul style="list-style-type: none"> <li>• Endorses the ESMP</li> <li>• Administrative owner of the ESMP documentation</li> <li>• Jointly accountable with Operations Management for implementation of the ESMP</li> <li>• Provides technical support to operational staff for safety, health, environmental, and regulatory compliance-related ESMP requirements</li> <li>• Coordinates interfaces with Government agencies and external stakeholders on safety, health, environmental, regulatory compliance matters</li> <li>• Manages OIMS implementation and execution such that EEPGL meets the Corporate OIMS expectations</li> <li>• Responsible for EEPGL SSHE stewardship and performance reporting</li> </ul>
OIMS Administrator	<ul style="list-style-type: none"> <li>• Prepares and coordinates development of the detailed documentation and implementation plan for the System, including the development of procedures and practices that address applicable OIMS Expectations</li> <li>• Coordinates and participates in implementing the System including communicating the requirements and training personnel</li> <li>• Coordinates user measurement and verification activities and reports these results to the System Owner at an agreed frequency</li> <li>• Prepares and coordinates implementation of System maintenance activities including refresher training programs</li> <li>• With respect to changes to a System, the System Administrator will: <ul style="list-style-type: none"> <li>– Identify improvements to the System by evaluating the Measurement and verification processes, internal and external assessment results, and input solicited from or by System users</li> <li>– Develop improvement proposals</li> <li>– Coordinate proposed significant changes with the System 1-1 Administrator</li> </ul> </li> <li>• Implements approved System improvements, including new or revised procedures and practices; distributes revisions and conducting any recommended communication and training</li> </ul>
OIMS Steering Committee	<ul style="list-style-type: none"> <li>• Stewards the performance of OIMS System Operating and Environmental Obligations through OIMS System Leading, Managing &amp; Driving Performance,</li> </ul>
General Counsel	<ul style="list-style-type: none"> <li>• Evaluates application and interpretation of relevant laws, regulations, and other legal frameworks</li> <li>• Advises on appropriate mechanisms to ensure compliance with legal requirements by the company</li> </ul>
Wells Execution Manager	<ul style="list-style-type: none"> <li>• Implements the operational requirements of the ESMP within the Wells organization.</li> <li>• Responsible for implementation of operations integrity requirements related to Wells.</li> <li>• Coordinates with Wells contractor community to enhance local content.</li> </ul>

Role	Responsibilities
Senior Director Public & Government Affairs	<ul style="list-style-type: none"> <li>• Jointly accountable with Operations Management for implementation of the Socioeconomic Management Plan within the ESMP</li> <li>• Provides technical support to operational staff for socioeconomic-related ESMP requirements</li> <li>• Coordinates interfaces with Government agencies and external stakeholders with regards to public and government affairs matters</li> </ul>

## 2.7. COMPETENCY, TRAINING, AND AWARENESS

EEPGL will assign suitably competent personnel to manage and support the Project activities in alignment with OIMS, which provides guidelines for personnel selection, placement, and competency verification. EEPGL will provide/validate that its personnel have been provided the appropriate SSHE training, in alignment with OIMS. EEPGL will verify that its contractors have competency, training, and awareness programs in place that are consistent with EEPGL’s programs, in alignment with OIMS.

Training topics have been incorporated within EEPGL’s 5-2 training matrix to develop competency and awareness. The following topics will be covered in awareness training or specific training sessions based on designation of personnel:

- Environmental Awareness and Safety
  - Environment Policy, plans, and management system
  - Objectives and performance standards
  - Environmental issues (global, regional, and local)
  - Potential environmental risks and hazards related to specific work tasks, and preventive and mitigating measures for those risks
  - Emergency Response
  - Upstream Project Environmental Standards
  - Environmental Performance Indicators/EDMS
  - EEPGL’s ESMP
  - General / Onshore / Offshore Waste
- Regulatory Compliance
  - Legal requirements (laws, regulations, contracts, obligations, commitments, licenses, and approval/permit requirements)
  - IsoMetrix (compliance management)
  - Reporting of spills and releases (emissions, effluents, and wastes)
- Socioeconomic Management
  - Security and Human Rights
  - Upstream Socioeconomic Standard

EEPGL will include ESMP-related training and awareness in the above programs, as appropriate, to ensure that personnel with ESMP roles and responsibilities understand expectations related to commitments and obligations, mitigation measures, monitoring

programs, and reporting. Table 2.7-1 provides a conceptual overview of roles and responsibilities for EEPGL’s competency, training, and awareness program.

**Table 2.7-1: Training Roles and Responsibilities**

<b>Position</b>	<b>Responsibilities</b>
Management	<ul style="list-style-type: none"> <li>• Endorse overall training processes and procedures</li> <li>• Verify competent and trained personnel are available to support Project activities</li> </ul>
Site Supervision	<ul style="list-style-type: none"> <li>• Ensure their personnel have the required knowledge and skills to perform job tasks</li> <li>• Review and approve training plans for their personnel</li> <li>• Provide time/resources required for their personnel to complete/maintain training</li> <li>• Review training progress for their personnel on an annual basis</li> <li>• Consult with management on actions to take when a person does not meet the requisite knowledge/skills after training has occurred</li> </ul>
Personnel	<ul style="list-style-type: none"> <li>• Complete training requirements</li> <li>• Provide feedback on training received</li> </ul>
SSHE Personnel	<ul style="list-style-type: none"> <li>• Provide SSHE training programs with support from training resources</li> </ul>
Training Resources	<ul style="list-style-type: none"> <li>• Provide SSHE training programs with support from SSHE personnel</li> <li>• Assist with delivery of training (where appropriate) and evaluate training results</li> </ul>

### **2.7.1. Training Programs and Delivery**

EEPGL will develop competency, training, and awareness programs appropriate to the Project’s needs. Training may be provided through a variety of means, which may include but is not limited to briefings, toolbox talks, coaching/mentoring, on-the-job training in specific elements or tasks, self-study, instructor-led training, seminars, workshops, computer-based training, or the provision of specific skills, as necessary. These and other means (such as posters, signs, site newsletters, etc.) may be used to promote environmental, socioeconomic, and regulatory compliance awareness. Training programs may be delivered by both EEPGL, contractor, and third-party training resources.

## **3. PROJECT-SPECIFIC AND COUNTRY-SPECIFIC MANAGEMENT PLANS**

In accordance with the structure of the ESMP as described in Chapter 11 of the Yellowtail EIA, the ESMP includes several Project- and country-specific management plans that are organized into five categories:

- Environmental Management
- Socioeconomic Management
- Environmental and Socioeconomic Monitoring
- Emergency Response, which includes Oil Spill Response
- Preliminary End of Operations Decommissioning

Each of the above categories includes one or more specific management plans, which are included within the body of this document unless otherwise noted, as shown in Figure 3.1-1.

### **3.1. ENVIRONMENTAL MANAGEMENT PLAN**

#### **3.1.1. Introduction and Scope**

The purpose of the Environmental Management Plan is to identify specific measures that EEPGL or its contractors will implement to avoid or minimize potential adverse environmental impacts of the Project, and enhance positive benefits. The scope of this plan includes environmental impacts that could potentially result directly or indirectly from the Project, and over which EEPGL exercises control.

#### **3.1.2. Management Measures**

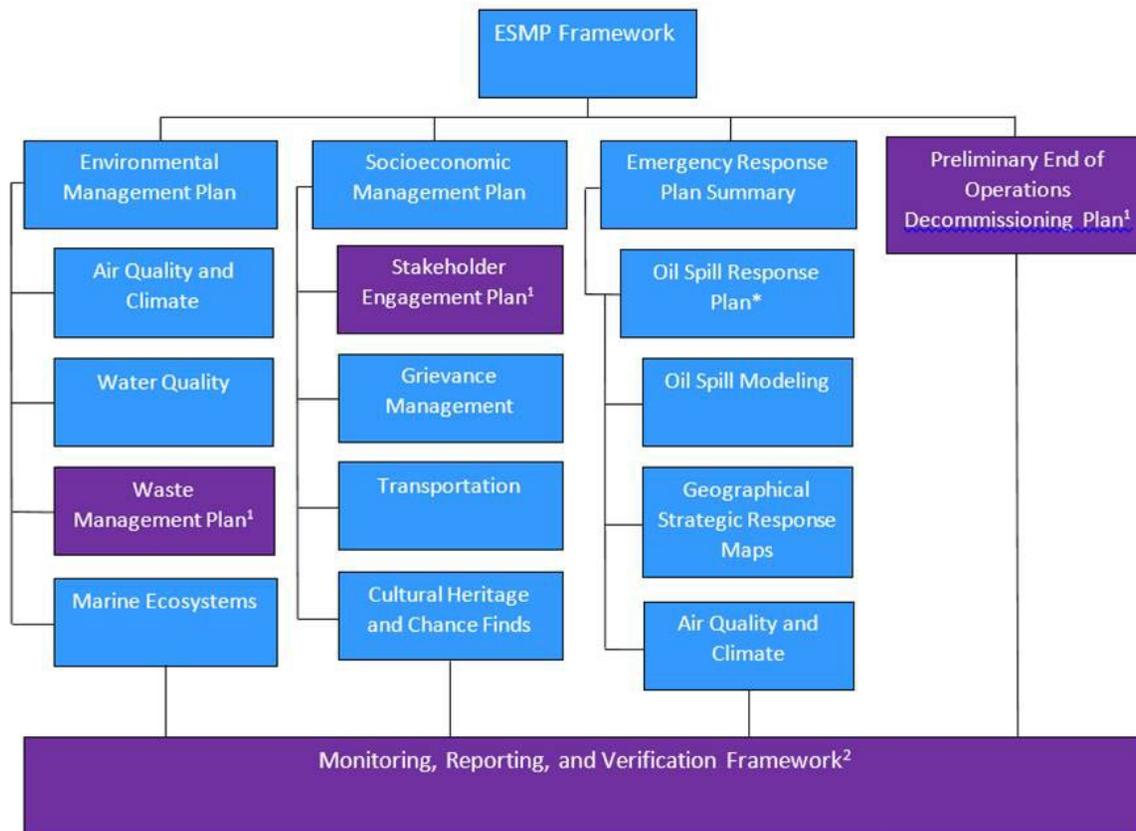
This section summarizes the potential impacts of the Project that require management actions as identified in the EIA. The following sub-sections identify the source of impact, the affected receptor, a description of the management measure, and the specific Project facilities for which the control/measure will be implemented. The sub-sections are organized by primary receptor, but many of the measures listed in the following subsections will address potential induced or indirect impacts on other receptors as well as those on the primary receptor.

##### ***3.1.2.1. Air Quality and Climate Management Measures***

EEPGL will implement measures to manage potential impacts on air quality and climate as listed in Table 3.1-1.

##### ***3.1.2.2. Water Quality Management Measures***

EEPGL will implement measures to manage potential impacts on marine water quality as listed in Table 3.1-2.



<sup>1</sup> Due to the size and/or complexity of these documents, these are stand-alone plans, and are provided as an appendix to the ESMP or as a separate attachment to the regulatory submittal for the Yellowtail Development Project (e.g., Oil Spill Response Plan).

<sup>2</sup> The Monitoring, Reporting, and Verification Framework is currently under development by EEPGL in accordance with the Environmental Permit issued for the Payara Development Project.

**Figure 3.1-1: ESMP Structure**

**Table 3.1-1: Air Quality and Climate Management Measures**

Source of Impact	Receptor	Management Measure	Involved Facility
Emissions to Atmosphere	Air Quality and Climate	Instead of continuous flaring of gas produced during crude oil production, re-inject associated gas that is not used as fuel gas on the FPSO into the reservoir, to avoid routine flaring of associated gas.	FPSO
Emissions to Atmosphere	Air Quality and Climate	EEPGL plans to develop a flare minimization plan for the Yellowtail Development Project.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Implement an FPSO topsides leak detection and repair program to reduce fugitive emissions.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Use highly efficient combustion equipment that utilizes recovery heat systems as part of the heat and power production.	FPSO
Emissions to Atmosphere	Air Quality and Climate	With respect to non-routine flaring, the following measures will be implemented: <ul style="list-style-type: none"> <li>• Properly inspect, maintain, monitor, certify, and function-test flare equipment prior to and throughout operations;</li> <li>• Design and build combustion equipment to appropriate engineering codes and standards;</li> <li>• Use flare tip of a non-pollutant type, with low NOx emissions, and a burning efficiency high enough to support low hydrocarbon emissions to the atmosphere.</li> <li>• Minimize risk of pilot blowout by ensuring sufficient exit velocity and provision of wind guards;</li> <li>• Use a reliable pilot ignition system;</li> <li>• Install high-reliability instrument pressure protection systems, as appropriate, to reduce overpressure events and avoid or reduce flaring situations;</li> <li>• Minimize liquid carryover and entrainment in the gas flare stream with a suitable liquid separation system, with sufficient holding capacity for liquids that may accumulate, and which is designed in accordance with good engineering practice;</li> <li>• Equip liquid separation system (e.g., knockout drum) with high-level facility shutdown or high-level alarms and empty as needed to increase flare combustion efficiency;</li> <li>• Minimize flaring from purges and pilots without compromising safety through measures such as installation of purge gas reduction devices, vapor recovery units, inert purge gas, and soft seat valve technology where appropriate, and installation of pilot flares;</li> <li>• Minimize flame lift off and/or flame lick.</li> </ul>	FPSO
Emissions to Atmosphere	Air Quality and Climate	Employ reasonable efforts and execute a maintenance program to minimize equipment breakdowns and plant upsets that could result in flaring, and make provisions for equipment sparing and plant turn-down protocols where practical.	FPSO

Source of Impact	Receptor	Management Measure	Involved Facility
Emissions to Atmosphere	Air Quality and Climate	Implement inspection, maintenance, and surveillance programs to identify and prevent unplanned emissions to atmosphere onboard the FPSO.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Use aero-derivative turbines instead of industrial turbines on the FPSO.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Use a crude–crude exchanger to recover heat from the dead crude to heat up live crude, instead of using a fired heater.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Install waste heat recovery units (WHRUs) on turbine generators to reduce the demand of more power generation or fired heaters, thus decreasing fuel gas consumption.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Use a large power plant and maximize the use of mechanical driven equipment that is more energy efficient. Use a gas turbine to drive the compressor directly, allowing savings in fuel versus using a gas turbine to generate electricity, then using an electric motor to drive the compressor—reducing motor losses and power generation losses.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Use large, high-voltage motors, which are more efficient than industry-standard machines.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Use the same gas turbines for the main generators, designed slightly larger than the need for the compressor such that when one compressor trips, the second unit still can meet 60 percent of production and thus reduce flaring.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Use an increased inlet pressure to decrease the overall compression requirements, which leads to a reduction in power demand and fuel consumption.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Optimize gas turbine maintenance to ensure that gas turbines are not overhauled more often than needed, and also to ensure overhauls are completed at the right time, in alignment with other FPSO maintenance activities to reduce the need to flare.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Implement trip reduction initiatives for the gas turbines to improve reliability / availability to reduce flaring.	FPSO
Emissions to Atmosphere	Air Quality and Climate	If well testing <sup>1</sup> is performed, implement the following measures: <ul style="list-style-type: none"> <li>• Flow only the minimum volume of hydrocarbons required for the test and reduce the test duration to the extent practical;</li> </ul>	Drill Ships

<sup>1</sup> While well testing is not planned for the Project, there is the potential it could be needed, in which case EEPGL will implement the measures in Table 3.1-1.

Source of Impact	Receptor	Management Measure	Involved Facility
		<ul style="list-style-type: none"> <li>• Use an efficient test flare burner head equipped with an appropriate combustion enhancement system to minimize incomplete combustion, black smoke, and hydrocarbon fallout<sup>2</sup> to the sea;</li> <li>• Provide adequate gas sensors that are appropriately located during testing operations, so that all sources of gas can be detected;</li> <li>• Monitor pipes and joints on a daily basis for leakages and fugitive emissions. Burn all collected gaseous streams in high-efficiency flares, and implement and maintain a leak detection and repair program;</li> <li>• Keep the well test to the minimum practical time, in keeping with a pre-approved schedule with the EPA. Notify the EPA immediately in case of any deviation/variation to the well test; and</li> <li>• Provide sufficient compressed air to the oil burner for efficient flaring assignment.</li> </ul>	
Emissions to Atmosphere	Air Quality and Climate	Regularly maintain equipment, marine vessels, vehicles, and helicopters and operate them in accordance with manufacturers' guidance and/or Company and Operator best practices, as applicable, and at their optimal levels to minimize atmospheric emissions and sound levels to the extent reasonably practicable.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels, Shorebases
Emissions to Atmosphere	Air Quality and Climate	Shut down (or throttle down) sources of combustion equipment in intermittent use where reasonably practicable in order to reduce air emissions.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels, Shorebases
Emissions to Atmosphere	Air Quality and Climate	Use low-sulfur (less than 0.5% sulfur content) fuels and/or natural gas on all Project vessels in turbines, reciprocating engines, or boilers used for heat or power generation or to drive machinery such as compressors or pumps per IMO Requirements (MARPOL 73/78 Annex 6).	Drill Ships, Installation / Decommissioning Vessels, Other Marine Vessels
Emissions to Atmosphere	Air Quality and Climate	Utilize dust suppression measures at the shorebases to reduce impacts on air quality.	Shorebases
Emissions to Atmosphere	Air Quality and Climate	Avoid routine venting (excludes tank flashing emissions, standing/ working/breathing losses, secondary seals) except during safety and emergency conditions.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Install vapor recovery for on the FPSO cargo tanks and low-flow process streams from produced water and triethylene glycol regeneration, resulting in a reduction in emissions to the atmosphere.	FPSO

<sup>2</sup> Hydrocarbons that are deposited on the ocean surface due to both wet and dry deposition processes

**Table 3.1-2: Water Quality Management Measures**

Source of Impact	Receptor	Management Measure	Involved Facility
Operational Discharges	Marine Water Quality	Treat produced water onboard the FPSO to an acceptable specification prior to discharging. Limit oil content of discharged produced water to 42 milligrams per liter (mg/L) on a daily basis or 29 mg/L on a monthly average. If oil content of produced water is observed to exceed these limits, route it to an appropriate storage tank on the FPSO until the treatment system is restored, and the discharge meets the noted specification.	FPSO
Operational Discharges	Marine Water Quality	Design cooling water discharges from FPSO to avoid increases in ambient water temperature of more than 3 degrees Celsius (5.4 degrees Fahrenheit) at 100 meters (approximately 328 feet) from discharge point.	FPSO
Operational Discharges	Marine Water Quality	Evaluate available alternatives for antifouling chemical dosing to prevent marine fouling of offshore facility cooling water systems. Where practical, optimize seawater intake depth to reduce the need for use of chemicals.	FPSO
Operational Discharges	Marine Water Quality	Implement chemical selection processes and principles that exhibit recognized industry safety, health, and environmental standards. Use low-hazard substances. The chemical selection process is aligned with applicable Guyanese laws and regulations and includes; <ul style="list-style-type: none"> <li>• Review of Safety Data Sheets;</li> <li>• Evaluation of alternate chemicals;</li> <li>• Consideration of hazard properties, while balancing operational effectiveness and meeting performance criteria, including: <ul style="list-style-type: none"> <li>– Using the minimum effective dose of required chemicals; and</li> <li>– Minimum safety risk relative to flammability and volatility;</li> </ul> </li> <li>• Risk evaluation of residual chemical releases into the environment.</li> </ul>	Drill Ships, FPSO, Installation/ Decommissioning Vessels, Other Marine Vessels
Operational Discharges	Marine Water Quality	Adhere to operational controls regarding material storage, wash-downs, and drainage systems.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Effluent Discharge to Sea	Marine Water Quality	Monitor residual chlorine concentration of sewage discharges from the FPSO monthly to ensure it is below 0.5 mg/L in accordance with MARPOL 73/78 regulations.	FPSO
Effluent Discharge to Sea	Marine Water Quality	For effluent released from the onboard sewage treatment plant, comply with aquatic discharge standards in accordance with MARPOL 73/78 regulations.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels

Source of Impact	Receptor	Management Measure	Involved Facility
Effluent Discharge to Sea	Marine Water Quality	Treat bilge water in accordance with MARPOL 73/78 to comply with an oil-in-water content of less than 15 ppm, as applicable. Perform oil in water content (automatic) monitoring of bilge water to verify compliance with 15 ppm and record in Oil Record Book.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Effluent Discharge to Sea	Marine Water Quality	Treat food waste in accordance with MARPOL 73/78 (e.g., food comminuted to 25-millimeter-diameter particle size or less) prior to discharge.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Discharge of Cuttings to Sea	Marine Water Quality	Use water-based drilling fluids to the extent reasonably practicable (upper sections of the wells). For well sections requiring non-aqueous drilling fluid (NADF), use only low-toxicity International Oil and Gas Producers Group III NADF.	Drill Ships
Discharge of Cuttings to Sea	Marine Water Quality	When NADF is used, use a solids control and cuttings dryer system to treat drill cuttings such that end-of-well maximum weighted mass ratio averaged over all well sections drilled using NADF does not exceed 6.9 percent wet weight base fluid retained on cuttings.	Drill Ships
Discharge of Cuttings to Sea	Marine Water Quality	Visually check and take appropriate measures to mitigate occurrence of free oil resulting from discharge of NADF drill cuttings.	Drill Ships
Commissioning Discharges; Operational Discharges	Marine Water Quality	Confirm there is no visible oil sheen from commissioning-related discharges (i.e., flowlines/risers commissioning fluids, including hydrotesting waters) or FPSO cooling water discharge. Perform daily inspections to verify no visible sheen from discharge of cooling water.	All Marine Vessels, SURF, FPSO
Drilling and Operational Discharges	Marine Water Quality	For all vessel effluent discharges (e.g., storage displacement water, ballast water, bilge water, deck drainage), comply with International Maritime Organization (IMO) and (MARPOL 73/78) requirements.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Ballast Water Discharges	Marine Water Quality	Abide with IMO guidelines including the International Convention for the Control and Management of Ship's Ballast Water and Sediments (2004), with the exception of Regulation D-2 (Ballast Water Performance Standard) while the FPSO is on station, and abide with MARPOL 73/78.	FPSO
Drilling and Operational Discharges	Marine Water Quality	Inspect and maintain onboard equipment (engines, compressors, generators, sewage treatment plant, and oil-water separators) in accordance with manufacturers' guidance and/or Company and Operator best practices, as applicable, in order to maximize efficiency and minimize malfunctions, and unnecessary discharges into the environment.	Drill Ships, FPSO, Installation/ Decommissioning Vessels, Other Marine Vessels

Source of Impact	Receptor	Management Measure	Involved Facility
Hydrocarbon Spills	Marine Water Quality	With respect to prevention of spills of hydrocarbons and chemicals during the drilling stage: <ul style="list-style-type: none"> <li>• Change liquid hydrocarbon transfer hoses periodically;</li> <li>• Use dry-break connections on liquid hydrocarbon bulk transfer hoses;</li> <li>• Use a liquid hydrocarbon checklist before every bulk transfer;</li> <li>• Perform required inspections and testing of all equipment prior to deployment/installation;</li> <li>• Use overbalanced drilling fluids to control wells while drilling;</li> <li>• Perform operational training certification (including well-control training) for drill ship supervisors and engineers;</li> <li>• Regularly audit field operations on the drill ships to ensure application of designed safeguards</li> </ul>	Drill Ships
Hydrocarbon Spills	Marine Water Quality	Install a blowout preventer system that can be closed rapidly in the event of an uncontrolled influx of formation fluids and that allows the well to be circulated to safety by venting the gas at surface and routing oil so that it may be contained.	Drill Ships
Hydrocarbon Spills	Marine Water Quality	Test blowout preventer equipment at installation, after disconnection or repair of any pressure containment seal, and at regular intervals (at least every 14 days or as operations allow).	Drill Ships
Hydrocarbon Spills	Marine Water Quality	Utilize breakaway couplers on offloading hose that would stop the flow of oil from FPSO during an emergency disconnect scenario.	FPSO
Hydrocarbon Spills	Marine Water Quality	Utilize leak detection controls during FPSO offloading (e.g., for breach of floating hose, instrumentation/procedures to perform volumetric checks).	FPSO
Hydrocarbon Spills	Marine Water Quality	Establish operating conditions for FPSO offloading to tankers to support safe operations. In the event that adverse weather occurs during offloading operations that is beyond the environmental operating limit, the tanker will cease offloading operations, and may disconnect and safely maneuver away from the FPSO as appropriate.	FPSO, Offloading Tankers
Hydrocarbon Spills	Marine Water Quality	Utilize leak detection controls during installation and operation of SURF equipment (e.g., pigging and pressure testing of lines, periodic remotely operated vehicle (ROV) surveys of subsea trees, manifolds, flowlines, and risers).	FPSO, SURF
Hydrocarbon Spills	Marine Water Quality	Utilize leak detection systems for equipment, treatment, and storage facilities (fuel, chemical, etc.) on drill ships in accordance with good international oilfield practice.	Drill ships

Source of Impact	Receptor	Management Measure	Involved Facility
Hydrocarbon Spills	Marine Water Quality	Utilize secondary containment for storage of bulk fuel, drilling fluids, and hazardous materials, where reasonably practicable.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels, Shorebases
Hydrocarbon Spills	Marine Water Quality	With respect to prevention of spills of hydrocarbons and chemicals: <ul style="list-style-type: none"> <li>Regularly (e.g., monthly) check pipes, storage tanks, and other equipment associated with storage or transfer of hydrocarbons/chemicals for leaks.</li> <li>Regularly inspect and service shorebase cranes and construction equipment to mitigate the potential for spills to the extent reasonably practicable.</li> </ul>	Shorebases
Hydrocarbon Spills	Marine Water Quality	Maintain an OSRP to support an effective response to an oil spill, including maintaining the equipment and other resources specified in the OSRP. Conduct periodic inspections, training and drills including monthly inspection of oil spill response equipment, quarterly test runs of oil spill response equipment, annual preventive maintenance program execution, and annual exercise and deployment of oil spill response equipment to test readiness and response capability.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels, Shorebases
Hydrocarbon Spills	Marine Water Quality	Implement the OSRP in the unlikely event of an oil spill, including: <ul style="list-style-type: none"> <li>Conducting air quality monitoring during emergency response;</li> <li>Requiring use of appropriate Personal Protective Equipment by response workers; and</li> <li>Implementing a Wildlife Oil Response Program, as needed.</li> </ul>	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels, Shorebases
Spills	Marine Water Quality	Procedures for loading, storage, processing, and offloading operations, either for consumables (i.e., fuel, drilling fluids, and additives) or for liquid products, should be utilized to minimize spill risks. Pumps, hoses, and valves should be inspected and maintained on a monthly basis.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels, Shorebases

### **3.1.2.3. Waste Management**

The Project will evaluate waste generation volumes associated with Project activities. Locations and capacities of acceptable waste handling, treatment, storage, and disposal facilities will be further assessed in relation to Project waste generation.

### **3.1.2.4. Marine Ecosystems**

EEPGL will implement measures to manage potential impacts on marine ecosystems as listed in Table 3.2-1.

In addition to the measures listed in Table 3.2-1, most if not all of the water quality management measures listed in Table 3.1-2 will also contribute to management of Project-related impacts on marine ecosystems.

## **3.2. SOCIOECONOMIC MANAGEMENT PLAN**

Under planned operations, the Project is expected to have few adverse socioeconomic impacts, and likely an overall positive impact due to increased revenues to the Guyanese government, as well as increased local business activity as a result of Project procurement and employment. Nevertheless, EEPGL is committed to minimizing any anticipated adverse socioeconomic impacts, as well as enhancing positive benefits associated with the Project, through the implementation of a Project-specific Socioeconomic Management Plan (SMP).

### **3.2.1. Introduction and Scope**

The purpose of the SMP is to identify actions that EEPGL or its contractors will implement to avoid, minimize, or mitigate potential adverse socioeconomic impacts from the Project, or to enhance benefits of the Project.

The scope of this plan includes socioeconomic impacts that could potentially result directly or indirectly from the Project, due to activities over which EEPGL exercises control. In addition, specific actions and goals related to local workforce and supplier development are addressed separately under a Project-specific Local Content Plan, which is outside the scope of the EIA and ESMP.

**Table 3.2-1: Marine Ecosystem Management Measures**

Source of Impact	Receptor	Management Measure	Involved Facility
Collision Between Vessels and Marine Species	Marine Mammals, Riverine Mammals, Marine Turtles, Seabirds	<ul style="list-style-type: none"> <li>• Provide awareness training to Project-dedicated marine personnel to recognize signs of marine mammals and riverine mammals at the sea surface. Provide standing instruction to Project-dedicated vessel masters to avoid marine mammals, riverine mammals, and marine turtles while underway and reduce speed or deviate from course, when possible, to reduce probability of collisions.</li> <li>• Provide standing instruction to Project-dedicated vessel masters to avoid any identified rafting seabirds when transiting to and from PDA.</li> </ul>	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Collision Between Vessels and Marine Species	Marine Mammals, Marine Turtles	<ul style="list-style-type: none"> <li>• Provide standing instructions to Project-dedicated vessel masters to reduce their speed within 300 meters (984 feet) of observed marine mammals and marine turtles, and to not approach the animals closer than 100 meters (328 feet).</li> </ul>	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Auditory Impacts on Marine Species	Marine Mammals, Marine Turtles, Marine Fish	<ul style="list-style-type: none"> <li>• Employ trained Marine Mammal Observers during the conduct of seismic-related activities. Although use of Marine Mammal Observers is more effective for identification of marine mammals, these individuals can also detect marine turtles depending on weather conditions, and they will be tasked with observing for marine turtles as well.</li> <li>• Conduct a continuous observation of a mitigation zone (500 meters [1,640 feet] around the sound source) to verify whether it is clear of marine mammals and marine turtles before commencing sound producing seismic operations. Do not conduct sound-producing seismic operations (including soft starts) if marine mammals or turtles are sighted within the mitigation zone during the 30 minutes prior to commencing sound-producing operations in water depths less than 200 meters (656 feet), or 60 minutes prior to commencing sound-producing operations in water depths greater than 200 meters (656 meters).</li> <li>• Adhere to the JNCC Guidelines (2017) during the conduct of seismic-related activities. Record all marine mammals, protected species, and marine turtle observations and respective mitigation actions (e.g., delay of soft start) in a standardized report format and submit a copy of the report to the Agency within 45 days of the activity completion. The report should contain at minimum the following:               <ol style="list-style-type: none"> <li>i. The location, date and start time of the activity;</li> <li>ii. Name, qualification and experience of Marine Mammal Observers involved in the survey;</li> <li>iii. The location, time and reasons when observations were hampered by poor visibility or high winds;</li> </ol> </li> </ul>	Drill Ships, FPSO, Installation/ Decommissioning Vessels, Other Marine Vessels

Source of Impact	Receptor	Management Measure	Involved Facility
		iv. The location and time when any start-up delays, power downs or stop work procedures were initiated due to marine mammal, protected species and marine turtle sightings; v. The location, date, time and distance of any marine mammal, protected species and marine turtle sighting including species where possible and whether the sound source was active at the time of sighting; and • vi. The date and time when the activity was completed. • Where reasonably practicable, equip sound-making devices or equipment with silencers or mufflers that are enclosed, and/or use soft-start procedures (e.g., for pile driving, vertical seismic profiling, etc.) to reduce noise to levels that do not cause material harm or injury to marine species.	
Entrainment or Impingement of Marine Fish	Marine Fish	• Provide screening for seawater intakes to avoid entrainment and impingement of marine flora and fauna.	FPSO, Drill Ships
Visual Disturbance of Marine Species	Marine Turtles, Seabirds	• Where reasonably practicable, direct lighting on FPSO and major Project vessels to required operational areas rather than at the sea surface or skyward. Adhere to maritime safety regulations/standards for lighting on vessels.	FPSO, Drill Ships

## **3.2.2. Management Measures**

### **3.2.2.1. Stakeholder Engagement**

EEPGL has developed a Stakeholder Engagement Plan for Guyana Operations (SEP) aimed at fostering ongoing communication with stakeholders, toward the objectives of (1) identifying, understanding, and addressing community/stakeholder priorities and concerns, and (2) improving Project decision-making and transparency. The SEP is considered a key component of the SMP and is an evergreen document subject to update throughout the Project as EEPGL conducts more engagement activities and gains further insight and understanding about different stakeholders and their concerns. The full SEP is provided as a stand-alone document separate from this ESMP. The SEP supports EEPGL's activities in Guyana and includes a summary of major engagements conducted to date, including those related to the Liza Phase 1, Liza Phase 2, Payara, and Yellowtail EIA processes.

### **3.2.2.2. Grievance Management**

EEPGL has developed a mechanism by which stakeholders (including employees) can provide feedback in the form of issues, concerns, comments, and grievances, and which will allow the Project to respond to or address such feedback in a consistent, transparent, and timely manner. The implementation of such a mechanism complements proactive or preventative management policies or procedures already in place, ensuring that when administrative controls do not adequately address an issue, there is recourse for resolution. EEPGL has a Community Grievance Mechanism (CGM), which allows EEPGL and its contractors to receive and respond to stakeholders regarding a range of potential Project activities and impacts. The CGM will apply to all aspects of the Project and will be open to any affected stakeholder. As such, it will play a role in monitoring the effectiveness of other socioeconomic management measures (see Section 3.6, Environmental and Socioeconomic Monitoring Plan). EEPGL has the responsibility for day-to-day functioning of the CGM.

Objectives of the CGM are to:

- Provide stakeholders with a mechanism to communicate feedback, issues, concerns, requests, and/or complaints to EEPGL in a timely manner so that they can be addressed quickly and proactively;
- Process grievances so they are acknowledged, tracked, and addressed by EEPGL in a timely and confidential manner;
- Continuously improve Project performance in key areas as a result of stakeholder feedback provided through the CGM; and
- Demonstrate EEPGL's commitment to meaningful stakeholder engagement and respect for local opinions and concerns.

## **Guiding Principles of the CGM**

The CGM has been developed in line with the following core principles:

- Ensure communities face no barriers to accessing and using the mechanism;
- Establish the mechanism early on;
- Base the mechanism on a transparent, predictable process and ensure it is well publicized and understood;
- Build trust in the legitimacy and fairness of the mechanism; and
- Create an organizational structure and mind-set that support the mechanism.

## **Definition of Grievances**

Inquiries received by EEPGL will fall into one of five categories defined as follows:

1. **Complaint**—An expression of discontent, regret, pain, censure, resentment, or grief. A direct, tangible incident along with its alleged damage, impact, or dissatisfaction that occurred as a result of company or contractor actions, perceived or actual. Complaints are typically accompanied by a request for resolution and rectification.
2. **Concern**—A matter that engages a person’s attention, interest, or care, or that affects a person’s welfare or happiness. Related to questions or requests for information or general perceptions unrelated to a specific impact or incident and/or recorded in an individual grievance. Concerns are good indicators of where stakeholders lack or misunderstand information.
3. **Issue**—A point in question or a matter that is in dispute, as between contending parties in an action at law. A pre-existing complaint or concern between two non-Project entities, one of which may attempt to use the company’s activities as the leverage to achieve resolution. Issues should be transmitted to the entities directly involved along with an explanation as to how they can affect the company. Issues may evolve into loss of the Project’s social license to operate if not handled properly.
4. **Request**—The act of asking for something to be given or done, especially as a favor or courtesy; a solicitation or petition. A communication from a stakeholder asking for something—donation, community project, job, contract, or some other benefit for a group or individual. Requests may evolve into loss of the Project’s social license to operate if not handled properly.
5. **Guidance**—A piece of advice or information aimed at resolving a problem or difficulty, especially as given by someone in authority.

## Implementation of the CGM

Project contractors and EEPGL will coordinate in the process of addressing issues on a regular basis. It is the responsibility of Project contractors to report all grievances received, along with the required information for entry into the CGM, and it is the responsibility of EEPGL to investigate each grievance and ensure the grievance is addressed in a timely manner. Contractors will be provided a Project-specific CGM log (consistent with EEPGL's log) to ensure the consistent collection of grievance information, which will be completed and submitted to EEPGL on a periodic basis. This will include:

- Type of grievance—issue, concern, compliant (e.g., property damage, work conditions, noise, traffic);
- Brief description of grievance;
- Status of grievance (registered, assessed, under investigation, in resolution, closed);
- Date grievance was received; and
- Date the incident occurred, if applicable.

The CGM procedure is depicted in Figure 3.2-1. As shown on Figure 3.2-1, stakeholder feedback can be received by EEPGL or its contractors in the following five ways:

1. In person, either to an EEPGL employee, representative or contractor;
6. Via EEPGL telephone— (592) 231 2866
7. Via EEPGL email—[Guyanastaff@exxonmobil.com](mailto:Guyanastaff@exxonmobil.com)
8. Via ExxonMobil Guyana Facebook—<https://www.facebook.com/exxonmobilguyana>
9. Via EEPGL website—[www.exxonmobil.com/guyana](http://www.exxonmobil.com/guyana)

Responsible parties must be identified to manage receipt of the grievances at each feedback avenue, and these individuals must be trained in proper documentation of information and timely input of the data into the database. Upon receipt, EEPGL will register the grievance in a CGM database, determine the appropriate responsible party, and forward the grievance to that party for resolution. As is required by the type of grievance, the responsible party will then undergo investigation activities as appropriate for resolution and appropriate response to the grievant. Once resolved, a summary of the grievance resolution will be entered into the CGM database to allow for tracking and reporting. This consolidated database will also allow for the monitoring of Project-wide trends and for identification of potential recurring issues associated with specific contractors or Project activities.



GM = grievance mechanism

**Figure 3.2-1: EEPGL's Five-Step Grievance Management Procedure**

Responsible parties will be identified to manage receipt of the grievances at each feedback avenue, and these individuals will be trained in proper documentation of information and timely input of the data into the database. Upon receipt, EEPGL will register the grievance in a CGM database, determine the appropriate responsible party, and forward the grievance to that party for resolution. As is required by the type of grievance, the responsible party will then undergo investigation activities as appropriate for resolution and appropriate response to the grievant. Once resolved, a summary of the grievance resolution will be entered into the CGM database to allow for tracking and reporting. This consolidated database will also allow for the monitoring of EEPGL trends and for identification of potential recurring issues associated with specific contractors or EEPGL activities. Receipt, registration, prioritization, and resolution of grievances using the CGM should adhere to the following guidelines:

1. Established forms to be filled in with all necessary information—clarify that if a grievance is submitted verbally, it must be transcribed as soon as practicable thereafter.
2. Details should be compiled, electronically if possible, and registers of chain of custody and communication must be established.
3. When a grievance is received with a name attached, the grievant must be notified within a specific timeline that their grievance has been registered, as well as provided with a timeline for future activities, including the timeline by when the Project should have a proposed resolution.
4. When a grievance is received without a name attached, the grievance must be addressed and documented within a pre-specified timeframe. If relevant and practicable (for example in the case of worker grievances), information on the grievance and how it has been addressed should be disseminated publicly. This should in no way infringe on the confidentiality of any grievant.
5. Where necessary/relevant, an interview with the grievant could be helpful to obtain further details.
6. Specified timeframes should be established for confirming receipt of the grievance, completing the investigation, and providing a resolution.
7. Options for resolution should include unilateral response, bilateral response (the aggrieved party and EEPGL developing a solution together), third-party response (though a mediator), or through a judicial process as appropriate, outside of the CGM. Given that the purpose of the mechanism is to proactively address concerns before they escalate, it is important to maximize the opportunities for bilateral response, wherever practicable.

### **CGM Mechanism Monitoring**

In addition to monitoring the effectiveness of the CGM itself, data from the CGM can be a useful tool in monitoring the effectiveness of management measures for a range of EEPGL and Project

aspects, in combination with other resource-specific monitoring indicators. CGM indicators that should be monitored include:

- Number and type of grievances registered within the reporting period (e.g., monthly, quarterly, or annually);
- Number of grievances closed during the reporting period; and
- Average time for processing and resolution of grievances.

Monitoring of these indicators will allow EEPGL to identify trends across the Project stages, activities, and facilities, allowing for adjustment of the CGM or other management plans and procedures.

It should be understood that receipt of a large number of grievances does not necessarily indicate poor Project performance; a large number could in fact be indicative of high-quality engagement and dialogue between the Project and the community. The goal of the CGM mechanism process should therefore not be to reduce the number of grievances received, but rather to develop and maintain trust and confidence on the part of the community that, when valid grievances arise, EEPGL will respond appropriately. Ensuring the same types of grievances are not raised repeatedly and maintaining a reasonable average time to achieve closure of grievances, are key indicators of good performance.

### **3.2.2.3. Socioeconomic Management Measures**

EEPGL will implement measures to manage potential socioeconomic impacts as listed in Table 3.2-2.

### **3.2.2.4. Marine Transportation**

EEPGL will implement measures to manage potential impacts on marine transportation, inclusive of marine safety risks, as listed in Table 3.2-3.

### **3.2.2.5. Air and Road Transportation**

EEPGL will implement measures to manage potential impacts on air and road transportation, inclusive of road safety risks, as listed in Table 3.2-4.

### **3.2.2.6. Cultural Heritage Management and Chance Finds**

#### **Cultural Heritage Management Plan**

EEPGL will implement a Cultural Heritage Management Plan aligned with good international oilfield practice and the National Trust of Guyana's "Guidelines for the protection of Monuments and Sites"<sup>3</sup> to protect cultural heritage that is inadvertently discovered during drilling and installation activities. The Cultural Heritage Management Plan includes a Cultural Heritage Monitoring Plan, Chance Find Procedure, and Cultural Heritage Training Program, as described below.

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<sup>3</sup> Guyana National Trust. "Guidelines for the Protection of Monuments and Sites." Revised 2017.

**Table 3.2-2: Socioeconomic Management Measures**

Source of Impact	Receptor	Management Measure	Involved Facility
Project Employment	Guyanese Population	Employ Guyanese citizens having the appropriate qualifications and experience where reasonably practicable. Partner with select local institutions and agencies to support workforce development programs and proactively message Project-related employment opportunities.	Project <sup>4</sup>
Project Procurement	Guyanese Population	Procure Project goods and services from Guyanese suppliers when available on a timely basis and when they meet minimum standards and are commercially competitive.	Project
Project Workforce	Guyanese Population	Proactively communicate the Project's limited staffing requirements as a measure to reduce the magnitude of potential population influx to Georgetown from job seekers.	Project
Project Workforce	Guyanese Population	Require Project workers to adhere to a Worker Code of Conduct, which will address shore-leave considerations.	Project
Waste Generation	Waste Management	Avoid, reduce, reuse, or recycle wastes preferentially prior to disposal in accordance with waste management hierarchy.	Shorebases, FPSO, Drill Ships, Installation Vessels
Waste Generation	Waste Management	Perform onshore waste treatment for certain categories of waste, thereby reducing demand on landfill capacity.	Waste management contractors
Waste Generation	Waste Management	Provide for adequate onshore waste management equipment and facilities for the proper management of waste in accordance with local regulation and good international oil field practice.	Waste management contractors
Waste Generation	Waste Management	For wastes that cannot be reused, treated, or discharged/disposed on the drill ships or FPSO, properly manifest and transfer such wastes to appropriate onshore facilities for management.	FPSO, Drill Ships, Shorebases, Installation Vessels
Waste Generation	Waste Management	For transport of hazardous wastes offsite for treatment or disposal, ensure the waste is accompanied by a manifest signed by the hazardous waste generator and transporter.	Shorebases, FPSO, Drill Ships, Installation Vessels
Waste Generation	Waste Management	Periodically audit waste contractors to verify appropriate waste management practices are being used.	Waste management contractors
Waste Generation	Waste Management	To address future waste capacity constraints in Georgetown relative to Project's predicted waste management needs:	Waste management contractors

<sup>4</sup> "Project" indicates these measures are not specific to an individual facility or group of facilities; they are companywide policies that would be applied across all Project-associated activities.

Source of Impact	Receptor	Management Measure	Involved Facility
		<ul style="list-style-type: none"> <li>• Monitor the construction of additional landfill sites (as decided by the government and subject to approval by the EPA), or identify suitable alternative (interim) local solutions for non-hazardous waste management.</li> <li>• As warranted based on anticipated future EEPGL hazardous waste generation trends and trends in non-EEPGL hazardous waste generation, continue enabling the expansion of existing local waste management capacity for hazardous wastes, and explore use of new local hazardous waste treatment facilities, or identify suitable alternative solutions.</li> <li>• Continue monitoring of plans for further expansion of the HBL and/or (if approved by the EPA) construction of additional landfill sites in other locations (as decided by the government), or identify suitable alternative (interim) local solutions for non-hazardous waste management.</li> </ul>	
Project Workforce	Guyanese Population	Use a dedicated medical provider to complement the services of the local private medical clinic used by the Project, and procure a dedicated ambulance to supplement the local medical infrastructure (ambulance has already been procured as of the writing of this EIA).	FPSO, Drill Ships, Installation Vessels
Various	Guyanese Population	Implement a transparent, accessible, and consistent CGM early on, prior to onset of Project activities.	NA
Various	Guyanese Population	Develop and implement a SEP.	NA
Various	Guyanese Population	Monitor grievances received and resolved by the CGM; adjust CGM and other management measures, as appropriate (see Section 3.6, Environmental and Socioeconomic Monitoring Plan).	NA
Various	Cultural Resources	Train Project and contractor personnel with the potential to identify underwater chance finds, so that these operators are informed about the identification of chance finds, appropriate use of the Chance Find Procedure, and monitoring and reporting requirements.	FPSO, Drill Ships, Installation Vessels
Various	Social Infrastructure	Communicate EEPGL's health, safety, and security standards and requirements to vendors and contractors, as appropriate.	NA

NA = not applicable

**Table 3.2-3: Marine Transportation Management Measures**

Source of Impact	Receptor	Management Measure	Involved Facility
Marine Casualty Event (Collision)	Non-Project Marine Vessels	<ul style="list-style-type: none"> <li>• Use a Class 3 Dynamic Positioning (DP) system, which includes numerous redundancies.</li> <li>• Ensure rigorous personnel qualifications and training.</li> <li>• Use sea trials and acceptance criteria.</li> <li>• Implement DP proving trials.</li> <li>• Conduct a System Failure Mode and Effects Analysis.</li> <li>• Conduct a DP failure consequence analysis.</li> <li>• Establish well-specific operations guidelines.</li> </ul>	Drill Ships
Marine Casualty Event (Collision)	Non-Project Marine Vessels	<ul style="list-style-type: none"> <li>• Employ dedicated Mooring Master to supervise offloading activities, according to the conditions of the sea. The conditions and characteristics of the export tankers will be assessed by the Mooring Master and reported to the Offshore Field Manager prior to commencing offloading operations. Use only properly registered and well-maintained double-hull vessels.</li> <li>• Use support tugs to aid tankers in maintaining station during approach/ departure from FPSO and during offloading operations.</li> <li>• Use a hawser with a quick release mechanism to moor the FPSO to the tanker at a safe separation distance during offloading operations.</li> </ul>	FPSO, Offloading Tankers
Marine Casualty Event (Collision)	Non-Project Marine Vessels	<ul style="list-style-type: none"> <li>• Promptly remove damaged Project vessels (associated with any vessel incidents) to minimize impacts on marine use, transportation, and safety</li> </ul>	FPSO, Drill Ships, Installation / Decommissioning Vessels, Other Support Vessels
Increased Vessel Traffic; Marine Casualty Event (Collision, Grounding); Reduced Ocean Surface Area Available for Non-Project Activities	Commercial Cargo and Fishing Vessels; Subsistence Fishing Vessels	<ul style="list-style-type: none"> <li>• Observe standard international and local navigation procedures in and around the Georgetown Harbour and Demerara River, as well as best ship-keeping and navigation practices while at sea.</li> <li>• Notices to Mariners are issued through MARAD for their communication with the public, and information is provided to the Department of Fisheries for their distribution to stakeholders (including associations, co-ops, and fisherfolk) within the fishing industry in country, regarding movements of major marine vessels (including the FPSO, drill ship, and installation vessels)—to aid them in avoiding areas with concentrations of Project vessels and/or where marine safety exclusion zones are active.</li> <li>• Augment ongoing stakeholder engagement process (along with relevant authorities) to identify commercial cargo, commercial fishing, and subsistence fishing vessel operators who might not ordinarily receive Notices to Mariners and, where possible,</li> </ul>	Shorebases, FPSO, Drill Ships, Installation / Decommissioning Vessels, Other Support Vessels

Source of Impact	Receptor	Management Measure	Involved Facility
		<p>communicate with them regarding major vessel movements and marine safety exclusion zones.</p> <ul style="list-style-type: none"> <li>• Equip Project vessels with radar systems and communication mechanisms to communicate with third-party mariners.</li> <li>• Maintain marine safety exclusion zones to be issued through the Maritime Administration Department with a 500-meter (approximately 1,640-foot) radius around drill ships and major installation vessels, and a 2-nautical-mile (approximately 12,150-foot) radius around FPSO during offloading operations, to prevent unauthorized vessels from entering areas with an elevated risk of collision.</li> <li>• Implement a SEP that includes a CGM process for stakeholders, including local fishing interests.</li> </ul>	

**Table 3.2-4: Air and Road Transportation Management Measures**

Source of Impact	Receptor	Management Measure	Involved Facility
Increased Aviation Traffic	Other Aircraft and Users of Ogle Airport	Coordinate with relevant aviation authorities and stakeholders to understand peak Project-related utilization rates.	FPSO, Drill Ships
Vehicular Accidents	Local Communities	Implement a community safety program for potentially impacted schools and neighborhoods to increase awareness and minimize potential for community impacts due to vehicle incidents.	Shorebases and Onshore Support Infrastructure
Vehicular Accidents	Local Communities	<p>Implement a Road Safety Management Procedure to mitigate increased risk of vehicular accidents associated with Project-related ground transportation activities. The Road Safety Management Procedure has been implemented as of the writing of this EIA, and the procedure includes the following components:</p> <ul style="list-style-type: none"> <li>• Definition of typical, primary travel routes for ground transportation in Georgetown area;</li> <li>• Development of an onshore logistics/journey management plan to reduce potential conflicts with local road traffic when transporting goods to/from onshore support facilities;</li> <li>• Definition of required driver training for Project-dedicated drivers, including (but not limited to) defensive driving, loading/unloading procedures, and safe transport of passengers, as applicable;</li> <li>• Designation and enforcement of speed limits through speed governors, global positioning system, or other monitoring systems for Project-dedicated vehicles;</li> <li>• Avoidance of deliveries during typical peak-traffic hours as well as scheduled openings of the Demerara Harbour Bridge, to the extent reasonably practicable;</li> <li>• Monitoring and management of driver fatigue;</li> <li>• Definition of vehicle inspection and maintenance protocols that include all applicable safety equipment for Project-dedicated vehicles; and</li> <li>• Community outreach to communicate information relating to major delivery events or periods.</li> </ul>	

## **Cultural Heritage Management Plan**

EEPGL will implement this Cultural Heritage Management Plan aligned with international practice to protect cultural heritage that is inadvertently discovered during drilling and installation activities. The plan includes a Cultural Heritage Monitoring Plan, Chance Find Procedure, and Cultural Heritage Training Program, as described below.

### **Cultural Heritage Monitoring Program**

In consultation with the National Trust of Guyana and other relevant cultural heritage stakeholders, EEPGL will implement a Cultural Heritage Monitoring Program for all activities that disturb the seafloor. The purpose of this monitoring is to identify, record, and protect cultural heritage that was not identified during pre-drilling or pre-installation cultural heritage investigations. Monitoring will be conducted by Project staff supported by a remote professional cultural heritage specialist (CHS) who will be on call to assess any potential chance finds that are identified. Cultural heritage monitoring will be conducted by any EEPGL or contractor staff with the potential to discover underwater cultural heritage, which would generally be limited to automated underwater vehicle/remotely operated vehicle (ROV) operators. These staff will be responsible for reporting any potential chance finds to Project management, who would then notify the CHS.

### **Chance Find Procedure**

The following types of underwater cultural heritage, while not likely present based on studies conducted to date, could potentially be encountered during the drilling or installation stages:

- Shipwrecks or parts thereof; and
- Artifacts from debris fields associated with shipwrecks.

The Chance Find Procedure will use a two-tiered approach for identifying, assessing, and resolving potential chance finds. The purpose of this approach is to utilize an on-call CHS to resolve minor chance finds without necessitating consultations with the National Trust of Guyana, and to minimize Project delays by allowing for the quick resolution of non-significant finds. The defining characteristics of each chance find tier and the processes for assessing them and determining if consultation is required will be developed in consultation with the National Trust of Guyana and other cultural heritage stakeholders prior to the drilling and installation programs, as appropriate.

Potential chance finds identified will be reported as soon as practicable (i.e., within approximately 24 hours) to EEPGL and the designated CHS, using the Chance Find Reporting Form in Figure 3.2-2. The CHS will determine if the potential chance find is cultural heritage and, if so, assign it to a chance finds tier. Figure 3.2-3 provides a detailed flow diagram of the Chance Find Procedure. All chance finds will follow the two-tiered hierarchy that is presented in Table 3.2-5.

Chance Find Reporting Form

Date of find:

Location of find (description and GPS):

Photo of find (to be attached to form):

Project person making the find:

Project person notified of the find:

Date notified:

Time notified:

Cultural Heritage Specialist notified of the find:

Date notified:

Time notified:

Description of the find:

Description of the initial response to the find:

Prescribed treatment methodology for the find and any needed modifications to Project execution:

Date of handover of the artifact(s), if recovered to surface:

Recipient of the artifact(s), if recovered to surface:

Date of closure of the chance find:

**Figure 3.2-2: Chance Find Reporting Form**

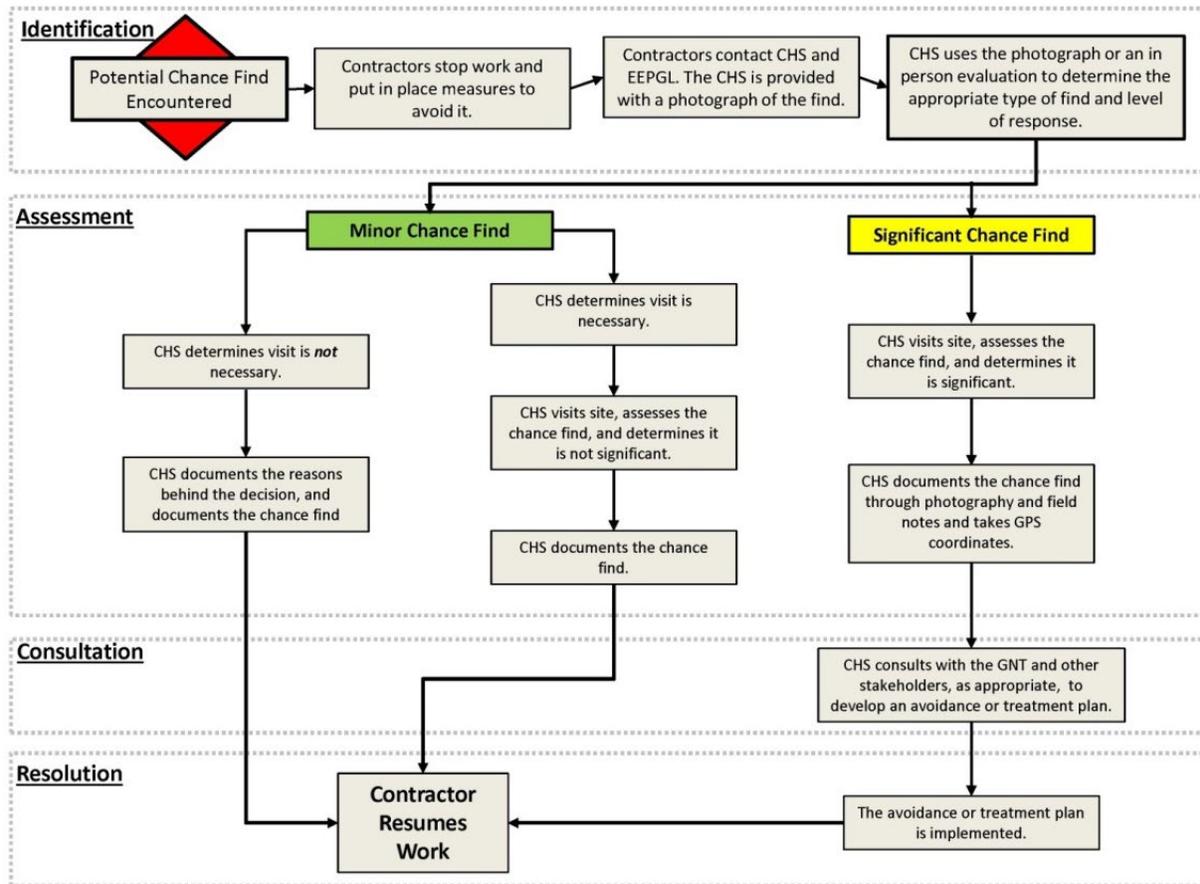


Figure 3.2-3: Chance Find Procedure Flow Chart

Table 3.2-5: Two-tiered Chance Find Hierarchy

Chance Find Type	Characteristics	Evaluation Process
Minor Chance Finds	Modern features or objects that do not meet the criteria for cultural heritage under Guyana laws and regulations.	Drilling and installation activities will stop in the area of the find as soon as safely possible, where appropriate and where practical. The potential chance find will be reported to EEPGL (if found by a contractor) and the CHS within approximately 24 hours. In the unlikely event an artifact is brought to the surface, the CHS will determine if a site visit is necessary to examine the artifact. If the potential chance find is discovered in situ, the CHS will examine images collected from the ROV. If the CHS determines that it is a minor chance find, drilling and installation activities will resume in the area. Drilling and installation activities will not be stopped if there is no reasonable expectation that the potential chance find would not be disturbed/damaged.

Chance Find Type	Characteristics	Evaluation Process
Significant Chance Finds	Significant historic features (e.g., shipwrecks), objects (i.e., artifacts), or human remains that meet the criteria for cultural heritage under Guyana laws and regulations.	Drilling and installation activities will stop in the area of the find as soon as safely possible, where appropriate and where practical. The potential chance find will be reported to EEPGL (if found by a contractor) and a CHS within approximately 24 hours. In the unlikely event an artifact is brought to the surface, the CHS will determine if a site visit is necessary to examine the artifact. If the potential chance find is discovered in situ, the CHS will examine images collected from the ROV. If the CHS determines that it is a significant chance find, the CHS will develop an avoidance or treatment plan in consultation with the National Trust of Guyana. Installation activities will resume in the area upon acceptance of the avoidance plan or completion of the treatment plan. Drilling and installation activities will not be stopped if there is no reasonable expectation that the potential chance find would not be disturbed/damaged.

Since little to no material from the seafloor is expected to be brought to the surface, the collection of artifacts is not anticipated. In the unlikely event underwater chance finds are accidentally brought to the surface, they should be immediately placed in a container filled with sea water from the area of the find and maintained indefinitely, as exposure to the air can cause artifacts that have been underwater to decompose or oxidize very rapidly. Documentation of the find, including photographs of the artifact(s) with a scale included in the frame, should be made immediately. Artifacts and associated documentation and photographs taken by Project personnel should be given to the designated CHS.

Although recovery of underwater artifacts to the surface is not anticipated, any recovered artifacts would belong to the Guyanese government. All recovered artifacts would be handled in accordance with the guidance provided by the guidelines and EEPGL would be responsible for providing recovered artifacts to the National Trust of Guyana. For underwater chance finds not brought to the surface, such as shipwrecks or associated debris fields, avoidance is the preferred approach, as excavation of underwater archaeological sites is costly and time consuming. Specific management guidance will be provided by the Project for each cultural heritage site identified and documented.

The Project will maintain records on chance finds and the implementation of treatment plans. These may include:

- Reports that describe chance finds identified, the results of chance find assessments, internal and external communications and instructions, and supporting documentation (or other reference materials as appropriate); and
- Any additional reports prepared to fulfill specific requirements of the National Trust of Guyana.

## **Cultural Heritage Training Program**

Project and Project contractor personnel with the potential to identify underwater chance finds (e.g., automated underwater vehicle/ROV operators) will receive awareness training in the identification of chance finds and the Chance Find Procedure as described above. The Project will develop training materials, such as a quick reference hand-out, which will be provided to applicable Project personnel. The Project will maintain records of all chance find training provided to Project personnel.

EEPGL and its contractors will establish the communication and engagement protocols for the on-call CHS. The Project contractors will designate personnel that require cultural heritage awareness training. The training will provide the necessary information on how to identify and respond to chance finds.

All Project personnel who may have contact with cultural heritage objects will be made aware that it is illegal and forbidden to disturb or remove cultural heritage objects offsite for personal gain.

## **3.3. EMERGENCY RESPONSE PLAN SUMMARY**

### **3.3.1. Introduction**

This section provides a summary overview of the EEPGL Emergency Response Plan (ERP) covering EEPGL operations in Guyana.

The EEPGL ERP is a country-level document that provides structured processes, tools, and guidelines to assist production, project, drilling, exploration, and office facilities management teams in effectively responding to an emergency that originates from or escalates into EEPGL operations. The EEPGL ERP describes the overall emergency response model utilized by EEPGL, with a focus on how emergencies are managed at the country level in Guyana.

The EEPGL ERP describes emergency interfaces with the EEPGL field organizations, mutual aid responders, regional response teams, Georgetown-based emergency response teams (ERTs), and headquarters-based ERTs in the United States. The EEPGL ERP does not attempt to duplicate or describe in detail the tactical emergency response procedures managed by its field ERTs or by external organizations.

The EEPGL ERP is complemented by a number of standalone emergency response documents which provide additional processes, tools, and guidelines in support of overall emergency response planning and response. Examples of these complementary documents include:

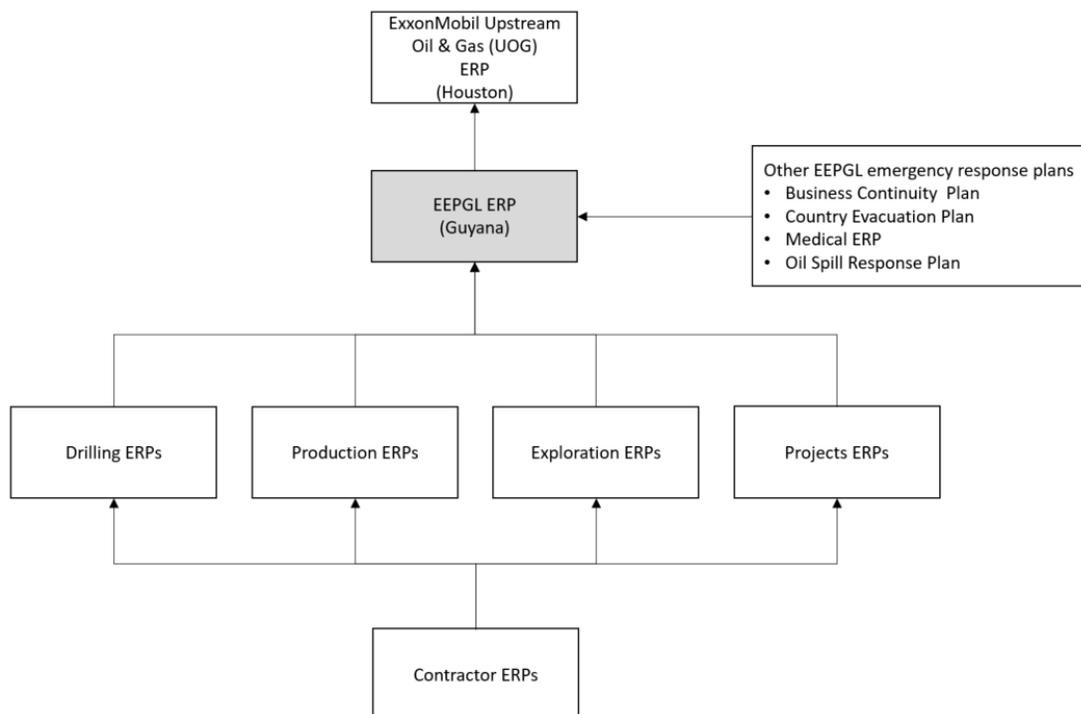
- Business Continuity Plans
- Personnel Evacuation Plans
- Oil Spill Response Plans (OSRPs)
- Medical ERPs
- Security Management Plans (covering security related response)
- Site-specific ERPs (facilities, vessels, worksites)

Where contractors or subcontractors serve as the dominant on-site organization at a worksite or for an activity, they are required to develop site specific ERPs, which are bridged into the EEPGL ERP.

Figure 3.3-1 illustrates how the EEPGL ERP fits into the hierarchy of ERPs supporting EEPGL operations.

The EEPGL OSRP is a comprehensive, standalone ERP that describes how EEPGL manages oil spills. The EEPGL ERP is a parent document to the OSRP. See Volume III of the regulatory submittal to review the OSRP.

The EEPGL ERP and its associated plans (as needed) may be activated in response to emergency events that pose, or could pose, a threat to people, the environment, assets, and reputation.



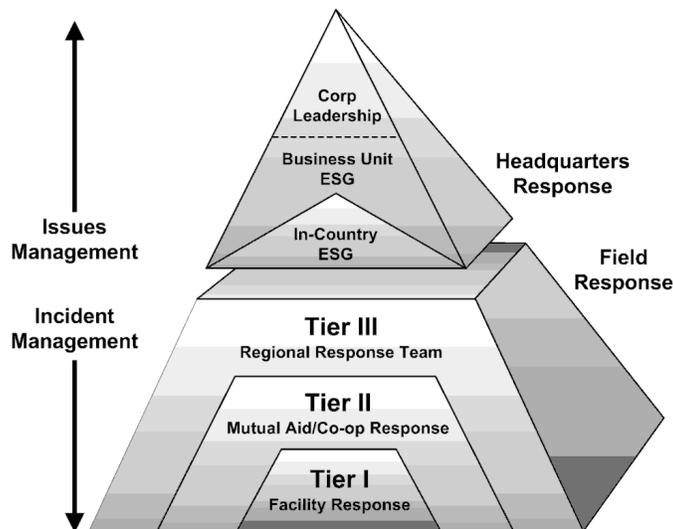
**Figure 3.3-1: Hierarchy of Emergency Response Plans**

### 3.3.2. Document Ownership and Administration

The EEPGL Country Manager is the Owner of the EEPGL ERP, while the EEPGL SSHE Manager serves as the EEPGL ERP Plan Administrator. The Owner and Administrator review this plan on an annual basis, at minimum to ensure it is current based upon EEPGL's operations. Similarly, subordinate EEPGL ERPs have Owners and Administrators.

### 3.3.3. Emergency Response Model

ExxonMobil utilizes a worldwide emergency response model in its operations. The model is a proven tiered response system which provides operational and management teams with guidelines for an appropriate field and issues management response to an emergency event, at both tactical and strategic levels. The model illustrates the multiple levels of organizational support that is available to EEPGL operational field teams and management. The model is represented in Figure 3.3-2.



**Figure 3.3-2: Emergency Response Model**

As illustrated in the emergency response model, emergency response (at the field operational level) follows a tiered approach. Tier levels are generally matched to the physical size of an emergency event (e.g., oil spill, fire, medical response, natural disaster). Labeling an emergency event by tier level provides a quick and convenient way of classifying the relative size of the response team(s) and resources needed to respond to an emergency.

A tiered approach provides for the seamless escalation of tactical field operational response efforts (as needed); tier levels are defined in Table 3.3-1.

**Table 3.3-1: Tier Level Definitions**

Tier	Definition
I	Incident is small, under control, and may involve a response from a local company-managed resource.
II	Incident is large, under control, and involves mutual aid cooperative response.
III	Incident is large, not under control, and requires response by the appropriate Regional Response Team and specialized resources.

Emergency response follows the organizational structure of the model.

- Tactical response to an initiating incident for field operations (Field Response) is managed at the lowest appropriate level through implementation of a Site Specific ERP by a Site ERT at a worksite.
- Site emergency response follows the tiered response model concept as needed to address escalating emergency events.
  - Where an emergency escalates beyond the Tier 1 capability of the Site ERT, additional organizations/resources are activated to provide a complementary response.
  - Where an emergency event escalates to Tier II or III, an EEPGL Incident Management Team (IMT) is activated to provide broad-level operational coordination of the emergency event.
  - Complementary response may be provided by mutual aid organizations, ExxonMobil's Americas Regional Response Team (ARRT), and/or industry response organizations (e.g., oil spill response organization) as necessary.
  - Where complementary response organizations/resources are activated, they supplement the EEPGL IMT and are managed through the Incident Command System (ICS).
- Government response organizations/resources may also be activated by the relevant government authorities after notification.
- Strategic in-country response and issues management (Headquarters Response) is implemented at EEPGL in Georgetown through the activation of the EEPGL Emergency Support Group (ESG), as required based on the complexity and severity of the emergency event.
- Strategic response and issues management is implemented in Houston (United States) through activation of the ExxonMobil Upstream Oil & Gas (UOG) ESG, as required based on the complexity and severity of the emergency event.
- Corporate strategic support is implemented in Dallas (United States) through activation of the Emergency Management Review Group, as required based on the complexity and severity of the emergency event.

EEPGL has defined protocols in place to activate the various in-country and ex-country emergency response organizations.

### **3.3.4. Emergency Severity Assessment and Internal/External Notification**

EEPGL has a structured system to assign an internal severity level to an emergency event. The system has four classification levels that help the management team understand the appropriate level of internal notification relative to the severity level.

As a general rule, the pace and extent of upward notification increase as the severity of an emergency event increases. For more significant emergency events, upward notification occurs up to ExxonMobil corporate headquarters.

Even where activation of emergency response support outside of Guyana is not required, structured management monitoring protocols are in place to keep the appropriate level of management team support abreast of an emergency event.

Notifications are also provided to the appropriate Guyanese authorities in alignment with regulatory requirements. EEPGL has a structured process for government notification and maintains an evergreen contact list to facilitate timely notification.

### **3.3.5. Overview of Emergency Response Organizations**

#### **3.3.5.1. Site Emergency Response Teams**

Site ERTs are responsible for implementing Site-Specific ERPs at their respective worksites. A Site ERT provides tactical response to an emergency event. A Site ERT is the operational team which carries out the physical response at a work location, and the team is staffed with personnel who are resident at the worksite.

A Site ERP includes the following emergency response elements:

- Site ERT structure and associated roles and responsibilities;
- Defined interfaces with other offsite response organizations
- Internal communications protocols, and associated contact information;
- External communications protocols and associated contact information;
- Defined risk scenarios;
- Emergency action plans for defined risk scenarios;
- Method for activating emergency response;
- Method for personnel accounting;
- Defined evacuation procedures;
- Defined protocols for resuming work;
- Training requirements for responders and non-responders; and
- Requirements for drills, simulations, and exercises.

Where contractors or subcontractors serve as the dominant on-site organization at a worksite (e.g., installation vessel, shorebase operator), they will develop Site ERPs that bridge into the EEPGL ERP as appropriate. EEPGL has structured mechanisms to review, approve, and monitor contractor and subcontractor Site ERPs.

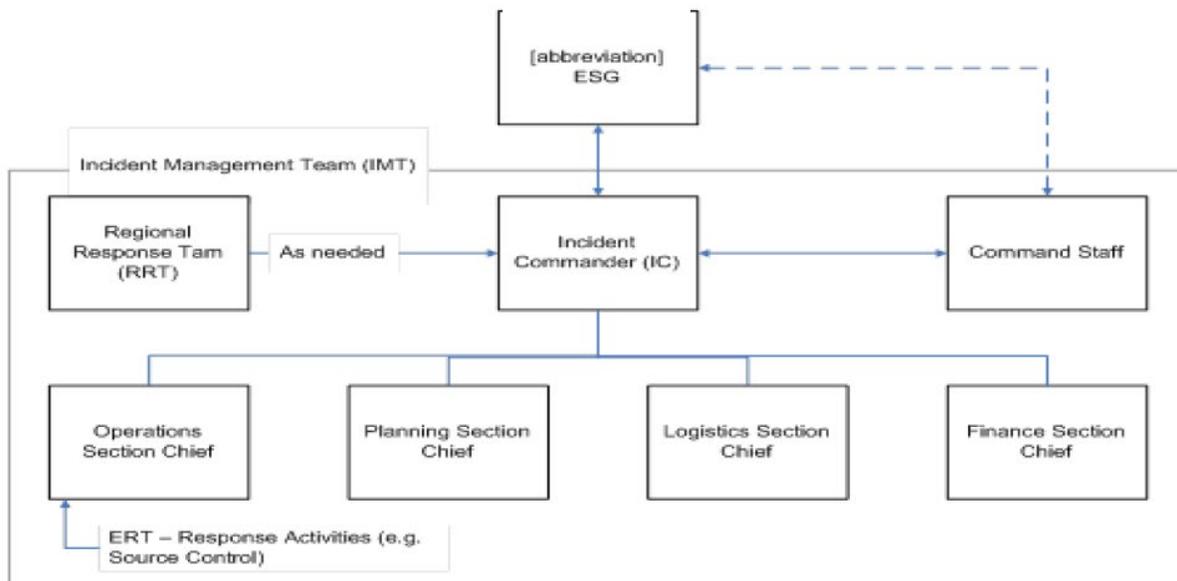
#### **3.3.5.2. Incident Management Team**

The EEPGL IMTs are responsible for providing tactical support to EEPGL/contractor/subcontractor managed Site ERTs. The EEPGL IMT is activated when the emergency response capabilities of a worksite have been exceeded, and the Site ERT needs additional emergency response operational support. As such, the EEPGL IMT is generally activated when an emergency escalates to a Tier II or III level. The EEPGL IMT provides broad

level operational coordination of an emergency event once activated, typically from an onshore in-country coordination center.

When the EEPGL IMT is activated, it is organized in accordance with the ICS. ICS is a proven, standardized emergency response organization structure and process that is used in many jurisdictions around the world.

Figure 3.3-3 illustrates a typical ICS organizational structure. The ICS includes an Incident Commander and General Staff and Command Staff that provide technical support across several disciplines. Interfaces between the EEPGL IMT, EEPGL ESG, and Site ERTs are shown.



**Figure 3.3-3: Typical ICS Organizational Structure**

In some cases, the EEPGL IMT provides an adequate level of resources to support an emergency response event with in-country core resources. In other cases, the EEPGL IMT has to be expanded to accommodate larger and/or more complex emergency events. Where the EEPGL IMT has to be expanded with additional emergency response resources, the ExxonMobil ARRT will be activated and integrated into the EEPGL IMT's ICS organization.

Where complementary response organizations/resources are activated, they supplement the EEPGL IMT and are managed through the EEPGL IMT's ICS organization.

The key initial roles of the EEPGL IMT are described below:

- Incident Commander (IC) is responsible for managing the onsite operational incident response. The IC provides guidance to the General Staff (Section Chiefs) and Command staff. The IC is also the main interface with the EEPGL ESG.

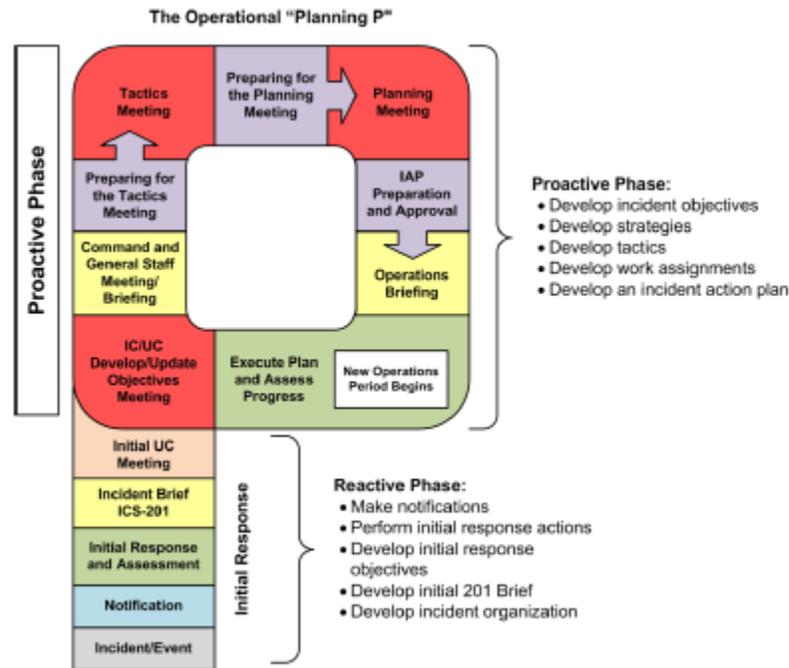
- General Staff consists of four Section Chiefs.
  - Operations Section Chief is responsible for the management of response to the incident. The Operations Section Chief provides guidance to the Site ERT.
  - Planning Section Chief is responsible for the collection, evaluation, and dissemination of response information and maintaining status of assigned resources.
  - Finance Section Chief is responsible for all financial and cost analysis aspects.
  - Logistics Section Chief is responsible for providing facilities, services, and material in support of the incident.
- Command Staff includes Public & Government Affairs, SSHE, and Liaison activities. Depending on the size and complexity of the emergency event, the Command Staff may be duplicated or shared within the EEPGL ESG.

EEPGL maintains an evergreen list of the EEPGL IMT members with backups, all of which are trained in ICS. The ICS utilizes a proven, standardized process and suite of tools to manage an emergency event. Standardization allows for efficient and effective interfaces between multiple organizations/personnel that may be brought together to support an emergency response event.

The ICS is comprised of two main phases.

1. Reactive Phase: notifications, initial response, and assessment
2. Proactive Phase: planning meetings, action plan development, formal briefings, and updates

The standardized ICS Planning Cycle, commonly referred to as the Operational "Planning P" or "Planning P," is depicted in Figure 3.3-4.



**Figure 3.3-4: ICS Planning Cycle**

The Proactive Phase is typically for emergency events that are more complex and longer term in nature, such as a major facility fire or offshore spill. The majority of the emergency events are successfully managed during the Reactive Phase. Few incidents require the complete "Planning P" cycle.

In general, the EEPGL IMT will typically focus on the Reactive Phase; the Planning Phase would generally be implemented for large and/or complex incidents that require assistance from the ARRT. In such circumstances, the ARRT-sourced members of the IMT would provide expert guidance on the full ICS process as part of their established role.

During the Reactive Phase, EEPGL will:

- Assign pre-designated personnel to the initial roles of the IMT
- Perform notifications:
  - Follow the notification process previously described.
  - If required, implement protocols for activating additional emergency response resources.
- Perform initial response and assessment”
  - Monitor and support initial response to the emergency event, following the response procedures detailed in the Site ERP.
- Conduct incident briefing

The full suite of ICS tools/forms/etc. is immediately available in the designated emergency response command center for the EEPGL IMT to utilize upon activation. Roles and responsibilities for each IMT position are defined.

### **3.3.5.3. Regional Response Team**

Where the EEPGL IMT has to be expanded to accommodate larger and/or more complex emergency events, the ExxonMobil ARRT will be activated and integrated into the EEPGL IMT's ICS organization, providing depth and breadth to the core EEPGL IMT.

The Houston-based ARRT Emergency Response Advisor can initiate ARRT activation following instruction from the EEPGL Country Manager.

Prior to activation, the ARRT is comprised of a mix of emergency response personnel sourced from various ExxonMobil organizations outside of Guyana. The ARRT team members are generally part-time members who remain on call in a "ready to mobilize" mode, and they maintain competency through periodical training, drills, simulations, and exercises.

The ARRT maintains an evergreen list of ARRT members with backups, all of which are trained in ICS. Roles and responsibilities for each ARRT position are defined.

The ARRT can be partially or fully activated, depending on the size and/or complexity of the emergency event. Partial activation may be implemented when technical support is required by Site ERTs at the worksites where the emergency is occurring. In such cases, ARRT members will typically be embedded within the Site ERT structure.

For larger and/or more complex emergency events that require an extensive amount of tactical operational support work, ARRT members can be integrated into the EEPGL IMT to provide support.

In the event that the ARRT is activated, one or more command centers will be established in-country to accommodate the full EEPGL IMT.

### **3.3.5.4. Emergency Support Groups**

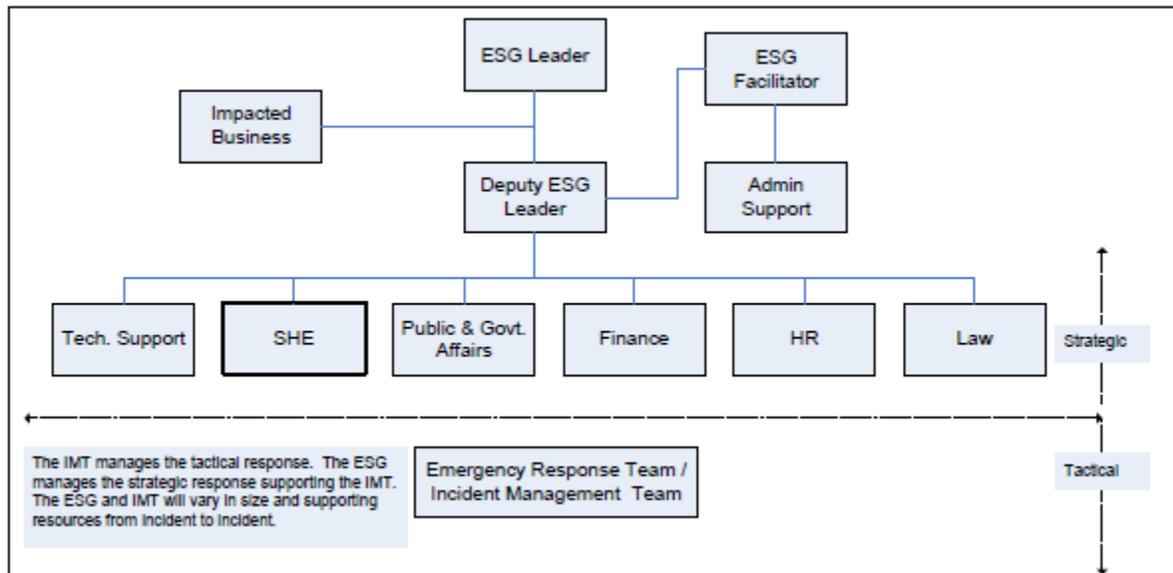
ESGs are utilized as needed to support strategic emergency response and issue management considerations. This level of support is typically described as "headquarters response" and is generally not operational in nature.

ESG organizations are located in Georgetown (Guyana) and Houston (United States). The Georgetown-based ESG is managed by the EEPGL in-country management team, while the Houston-based ESG is managed by the ExxonMobil UOG management team.

These teams are activated as needed based on the complexity and severity of an emergency event. In general, ESGs do not need activation when an emergency can be adequately managed by a Site ERT.

Protocols are in place for communications between the EEPGL ESG and the EEPGL IMT, as well as between the EEPGL ESG and the UOG ESG.

Figure 3.3-5 illustrates EEPGL ESG organizational structure, which is consistent with the UOG ESG. Positions are assigned as needed to match strategic support requirements.



**Figure 3.3-5: EEPGL ESG Structure**

Key strategic support objectives of the EEPGL ESG include:

- Support the EEPGL IMT and Site ERT as needed;
- Manage the strategic aspects of the emergency event;
- Respond to government groups, regulators, media, and other stakeholders;
- Determine the principal and potential impacts of an emergency event; and
- Facilitate the worst-case scenario process.

Upon activation of the EEPGL ESG, a full suite of ESG tools/forms is immediately available to EEPGL ESG members in the designated in-country ESG command center, which is a separate location than the EEPGL IMT.

EEPGL/UOG maintain evergreen lists of ESG members with backups, all of which are trained in ESG. Roles and responsibilities for each ESG position are defined.

### 3.3.6. Emergency Response Scenarios

EEPGL has developed a list of emergency situations that could potentially be encountered within its operations. Examples include, but are not limited to:

- Bomb threat
- Civil disturbance/protests
- Extortion/kidnapping
- Intruder response/security threat
- Medical emergency response (injury/illness)
- Natural disasters (onshore/offshore)

- Search and rescue/aviation incident
- Fire/explosion/gas release
- Hydrocarbon spill
- Vessel collision
- Automobile accident

### **3.3.7. Emergency Response Action Plans**

EEPGL has developed emergency response action plans to address the identified emergency response scenarios. Each action plan describes the key steps to mitigate the consequences of the associated emergency event. Checklists are available to ERT organizations. The action plans are periodically drilled, simulated, and exercised to ensure readiness.

### **3.3.8. Emergency Response Training**

EEPGL provides introductory and advanced emergency response training to its personnel who have an active role as emergency response responders (ESG, IMT, Site ERT). EEPGL personnel who are considered non-responders participate in awareness level emergency response training. EEPGL maintains training records for emergency response training.

### **3.3.9. Drills, Simulations, and Exercises**

EEPGL develops an annual plan for drills, simulations, and exercises in order to maintain readiness for the identified emergency response scenarios in the EEPGL ERP. Personnel with emergency response roles (EEPGL ESG, EEPGL IMT, Site ERT) are involved in the planning and execution of drills, simulations, and exercises. Lessons learned from drills, simulations, and exercises are integrated into emergency response procedures and protocols.

## **3.4. OIL SPILL RESPONSE PLAN FOR GUYANA OPERATIONS**

The Project's Country-wide Oil Spill Response Plan for Guyana Operations is provided as a stand-alone document separate from this ESMP.

## **3.5. PRELIMINARY END OF OPERATIONS DECOMMISSIONING PLAN FOR GUYANA DEVELOPMENT PROJECTS**

The EEPGL Preliminary End of Operations Decommissioning Plan for Guyana Development Projects is provided as a stand-alone document separate from this ESMP. The Preliminary End of Operations Decommissioning Plan for Guyana Development Projects governs decommissioning for all of EEPGL's development projects in Guyana—inclusive of the Liza Phase 1, Liza Phase 2, Payara, and Yellowtail projects.

### **3.6. ENVIRONMENTAL AND SOCIOECONOMIC MONITORING PLAN**

EEPGL will implement an Environmental and Socioeconomic Monitoring Plan to assess the accuracy of the residual impact predictions in the Project EIA and to assess the effectiveness of the management measures described in this ESMP and other supporting plans. This section provides a monitoring framework that describes the specific monitoring activities EEPGL will undertake upon commencement of development drilling to validate the findings of the EIA, ensure the effective implementation of the management measures described in Sections 3.1 and 3.2, track environmental and socioeconomic performance, and adjust Project operations or mitigations, if necessary, through the life of the Project (at least 20 years).

Monitoring activities for environmental and socioeconomic resources in Table 3.6-1 are generally organized by resource/receptor. The table also identifies the specific Project components each monitoring activity is intended to monitor. The specific monitoring activities included in Table 3.6-1 were selected based on the findings of the Project EIA; level of stakeholder interest in specific impacts and receptors, as assessed through the stakeholder engagement process; and the EPA's prior monitoring requirements for exploration activities in the Stabroek Block.

At the time this ESMP was prepared, the contracts for key components of the Project had not been finalized, so it was not possible to assign responsibility for implementing specific components of the monitoring program. EEPGL will ultimately be responsible for all monitoring, but may delegate some responsibility to contractors. The ESMP is intended to be a "living" document and will be updated to assign these responsibilities as contracts are finalized and responsible parties can be identified. The ESMP will also be updated as necessary throughout the operational stage of the Project to maximize the value of the data collected, capture lessons learned, achieve continuous improvement, and ensure cost-effective tracking of the Project's environmental and socioeconomic performance over time.

**Table 3.6-1: Environmental and Socioeconomic Monitoring Measures**

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
<i>Various Receptors</i>						
Various	Perform regular audits of field operations on the drill ships, FPSO, and shorebases to ensure application of designed safeguards.	FPSO, Drill Ships, Shorebases	1. Periodic audits of field operations 2. Perform annual audits on critical drilling operations and environmentally sensitive critical production operations	Annual	EEPGL	None
<i>Air Quality and Climate</i>						
Greenhouse Gas (GHG) Emissions	Quantify and report direct GHG emissions from Project offshore facilities and from offshore and onshore Project activities conducted by EEPGL and its dedicated contractors on an annual basis in accordance with internationally recognized methodologies.	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels, Shorebases	1. Fuel usage and specifications (see vessel and helicopter-related procedures below) will be collected from each vessel and from the shorebases (includes helicopter fuel use). 2. GHG emissions (e.g., carbon dioxide [CO <sub>2</sub> ] and methane) will be calculated based on mass balance considerations, taking into account the volume and composition of the gas and diesel consumed, which reflects directly the total emissions of CO <sub>2</sub> -equivalents that would be generated through combustion. This method is consistent with good international oilfield practice. a. For combustion sources aside from the flare, combustion is assumed to be complete, and methane and volatile organic compounds (VOCs) are calculated using standard emissions factors. b. For the flare (FPSO only), combustion is assumed to be at 98%, with the remaining gas passing through uncombusted. CO <sub>2</sub> emissions are calculated by mass balance on carbon in the combusted (98%) volume. Methane and VOC emissions are calculated using the uncombusted (2%) volume and gas composition.	Data will be collected monthly from each vessel.	EEPGL	Annual Compliance Report
Combustion Emissions	Monitor on an ongoing basis the volume of fuel used by all combustion sources and equipment on FPSO and other marine vessels.	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels	On the FPSO, fuel usage for each combustion source will either be directly metered or estimated based on run hours, engine size, or other appropriate methodology.  1. Total FPSO fuel gas usage will be metered and allocated to the various combustion equipment based on run hours, equipment type and specifications (e.g., engine size), or other relevant factors. 2. Diesel fuel usage will be estimated based on diesel run hours. In some cases, this will be tracked automatically using computer systems. In other cases, run hours will be recorded and tracked manually in a log book. 3. For the drill ships and other vessels, each vessel has the technical means to measure the consumption of fuel on a daily manner using flow meters, gauges, etc.  Fuel consumption information will be included in daily reports and provided to EEPGL on a monthly basis.	Data will be collected monthly from each vessel.	EEPGL	Fuel usage and specifications will be the basis for air emission calculations, which will be provided in the Annual Compliance Report.
Combustion Emissions	Monitor volume of fuel used for helicopter operation.	Helicopters	The aviation contractor will provide a summary of helicopter trips to the FPSO, Drill Ships, and any large Installation Vessels (with helidecks) and the fuel usage for each trip.	Data will be collected monthly from the aviation contractor.	EEPGL	Fuel usage and specifications will be the basis for air emission calculations that will be provided in the Annual Compliance Report. Additionally, fuel usage for helicopters will be provided in a monthly summary.

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
Combustion Emissions	Keep records of non-routine flaring of associated gas.	FPSO	To accommodate measurement of non-routine flaring, flow meters will be installed at the High-Pressure and Low-Pressure piping that lead to the flare in order to directly measure the total amount of gas flared. Flare gas volume is stored in the plant digital computer system. Composition of the fuel and flare gas will be determined periodically to ensure the correct composition is still being used.	Continuous	EEPGL	Total amount of gas flared, and corresponding dates will be provided to EPA in the Annual Compliance Report. Reporting and recordkeeping of Annual Air Emissions will be performed as required for New and Existing Operations utilizing the approved form. Composition of fuel and flare gas to be determined on an as-needed basis.
FPSO Emissions	An air emissions inventory report will be prepared annually.	FPSO	The air emissions inventory will include particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, VOCs, and GHGs.	Annually	EEPGL	Annual Compliance Report
FPSO Emissions	Monitor flare performance to maximize efficiency of flaring operation.	FPSO	The flare system is designed to maximize efficiency. The volume of pilot gas can be adjusted as needed to optimize efficiency. The pilot will be maintained to ensure safety of the facility.	Continuous	EEPGL	None
FPSO Emissions	Monitor flare performance to maximize efficiency of flaring operation.	FPSO	Monitor exhausts daily for smoke; in instances of visible smoke, the cause(s) must be investigated.	Daily	EEPGL	None
<b>Water Quality</b>						
Drilling Discharges	Prior to and post-drilling, an ROV will take pictures of the area immediately surrounding the well location to monitor for marine water quality impacts.	Drill Ships	Before and after photos will be provided in End of Well Report for each well.	Before and after drilling at each well	EEPGL	End of Well Reports will be submitted within 90 days following the completion of drilling operations for each well.
Drilling Discharges	Monitor daily during drilling to ensure that end of well maximum weighted mass ratio averaged over all well sections drilled using non-aqueous drilling fluid (NADF) shall not exceed 6.9 percent wet weight base fluid retained on cuttings.	Drill Ships	1. Measurement is taken in the field daily following good international oilfield practice. 2. The percentage of fluids retained on cuttings is documented daily in a log. 3. Once the well is complete, an average retained NADF on cuttings (%) is documented.	Daily	EEPGL	The averaged retained non-aqueous base fluid on cuttings (%) will be supplied to EPA in the End of Well Report for each well. End of Well Reports will be submitted within 90 days following the completion of drilling operations for each well.
Operational Discharges	Monitor daily produced water discharge volume.	FPSO	The volume of the produced water discharge will be metered and recorded in the FPSO digital computer system.	Continuous	EEPGL	The total volume of produced water discharged will be documented in the Annual Compliance Report.
Operational Discharges	Measure oil and grease content of produced water (grab sample once per day).	FPSO	A minimum of one grab sample will be taken each day to ensure compliance with the daily maximum oil in water content of 42 milligrams per liter (mg/L). The oil content in the produced water will be continuously monitored with a dedicated meter. Onboard FPSO lab measurements will verify meter reliability. Results will be documented in a log. A monthly average will be recorded to ensure compliance with the monthly average oil in water content of 29 mg/L.	Continuous (meter) Daily (grab)	EEPGL	Daily maximums and monthly averages will be documented and provided in the Annual Compliance Report.

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
Operational Discharges	Measure oil and grease in slop water tank	FPSO	The oil content in the slop tank will be continually monitored with a dedicated meter to ensure that the slop water discharged overboard meets the maximum oil-in-water content criteria.	Continuous (meter)	EEPGL	Results will be provided in the Annual Compliance Report.
Operational Discharges	Perform daily inspections to verify no visible sheen from discharge of cooling water.	FPSO	Routine overboard observations are part of overall surveillance program.	Daily	EEPGL	Confirmation that no visual sheens observed from cooling water discharge will be documented and provided in the Annual Compliance Report.
Operational Discharges	Monitor discharge temperature of cooling water and produced water to avoid increases in ambient water temperature of more than 3 degrees Celsius (°C) at 100 m (~328 feet) from point of discharge.	FPSO	Modeling will be done on outlet discharge stream to set temperatures such that the 3 degrees limit at 100 meters will not be exceeded. Cooling water temperatures of discharge points will be monitored to provide instantaneous temperature of cooling water and produced water effluent.	Continuous	EEPGL	The maximum and average daily temperature of cooling water and produced water discharge will be documented in the Annual Compliance Report.
Operational Discharges	Utilize load monitoring system in the FPSO control room to support FPSO offloading.	FPSO	A load monitoring system will consist of fixed and portable equipment that allows for continuous monitoring of the hawser tension between the FPSO and Export Tanker. In addition, offloading activities will be actively monitored by FPSO personnel to visually identify leaks, and volumetric checks will be performed on FPSO and Export Tanker during offloading.	Continuous during offloading	EEPGL	None
Operational Discharges	Monitor pressure and temperature of subsea wells and manifolds by a control system on the FPSO to detect and prevent leaks.	FPSO	Temperature and pressure are continuously monitored by operators and surveillance engineers utilizing temperature and pressure transducers located on the subsea equipment. Alarms built in to the control system will notify the operators of temperatures or pressures outside the normal operating range. The system will be designed to automatically shut-in any wells should the transducers detect anything outside of the operating ranges.	Continuous	EEPGL	None
Operational Discharges	Monitor chlorine concentration of treated sewage discharges.	FPSO, Drill Ships, Installation/Decommissioning Vessels, and Support Vessels	On the FPSO, a minimum of one grab sample will be taken each week. Samples will be analyzed for chlorine concentration using good international oilfield practice on board vessels. Results will be documented in a log.  Other Project vessels, including the drill ship, will be fitted with a MARPOL Annex IV approved sewage treatment system to comminute and disinfect the sewage.	Weekly (FPSO)	EEPGL	Weekly sampling results will be documented and provided in the Annual Compliance Report.
Operational Discharges	Perform daily visual inspection of discharge points to ensure absence of floating solids or discoloration of the surrounding waters.	FPSO, Drill Ships, Installation/Decommissioning Vessels, and Support Vessels	Routine overboard observations will be part of the overall surveillance program.	Daily	EEPGL	Confirmation that no floating solids were observed will be documented and provided in the Annual Compliance Report.
Operational Discharges	Record estimated quantities of grey water, black water, and comminuted food waste discharged (based on number of persons on board and water consumption) in Garbage Record Book.	FPSO, Drill Ships, Installation/Decommissioning Vessels, and Support Vessels	Grey Water/Black Water/Food Waste discharges will be based on persons on board per MARPOL.	Daily	EEPGL	Discharge summaries of Grey Water/Black Water/Food Waste will be documented and provided in the Annual Compliance Report. Additionally, discharge summaries of Grey Water/Black Water/Food Waste for marine support

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
						vessels will be provided in a monthly summary.
Operational Discharges	Perform oil in water content (automatic) monitoring of bilge water to ensure compliance with 15 parts per million MARPOL limit and record in Oil Record Book;	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels	The FPSO, Drill Ship and Installation/ Decommissioning/ Support vessels will be required to have a water treatment system per MARPOL. Discharges will be recorded in MARPOL Annex I Oil Record Book.	Continuous	EEPGL	Confirmation that bilge water discharge was <15 ppm will be documented in the Annual Compliance Report.
Operational Discharges	Record estimated volume of ballast water discharged and location (per ballasting operation).	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels	Ballast water discharge measurement will be described in the vessel's Ballast Water Management Plan. All ballast water discharges and associated volumes will be recorded in a log book.  Specifically for the FPSO, ballast water discharge will be estimated using level gauges (sounding pipe) that are installed in the tanks and conversion tables.	Per ballasting operation	EEPGL	Ballast Water Management Plans for each vessel will be submitted to the EPA. Ballast water discharge volumes will be documented and provided in the Annual Compliance Report.
<b>Waste</b>						
Waste	Record type and quantity of each individual waste stream on board any time a new waste is generated.	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels	An inventory of wastes stored aboard the FPSO and Drill Ships will be maintained. A log (i.e., IMO MARPOL Annex V Garbage Record Book) will be kept on Project vessels to track wastes generated and discharged (e.g., food waste), incinerated (e.g., paper/wood, waste oils), and sent to shore (e.g., domestic, operational wastes).	Ongoing	EEPGL and its contractors	Annual types and quantities of wastes including hazardous waste generated, treatment, and disposal (both onshore and offshore) will be provided to the EPA in the Annual Compliance Report.
Waste	Daily inspect waste storage area and containers; log inspections.	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels	Visual inspections of waste storage areas on board Project vessels will occur daily. Inspections will verify proper labelling of wastes, proper segregation, and container integrity.	Daily	EEPGL and its contractors	None
Waste	Document marine waste transfer.	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels, Shorebases	Waste transfers from sea to shore will be documented via logs (i.e., IMO MARPOL Annex V Garbage Record Book) on board the Project vessels and via garbage disposal receipts from onshore facilities.	As required	EEPGL and its contractors	None
Waste	Sample and perform analytical testing as needed to properly classify waste.	Waste Management Facility	Sampling and analytical testing will generally be performed by the waste contractor at the waste contractor's onshore waste management facility in order to verify that all wastes are classified and disposed of properly.	As needed	EEPGL and its Waste Contractor	Records will be kept by the onshore waste contractor.
Waste	Complete Recoverable Material and Waste Summaries.	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels	An inventory of wastes stored aboard the FPSO and Drill Ships will be maintained. A log (i.e., IMO MARPOL Annex V Garbage Record Book) is kept on Project vessels to track wastes generated and discharged (e.g., food waste), incinerated (e.g., paper/wood, waste oils), and sent to shore (e.g., domestic, operational wastes).	Ongoing	EEPGL	Annual types and quantities of wastes including hazardous waste generated, treatment, and disposal (both onshore and offshore) will be provided to the EPA in the Annual Compliance Report.
Waste	Complete and submit reports required per the Environmental Permit.	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels	Logs (i.e., IMO MARPOL Annex V Garbage Record Book), receipts, and manifests will be gathered from all Project vessels from the previous calendar year.	Annually	EEPGL	Annual types and quantities of wastes including hazardous waste generated, treatment, and disposal (both onshore and offshore) will be provided to the EPA in the Annual Compliance Report.

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
<i>Marine Ecosystems</i>						
Marine Mammals, Riverine Mammals, and Marine Turtles	Continue to monitor on an ongoing basis visual detections of Marine Mammals, Riverine Mammals, on the basis of incidental detections by MMOs and passive acoustic monitoring during seismic exploration activities	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels	Training on known marine mammals, riverine mammals, and marine turtles in the Project vicinity will be provided to workers on offshore vessels. Workers will be trained to report any marine mammal, riverine mammals, or marine turtle sightings to a designated person on board. The designated person will keep a log of all marine mammal, riverine mammal, and marine turtle sightings.	As sighted	EEPGL and its contractors	The inventory of marine mammals, riverine mammals, and marine turtles observed, and any measures implemented to avoid harm will be provided to EPA in the Annual Compliance report.
<i>Socioeconomic Receptors</i>						
Project Employment	Monitor percentage of Project Workforce made up of Guyanese nationals.	NA	Project contractors and suppliers are required to report workforce details, including nationality and Guyanese region of origin, to EEPGL.	Quarterly	EEPGL and its contractors and suppliers	Updates are provided quarterly and reports submitted bi-annually to the Ministry of Natural Resources.
Project Procurement	Monitor percentage of Project goods and services expenditures procured locally.	NA	Project contractors and suppliers are required to report amount of local spend, tender invitations, and activities that were performed in Guyana by subcontractors that are Guyanese owned, CARICOM owned, Foreign owned or Guyanese Government.	Quarterly	EEPGL and its contractors and suppliers	Updates are provided quarterly and reports submitted bi-annually to the Ministry of Natural Resources.
Various	Track number and types of complaints received via the Project CGM.	NA	Complaints/grievances will be reported and documented in the EEPGL Stakeholder Database.	As required	EEPGL	None
Various	Monitor processing and resolution of grievances.	NA	Grievances will be formally tracked in a database and stewarded to resolution. The average time for processing and resolving grievances will be continually monitored as a key performance metric.	Continuously	EEPGL	None
Various	Track percentage of grievances resolved.	NA	Grievances will be formally tracked in a database and stewarded to resolution. The percentage of grievances resolved will be continually monitored as a key performance metric.	Continuously	EEPGL	None
Hearing Impairment	Monitor Project workers' occupational exposure to sound.	All	Worker hearing protection program with exposure limits will be in place. Areas requiring double or single hearing protection will be clearly marked.	Continuously	EEPGL	None
Various	Monitor frequency of engagement with stakeholders, including fisherfolk, coastal communities, vulnerable groups, and Indigenous populations	NA	Engagements will be reported and documented in the EEPGL Stakeholder Database.	Monthly	EEPGL	None
Communicable Disease	Provide health screening procedures to Project workers to reduce risks of transmitting communicable diseases.	All	Tests for diseases that are communicable will be conducted through normal medical screening/ surveillance.	Upon mobilization and periodically thereafter	EEPGL	None
Cultural Heritage	Identify, record, and protect cultural heritage that was not identified during pre-drilling or pre-installation cultural heritage investigations	FPSO, Drill Ships, Installation/ Decommissioning Vessels, and Support Vessels	Detections of cultural heritage items will be formally tracked in a database	Continuously	EEPGL	None

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
<i>Vehicle and Vessel Traffic</i>						
Onshore Vehicular Traffic	Monitor vehicular speed for Project-dedicated vehicles through speed governors, Global Positioning System (GPS), or other monitoring systems.	Onshore Travel Routes	Project-dedicated vehicles will be monitored through speed monitoring, GPS, and a web based tool for vehicle tracking.	Continuously	EEPGL	None
Onshore Vehicular Traffic	Monitor driver fatigue (e.g., supervision, administrative constraints for work and rest periods, etc.) for Project-dedicated drivers.	Onshore Travel Routes	Drivers dedicated to the Project will be monitored for fatigue and will follow administrative controls (e.g., defined work and rest periods) to reduce risk.	Annual reviews of contractor performance	EEPGL and its contractors	None
Marine Vessel Traffic	Record instances of marine vessels entering marine safety exclusion zones.	FPSO, Drill Ships, Installation/Decommissioning Vessels	A 500-meter marine safety exclusion zone will be maintained around the drill ships, major installation vessels, and the FPSO. In addition, during offloading, a 2-nautical mile (3.7 kilometer) marine safety exclusion zone will be maintained around the FPSO. Procedures will be in place so that only authorized vessels enter the exclusion zone (i.e., they have sought and obtained approval via radio communication to enter the marine safety exclusion zone). Communication will be attempted with any unauthorized vessels prior to them entering the marine safety exclusion zone. Any unauthorized vessels that enter the marine safety exclusion zone will be documented in the daily report.	Continuously	Vessel Operators	None

NA = not applicable

### **3.7. DOCUMENTATION, REPORTING, AND RECORD KEEPING**

The requirement for monitoring stems from the need to verify Project activities are being conducted in accordance with commitments made and to provide performance information to regulators and other relevant stakeholders. As such, the results of monitoring will be reported internally and externally. Reporting requirements include those stipulated in the following:

1. Applicable regulations required by Guyana and related to the Petroleum Production Licence; and
2. Project commitments, regulatory filings, and Project agreements.

#### **3.7.1. Normal Operations**

##### ***3.7.1.1. Responsibilities***

Managers, Superintendents, and Supervisors are responsible for development drilling and production operations compliance and surrounding activities. The Environmental & Regulatory Advisor supports the development of procedures which document the monitoring and reporting requirements, maintains data, and coordinates the preparation of the reports required by regulations, approvals, or other permits or internal requirements.

##### ***3.7.1.2. Data Collection***

Reporting requirements will be agreed upon with regulatory agencies, Drilling, Operations, and other responsible entities as appropriate. Written procedures concerning these reports and their content will be developed and approved by the Environmental & Regulatory Advisor. EEPGL may choose to collect other data to evaluate operational risks.

Options for collecting data through various tools such as Data Control System (DCS), Petroleum Information (PI), Energy Components (EC), IsoMetrix and Environmental Data Management System (EDMS) are being considered by EEPGL.

#### **3.7.2. Non-Routine Operations**

##### ***3.7.2.1. Responsibilities***

EEPGL's Operations Manager and Drilling Superintendents and their line staff may identify non-routine operations (i.e., use of an unauthorized chemical, emergency flaring) that potentially have an adverse environmental impact and should advise the SSHE Coordinator or Environmental & Regulatory Advisor. The Environmental and Regulatory Manager will advise EEPGL senior management of reporting requirements and consult with Law and P&GA as necessary.

### 3.7.2.2. Exceptions

Prior to altering routine procedures or operations that would affect the type or quantity of permitted discharges (emissions, effluents, wastes), Drilling and Operations should contact the Environmental & Regulatory Advisor.

The Environmental & Regulatory Advisor will advise the appropriate manager on reporting applicability, types of reports, and timeliness of reporting. If the non-routine operation is continuous, the Environmental & Regulatory Advisor participates in the development, review and follow-up of an MOC for the operating procedures.

Reporting requirements are summarized in Table 3.7-1.

**Table 3.7-1: Summary of Reporting**

Reporting Requirement	Description
Monthly Reports	<p>Monthly Shared Environmental Logistics Report: Helicopter and Marine Vessel Fuel Consumption and Effluent Discharge Summary</p> <p>EEPGL will also notify the EPA in writing of the intent to commence seismic-related activities (e.g., vertical seismic profiling, site investigations or monitoring surveys) in the Yellowtail Area of Interest at least 30 days in advance of commencing activities.</p>
End of Well Reports	End of Well Reports will be submitted within 90 days following the completion of drilling operations for each well.
Compliance Report	EEPGL will provide a report on the progress of Project activities and compliance with conditions in the Project's Environmental Permit within 2 months of completion of the following Project stages: Drilling, Installation, Commissioning/Start-up, Production Operations, and Decommissioning.
Annual SSHE Report	<p>EEPGL will annually provide a report summarizing statutory SSHE metrics, in line with the reporting requirements as stipulated in the Project's Environmental Permit. These reports may include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• The identification information of the facility;</li> <li>• General waste types/volumes, disposal methods/locations;</li> <li>• Types and quantities of waste including hazardous waste generated, treatment and disposal (both onshore and offshore);</li> <li>• Discharges types/volumes (e.g., effluent, drill cuttings/fluids, etc.);</li> <li>• A report on generation, treatment, and disposal of wastewater generated on all vessels associated with the project;</li> <li>• Notwithstanding the obligation to immediately report any accidents and/or non-compliances, a summary of any accidents and non-compliances that may have occurred and any action(s) taken should be provided;</li> <li>• A report on all routine marine species observations on vessels, and any mitigation measures implemented to avoid injury or harm</li> <li>• Volumes of hydrocarbons flared</li> <li>• An inventory of prior years' emissions including but not limited to particulate matter, sulphur dioxide, volatile organic compounds, carbon monoxide, nitrogen dioxide, and GHGs as applicable;</li> <li>• A summary table of hazardous materials used at the facility, with the following information:                         <ul style="list-style-type: none"> <li>(a) Name and description;</li> </ul> </li> </ul>

Reporting Requirement	Description
	<ul style="list-style-type: none"> <li>(b) Classification e.g., code or class;</li> <li>(c) Quantity used per month;</li> <li>(d) Characteristic(s) that make(s) the material (s) hazardous e.g., flammability, toxicity</li> </ul> <ul style="list-style-type: none"> <li>• Fuel consumption;</li> <li>• Spills (e.g., hydrocarbons, chemicals) and non-compliances that may have occurred.</li> </ul>
Emergency/incident notification and reporting	<p>All environmental incidents and excursions will be appropriately documented and reported to the relevant authorities, in line with regulations.</p> <p>In the event of an oil spill response, EEPGL will notify the EPA in alignment with the approved OSRP for the utilization of in-situ burning and/or use of dispersant (e.g., Corexit 9500, Corexit 9527A, Finasol OSR 52, and Dasic Slickgone NS).</p>
Other reporting requirements as stipulated in the Project's Environmental Permit	EEPGL will comply with all other reporting requirements as stipulated in the Project's Environmental Permit.

In addition to the requirements in Table 3.7-1:

- EEPGL will keep a schedule of maintenance of all vessels, equipment, and/or plant on site and make available for inspection on request by the EPA.
- Records of spills and near misses shall be documented and made available to the EPA upon request.

## 4. OPERATIONAL STEWARDSHIP AND PROCEDURES

### 4.1. INTRODUCTION

To confirm progress in continually improving operations, procedures will be developed to document operations and their potential impacts. This documentation helps Operations management to identify potential gaps in procedures and competencies. Stewardship developed around specific areas identified in the EIA or common to normal operations confirms that internal expectations, as well as regulatory expectations, are met. Stewardship of environmental compliance is addressed through System 4-2.

### 4.2. RESPONSIBILITIES

Corporate management establishes stewardship criteria as outlined in the EPI Manual. EEPGL management may establish additional stewardship criteria (i.e., KPIs) to satisfy project or operational needs or regulatory requirements.

Managers assist with reviewing environmental performance metrics, identifying improvement areas, and providing resources to improve performance.

The Environmental & Regulatory Advisor advises on data collection, supports IsoMetrix, and generates appropriate reports for SSHE management and Operations management.

The EEPGL Environmental Advisor compiles monthly and annual Business Performance Review (BPR) reporting, which the Environmental and Regulatory Manager delivers to EEPGL management.

The Environmental Advisor coordinates and compiles the annual EPI reporting.

### **4.3. STEWARDSHIP**

EPIs are collected and reported to Shared | SSHE, EMPC SSHE, as well as EEPGL's Management. EEPGL KPIs are reported to EEPGL Management and reviewed during Asset Leadership Team (ALT) meetings on a regular basis. Feedback from Shared | SSHE, EMPC SSHE, and EEPGL Management is incorporated into operations planning and procedures are updated, as necessary.

## **5. DECOMMISSIONING**

Anticipated decommissioning and abandonment requirements are described in the Preliminary End of Operations Decommissioning Plans for LP1 and LP2. The procedures and tools for confirming compliance with EEPGL's plan, are supported by ExxonMobil Environmental Services (EMES).

Decommissioning has been planned using ExxonMobil Global Practices (GPs) for "Decommissioning Planning for Offshore Facilities" and "Offshore Decommissioning Toolkit." Activities and potential environmental issues include Decommissioning EAA, stakeholder engagement, public notice, removal, abandonment, waste disposal, ocean use monitoring, security measures, marine mammal and turtle observation, maintaining marine safety exclusion zones and mitigation.

Some sites may require long-term rehabilitation monitoring commitments that will be captured as obligations within the compliance tracker tool (e.g., IsoMetrix).

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# **STAKEHOLDER ENGAGEMENT PLAN FOR GUYANA OPERATIONS**

*Submitted with changes*

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**Esso Exploration and Production Guyana  
Limited**

**Stakeholder Engagement Plan  
for Guyana Operations**

**March 2022**

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## Acronyms and Abbreviations

Name	Description
CDC	Community Development Council
CGM	Community Grievance Mechanism
EEPGL	Esso Exploration and Production Guyana Limited
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ER&S	Environmental, Regulatory, & Socioeconomic
ERM	Environmental Resources Management
GGMC	Guyana Geology and Mines Commission
MARAD	Maritime Administration Department
MNR	Ministry of Natural Resources
NAREI	National Agricultural Research and Extension Institute
SEA	Strategic Environmental Assessment
SEP	Stakeholder Engagement Plan

## Glossary

Terms	Description
Stakeholder	Any individual or group who is affected by a project or may have an interest in, or influence over it
Consultation	The process of sharing information, ideas and concerns in a two-way dialogue between project proponents and stakeholders, allowing stakeholders to express their views and for these to be considered in the decisions about project planning and implementation
Disclosure	The process of publishing and making available information in various ways (such as on the internet, in paper form or in press announcements)
Engagement	General term for activity including disclosure and consultation
Environmental Impact Assessment	A systematic process for identifying and managing the potential environmental, social and health aspects, impacts and related risks associated with a project
Environmental Management Plan	A project-specific plan developed to identify and implement measures to protect the environment and comply with environmental legislation
Environmental and Social Management Plan	A system to manage the environmental and social risks and impacts of a project's activities
Esso Exploration and Production Guyana Limited	A subsidiary of ExxonMobil in Guyana
Feedback	Formally issued inquiry, comment, concern, or complaint about a project or associated activities by individuals or organizations
Feedback Mechanism	Process by which inquiries, comments, concerns, or grievances are formally submitted by interested parties, and tracked and addressed by a project proponent
Strategic Environmental Assessment	A systematic decision support process to consider environmental and socioeconomic aspects during the planning phases of a project
Terms of Reference / Terms and Scope	Document that describes the purpose, scope, limitations, and structure of a project assessment

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# 1 INTRODUCTION

The Esso Exploration and Production Guyana Limited (EEPGL) Stakeholder Engagement Plan (SEP) is designed for an ongoing exchange of information that allows the Company to 1) identify, understand and address community/stakeholders priorities and concerns, and 2) improve decision-making and transparency. This is an evergreen document that will evolve according to EEPGL activities. For example, Attachment A is the Synopsis of Previous Stakeholder Engagement Activities through September 2021, which will be updated at various stages of each major project or EEPGL activity.

Environmental Resources Management (ERM) has been contracted by EEPGL to support the company's environmental permitting processes, including completion of a Strategic Environmental Assessment (SEA), Environmental Impact Assessments (EIAs), and associated stakeholder engagement activities. All efforts occur on behalf of EEPGL. ERM has subcontracted with local environmental consultancies Ground Structures Engineering Consultants and Environmental Management Consultants, who also regularly assist in stakeholder engagement activities.

## 1.1 Objectives

This SEP has been developed to meet the expectations of the Company, regulators, and the communities. The SEP describes the stakeholder identification process and outlines an engagement program to promote meaningful, timely, and effective engagement with stakeholders. It builds on previous engagement efforts, including those documented in the SEA and the Liza Phase 1, Liza Phase 2, and Payara EIA processes through February 2020.

Engaging stakeholders is an important aspect of managing ongoing social and environmental performance and non-technical risks.

The objectives of stakeholder engagement are to:

- Promote the development of respectful and open relationships between stakeholders and EEPGL;
- Identify stakeholders and understand their interests, concerns and influence in relation to ongoing activities;
- Provide stakeholders with timely information about Company activities, in ways that are appropriate to their interests and needs;
- Support alignment with the Government of Guyana requirements and corporate standards and guidelines for stakeholder engagement;
- Record feedback and close out any grievances that may arise through a formal feedback mechanism.

## **2 ADMINISTRATIVE FRAMEWORK**

Socioeconomic and stakeholder components are considered in a number of laws, including the Environmental Protection Act. Additionally, Guyana is a signatory to a number of international and regional conventions and protocols aimed at addressing socioeconomic and stakeholder concerns. EEPGL proposes to conduct stakeholder engagement to comply with the spirit and intent of these laws, Guyana National Plans, and international agreements, including those outlined in the environmental authorizations for major project developments and other operational activities.

### **2.1 The Environmental Protection Act**

In 1996, the Environmental Protection Act (hereinafter referred to as the Act) was enacted to implement the environmental protection provisions of the Constitution. The Act is Guyana's single most significant environmental legislation because it articulates national policy on important environmental topics such as pollution control, the requirements for environmental review of projects that could potentially impact the environment, and the penalties for environmental infractions. Most importantly, the Act authorized the formation of the Environmental Protection Agency (EPA), and establishes the EPA as the lead agency on environmental matters in Guyana (FAO, 2013). The Act further mandates the EPA to oversee the effective management, conservation, protection and improvement of the environment (EPA, 2018). It also requires the EPA to take the necessary measures for the prevention and control of pollution, assessment of the impact of economic development on the environment, and the sustainable use of natural resources.

The Act outlines the process for conducting an EIA with timeframes for some steps. It specifically regulates stakeholder involvement. The stakeholder engagement process describes how a project proponent should undertake consultation to provide stakeholders with opportunities to express their views on project risks, impacts and mitigation measures, and to allow the project to consider and respond to them. There is a 28-day public consultation period for the scoping phase in which a Project Summary is submitted and a 60-day public consultation period after the Draft EIA is submitted.

Outside of and in addition to these EIA-related public consultation periods, EEPGL is committed to promoting and providing means for adequate engagement with stakeholders throughout the project life cycle on issues that could potentially affect them and so that relevant environmental and social information is disclosed and disseminated. EEPGL's ongoing and planned engagement activities are complementary to EIA-related consultation and disclosure periods.

## **3 STAKEHOLDER ENGAGEMENT STRATEGY**

### **3.1 Overview**

The stakeholder engagement strategy is one component of managing project risk by familiarizing stakeholders with EEPGL's activities and efforts to protect safety, health and the environment, incorporate stakeholder input into business decisions, and build a positive relationship between EEPGL and the community.

EEPGL's engagement strategy:

- Proactively identifies and engages stakeholders to provide an overview and understanding of activities;
- Collects stakeholder input for the identification of potential impacts and associated management plans;
- Facilitates the consideration of stakeholder input when making business decisions;
- Outlines a mechanism to address concerns/grievances in a timely manner;
- Monitors and reports trends.

The stakeholder engagement strategy integrates the following elements:

- Identification and assessment of stakeholders;
- Mechanisms, methods, and tools for engagement;
- Engagement activities that have been undertaken to date;
- Planned engagement activities;
- A formal stakeholder feedback mechanism;
- Monitoring and reporting of engagement activities.

### **3.2 Stakeholder Identification Methodology**

One of the first steps in stakeholder engagement planning is the identification of stakeholders. Stakeholders typically include government officials, regulators, co-venturers, members of the community and public at large, non-governmental organizations, and civic leaders, media, employees and contractors, and industry associations. Stakeholders can be individuals working on a project, groups of people or organizations, or even segments of a population. A stakeholder may be actively involved in a project's work, affected by the project's outcome, or in a position to affect the project's success.

To develop an effective SEP, it is necessary to identify stakeholders and to understand their needs and expectations for engagement, and their priorities and objectives in relation to a project.

As part of this process, it is particularly important to identify individuals and groups who may find it more difficult to participate and those who may be differentially or disproportionately affected by a project because of their marginalized or vulnerable status. It is also important to understand how stakeholders may be affected—or perceive they may be affected—so that ongoing engagement can be tailored to inform them in an appropriate manner and address their views and concerns.

One way to characterize stakeholders is by their relationship to the effort in question, for example:

- *Primary stakeholders* are the people or groups that stand to be directly affected, either positively or negatively, by an effort or the actions of an agency, institution, or organization;
- *Secondary stakeholders* are people or groups that stand to be indirectly affected, either positively or negatively, by an effort or the actions of an agency, institution, or organization;
- *Key stakeholders* are people or groups who might belong to either or neither of the first two groups, and who can have a positive or negative effect on an effort, or who are important within or to an organization, agency, or institution engaged in an effort.

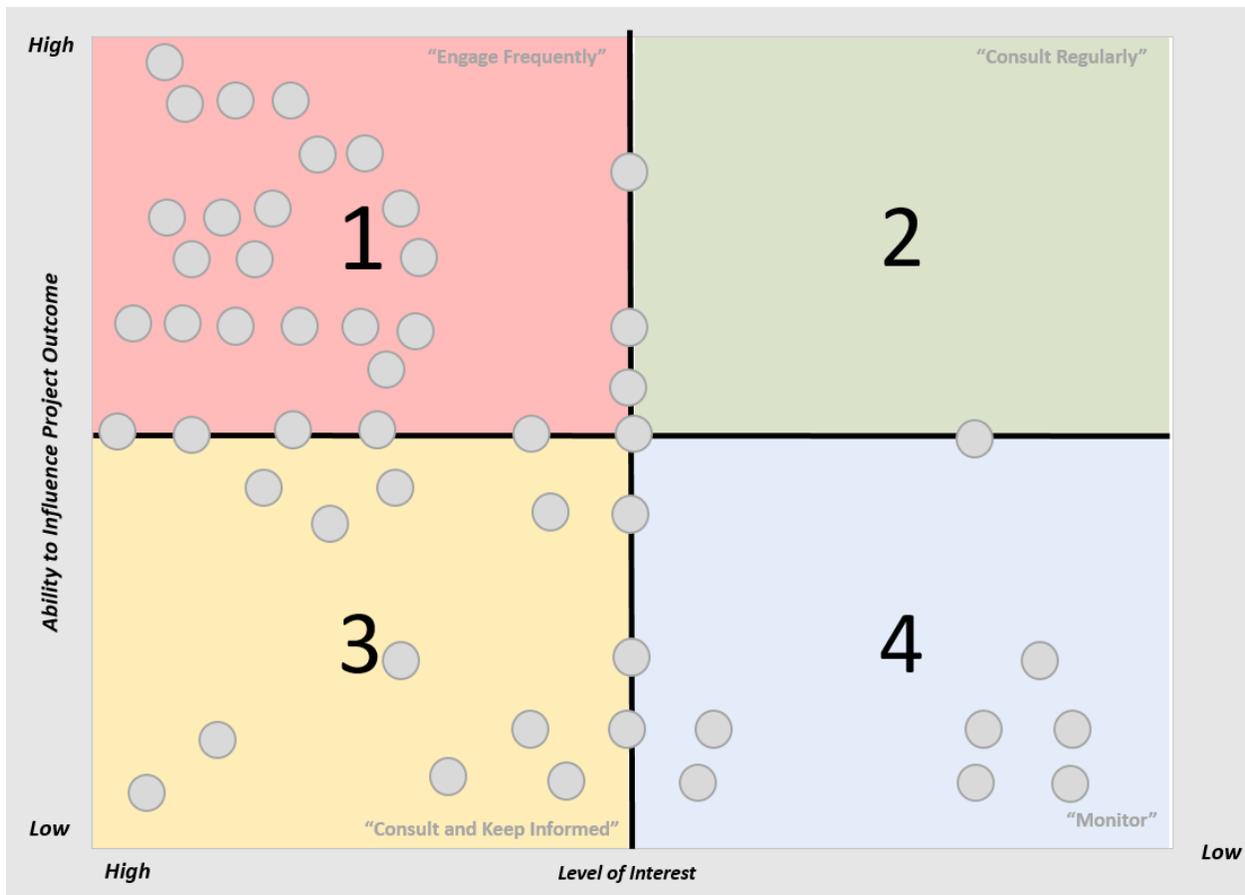
While an interest in an effort or organization could be just that – intellectually, academically, philosophically, or politically motivated attention – stakeholders are generally said to have an interest in an effort or organization based on whether they can affect or be affected by it. The more they stand to benefit or be adversely affected by a project, the stronger their interest is likely to be; and the more heavily involved they are in the effort or organization, the stronger their interest is likely to be.

Stakeholders' interests can be many and varied. A few of the more common include:

- Economics;
- Social change;
- Labor;
- Environment;
- Safety and security.

### **3.3 Stakeholders**

Stakeholders are identified at the beginning of new activities. Once identified, stakeholders are assessed based on their anticipated degree and topics of interest, as well as their role in processes which may affect activities (Figure 1). Stakeholder information is recorded in a stakeholder log. The SEP is an evergreen document, so additional stakeholders will be added to the stakeholder log as they are identified. Potential stakeholders, including those identified through the EIA-related data collection processes, are listed in Attachment B. This table is not exhaustive.

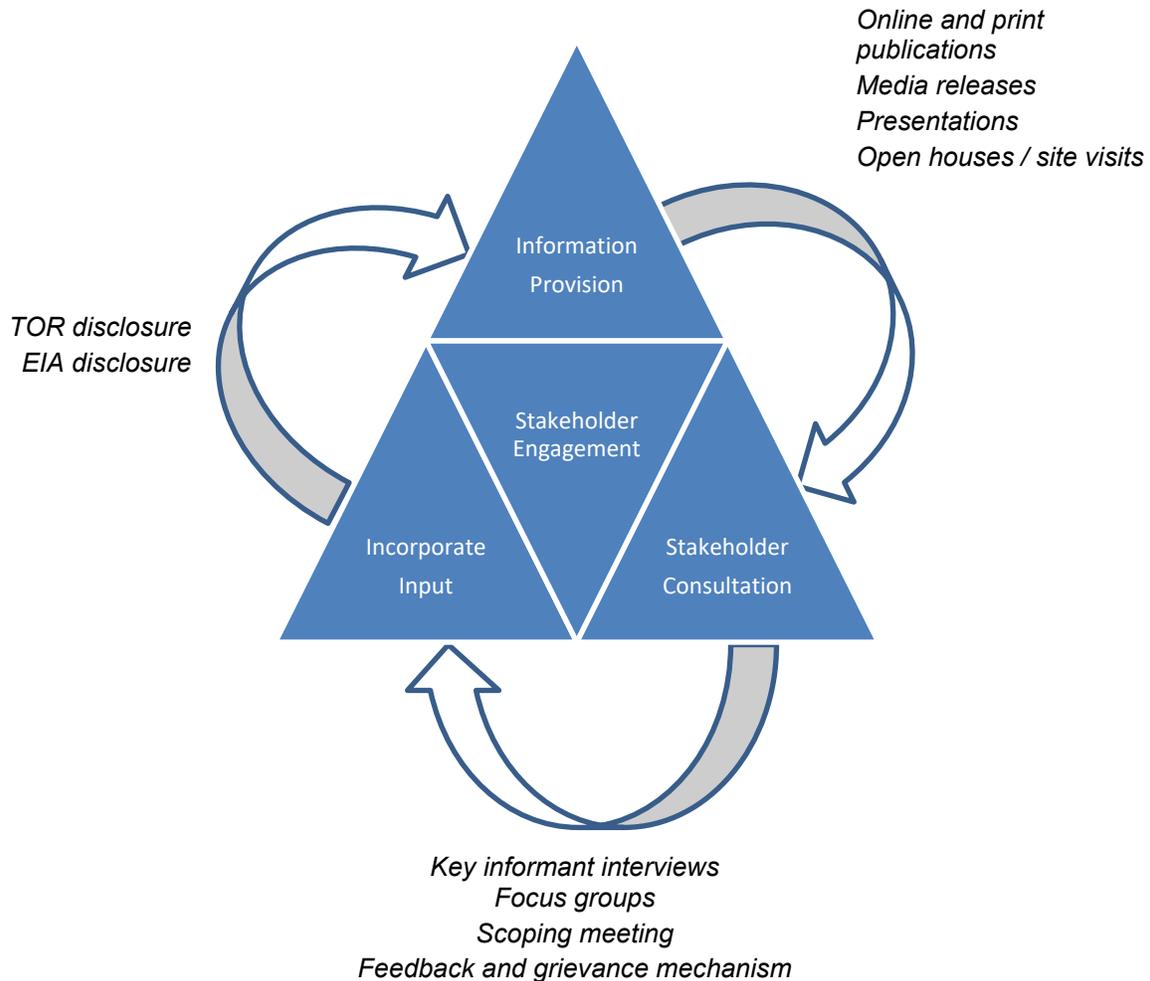


**Figure 1: Example Stakeholder Map**

### 3.3.1 Methods and Tools

EEPGL’s stakeholder engagement strategy includes methods and tools to facilitate stakeholder communication and dissemination of public information. As shown in Figure 2, the different types of methods employed interact to allow informed engagement. The first method is information provision, which offers stakeholders information to support their understanding of the proposed activities. The other methods are consultation—which supports dialogue and active receipt of stakeholder feedback/input based on the information provided, and incorporation of input. These methods capture opinions, concerns, and knowledge on how activities may interact with a stakeholder’s natural and social environment, allowing EEPGL to gather information concerning topics that are important to its stakeholders. These activities provide stakeholders an opportunity to ensure their comments and opinions are heard and concerns addressed.

The tools and mechanisms listed in *italics* in Figure 2 describe how EEPGL intends to provide information to stakeholders, consult with and solicit information from stakeholders, and report back on how stakeholder input has been incorporated into key documents such as project plans.



**Figure 2: Example Stakeholder Engagement Strategy for EIA Development**

Information Provision activities provide information to a broad audience or group of stakeholders as efficiently as possible. Activities include dissemination of online material and print publications, media releases, presentations, and open houses. Examples of how the Project uses simple communication tools that are inclusive and tailored to different audiences, including Indigenous and vulnerable populations, can be found in Attachment C.

Stakeholder Consultation activities involve a two-way flow or exchange of information between stakeholders and the Project. Activities include one-on-one and small group meetings, public meetings including a question and answer session, town hall meetings, feedback mechanism such as a webpage, email address, or a dedicated phone line. Examples of templates used for various types of Project-level engagements, including focus groups and one-on-one meetings (including with Indigenous and vulnerable populations), can be found in Attachment D.

Incorporate Input activities include Terms of Reference / Terms and Scope disclosure and EIA disclosure, which include making the documents available for review and comment.

### 3.3.2 Stakeholder Grievance Mechanism

EEPGL has a community grievance mechanism (CGM) for stakeholders to provide feedback related to any issues or concerns, guidance, requests and/or complaints (considered grievances) associated with activities. EEPGL will address these in good faith through a transparent and impartial process.

Objectives of the CGM are:

- Provide stakeholders with a mechanism to communicate feedback, issues or concerns requests and/or complaints to EEPGL in a timely manner so that they can be addressed quickly and proactively;
- Process grievances so they are acknowledged, tracked, addressed, and closed-out by EEPGL in a timely and confidential manner;
- Continuously improve Project performance related to stakeholder engagement; and
- Demonstrate EEPGL's commitment to meaningful stakeholder engagement and respect for local opinions and concerns.

For a full description of the CGM refer to the project-specific Environmental and Socioeconomic Management Plans. Examples of how feedback information is shared with the public in addition to print media and social media are provided in Attachment C. EEPGL will consider any feedback that it receives as a critical component of the broader stakeholder engagement activities, including monitoring and reporting. Stakeholders can contact EEPGL to submit feedback in three ways:

1. In person, either to an EEPGL employee or representative;
2. Via telephone – (592) 231 2866; or
3. Via email – [Guyanastaff@exxonmobil.com](mailto:Guyanastaff@exxonmobil.com)

NOTE: The EPA prescribes that stakeholder feedback and comments related to SEA/EIA should be addressed to:

The Environmental Protection Agency  
c/o Executive Director  
Ganges Street, Sophia, Georgetown  
Phone: 225-0506 / 225-5467-8 / 225-5471-2  
Fax: 225-5481  
E-mail [epa@epaguyana.org](mailto:epa@epaguyana.org)  
Website: [www.epaguyana.org](http://www.epaguyana.org)

### 3.3.3 Monitoring and Reporting

Monitoring is an important part of determining the effectiveness of the activities undertaken, and revising them, as required, to ensure effective engagement. A tool is used to log all engagements with stakeholders, and capture feedback received from stakeholders. This tool

allows for an analysis of trends in stakeholder interest and concern, which will help EEPGL design further engagement programs and activities.

As part of EEPGL's management systems, performance indicators are assigned to the monitoring process and will be tracked for completion. A number of key performance indicators will be monitored by EEPGL on a regular basis in relation to stakeholder engagement measures. These may involve the following parameters:

- Number of consultation meetings and other public discussions /forums conducted within a period and by region (e.g. monthly, quarterly, or annually)
- Number of grievances received within a period (e.g. monthly, quarterly, or annually)
- Number of those closed within the prescribed timeline and the reason for aged grievances within the prescribed timeline and trends
- Type of public grievances received and trends

### 3.4 Roles and Responsibilities

In order for an SEP to be implemented successfully, adequate resources and responsibilities need to be designated (see Table 1). Please note that this does not include roles filled by the Government of Guyana and the EPA.

**Table 1: Roles and Responsibilities**

Role	Responsibilities
<b>EEPGL</b>	
Lead Country Manager	<ul style="list-style-type: none"> <li>• Review and approve the SEP</li> <li>• Assist in implementation of the SEP</li> </ul>
Public and Government Affairs Manager	<ul style="list-style-type: none"> <li>• Review and approve SEP to ensure alignment with current affiliate stakeholder engagement information, philosophies, activities, and relationships</li> <li>• Own and steward the affiliate's feedback mechanism, including the management of grievances</li> <li>• Assist in the development and implementation of the SEP</li> <li>• Assist in documentation of engagements conducted</li> <li>• Help maintain a comprehensive archive on captured data</li> </ul>
Safety, Security, Health, and Environment Manager	<ul style="list-style-type: none"> <li>• Review and approve the SEP</li> <li>• Review and authorize any financial provisions for stakeholder engagement (tied to SEA/EIA –related stakeholder engagement)</li> </ul>
Environmental, Regulatory, & Socioeconomic (ER&S) Leads	<ul style="list-style-type: none"> <li>• Review, approve and steward the SEP to ensure it meets permitting requirements</li> <li>• Assist in the definition, development and implementation of the SEP, ensuring correct application of EEPGL internal requirements</li> <li>• Periodically review progress in the development and implementation of stakeholder engagement activities</li> <li>• Periodically review the SEP, monitoring outcomes, and elaborate where necessary</li> </ul>

Role	Responsibilities
Service Department and Business Leads/Advisors and Contractors	<ul style="list-style-type: none"> <li>• Conduct engagements as directed by the affiliate and/or ER&amp;S Leads</li> <li>• Complete all reporting including outcomes and stakeholder input for all engagements</li> </ul>
<b>Houston-based ExxonMobil Management</b>	
Project Leadership	<ul style="list-style-type: none"> <li>• Provide adequate resources to implement the SEP</li> <li>• Ensure that the SEP is designed, developed and implemented as per legal requirements and ExxonMobil requirements for all operations</li> </ul>
<b>Environmental and Social Consultants</b>	
Environmental and Social Consultants	<ul style="list-style-type: none"> <li>• Engage with stakeholders to explain the EIA process and collect information required to complete a robust EIA</li> <li>• Document all engagements conducted</li> <li>• Maintain a comprehensive archive on all items captured / generated during / related to the conduct of the EIA (lists of concerns / issues / comments, newspaper articles, handouts / posters developed, fact sheets, etc.).</li> </ul>

## **4 SUMMARY OF STAKEHOLDER ENGAGEMENT ACTIVITIES**

Ongoing positive stakeholder relationships throughout the entire life cycle of a project are critical to its success. Stakeholder engagements are ongoing throughout EEPGL's activities in Guyana, and will continue through the environmental authorization application and corresponding EIA development processes, as well as through the full life cycle of EEPGL's projects.

### **4.1 Overview of Engagement Activities to Date**

EEPGL began pro-active communication regarding the company's activities in 2013 to lay the groundwork for establishing and maintaining stakeholder relations. Informational meetings and exchanges of information were conducted between EEPGL and key external audiences, including government officials, stakeholders within the general public, and representative non-governmental organizations. In addition to being a good business practice, these early engagements helped to inform the SEA that was submitted to the EPA in March 2014.

Stakeholder engagements have been ongoing since then and have included meetings with individual stakeholders, public forums, and training for local agencies and officials in the form of workshops on topics such as oil spill management, crude lifting, and waste management. Newspaper notifications have been printed at various points in time throughout the regulatory process to increase public awareness.

A schedule of the larger and more structured stakeholder engagement activities conducted to date is presented in Attachment A (Synopsis of Previous Stakeholder Engagement Activities). Attachment A provides a synopsis of engagement activities related to the Liza (Phases 1 and 2), Payara, and Yellowtail development projects as well as the Fiber Optic Cable Project. Not all stakeholder engagement activities are included (for example, face-to-face meetings which are part of the ongoing course of business for EEPGL).

### **4.2 Regular Government Engagement**

Continuous engagements with government and agencies that have oversight of EEPGL's projects, such as the Department of Energy (which falls under the Ministry of Presidency and recently took over responsibility for petroleum operations from the Ministry of Natural Resources), Guyana Geology and Mines Commission, and Environmental Protection Agency, as well as other local decision-making bodies, will take place throughout EEPGL's operations. In addition, EEPGL engagement with other government ministries, departments, and statutory authorities that have interest in its projects will also be continuous throughout EEPGL's operations.

### **4.3 Environmental Application and Public Comment Period**

During all environmental authorization application processes, stakeholders have had the opportunity through a 28-day public review period to provide input on EPA's determination on

whether an EIA is required for a proposed project. For each of the Liza Phase 1, Liza Phase 2, Payara, and Yellowtail developments, the EPA determined an EIA is required.

#### 4.4 Terms of Reference / Terms and Scope and Public Comment Period

For the EIA processes conducted to date, EEPGL held face-to-face meetings with select members of civil society to provide project-specific information prior to the finalization of a Terms of Reference / Terms and Scope for the project EIA. Stakeholders had the opportunity through a series of EPA-led sector and public scoping consultation meetings to provide input into the issues and concerns they wished to be considered within the EIAs. The dates and locations of the sector and public scoping consultation meetings held to date are summarized in Table 2.

**Table 2: Sector and Public Scoping Consultation Meetings to Date**

Meeting Type	Meeting Date	Meeting Location
Liza Phase 1		
Sector Agencies	5 and 6 October 2016	Region 4
Public Meeting	24 October 2016	Region 3
Public Meeting	26 October 2016	Region 2
Public Meeting	8 November 2016	Region 6
Public Meeting	14 November 2016	Region 1
Public Meeting	2 December 2016	Region 5
Public Meeting	3 December 2016	Region 4
Liza Phase 2		
Sector Agencies	16 January 2018	Region 4
Public Meeting	17 January 2018	Region 5
Public Meeting	18 January 2018	Region 6
Public Meeting	24 January 2018	Region 2
Public Meeting	25 January 2018	Region 2
Public Meeting	25 January 2018	Region 3
Public Meeting	2 February 2018	Region 1
Public Meeting	5 February 2018	Region 4
Payara		
Public Meeting	13 March 2019	Region 5
Public Meeting	14 March 2019	Region 6
Public Meeting	22 March 2019	Region 1

Meeting Type	Meeting Date	Meeting Location
Public Meeting	26 March 2019	Regions 3 and 4
Public Meeting	28 March 2019	Region 2
Yellowtail		
Public Meeting (Virtual)	27 May 2021 (afternoon session)	All Regions
Public Meeting (Virtual)	27 May 2021 (evening session)	All Regions
Public Meeting	28 May 2021	Region 6
Public Meeting	31 May 2021	Region 1
Public Meeting (Virtual)	2 June 2021 (morning session)	All Regions
Public Meeting (Virtual)	2 June 2021 (evening session)	All Regions
Public Meeting	4 June 2021	Region 4

More information on the attendees and issues raised at the public scoping consultation meetings are summarized in Attachment A (Synopsis of Previous Stakeholder Engagement Activities).

## 4.5 EIA Baseline Data Collection

As part of the EIA preparation process, EEPGL and its EIA consultants (ERM, Environmental Management Consultants, and Ground Structures Engineering Consultants), conduct engagement sessions with select key informants who hold specialist knowledge about topics of relevance for the EIA. These engagements often involve key informant interviews to gather specific information, as well as requests for data such as annual reports and plans.

Key informant stakeholders that have been engaged to date include:

- African Culture Development Association;
- Association of Trawler Owners and Seafood Processors;
- Big Bird & Sons Fishing Complex (Charity);
- Bureau of Statistics;
- Centre for Local Business Development;
- Conservation International;
- Department of Tourism;
- Fishing Cooperatives (e.g. Lima Fishermen's Development Co-op, Georgetown Fishermen's Co-op Society Ltd., Parika Fishermen's Development Co-op, etc.);
- Georgetown-based real estate agents;
- Guyana Geology and Mines Commission;
- Guyana Hindu Dharmic Sabha;

- Guyana Land and Surveys Commission;
- Guyana Marine Conservation Society;
- Guyana Rice Producers' Association;
- Mainstay Amerindian Village;
- Maritime Administration Department;
- Ministry of Agriculture;
- Ministry of Agriculture, Department of Fisheries;
- Ministry of Agriculture, National Agriculture Research and Extension Institute;
- Ministry of Communities;
- Ministry of Indigenous Peoples' Affairs;
- Ministry of Public Health;
- Ministry of Public Infrastructure;
- Ministry of Social Protection;
- National Aquaculture Association of Guyana;
- National Toshios Council;
- National Trust of Guyana;
- Ogle International Airport;
- Pomeroon Women's Agro-Processors Association;
- Private Sector Commission;
- Protected Areas Commission;
- Region 1, 2, 3, 4, 5, and 6 Regional Democratic Councils;
- Region 4 hotels, including Pegasus Hotel Guyana, Regency Suites, Grand Coastal Hotel, Brandsville Hotel, Cara Lodge, El Dorado Inn, and Kanuku Suites;
- Seafood distributors and companies (e.g., Pritipaul Singh, Noble House Seafoods; Global Seafoods);
- Supenaam-Parika Speedboat Owners' Association;
- University of Guyana Centre for the Study of Biological Diversity;
- University of Guyana Department of Engineering;
- Vilvordeen-Fairfield Women's Association;
- West End Agricultural Development Society; and
- World Wildlife Fund.

Focus group engagement has also occurred, whereby stakeholders with similar interests are met in a group setting and two-way dialogue about key topics is facilitated. This has specifically included focus groups pertaining to a multi-year ecosystem services study and an ongoing, multi-season participatory fishing study, including: 62 Neighbourhood Democratic Councils, Regional Democratic Councils, Town Councils, and Village Councils along the coastline from Region 1 to Region 6 (see Table 3 and Figure 3) and artisanal and commercial fisherfolk and fishing cooperatives (including Rosignol, Lima, Parika, and Complex 66) at 16 landing sites (see Table 4 and Figure 4).

**Table 3: Focus Group Locations for Ecosystem Services Study**

Region 1	Region 2	Region 3	Region 4	Region 5	Region 6
Father's Beach Community	Charity/Urasara	Wakenaam (island)	Georgetown	Woodlands/ Farm	Ordinance/ Fort Lands No. 38
Manawarin Community	Evergreen/ Paradise	Leguan*	Industry/ Plaisance	Hamlet/ Chance	Kintyre/ No. 37*
Waramuri/ Haimokabra Communities	Aberdeen/ Zorg-en-Vlygt	Mora/Parika*	Better Hope/ La Bonne Intention	Profit/Rising Sun	Gibraltar/ Fyrish*
Santa Rosa Community	Anna Regina Town Council	Hydronie/Good Hope	Beterverwagting / Triumph	Mahaicony/ Abary	Kilcoy/ Hampshire*
Assakata Community	Annandale/Riverstown	Greenwich Park/ Vergenoegen	Mon Repos/ La Reconnaissance*	Union/ Naarstigheid	Rose Hall Town Council
Warapoka Community	Good Hope/Pomona	Tuschen/ Uitvlugt	Buxton/Foulis	Seafield/ Tempie	Port Mourant/ John
Three Brothers Community		Stewartville/ Cornelia Ida	Unity/ Vereeniging*	Bath/ Woodley Park	Bloomfield/ Whim
Mabaruma Town Council*		Hague/ Blankenburg	Haslington/ Grove	Woodlands/ Bel Air	Lancaster/ Hogstye*
Aruka Mouth Community*		La Jalousie/ Nouvelle Flanders	Enmore/Hope	Zeelust/ Rosignol	Black Bush Polder
Morawhanna Community*		Best/ Klien/ Pouderoeyen			Good Hope/ No. 51*
Smith's Creek Community*					Macedonia/ Joppa
Imbotero Community*					Bushlot/ Adventure
Almond Beach Community*					Maida/ Tarlogie
					No. 52/ No. 74*
					Corriverton Town Council

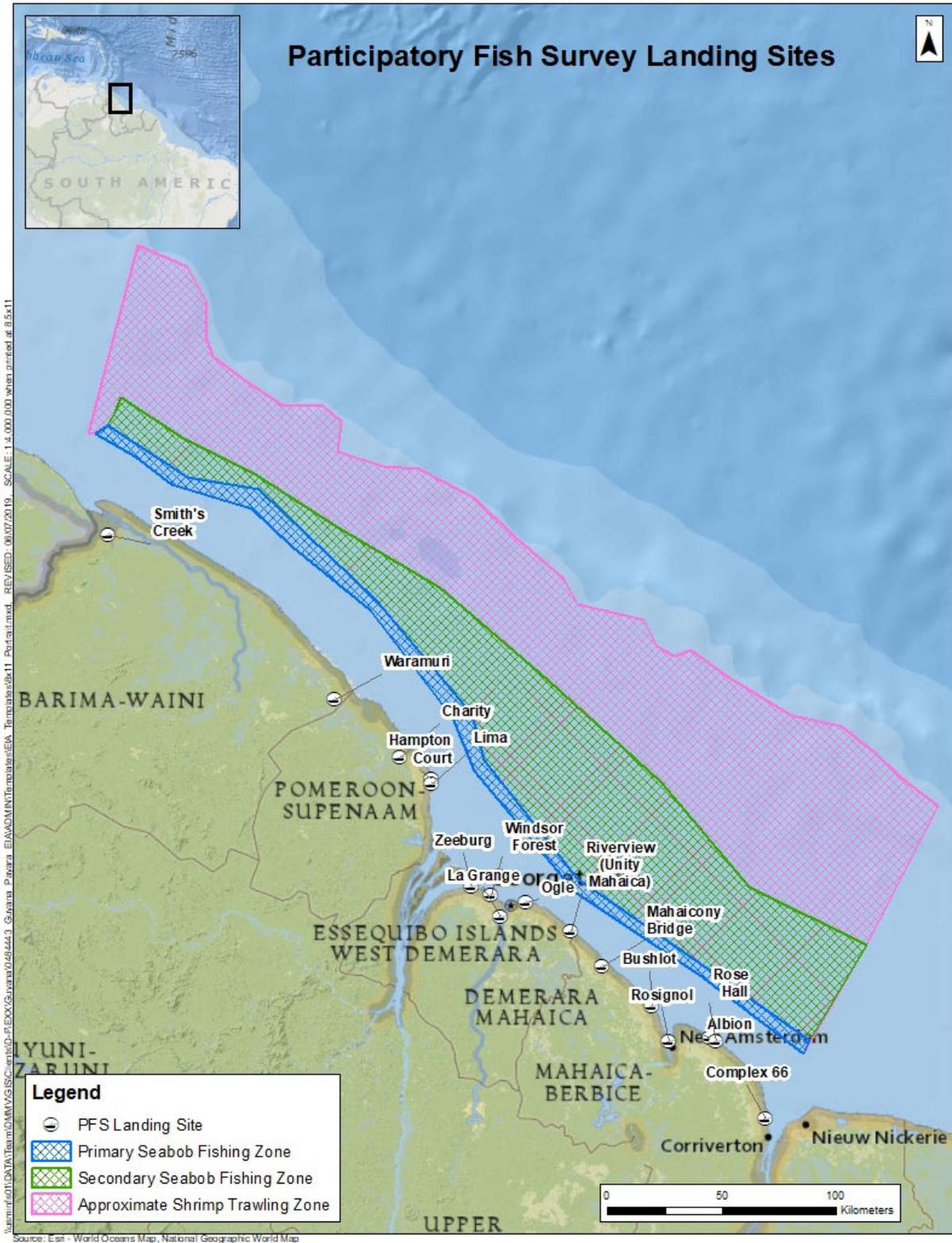
Note: Communities marked with an asterisk (\*) were re-engaged in 2021, including updates to ecosystem services.



**Figure 3: Focus Group Locations for Ecosystem Services Study**

**Table 4: Focus Group Locations for Participatory Fishing Study**

Region	Locations
Region 1	Smith's Creek; Waramuri
Region 2	Charity; Hampton Court; Lima
Region 3	Zeeburg; Windsor Forest; LaGrange
Region 4	Ogle; Riverview (Unity/Mahaica)
Region 5	Mahaicony; Bush Lot; Rosignol
Region 6	Albion; Rose Hall; Complex 66



**Figure 4: Landing Site Focus Group Locations for Participatory Fishing Study**

Information on key informant engagements aimed at obtaining existing conditions information for EIA development is summarized in Attachment A (Synopsis of Previous Stakeholder Engagement Activities).

## 4.6 EIA Submittal and Public Comment Period

Under the Guyana EPA's EIA process, a 60-day public comment period begins upon submittal of the EIA to the EPA. Per the Environmental Protection Act, as part of the EIA process, the developer and the person carrying out the EIA shall consult members of the public and interested bodies and organizations to disclose and discuss the results of the EIA. Public informational meetings held to date in accordance with these requirements are shown in Table 5.

**Table 5: Public Informational Meetings**

Meeting Type	Meeting Date	Meeting Location
Liza Phase 1		
Stakeholder meeting – Guyana Marine Conservation Society	28 February 2017	Georgetown
Stakeholder meeting – EPA	2 March 2017 15 March 2017 23 March 2017	Georgetown
Stakeholder meeting – Ministry of Natural Resources	2 March 2017	Georgetown
Stakeholder meeting – CDC	3 March 2017	Georgetown
Stakeholder meeting – Ministry of Indigenous Peoples Affairs	8 March 2017	Georgetown
Stakeholder meeting – National Trust of Guyana	16 March 2017	Georgetown
Stakeholder meeting – Ministry of Communities	22 March 2017	Georgetown
Stakeholder meeting – Guyana Hindu Dharmic Sabha	5 April 2017	Georgetown
Stakeholder meeting – Ministry of Public Health	6 April 2017	Georgetown
Stakeholder meeting – EPA, MNR, CDC, GGMC, MARAD	13 April 2017	Georgetown
Public Informational Disclosure Meeting	21 April 2017	Region 1
Public Informational Disclosure Meeting	24 April 2016	Region 6
Liza Phase 2		
Public Informational Disclosure Meeting – Region 1	20 July 2018	Mabaruma
Public Informational Disclosure Meeting – Region 2	12 July 2018	Anna Regina
Public Informational Disclosure Meeting – Region 2	13 July 2018	Charity
Public Informational Disclosure Meeting – Region 3	10 July 2018	Leonora
Public Informational Disclosure Meeting – Region 4	9 July 2018	Georgetown
Public Informational Disclosure Meeting – Region 5	16 July 2018	Hopetown
Public Informational Disclosure Meeting – Region 5	17 July 2018	No. 66 Village
Public Informational Disclosure Meeting – Region 6	17 July 2018	Rosehall

Meeting Type	Meeting Date	Meeting Location
<b>Payara</b>		
Public Informational Disclosure Meeting – Region 1	25 Oct 2019	Mabaruma
Public Informational Disclosure Meeting – Region 2	2 Oct 2019	Lake Mainstay
Public Informational Disclosure Meeting – Region 3	5 Nov 2019	Leonora
Public Informational Disclosure Meeting – Region 4	7 Nov 2019	Georgetown
Public Informational Disclosure Meeting – Region 5	15 Oct 2019	Hopetown Village
Public Informational Disclosure Meeting – Region 6	9 Oct 2019	Village 66
Open House – Region 4	30 Sep 2019	Georgetown
<b>Yellowtail</b>		
Public Informational Disclosure Meeting – Region 1	29 Oct 2021	Santa Rosa
Public Informational Disclosure Meeting – Region 1	5 Nov 2021	Mabaruma
Public Informational Disclosure Meeting – Region 2	27 Oct 2021	Anna Regina
Public Informational Disclosure Meeting – Region 3	1 Nov 2021	Leonora
Public Informational Disclosure Meeting – Region 4	25 Oct 2021	Georgetown
Public Informational Disclosure Meeting – Region 5	2 Nov 2021	Mahaicony
Public Informational Disclosure Meeting – Region 5	2 Nov 2021	Bushlot
Public Informational Disclosure Meeting – Region 6	3 Nov 2021	No. 66 Village
Public Informational Disclosure Meeting – All Regions	11 Nov 2021	Virual (Zoom)

*CDC = Community Development Council; GGMC = Guyana Geology and Mines Commission; MARAD = Maritime Administration Department; MNR = Ministry of Natural Resources*

In addition to public scoping consultation meetings and public informational meetings, EEPGL and its Consultants also conduct one-on-one meetings and focus groups with stakeholders (non-governmental organizations, civil society, members of interest groups, etc.) to discuss the preliminary EIA impacts and proposed mitigating measures, to seek feedback on progress and to help identify gaps/issues which may need to be addressed in more detail or new concerns/issues that need to be further investigated.

Meetings, focus groups, and other engagements conducted in accordance with EIA processes are summarized in Attachment A (Synopsis of Previous Stakeholder Engagement Activities).

## 4.7 Post-EIA Engagements

Conditions such as requirements for additional engagements may be included as part of the EPA's environmental authorization. Information on these and other engagements conducted as part of Post-EIA requirements is summarized in Attachment A (Synopsis of Previous Stakeholder Engagement Activities).

## **4.8 Other Engagements**

The Company is committed to providing stakeholders with regular access to information about the activities as well as access to a feedback mechanism through which stakeholders may provide input and receive response to feedback. To date, this has included, but is not limited to, oil spill management training in Regions 1 and 6, waste management training, capacity-building efforts and training, offshore oil and gas seminars through the Centre for Local Business Development, and community outreach events (e.g., job fairs, schools, informational booths) in Regions 1, 2, 3, 4, 5, 6, 9, and 10.

## **5 CONCLUSION**

This SEP will be periodically revised and updated as necessary according to EEPGL's ongoing activities. This will help to maintain the validity and adequacy of the information presented, and to confirm that the identified methods of engagement remain appropriate in relation to the legislative requirements and specific phases of EEPGL project development. Any major changes to EEPGL's project activities or schedule will be duly reflected in the SEP.

## ATTACHMENT A SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
Liza-1 Well Drilling Program [August 2011 to November 2013]	Liza-1 well Strategic Environmental Assessment and Environmental Permit	Ministry of Natural Resources	Available skilled/unskilled labor in oil and gas operations
		Guyand Geology and Mines Commissoin (GGMC)	Meeting or exceeding Gulf of Mexico standards Education and communication on Project and Deepwater Oil Spill Response Plan
		Environmental Protection Agency (EPA)	<ul style="list-style-type: none"> <li>• First Deepwater well in Guyana</li> <li>• Resource-or constituency – related concerns</li> </ul>
		Natural Resource Management Division of EPA	Potential impact on fisheries resources and supporting coastal ecosystems
		Environmental Assessment Board	First Deepwater well in Guyana
		Ministry of Labor, Human Services and Social Security, and Special Department of Occupational, Safety and Health Department	Local employment
		<ul style="list-style-type: none"> <li>• Ministry of Labor, Human Services and Social Security</li> <li>• Special Department of Occupational, Safety and Health Department</li> </ul>	Occupational, Health and Safety requirements
		Ministry of Local Government and Regional Development	Potential effect on communities
		Guyana Defense Forces and Guyana Police Forces	<ul style="list-style-type: none"> <li>• Port Security issues</li> <li>• Road Safety through Town</li> </ul>
		Ministry of Local Government – Solid Waste Management Department	Capacity and stability of waste management facility
		Ministry of Public Works, and Maritime Administration Department (MARAD)	<ul style="list-style-type: none"> <li>• Maritime issues, maritime traffic</li> <li>• Security issues, incidents</li> </ul>
		Transportation and Harbors Division, and Harbour Master	Wharf/Port access and development
		National Trust Department	<ul style="list-style-type: none"> <li>• Cultural heritage issues</li> <li>• Archaeological finds</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		Mangrove Restoration Project – National Agriculture Research and Extension Institute (NAREI)	<ul style="list-style-type: none"> <li>Risk and impact to Mangrove ecosystem</li> <li>Impacts on coastal livelihood artisan fishing, beekeeping and sea defense protection</li> </ul>
		Guyana Marine Conservation Society (GMCS) and Volunteer Youth Corp (Math and Science Initiative)	<ul style="list-style-type: none"> <li>Potential disturbance to sea coastline and transboundary movement</li> <li>Community and social benefits from Project</li> <li>Impacts of sound and noise from exploration on marine turtles and other sensitive biodiversity</li> <li>Blowout prevention and emergency response</li> </ul>
Six-Well Drilling Program (Liza-2 and Liza-3 wells) [mid-December 2015 to February 2016]	Six-well Drilling Program Environmental Management Plan (EMP) and Environmental Permit(s) and present out comes of Multi-well EMP Process	EPA, GGMC, Conservation International (CI), World Wildlife Fund (WWF) and other external stakeholders	<ul style="list-style-type: none"> <li>Marine sound</li> <li>Waste management</li> <li>Effluent discharge standards</li> <li>Oil spill preparedness and response</li> </ul>
	Ongoing dialogues with agencies	EPA/GGMC	Ongoing clarity of EMP and permit status. Discussing document comments and revisions
Liza Phase 1 Development Environmental Impact Assessment (EIA) [July 2016 to present]	<ul style="list-style-type: none"> <li>Presidential briefing</li> <li>Continue to build public support for the Project and confidence EEPGL capability.</li> <li>Identify potential roadblocks/issues before they cause project risk.</li> </ul>	President of Guyana	<ul style="list-style-type: none"> <li>Legislative requirements, policy requirements, general compliance and project support.</li> <li>Economic development and local workforce and supplier participation in the project</li> </ul>
	<ul style="list-style-type: none"> <li>General briefing</li> <li>Ensure timelines and process is well understood.</li> <li>Identify potential roadblocks/ issues before they cause project risk.</li> </ul>	EPA/GGMC	<ul style="list-style-type: none"> <li>Legislative requirements, policy requirements, general compliance and project support.</li> <li>Capacity concerns due to increasing activities in sector</li> <li>Evolving regulations and legislation that can affect the agency</li> <li>Pressure to evolve regulations to meet international standards</li> </ul>
	EIA information sharing and baseline data collection interviews	Ministry of Agriculture, Department of Fisheries	<ul style="list-style-type: none"> <li>Potential overlap of Project activity with new deep-sea tuna fishery</li> <li>Potential security concerns related to illegal fishing vessels entering floating production, storage, and offloading vessel exclusion zone</li> </ul>
		Ministry of Communities	No Project-specific concerns/issues identified
Ministry of Public Health		<ul style="list-style-type: none"> <li>Potential for added burden on Guyanese health system</li> <li>Potential for social investment in the health sector</li> </ul>	
Department of Tourism		<ul style="list-style-type: none"> <li>Possible changes to Guyana’s image as a “green” nation</li> </ul>	

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		Ministry of Social Protection	<ul style="list-style-type: none"> <li>• Proper fulfilment of Occupational Health and Safety requirements for contractors; ensure contracts are clear on who is responsible</li> <li>• Proper payment and documentation for worker insurance coverage</li> <li>• Potential for informal communities to arise, with potential for prostitution or other exploitation</li> </ul>
		Ministry of Indigenous Peoples Affairs	Need for consultation with indigenous communities in Region 1
		Ministry of Public Infrastructure	Possible traffic disruption if offsite storage facilities are used
		Maritime Administration Department	Maintenance of maritime safety and security in offshore project areas
		Guyana Land and Surveys Commission	<ul style="list-style-type: none"> <li>• Current land speculation in relation to the Project</li> <li>• Guyana Land and Surveys Commission vetting of any new data produced</li> </ul>
		Bureau of Statistics	Project information required to develop economic indicators for the country's new petroleum sector
		National Trust of Guyana	<ul style="list-style-type: none"> <li>• No Project-specific concerns or issues identified</li> <li>• Interest in Corporate Social Responsibility support</li> </ul>
		Private Sector Commission	<ul style="list-style-type: none"> <li>• Ensure appropriate local content targets</li> <li>• Accountability and involvement in proper management and investment of the country's revenues from the Project</li> <li>• EPA capacity</li> <li>• Retention of institutional knowledge and experience from this Project</li> </ul>
		Protected Areas Commission (PAC)	Potential impacts of an oil spill on Shell Beach; recommendation for consultation with the 18 communities living on or adjacent to Shell Beach
		University of Guyana Centre for the Study of Biological Diversity	Lack of data regarding pelagic species beyond the continental fish
		GMCS	<ul style="list-style-type: none"> <li>• EPA/EEPGL transparency; availability of data and studies conducted to date for the Project</li> <li>• Recommendation for consultation with indigenous communities</li> </ul>
		Conservation International	<ul style="list-style-type: none"> <li>• Short timeline of the EIA and lack of EPA capacity</li> <li>• Appropriate use of mitigation hierarchy</li> <li>• Participation of ExxonMobil in the sustainable development of the country</li> </ul>
		World Wildlife Fund	No Project-specific issues or concerns identified

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		Association of Trawler Owners and Seafood Processors	No Project-specific concerns identified; the Project will be well seaward of trawling activity
		National Aquaculture Association of Guyana	No Project-specific concerns or issues identified; fish farms are segregated from seawater intrusion using the same irrigation and drainage systems as rice fields.
		Guyana Rice Producers' Association	<ul style="list-style-type: none"> <li>• Main concern for rice industry is improved access to lower cost fuel, which is a significant industry input.</li> <li>• No other concerns or issues identified; rice fields are protected from potential seawater intrusion (and thus oil spills) by elaborate drainage and irrigation systems whereby fields are always upgradient of tidally influenced drainage canals</li> </ul>
		Supenaam-Parika Speedboat Owners' Association	No Project-specific issues or concerns identified
		Mainstay Amerindian Village	Reliance of Amerindian communities on natural resources
		Vilvordeen-Fairfield Women's Association	No Project-specific issues or concerns identified
		Pomeroon Women's Agro-Processors Association	<ul style="list-style-type: none"> <li>• Interested in whether fuel costs will go down</li> <li>• Potential for damage to livelihoods in event of a spill for those residing near the mouth of the Pomeroon River</li> </ul>
		West End Agricultural Development Society	No Project-specific issues or concerns identified
		Big Bird and Sons Fishing Complex	No Project-specific issues or concerns identified
		Lima Fishermen's Development Co-op	No Project-specific issues or concerns identified
		Georgetown Fishermen's Co-op Society Ltd.	<ul style="list-style-type: none"> <li>• Potential for oil spills and their impact on those directly and indirectly employed by fishing</li> <li>• Expected communication from EEPGL sooner, given that exploration has been ongoing</li> </ul>
		Parika Fishermen's Development Co-op	No Project-specific issues or concerns identified
		Ogle International Airport	No Project-specific issues or concerns identified
		African Culture Development Association	<ul style="list-style-type: none"> <li>• Use of Kingston seawall area for festivals and religious ceremonies</li> <li>• Local employment, including skills and technology transfer</li> </ul>
		Guyana Hindu Dharmic Sabha	<ul style="list-style-type: none"> <li>• Use of seashore for religious ceremonies, including funerals</li> <li>• Community investment</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		Region 2 Development Council	<ul style="list-style-type: none"> <li>• Importance of face to face consultation with Region 1 and 2 local stakeholders</li> <li>• Potential for spills</li> <li>• EPA capacity</li> <li>• Community investment</li> </ul>
	Two (2) Agency EIA scoping meetings led by EPA	Multiple public and private agencies and non-governmental organizations including EPA, GGMC, Ministry of Public Health, Ministry of the Presidency, PAC, GMCS, WWF, CI, others.	<ul style="list-style-type: none"> <li>• Oil spill response procedures and capabilities</li> <li>• Process for updating Terms of Reference (ToR) to reflect scoping comments</li> <li>• Other potential uses of produced gas</li> <li>• Government revenues from Project</li> <li>• Local employment</li> </ul>
	Six (6) Public EIA scoping meetings (Regions 1-6) led by EPA	Various national, regional and local agency representatives as well as private citizens.	<ul style="list-style-type: none"> <li>• National and local benefits, proper management/oversight of revenues</li> <li>• Local employment</li> <li>• Oil spill response procedures and capability</li> <li>• Impacts on fishing</li> <li>• MMO data availability</li> <li>• Impact of potential natural disaster on Project infrastructure and development area</li> <li>• Recommendations to increase public participation at scoping meetings</li> <li>• Other potential uses for produced gas</li> </ul>
	Agency-specific EIA disclosure meetings	Guyana Marine Conservation Society	<ul style="list-style-type: none"> <li>• Coastal sensitivity mapping process, and ways to improve quality of maps</li> </ul>
EPA		<ul style="list-style-type: none"> <li>• Air monitoring equipment and methodology</li> <li>• Rationale for EIA conclusions on air emissions impact on public health</li> <li>• Economic impacts of cooling water discharges to fish e.g. yellowfin tuna</li> <li>• Details of water modeling assumptions and limits</li> </ul>	
Ministry of Natural Resources		<ul style="list-style-type: none"> <li>• Factors considered in oil spill modeling</li> <li>• Possibility of piping gas to shore or locating a refinery in Guyana</li> </ul>	
Community Development Council and MARAD		<ul style="list-style-type: none"> <li>• Definition of routine discharges</li> <li>• Engagement with neighboring countries that could be impacted by spills (T&amp;T, Venezuela)</li> <li>• Liability for cleanup/restoration in event of a spill</li> </ul>	

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		Ministry of Indigenous Peoples' Affairs	<ul style="list-style-type: none"> <li>• Possibility of piping gas to shore or locating a refinery in Guyana</li> <li>• Likelihood of oil spills reaching the coast</li> <li>• Capacity-building needs to allow proper use of government revenues: Engineering, IT, infrastructure, environmental protection</li> <li>• How to use Project benefits to optimize and protect Guyana's natural riches</li> </ul>
		National Trust of Guyana	No Project-specific issues or concerns identified
		Ministry of Communities	<ul style="list-style-type: none"> <li>• Oil spill impacts on fish and commercial fisheries</li> <li>• Waste management – request for guidance on influencing cultural and behavioral changes with respect to waste management practices in the country</li> </ul>
		Guyana Hindu Dharmic Sabha	<ul style="list-style-type: none"> <li>• Estimate of local employment</li> <li>• Request info on local opportunities</li> <li>• Procedure for removing fishing boats from exclusion zone</li> <li>• Frequency/duration of disruption to fishing during Project vessel transits</li> <li>• Publicizing of Grievance Mechanism</li> </ul>
		Ministry of Public Health	<ul style="list-style-type: none"> <li>• Estimate of local employment</li> <li>• Why is a refinery not considered for Guyana</li> <li>• Clarification about potential health impacts of air emissions</li> </ul>
	One (1) multi-agency EIA disclosure meeting	MARAD, GGMC, Ministry of Natural Resources, Community Development Council, Ministry of Agriculture (Dept of Fisheries)	<ul style="list-style-type: none"> <li>• Time required for recovery of benthic species</li> <li>• Request to see remotely operated vehicle images</li> <li>• Chemical discharges and their toxicity</li> <li>• Species that could be introduced by ballast water</li> <li>• Potential for impacts within the mixing zone</li> </ul>
	Two (2) Public EIA disclosure meetings led by Environmental Resources Management		<ul style="list-style-type: none"> <li>• Potential oil spills - how would they be responded to/compensated.</li> <li>• Benefit sharing – how would this be distributed among regions</li> <li>• Timeframe in which Guyanese will experience socioeconomic benefits</li> <li>• Request for social scholarships, jobs, job training, and extra help to better plan for the environment</li> <li>• Wastes generated and their potential impacts</li> <li>• Management of drill cuttings</li> <li>• Seismic survey impacts on whales</li> <li>• Approach if impacts are found to be greater than predicted – would operations be stopped</li> <li>• Potential impacts on fishing livelihoods, sustainability of fisheries for future generations.</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
			<ul style="list-style-type: none"> <li>Process for monitoring air pollution</li> <li>Liability in the event of an oil spill moving to another country's coast</li> <li>Rationale for low spill potential</li> <li>Consider use of fisherfolk and other citizens in environmental monitoring efforts</li> <li>Transparency regarding revenue sharing agreement</li> </ul>
Liza Phase 1 EIA Post-Permit Studies [June 2017 to May 2018]	Coordination and Planning Workshop	EPA, PAC, GMCS, CI, National Toshias Council, University of Guyana	Development of methodologies for the coastal mapping studies, including ecosystem services and biodiversity, and turtle telemetry
	Consultations for planning and execution of post-permit studies	EPA	Coordination and approvals of Post-Permit Studies methodologies and timelines, including participation from EPA staff
		Ministry of Agriculture (Department of Fisheries)	Representative from Department of Fisheries to participate in Coastal Fishing Study consultations and execution
		Various fishing associations, boat owners, and equipment suppliers	Provision of information regarding potential boat rentals and equipment procurement.
		<ul style="list-style-type: none"> <li>39 coastal regional, democratic and village council meetings in Regions 1-4</li> <li>More than 369 neighborhood and village council leaders and community members engaged</li> </ul>	<ul style="list-style-type: none"> <li>Ecosystem Services Baseline data collection and field verification</li> <li>Requests for more information and updates on EEPGL's activities and the oil and gas sector in general</li> <li>Requests for copies of the coastal sensitivity map once completed</li> </ul>
		Protected Areas Commission	Coordination and approvals of Turtle Telemetry Study conducted on Shell Beach Protected Area
Fisherfolk throughout Regions 2-6	Participatory fishing study survey to determine		
Liza Phase 1 Development Drilling [April 2018]		Fisheries Department, fishing associations, boat owners, fisherfolk throughout Regions 2-6	<ul style="list-style-type: none"> <li>Discuss Notice to Mariners pertaining to Development Drilling start date of 1 May 2018</li> <li>Identify and communicate with maritime users who might not ordinarily receive Notices to Mariners</li> <li>Record locations of fisheries activities and to check for adherence to communications protocol and grievances follow up</li> </ul>
Liza Phase 2 Development EIA [January 2018 to August 2018]	One Agency ToR scoping meeting led by EPA	Multiple public and private agencies and non-governmental organizations including EPA, GGMC, Ministry of Public Health, Ministry of the Presidency, GMCS, WWF, CI, others.	<ul style="list-style-type: none"> <li>Status of Liza Phase 1 Post-Permit studies</li> <li>Cumulative Impacts</li> <li>Timelines for the ToR and EIA study</li> <li>Public benefits as a result of oil wealth and how that influences their behavior</li> <li>How EIA studies will account for cycles on an annual and multi-year basis</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
	Continued engagement; scoping discussions (January 2018)	<ul style="list-style-type: none"> <li>• Twenty-four (24) coastal regional, democratic and village council meetings in Regions 5 and 6</li> <li>• More than 167 neighborhood and village council leaders and community members engaged</li> </ul>	<ul style="list-style-type: none"> <li>• Ecosystem Services Baseline data collection and field verification</li> <li>• Requests for more information and updates on EEPGL's activities and the oil and gas sector in general</li> <li>• Requests for copies of the coastal sensitivity map once completed</li> </ul>
	Seven (7) Public EIA scoping meetings (Regions 1-6) led by EPA (January and February 2018)	Various national, regional and local agency representatives as well as private citizens.	<ul style="list-style-type: none"> <li>• Production schedule and drilling locations</li> <li>• National and local benefits, proper management/oversight of revenues</li> <li>• Local employment and training</li> <li>• Oil spill response procedures and capability including compensation and insurance</li> <li>• Impacts on coastal zones, mammals, fishing and other livelihoods</li> <li>• Waste management procedures including independent monitors</li> <li>• Impact of potential seismicity and natural disasters</li> <li>• Recommendations to increase public participation at scoping meetings</li> <li>• Considerations given to socioeconomic resources</li> <li>• Responsibility of regulatory agencies and dissemination of information</li> <li>• Regional and other country concerns</li> </ul>
	Scoping and baseline data collection interviews (April and May 2018)	<ul style="list-style-type: none"> <li>• 14 coastal regional and village council meetings in Region 1</li> <li>• More than 167 neighborhood and village council leaders and community members engaged</li> </ul>	<ul style="list-style-type: none"> <li>• Ecosystem Services Baseline data collection and field verification</li> <li>• Discussion on oil spill response and training, including potential impacts on Shell Beach</li> <li>• Requests for copies of the coastal sensitivity map once completed</li> </ul>
PAC		<ul style="list-style-type: none"> <li>• Details pertaining to Liza Phase 1 post-permit studies</li> <li>• Potential impacts on Shell Beach</li> <li>• Participation of Amerindian villages surrounding Shell Beach Protected Area, including updates on previous exercises conducted</li> <li>• Access to turtle tracking information</li> </ul>	
GMCS		<ul style="list-style-type: none"> <li>• Expansion of marine mammal observation over larger geographic area</li> <li>• How will Liza Phase 1 post-permit studies be utilized in the EIA and shared</li> <li>• Oil spill modeling should take into consideration seasons and cumulative effects</li> <li>• EEPGL insurance and protocols in the event of a disaster</li> </ul>	

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		GGMC	<ul style="list-style-type: none"> <li>• Details on exclusion zones for workovers</li> <li>• Changes in boundary/area for harvesting of certain fish species</li> <li>• Oil spill modeling should take into consideration cumulative effects</li> <li>• Environmental studies should consider monitoring</li> <li>• Worker health and safety and emergency response</li> <li>• Hazardous waste handling</li> </ul>
		Conservation International	<ul style="list-style-type: none"> <li>• Synergy between Liza Phase 1 post-permit studies and a CI Mangrove Study planned for area from Guyana coast to North of Brazil.</li> <li>• Potential involvement of University of Guyana students in future studies to allow for capacity-building</li> <li>• Availability of data resulting from current and ongoing studies</li> </ul>
		Ministry of Agriculture, Fisheries Department	<ul style="list-style-type: none"> <li>• Need for Notice to Mariners to be supplemented by targeted information sharing through engagement</li> <li>• Protocols for encroachment on safety exclusion zones</li> </ul>
		Fishing associations, boat owners, fisherfolk throughout Regions 2-6	<ul style="list-style-type: none"> <li>• Oil spill response protocols and compensation</li> <li>• Protocols for encroachment on safety exclusion zones</li> </ul>
		National Trust of Guyana	<ul style="list-style-type: none"> <li>• Chance Find Procedure and Cultural Heritage Monitoring Programme previously shared was reviewed and is acceptable</li> <li>• Indicated that its own procedures have been published although guidelines are subject to change during revisions</li> <li>• Queried what mechanism will be in place to detect cultural heritage offshore if encountered</li> <li>• Clarified point of contact for further engagements is the Chief Executive Officer</li> </ul>
		WWF	<ul style="list-style-type: none"> <li>• Questions about methodology and data for coastal mapping</li> <li>• Expect EIA to be more rigid in terms of analysis (modelling and extrapolation)</li> <li>• Recommended that the Post Permit Studies be annexed to the EIA so that the reader can have a better view/understanding of reporting / would also serve to address the difficulty in obtaining data from EPA</li> <li>• Results of the marine turtle telemetry will be useful to the for PAC's marine turtle conservation plan</li> </ul>
	Continued engagement with Region 1 coastal communities (June 2018)	Shell Beach Protected Area residents; Protected Areas Commission Rangers.	<ul style="list-style-type: none"> <li>• Review of turtle telemetry programming</li> <li>• Oil spill response and training requirements</li> <li>• Impacts on marine mammals and mitigations</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
	Eight (8) public EIA informational meetings (Regions 1-6) led by EPA (July 2018)	Various national, regional and local agency representatives as well as private citizens.	<ul style="list-style-type: none"> <li>Results of the oil spill modeling and compensation in the event of an unmitigated spill</li> <li>Impacts on biodiversity, especially marine mammals</li> <li>Impacts on livelihoods, with a particular focus on fishing and agriculture</li> </ul>
	EIA workshop with EPA and Environmental Assessment Board(August 2018)	EPA, Environmental Assessment Board, Ramboll Consulting	<ul style="list-style-type: none"> <li>Question and answer session led by technical specialists</li> </ul>
All Projects [November 2018]	Ongoing engagement related to improving capacity of social infrastructure	Ministry of Tourism	<ul style="list-style-type: none"> <li>Communicate EEPGL's health, safety, and security standards and requirements for lodging and accommodations</li> </ul>
Liza Phase 1 Development Drilling [January 2019]	Ongoing Monitoring – Stakeholder Engagement	Fisheries Department, fishing associations, cooperatives, boat owners, artisanal and commercial fisherfolk throughout Regions 1-6	<ul style="list-style-type: none"> <li>Discuss Notice to Mariners pertaining to Development Drilling updated January 2019</li> <li>Identify and communicate with maritime users who might not ordinarily receive Notices to Mariners; check for adherence to communications protocol and grievances follow up</li> </ul>
Liza Phase 1 EIA Post-Permit Studies Follow-up [January to July 2019]	Turtle Telemetry Capacity Building Workshop (January 2019)	Chelonian Research Institute, PAC, EPA, GMCS, Department of Wildlife, Fisheries Department	<ul style="list-style-type: none"> <li>Presentation on the methodology, techniques, and findings of the Liza Phase 1 Post-Permit Turtle Telemetry Program (conducted in 2018)</li> <li>Training on telemetry devices and computer tracking systems</li> <li>Discuss future turtle research and programming ideas</li> </ul>
	Geographic information system and coastal mapping capacity building (March 2019)	NAREI, EPA	<ul style="list-style-type: none"> <li>Presented coastal mapping efforts and mangrove research</li> <li>Reviewed geographic information system survey data platforms and methodologies</li> </ul>
	Coordination on Ecosystem Services Validation Efforts in Region 1 (April 2019)	Ministry of Indigenous Affairs; National Tshaos Council; Region 1 leadership	<ul style="list-style-type: none"> <li>Discuss planning and methodology for Ecosystem Services validation efforts</li> <li>Ensuring participation in focus group meetings at the Village level by members of vulnerable populations</li> </ul>
	Ecosystem Services Validation Efforts (May to July 2019)		
	Region 2 validation of 2017/2018 ecosystem services data (May 2019)	60 stakeholders in 6 Neighborhood Democratic Councils (NDCs): Charity/Urasara; Evergreen/Paradise; Aberdeen/Zorg-en-Vlygt; Anna Regina Town Council; Annandale/Riverstown; Good Hope/Pomona	<ul style="list-style-type: none"> <li>Seabed disturbance after decommissioning</li> <li>Impacts from drilling to irrigation and saltwater intrusion along Pomeroon River</li> <li>Socioeconomic impacts, including "Dutch Disease"</li> <li>Coastal erosion and impacts on sea defense</li> <li>Oil spill response procedures, impacts on livelihoods, compensation</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
			<ul style="list-style-type: none"> <li>Request more frequent engagement</li> <li>Sargassum weed proliferation of the marine space and canals and connection to drilling</li> <li>Hurricane and seismic concerns as a result of drilling</li> <li>Employment and training opportunities</li> </ul>
	Region 4 validation of 2017/2018 ecosystem services data (May 2019)	58 stakeholders in 9 NDCs/Town Council (TC): Georgetown; Industry/Plaisance; Better Hope/La Bonne Intention; Beterverwagting/Triumph; Mon Repos/La Reconnaissance; Buxton/Foulis; Unity/Vereeniging; Haslington/Grove; Enmore/Hope	<ul style="list-style-type: none"> <li>Biodiversity baseline data and environmental impacts</li> <li>Impacts and genesis of the Sargassum weed on the local environment</li> <li>Oil spill response procedures, impacts on livelihoods, compensation</li> <li>Employment and training opportunities</li> </ul>
	Region 5 validation of 2017/2018 ecosystem services data (May 2019)	74 stakeholders in 9 NDCs: Woodlands/Farm; Hamlet/Chance; Profit/Rising Sun; Mahaicony/Abary; Union/Naarstigheid; Seafield/Tempie; Bath/Woodley Park; Woodlands/Bel Air; Zeelust/Rosignol	<ul style="list-style-type: none"> <li>National and local benefits as a result of oil and gas revenue</li> <li>Oil spill response procedures, impacts on livelihoods, compensation</li> <li>Government’s gas to shore project site selection and refinery questions</li> <li>Hurricane and seismic concerns as a result of drilling</li> <li>Employment and training opportunities</li> <li>Offshore and nearshore safety exclusion zones</li> <li>Impacts on mangroves and sea defense systems</li> </ul>
	Region 1 validation of 2017/2018 ecosystem services data (June 2019)	175 stakeholders, National Toshias Council (NTC) Representative, GMCS representative in 13 Village Councils, TC: Father’s Beach, Manawarin, Haimokabra/Waramuri, Santa Rosa, Assakata, Warapoka, Three Brothers, Mabaruma, Aruka Mouth, Morawhanna, Smith’s Creek, Imbotero, Almond Beach	<ul style="list-style-type: none"> <li>More information/awareness required on oil and gas in easy to understand format and tools (e.g., brochures)</li> <li>Concerns regarding oil spills, environmental impacts, turtles, crabbing and fishing, hinterland communities</li> <li>Profit sharing and cost of exploration activities</li> <li>EPA Scoping/Disclosure meetings held in Mabaruma should have also occurred in Moruca Sub-region, which has a larger population.</li> </ul>
	Region 6 validation of 2017/2018 ecosystem services data (June 2019)	97 stakeholders in 15 NDCs, TCs: Ordinance/Fort Lands No. 38; Kintyre/No. 37; Gibraltar/Fyrish; Kilcoy/Hampshire; Rose Hall Town Council; Port Mourant/John; Bloomfield/Whim; Lancaster/Hogstye; Good Hope/No. 51; Macedonia/Joppa; Bushlot/Adventure; Maida/Tarlogie; No. 52/No. 74; Corriverton Town Council	<ul style="list-style-type: none"> <li>Benefits as a result of oil and gas revenues to Region 6, support for local businesses and enterprises, sustaining traditional sectors in an oil and gas economy</li> <li>Oil spill prevention, preparedness, response procedures, impacts on coastal livelihoods, insurance, and compensation</li> <li>Employment and training opportunities including opportunities for retrenched sugar workers and for young persons</li> <li>Seismic and land subsistence concerns as a result of drilling</li> <li>Impacts of hurricanes on the FPSO; sea turtles; and mangroves</li> </ul>
	Region 3 validation of 2017/2018 ecosystem services data (July 2019)	110 stakeholders in 10 NDCs: Wakenaam (island); Leguan; Mora/Parika; Hydronie/Good Hope;	<ul style="list-style-type: none"> <li>Oil spill response procedures, impacts on livelihoods, compensation</li> <li>Employment, training, and community development opportunities</li> </ul>

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Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		Greenwich Park/Vergenoegen; Tuschen/Uitvlugt; Stewartville/Cornelia Ida; Hague/Blankenburg; La Jalousie/Nouvelle Flanders; Best/Klien/Pouderoyen	<ul style="list-style-type: none"> <li>• Project location and details related to FPSO components</li> <li>• More frequent engagement and dissemination of information</li> <li>• Seabed and marine life disturbance</li> <li>• Offshore and industrial waste management</li> </ul>
Payara Development [March 2019 – February 2020]	Five (5) Public EIA scoping meetings (Regions 1-6) led by EPA (March 2019)	Various national, regional and local agency representatives as well as private citizens.	<ul style="list-style-type: none"> <li>• Production schedule and drilling locations</li> <li>• National and local benefits, proper management/oversight of revenues</li> <li>• Local employment and training</li> <li>• Oil spill response procedures and capability including compensation and insurance</li> <li>• Impacts on environmental resources, coastal zones, mammals</li> <li>• Impacts on socioeconomic resources, including fishing and other livelihoods</li> <li>• Waste management procedures including independent monitors</li> <li>• Recommendations to increase public participation at scoping meetings and enhance stakeholder engagement process</li> <li>• Responsibility of regulatory agencies and dissemination of information in EIA process and environmental monitoring</li> <li>• Consideration of cumulative impacts and lessons learned from Liza 1 and Liza 2 developments</li> </ul>
	Scoping and baseline data collection on fisheries through Participatory Fishing Study focus groups (April–July 2019)	<ul style="list-style-type: none"> <li>• 100+ fisherfolk at 16 fisheries landing sites in Regions 1 to 6: Smith’s Creek; Waramuri</li> <li>• Charity; Hampton Court; Lima; Zeeburg; Windsor Forest; LaGrange; Ogle; Riverview (Unity/Mahaica); Mahaicony; Bush Lot; Rosignol; Albion; Rose Hall; Complex 66</li> </ul>	<ul style="list-style-type: none"> <li>• Obtain biological and socioeconomic data from fisherfolk regarding artisanal and commercial fishing activities</li> <li>• Engagement continues on a monthly basis in Region 1 and bi-monthly basis in Regions 2-6</li> </ul>
	Scoping and baseline data collection on fisheries through Participatory Fishing Study focus groups at cooperatives (April–July 2019)	Lima Fishing Co-op; Parika Co-op; Rosignol Co-op; #66 Co-op	<ul style="list-style-type: none"> <li>• Obtain biological and socioeconomic data from fishing cooperatives</li> <li>• Discuss Payara project and general EEPGL-related offshore activities</li> <li>• Engagement continues on a monthly basis</li> </ul>
	Continued engagement with Region 1—Year 2 Turtle Telemetry Research (May 2019)	Shell Beach Protected Area residents; PAC Rangers; EPA; University of Guyana	<ul style="list-style-type: none"> <li>• Participation in turtle telemetry programming and field efforts</li> <li>• Impacts on marine mammals and mitigations</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
	Scoping and baseline data collection key informant interviews (May and June 2019)	Bureau of Statistics	<ul style="list-style-type: none"> <li>Shared plans for including oil and gas in the national accounts and provided updates on several surveys that are being planned and implemented by the bureau</li> <li>Requested copies of the reports of studies conducted in support of the EIA</li> </ul>
		Ministry of Agriculture	<ul style="list-style-type: none"> <li>Shared views on how the oil and gas sector may impact the agricultural sector</li> <li>Provided information on projects to develop the agricultural sector, including value-added initiatives</li> <li>Shared statistics for the agricultural sector</li> </ul>
		GGMC	<ul style="list-style-type: none"> <li>Consider the volumes and disposal methods for general solid waste that will be generated by the Liza Phase 1, Liza Phase 2, and Payara projects cumulatively</li> <li>Methods for managing increased vessel traffic in Georgetown Harbour</li> <li>Probabilities of significant oil spills occurring in Guyana</li> <li>Security for floating production, storage, and offloading vessel against foreign military vessels</li> </ul>
		Conservation International	<ul style="list-style-type: none"> <li>Requested the EIA assess critical habitats that need special treatment under International Finance Corporation</li> <li>Cumulative research effort, in particular for biological studies, that was conducted in support of the Liza Phase 1, Liza Phase 2, and Payara projects</li> <li>Goal of the EIA towards environmental management</li> <li>Volumes of waste that will be disposed at the Haags Bosch Landfill</li> <li>Expressed need for a non-technical Executive Summary</li> <li>Concerns on traffic congestion and safety in the vicinity of the Guyana Shorebase Inc.</li> <li>Requested access to the data and reports of the studies conducted in support of the EIA.</li> </ul>
		Ministry of Agriculture, Fisheries Department	<ul style="list-style-type: none"> <li>Shared plans for enhancing the management of Guyana’s fisheries sector and further development of the sector, including deep-sea fishing</li> <li>Outlined the challenges facing the fishing industry</li> <li>Indicated some of the concerns for the fishing sector as it pertains to oil and gas</li> <li>Requested copies of the reports of the studies conducted in support of the EIA (those related to the fisheries sector)</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		NAREI	<ul style="list-style-type: none"> <li>Shared feedback on mangrove coverage in the coastal sensitivity maps prepared as part of the Liza Phase 1 Post-Permit Ecosystem Services Study</li> <li>Provided information on a mangrove mapping project that is being implemented in collaboration with CI</li> <li>Shared plans for additional mangrove restoration activities, including in Region 1</li> </ul>
		National Trust of Guyana	<ul style="list-style-type: none"> <li>Shared concerns on how the oil and gas sector may influence cultural heritage sites in Georgetown</li> <li>Shared plans for reconsidering the current system for historical preservation of these sites</li> <li>Provided data on cultural heritage sites and archaeological sites in Guyana.</li> </ul>
		WWF	<ul style="list-style-type: none"> <li>Indicated that any feedback from the WWF will be provided directly to the EPA which may then share it with EEPGL and the consulting team at their discretion.</li> </ul>
		Centre for Local Business Development (CLBD)	<ul style="list-style-type: none"> <li>Overview on their Supplier Registration Portal</li> <li>Discussed training programs offered on behalf of EEPGL by the CLBD and some of the key issues participants in these program raised in relation to the sector (note: offshore oil and gas course provides an update on operational activities, including Payara);</li> <li>Views on how the CLBD contributes to local content</li> <li>How the oil and gas sector is likely to contribute to national development in Guyana</li> </ul>
		University of Guyana, Department of Engineering	<ul style="list-style-type: none"> <li>Advocated for one cumulative EIA instead of multiple EIAs for each development project</li> <li>Shared plans for developing courses to prepare students for employment in oil and gas</li> <li>Welcomed partnerships with EEPGL and the Consultants to share knowledge and experiences with students</li> </ul>
		Ministry of Social Protection	<ul style="list-style-type: none"> <li>Highlighted the need to ensure the welfare, health, and safety of Guyanese workers</li> <li>Shared information on the process to develop occupational health and safety regulations for the oil and gas sector</li> </ul>
		Guyana Lands and Surveys Commission	<ul style="list-style-type: none"> <li>Indicated perceptions of how the oil and gas sector has impacted the demand for land in Region 4, particularly in Georgetown</li> <li>Shared plans for enhancing the system for integrated land use planning in Guyana</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		Ministry of Business Department of Tourism	<ul style="list-style-type: none"> <li>Shared views on how the oil and gas sector may impact tourism in Guyana</li> <li>Provided plans for development of tourism initiatives in Regions 1 to 6</li> </ul>
		Ministry of Communities	<ul style="list-style-type: none"> <li>Suggested that the EIA consider how oil and gas may influence the socioeconomic conditions of Regions 7 to 10</li> <li>Suggested the EIA should include a study on commercial sex workers in relation to the oil and gas sector</li> <li>Shared plans for the housing and water sectors</li> </ul>
		Ogle Airport	<ul style="list-style-type: none"> <li>Obtained data on airport capacity; monthly passenger count; runway dimensions; helicopter landing zones demand and associated constraints</li> </ul>
		Protected Areas Commission	<ul style="list-style-type: none"> <li>Shared views that the NTC and GMCS should be included in engagement in Region 1.</li> <li>Enquired about the methods of biological and socioeconomic baseline data collection in indigenous communities.</li> <li>Asked that Consultants meet with all stakeholders in a single session going forward (instead of one-on-one engagements) and provide regular EIA progress updates.</li> </ul>
	Collect baseline data on lodging and housing capacity in/around Georgetown (May to July 2019)	14 hotels and 8 real estate entities in Region 4	<ul style="list-style-type: none"> <li>Stakeholders provided information on facilities, existing capacity rates, and demand forecasting, including any current and potential influence from the increased activity in the oil and gas sector.</li> </ul>
	EEGPL-led public informational meeting/targeted engagement with Region 3 stakeholders (July 2019)	Region 3 community leaders and members in Wakenaam and Leguan	<ul style="list-style-type: none"> <li>Job opportunities, oil spill response, split revenues, and benefits for Guyanese people (training / scholarships).</li> <li>Social support for schools in Wakenaam requested.</li> </ul>
	Participatory Fishing Study focus groups and one-on-one engagement (August 2019–ongoing)	19 volunteer fisherfolk participants plus other fishing community members at 16 fisheries landing sites in Regions 1 to 6: Smith's Creek, Waramuri, Charity, Hampton Court, Lima, Zeeburg, Windsor Forest, La Grange, Ogle, Riverview (Mahaica), Mahaicony, Bushlot, Rosignol, Albion, Rose Hall, Complex 66	<ul style="list-style-type: none"> <li>Obtain seasonal biological and socioeconomic data from fisherfolk regarding artisanal and commercial fishing activities</li> <li>Engagement continues on a monthly basis in Region 1 and bi-weekly basis in Regions 2-6</li> <li>Discuss Payara project and general EEPGL-related offshore activities and provide</li> </ul>
	EEGPL-led Payara EIA Open House in Georgetown for the general public (September 2019)	More than 180 people from the general public, civil society, government and academia attended the Open House.	<ul style="list-style-type: none"> <li>Provide opportunity for the general public to learn more about the Payara Project and engage one-on-one with experts on key topics</li> <li>Questions were asked of experts one-on-one related to biological resources, physical resources, socioeconomic resources, unplanned events, and local content opportunities, among others</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
	Six Public EIA Informational Disclosure Meetings (Regions 1-6) led by EPA (October–November 2019)	Various national, regional, and local agency representatives as well as private citizens.	<ul style="list-style-type: none"> <li>• Project description details</li> <li>• Local employment and training</li> <li>• Oil spill response procedures, capabilities and responsibilities</li> <li>• Impacts on environmental resources, marine life, coastal zones, fisheries</li> <li>• Impacts on socioeconomic resources, including fishing and other livelihoods</li> <li>• Waste management procedures including independent monitors</li> </ul>
	Ecosystem Services Study Information provision meetings (December 2019)	61 NDCs, CDC, VC, TCs along the coast in Regions 1 to 6 who participated in the Ecosystem Services Study baseline and validation efforts	<ul style="list-style-type: none"> <li>• Provision of packages to each of the local community groups who participated in the Ecosystem Services Study, including finalized maps, analysis and thank you letters</li> <li>• Provision of EEPGL and Project related material, including community feedback mechanism information</li> </ul>
	EIA and other government agency meetings to review EIA (January and February 2020)	Various government entities, including third party reviewers	<ul style="list-style-type: none"> <li>• Discussed questions and suggestions for amendments to EIA that were provided by the EPA, EAB, NGOs, members of the public and third-party reviewers</li> </ul>
Fiber Optic Cable Project [September 2020–May 2021]	Engagement and information sharing (September 2020–May 2021)	Fisheries Department, Ministry of Agriculture	<ul style="list-style-type: none"> <li>• Meetings to share plans and schedules for activities that may affect fisherfolk, and to discuss approaches to reduce and mitigate impacts.</li> <li>• The Department also supported EEPGL in mobilizing fisheries stakeholders and sharing of Fiber Optic Cable Project materials (including project factsheets and coordinates of surveying activities).</li> </ul>
		Fisherfolk and other fishing industry stakeholders (Upper Corentyne Fishermen’s Coop; Guyana Association of Trawler Owners and Seafood Producers; Greater Georgetown Fishing Coop in Meadowbank; Goed Fortuin fishing community; and Ogle / Better Hope fishing community)	<ul style="list-style-type: none"> <li>• Shared updates about the progress of surveying and installation activities for the Fiber Optic Cable Project</li> <li>• Updates included information to improve awareness of activities in the offshore and nearshore area, vessel movement restrictions, timeline, and contact information for fisherfolk and other stakeholders to communicate feedback, issues, concerns and requests.</li> </ul>
Yellowtail Development [May–November 2021]	Seven (7) Public EIA scoping meetings (Regions 1–6) led by EPA (May–June 2021)	Various stakeholders and special interest groups, as well as private citizens	<ul style="list-style-type: none"> <li>• Impacts on water quality due to waste and flaring</li> <li>• Recommendations to broaden and enhance stakeholder engagement participation, namely in Region 1</li> <li>• Consideration of cumulative impacts (local and global) and lessons learned from Liza 1, Liza 2, and Payara developments</li> <li>• Compensation for impacts on livelihoods, namely fisheries</li> <li>• Marine waste discharge types and management protocols</li> <li>• Oil spill impacts and response procedures</li> <li>• Impacts of increased vessel traffic and noise on marine life and fisheries</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
Baseline data updates including key informant interviews (August–September 2021)			<ul style="list-style-type: none"> <li>Impacts on coastal zones, marine life, fishing and other livelihoods</li> </ul>
		Ministry of Agriculture	<ul style="list-style-type: none"> <li>Shared agricultural data</li> </ul>
		Hydromet	<ul style="list-style-type: none"> <li>Shared climatic variability data</li> </ul>
		Fisheries Department Ministry of Agriculture	<ul style="list-style-type: none"> <li>Shared fishery management and aquaculture data</li> <li>Observed changes in demand for marine fish and shellfish, and COVID-19-related changes in the fishing industry</li> </ul>
		National Agricultural Research Education Institute	<ul style="list-style-type: none"> <li>Shared data on current and planned mangrove and beach restoration efforts</li> <li>Provided an update on the pandemic's impact on planned activities</li> </ul>
		National Trust Guyana	<ul style="list-style-type: none"> <li>Described structure of the National Trust</li> <li>Shared policy changes that could impact the Project's Chance Find Procedure</li> </ul>
		Ministry of Social Protection	<ul style="list-style-type: none"> <li>Shared updates regarding migrant populations in Guyana and related humanitarian support efforts.</li> <li>Identified opportunities to support vulnerable populations</li> </ul>
		Civil Defence Commission	<ul style="list-style-type: none"> <li>Shared updated (2020) Oil Spill Plan</li> <li>Highlighted importance of local content for Project development, as well as independent surveying and assessment</li> </ul>
		Guyana Tourism Authority	<ul style="list-style-type: none"> <li>Shared reports about impact of Covid-19 on tourism</li> <li>Shared tourism data</li> </ul>
		Ministry of Tourism, Industry and Commerce	<ul style="list-style-type: none"> <li>Shared GDP data</li> <li>Questions about direct and indirect positive economic impacts</li> </ul>
		Conservation International	<ul style="list-style-type: none"> <li>Shared mangrove restoration information</li> <li>Concerns about climate impacts, ecosystem health and flaring</li> <li>Importance of community engagement and water quality testing</li> </ul>
		Almond Beach Community Development Council	<ul style="list-style-type: none"> <li>Shared data on tourism and ecosystem health changes</li> <li>Shared information on COVID-19 impacts</li> <li>Protected Areas Commission Update—work continues with the commission</li> </ul>
		Aruka Mouth Community Development Council	<ul style="list-style-type: none"> <li>Shared update on ecosystem services and fisheries</li> </ul>
	Barabina VC	<ul style="list-style-type: none"> <li>Shared update on ecosystem services, hunting and fisheries, including flooding impacts</li> </ul>	

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Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		Gibraltar/Fyrish NDC	<ul style="list-style-type: none"> <li>Shared community information about commodity prices, employment, COVID-19 impacts and flooding</li> </ul>
		Good Hope/ No. 5 Village NDC	<ul style="list-style-type: none"> <li>Shared update on ecosystem services and flood impacts</li> </ul>
		Hosororo Hill Community Development Council	<ul style="list-style-type: none"> <li>Shared community information about community investment, employment and flooding impacts</li> </ul>
		Imbotero Community Development Council	<ul style="list-style-type: none"> <li>Shared community information about immigration rates, employment and sanitation</li> <li>Shared information about COVID-19 and flooding impacts</li> </ul>
		Kilcoy / New Hampshire NDC	<ul style="list-style-type: none"> <li>Shared update on ecosystem services, including mangrove restoration</li> <li>Shared information about COVID-19 and flooding impacts</li> </ul>
		Kintrye NDC	<ul style="list-style-type: none"> <li>Shared community information about commodity prices, employment, COVID-19 impacts</li> <li>Shared update about flooding impacts and ecosystem services</li> </ul>
		Lancaster/Hogsty NDC	<ul style="list-style-type: none"> <li>Shared community information about commodity prices, COVID-19 impacts and flooding</li> <li>Concerns about oil spills protocols and compensation</li> </ul>
		Leguan NDC	<ul style="list-style-type: none"> <li>Shared community information about commodity prices, community investment, emigration, COVID-19 impacts and moderate flooding</li> </ul>
		Mon Repos / La Reconnaissance	<ul style="list-style-type: none"> <li>Observed land use conflicts between local stakeholders on the seashore</li> <li>Shared information on gender-based violence, commodity prices, and solid waste management concerns</li> </ul>
		Morowhanna Community Development Council	<ul style="list-style-type: none"> <li>Shared community information about fisheries, immigration, COVID-19 impacts and fuel price stabilization</li> </ul>
		No. 52 / No. 74 NDC	<ul style="list-style-type: none"> <li>Fishing update including increase in fishing activity; a shift to Suriname</li> </ul>
		Parika NDC	<ul style="list-style-type: none"> <li>Shared community information about fisheries, ecosystem services and COVID-19 impacts</li> </ul>
		RDC Region 5	<ul style="list-style-type: none"> <li>Shared community information about commodity prices, fisheries, marine water quality, COVID-19 impacts and flooding</li> </ul>
		Smith Creek Community Development Council	<ul style="list-style-type: none"> <li>Shared community information about shoreline housing and flooding</li> <li>Shared community investment opportunities, including empoldering a 40.5 hectare (100-acre) plot of land and community fuel trade</li> </ul>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	Objective / Desired Outcome	Stakeholders / Audience	Potential Concerns, Issues & Sensitivities
		Unity/Vereeniging NDC	<ul style="list-style-type: none"> <li>Shared community information about commodity prices, COVID-19 impacts and flooding</li> <li>Concerns about oil spills protocols and compensation</li> </ul>
		White Water Village Community Development Council	<ul style="list-style-type: none"> <li>Shared community update including reduced spending power causing a slowdown in economic activities such as farming and fishing</li> </ul>
	Nine Public EIA Informational Disclosure Meetings (Regions 1-6, and virtual) led by EPA (October–November 2021)	Various national, regional, and local representatives as well as private citizens	<ul style="list-style-type: none"> <li>Project description details</li> <li>Impacts on biological and physical resources, including marine life, coastal zones, fisheries</li> <li>Impacts on socioeconomic resources, including fishing and other livelihoods</li> <li>Local employment and training</li> <li>Oil spill response procedures, capabilities and responsibilities</li> <li>Waste management procedures</li> </ul>

**ATTACHMENT B SAMPLE OF IDENTIFIED POTENTIAL STAKEHOLDERS**

Stakeholder Category	Interest in Project	Potential Stakeholders
Regulatory / Government	National authorities have an interest in the Environmental Impact Assessment and permitting procedures and Guyanese resources. Local and regional authorities have a general interest in potential impacts and benefits to their respective communities, and may facilitate engagement with local communities. They may also provide permits for EEPGL project activities and business licenses for onshore and offshore facilities.	President of Guyana; Department of Energy; Ministry of Natural Resources; Sectoral Committee on Natural Resources; Members of Cabinet; Opposition Government leaders, Guyana Geology and Mines Commission; Environmental Protection Agency; Protected Areas Commission; Government Information Agency; Civil Defense Commission; Guyana Maritime Administration Department; leadership of Regions 1-10; Attorney General; Civil Aviation Authority; Guyana Defence Force; Transportation and Harbors Department; Pesticides and Toxic Chemicals Board; Hydrometeorological Service; Guyana Forestry Commission; Guyana Tourism Authority; Bureau of Statistics; National Trust of Guyana; National Toashao's Council
Community	Communities who may potentially be impacted positively or negatively by Project activities, or are concerned that they may be impacted.	Georgetown residents; coastal beach users/residents; indigenous people; commercial and artisanal fisherfolk
Civil Society, Interest Groups, non-governmental organizations	Non-governmental or other organizations and entities that may be interested in a diverse set of issues including environmental protection, socioeconomic development and human rights.	Non-governmental organizations focused on indigenous peoples' issues; Conservation International; World Wildlife Fund; Religious organizations; Guyana Marine Conservation Society; Mangrove Restoration Project; ECO1
Private Sector	Businesses of any scale that could be affected positively or negatively by the Project.	Fuel and Waste; Subsea, Umbilicals, Risers, and Flowlines; Drilling; Floating Production, Storage, and Offloading Shorebase Contractors
Media	News media outlets that may range from local to international in distribution.	Stabroek News, Kaieteur News, Guyana Chronicle, Guyana Times, www.demerarawaves.com, www.inewsguyana.com, www.newsroom.gy, www.newsourcegy.com, www.newsnow.gy, www.citizensreportgy.com, www.gnnonline.com, National Communications Network TV and others TV and radio networks
Academic Institutions	Academic institutions or foundations that provide research on specific topics of interest.	National Agricultural Research and Extension Institute; Caribbean Agricultural Research and Development Institute; Universities and technical institutes
Professional, Business and Workers' Associations	General or industry-specific associations with interest in how EEPGL project activities may represent opportunities for their members or impacts on them.	Private Sector Commission; Guyana Oil & Gas Association, Guyana Manufacturing and Services Association; Guyana Association of Trawler Owners and Seafood Processors; Shipping Association of Guyana; Chambers of Commerce; African Business Roundtable; Rotary Clubs; National Aquaculture Association of Guyana; Tourism and Hospitality Association of Guyana

**ATTACHMENT C EXAMPLES OF INFORMATIONAL MATERIALS SHARED WITH THE PUBLIC**

**How big is a 500 meter Exclusion Zone?**



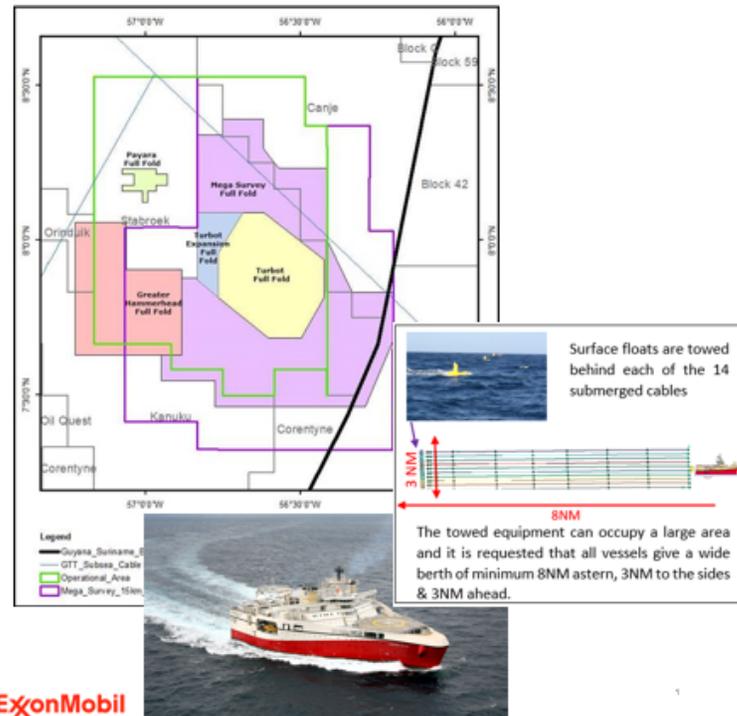
**FOR SAFETY – No Fishing Near Drill Ship and Survey Vessels**

- 500 meter exclusion zone around Stationary Drill Ship
- Requested berth of 3NM ahead, 3NM to the sides, and 8NM astern for seismic vessels

**NOTICE TO FISHERFOLK**

**Ongoing Seismic Survey**

- Collecting seismic data in southeast portion of the Stabroek Block
- Vessels: Ramform Tethys, Delta Monarch, Ocean Fortune, and Miss Megan
- Started mid-January 2019 and lasting to ~April 2020



**Figure C-1: Notice to Fisherfolk Shared with Fishing Communities in Regions 1 to 6 through Targeted Engagement**

### Findings of the Ecosystems Services Study in Region 1

Ecosystem services are the benefits that people obtain from natural environments that support survival, health, economic activities and provide cultural fulfilment.



As part of Post-Permit Studies for Liza 1, an extensive six-month **Ecosystem Services Study** was conducted along 427 kilometers of Guyana’s coastline from Regions 1 – 6.

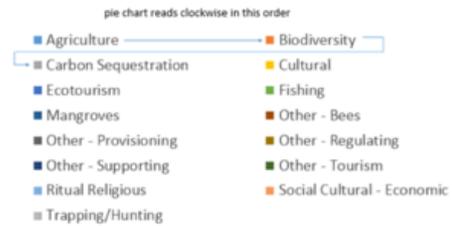
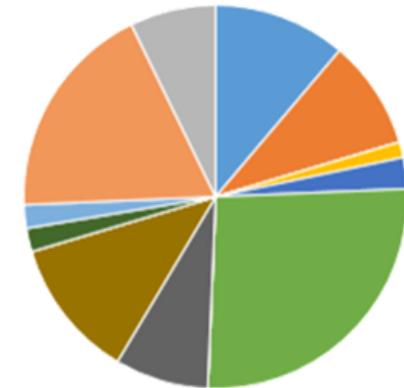
The Study was able to, for the first time, map exact locations of where ecosystem services exist along the coast. Over 700 community leaders and members, from National Democratic Councils, Village Councils, Town Councils, Regional Democratic Councils participated in the Study.

The communities and villages that were engaged in Region 1 are shown in the Map below.



The **critical** ecosystem services identified by stakeholders in Region 1 include: fishing and crabbing, crop cultivation, freshwater for household use, transportation by rivers and other waterways, erosion control and shoreline protection and providing habitats for wildlife.

All ecosystem services identified in Region 1 are shown in the Pie Chart.



The locations of these ecosystem services along the Region 1 coastline are shown in the Map on the next page.

Figure C-2: Handout for Region 1 NDCs on Initial ESS Findings

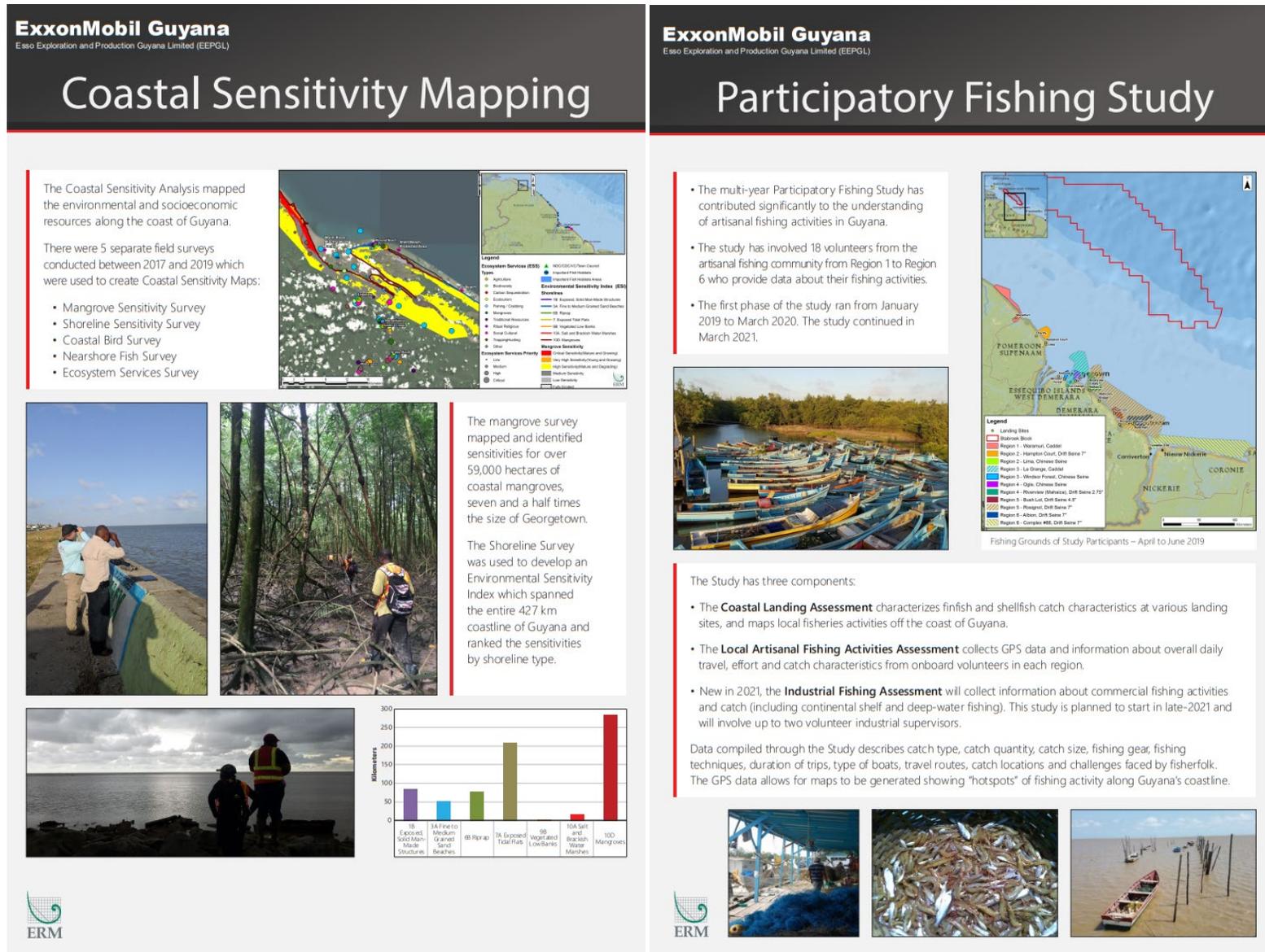
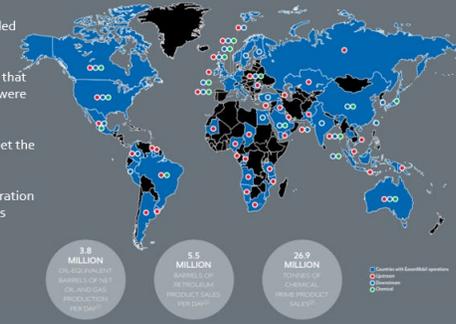


Figure C-3: Examples of Posters and Handouts for Yellowtail EIA Public Informational Sessions



### ExxonMobil: Who we are

- ExxonMobil is one of the world's largest publicly traded energy providers and chemical manufacturers
- We develop and apply next-generation technologies that enable us to drill oil and gas deposits in regions that were not accessible a generation ago
- We are committed to help safely and responsibly meet the world's growing need for energy
- The full name of ExxonMobil in Guyana is Esso Exploration and Production Guyana Limited – often referred to as EEPGL



### Nearshore and Offshore Fisheries Study

- First fish study of its kind in Guyanese waters in over 50 years
- Study included sample locations in the deepwater, continental shelf, and nearshore/coastal zones
- Continental shelf supports the most diverse fish community of any of the zones sampled
- Exotic lionfish appear to have become established in Guyana's waters
- Sampling has documented the importance of the continental shelf as a nursery area for *Carcharias* sharks
- Composition of the nearshore fish community is strongly influenced by seasonal fluctuations in freshwater input, and is dominated by anchovies, catfishes, and drums/croakers, but initial ichthyoplankton assessment results indicate high biological connectivity between the offshore and nearshore zones



### ExxonMobil's Oil Spill Response Approach

Our approach is to **prevent, prepare, and practice**

- First priority is **prevention**. We use the best technology, processes, and people in our operations to prevent a spill from happening.
- We **prepare** for the unexpected. A comprehensive response plan has been in place since before drilling our first well. This plan is continuously revised and enhanced as our activities increase.
- We **practice**. We continuously conduct trainings and drills to ensure there is an understanding of roles and responsibilities.



Figure C-4: EEPGL's 27-Page Informational Guide Provided to Members of the Public in 2019

**For information or inquires**

**Esso Exploration & Production Guyana Limited**

99 New Market Street  
North Cummingsburg,  
Georgetown, Guyana



Telephone number: 592-231-2866



E-Mail: [guyanastaff@exxonmobil.com](mailto:guyanastaff@exxonmobil.com)



[www.exxonmobil.com/guyana](http://www.exxonmobil.com/guyana)



@ExxonMobilGuyana



@ExxonMobilGuyana



**Figure C-5: Sharing EEPGL’s Community Feedback Mechanism through Presentations, Brochures, Handouts, and Cards**

## ATTACHMENT D EXAMPLES OF ENGAGEMENT TEMPLATES

### Stakeholder Engagements – Payara ESIA

#### Minutes of the Meeting with Ministry of XXX

**Date:** May 10, 2019

**Time:** 09.27hrs

**Venue:** Ministry of XXX, Georgetown

#### Consultants Team:

Neil Henry Environmental Resources Management (ERM)  
Kandila Ramotar Environmental Management Consultants (EMC)

#### Ministry Team:

XXX Title  
XXX Title

#### Feedback from XXX

Prior to the official start of the meeting, XXX met with the consulting team to share his views on the oil and gas sector. These included:

- The need to protect Guyanese workers. Guyana’s labour laws are not relevant in 2019 and there is a concern that these are being exploited by overseas companies.
- It is important for sub-contractors to be fairly compensated.

#### Introduction and Presentation

Mr. Neil Henry thanked the representatives from XXX for meeting with the consulting team and introductions were made. Mr. Henry indicated that the purpose of the meeting was to provide brief progress updates on the Liza Phase 1 and Liza Phase 2 Development Projects, provide a description of the Payara Development Project and receive feedback from the Ministry.

Mr. Henry delivered a presentation which outlined the following:

- A brief progress update of the Liza Phase 1 and Liza Phase 2 Development Projects;
- An overview of the Payara Development Project including the project workforce, onshore support infrastructure and logistics, etc.;
- The resources and receptors that will be considered in the ESIA; and
- Studies and analyses that support the ESIA.

#### Summary of Discussions

The following comments and issues were discussed by the Ministry team and the consultant team during and after the presentation:

- **Distance between Discoveries:** It was queried what is the distance between the 3 discoveries.
- **Readiness for Oil Spill Response:** It was asked whether EEPGL supports the Civil Defence Commission in oil spill response training.

- **Installation of SURF:** It was enquired whether divers will be required to support installation of the SURF.
- **Safety and Health:** Main concern is of the safety and health of the people who will work in the oil and gas sector. Concerns were also expressed about Guyanese workers being paid fairly, granted leave, etc.]
- **Workforce and Employment:** It was recommended that the ExxonMobil and its contractors utilize the Government’s Central Recruitment and Manpower Agency. The Agency helps to connect suitable employers and employees. Employers will advertise vacancies through the Agency who then searches their database for a suitable employee. It is a free service. Potential employers are not obligated to hire any person recommended by the Agency.  
  
The oil and gas sector will benefit the local workforce. Guyanese could be expected to benefit in resources and skills and over the next 5 years expertise would be built up in Guyana.
- **Impact to Fisheries:** It was queried whether the livelihoods of fisherfolk would be negatively affected by the FPSO.
- **Accessing draft EIA:** It was asked how the draft EIA could be accessed.

#### Next Steps:

1. The consultants will share the presentation with the team

The meeting closed at 10.40hrs.

**Figure D-1: Example of Meeting Minutes from One-on-One EIA-Related Engagements**

**Esso Exploration and Production Guyana Ltd (EEPGL)**

Name of  Meeting /  Training /  Session: **Metocean Survey Stakeholder Engagement**  
 Date: June 9, 2019

Venue: Parika

Attendees:

NAME	ORGANISATION	DESIGNATION	SIGNATURE
1. <i>Vernard Madanta</i>			
2. <i>D. Bisson</i>			
3. <i>D. Surj Prasad</i>			
4. <i>O. Biso</i>			
5. <i>Ranesh</i>			
6. <i>Z. Hamid</i>			
7. <i>J. Dotal</i>	Ministry of Agriculture	Fisheries Officer	<i>J. Dotal</i>
8. <i>ASIF NIZAM</i>			<i>ASIF NIZAM</i>
9. <i>G. Mongra</i>			
10.			
11.			
12.			

**Isometrix Information for Joint Field Survey of the PFS and Marine Team**

CONTACT PERSON	
First Name	XX
Last Name	XX
Title	Artisanal Fisherman
Gender (please circle)	Male <span style="margin-left: 150px;">Female</span>
Phone	XX
Email	None
Address	Ogle, Region 4
ENTITY INFO	
Entity Name	Independent
Entity Type	N/A
Entity Phone	N/A
Entity Email	N/A
Entity Address	N/A
ENGAGEMENT INFO	
Engagement title	Handing over of equipment to individuals that were pre-identified during the selection of supervisors during previous PFS field missions. This also includes the training of individuals for the use of the equipment to facilitate data collection for the PFS.
Engagement date	April 11, 2019
Engagement method (please circle)	In Person <span style="margin-left: 20px;">Telephone</span> <span style="margin-left: 20px;">Newsletter</span> <span style="margin-left: 20px;">Web Presentation</span> Letter <span style="margin-left: 20px;">Email</span> <span style="margin-left: 20px;">Social media</span> <span style="margin-left: 20px;">Texting/Instant messaging</span>
Purpose (please circle)	Regulatory driven [Phase 1] <span style="margin-left: 50px;">Discretionary</span>
Project / Phase	Phase 1 Monitoring / Payara PFS
Location	Ogle
Description	1:00-hour one on one Training on Use of equipment for the Participatory Fish Survey. This included training in use of equipment such as hand held camera, GPS unit, scales, measuring tapes and data sheets for entry of catch.
Attendees/staff	XXX, EMC
Attendees/stakeholder	XXX
Actions	1) EMC will continue periodically communicate with fisherfolk to ascertain progress; 2) EMC will continue to engage individual as it relates to future supply of Data sheets and batteries for equipment; 3) Data collected will be entered and given back to individual.

**Figure D-2: Examples of Sign-In Sheets and Engagement Records to Track Engagement Efforts**

Attachment: Questions on Guyana's Hospitality Sector	Baseline Data Needed								
<p>1. What is your current bed count? _____</p> <p>2. What is your average capacity rate?  <input type="checkbox"/> Under 50%   <input type="checkbox"/> 40-70%   <input type="checkbox"/> Above 70%</p> <p>3. Please provide the average price points for different types of rooms.            _____            _____</p> <p>4. What amenities do you offer?            _____            _____</p> <p>5. What percentage of your guests are citizens of Georgetown and the surrounding metro area versus citizens of Guyana but from outside the Georgetown metro area versus foreign guests?  <input type="checkbox"/> Under 50%   <input type="checkbox"/> 40-70%   <input type="checkbox"/> Above 70%</p> <ul style="list-style-type: none"> <li>• For foreign guests, do you have this broken down by CARICOM and other? _____</li> <li>• Has this fluctuated over the last year? Two years? Three years? _____</li> </ul> <p>6. Have you seen a change in vacancy and room rates in the last year? Two years? Three years?  <input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <ul style="list-style-type: none"> <li>• If yes, what do you believe caused this change? _____</li> </ul> <p>7. Have you noticed any changes to your vacancy rate and origin of guests that could be linked to Guyana's recent oil developments?            _____</p> <p>8. Do you provide permanent housing to residents (locals and/or expats) of the Georgetown metro area?  <input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <ul style="list-style-type: none"> <li>• If yes, approximately how many? _____</li> <li>• Have you noticed a trend with this population in the last year? Two years? _____</li> </ul> <p>9. Do you have any plans for expansion?            _____            _____</p>	<table border="1"> <thead> <tr> <th style="background-color: #cccccc;">Entity</th> <th style="background-color: #cccccc;">Baseline Data Needed</th> </tr> </thead> <tbody> <tr> <td>Bureau of Statistics</td> <td> <ol style="list-style-type: none"> <li>Tell us about the Multi-Indicator Cluster Survey slated to start in 2019. What indicators will be covered? For which time periods? When will the Survey be completed?</li> <li>What are some of the main findings of the Guyana Labour Force Survey? Will there be 2018 surveys?</li> <li>Is there updated population data since the 2012 census? Similarly, is updated data on the number of dwellings per Region available since the 2012 census? 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**Figure D-3: Engagement Templates for Various Baseline Data Collection Scopes of Work (Socioeconomic Resources)**



DRAFT FOR DISCUSSION



**Environmental Permit for Liza Phase 1 Development Project**  
 Post Permit Activities – Field Studies to verify selected shoreline and coastal habitat classification.  
 Focus Area: Ecosystem Services

**Ecosystem Services Survey Data Sheet**

**Approach:**

This data sheet is to be utilised in the collection of data for the Ecosystem Services Survey. It is intended that one data sheet will be utilised for each Neighbourhood Democratic Council (NDC) to guide the data collection process and to inform the verification exercise. The data sheet will be completed by the ERM-EMC team.

The participants at the meeting with the NDCs will be asked to identify the various ecosystem services provided by the coastline within each NDC District and to locate these services on a map provided. The services will be listed in a table with additional information which can be used to further determine the nature, magnitude and extent of activity and frequency within the ecosystem. The map of the NDC district provided will be utilised for interaction and identification of the various areas.

**Question 1: What kind of use do you make of the coastal area within your NDC?**

Ecosystem Service	Types and Extent of Usage		General Location & Frequency
<b>Fishing</b>	Fish		
	Shrimp		
	Crabs		
	Other		
<b>Wildlife Trapping</b>	Mammals		
	Birds		
	Ducks		
<b>Bird Hunting</b>	Shore birds		

DRAFT FOR DISCUSSION

	Ducks		
	Song birds		
<b>Biodiversity</b>	Nature/Mangrove Reserve		
	Wildlife Habitat		
<b>Apiculture</b>	Honey		
<b>Mangroves</b>	Wood		
	Fishing poles		
	Fishing ponds		
	Do you have any historical information about change in mangroves in your area?		
	Number of grazing animals accessing the shoreline area (number of animals and length of time present in the shoreline area per month)		
	Amount of harvesting occurring (estimate of m <sup>2</sup> per month)		
<b>Ecotourism</b>	Relaxing		
	Bird watching		
	Family Outings		
<b>Carbon Sequestration</b>	Vegetation cover		

Frequency Key: 1- daily use, 2 – few times per week, 3 weekly, 4 – monthly, 5 – few times per year

**Figure D-4: Engagement Templates for Various Baseline Data Collection Scopes of Work (Ecosystem Services)**

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# **PRELIMINARY END OF OPERATIONS DECOMMISSIONING PLAN**

*Submitted with changes*

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**Esso Exploration and Production Guyana  
Limited**

**Preliminary End of Operations Decommissioning  
Plan for Guyana Development Projects**

**March 2022**

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# Appendices

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Appendix B	Liza Phase 2 Development Project Overview
Appendix C	Payara Development Project Overview
Appendix D	Yellowtail Development Project Overview

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# 1 INTRODUCTION

The purpose of this Preliminary End of Operations Decommissioning Plan (Plan) is to provide an overview of the proposed abandonment and decommissioning of development project wells and facilities at the end of operations, and to describe the anticipated work required to confirm that the abandoned facilities will be left in a condition that avoids harm to the environment. This Plan uses a decommissioning methodology and approach that is consistent with international best practice standards.

The objectives of this Plan are to:

- Describe the proposed methods for the safe abandonment, removal, disposal, and/or decommissioning of the development project assets; and
- Describe the plans for managing potential impacts as a result of decommissioning activities through mitigation measures and monitoring.

The scope of this Plan covers the preliminary plans for the plugging and abandonment (P&A) of development wells and the decommissioning of development project production facilities. As a development project approaches the end of field life (e.g., several years prior to commencement of decommissioning), it is envisioned that this Plan will be revised to cover the ultimate decommissioning of the facility in compliance with applicable laws and regulations in effect at that time, while also considering the technology and infrastructure available at that time. The current scope of abandonment and decommissioning activities for development projects includes:

- Subsurface—development wells;
- Subsea—trees, manifolds, jumpers, flowlines, umbilical, risers, and other subsea equipment;
- Floating production, storage, and offloading vessel (FPSO)—marine vessel, topsides facilities, and the vessel mooring system; and
- End of operations-related waste.

## 2 STANDARDS AND LEGAL / REGULATORY FRAMEWORK

The offshore decommissioning process is regulated by a framework of international conventions and guidelines, regional seas conventions, and national legislation. Guyana is currently a party to some of these international conventions and guidelines that pertain to offshore decommissioning, such as:

- United Nations Convention on the Law of the Sea;
- Basel Convention on the Transboundary Movement of Hazardous Wastes and their Disposal; and
- International Maritime Organization (IMO) Guidelines for the Removal of Offshore Installations and Structures (1989).

Globally, ExxonMobil employs good international oilfield practice for decommissioning and abandonment. For offshore facilities, this includes utilizing IMO Resolution A.672(16) Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone as a basic standard worldwide, as well as the UK Offshore Petroleum Regulator for Environment and Decommissioning's (OPRED's) "Offshore Oil and Gas Decommissioning Guidance Notes" November 2018, (ANNEX A—A Guide to Comparative Assessments). These embody that where a decision is made to allow an offshore installation, structure, or parts thereof to remain on the seabed, this should be based on a case-by-case evaluation (by the jurisdiction over the installation or structure).

For well P&A, ExxonMobil P&A guidelines are broadly consistent with Oil and Gas UK's Well Decommissioning Guidelines, Issue 6 (June 2018).

The decommissioning plan and strategy will be based on a notice of the intent for P&A of the development wells and decommissioning the production facilities, which will be provided to the appropriate Guyanese regulators, to obtain approval in accordance with the following requirements, and/or with future applicable legislation:

- Environmental Protection Act, Cap 20:05
- Petroleum Exploration and Production Act (1986)
- Petroleum Exploration and Production (Amendment) Act (1992)

The project-specific Environmental and Socioeconomic Management Plans and the project-specific Environmental Impact Assessments (EIAs) further identify these international conventions, guidelines, and laws; summarize their relevance to the Project; and articulate the environmental performance criteria they impose.

## **3 MAJOR DECOMMISSIONING COMPONENTS AND ACTIVITIES**

### **3.1 Prior to Decommissioning**

Near the time of decommissioning, Esso Exploration and Production Guyana Limited (EEPGL) will develop a more detailed decommissioning plan, in consultation with the appropriate Guyanese regulators. EEPGL will perform inspections, surveys, and testing to assess current conditions that will provide the basis and required information to prepare a more detailed plan for decommissioning. As part of that planning process, EEPGL will perform comparative assessments of decommissioning options for the various facilities components, as described in OPRED's "Offshore Oil and Gas Decommissioning Guidance Notes" November 2018, (ANNEX A—A Guide to Comparative Assessments), including facility components left *in situ*. The assessments will assist in arriving at the final decommissioning recommendation. The comparative assessment is designed to evaluate five (5) criteria—safety, environmental, technical, societal, and economics—and to select the best option for the final decommissioning plan. Consultation with stakeholders will also be conducted by EEPGL during decommissioning planning. An updated End of Operations Decommissioning Plan will be submitted to the appropriate Guyanese regulators in advance of commencing field work.

### **3.2 Development Wells**

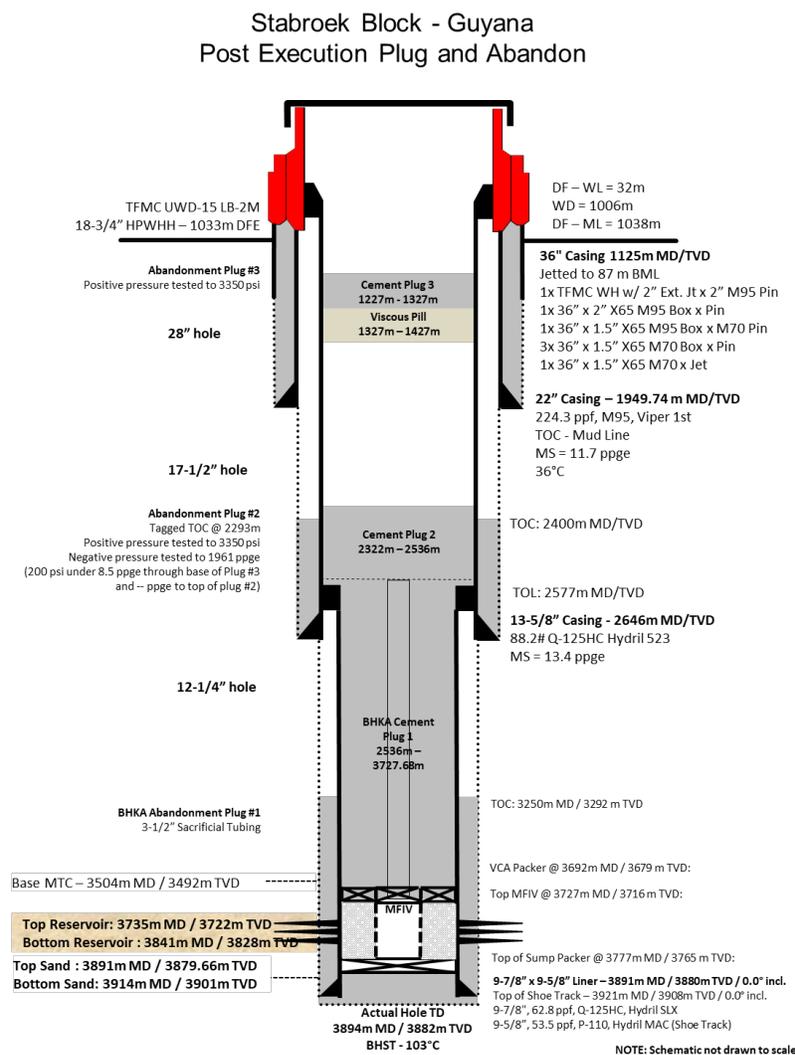
The objective of permanent well abandonment is to prevent escape of hydrocarbons to the environment. Well abandonment is concerned with the isolation of rock formations that have flow potential and is achieved by restoring suitable cap rock via placement of P&A barriers. P&A barriers must be set adjacent to suitable cap rock and establish full lateral coverage (rock-to-rock) across the well bore. The P&A barrier must be at a depth with a fracture gradient that exceeds the highest anticipated future pressure from the intervals being abandoned. The material, number, position, length, and placement of P&A barriers, and appropriate technology (e.g., rig or tool selection) are based on assessment of well condition, formation fluids, pressures, formation strength, potential flow rates, sustainability of potential flow, and environmental impact. P&A barriers (wellbore and annulus) must be verified (for example pressure tested, tagged, installation performance confirmed, logged or otherwise), as appropriate for the specific barrier element in question. A representative P&A schematic from a Stabroek Block exploration / appraisal well is shown on Figure 1. The schematic depicts zones isolated with full lateral coverage (rock-to-rock) for the following:

1. Isolating reservoir from overlying zones; and
2. Isolating any intermediate intervals with potential to flow to sea.

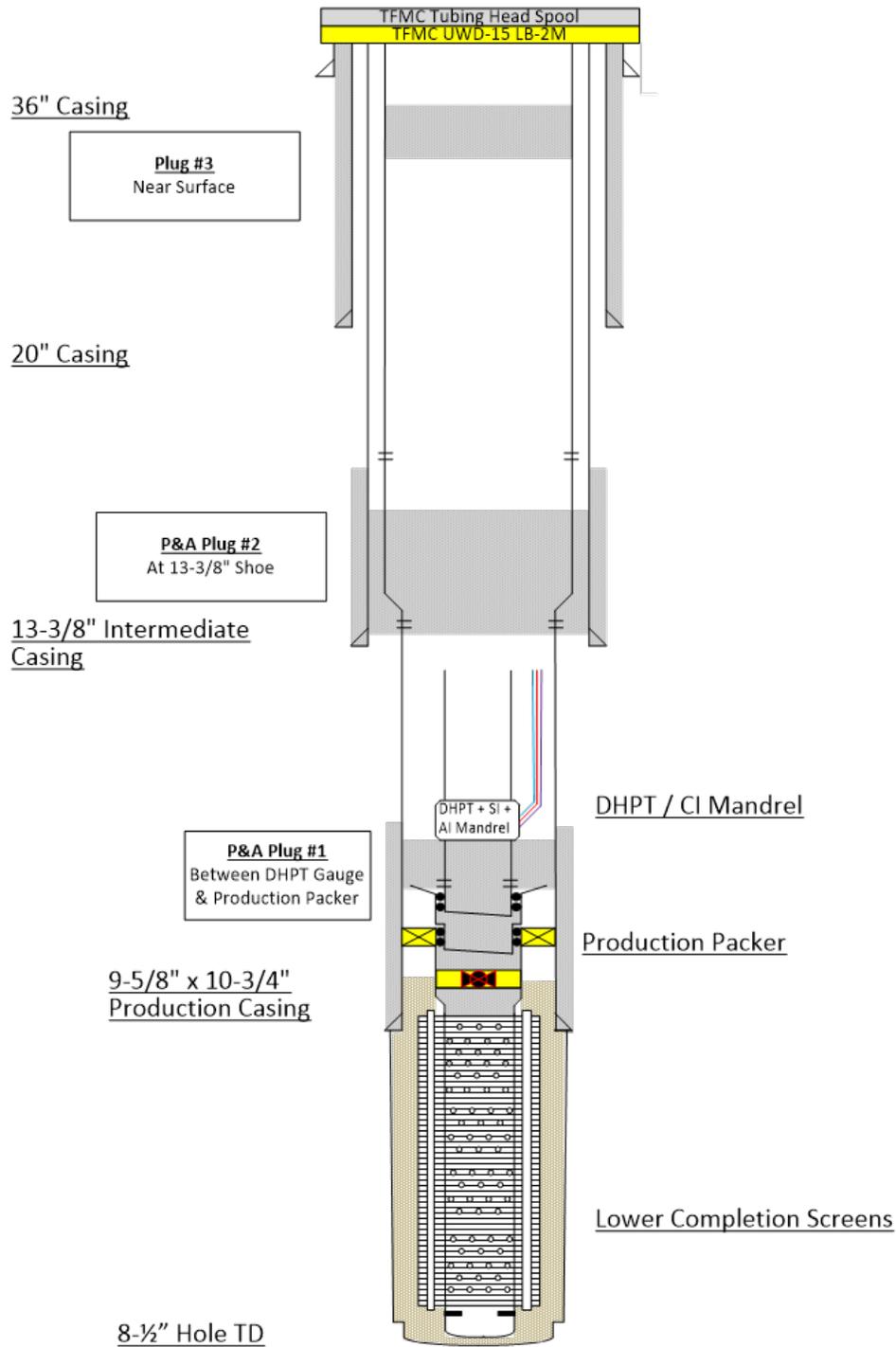
Figure 2 depicts a representative P&A schematic for what is envisioned for a development well P&A.

There is a range of complexities associated with well P&As. Because of this, EEPGL employs an approach for this Plan that assumes a range of P&A methods. Some wells with lower P&A complexity can be abandoned riserless using light well intervention (LWI) vessels. Based on industry experience, there will also be a number of the wells that require riser-based heavy well intervention (HWI) or P&A using a drilling rig.

In all cases, it is currently envisioned that the wellhead, tubing head, and potentially the production tree will be left in place, consistent with current industry deep water practice where the top of this equipment is lower than the subsea, umbilicals, risers and flowlines (SURF) infrastructure.



**Figure 1: Representative Exploration / Appraisal Well P&A Schematic**



**Figure 2: Representative Development Well P&A Schematic if Production Tree is Removed**

### **3.3 Subsea Equipment**

As part of the decommissioning process, all risers, pipelines, umbilicals, and other subsea equipment will be safely and properly isolated, de-energized, and flushed to remove hydrocarbons and any hazardous materials to a suitable level prior to being taken out of service.

It is currently envisioned that the risers, pipelines, umbilicals, and subsea equipment will be disconnected after flushing and preparation and left in situ on the seafloor at the production location. Alternative strategies will be considered and may be selected during detailed decommissioning plan development based on the results of the comparative assessments discussed previously.

As an example, one of the options that is planned to be evaluated through a comparative assessment is recovering risers vs. abandoning in place. Additional subsea components that will be evaluated by comparative assessment are:

- Well heads, manifolds, Pipeline End Terminations (PLETs), suction piles, and other subsea equipment;
- Pipelines and umbilicals; and
- Risers and mooring lines.

### **3.4 FPSO**

The FPSO will be disconnected from its mooring system, removed from the production location, and towed to a new location for re-use or decommissioning. The FPSO anchor piles and mooring lines are expected to be disconnected and abandoned in place on the seafloor at the production location, consistent with current standard industry practice, unless an alternative strategy is selected based on the results of the comparative assessment.

### **3.5 Decommissioning Waste**

Waste streams associated with decommissioning activities, including hazardous and non-hazardous wastes, will be managed and disposed of in accordance with applicable Guyanese regulations, applicable international conventions and guidelines, and standard industry practice. Methods may include injection downhole into the reservoir for certain types of wastes, separation and incineration offshore for certain types of wastes, or transport to onshore waste management facilities for management and disposal for certain types of wastes. This includes any waste streams found to contain Naturally Occurring Radioactive Material (NORM). Further details on waste management can be found in EEPGL's Comprehensive Waste Management Plan. Infrastructure for waste management is expected to continue to develop as the development projects approach the end of their production stages, and a more comprehensive plan for waste management will be developed at that time.

## 4 MITIGATION AND MONITORING

There will be areas of disturbance at the sea surface and the seafloor associated with the end of operations activities, as noted in the project-specific EIAs. The Project Development Area (PDA) for each project will be the site of marine vessel activity for the duration of the decommissioning program as support vessels transfer supplies and personnel to and from the PDA. All disturbances at the sea surface will be temporary in nature. Disturbances at the seafloor will be associated with the decommissioning of the development wells, FPSO mooring lines, and SURF equipment.

EEPGL will implement measures to manage potential decommissioning-related impacts as listed in Sections 4.1 and 4.2.

### 4.1 Description of Embedded Controls for Decommissioning

This section of the Plan identifies the embedded controls that EEPGL will implement to reduce potential environmental and socioeconomic impacts related to decommissioning activities. Additional embedded controls that are specific to the decommissioning stage may be identified during the future comparative assessments performed by EEPGL:

- Maintain marine safety exclusion zones with a 500-meter (~1,640-foot) radius around major decommissioning vessels to prevent unauthorized vessels from entering areas with an elevated risk of collision.
- Regularly maintain equipment, marine vessels, vehicles, and helicopters and operate them in accordance with manufacturers' guidance and/or Company and Operator best practices, as applicable, and at their optimal levels to reduce atmospheric emissions and sound levels to the extent reasonably practicable.
- Shut down (or throttle down) sources of combustion equipment in intermittent use where reasonably practicable in order to reduce air emissions.
- Use secondary containment for storage of bulk fuel and hazardous materials, where practicable.
- Regularly check pipes, storage tanks, and other equipment associated with storage or transfer of hydrocarbons/chemicals for leaks.
- For wastewater released from the onboard sewage treatment plant, comply with aquatic discharge standards in accordance with International Convention for the Prevention of Pollution by Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) regulations.
- For those wastes that cannot be reused, treated, or discharged/disposed on the major decommissioning vessels, manifest and safely transfer them to appropriate onshore facilities for management.
- Periodically audit waste contractors to verify appropriate waste management practices are being used.

- Treat bilge water in accordance with MARPOL 73/78, as applicable.
- Provide awareness training to Project-dedicated marine personnel to recognize signs of marine mammals at the sea surface. Provide standing instruction to Project-dedicated vessel masters to avoid marine mammals (inclusive of riverine mammals) and marine turtles while underway and reduce speed or deviate from course, when possible, to reduce probability of collisions.
- Provide standing instructions to Project-dedicated vessel masters to reduce their speed within 300 meters (984 feet) of observed marine mammals and marine turtles, and to not approach the animals closer than 100 meters (328 feet).
- Provide standing instruction to Project-dedicated vessel masters to avoid any identified rafting seabirds when transiting to and from PDA.
- Observe standard international and local navigation procedures in and around the Georgetown Harbour and Demerara River, as well as best ship-keeping and navigation practices while at sea.
- Subject Project workers to health screening procedures to minimize risks of transmitting communicable diseases.
- Procure Project goods and services locally when available on a timely basis and when they meet minimum standards and are commercially competitive.
- Employ Guyanese citizens having the appropriate qualifications and experience where reasonably practicable. Partner with select local institutions and agencies to support workforce development programs and proactively message Project-related employment opportunities.
- Use an established Safety, Security, Health, and Environment (SSHE) program to which all Project workers and contractors will be required to adhere to mitigate against risk of occupational hazards. Ensure all workers and contractors receive training on implementation of these principles and are required to adhere to them in the daily execution of their duties.
- Maintain an Oil Spill Response Plan (OSRP) to ensure an effective response to an oil spill, including maintaining the equipment and other resources specified in the OSRP and conducting periodic training and drills.
- Where practicable, direct lighting on and major Project vessels to required operational areas rather than at the sea surface or skyward. Ensure lighting on vessels adheres to maritime safety regulations/standards.

## **4.2 Description of Mitigation Measures for Decommissioning**

This section of the Plan identifies the mitigation measures that EEPGL will employ to mitigate potential environmental and socioeconomic impacts related to decommissioning activities. Additional mitigation measures that are specific to the decommissioning stage may be identified during the future comparative assessments performed by EEPGL:

- Quantify and report direct greenhouse gas emissions from Project offshore facilities and from offshore and onshore Project activities by EEPGL and its dedicated contractors on an annual basis in accordance with internationally recognized methodologies.
- Notices to Mariners are issued through the Maritime Administration Department for their communication with the public, and information is provided to the Department of Fisheries for their distribution to stakeholders (including associations, co-ops, and fisherfolk) within the fishing industry in country, regarding movements of major marine vessels to aid them in avoiding areas with concentrations of Project vessels and/or where marine safety exclusion zones are active.
- Augment ongoing stakeholder engagement process (along with relevant authorities) to identify commercial cargo, commercial fishing, and subsistence fishing vessel operators who might not ordinarily receive Notices to Mariners and, where possible, communicate with them regarding major vessel movements and marine safety exclusion zones.
- Proactively communicate the Project's limited staffing requirements for decommissioning as a measure to reduce the magnitude of potential population influx to Georgetown from job seekers.
- Adopt, and implement as needed, a Chance Find Procedure that describes the reporting requirements in the event of a potential chance find of heritage or cultural resources during decommissioning activities.
- Require Project workers to adhere to a Worker Code of Conduct, which will address shore-leave considerations.
- Use a dedicated medical provider on board major decommissioning vessels to complement the services of the local private medical clinic used by the Project, and procure a dedicated ambulance to avoid overwhelming the local medical infrastructure.

### **4.3 Description of Monitoring Program**

An inspection will be performed following final P&A of wells and decommissioning of facilities if any anomalies were identified with the decommissioning barrier verifications. If required, the scope and frequency of offshore post-decommissioning inspection should be determined by the Entities under Contract, but as a minimum it would be performed twice (utilizing a remotely operated vehicle, drones, or other available technologies) within 15 months of the completion of all decommissioning work. The first inspection would be performed within 90 days of completing the decommissioning work. The second inspection would be done no sooner than 12 months from the completion of the decommissioning work, but within 15 months. In the unlikely event that shortly after decommissioning a leak occurs indicating that the P&A work was potentially defective, EEPGL would respond and address the issue to ensure proper abandonment.

## 5 SCHEDULE

End of operations/decommissioning planning activities are expected to begin approximately 3 to 5 years before the end of field life for a project. A comparative assessment will be performed in accordance with IMO guidelines in effect at the time, which considers environmental and socioeconomic aspects. EEPGL will notify the relevant Guyanese regulators approximately 2 years prior to the planned decommissioning of the field facilities and will submit an updated End of Operations Decommissioning Plan, including a Well Abandonment Plan for development wells that will be in place at the time of field facility decommissioning, for approval. The updated plan would be approved prior to the commencement of abandonment and decommissioning activities in the PDA.

The notional schedule for decommissioning is shown below.

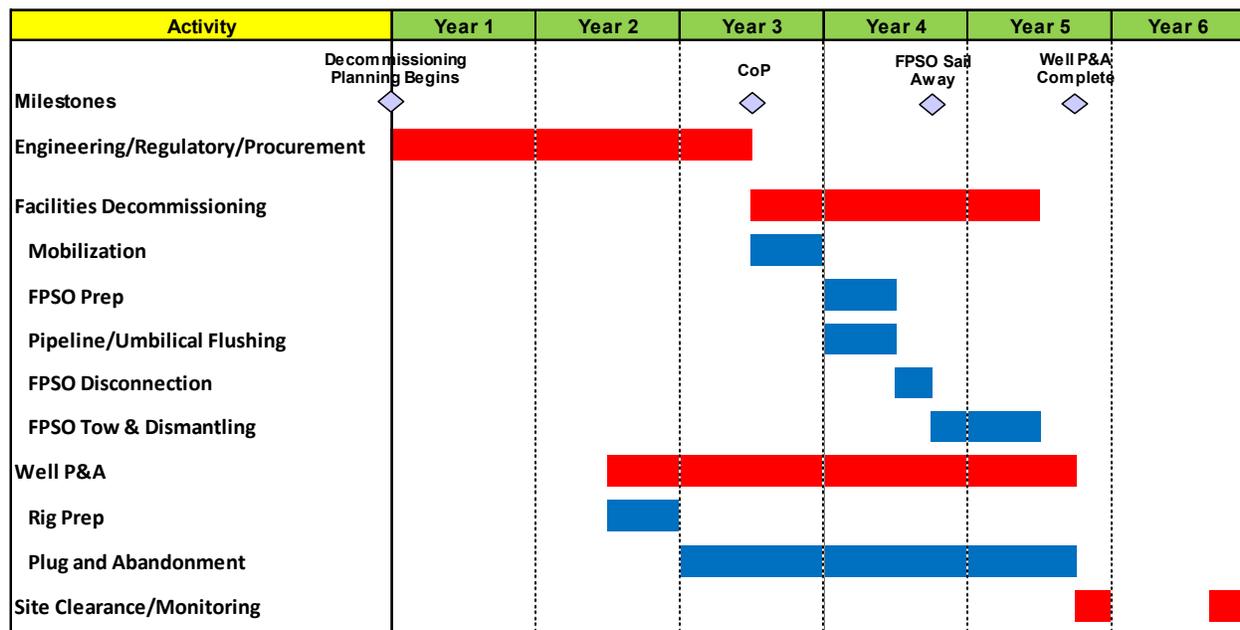


Figure 3: Notional Decommissioning Schedule (if post-decommissioning monitoring is required)

## 6 INFORMATION MANAGEMENT AND REPORTING

Reporting requirements for decommissioning activities include those stipulated in the following:

- Applicable laws and regulations in Guyana; and
- Project-specific commitments contained in regulatory filings and Project-specific agreements.

Decommissioning-related reporting to be provided may include, but is not limited to:

- Decommissioning activities being carried out (e.g., vessels used, surveys conducted, Wells P&A, equipment decommissioned and removed and/or left in-situ);
- SSHE reports;
- Emergency/incident reporting;
- Summary of waste volumes/types disposed;
- Air emissions;
- Wastewater discharges;
- Fuel consumption (e.g., from supply/support vessels, helicopters, etc.); and
- Close-out reporting at the conclusion of decommissioning activities.

## 7 TRAINING AND ENVIRONMENTAL AWARENESS

EEPGL will appoint suitably competent staff and develop and implement training and orientation programs so that requirements are well understood and systematically applied.

EEPGL personnel will be provided with training appropriate to their level of responsibilities on key environmental, regulatory, and socioeconomic issues and on the required mitigation, monitoring, and reporting measures.

Training may be provided in a variety of means, including formal training as well as informal training such as briefings, toolbox talks, and coaching. Other training may take the form of on-the-job training in specific elements or tasks or the provision of specific skills as necessary. These and other means (such as posters, signs, site newsletters, etc.) may be used to promote SSHE awareness. Orientations will be provided to verify that personnel understand expectations and requirements on arrival to a particular work location or vessel.

EEPGL will verify that its contractors supporting the decommissioning activities have implemented a training and orientation program that is consistent with EEPGL competency requirements.

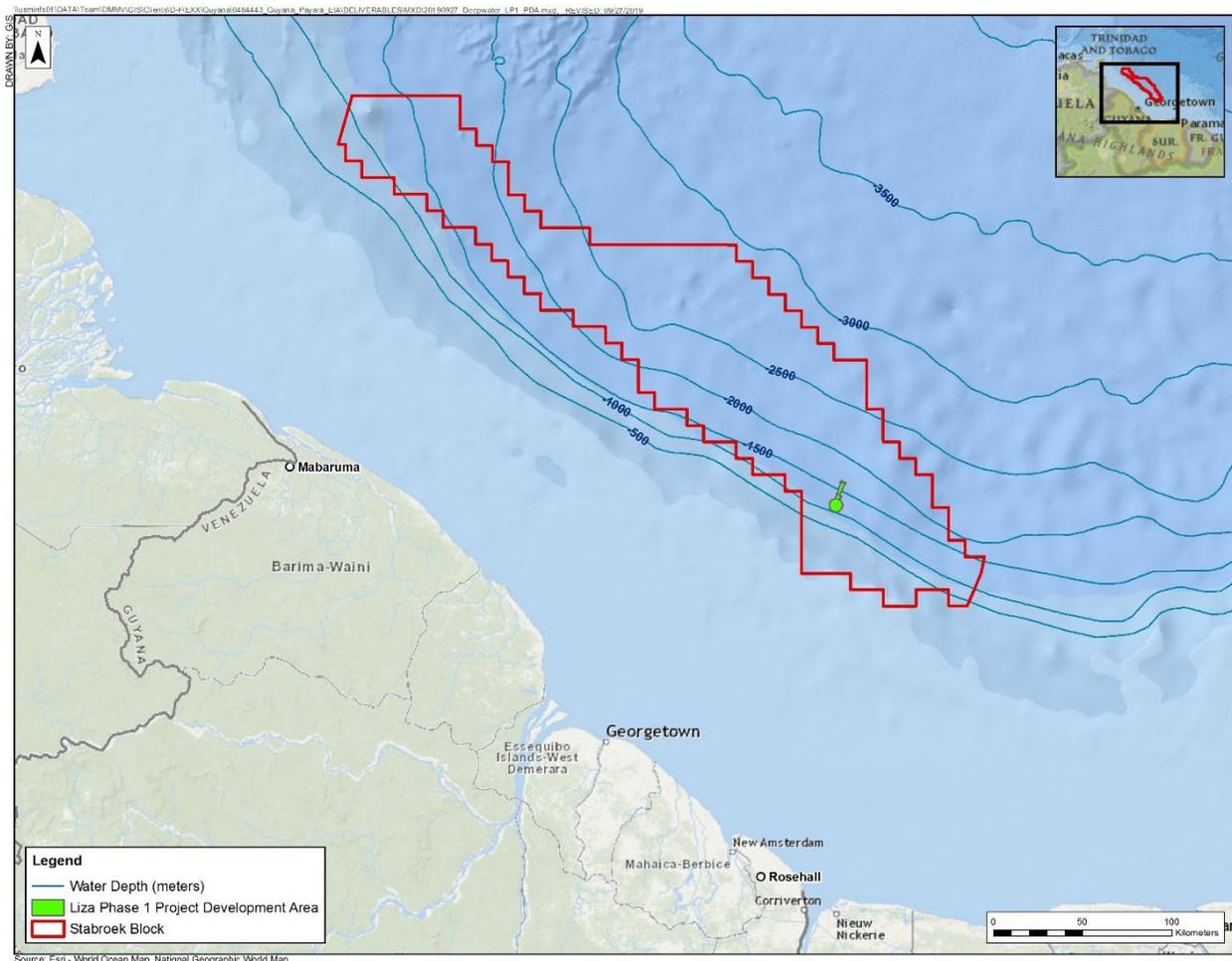
## **8 COMPLETION OF DECOMMISSIONING ACTIVITIES AND RELEASE OF LIABILITY**

The relevant Guyanese regulators will have access to the work site during the decommissioning activities to monitor and witness the final completion of the work. After the completion of well P&A and facilities decommissioning work, EEPGL will submit a final decommissioning report to the relevant Guyanese regulators that will include a description of the scope of work performed, work logs, final inspection reports, videos, and photos, as applicable. The relevant Guyanese regulators will be requested to review the submitted report and issue a certificate of completion of the decommissioning work as well as a certificate of release of liability within 60 days of completion of final inspection.

## APPENDIX A LIZA PHASE 1 DEVELOPMENT PROJECT OVERVIEW

### A.1 Introduction

Esso Exploration and Production Guyana Limited (EEPGL)<sup>1</sup>, together with its co-venturers Hess Guyana Exploration Limited and CNOOC Petroleum Guyana Limited, is the operator for the first phase of development of the Liza field in the eastern half of the Stabroek Block (hereafter referred to as the Liza Phase 1 Development Project, or the Project); the area that is being developed as part of the Project is located approximately 190 kilometers (120 miles) northeast of the coastline of Georgetown, Guyana (Figure A-1).



**Figure A-1: Location of the Liza Phase 1 Project Development Area within Stabroek Block**

<sup>1</sup> EEPGL is the operator of the Project, and is used in this appendix to represent the co-venturers.

## A.2 Project Overview

The Project consists of the drilling of up to 17 development wells (including production, water injection, and gas re-injection wells); installation and operation of subsea, umbilicals, risers and flowlines (SURF) equipment; and installation and operation of a floating production, storage, and offloading (FPSO) vessel in the eastern half of the Stabroek Block (Figure A-2). Onshore logistical support facilities and marine/aviation services will be utilized to support each stage of the Project. The various components shown on Figure A-2 are further described in the relevant drilling, SURF, and FPSO sections in Chapter 2 of the Liza Phase 1 Development Project Environmental Impact Assessment.

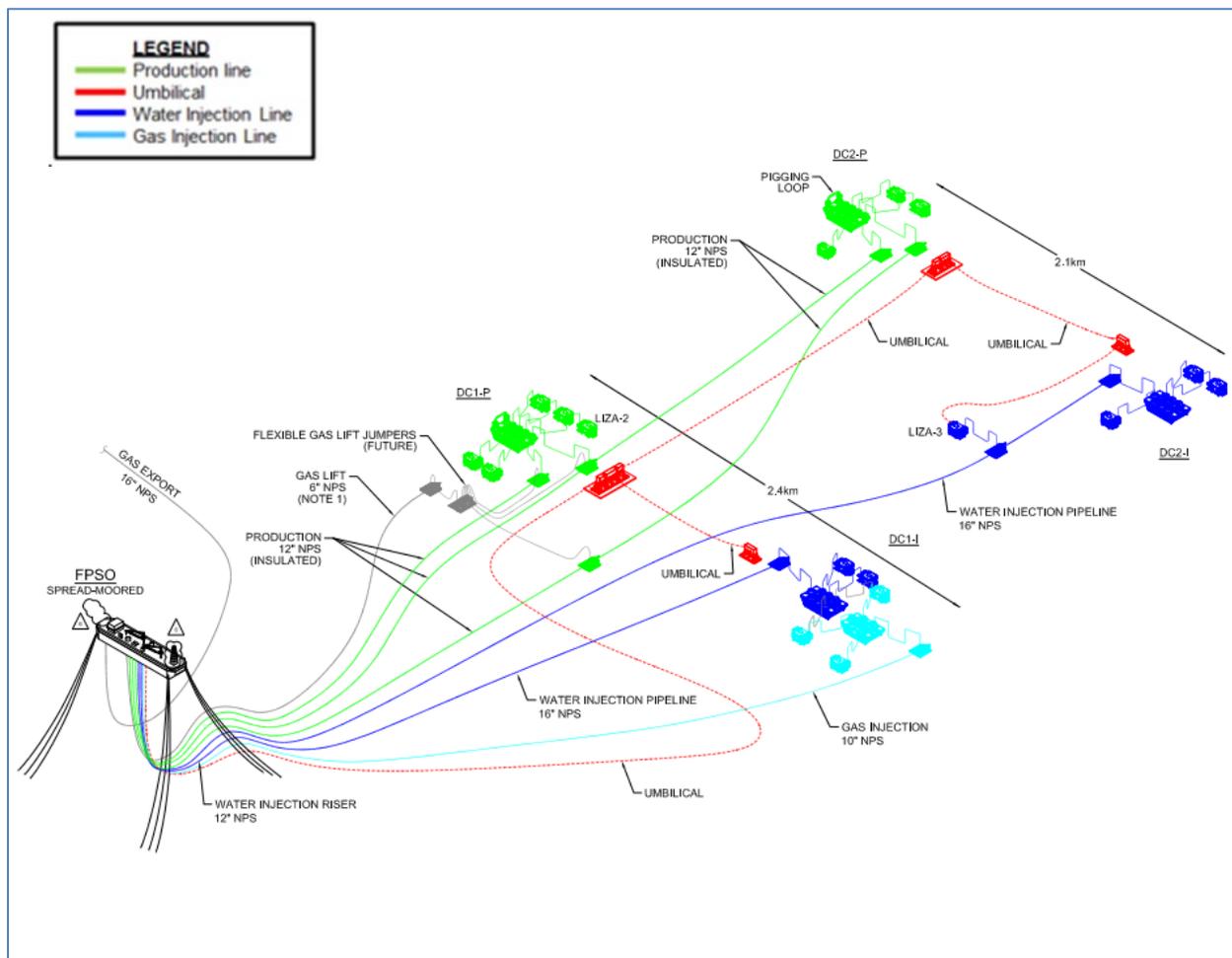


Figure A-2: Liza Phase 1 Field Layout

## APPENDIX B LIZA PHASE 2 DEVELOPMENT PROJECT OVERVIEW

### B.1 Introduction

Esso Exploration and Production Guyana Limited (EEPGL)<sup>2</sup>, together with its co-venturers Hess Guyana Exploration Limited and CNOOC Petroleum Guyana Limited, is the operator for the second phase of development of the Liza field in the eastern half of the Stabroek Block (hereafter referred to as the Liza Phase 2 Development Project, or the Project); the area that will be developed as part of the Project is located approximately 183 kilometers (114 miles) northeast of the coastline of Georgetown, Guyana (Figure B-1).

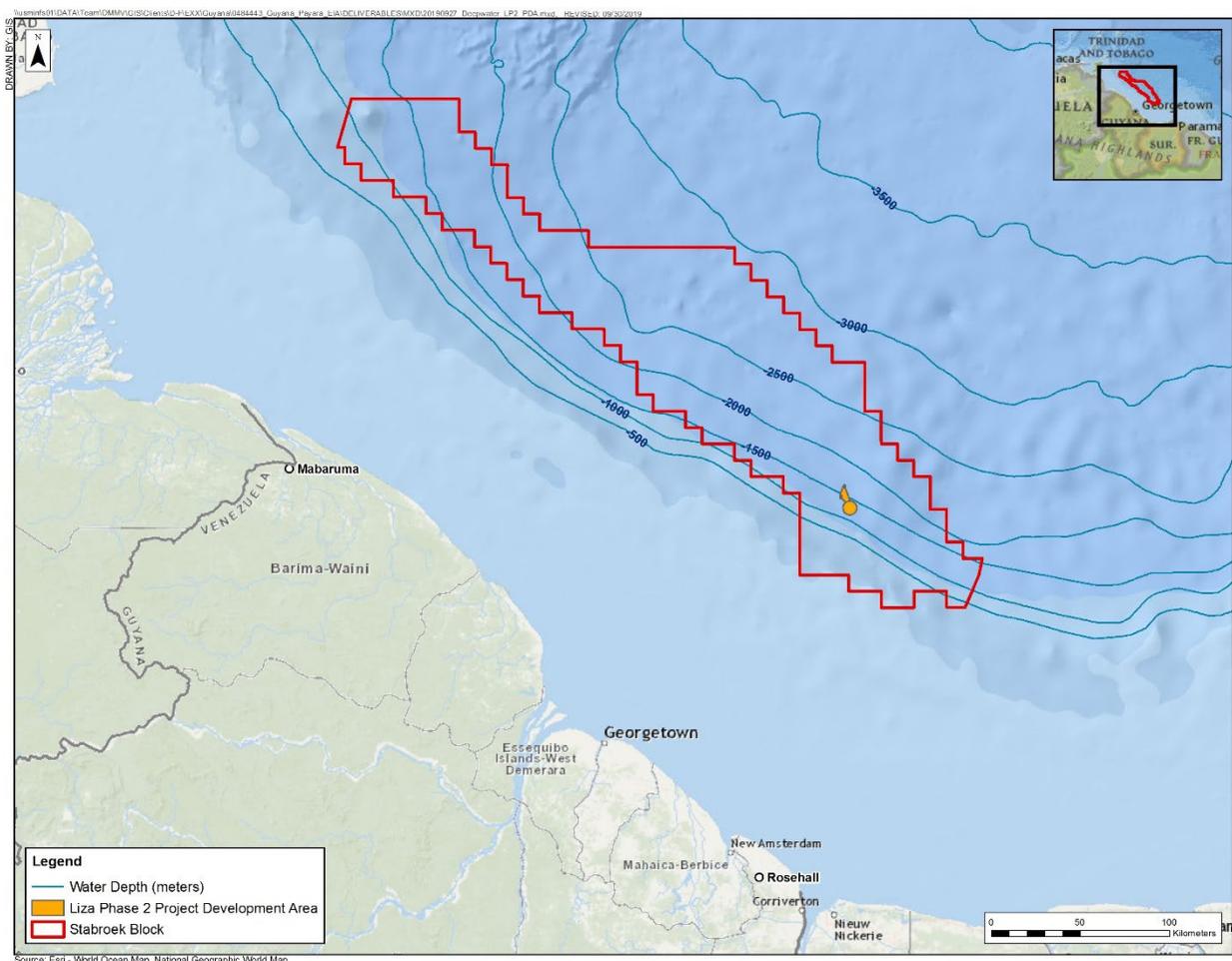


Figure B-1: Location of the Liza Phase 2 Project Development Area within Stabroek Block

<sup>2</sup> EEPGL is the operator of the Project, and is used in this appendix to represent the co-venturers.

## B.2 Project Overview

The Project will consist of the drilling of up to 33 development wells (including production, water injection, and gas re-injection wells); installation and operation of subsea, umbilicals, risers and flowlines (SURF) equipment; and installation and operation of a floating production, storage, and offloading (FPSO vessel) in the eastern half of the Stabroek Block (Figure B-2). Onshore logistical support facilities and marine/aviation services will be utilized to support each stage of the Project. The facility layout will continue to evolve during the design development process. The various components shown on Figure B-2 are further described in the relevant drilling, SURF, and FPSO sections in Chapter 2 of the Liza Phase 2 Development Project Environmental Impact Assessment.

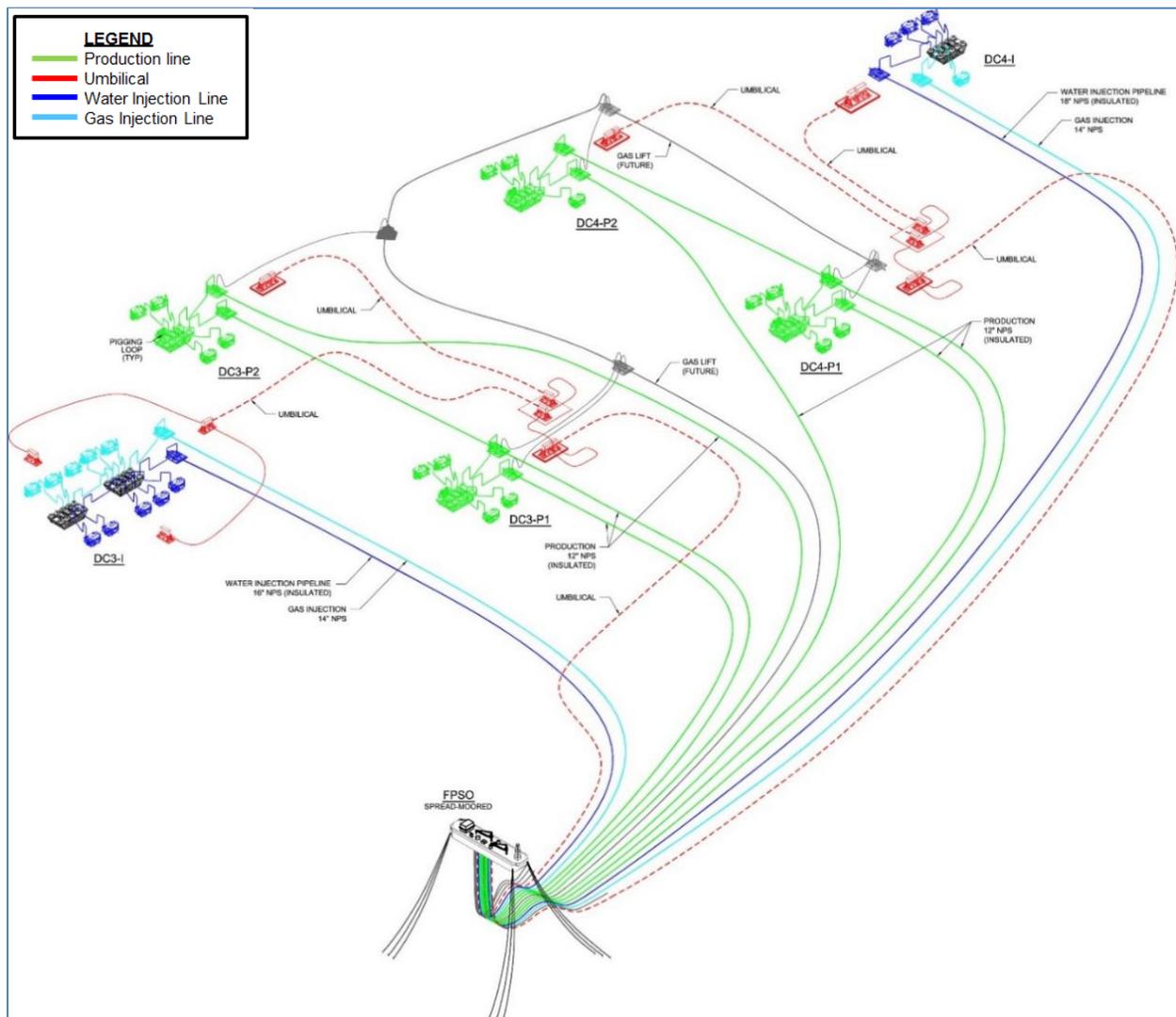


Figure B-2: Preliminary Liza Phase 2 Field Layout

## APPENDIX C PAYARA DEVELOPMENT PROJECT OVERVIEW

### C.1 Introduction

Esso Exploration and Production Guyana Limited (EEPGL)<sup>3</sup>, together with its co-venturers Hess Guyana Exploration Limited and CNOOC Petroleum Guyana Limited, is the operator for the third development in the eastern half of the Stabroek Block (hereafter referred to as the Payara Development Project, or the Project); the area that will be developed as part of the Project is located approximately 207 kilometers (128 miles) northeast of the coastline of Georgetown, Guyana (Figure C-1).

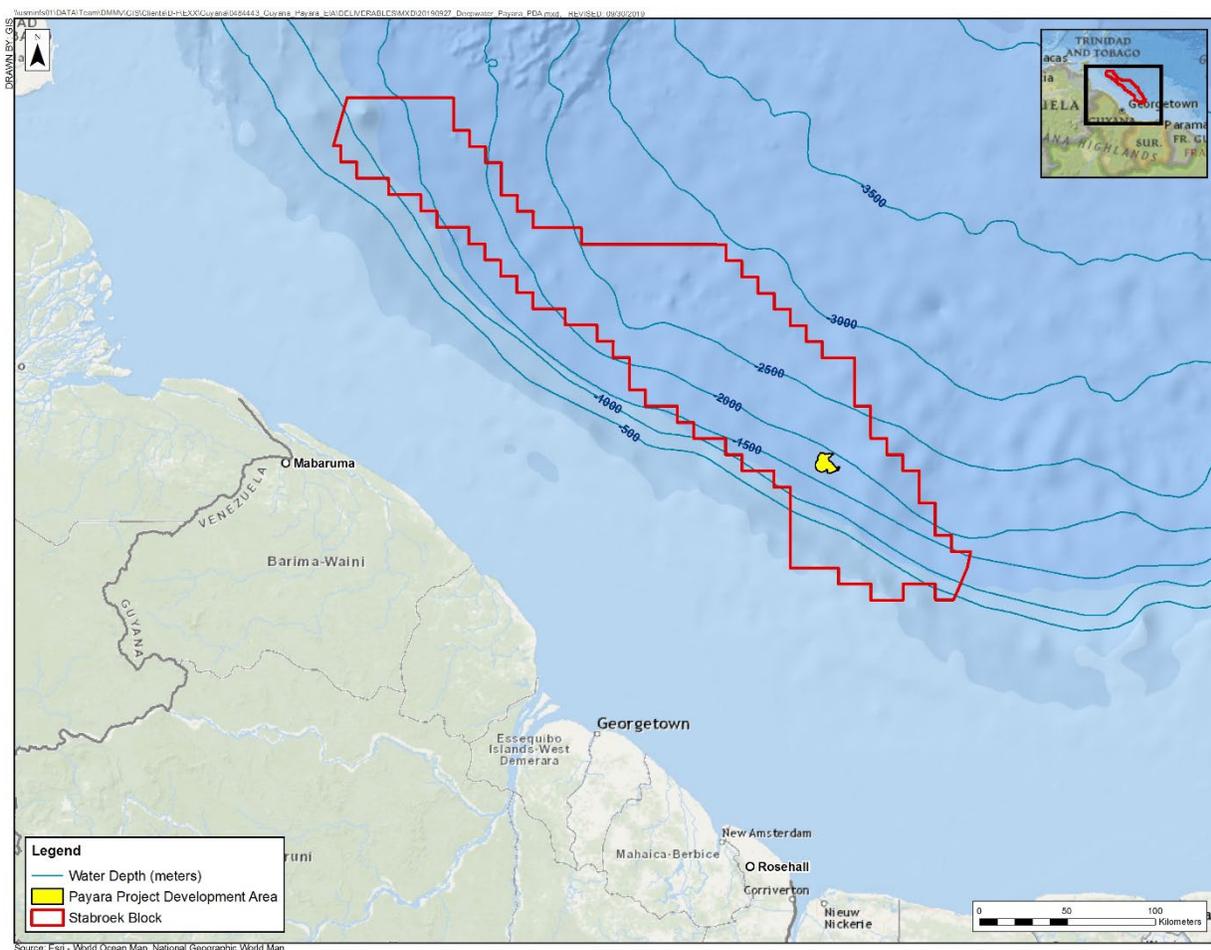


Figure C-1: Location of the Payara Project Development Area within Stabroek Block

<sup>3</sup> EEPGL is the operator of the Project, and is used in this appendix to represent the co-venturers.

## C.2 Project Overview

The Project will consist of the drilling of up to 45 development wells (including production, water injection, and gas re-injection wells); installation and operation of subsea, umbilicals, risers and flowlines (SURF) equipment; and installation and operation of a floating production, storage, and offloading vessel (FPSO) in the eastern half of the Stabroek Block (Figure C-2). Onshore logistical support facilities and marine/aviation services will be utilized to support each stage of the Project. The facility layout will continue to evolve during the design development process. The various components shown on Figure C-2 are further described in the relevant drilling, SURF, and FPSO sections in Chapter 2 of the Payara Development Project Environmental Impact Assessment.

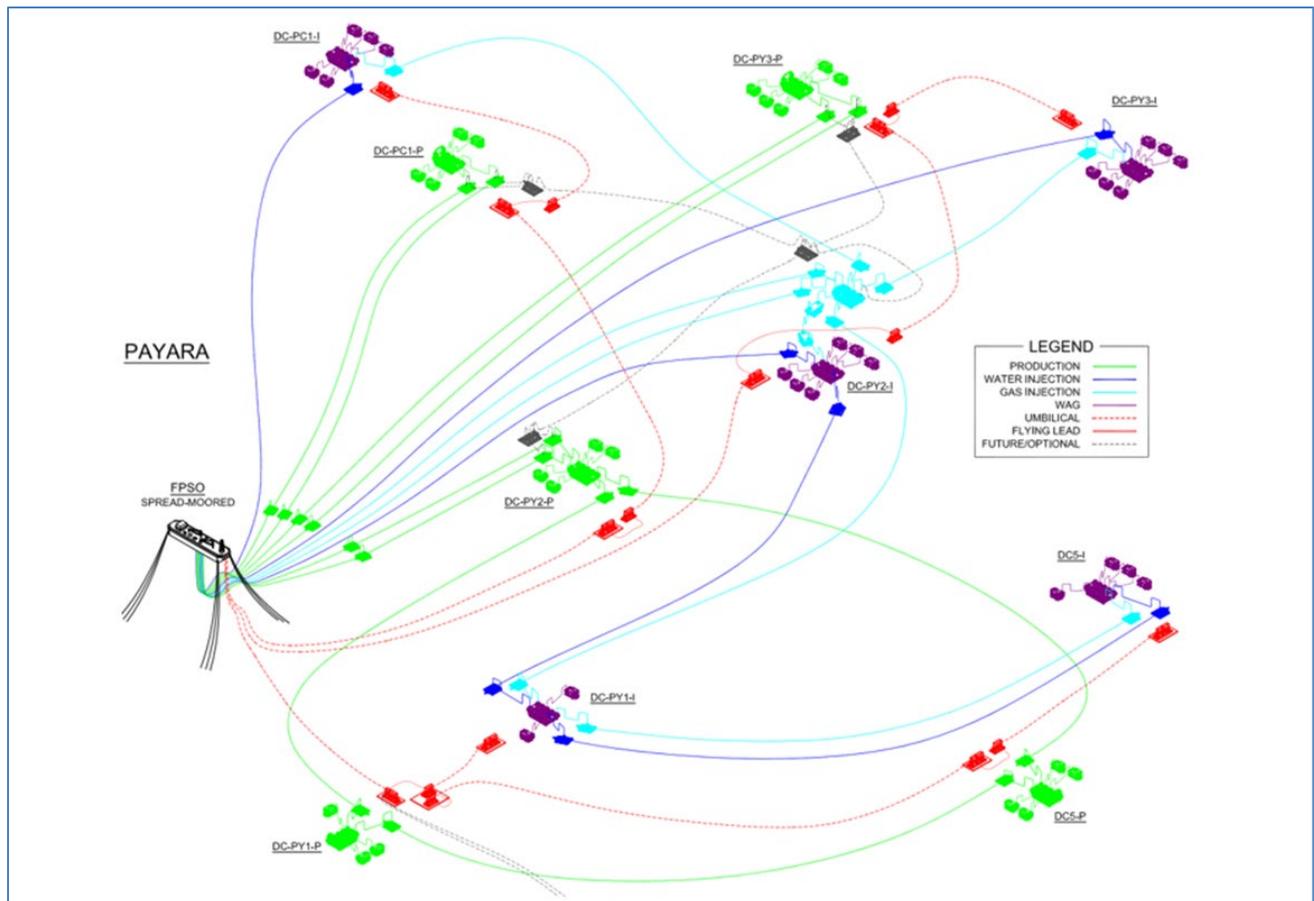


Figure C-2: Preliminary Payara Field Layout

## APPENDIX D YELLOWTAIL DEVELOPMENT PROJECT OVERVIEW

### D.1 Introduction

Esso Exploration and Production Guyana Limited (EEPGL)<sup>4</sup>, together with its co-venturers Hess Guyana Exploration Limited and CNOOC Petroleum Guyana Limited, is the operator for the fourth development in the eastern half of the Stabroek Block (hereafter referred to as the Yellowtail Development Project, or the Project); the area that will be developed as part of the Project is located approximately 203 kilometers (126 miles) northeast of the coastline of Georgetown, Guyana (Figure D-1).

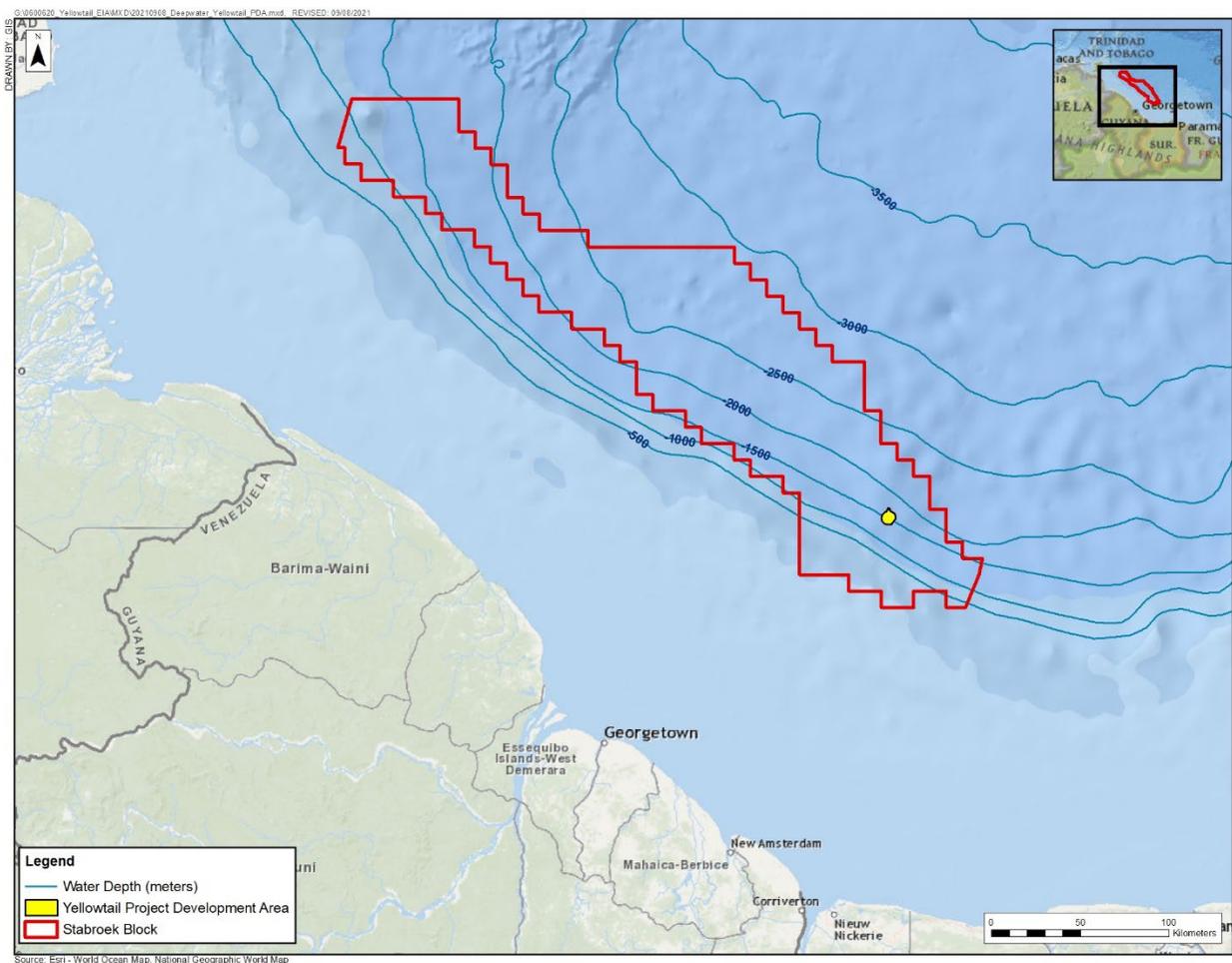


Figure D-1: Location of the Yellowtail Project Development Area within Stabroek Block

<sup>4</sup> EEPGL is the operator of the Project, and is used in this appendix to represent the co-venturers.

## D.2 Project Overview

The Project will consist of the drilling of approximately 45 to 67 development wells (including production, water injection, and gas re-injection wells); installation and operation of subsea, umbilicals, risers and flowlines (SURF) equipment; and installation and operation of a floating production, storage, and offloading vessel (FPSO) in the eastern half of the Stabroek Block (Figure D-2). Onshore logistical support facilities and marine/aviation services will be utilized to support each stage of the Project. The facility layout will continue to evolve during the design development process. The various components shown on Figure D-2 are further described in the relevant drilling, SURF, and FPSO sections in Chapter 2 of the Yellowtail Development Project Environmental Impact Assessment.

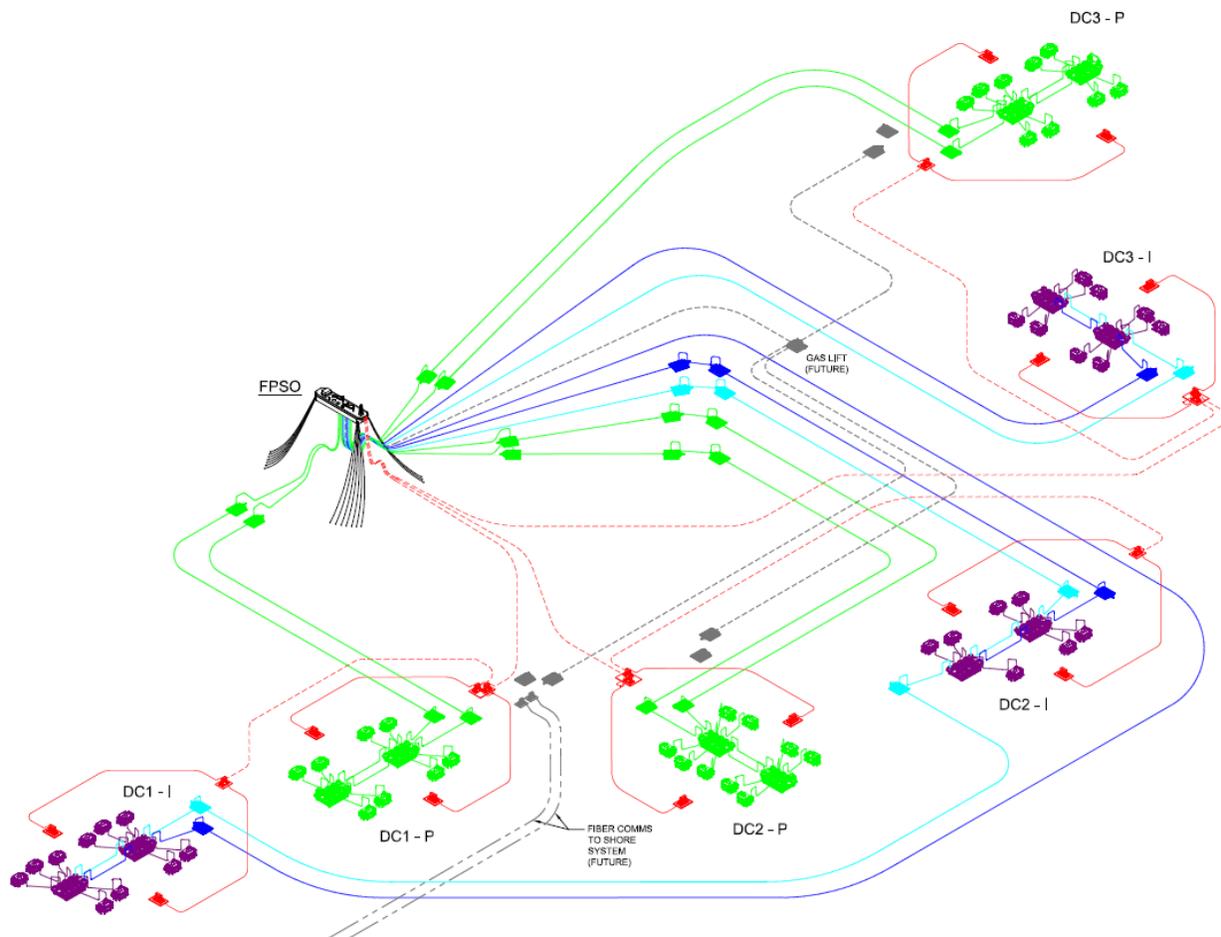


Figure D-2: Preliminary Yellowtail Field Layout

# **OIL SPILL RESPONSE PLAN FOR GUYANA OPERATIONS**

*Submitted with changes*

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**Esso Exploration and Production Guyana  
Limited (EEPGL)**

**Oil Spill Response Plan for Guyana Operations**

**March 2022**

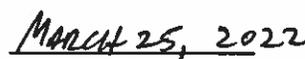
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## OSRP Content Endorsement and Approval

Endorsed by:

Environmental,  
Regulatory and Socioeconomic Manager

  
Michael B. Persaud

  
Date

Nothing herein is intended to override the corporate separateness of any affiliate. From time to time, working relationships described in this document may reflect functional guidance or stewardship, not reporting relationships. The short terms "ExxonMobil" or "EM" may be used to refer to groups of companies or to specific affiliates of Esso Exploration and Production Guyana Limited. For all of these situations, word selection may have been based on convenience and simplicity, or may reflect actions taken pursuant to applicable affiliate service agreements, and may not identify reporting relationships, legal entities, or relationships among legal entities."

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**Document Management**

## Amendment Record

For each revision of EEPGL's Oil Spill Response Plan (OSRP), EEPGL will insert approval signatures and details in the table below, and include details on the revision number, description, and indication of the revised pages or paragraphs and amendment approval date.

Revision Number	Date	Summary of Amendment	Approved by (Signature)
Rev 0	February 8, 2016	Initial issue for use.	J. Simons
Rev 1	February 27, 2017	EEPGL OSRP Amendment Amended to reflect further spill scenarios associated with Liza Phase 1 FPSO Development Project and addition of Wildlife Response Plan.	J. Simons
Rev 2	May 10, 2017	Final edits/revisions based on comments received to Liza Phase 1 FPSO Development Project EIA and OSRP.	R. Henson
Rev 3	May 2018	Transitioned OSRP to a single plan covering all Guyana operations. This version supersedes all previous versions. Amended to reflect further oil spill modeling associated with Liza Phase 2 FPSO Development Project, updates to align with the Guyana National Contingency Plan, and EEPGL tactical response maps and equipment).	R. Henson
Rev 4	September 2018	Final edits/revisions based on comments received on Liza Phase 2 Development Project EIA and OSRP.	R. Henson
Rev 5	August 2019	Amended to reflect inclusion of Payara Development Project.	R. Henson
Rev 6	November 2019	Amended to include WCD for Liza Phase 1 and Liza Phase 2	R. Henson
Rev 7	July 2020	Edits/revisions based on comments received on Payara Development Project EIA and OSRP	A. Routledge
Rev 8	March 2022	Edits/revisions based on Guyana National Oil Spill Contingency Plan; Yellowtail Development Project	M. Persaud

Triggers that require a revision to this document are included in Section 3.5.

Approved updates to the OSRP shall be distributed to the following per EEPGL protocols:

- EEPGL core management team
- EEPGL asset management teams
- EEPGL project management teams
- EEPGL EP&R Plan Owner and Administrator
- External organizations with defined responsibilities in this plan (e.g., OSRL, CDC, EPA)

### Plan Owner

EEPGL

Environmental, Regulatory and  
Socioeconomic Manager

Michael B. Persaud      MARCH 25, 2022.  
Michael B. Persaud      Date

### Plan Administrator

EEPGL Projects

Environmental & Regulatory Manager

Erik DeMicco      25 March 2022  
Erik DeMicco, Ph.D.      Date

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## Acronyms and Abbreviations

<b>Name</b>	<b>Description</b>
µg/g	micrograms per gram
µg/L	micrograms per liter
bbl	barrel(s)
BOEM	US Bureau of Ocean Energy Management
BOP	Blowout Preventer
BSEE	US. Department of the Interior Bureau of Safety and Environmental Enforcement
CBT	Computer Based Training
CDC	Civil Defense Commission
CSS	Capping Stack Systems
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESG	Emergency Support Group
FDA	US Food and Drug Administration
FPSO	Floating Production Storage and Offloading
FSV	Fast Supply Vessel
GCG	Guyana Coast Guard
GEA	Guyana Energy Agency
GIS	Geographic Information System
GoM	US Gulf of Mexico
GRIP	Global Rapid Intervention Package
GRP	Geographic Response Plan
GSI	Gemini Solutions, Inc.
ICS	Incident Command Structure
IMH	Incident Management Handbook
IMT	Incident Management Team
MARAD	Maritime Administration Department
MSRC	Marine Spill Response Corporation
MWCC	Marine Well Containment Company

<b>Name</b>	<b>Description</b>
NADF	Non-aqueous Drilling Fluid
NEBA	Net Environmental Benefit Analysis
NDC	Neighbourhood Democratic Councils
NOAA	US National Oceanic and Atmospheric Administration
NRC	National Response Corporation (Trinidad & Tobago)
OIMS	Operations Integrity Management System
OSPD	US BSEE Oil Spill Preparedness Division
OSRL	Oil Spill Response Limited
OSRO	Oil Spill Response Organization
OSRP	Oil Spill Response Plan
PAH	Polycyclic Aromatic Hydrocarbons
ppm	parts per million
PSV	Project Support Vessel
RDC	Regional Democratic Councils
ROV	Remotely Operated Vehicle
RRT	Regional Response Team
SIRT	Subsea Incident Response Toolkit
SLA	Service Level Agreement
SOPEP	Shipboard Oil Pollution Emergency Plan
SSHE	Safety, Security, Health, and Environment
SWIS	Subsea Well Intervention Service
TRG	The Response Group
US EPA	United States Environmental Protection Agency
VOO	Vessel Of Opportunity
WCD	Worst Case Discharge
WRP	Wildlife Response Plan

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1. Introduction

# 1 INTRODUCTION

The Government of Guyana is conscious of the need to preserve and protect the environment and seeks to safely develop its oil and other mineral resources. It recognizes that a degree of risk is associated with the infrastructure built to support the development of these resources thus it's incumbent for organizations with oil spill risk potential to accept that oil spill response preparedness is a necessary function of their business.

This Oil Spill Response Plan (OSRP) delineates responsibilities for the operational preparedness, efficient response to, containment of and/or recovery to marine and terrestrial ecosystem emergencies, which could result from an unplanned discharge or release of a petroleum product. Furthermore, it addresses the engagement between the Operator (Esso Exploration and Production Guyana Limited [EEPGL]), the Guyana Authorities (e.g., Environmental Protection Agency [EPA], Civil Defense Commission [CDC], Maritime Administration Department (MARAD), and Guyana Coast Guard [GCG]), the ExxonMobil Corporate support team, and use of third-party support organizations.

This document is a country-wide management plan<sup>1</sup> which covers all aspects of EEPGL's operations in Guyana as they pertain to unplanned spillage events. The information in this document serves as a supplement to, and not replacement for, the information in the EEPGL Emergency Response Plan (ERP). The information in the ERP continues to apply in the case of an unplanned spill-related event including but not limited to incidents associated with the shorebases utilized by EEPGL as well as the offshore operations in the geographic response area, including the possibility of hydrocarbon and chemical releases, search and rescue, offshore medical evacuation, medical emergency, fatality, fire or explosion at a work site, natural disaster, and security or civil disturbance. While the ERP is the primary document for use in all emergencies, it is supplemented by this OSRP in the specific case of an oil spill. This document addresses information specific to spill contingency or mitigation, response and recovery activities not covered in the ERP.

The OSRP is a "evergreen document" that will be revised or amended as Project development progresses and production operations commence in response to changing circumstances, lessons learned, or other appropriate reasons. This document supersedes previously published EEPGL Oil Spill Response Plans.

## 1.1 Scope

Given the sensitivity to many of the resources that could potentially be impacted by an unplanned discharge or release, EEPGL has conducted multiple risk assessments and identified various spillage-type scenarios, including spills of different types of hydrocarbons

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<sup>1</sup> Noted in EEPGL Environmental Impact Assessments, under the Environmental and Socioeconomic Management Plan (ESMP) Chapter, the OSRP is a specific management plan following the ESMP guiding principles.

## 1. Introduction

(e.g., crude oil, marine diesel, fuel oil, lubricating oil, NADF), with several being applicable for spills at the shorebase(s) and on vessels in the Demerara River estuary (e.g., from a supply vessel) or in the Atlantic Ocean (e.g., from a well, drillship, supply vessel, tanker, FPSO). This ORSP describes the spillage response framework, equipment and facilities used to tactically respond, and how the organization will collaborate with Guyana agencies.

### 1.1.1 Response Priority

The primary response objectives of all countermeasure operations will be to minimize the threat to human health, ensure the safety of the responders and the public, reduce the impact to the environment by protecting terrestrial and marine ecosystems as well as other economically relevant facilities and amenities at risk.

### 1.1.2 Covered Operations

EEPGL will be drilling, producing, processing, storing, and offloading oil as its core activity, and has proactively embedded many controls into the Project design to prevent and/or mitigate a loss of containment or spill from occurring.

This document covers all of EEPGL's business operations in Guyana, and is focused on those operations where there is a risk of a spillage or release of product to the environment, such as but not limited to:

- Exploration operations (e.g., exploration and appraisal drilling, seismic surveys)
- Project development (inclusive of all phases, e.g., drilling, installation, production operations, decommissioning)
- Other supporting field operations (e.g., marine logistics, aviation logistics, and ancillary survey programs such as geotechnical, geophysical, environmental, metocean)

## 1.2 Regulatory Requirements

The legal framework consists of key general and resource-specific environmental and socioeconomic laws that have either a direct or indirect relevance to the management of potential impacts from oil and gas development. Statutes that impose specific legal obligations on EEPGL under Guyana law include, but are not limited to:

- The National Constitution of Guyana
- The Environmental Protection Act
- The Guyana Geology and Mines Commission Act

## 1. Introduction

- The Defence (Amendment) Act 1990 (also referred to as the Coast Guard Act);
- Maritime Zones Act 2010;
- Guyana Energy Agency (Amendment) Act 2003
- The Petroleum (Exploration and Production) Act
- Petroleum and Petroleum Products Regulations 2014
- Environmental Protection (Hazardous Waste Management) Regulations 2000
- Environmental Protection (Water Quality) Regulations 2000
- Protected Areas Act 2011
- Wildlife Conservation Management Act 2016

Resource-specific environmental and socioeconomic laws and associated regulatory reporting requirements are covered in either EEPGL's Emergency Response Plan (ERP) or in the Environmental Impact Assessment (EIA) for the respective Projects.

### 1.2.1 National Oil Spill Contingency Plan (NOSCP)

The Government of Guyana sees the importance of defining measures that can aid in the prevention and if unavoidable, prompt effective actions to minimize the harm which may result from an unplanned spillage or chemical release into the environment. In August 2020, under the Chairmanship of the Civil Defense Commission (CDC), the National Oil Spill Committee created and submitted to the Government of Guyana the National Oil Spill Contingency Plan (NOSCP) which is a Hazard Specific Annex or Sub-Plan to the Guyana National Multi-Hazard Disaster Preparedness and Response Plan.

Key aspects of the Guyana National Oil Spill Contingency Plan are highlighted below:

- The CDC is the lead agency for maintaining the oil spill response plan, which includes the management of the National Emergency Operating Centre (NEOC).
- Defines lead incident positions and use of the Incident Command System. Authorized incident management positions are:
  - The Competent National Authority or CNA (Incident Commander) is the Director General, CDC
  - Deputy Incident Commander (Maritime) is the Director Maritime Safety, MARAD
  - Deputy Incident Commander (Land) is the Chief Executive Officer, Guyana Energy Agency
- Defines agency specific Lead / Support responsibilities based on response type
- Any oil spill (as defined) over 5 gallons shall be reported to the respective National Focal Point (NFP) – MARAD for maritime, or GEA if on land.

## 1. Introduction

- Annexes provide are but not limited to the following reference/guidance:
  - Agency contact lists
  - Use of Dispersants criteria
  - In-Situ Burning protocols
  - Deep Water Response Requirements

**Reference: National Oil Spill Contingency Plan, dated Aug 2020**

### 1.2.2 International Conventions & Agreements

The Government of Guyana is signatory to and has ratified the following international conventions on the oil and gas industry:

- International Oil Pollution Preparedness and Response Cooperation (OPRC) Convention (1990)
- The Civil Liability Convention (1992)
- The International Oil Pollution Compensation Fund (1992)
- The International Convention for the Prevention of Pollution from Ships of 1973, as modified by the protocol of 1978 relating thereto (MARPOL 1973/1978)
- Bilateral Agreements with Trinidad and Tobago, and Suriname

### 1.2.3 Transboundary Impacts

Working jointly with the Government of Guyana and, as appropriate, with the government(s) of other potentially impacted jurisdictions to support bi-lateral oil spill response agreements in the region, in alignment with the principles and protocols of the Guyana National Oil Spill Contingency Plan. In the event that there is an oil spill incident that impacts areas outside the Guyana Exclusive Economic Zone, EEPGL—with support and approval from the Government of Guyana—will work closely with representatives for the respective locations to:

- Coordinate oil spill response operations and communication between different command posts in the region;
- Create a spill-specific transboundary workgroup to manage waste from a product release—including identifying waste-handling locations in the impacted regions and managing commercial and legal issues;
- Work with nominated spill response vessel owners/operators to identify places of refuge in the impacted regions where vessels could go for repairs and assistance;

## 1. Introduction

- Determine how EEPGL and the impacted regional stakeholders can work together during a spill response to allow equipment and personnel to move to assist in a spill response outside the region while still retaining a core level of response readiness within the jurisdictions;
- Determine spill-specific financial liability during a response to a transboundary event; and
- On a spill-specific basis, work with local communities within the impacted areas to raise awareness of oil spill planning and preparations.

### 1.3 Shared Services and Contractual Relations

Standing contracts with Oil Spill Response Organizations, equipment and personnel providers, and other mutual aid agreements shall be maintained as business activities warrant. These resources are documented within the EEPGL Emergency Response Plan (ERP).

### 1.4 Using the Document

The principal users of the Plan include EEPGL employees and contractors, government officials (as appropriate), and other personnel that are expected to participate in or are concerned with response activities and recovery operations.

### 1.5 OSRP Owner Responsibility

**Owner and Administrator:** The EEPGL Environmental and Regulatory Manager is the Owner of the EEPGL OSRP and the EEPGL Project Environment and Regulatory Manager is the Plan Administrator.

**Plan Review:** The OSRP Administrator and Owner review and update this plan on a periodic basis, including any time a significant change occurs to:

- As stated in the Introduction, this is an “evergreen document” and will be managed as EEPGL in-country operations change, spill response strategies/tactics evolve, spill response capabilities grow, and/or regulatory requirements dictate; or as a result of application of key learnings from a response or exercise/simulation/drill reveal.

**Site Specific Plans:** Other Activity or Site-specific ERPs for shorebases and those individual vessels owned and operated by others are the responsibility of the site-specific Emergency Response owners and administrators for those companies. These include the following planned vessel Shipboard Oil Pollution Emergency Plans (SOPEPs).

**1. Introduction**

- ONSHORE
  - Fuel Storage Terminal Owner/Operator ERP; and
  - Shorebase(s) Owner/Operator ERP.
- OFFSHORE
  - FPSO(s) Owner/Operator SOPEPs;
  - Conventional Crude Oil Tanker Owners/Operators SOPEPs;
  - Drillship Owners/Operators SOPEPs; and
  - Other Installation, Supply, Support Vessel Owners/Operators SOPEPs.

EEPGL's On-Scene Incident Commander will communicate and coordinate with the owners / operators of such assets to ensure they have effectively implemented their ERP / SOPEP in the event of an unplanned spill or release.

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## 2. Emergency Management

# 2 EMERGENCY MANAGEMENT

Emergency management is the organization and management of the resources and responsibilities for dealing with all aspects of emergencies. The aim is to reduce the harmful effects of all hazards, including disasters.

## 2.1 Response Relationships

Fundamentally, Emergency Management consist of the following focus areas or combinations thereof:

- Emergency Response – Is the initial recognition of an abnormal condition or unplanned incident is occurring, rising awareness, taking protective measures, and initiating immediate mitigation actions. These emergencies are usually small-scale, localized incidents which tend to resolve quickly using local resources. However, even small-scale emergencies can escalate when initial efforts, preparedness, equipment or other resources are insufficient. From the ICS Planning cycle this is the reactive phase, e.g., a life safety, process safety demand on safety system, or limited environmental impact.
- Business Continuity – a proactive phase event triggered by an outcome other than the usual or expected business process or operating environment. It addresses program or system risks for an exceptional hazard or loss that would have catastrophic business consequences.
- Disaster Recovery or Consequence Management – Is when an unplanned occurrence or loss of containment – spillages, gas releases, product igniting, explosion or catastrophic source control failure – leads to a prolonged impact moving beyond the reactive phase capabilities, requiring continuous response endeavors and extended recovery efforts. These crisis or disasters are typically large-scale, exceed local response tactics and resources, and potentially extend across geographic boundaries.

### 2.1.1 Localized Emergency Response Efforts

Each operating location maintains an Emergency Response Team (ERT) governed by their Facility Response Plan (FRP) that addresses the immediate actions required upon the discovery of an abnormal condition or emergency. This OSR Plan may highlight some tactics, including the notification process, but it is not intended to be all inclusive of initial response actions.

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## **2. Emergency Management**

### **2.1.2 Business Continuity**

Business continuity efforts are not subject to the OSR Plan.

### **2.1.3 Consequence Management / Disaster Recovery**

The primary focus of the Oil Spill Response Plan is to mitigate consequences, address response and recovery efforts associated with unplanned spillage or release of a product to the environment. Such consequences, include the elimination and maximum collection of spilled products in order to prevent its approach to the coast and subsequent stranding on the shoreline.

## **2.2 Geographic Response Area**

A geographic response survey captures coastal and shoreline waterways, and highlights sensitive natural, cultural and economic resources. By identifying these geographic response areas, it allows EEPGL to tailor a spill response and protect a specific sensitive area from potential impacts following an unplanned release or discharge.

Oil spill modeling, based on various spill scenarios, has determined potential natural geographic areas that could be impacted by an unplanned spillage. Based on this modeling, the geographic response area generally covers Guyana's territorial waters North / Northwest of Georgetown. Although it is unlikely a fully mitigated oil spill would reach outer Guyana territorial waters, EEPGL's geographic response areas do extend into other regional territories including those of Venezuela, Trinidad and Tobago, and the Lesser Antilles. EEPGL maintains the capability to broaden its geographic response area as needed.

EEPGL will manage and coordinate the response efforts primarily from Georgetown, Guyana. As appropriate, EEPGL has the capability to setup support operations from other countries, where it is safe to operate, and where the authorities allow such support within their jurisdictions.

## **2.3 Tiered Response Overview**

ExxonMobil has a tiered response approach to oil spill planning globally. Table 2-1 summarizes the tiered response approach and chain of command for operational coordination of an incident adopted by EEPGL which is in agreement with the Guyana National Oil Spill Contingency Plan.

**2. Emergency Management**

**Table 2-1: Tiered Oil Spill Response Approach**

Tier	Description	Operational Coordination of Incident
I	Incident is small or incipient stage, under control, and may involve a local company-managed resource response. <u>(Local Response)</u>	On-scene Emergency Response Team (EEPGL or designated contractor) is responsible for managing the incident.
II	Incident is larger, partial controlled or spill source not immediately under control, and involves mutual aid cooperative response. <u>(Regional Response)</u>	EEPGL onshore IMT will, typically, manage the incident, supported by the on-scene ERT and regional / international Oil Spill Response Organizations (OSROs).
II	Incident is large, uncontrolled, requires prolonged response and specialized resources. <u>(International Response)</u>	EEPGL onshore IMT, complemented by RRT, will manage the incident, supported by the on-scene ERT and regional / international OSROs.

The on-site ERT will manage Tier I incidents in accordance with the site-specific ERP covering its field operations and rely on resources locally available to the asset (e.g., FPSO).

Figure 2-1 depicts the emergency response escalation model, which further defines the operational coordination responsibilities in Table 2-1. EEPGL will proactively obtain additional support and resources to reduce the impact of a spill in the unlikely event it has the potential to exceed Tier I capabilities.

2. Emergency Management

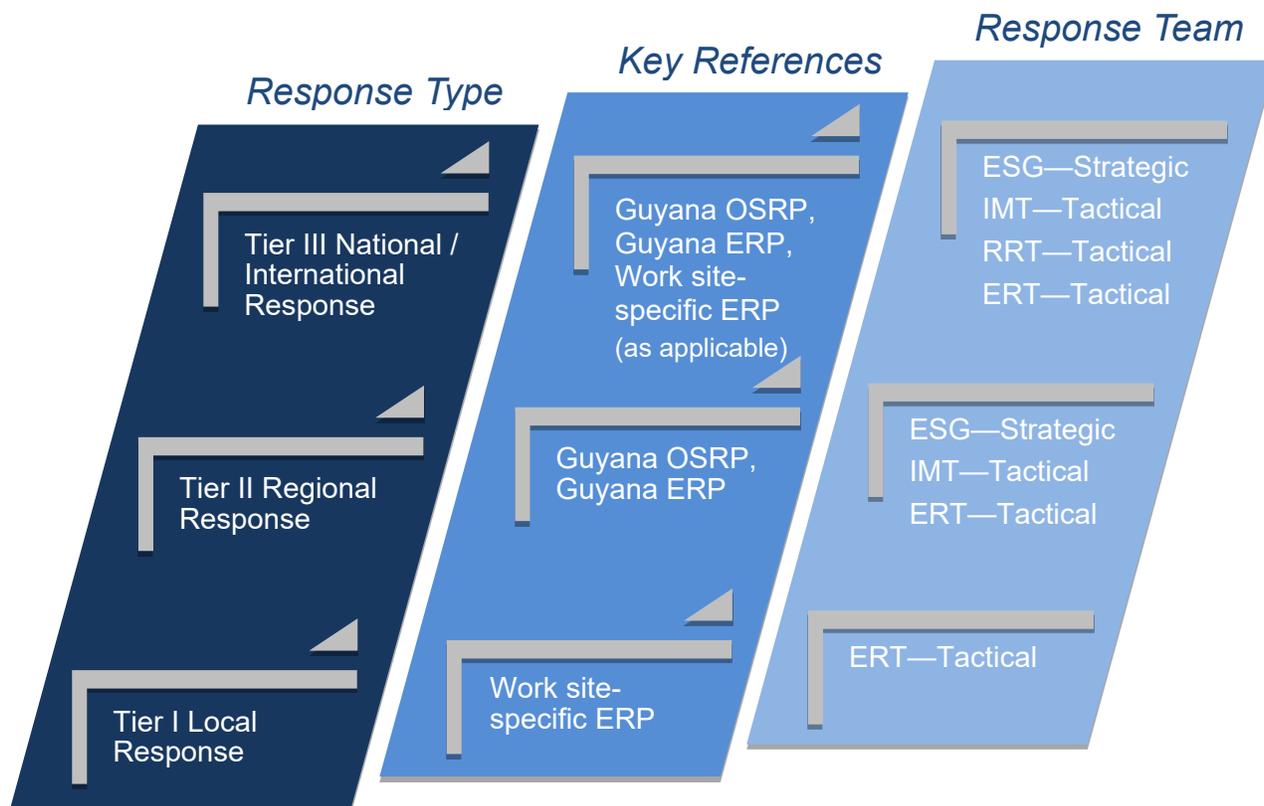


Figure 2-1: Emergency Response Escalation Model

For incidents that may exceed Tier I capabilities, spill response resources including an EEPGL supported Incident Management Team (IMT) and specialized contractors, such as Oil Spill Response Limited (OSRL) in Southampton, UK<sup>2</sup>, as well as other regional Oil Spill Response Organizations (OSROs), will be activated to provide immediate incident management support.

Consistent with international response protocols, EEPGL’s spill management team will maintains contact with the appropriate authorities in Guyana and any other affected countries, which will include rapid development of a plan to identify and engage potentially affected stakeholders and communities. EEPGL continues to work cooperatively with Guyanese regulators, agencies, and interested stakeholders.

To supplement in-country response resources, EEPGL is collaborating and pursuing other cooperatives with regional OSRO(s) to support Tier II+ spill response efforts, should additional OSROs with appropriate capabilities be identified, and should there be interest among other regional organizations in industry to participate. Whether using a direct agreement or a cooperative, Tier II+ oil spill response readiness in-country is critical, as such spills could potentially have transboundary impacts to neighboring countries.

<sup>2</sup> OSRL merged with the Clean Caribbean and Americas (CCA) cooperative in 2013. The heritage CCA equipment base and personnel located in Ft. Lauderdale, FL, are now an integral part of a larger global response co-operative under the name OSRL.

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### 3. Planning and Scenario Development

## 3 PLANNING AND SCENARIO DEVELOPMENT

The best scenario is to never have an oil spill, and the EEPGL workforce takes significant precautions to prevent spills from occurring. Although the goal is to prevent spills, it also includes ensuring the protection of our shared values – local businesses, health and safety of the community, regional industries and sensitive ecosystems – thus, preparing for a potential oil spill response is essential. Should an unlikely event occur, well-defined strategies and access to selective response capable tools and resources will enable a successful outcome.

### 3.1 Spill Properties and Behaviors

The physical and chemical changes oil undergoes in an aquatic environment is collectively known as weathering. Understanding the release behavior is vital to implementing an optimal spill response strategy. Important factors that influence the behavior and fate of spilled oil include:

- Physical and chemical characteristics, such as viscosity, specific gravity, volatility, and maximum water content.
- The quantity of oil spilled
- The prevailing weather and sea state conditions

The figure below depicts these processes, which are further described in the Oil Spill Response Field Manual published by ExxonMobil.

### 3. Planning and Scenario Development

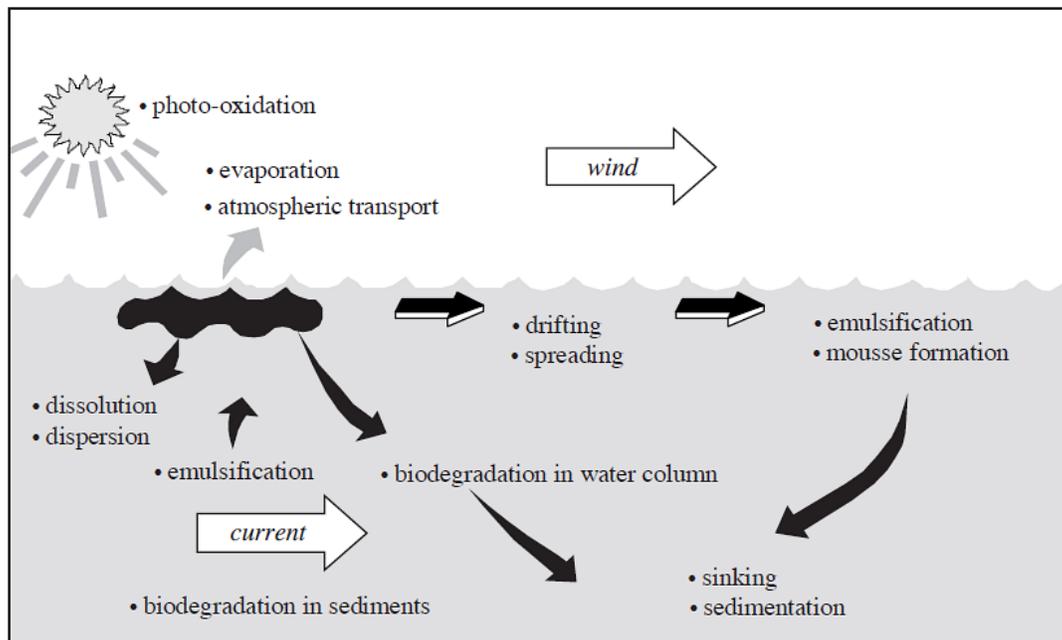


Figure 3-1: Processes Acting on Spilled Oil

Today, oil modeling programs account for the regions weathering effects and oil behavior characteristics to accurately predict physical movement, evaporation and dispersion transfer amongst other weathering results.

### 3.2 Unplanned Hydrocarbon Release Sources

A small degree of unplanned risks is associated with the development of Guyana’s natural resources despite the engineering design and selection, mitigative and preventive measures incorporated, and continuous hazard awareness focus of facility personnel. The majority of these unplanned events or accidents are attributed to minor occurrences (i.e., dropped objects, slipping or tripping incidents, minor fluid spillage within containment, etc.) and a few could result in a worker injury, generally they would not impact the environment or the receptors noted within the Environmental Impact Assessments.

For a selected group of unlikely but possible events various hydrocarbon release scenarios in terms of location, hydrocarbon type, volume, and potential environmental impacts were studied. Table 3-1 summarizes the possible hydrocarbon release scenarios and classifies the potential consequence in terms of the Plan’s tiered response approach. These scenarios are generally representative of the range of risks associated with the FPSO Development Projects, Exploration Drilling, and Production Operations, with the exception of the Worst-Case Discharge (WCD) scenarios.

Ultimately, the key is to prevent oil spills rather than respond to them. Today, EEPGL and other industry organizations continue to advance spill control technology to reduce, control, and

### 3. Planning and Scenario Development

eliminate accidental releases. These pioneering efforts will further reduce the frequency, release volume, and / or duration of accidental releases going forward.

The following are examples of potential locations where a hydrocarbon release during EEPGL operations in Guyana could occur:

- Guyana fuel terminal;
- Guyana shorebase(s);
- Trinidad shorebase;
- Drillship(s);
- FPSO(s);
- Tankers (during offloading from FPSO)
- Installation vessel(s);
- Marine support vessel(s); and
- Survey vessel(s).

Section 13 provides details of potential response strategies for each identified scenario. Section 6 details response resources available to EEPGL.

### 3.3 Potential Release Scenarios

Hydrocarbons potentially released include crude oil, marine diesel, fuel oil, aviation fuel, lubricating oil, and non-aqueous drilling fluid. Summarized with the scenarios and potential impacts outlined in Table 3-1 are the most appropriate response strategies for a given incident based on the given hydrocarbon properties. For example, heavy oils tend to persist in the environment longer than lighter hydrocarbons. Diesel and aviation fuels are non-persistent materials; a significant fraction of any spilled diesel fuel may be expected to evaporate and naturally disperse more readily.

3. Planning and Scenario Development

Table 3-1: Possible Hydrocarbon Release Scenarios by Tier

#	Tier	Location	Possible Scenario	Potential Impact <sup>a</sup>	Potential Response Strategies
1	I	Shorebase	Onshore spill of less than 10 bbl of fuel (e.g., partial loss of diesel storage tank contents)	Contained onshore; no shoreline impact likely	Onshore/Nearshore Response Waste Management Decontamination Demobilization
2	II	Shorebase	On-water spill of less than 100 bbl of fuel (e.g., shore to vessel bunkering spill)	Diesel enters water; possible minor shoreline impact	Onshore/Nearshore Response Surveillance and Monitoring Assisted Natural Dispersion Waste Management Decontamination Demobilization
3	II	Supply vessel at shorebase	On-water release of less than 500 bbl of fuel (e.g., shore to vessel bunkering)	Diesel enters water; possible shoreline impact	Onshore/Nearshore Response Surveillance and Monitoring Assisted Natural Dispersion Waste Management Decontamination Demobilization
4	II	Supply vessel at shorebase or nearshore	On-water spill of less than 100 bbl of fuel (e.g., resulting from grounding or collision with a non-Project vessel or structure)	Diesel enters water; possible minor shoreline impact	Onshore/Nearshore Response Surveillance and Monitoring Assisted Natural Dispersion Waste Management Decontamination Demobilization
5	I	Supply vessel or remotely operated vehicle/Subsea Hydraulic Power Unit offshore	Offshore spill of less than 50 bbl of fuel or hydraulic oil	Hydrocarbons enter water, creating sheen on the water surface; no shoreline impact likely	Onshore/Nearshore Response Surveillance and Monitoring Assisted Natural Dispersion Waste Management Decontamination Demobilization
6	I	Drill ship or FPSO offshore	Offshore spill of less than 50 bbl of fuel (e.g., leak or release due to human error or failure of equipment)	Contained on deck of vessel or enters offshore Atlantic Ocean; no shoreline impact likely	Surveillance and Monitoring Assisted Natural Dispersion Offshore Containment and Recovery Wildlife Response Waste Management Decontamination Demobilization

**3. Planning and Scenario Development**

#	Tier	Location	Possible Scenario	Potential Impact <sup>a</sup>	Potential Response Strategies
7	II	Drill ship or FPSO offshore	Offshore spill of less than 250 bbl of fuel (e.g., leak or release due to human error or failure of equipment)	Contained on deck of vessel or enters offshore Atlantic Ocean; no shoreline impact likely	Surveillance and Monitoring Assisted Natural Dispersion Offshore Containment and Recovery Wildlife Response Waste Management Decontamination Demobilization
8	I	Helicopter offshore	Offshore spill of less than 50 bbl of fuel resulting from helicopter ditching and resultant release of fuel tank contents	Enters offshore Atlantic Ocean; no shoreline impact likely	Surveillance and Monitoring Assisted Natural Dispersion
9	I	FPSO offshore	Offshore spill of less than 50 bbl of fuel resulting from discharge of hydrocarbons along with washover of firewater	Contained on deck of vessel or enters offshore Atlantic Ocean; no shoreline impact likely	Surveillance and Monitoring Assisted Natural Dispersion Offshore Containment and Recovery Wildlife Response Waste Management Decontamination Demobilization
10	I	FPSO offshore	Offshore spill of less than 50 bbl of crude oil from FPSO topsides (e.g., leak or release due to human error or failure of equipment)	Contained on deck of vessel or enters offshore Atlantic Ocean; low probability of shoreline impact	Surveillance and Monitoring Assisted Natural Dispersion Offshore Containment and Recovery Wildlife Response Waste Management Decontamination Demobilization
11	II	Drill ship/well offshore	Well control release of less than 250 bbl of crude oil (e.g., well becomes unbalanced during the drilling process and begins flowing prior to containment)	Hydrocarbons enter Atlantic Ocean; low probability of shoreline impact	Surveillance and Monitoring Assisted Natural Dispersion Dispersant Application Offshore Containment and Recovery Wildlife Response Waste Management Decontamination Demobilization

3. Planning and Scenario Development

#	Tier	Location	Possible Scenario	Potential Impact <sup>a</sup>	Potential Response Strategies
12	II	FPSO, offloading tanker offshore	Offshore release of 2,500 bbl of crude oil (e.g., failure of offloading hose during offloading from FPSO to tanker)	Oil enters Atlantic Ocean; possible shoreline impact	Surveillance and Monitoring Assisted Natural Dispersion Dispersant Application Offshore Containment and Recovery Wildlife Response Waste Management Decontamination Demobilization
13	III	Drill ship /well offshore	Offshore release of crude oil from well control event (30-day duration at 88,728 bbl per day—Most Credible WCD)	Oil enters Atlantic Ocean; possible shoreline impact	Surveillance and Monitoring Assisted Natural Dispersion Onshore/Nearshore Response Dispersant Application Offshore Containment and Recovery Wildlife Response In-situ Burning Waste Management Decontamination Demobilization
14	III	Drill ship /well offshore	Offshore release of crude oil from well control event (30-day duration at initial rate of 202,192 bbl per day—Maximum WCD for Payara Project)	Oil enters Atlantic Ocean; possible shoreline impact	Surveillance and Monitoring Assisted Natural Dispersion Onshore/Nearshore Response Dispersant Application Offshore Containment and Recovery Wildlife Response In-situ Burning Waste Management Decontamination Demobilization
15	II	Drill ship / well offshore	Offshore release of approximately 2,200 bbl of NADF due to loss of riser contents after emergency disconnect due to DP station keeping failure	NADF enters water near the seafloor; no shoreline impact likely	Surveillance and Monitoring Assisted Natural Dispersion

bbl = barrel(s); NADF = non-aqueous drilling fluid; WCD = worst case discharge

<sup>a</sup> Potential impact is based on modeling of an **unmitigated** spill scenario.

**3. Planning and Scenario Development**

The hydrocarbon crude properties and these modeling results, along with previous spill experience of different oil types, were used to complete the predicted impacts of each spill scenario.

**Table 3-2: Modeled Scenarios by Development Project Assets**

	Scenario	Season	Liza I	Liza II	Payara	Yellowtail
Marine Diesel	50 BBL Surface	Summer	X	X	X	
		Winter	X	X	X	
	250 BBL Surface	Summer	X	X	X	
		Winter	X	X	X	
Crude Oil	50 BBL Surface	Summer	X	X	X	
		Winter	X	X	X	
	250 BBL Surface	Summer	X	X	X	
		Winter	X	X	X	
	2500 BBL Surface	Summer	X	X	X	
		Winter	X	X	X	
Wellbore Fluids / Crude Oil	5K BBL Well Head	Summer		X		
		Winter		X		
	20K BPD Well Head	Summer	X	X	X	
		Winter	X	X	X	
	88K BPD Most Credible WCD	Summer				X
		Winter				X
	WCD Well Head	Summer	X	X	X	X
		Winter	X	X	X	X

**3.4 Summary of Predicted Hydrocarbon Impacts**

Hydrocarbon releases of less than 100 barrels (bbl) (e.g., Scenarios 1, 2, 4, 5, 6, 8, 9, and 10) are expected to be quickly brought under control, and would be managed with local countermeasures and spill control equipment. Scenarios 9 and 10 assumed the product was contained to the vessel with no or minimal product expected to enter the ocean environment, thus these scenarios were not modeled potential shoreline impact. For the potential discharge of diesel fuel into the Demerara River, these non-persistent fuel material releases are known to be transient with a short duration in the environment thus were not modeled. Spills of this type would not represent an active response beyond possible diversion booming and dependent upon seasonal conditions and local wildlife.

### 3. Planning and Scenario Development

The focus of Scenario 8 is the safety, rescue, and recovery of the helicopter personnel. The aviation fuel volume is quite small and this is not a hydrocarbon that is persistent in the environment. Considering the known transient nature of this fuel in the environment, no modeling was performed and no spill response is anticipated. A temporary, visible sheen on the water surface may occur, water quality would be temporarily impaired in a localized area, and sensitive receptors (e.g., plankton and possibly some seabirds or shorebirds) may be locally affected.

A hydrocarbon release under Scenario 15 involves a spill of approximately 2,200 bbl of non-aqueous drilling fluid (NADF). Under this scenario, the spill is limited to the volume capacity of the drilling riser. The potential release impact would primarily occur at or near the seabed, and may include localized smothering and toxicity to benthic species. Other than a localized area where the material has deposited, any water quality or other effects would be short-term, as the product would disperse within the water column and be carried away by currents.

A hydrocarbon release under Scenario 3 involves a spill of approximately 500 bbl of diesel into an adjacent river or body of water near a shorebase. The natural dispersion and rapid evaporation of diesel, combined with dilution by water movement and tidal exchange, would be limited in duration and distance from spill site.

Hydrocarbon releases under Scenarios 11 (minor well control release during drilling), 12 (release during offloading from FPSO to tanker), and 13–14 (larger well control incidents) would involve a spill response requiring local and regional mitigation and recovery resources as well as the use of other OSROs' technical teams and equipment.

### 3.5 Net Environmental Benefit Analysis (NEBA)

For spills larger in nature, the use of all available response resources including mechanical recovery, burning product on water and dispersants is anticipated. Leveraging results of the Net Environmental Benefit Analysis for selection of response technologies is vital to the responses decision making process. A Net Environmental Benefit Analysis (NEBA) or the Spill Impact Mitigation Assessment is a process used by the response community for making the best choices to minimize impacts of oil spills on people and the environment.

During spill modeling reviews, EEPGL completed NEBA studies for a Tier III (loss of well control) and Tier II (crude spill from FPSO loading operations) by applying different available response options. The NEBA process helps identify and select the option or combination of options that minimizes overall harm to environmental and socioeconomic resources (including cultural sensitivities). The combination of response options and strategies is factored into Table 3-1 content.

The Project led analysis is summarized in Section 3.3 which typically involves the following criteria: Compile and evaluate relevant oil spill scenarios data; Predict outcomes for 'no intervention' and effective response options; Balance trade-offs of benefits and drawbacks associated with response options; and Selecting the best response option(s) for each scenario.

4. Initial Response Actions

## 4 INITIAL RESPONSE ACTIONS

### 4.1 On-Scene Initial Response Actions

Figure 4-1 describes the immediate actions of an on-scene Emergency Response Team (ERT) upon discovery of an unplanned loss of containment incident (e.g., spill), including the initial situation analysis and identification of actual or potential health and safety hazards. More detailed site-specific procedures are found in each asset’s Emergency Response Plan (ERP).

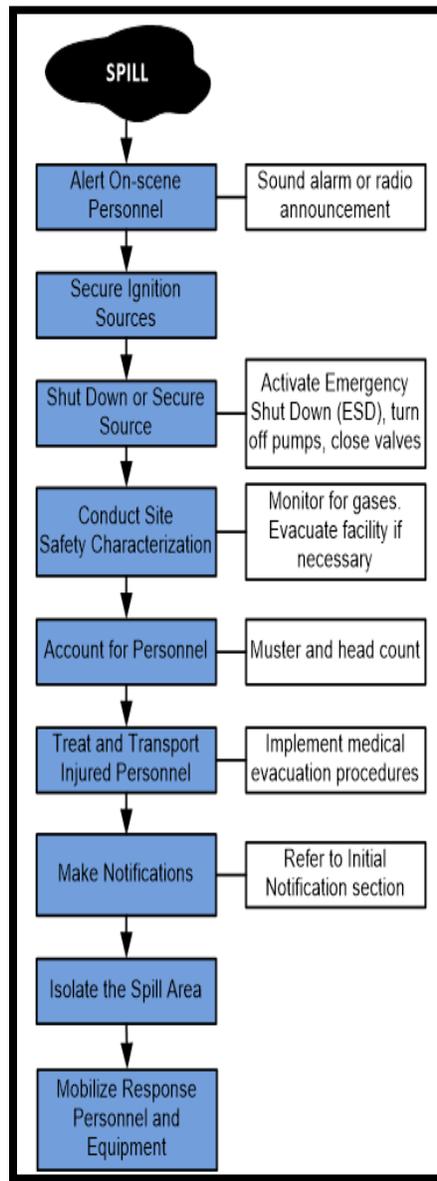


Figure 4-1: On-Scene Response Actions

4. Initial Response Actions

4.2 On-Scene Incident Commander Initial Actions

The On-Scene Incident Commander is responsible for implementing the appropriate initial oil spill response actions as described in the site-specific ERP including, but not limited to, those in Table 4-1.

Table 4-1: Incident Commander Initial Checklist

✓	Action
	Notify EEPGL Duty Manager immediately (use Initial Spill Report Form <b>Appendix I</b> ).
	Request resources, if required, to carry out spill response activities.
	Activate personnel and equipment maintained by EEPGL.
	Activate, if required, external oil spill response organizations.
	Act as liaison with the lead government organization.
	Authorize notification of applicable external organizations (Table 4-2).

For site-specific actions, refer to the appropriate ERPs and the ExxonMobil Incident Management Handbook (IMH).

The first few hours after an incident occurs are critical to a successful incident response. The attending On-Scene Incident Commander must implement the ERP while concurrently assessing the potential for the incident to escalate. Should there be potential for escalation to a Tier II or III event, the On-Scene Incident Commander will activate the EEPGL Incident Management Team (IMT). This onshore emergency organization will assume overall command and control of the incident and resource allocations while the On-Scene Incident Commander and site resources solely focus on the operational tactics at the site.

4.3 Initial Notifications

The notifications matrix, Table 4-2, highlights external organizations to notify when a reporting threshold is potentially exceeded. Table 4-3 provides contact details for the entities listed in the notifications matrix. Contact information for named individuals is not included in a public document.

EEPGL – OIMS 9-1 Reporting defines Internal & External Reporting criteria

The Guyana National Oil Spill Contingency Plan outlines the inter-agency notification responsibilities should other Government jurisdictions be impacted from a spill event. EEPGL will adhere to good industry practices, such as providing the appropriate situational information for government-to-government notifications to successfully occur.

4. Initial Response Actions

Table 4-2: Notifications Matrix (Abbreviated)

Regulatory Notification	Reporting Threshold	External Organizations								Timing
		MNR	GGMC	EPA	CDC (NEMS)	MARAD (NFP – Maritime)	Harbor Master	GEA (NFP – Land)	OSRL Boots & Coats	
Spills / Process Safety Releases										
Hydrocarbon Liquid (On-Land)	> 5 gallons <sup>3</sup> Oil		X	X	X			X		Immediate
Hydrocarbon Liquid (On-Water)	> 5 gallons <sup>4</sup> Oil	X		X	X	X	X			Immediate
	> 50 BBL	X	X	X	X	X	X	X		Immediate
Chemical (general) Spills / Release	> 500 kg/500 L		X	X	X	Water only		Land only		Immediate
Gas / Vapor Release	Requiring site evacuation		X	X	X	X				Immediate
Loss-of-Well Control Event	Use thresholds above	X	X	X	X	X			X	Immediate

**NOTE:** Table summarized from EEPGL Internal and External Reporting Matrix (reference OIMS 9-1 Reporting for specific reporting / notification process)

<sup>3</sup> Guyana NOSCP, Section 5 – Notifications, Alerts and Reporting.

<sup>4</sup> Guyana NOSCP, Section 5 – Notifications, Alerts and Reporting.

**4. Initial Response Actions**

**Table 4-3: Regulatory Authorities Contact Details**

Organization	Country	Contact Details
Civil Defence Commission (CDC)	Guyana	+592 226 8488 (All Hours) +592 226 1114 / 226 1117 (NEMS)
Environment Protection Agency (EPA)	Guyana	+592 225 2062 (Business Hours) +592 661 6862 / +592 622 6320 (A/H)
Guyana Energy Authority (GEA)	Guyana	+592 226 0394 (Business Hours) +592 615 3656 (A/H)
Guyana Geology and Mines Commission (GGMC)	Guyana	+592 225 3047 (Business Hours) +592 225 2865 (ext 247) (A/H)
Harbor Master Transport and Harbors Department Stabroek Georgetown	Guyana	+592 226 9871 (All Hours)
Maritime Administration Department (MARAD)	Guyana	+592 226 9871 (All Hours)
Ministry of Natural Resources (MNR)	Guyana	+592 231 2506

**4.4 Initial Source Control Actions**

Initial source control actions and resources to control the source of operational spills, including the initial actions to a loss-of-well-control incident, are described in site specific ERPs.

Sustained source control response operations will be managed and coordinated by the EEPGL IMT, including the Source Control Branch under the Operations Section. See Figure 4-2 for an example IMT with Source Control Branch.

4. Initial Response Actions

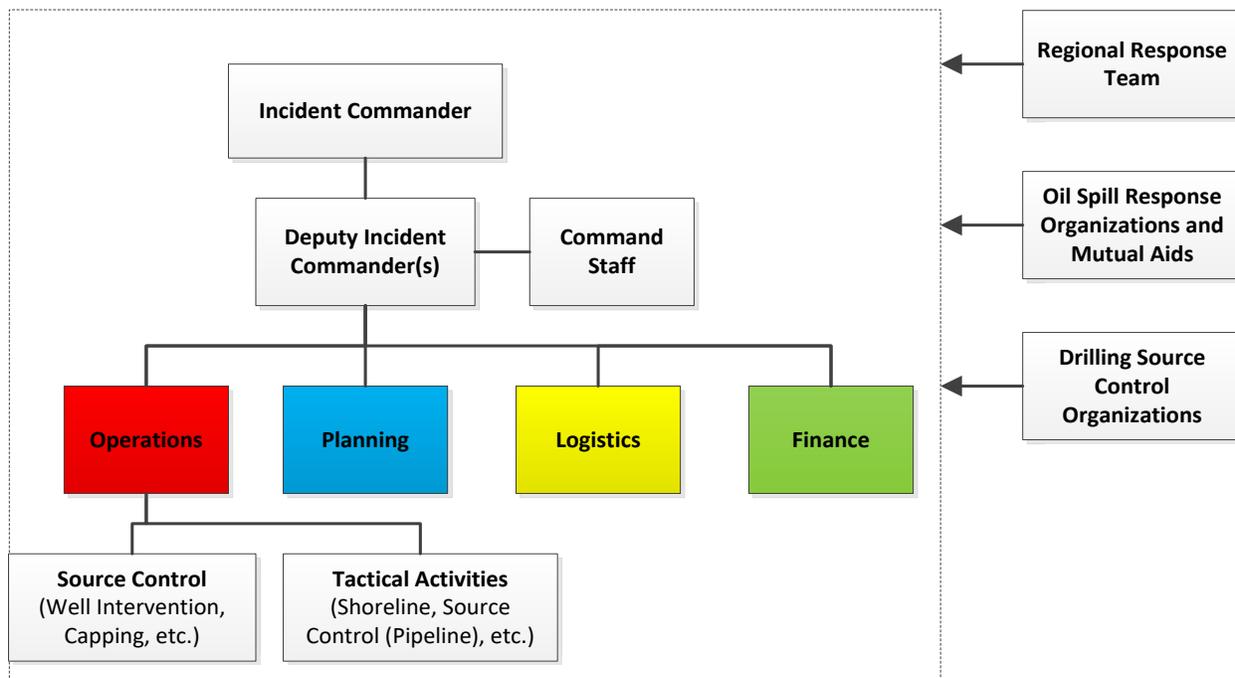


Figure 4-2: Example Incident Management Team with Operations led Source Control Branch

4.5 Spill Assessment

An accurate estimation of total spill volume, location, and movement is essential to determine the required response Tier, and to plan for and initiate spill response and cleanup operations. Quick estimation will aid in determining the:

- Equipment and personnel required;
- Potential threat to shorelines and/or sensitive areas, including ecological impact; and
- Waste storage and disposal requirements.

Typical response protocols initiated by EEPGL include, but are not limited to:

- A systematic search to locate the spill and determine its coordinates.
- A spill size estimate and movement using coordinates, photographs, drawings, and other information received from vessels, aircraft, and satellite imagery.
- Modeling of the oil released to predict the oil’s surface movement or trajectory
- Conduct spill-specific NEBA for response tool selection and agency submission
- If necessary, the Source Control Branch will estimate the volume and rate of a subsea well release

5. Initial Response Actions

## 5 RESPONSE STRATEGIES AND TACTICS

A tier II+ spill response, typically, requires command generated strategies, key response objectives, defined tactics and executable plans all supported through a systematic organization with resource capabilities. In the course of any response, other constraints or variables must be evaluated for their impacts, such as, physical conditions, health and safety considerations, prevailing weather, sea states are examples of these possible constraints.

The following sections provide an overview and describe the implementation of each response strategy available to EEPGL.

### 5.1 Response Strategy Overview

Any response strategy must start with an understanding of the regulatory framework in which the assets and operating units are located. It is paramount for the oil and gas industry to work with government entities to ensure clear understanding and common interpretation of national requirements. The fostering of these relationships and those of interested or concerned about response preparedness are vital to establishing healthy stakeholder engagements.

To define appropriate response strategies, EEPGL leveraged reservoir data, tested fluid properties, gathered physical oceanographic and geological data, evaluated risks and selected oil spill planning scenarios to model for potential unmitigated environmental impacts. These results led to spill impact mitigation assessments or NEBA that dictated modelled oil movement and its potential environmental or socioeconomic impacts and the necessary response techniques to eliminate or mitigate possible harm.

EEPGLs response strategy is to maintain a level of preparedness and readiness, often stated as Ready-to-Respond, should an unlikely oil spill event occur. While response objectives may vary depending on the specific spill circumstances, certain basic objectives will guide any response:

- Safeguarding the health and safety of people, both of responders and the communities,
- Minimizing environmental and community impacts,
- Securing the source of the spill as soon as possible, and
- Minimizing the risk and impacts of the oil

### 5.2 Appropriate Response Strategies

Response to any unplanned or observed release will be expeditious, using all appropriate tools and tactics to minimize harm and shoreline impact. In addition to the safety of responders, response tactics depend upon a variety of environmental conditions. In consultation with the

## 5. Initial Response Actions

Guyana EPA, EEPGL will develop Incident Response Plans that could include the following response strategies for an offshore release:

- Deploy aerially applied dispersants, which can be quickly deployed and treat large surface areas rapidly and efficiently;
- For subsea releases, implement subsea dispersant application as soon as possible, if warranted, to treat most if not all oil spilled at the source before it encounters surface water resources;
- Deploy in-situ burning equipment to burn thick oil near the source;
- Continue to use aerially applied dispersant as a response tool for oil further from the source where mechanical recovery/in-situ burning operations are less effective;
- Utilize aerial dispersant application during calm seas on emulsified oil;
- Outfit vessels of opportunity (VOO) with dispersant delivery and mechanical containment and recovery systems to provide a fleet of vessels that can be a line of defense against surface oil approaching shorelines.

Shoreline protection and/or cleanup may be needed for some scenarios, in which case, sensitive shorelines will receive prioritization for protective booming.

EEPGL anticipates the use of all appropriate oil spill response tools with the aim to mitigate the impacts of oil on the environment. Due to the potential challenges of offshore mechanical recovery, the initial, and in certain cases, primary offshore response strategy is dispersant application. Depending on the volume, mechanical recovery at sea may be possible due to the anticipated oil thicknesses, but can typically be difficult and unsafe due to the active metocean conditions.

## 5. Initial Response Actions

Figure 5-1 shows the cone of response when responding to a loss-of-well-control event with loss of containment using all the available response strategies at once.

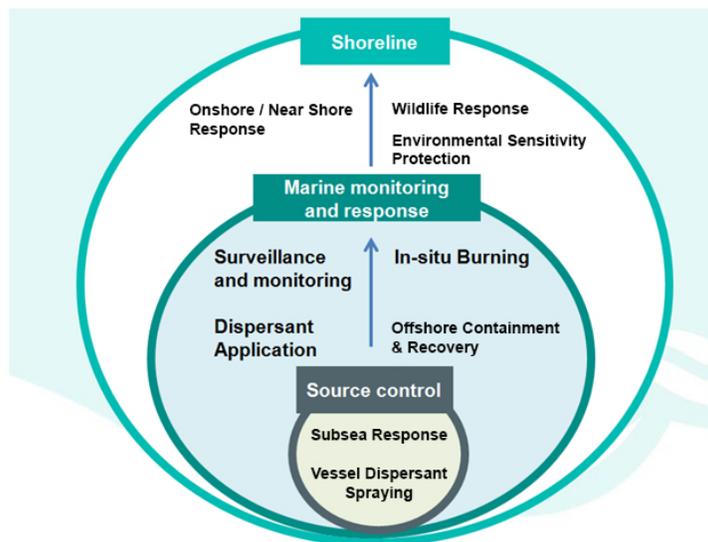


Figure 5-1: Cone of Response Diagram

There is a health and safety hazard posed by high atmospheric concentrations of hydrocarbons. Air quality should be monitored at all times and personnel should be evacuated immediately if **an exclusion zone** is required. Consideration for air quality monitoring is included in the Site Safety Plan.

### 5.3 Surveillance and Monitoring

Surveillance and monitoring is a key strategy relevant to all oil spills that enter the marine environment. Surveillance and monitoring teams can fulfill the following response objectives:

- Verify oil spill scale and location;
- Monitor effectiveness of applied response strategies;
- Visually quantify spill volume (iterative as needed);
- Direct operations—dispersant application, containment and recovery, shoreline assessment, in-situ burning; and
- Monitor wildlife.

The resources mobilized will vary depending on the scale or complexity of the incident. At a minimum, personnel will take visual observations, and vessel owners / operators will implement their ERP / SOPEPs, deploying the Tier I response equipment they have onboard or at location.

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For Tier II or Tier III incidents, the optimal method of tracking the movement of oil on water is by aerial surveillance which includes helicopters, fixed wing aircraft, and satellite imagery. Apart from aerial surveillance, spill response management will undertake predictive analysis to better understand spill movement and trajectory in order to ensure the critical placement of spill response equipment and to the timing of spill response measures.

Figure 5-2 illustrates the key steps involved in surveillance and monitoring; refer to the ExxonMobil IMH and the OSRL Field Guides for further details.

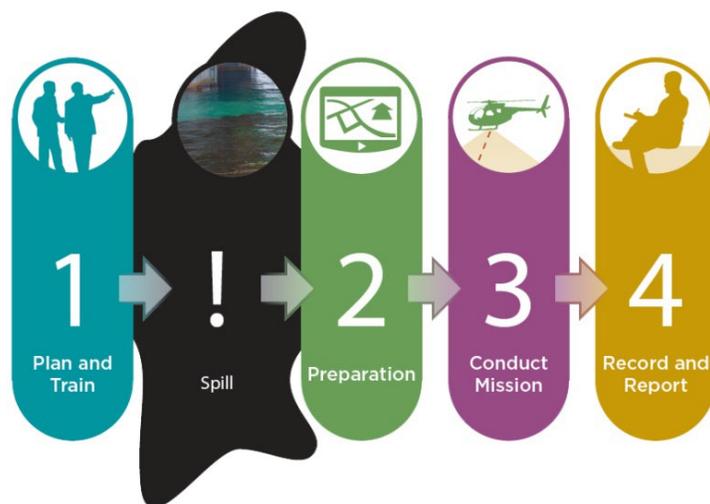


Figure 5-2: Surveillance and Monitoring Key Steps

## 5.4 Assisted Natural Dispersion

Assisted natural dispersion is the process of speeding up the natural breakdown of hydrocarbons without the use of chemicals. This strategy is suitable for smaller spills or in combination with other strategies for larger spills.

To assist the natural dispersion process, techniques such as prop washing or water hoses can be implemented to introduce energy and agitate the hydrocarbons, thereby assisting with the breakup of a surface slick and promoting biodegradation.

## 5.5 Operational Spill Cleanup

Operational spills are small in volume and easily contained on land, on deck or in very close proximity to a vessel. These spills can originate from shore facilities, vessels, or the drill ship. Equipment used for operational spills include sorbent pads, booms, shovels and PPE. This equipment is stored close to the work site for ease of deployment.

**5. Initial Response Actions**

- Shorebases in Guyana (and Trinidad) have site-specific ERPs and are equipped with Tier I spill response kits;
- Vessels maintain a Shipboard Oil Pollution Emergency Plan (SOPEP) and associated equipment onboard the vessel.

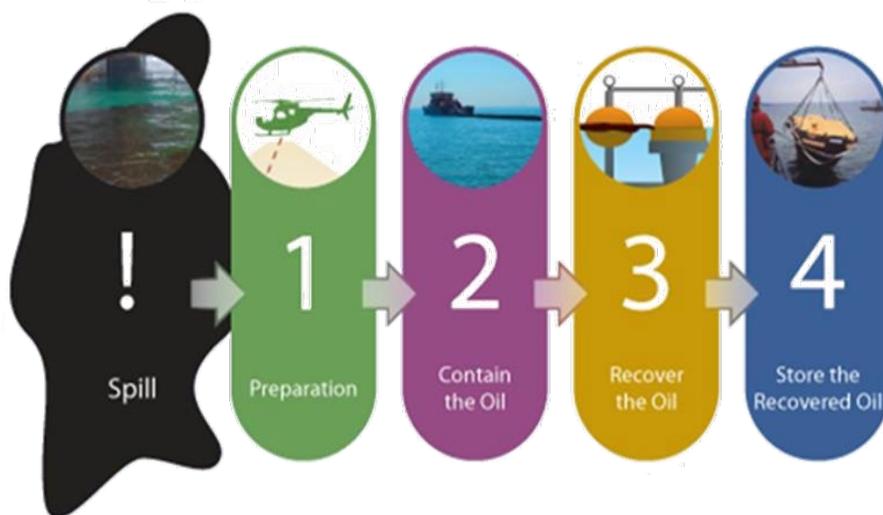
For further details on operational spill cleanup, refer to the ExxonMobil IMH and the OSRL Field Guides.

**5.6 Onshore / Nearshore Response**

**5.6.1 Harbor Containment and Recovery**

EEPGL will use harbor containment and recovery should a marine support vessel (e.g., PSV or FSV) release hydrocarbons in port. The harbor response team will employ a strategy that considers tides, currents, wind, vessel traffic, and local infrastructure with stakeholder input. EEPGL will deploy equipment available on site and in the port (such as or similar to the equipment and trained personnel at the Guyana Fuel Terminals and resources held by NRC for Trinidad) immediately following a release.

Figure 5-3 illustrates the key steps involved in harbor containment and recovery; refer to the ExxonMobil IMH and OSRL Field Guide for detailed information. Refer to Section 8 for a list of available resources.



**Figure 5-3: Harbor Containment and Recovery Key Steps**

5. Initial Response Actions

5.6.2 Shoreline Response

If surveillance or predictive modeling indicate that released hydrocarbons show the potential to affect a shoreline, prioritizing environmentally or socioeconomically sensitive areas is essential. These areas were ranked using an Environmental Sensitivity Index and corresponding resource / receptor ratings to identify those projected areas, special status species, fish, and other marine life on which these local coastal communities depend, as assessed in the EIAs for the FPSO Development Projects.

Shoreline response may consist of using vessel dispersant application on the surface to prevent approaching slick(s) from impacting socio-economically sensitive areas and using shoreline booming techniques to protect sensitive areas and provide collection points for hydrocarbon recovery.

In addition to the pre-identified environmentally and socioeconomically sensitive areas, Coastal Sensitivity Maps were developed which identify sensitive habitats / wildlife areas / features associated with the coastlines in the respective geographic response area. The Coastal Sensitivity Maps are included as an appendix to the initial Development Projects EIAs. Geographical Strategic Response Maps have also been developed to define the equipment needs in specific coastline areas of portions of the geographic response area, considering sensitive areas, access points, and likely response actions. The IMT will use this information for response planning, including development of protection strategies.

Figure 5-4 illustrates the key steps involved in a shoreline response; refer to the ExxonMobil IMH and the OSRL Field Guide for detailed information. Refer to Section 6 for a list of available resources.



Figure 5-4: Shoreline Response Key Steps

## 5. Initial Response Actions

### 5.6.3 Shoreline Cleanup Strategies

Shoreline clean-up is often thought of as a three-phase process:

- Phase one involving the collection of bulk oil, either floating against the shoreline or stranded on it;
- Phase two involving removal or in-situ treatment of shoreline substrates subject to moderate to heavy contamination such as polluted sand or stone; and
- Phase three involving removal of the remaining residues of oil to complete the clean-up.

The first phase is often thought of as the emergency phase because of the urgency of collecting oil before it has the chance to move elsewhere, whereas phases two and three are often referred to as the project phase.

#### 5.6.3.1 Debris Removal

One of the most effective ways to minimize both the effort required to clean a shoreline and the amount of oily waste for disposal is to remove debris from the shoreline or out of the path of the spill before the oil arrives and so avoid the debris becoming contaminated. This may be general flotsam and jetsam that have accumulated in natural collection points, seaweed thrown up by winter storms, or even tree trunks. However, in some situations, large natural debris can assist in stabilizing the shoreline and its large-scale removal could lead to erosion. Furthermore, stranded seaweed provides a valuable source of nutrients to littoral ecosystems.

To take account of both these concerns, an assessment should be conducted to determine whether, on balance, removal would be the best option. The areas where oil is most likely to strand are usually the same natural collection points where debris accumulates. These should be highlighted as priority areas for pre-stranding debris removal. Aerial observations of the movement of oil and oil spill trajectory modeling also provide warning of where there is an imminent threat of oil stranding. Given enough time, clearing beach debris prior to it becoming oiled may also allow the collected waste to be disposed of at non-hazardous waste processing facilities, depending upon local regulations. The oil spill modeling analyses indicate that sufficient time is available to clear shorelines of beach debris and protect critical habitats prior to the arrival of oil at a shoreline.

#### 5.6.3.2 General Cleanup

Shoreline treatment following an oil spill typically involves manual or mechanical removal, washing, and/or chemical treatment. The differences in oiling conditions and variable shoreline and coastline characteristics of Northeast South America and the Caribbean preclude the use of a common cleanup method in all cases. Key considerations in selecting the cleanup methods

## 5. Initial Response Actions

for coastlines are minimization of sand and stone removal and therefore waste generation, minimization of restoration time for amenity beaches used for recreation, and maintenance of beach stability against storms. The removal of bulk and mobile oil in intertidal areas that poses a threat to adjacent habitats or resources may be necessary in areas of high environmental significance such as turtle-nesting areas, high-use tourist beaches, waterfront parks, and local residential areas. Amenity beaches that experience recurring oiling from remobilized oil or reworking of the shoreline by wind and wave action are also treated with continued oil removal operations.

### 5.6.3.3 Manmade Structures

Human-constructed shorelines of sea defenses, seawalls, riprap, breakwaters, groins (low walls or timber barriers extending into the sea from a beach to check erosion), and jetties are treated by manual removal of bulk oil, followed by washing using a range of temperatures and pressures appropriate for the level of oiling and substrate. Manual equipment may include long-handle hand-mesh and screens, pitchforks with screens, pool nets for surface residue balls along the water line, and mechanical adaptations such as rotary screens for extended-reach backhoes working with surface residue and patties in water-saturated sand.

### 5.6.3.4 Sand and Stone Washing

A fixed washing system, constructed with a shaker sieve to remove large surface residue balls and patties along with debris, as well as heated wash units, may be appropriate. Any residual oil remaining in the treated sediments from this procedure is then removed by surf-washing operations. Oil stranded in the supratidal zone during storms requires extensive excavation, especially on amenity beaches. The use of heavy equipment may be limited because of concerns that mechanical methods would result in increased beach erosion, because of access in remote areas, and because of restrictions and prohibitions on the use of mechanical equipment at remote locations. Treatment criteria established in conjunction with regulatory authorities for oil above background on amenity beaches are important to establish early in the clean-up process.

### 5.6.3.5 Surf Washing

Surf washing, including the enhanced natural dispersion of oil by the formation of oil-mineral aggregates existing in the substrate, may be carried out depending upon the extent of beach contamination, and the sensitivity of the surrounding habitats. Surf washing by relocation of sediment to the lower intertidal zone does not cause significant sediment loss, nor does the technology increase hydrocarbon concentrations in intertidal or subtidal sediments or water.

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### 5.6.3.6 Salt Marshes

Cleanup techniques for salt marshes and mangroves include natural attenuation, low-pressure ambient-temperature flushing (to float the oil), mobile vacuum systems, securely deployed containment sorbents or snares, manual removal (on sand or shell substrates only), and vegetation cutting from boats for limited access marshes. In salt marsh habitats where there is little or no risk of repeated oiling, bulk oil removal should be done once on a limited scale, conducted from floating platforms, skiffs, or shallow-draft barges fitted with flushing and vacuum systems. These floating craft should reach into oiled fringe wetlands to wash and recover mobile oil. When stranded oil is removed, it is primarily carried out by hand with sorbent material and by cutting oiled vegetation. The preferred oil spill response in salt marshes is natural attenuation.

### 5.6.3.7 Salt Marsh Impacts from Cleanup Operations

Physical destruction of marsh habitat during cleanup operations is the most common concern, but virtually all options will cause some damage to marshes during cleanup. Fertilizer, such as phosphorus, may be utilized to encourage regrowth of oiled marsh plants. In the examinations of previous industry oil spills, it has been determined that marshes will recover by natural attenuation because prior research has demonstrated their intrinsic resilience. Natural attenuation was the preferred option in the case of the Deep Water Horizon oil spill.

Aeration from tidal action, along with the addition of nitrogen in the form of ammonia, has been shown to significantly increase oil biodegradation in salt marsh sediments. Anaerobic biodegradation of oil in marsh sediments can be enhanced in the presence of mixed sulfate and nitrate. This enhancement is utilized in salt marsh sediments where anaerobes that degrade petroleum hydrocarbons coexist. The recovery rate will depend on the extent of oiling, depth of oil penetration into the sediments, and types of plant species affected.

### 5.6.3.8 Natural Attenuation

Natural attenuation is the “reduction in mass or concentration of a contaminant in the environment over time or distance from its source of release due to naturally occurring physical, chemical, and biological processes, such as biodegradation, dispersion, dilution, adsorption, and volatilization. The natural attenuation of oil can be defined as the biotic and abiotic degradation and dispersion of oil that results in natural recovery of an oil-impacted environment. When oil enters the marine environment, abiotic weathering processes (evaporation to the air, dissolution in water, emulsification with water, dispersion, and photodegradation) alter properties of the oil (density, viscosity, water content, surface and interfacial tensions), which ultimately define its fate.

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### 5.6.3.9 Biodegradation

A large number of microorganisms are capable of biodegrading hydrocarbons, and bacteria are the predominant hydrocarbon degraders in the marine environment. Biodegradation by microbial communities is the major process controlling the eventual removal of oil that enters the marine environment from natural seeps. Although much slower, anaerobic (oxygen absent) biodegradation of oil should not be underestimated as a strategy, because it has been shown to be a major process in anoxic marine sediments. Although normally present in small numbers in pristine environments, oil-degrading microbes multiply rapidly upon the introduction of oil.

## 5.7 Dispersant Application

The benefits of modern dispersants are widely recognized and have been documented to successfully reduce shoreline and surface impact during many oil spill incidents in industry. Dispersants are among the many tools available to address an oil spill. When used properly, dispersants can rapidly reduce the volume of oil on the sea surface and accelerate the natural biodegradation process. Dispersants can reduce or eliminate the potential for oil to impact shorelines. There are dispersants that have been pre-authorized by the EPA<sup>5</sup> for use in Guyanese waters following their approval for application on a case-by-case basis. The application of dispersants will follow good industry practices such as, if there is a direct advantage to protecting environmental or socioeconomic sensitivities **and** where the EPA concurs with its spill-specific use.

Vessel-mounted systems will generally be used to apply dispersant on the surface in small-scale incidents, and aircraft will generally apply dispersant on the surface for large oil slicks. A small supply of dispersant will be kept at the shorebase or other easily accessible location where it can be easily loaded on marine support vessels for application in small-scale spills. An OSRO will conduct aerial dispersant application on the surface for larger-scale spills and will likely base the operation out of the Georgetown or other Regional airport. In the unlikely event of a Tier III loss-of-well-control, dispersant will be injected subsea at the wellhead location near the seafloor using specialized equipment and remote operated vehicles (ROVs).

In Guyana, dispersant usage for a specific spill is subject to permission from the EPA. EEPGL and the EPA both recognize that pre-planning and operational readiness is essential for selecting the best strategy and achieving an effective and timely response. The EPA's acceptance of response strategies for scenarios identified in this plan (via EPA September 2018 acceptance of the OSRP as part of the environmental authorization process for the Liza Phase 2 Development Project) serves as pre-authorization. However, in the event of an incident, all relevant agencies will be notified and consulted on a spill-specific basis, as appropriate, prior to dispersant application. Pre-authorization from the EPA is related to the potential use of the four primary (i.e., most broadly approved and studied) dispersants: Corexit 9500, Corexit 9527A,

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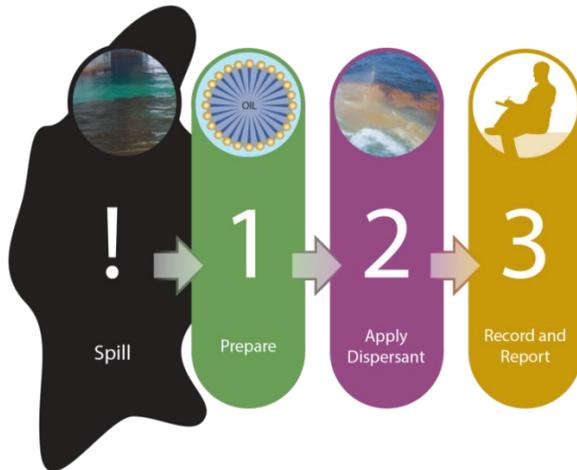
<sup>5</sup> per OSRP Rev 4 plan approval by the EPA in September 2018

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Finasol OSR 52, and Dasic Slickgone NS. These dispersants have been found to be of low toxicity, are effective across a broad range of oil types and environmental conditions, and are readily available globally. For reference, in a 2010 study conducted by the USEPA, Corexit 9500A was found to be of lower toxicity during standard aquatic toxicity tests than several other commercially available products, i.e., slightly toxic to practically non-toxic (USEPA 2010). Safety Data Sheets for each of the above-mentioned products have been provided in **Appendix D**.

Delays in spill-specific acceptance of dispersant use at the time of an incident can delay and/or negatively impact the response, and may result in a missed window of opportunity to apply dispersants, potentially increasing environmental damage. EEPGL will use the Dispersant Spraying Considerations Flowchart as a guide for whether to use dispersants. Dispersant will be applied according to manufacturers’ guidelines and the operating procedures of the spray applicators.

EEPGL in partnership with the EPA will develop a dispersant application, monitoring, and evaluation strategy as part of a spill response strategy. **Appendix D** includes the following dispersant use application forms that would capture all relevant information to assist in this process: Dispersant Use Planning Form—Initial Incident Information; and Dispersant Use Planning Form—Application Tactics. illustrates the key steps involved in dispersant operations; refer to the ExxonMobil IMH and the OSRL Field Guides for further details. Refer to Section 8 for a list of available resources.



**Figure 5-5: Dispersant Application Key Steps**

**5.7.1 Toxicity**

Toxicity is a parameter associated with all materials. Every substance exhibits toxic effects at some concentration, so it is not a binary (i.e., yes or no) parameter. The essential element of toxicology is the magnitude of the effect on an organism caused by a chemical compound is

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dependent on the exposure of the organism to the chemical compound. Highly toxic materials require exposure to only very small concentrations of the substance, e.g., low part per billion levels, while low toxicity materials require exposure to much higher concentrations, e.g., 100s of parts per million (ppm). Exposure is the concentration of the chemical to which the organism is in contact, the route of that exposure (e.g., gills, lungs, skin, stomach), and the duration of exposure. Sections 5.7.2 through 5.7.5 discuss the potential toxic effects of dispersants.

### 5.7.2 Potentially Toxic Chemical Compounds in Oil

Most alkanes and cycloalkanes have a limited potential to cause toxic effects on marine organisms due to their low water solubility. Aromatic hydrocarbons are the components of crude and fuel oils that are generally considered to be toxic to aquatic organisms (Anderson et al. 1974; Di Toro et al. 2007).

### 5.7.3 Exposure to Oil, Dispersed Oil, and Water-Soluble Compounds from Oil

Once an oil spill has occurred, it is inevitable some marine organisms will be exposed to elevated concentrations of naturally dispersed oil droplets and water-soluble compounds from the oil in the upper water column (González et al. 2006). The one-ring aromatic compounds (or benzene, toluene, ethylbenzene, and xylene) will rapidly evaporate from floating oil into the air. There remains potential for toxic effects to be caused by the remaining oil (Neff et al. 2000).

The main cause of acute (short-term [48 to 96 hour], high concentration exposure) toxic effects in marine organisms is exposure to 2-ring polycyclic aromatic hydrocarbons (PAHs) (substituted naphthalenes) in the water through absorption across the gills and other organs. The dispersion of oil as small droplets, either naturally or enhanced by dispersants, may increase the exposure of some marine life to these and other partly water-soluble compounds from the oil due to the increased oil/water surface area. However, the dispersion process does not increase the oil's toxicity. Modern dispersants are designed for low toxicity and the combination of these dispersants and dispersed oil are not more toxic than the oil alone.

The uppermost water layer typically contains high densities of planktonic organisms, including the developing spawn (embryos and larvae) of some fish species. These early life stages are known to be sensitive to low concentrations of 2- and 3-ring PAHs in the water (Carls et al. 2008). Plankton drifts with the currents in the water and cannot avoid exposure to the compounds from the oil, but any effects on plankton would be localized, and recovery by recruitment from outside of the affected area is rapid. Most oil spills are of limited area and short duration, and the resulting impact, if any, would be limited and localized (Kingston 1999). Furthermore, the recovery of plankton occurs on the order of several weeks.

In water more than 10 meters deep, the concentration of naturally dispersed oil and water-soluble compounds from the oil will be rapidly diluted to low levels in the underlying water. Adult fish can detect oil compounds in the water and are likely to avoid the contaminated area

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(Maynard and Weber 1981). There is no recorded case of any massive fish-kill being caused by an oil spill in the sea.

Fish swimming through water containing oil can absorb some of the water-soluble compounds (most usually the 2-ring aromatic compounds) from the oil into their tissues, but these compounds are quickly lost (depurated) by normal metabolic processes when the fish passes into clean water. Fishing bans or restrictions are often put in place as a precautionary measure to prevent fishing boats and their equipment being oiled, and to reassure the public and protect the reputation/viability of the seafood markets. These bans often benefit regional fish populations because greater numbers of the adult fish spawn to reproduce and remain in the population until fishing bans are eliminated.

### 5.7.4 Effect of Using Dispersants

Dispersants break up the oil slick into tiny droplets that move into the water column that are then diluted to non-toxic concentrations and ultimately biodegraded. However, dispersing more of the oil as small droplets into the water column will temporarily increase the exposure of all marine organisms in the upper water column (Singer et al. 1998). The increase in oil / water surface area will enable more of the partially water-soluble chemical compounds to transfer into the water. They will also be rapidly diluted, as long as sufficient water depth is available (Law and Kelly 1999; Bejarano et al. 2013). The elevated concentrations of these compounds (the 2- and 3-ring aromatic compounds) in the water column have the potential to cause toxic effects, with the magnitude of the effect depending on the duration of exposure (Kelly and Law 1998; Sterling et al. 2003; Bejarano et al. 2014). If dispersants are used on spilled oil over water deeper than 10 or 20 meters the concentrations of dispersed oil droplets and water-soluble chemical compounds from the oil will initially increase, but then rapidly decrease as they are diluted into the surrounding water. Marine organisms will therefore be exposed to a brief 'spike' of elevated concentration of these compounds (Singer et al. 1991; Bragin et al. 1994; Clark et al. 2001), typically reaching a concentration around 50 ppm and rarely exceeding 100 to 200 ppm in the top few meters and falling to about 1 ppm within a few hours. The overall levels of exposure in the marine environment are much lower than those used in standard laboratory toxicity testing procedures (Pace et al. 1995; Coelho et al. 2013).

### 5.7.5 Exposure of Marine Organisms by Ingestion of Dispersed Oil Droplets

Marine organisms may also be exposed to the higher molecular weight PAHs through ingestion of food. Filter-feeding organisms that prey on plankton can ingest naturally or chemically dispersed oil droplets when they are of similar size to some plankton. Relatively simple organisms, such as bivalves, cannot biochemically process the higher molecular weight PAHs in the oil, and these PAHs can build up (bioaccumulate) in some organs (Neff and Burns 1996). These compounds will subsequently be lost by depuration into clean water. Predators that

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consume oil-contaminated bivalves can therefore be exposed to elevated concentrations of the higher molecular PAHs by this ingestion route. Organisms that possess livers, such as fish, can metabolize PAH, and some of these metabolites are harmful, causing lesions and other effects. The magnitude of toxic effects caused by this exposure route in most circumstances is likely to be low and without population-level effects.

In summary, the assessment of environmental effects from dispersing accidentally spilled oil requires that the effects be compared to that of oil alone. Crude oils are materials that contain constituents considered to be moderately toxic. When they enter a nearshore area or strand on a shoreline, they can potentially produce negative physical (smothering) and chemical environmental effects. The effects have the likelihood of being persistent because bulk oil does not readily degrade. Dispersing these oils into very small droplets will greatly reduce the persistence of the spilled oil and provide the ability of naturally occurring oil-degrading bacterial to remove it from the environment.

In the years since the 2010 Macondo spill in the Gulf of Mexico, numerous publications, e.g., Wise et al. (2014), have studied dispersant hazard on organism tissues among a variety of other test species. Unfortunately, most of these studies do not address risk (e.g., exposure x hazard) from dispersants. Rather, they report only the hazard or the concentration or dosage required to achieve a certain endpoint, whether mortality or some other biological observation.

The US EPA and U.S. Food and Drug Administration (FDA) have determined, through a combination of pre- and post-application assessments and approvals for each of the chemical constituents of the Corexit® dispersants used in the Macondo response, that the effect of Corexit® dispersant products (and dispersants in general) in the environment is not greater than the effect of the oil alone. Table 5-1 lists these constituents and the following discussion explains how that determination was reached.

**Table 5-1: Chemical Constituents of Corexit® Dispersants**

Chemical Abstracts Service Registry Number <sup>a</sup>	
111-76-2	2-Butoxyethanol (ethylene glycol mono-n-butyl ether)
57-55-6	Propylene glycol
29911-28-2	Dipropylene glycol monobutyl ether
577-11-7	Diocetyl sodium sulfosuccinate
64742-47-8	Petroleum distillates, hydrotreated light fraction
1338-43-8	Sorbitan, mono-(9Z)-9-octadecenoate
9005-65-6	Polyoxy-1,2-ethanediyl derivatives of sorbitan, mono-(9Z)-9-octadecenoate
9005-70-3	Polyoxy-1,2-ethanediyl derivatives of sorbitan, tri-(9Z)-9-octadecenoate

<sup>a</sup> The Chemical Abstracts Service is a division of the American Chemical Society that monitors the scientific and chemical industry literature to identify and catalog recently discovered or synthesized chemical compounds. Source: Dicky and Dickhoff undated.

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### 5.7.6 Direct Human Exposure and General Environmental Safety of Dispersants

The USEPA collected over 600 samples of water from the Gulf of Mexico during the 2010 Macondo oil spill and analyzed them for concentrations of dioctyl sodium sulfosuccinate (DSS). The USEPA's findings were that the vast majority of the samples did not have DSS concentrations above the 20 micrograms per liter ( $\mu\text{g/L}$ ) limit of detection. The USEPA reported only one sample that exceeded the limit of detection (at  $26 \mu\text{g/L}$ ).<sup>6</sup> This is important because it represents the range of likely exposure concentrations for marine organisms. Other common uses of DSS include wetting and flavoring agents in food, industrial, and cosmetic applications, and a medicinal stool softener in over-the-counter use. The FDA has approved this compound as a "Generally Recognized as Safe"<sup>7</sup> ingredient, and as an indirect and direct food additive (Dickey and Dickhoff undated).

### 5.7.7 Safety of Dispersant Residues in Seafood

Following the Macondo spill, the USEPA developed a program to monitor dispersant residues in Gulf of Mexico seafood. The USEPA selected dioctyl sodium sulfosuccinate (DSS) as the indicator compound for potential Corexit® contamination in seafood due to its inclusion in both Corexit® formulations, extremely low volatility, and potential to persist in the environment (Dickey and Dickhoff undated). Mean DSS concentrations in muscle tissue of laboratory exposed and depurated oysters, fish, and crabs all declined by more than 95 percent within 72 hours of cessation of exposure, indicating that DSS has very little potential for bioconcentration and persistence in the edible tissues of seafood species. In retrospective analyses of 393 samples from seafood species, DSS was detected at or above the Level of Quantitation in less than 3.6 percent (14/393) of the re-opening samples tested and all were below safety thresholds determined for DSS in finfish (100 micrograms per gram [ $\mu\text{g/g}$ ]), shrimp and crabs (500  $\mu\text{g/g}$ ), and oysters (500  $\mu\text{g/g}$ ) (Dickey and Dickhoff undated). This is not surprising given the low DSS concentrations in water measured by the USEPA.

### 5.7.8 Summary

In conclusion, all of the chemical constituents in Corexit® 9500 have either been pre-approved for use in dispersants by the USEPA or as a food additive by the FDA, and most have been approved by both agencies for use as dispersants and food additives respectively. The physical-chemical characteristics and scientific literature of Corexit® dispersants indicate that dispersant constituents are susceptible to chemical and biological degradation, and further

<sup>6</sup> Dispersants generally fall into the International Maritime Organization GESAMP (2013) rank of *slightly toxic* (toxicity observed at  $>10$  ppm) or *practically non-toxic* (toxicity observed at 100 to 1,000 ppm). One ppm is equivalent to 1,000  $\mu\text{g/L}$ , meaning that dispersants generally begin to have toxic effects on wildlife at concentrations 2 to 4 orders of magnitude above the detection limit for DSS.

<sup>7</sup> Under U.S. law, a substance may be designated as Generally Recognized as Safe in two ways: (1) through scientific analysis or (2) for substances used in food before 1958, through experience based on common use in food.

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indicate that dispersants are unlikely to pose a threat to the safety of seafood during or after their use (Dickey and Dickhoff undated).

**5.8 Offshore Containment and Recovery**

EEPGL is likely to use containment and recovery operations for spills that enter the marine environment. EEPGL and its contractors, including OSRL, will provide containment and recovery resources for an offshore response. EEPGL will source VOOs to provide platforms for the containment and recovery systems. Barges will store and transport recovered waste in accordance with the Waste Management Plan. Refer to Section 5.11, for more information.

EEPGL anticipates the use of all appropriate oil spill response tools with the aim to mitigate the impacts of oil on the environment. Due to the potential challenges of offshore mechanical recovery, the initial, and in certain cases, primary offshore response strategy is dispersant application. Depending on the volume, mechanical recovery at sea is possible, but can typically be difficult and unsafe due to the active metocean conditions. OSRO/OSRL activation will be carried out to assist in providing the resources required for offshore containment and recovery.

Figure 5-6 illustrates the key steps involved in containment and recovery operations; refer to the ExxonMobil IMH and OSRL Field Guide for detailed information. Refer to Section 6, for a list of available resources.



**Figure 5-6: Containment and Recovery Key Steps**

**5.9 Wildlife Response**

In the event of an oil spill, there is potential for wildlife to either become oiled or require protection from the oil. Both require specialist knowledge and regulatory authorization. A

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Wildlife Response Plan (WRP) specific to Guyana has been developed and provided to allow for a timely, coordinated, and effective protection, rescue, and rehabilitation of wildlife to minimize any negative impacts of a spill. The WRP outlines the measures to avoid and mitigate impacts to wildlife, as well as rescue and rehabilitation of affected or injured wildlife resulting from a spill from EEPGL operations should such measures be required. Wildlife response can be provided in Guyana, in the region, and internationally as needed. Details of the wildlife that could be impacted are provided in initial Development Projects EIAs. Should a wildlife response be required, EEPGL will call upon the Sea Alarm Foundation via OSRL, as well as Guyanese / regional organizations, to provide specialist advice and assistance with carrying out a response. Refer to **Appendix F** for additional details.

### 5.10 In-Situ Burning

In-situ burning is a technique for burning spilled hydrocarbons on the water's surface. EEPGL is only likely to use in-situ burning for large-scale Tier III incidents. OSRL will provide the resources required.

Hydrocarbons must be contained within fire retardant boom with sufficient thickness to achieve a successful burn. Other factors that influence burn success include:

- Weather and sea state;
- Volatility of the hydrocarbons;
- Suitable vessel availability; and
- Regulatory approval.

Figure 5-7 illustrates the key steps involved in burning operations; refer to the ExxonMobil IMH and OSRL Field Guide for detailed information. Refer to Section 6, for a list of available resources.

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Figure 5-7: In Situ Burning Key Steps

5.11 Waste Management

EEPGL will manage hazardous wastes resulting from cleanup activities and ensure appropriate disposal. Large spills can typically result in significant quantities of waste in various forms:

- Recovered oil;
- Oily water mixed with recovered oil;
- Sorbent materials;
- Oiled containment boom;
- Oiled PPE;
- Oiled sediment;
- Oiled vegetation;
- Oiled debris; and
- Deceased wildlife.

Effective waste management will minimize secondary contamination, thereby minimizing waste volume. EEPGL maintains a Waste Management Plan, which may be adapted as required if a spill is likely to produce more waste than can be handled by their regular waste contractors. Key provisions of their Waste Management Plan should include the collection, segregation, storage, treatment, transportation, and disposal of both solid municipal and industrial hydrocarbon-contaminated wastes. Wastes collected in countries outside of Guyana will be handled according to the regulations required specific to that location.

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EEPGL’s OSROs have waste management equipment, materials, supplies, and consumables that would be brought as part of the initial response to a Tier 3 spill. EEPGL would also leverage both domestic and international waste management service providers, contractors, and specialists—as needed—to bring additional resources to the locations where such wastes and debris would be generated. Identification of existing local infrastructure is part of the initial planning and execution during a response for not only waste management facilities and services, but also for the necessary food, accommodations, transportation, containers, trucks, supplies, and consumables that would be mobilized to support a spill response.

Figure 5-8 illustrates the key steps involved in waste management; refer to the ExxonMobil IMH and OSRL Field Guide for detailed information.

Refer to Section 6, for a list of available resources.



**Figure 5-8: Waste Management Key Steps**

**5.12 Subsea Response**

The Drilling ERP contains managerial and logistical details on debris clearance, subsea dispersant injection, well capping, and relief well drilling. The FPSO ERP will be implemented on the surface and subsea for a spill either from the FPSO or from SURF (Subsea, Umbilicals, Risers, Flowlines) equipment during production operations. Tankers (owned/operated by others) will have similar ERPs that would be implemented complementary to the FPSO ERP, for spills during offloading.

If a Tier III loss-of-well control incident occurs involving the release of wellbore fluids into the sea, EEPGL will be responsible for containing the source. This team is responsible for performing site survey, conducting debris removal operations (as required), evaluating and

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executing well intervention options, installing subsea dispersant application hardware, and mobilizing and installing a capping device/auxiliary equipment as required. Initially, the team will attempt to operate the existing subsea well control equipment through intervention. If required, the team will mobilize and install a capping device to shut-in the well at the sea floor. Once under control, the forward plan will be designed and executed according to the details of the incident itself. If a relief well is required, it will be drilled to intersect the original well and address specific issues encountered in the original wellbore.

EEPGL has access to a dedicated in-country First Response Toolkit (FRT). The FRT consists of a suite of site survey, blowout preventer (BOP) intervention, light debris removal, and subsea dispersant injection (SSDI) tooling designed to support the immediate response activities resulting from a subsea source control event. In addition, EEPGL has access to the OSRL SWIS, Oceanering, Wild Well Control, Trendsetter Engineering, and Boots & Coots equipment. OSRL's Subsea Well Intervention Service (SWIS) provides EEPGL with access to a Subsea Incident Response Toolkit (SIRT), the Global Dispersant Stockpile (GDS), and multiple Capping Stack Systems (CSSs). The CSS and SIRT include equipment that can be mobilized directly to the well site:

- Survey and debris clearance equipment;
- Intervention equipment;
- Dispersant hardware application system;<sup>8</sup> and
- CSSs and auxiliary equipment.

Figure 5-9 illustrates the key steps involved with a subsea response.



**Figure 5-9: Subsea Response Key Steps**

<sup>8</sup> Dispersant will be mobilized simultaneously through the OSRL GDS service via the EEPGL IMT.

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### 5.13 Decontamination

In the event of a spill, an incident-specific Decontamination Plan will be developed by EEPGL relevant to the nature and extent of the spill to prevent further oiling through secondary contamination. Decontamination is the process of removing or neutralizing contaminants on personnel and any equipment that has come into contact with the oil or oily wastes. To ensure the safety of the responders and the public, and to prevent further potential impact to the environment, a Decontamination Plan and dedicated area with clearly delineated hot (exclusion), warm (contamination reduction), and cold (clean support) zones will be developed and established. Decontamination procedures are supplemental to the Site Safety Plan. The Planning Section of the RRT will support development of the Decontamination Plan with input from Operations and Logistics.

The decontamination procedures will depend on the type and volume of oil that has been spilled, and the type of equipment used during the clean-up operation. Regular decontamination during the response is necessary for the personnel involved with direct clean-up efforts, the vessels involved in the response, and a wide range of spill-related equipment. Any spill response contractor will follow established guidelines for decontamination operations in order to facilitate proper decontamination through the duration of the cleanup effort.

Establishing a field decontamination process is a priority. Regular decontamination will occur in the field, particularly during a large-scale response, so all personnel must be briefed on the decontamination requirements at the beginning of the spill response in order to ensure functioning decontamination operations.

Supervisory personnel are responsible for ensuring that all decontamination activities are occurring according to the guidelines. At the end of the response effort, all the vessels and equipment used at the site(s) will undergo a more thorough cleaning in order to ensure their suitability for future use, including normal operations.

For detailed information on the implementation techniques involved with decontamination, refer to the ExxonMobil Field Manual and OSRL Field Guide.

### 5.14 Demobilization

Once an incident has stabilized and response operations are being completed, a decision will be made to commence demobilization of resources (personnel and equipment) as appropriate. An incident-specific Demobilization Plan will be developed incorporating guidance from the Resource Unit Lead, Operations, Logistics, and Legal.

The Resource Unit will then coordinate demobilization of resources in accordance with the approved Demobilization Plan.

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There are a number of tools available to assist in the determination of cleanup endpoints, including:

- Shoreline Assessment Manual, Third Edition (NOAA 2013);
- Shoreline Assessment Job Aid (NOAA 2007);
- Marine Oil Spill Response Options for Minimizing Environmental Impacts (NOAA 2010);  
and
- Options for Minimizing Environmental Impacts of Freshwater Spill Response (NOAA and API 1994).

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**6. Response Resources**

## **6 RESPONSE RESOURCES**

ExxonMobil and its subsidiary companies (including EEPGL) are members of OSRL, Marine Well Containment Company (MWCC); in addition, ExxonMobil and its subsidiary companies (including EEPGL) have contracts in place with Marine Spill Response Corporation, Boots & Coots, Wild Well Control, Add Energy, and other OSRO vendors, and, as members/customers, have access to worldwide stocks of equipment. Table 6-1: lists or otherwise describes the international, regional, and local resources available to EEPGL for each potential response strategy.

It should also be noted that ExxonMobil, OSRL, and other OSRO vendors regularly exercise spill response for projects around the world. As a result, the availability of aircraft, helicopters, response vessels, and associated equipment from various vendors is well understood and the receiving locations, timing for access, and utilization information are available. Table 6-2 through Table 6-7 provide a further summary of the representative oil spill response equipment in Guyana. Both EEPGL and its OSRO contractors have robust inspection and maintenance programs to ensure oil spill response equipment identified in this plan is maintained in a state of operational readiness.

6. Response Resources

Table 6-1: Oil Spill Response Resources <sup>a</sup>

Response Strategy	Resources Available	Quantity (Based on business needs)	Location
Surveillance and Monitoring	Heliport / Shorebase	2	Guyana Airport / Shorebase (Examples: Correia International Airport / GYSBI Shorebase or similar, Guyana)
	Helicopters (3 Sikorsky S-92; 3 AgustaWestland AW-139 with one outfitted for Search-and-Rescue)	6	Bristow Group Inc. / Infield helicopter provider
	Additional Helicopters	As required	National Helicopter Services Limited or similar, Trinidad
	Tracking Buoy	10	Horizon Marine or similar
	OSRL Trained personnel Fluorometry Satellite Imagery Tracking buoys	Refer: Section 6.3.2, OSRL	
Assisted Natural Dispersion	PSVs / FSV marine support vessels (each of 22 vessels have mounted dispersant application monitors and one tote of dispersant)	22	Infield
Operational Spill clean-up	SOPEP material Spill Equipment at shoreside facilities	As required	Onboard all vessel's, at shorebases in Guyana and Trinidad, Fuel Terminals [Examples: SOL Terminal (Guyana), NRC base (Trinidad)]
Onshore/nearshore	Onshore/nearshore package Fence Boom Skimmers Temporary storage	Variable	Guyana Fuel Terminal (SOL Terminal or similar, Guyana) Trinidad Shorebase (NRC base or similar)
	OSRL	Refer: Section 6.3.2, OSRL	
	1,200-ft 8" x 16" Solid Float Containment Boom (24 ea. 50-ft Sections)	2	Georgetown Shorebase

**6. Response Resources**

Response Strategy	Resources Available	Quantity (Based on business needs)	Location
	1,200 ft 6" x 12" TC Solid Float Containment Boom (12 ea. 100 ft Sections)	2	Georgetown Shorebase
	CRUCIAL Drum Skimmer Package (Including Skimmer Head, Diesel Hydraulic Power Pack, PD75 Oil Transfer Pump, Hose Package, and Spares)	2	Georgetown Shorebase
	Weir Skimmer Head	2	Georgetown Shorebase
	Tow Bridles	8	Georgetown Shorebase
	Boom Repair Kit	4	Georgetown Shorebase
	20 lb Anchor	40	Georgetown Shorebase
	40 lb Anchor	8	Georgetown Shorebase
	Buoys	50	Georgetown Shorebase
	Spools of Rope	16	Georgetown Shorebase
	Box of Shackles, Fittings, etc.	2	Georgetown Shorebase
	End Opening Container	4	Georgetown Shorebase
	Dispersant Spray Package 4000 liters chemical dispersant Afedo Spray nozzles	2	Georgetown Shorebase
	OSRL Vessel mounted spray equipment Aerial spray platform Trained personnel	Refer: Section Section 6.3.2, OSRL	
	GDS	Refer to: Section 6.3.6, Global Dispersant Stockpile	

**6. Response Resources**

Response Strategy	Resources Available	Quantity (Based on business needs)	Location
	OSRL Offshore boom Offshore skimmers Temporary storage Trained personnel	Refer: Section 6.3.2, OSRL	
	Inflatable Offshore Boom (43in Inflatable Boom, 100-ft Sections)	1,400 ft	Georgetown Shorebase
	Hydraulic Boom Reel	2	Georgetown Shorebase
	Tow Bridles with Tow Line	4	Georgetown Shorebase
	Inflation Blower with Hoses	2	Georgetown Shorebase
	Diesel Hydraulic Powerpack	2	Georgetown Shorebase
	Hydraulic Hoses (Pair)	2	Georgetown Shorebase
Offshore containment and recovery	Boom Spares Kit	2	Georgetown Shorebase
	Double door 20 ft Container (Opens both ends)	2	Georgetown Shorebase
	CRUCIAL Model C-Disc 13/24 skimmer	2	Georgetown Shorebase
	Diesel hydraulic power pack (Lamor model LPP-6 with Hatz diesel engine)	2	Georgetown Shorebase
	Spate PD75 oil transfer pump coupled on two wheel cart	2	Georgetown Shorebase
	Hose package	2	Georgetown Shorebase
	Towable bladders (approx. 5-6K gal total combined capacity of both bladders)	4	Georgetown Shorebase
	Spool rope	2	Georgetown Shorebase
	Spares package	2	Georgetown Shorebase
	Hose floats	16	Georgetown Shorebase
	20-ft Standard shipping container (with doors on one end)	1	Georgetown Shorebase

**6. Response Resources**

Response Strategy	Resources Available	Quantity (Based on business needs)	Location
Wildlife	OSRL	Wildlife response equipment	Refer: Section 6.3.2, OSRL
	Sea Alarm Foundation	Technical expertise	
	ExxonMobil Biomedical Sciences, Inc.	Wildlife expertise	
In-Situ Burning	OSRL Fire resistant boom Ignition equipment Trained personnel	Refer: Section 6.3.2, OSRL	
Waste Management	Waste contractor	NA	Guyana
	OSRL	Refer: Section 6.3.2, OSRL	
Subsea Response	OSRL SWIS 15k air-freightable capping stack 15k capping stack SIRT	Refer: Section 6.3.7, Subsea Well Response	Norway and Brazil
	Boots & Coots GRIP 15k capping stack	Refer: Section 0, Boots & Coots	Houston, TX
	ROV contractor ROVs onboard Technicians (4 person crew per vessel)	1-2 per Drill Ship / MSV	Houston, TX
	Trendsetter Engineering Inc. Engineers/technicians to support capping equipment mobilization and installation	NA	

**6. Response Resources**

Response Strategy	Resources Available		Quantity (Based on business needs)	Location
	Additional available equipment: Wild Well Control Well CONTAINED Blowout Prevention (BOP) Intervention Subsea Dispersant application kit Debris removal kit CSS		See Well CONTAINED™	
	Relief Well: Halliburton Boots & Coots active ranging technology	NA	Houston, TX	
	Crude Oil Tanker	1	Infield (During scheduled tanker offloading)	
	PSVs / FSV	PSV (Similar in class to Hornbeck Commander, 320 ft class)	4	
	Trendsetter Engineering Inc. Engineers/technicians to support capping equipment mobilization and installation	FSV (Similar in class to Chouest Fast Hauler)	1	
	Installation Vessels	MPV (Multi-Purpose Support vessel)	1	
	Tugs	1x 120 MT Azimuth Stern Driven (ASD) Tug 2 x 80 MT ASD Tugs	3	
	Vessels of Opportunity	Various	N/A	

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Response Strategy	Resources Available	Quantity (Based on business needs)	Location
Multi strategy use	Drillship	Multiple	Infield
	FPSO <sup>a</sup>		Infield

ft = foot/feet

Multi strategy use

<sup>a</sup> Note: All equipment and vessels specified are reflective of the peak resources needed during concurrent drilling and production operations.

Global note: Each oil spill is unique; the specific vessels and equipment required for one spill may not be appropriate for another spill. Many vessels change theater of operations periodically and may not be in service at the time, which may require need for alternate vessels. Final configuration of the oil spill vessels and equipment will be performed by ExxonMobil, who has a division responsible for obtaining equipment and materials for its global operations through worldwide contracts with providers, including vessels and oil spill response equipment.

**Table 6-2: Oil Spill Response Equipment Supplied — Oil Containment Boom**

<b>GENERAL</b>	QUANTITY	2
	DESCRIPTION	10' Containerised System with 300m Hi-Sprint Boom
	TYPE	Boom reel with integral power pack and air pack
	MANUFACTURER	Vikoma (or equivalent)
	MODEL	400 P (or equivalent)
	WEIGHT	5,140 kg
<b>CONTAINER</b>	TYPE	Stackable 10' ISO certified container with doors on both sides
	PAINT	Orange RAL 2008 two pack PU paint system
	VENT/EXHAUST	Louvre vents both sides, and exhaust outlet for the power pack
	FLOORING	Non-slip internal flooring coated with black Epidek non-slip paint
	DOORS	Doors with weather seals and lockable door latches with galvanised bolts
	ISO BLOCKS	ISO blocks in all four corners
<b>REEL</b>	TYPE	Boom reel with integral diesel/hydraulic power pack
	ENGINE	Single cylinder diesel, air cooled with electric start
		Safety Devices: Over-speed shut-down valve and spark arrestor
		Power: 7.4 kW @ 3,600 rpm
		Electrics: 12 volt—alternator charging
		Fuel Tank: 5.5 litres
		Hydraulic oil: 40 litres
	REEL DRIVE AND CONTROL (HYDRAULICS)	Double stage planetary gearbox driven by hydraulic motor
		Forward and reverse
Dead-man's stop		

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		Low/high torque selection 0-12 rpm
	CONSTRUCTION	Steel-tube and box section
	PAINT	Epoxy primer with two part sprayed polyurethane top coat
AIR PACK	ENGINE	Single cylinder diesel, air cooled with electric start Safety Devices: Over-speed shut-down valve and spark arrestor Power: 4.1 kW @ 3,300 rpm Fuel Tank: 3.5 litres
	AIR FAN	Centrifugal, high volume, low pressure Control: Via engine speed Construction: Marine grade aluminium alloy
BOOM	TYPE	Hi-Sprint 1500
	LENGTH	300m (in 50 m sections)
	MATERIAL	Reinforced double faced Neoprene
	MINIMUM HEIGHT	1500 mm (inflated)
	FREEBOARD	600 mm
	DRAFT	900 mm
	BOOM AIR PRESSURE	0.3 psig
	BUOYANCY / WEIGHT RATIO	31.5:1
	ACCESSORIES	Towing Bridles Tow bar: Marine grade aluminium, self-buoyant Strops: High integrity webbing (no metal) Rope: Polypropylene, self-buoyant
CERTIFICATION	BOOM	ASTM F1523 - 94(2007)
		ASTM F1093—99(2012)
		ASTM F2438 - 04(2010)
		ASTM F962 - 04(2010)
	CONTAINER	ISO/ABS (IACS)

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Table 6-3: Oil Spill Response Equipment Supplied — Skimmer System

<b>GENERAL</b>	QUANTITY	2	
	DESCRIPTION	Skimmer system with power pack and hose kit.	
	TYPE	Disc skimmer for recovery of oil with viscosity range per section 3.3	
	MANUFACTURER	Vikoma (or equivalent)	
	MODEL	Komara 50 Skimmer System (or equivalent)	
WEIGHT	Skimmer/hoses—618 kg; Power-pack—690 kg		
<b>SKIMMER</b>	TYPE	High capacity disc skimmer	
	RECOVERY RATE	52 m <sup>3</sup> /hr (maximum)	
	EFFICIENCY	98% (oil to free water)	
	UPPER STRUCTURE	Stainless steel (316) and F.R.P.	
	FITTINGS	Stainless steel (316) and marine grade aluminium	
	BUOYANCY	MDPE floats	
	SCRAPERS	Flexible polymer	
	DISCS	Oleophilic plastic	
	HYDRAULICS	Operating pressure	150 bar max.
		Flow discs:	max. 10 l/min @ 100 rpm (controller on power pack)
		Flow pump:	max. 50 l/min (automatic control)
	OPERATING DRAFT	44 cm	
LIFTING	Single point		
ANCILLIARY EQUIPMENT	Lifting sling		
	Operating and maintenance manual		
<b>POWER PACK</b>	TYPE	Diesel hydraulic	
	MODEL	GP35 (or equivalent)	
	RATED OUTPUT	26.8kW at 3,000 rpm	
	HYDRAULIC OUTPUT	65 l/min @ 160 bar (maximum)	
	FRAME	Mild steel	
	HYDRAULIC OIL TANK	Mild steel 60L working capacity	
	DIESEL FUEL TANK	Aluminium alloy 29 l capacity	
	PAINT FINISH	2 coats polyurethane primer and polyurethane top coat—Orange RAL 2008	
	SAFETY DEVICES	Low oil pressure shut-down	
		High coolant temperature shut-down	
		Low hydraulic oil level shut-down	
		Engine over-speed shut-down	
Exhaust spark arrestor			
LIFTING	Central single lift and fork pockets		
ANCILLIARY EQUIPMENT	Lifting sling and shackle		
	Operating and maintenance manual		
<b>TRANS-FER PUMP</b>	TYPE	Rotary lobe	
	DRIVE	Hydraulic motor	
	DISCHARGE	4.5 bar maximum	
	SOLIDS HANDLING	20 mm maximum	

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HOSE KIT	HYDRAULIC	1 x 3/8" NB x 15 m long with quick release couplings on both ends
		1 x 3/4" NB x 15 m long with quick release couplings on both ends
		1 x 1" NB x 15 m long with quick release couplings on both ends
	DISCHARGE	30 m length of 4" NB with quick release coupling from the skimmer pump
		2 x inflatable hose floats (foot pump included)
CERTIFICATION	SKIMMER	ASTM F1778 - 97(2008)

**Table 6-4: Oil Spill Response Equipment Supplied — Floating Storage**

GENERAL	QUANTITY	4	
	CAPACITY	50 m <sup>3</sup>	
	TYPE	Floating Recovered Oil Storage Tank (F.R.O.S.T.)	
	MANUFACTURER	Vikoma (or equivalent)	
	MODEL	6050PL (or equivalent)	
	WEIGHT	410 kg	
FLOATING RECOVERED OIL STORAGE TANK F.R.O.S.T	APPLICATION	APPLICATION The floating recovered oil storage tank is a towable floating oil / water storage tank with hull shaped storage pocket. It can be used for recovered oil as collected from a skimmer, or may be used for transportation of all kinds of low-density products.	
	MATERIAL	Neoprene.	
	CONSTRUCTION	Superstructure composed of compartments with internal airtight conical bulkheads for increased integrity	
	HANDLING	8 lifting points with 2 four-legged slings for deployment (note: tank cannot be lifted when full) Tow point aft for connecting to another tank	
	LENGTH	1100 cm	
	WIDTH	460 cm	
	DRAUGHT FULL	225 cm	
	HORSE SHOE SHAPED HULL DIAMETER	90 cm	
	AIR CHAMBER COMPARTMENTS	9	
	INFLATABLE VOLUME	18 m <sup>3</sup>	
	TOWING SPEED	4.5 knots maximum when full	
	INFLATION PRESSURE	0.15 bar (hot countries)	
	ACCESSORIES		Top cover (PUA)
			Integral towing strop (forward and aft)
		Lifting sling	

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		Inflator / Deflator unit (ATEX approved)
		Repair kit
		Weatherproof aluminium alloy storage container (stackable) with certified
		Lifting points
		Relief valve inflation unit

**Table 6-5: Oil Spill Response Equipment Supplied — Dispersant Spray System**

<b>GENERAL</b>	QUANTITY	2
	TYPE	Portable lightweight oil dispersant sprayer
	MANUFACTURER	Vikoma (or equivalent)
	MODEL	Vikospray 1000 (or equivalent)
	WEIGHT	100 kg
<b>SPRAY UNIT</b>	APPLICATION	For both concentrate and dilute dispersant application
	LANCES (QTY)	2
	ACCESSORIES	Suction hose
		Trolley mounted
	Operation/maintenance manuals	
<b>PUMP UNIT</b>	ENGINE	Single cylinder, 3 kW air cooled, diesel with recoil start and exhaust spark arrestor
	MAIN PUMP	Self-priming roller vane type
	PUMP DRIVE	Direct via coupling from engine (concentrate application)
	CHEMICAL PUMP	Liquid Jet type (for dilute application)
	MIXTURE CONTROL	Chemical/seawater ratio is controlled via a graduated valve on suction side of liquid jet pump working in conjunction with pressure relief valve.
	TOTAL OUTPUT	TOTAL OUTPUT Chemical/seawater mix = 18 l/min per lance maximum Chemical concentrate = 5 l/min per lance maximum
<b>HOSE KIT</b>	CHEMICAL SUCTION	1" NB x 4 m hose with strainer and non-return valve QCR to Vikospray
	WATER SUCTION	1" x 4 m hose with strainer QCR to Vikospray
	HAND LANCE	2 x ½" NB x 10 m hose and lance

6. Response Resources

**Table 6-6: Oil Spill Response Equipment Supplied — Offshore Container**

GENERAL	QUANTITY	4
	TYPE	10' offshore container for skimmer and dispersant spray systems, inflater for FROST units and ten (10) drums (55 gallons each) of oil dispersant
	MANUFACTURER	Vikoma (or equivalent).
	WEIGHT	5,118 kg (with equipment)
CONTAINER	TYPE side	Stackable 10' ISO certified container with doors on one side
	PAINT	Orange RAL 2008 two pack PU paint system
	VENTS/EXHAUST	Louvre vents both sides
	FLOORING	Non-slip internal flooring coated with black Epidek non-slip paint
	DOORS	Doors with weather seals and lockable door latches with galvanised bolts
	ISO BLOCKS ISO	ISO blocks in all four corners
CERTIFICATION	CONTAINER	ISO/ABS (IACS)

**Table 6-7: Oil Spill Dispersant (Guyana)**

Dispersant Type	Volume (m <sup>3</sup> )	Location
Corexit 9527A	547	GYSBI (Georgetown)
Corexit 9500 or Corexit 9527A	31	Destiny FPSO, various Support Vessels

**6. Response Resources**

**Table 6-8: First Response Toolkit (Guyana)**

Item	Element Description	Total Quantity	Part No. (if applicable)	Storage Location	Function / Use
<b>Onshore</b>					
1	8' x 20' Tooling and Spares Container	3	N/A	Onshore	Storage / Maintenance
2	Dual BOP Interface Manifold + Jumper Assembly	1	PN-ASY-000000584, PN ASY-000000617	Onshore	BOP Intervention
3	GR29 Hydraulic Grinder	2	PN-ASY-000000580	Onshore	Debris Clearance
4	Hydraulic Flange Spreader	2	PN-ASY-000000568	Onshore	
5	Hydraulic Nut Splitter, 1.13-1.56"	2	PN-ASY-000000565	Onshore	
6	Hydraulic Nut Splitter, 1.56-2.0"	2	PN-ASY-000000567	Onshore	
7	60" Chop Saw	1	PN-ASY-000000599	Onshore	
8	24" Diamond Wire Saw	1	PN-ASY-000000591	Onshore	
9	Pipe Grapple Tool, 10-24"	1	PN-ASY-000000594	Onshore	
10	Subsea Deployment Basket	1	PN-ASY-000000555	Onshore	
11	17H Hot Stab and Manifold, Dual Port, 15K, 0.25"	2	PN-ASY-000000606	Onshore	
12	17H Hot Stab and Manifold, Dual Port, 10K, 0.5"	2	PN-ASY-000000607	Onshore	
13	17H Hot Stab and Manifold, Quad Port, 3.6K, 0.375"	2	PN-ASY-000000609	Onshore	
14	Intensifier Panel	2	PN-ASY-000000583	Onshore	
15	IW12 Impact Wrench + Socket Set	1	PN-ASY-000000582, PN ASY-000000586	Onshore	
16	Coil Termination Panel	1	PN-ASY-000000585	Onshore	
17	HFL Deployment Frame (c/w 2x deployment racks and 2x 500' sections of 1" 5K HFL)	1	PN-ASY-000000556	Onshore	

**6. Response Resources**

Item	Element Description	Total Quantity	Part No. (if applicable)	Storage Location	Function / Use
18	Dispersant Wand Kit (c/w 1x 3' straight wand, 1x 3' 90° wand, 1x 3' 180° wand, 1x 6' straight wand, 1x 6' 90° wand, 1x 6' 180° wand)	1	PN-ASY-000000521	Onshore	
<b>Offshore</b>					
1	ROV Inspection Camera	2	N/A	Offshore (1x C-Installer MPV, 1x Kirt Chouest MPV) *	Site Survey
2	2D Sonar	2	N/A	Offshore (1x C-Installer MPV, 1x Kirt Chouest MPV) *	
3	BOP Intervention Skid	2	N/A	Offshore (1x C-Installer MPV, 1x Kirt Chouest MPV) *	BOP Intervention
4	IW12 Impact Wrench + Socket Set	1	N/A	Offshore (C-Installer MPV) *	Debris Clearance
5	ROV Knife	2	N/A	Offshore (1x C-Installer MPV, 1x Kirt Chouest MPV) *	Debris Clearance
6	Hydraulic Cutter	2	N/A	Offshore (1x C-Installer MPV, 1x Kirt Chouest MPV) *	
7	17D Torque Tool, Class 1-4	2	N/A	Offshore (1x C-Installer MPV, 1x Kirt Chouest MPV)	
<b>Combined</b>					
1	8' x 20' Tooling and Spares Container	3	N/A	Onshore	Storage / Maintenance
2	ROV Inspection Camera	2	N/A	Offshore	Site Survey

**6. Response Resources**

Item	Element Description	Total Quantity	Part No. (if applicable)	Storage Location	Function / Use
3	2D Sonar	2	N/A	Offshore	
4	Dual BOP Interface Manifold + Jumper Assembly	1	PN-ASY-000000584, PN ASY-000000617	Onshore	BOP Intervention
5	BOP Intervention Skid	2	N/A	Offshore	
6	GR29 Hydraulic Grinder	2	PN-ASY-000000580	Onshore	Debris Clearance
7	Hydraulic Flange Spreader	2	PN-ASY-000000568	Onshore	
8	Hydraulic Nut Splitter, 1.13-1.56"	2	PN-ASY-000000565	Onshore	
9	Hydraulic Nut Splitter, 1.56-2.0"	2	PN-ASY-000000567	Onshore	
10	60" Chop Saw	1	PN-ASY-000000599	Onshore	
11	24" Diamond Wire Saw	1	PN-ASY-000000591	Onshore	
12	Pipe Grapple Tool, 10-24"	1	PN-ASY-000000594	Onshore	
13	Subsea Deployment Basket	1	PN-ASY-000000555	Onshore	
14	17H Hot Stab and Manifold, Dual Port, 15K, 0.25"	2	PN-ASY-000000606	Onshore	
15	17H Hot Stab and Manifold, Dual Port, 10K, 0.5"	2	PN-ASY-000000607	Onshore	
16	17H Hot Stab and Manifold, Quad Port, 3.6K, 0.375"	2	PN-ASY-000000609	Onshore	
17	Intensifier Panel	2	PN-ASY-000000583	Onshore	
18	IW12 Impact Wrench + Socket Set	2	PN-ASY-000000582, PN ASY-000000586 N/A	1x Onshore 1x Offshore	
19	ROV Knife	2	N/A	Offshore	
20	Hydraulic Cutter	2	N/A	Offshore	
21	17D Torque Tool, Class 1-4	2	N/A	Offshore	
22	Coil Termination Panel	1	PN-ASY-000000585	Onshore	

**6. Response Resources**

Item	Element Description	Total Quantity	Part No. (if applicable)	Storage Location	Function / Use
23	HFL Deployment Frame (c/w 2x deployment racks and 2x 500' sections of 1" 5K HFL)	1	PN-ASY-000000556	Onshore	Subsea Dispersant Injection
24	Dispersant Wand Kit (c/w 1x 3' straight wand, 1x 3' 90° wand, 1x 3' 180° wand, 1x 6' straight wand, 1x 6' 90° wand, 1x 6' 180° wand)	1	PN-ASY-000000521	Onshore	

## 6. Response Resources

### 6.1 Tier I Resources

#### 6.1.1 Mobilization

Each onsite Emergency Response Team (ERT) is responsible for mobilizing resources to coordinate a Tier I spill response. In some cases, the onsite ERT may be contractor-managed and, in such circumstances, the associated ERPs will be vetted by EEPGL. As part of their IMO certification, flag state requirements, and EEPGL requirements, the major vessels supporting EEPGL operations (e.g., FPSOs, Installation Vessels, Drill Ships, Tankers) are required to have site-specific ERPs and SOPEPs in place.

The Tier I equipment held at EEPGL's onshore and offshore operations, including shorebases, fueling terminal, support vessels, drill ships, tankers, and FPSOs will be available for rapid onsite deployment in the event of an incident.

Each ERT will have a comprehensive ERP which is a comprehensive document that addresses various types of site-specific emergency response scenarios, including oil spill response. Each ERT describes:

- Onsite response organizational structure;
- Team makeup and organizational roles and responsibilities;
- Interfaces with internal and external response organizations;
- Notification and contact information;
- Identification of oil spill response equipment;
- Tactical action plans for oil spill response;
- Drills, exercises, and simulations; and
- Training

### 6.2 Tier II Resources

The EEPGL Incident Management Team (IMT) is responsible for mobilizing additional offsite resources to coordinate a Tier II response. The EEPGL IMT is activated when an oil spill response escalates from Tier I to Tier II.

In-country equipment and trained personnel to support the EEPGL IMT are available through the Guyanese terminals and shorebases supporting EEPGL operations to initiate a response to a Tier II incident.

Vessel dispersant spray operations will be initiated from the PSVs and supported from the shorebases or other accessible locations as needed to supplement other Tier II response actions.

## 6. Response Resources

Given the type and quantity of hydrocarbons identified in the EIA impact analyses, the distance of the FPSOs and drill ships from the coastline, and the likelihood that oil from a marine oil spill offshore is unlikely to impact a shoreline in less than approximately 5-10 days; it is estimated that regional and international resources can be cascaded into a response in sufficient time to be effective. Therefore, in the event country/regional Tier II resources are insufficient, EEPGL would immediately activate additional resources such as ExxonMobil's RRT and OSRL per Section 6.3 (see Tier III Arrangements Section 2) early in an incident response operation.

In addition, the EEPGL IMT could call upon its in-country contracted companies to provide specific technical or logistical assistance (e.g., aircraft, road transportation, waste management, equipment providers, deployment assistance) for Tier II incidents, as well as VOOs located in Guyana and Trinidad, as needed.

The EEPGL IMT may also request Tier II assistance with the provision of equipment (e.g., boom, skimmers) and deployment assistance from the organizations/contractors supporting the Guyana National Oil Spill Contingency Plan.

### 6.3 Tier III Resources

#### 6.3.1 ExxonMobil's Regional Response Teams

The EEPGL IMT is responsible for mobilizing additional offsite resources to coordinate a Tier III response. The EEPGL IMT will activate the Regional Response Team (RRT) when an oil spill response escalates to Tier III; it may also activate the RRT for Tier II support.

The ExxonMobil RRT is comprised of two geographically based units:

- Europe-Africa-Middle East / Asia-Pacific RRT; and
- Americas RRT

The first point of contact for EEPGL is the Emergency Preparedness and Response Coordinator for Americas RRT, who can initiate activation following instructions from the EEPGL Country Manager or designated representative. Although organized geographically, resources from all RRT units can be mobilized to support the EEPGL IMT.

The RRT is organized in accordance with the Incident Command System (Figure 6-1). The organization is led by in-country personnel and the incident managed by the Incident Commander and the Command Section, supported by Operations, Planning, Logistics, and Finance Sections. The support sections are further sub-divided into branches and units depending on the scale and type of incident.

6. Response Resources

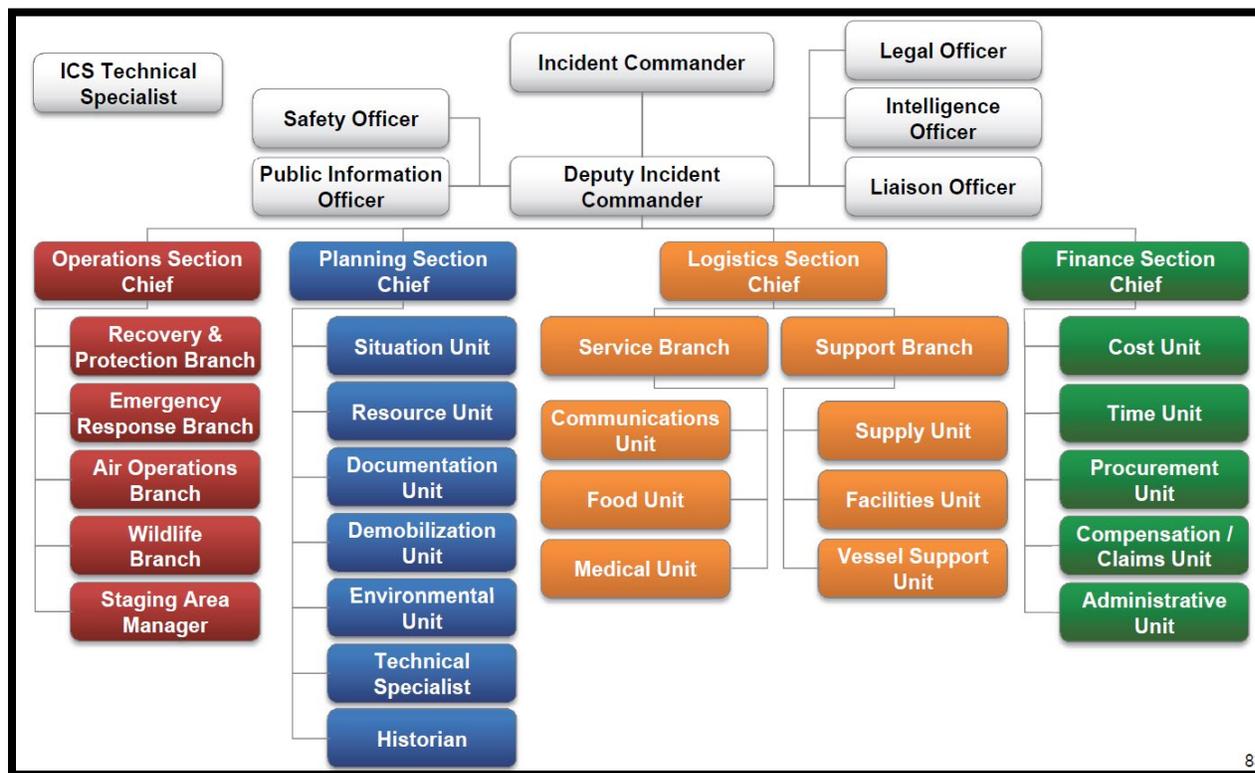


Figure 6-1: Sample Incident Command System Organization

The RRT includes trained individuals and specialists, with assigned roles and responsibilities, who can be deployed at short notice to address a broad range of emergency situations.

The RRT can be partially or fully activated. Partial activation may be implemented when functional support is required by ERTs at incident sites. Should this occur, RRT members will typically be deployed within the existing on-site ERT structure. For larger incidents, that require an extensive amount of tactical work, an intermediate group called the IMT may be established to provide tactical management support for the ERT. Additional company support can be called upon independent of RRT activation, if required.

For large emergencies and incidents in remote locations, full activation may be implemented. Partial or full activation of the RRT to support the EEPGL IMT is likely for all Tier II and Tier III incidents in Guyana or in any area in the region affected by a spill from Guyana, to help manage a major tactical response. In the event that the RRT is activated, an RRT Command Center will be established by the Americas RRT.

6. Response Resources

6.3.2 Oil Spill Response Limited (OSRL)

EEPGL is a Participant member with OSRL and has a worldwide contract in place with OSRL, and therefore has immediate access to Tier III technical advice, resources, and expertise 365 days a year on a 24-hour basis. Table 6-9 summarizes the OSRL service level agreement (SLA) available to EEPGL.

Table 6-9: OSRL Service Level Agreement Summary

Service	Service Standard		EEPGL Membership Type: Participant	
<b>Response notification, mobilization, service and advice</b>	Notification of a spill contact information			
	OSRL BASE	Fort Lauderdale, USA		
	TELEPHONE	+1 954 983 9880		
	FAX	+1 954 987 3001		
	EMAIL	<a href="mailto:dutymanagers@oilspillresponse.com">dutymanagers@oilspillresponse.com</a>		
	FORMS	Refer to <b>Appendix D</b> : OSRL Notification Form		
	The Duty Manager will speak with and advise EEPGL immediately, or call EEPGL back within 10 minutes.			
<b>Nominated Contact</b>	OSRL must receive an official mobilization authorization from one of EEPGL's Nominated Call-Out Authorities however anyone can notify OSRL.		EEPGL's Nominated Authority: <ul style="list-style-type: none"> <li>• Greg DeMarco</li> <li>• Arthur Powers</li> </ul>	
<b>Spill response equipment</b>	SLA response equipment is housed in secure facilities in Southampton, Fort Lauderdale, Bahrain, and Singapore. Response equipment is customs cleared response ready. Refer to: OSRL Yearbook for a complete list of equipment available, <a href="http://www.oilspillresponse.com">www.oilspillresponse.com</a> and refer to the equipment stockpile status report <a href="http://www.oilspillresponse.com/activate-us/equipment-stockpile-status-report">http://www.oilspillresponse.com/activate-us/equipment-stockpile-status-report</a>			
	As per the SLA, EEPGL can mobilize up to 50% of the global stockpile. If there is more than one spill, EEPGL can mobilize 50% of what remains.			
<b>Dispersant stockpile</b>	If there was an incident, the spiller is entitled to 50% of the ~680 m <sup>3</sup> of dispersant located in Southampton, Singapore, Fort Lauderdale, and Bahrain. OSRL may be able to obtain further dispersant through the Global Response Network (GRN) and other organizations, if required.			
<b>World-wide transportation of equipment</b>	Aircraft Type	Location	Dispersant Capacity	Range
	C-130 Hercules (1x aircraft)	Singapore, Seletar	13,000 liters	2,000 nm in 8 hours
	Boeing 727 (2x aircraft)	UK, Doncaster	17,500 liters	2,400 nm in 6 hours
	Aerial dispersant coverage is provided within a six hour notice period. 24-hour access to global network of cargo and passenger charter services through a dedicated broker.			

**6. Response Resources**

Service	Service Standard	EEPGL Membership Type: Participant
<b>Oil spill trajectory and tracking</b>	Trajectory and stochastic services for surface or subsurface oil spills on request, and backtrack services for surface oil spills using commercial modeling software:	
	OILMAP	Oil Spill Contingency and Response Model
	Satellite imagery services can be provided on request. There are 10 satellite tracking buoys in Georgetown	
<b>Response Personnel</b>	OSRL will provide the following response personnel on a first come, first served basis: 1 x Senior oil spill response manager 1 x Oil spill response manager 15 x Spill response specialists / responders 1 x Logistics Service branch coordinators	
	A Technical Advisor can be dispatched to offer support to EEPGL when they have an oil spill incident or the potential for an incident to occur. This is provided free of charge for the initial assessment period of up to 48 hours. If a full response team is then mobilized, the technical advisor will form part of the available team headcount.	

m<sup>3</sup> = cubic meter

**6.3.3 Marine Spill Response Corporation (MSRC)**

ExxonMobil has a contract in effect with the MSRC that allows ExxonMobil to request personnel, services, and equipment on a 24-hours per day basis. Equipment availability is subject to approval based on factors including contract terms, current response activity, and regulatory needs. MSRC should be activated by calling the Toll-Free number below in Table 6-10 and providing the information requested.

**Table 6-10: MSRC Contact Information**

Company	International	Secondary #	Internet
<b>Marine Spill Response Corporation (MSRC)</b>	+1 (732) 417-0175	+1 (703) 326-5609	<a href="http://www.msrc.org">http://www.msrc.org</a>
<b>Spill Response Equipment</b>	Dispersant aircraft, dispersants, mechanical response equipment, communications equipment, vessels, capping stacks		

**6.3.4 Boots & Coots**

EEPGL has a subscription with Boots & Coots (in Houston, Texas, USA) for access to the Boots & Coots GRIP system, which includes a 15k capping stack, debris removal equipment, and other associated equipment. The GRIP system is an air-freightable system that is located adjacent to George Bush Intercontinental Airport. A response time analysis indicates that the capping stack deployment is possible within 5 days, assuming no debris removal activities are required. Once deployed, final capping operations could occur to shut in the well. Boots &

**6. Response Resources**

Coots should be activated by calling the number below in Table 6-11 and providing the information requested.

**Table 6-11: Boots & Coots Contact Information**

Company	Toll-Free	Main	Internet
<b>Boots &amp; Coots</b>	+1 (844) 307-8094	+1 (281) 931-8884	<a href="https://www.halliburton.com/en/integrated-services/well-control-prevention-services/well-control-response">https://www.halliburton.com/en/integrated-services/well-control-prevention-services/well-control-response</a>
<b>Spill Response Equipment</b>	Capping stacks, debris removal equipment, and other associated equipment		

**6.3.5 Add Energy**

Add Energy is a Norway-headquartered international consultancy provider to the energy industry that offers a range on engineering services in support of wells operations. These services include, but are not limited to, well kill support, well management, well engineering, well servicing, well integrity, reservoir and flow simulations, and loss-of-well-control contingency.

**Table 6-12: Add Energy Contact Information**

Company	Primary	Secondary	Internet
<b>Add Energy</b>	+47 66 98 32 90	+1 832 604 7326	<a href="https://addenergy.no/">https://addenergy.no/</a>

**6.3.6 Global Dispersant Stockpile**

The Global Dispersant Stockpile (GDS) is an additional 5,000 cubic meters (m<sup>3</sup>) of dispersant located across the OSRL bases and in France (see Table 6-13). The dispersant types are those with the largest worldwide approval. Copies of the Safety Data Sheets for all four of these products have been furnished as part of **Appendix D**.

6. Response Resources

Table 6-13: OSRL GDS Quantities and Locations

Dispersant	Quantity (m <sup>3</sup> )	Storage Location
Slickgone NS	350	Singapore
	500	Southampton, UK
	800	Saldanha, South Africa
Finasol OSR52	350	Singapore
	500	Southampton, UK
	1,500	Vatry, France
Corexit 9500	500	Rio de Janeiro, Brazil
	500	Fort Lauderdale, USA

OSRL and EEPGL mobilization responsibilities depend on the location of the stockpile (see Figure 6-2). For all GDS dispersant located in Southampton, Singapore, and Fort Lauderdale, normal SLA logistics and mobilization agreements apply. OSRL will mobilize the GDS alongside all other Tier III equipment.

The GDS stockpile would complement the EEPGL’s in-country dispersant stockpile.

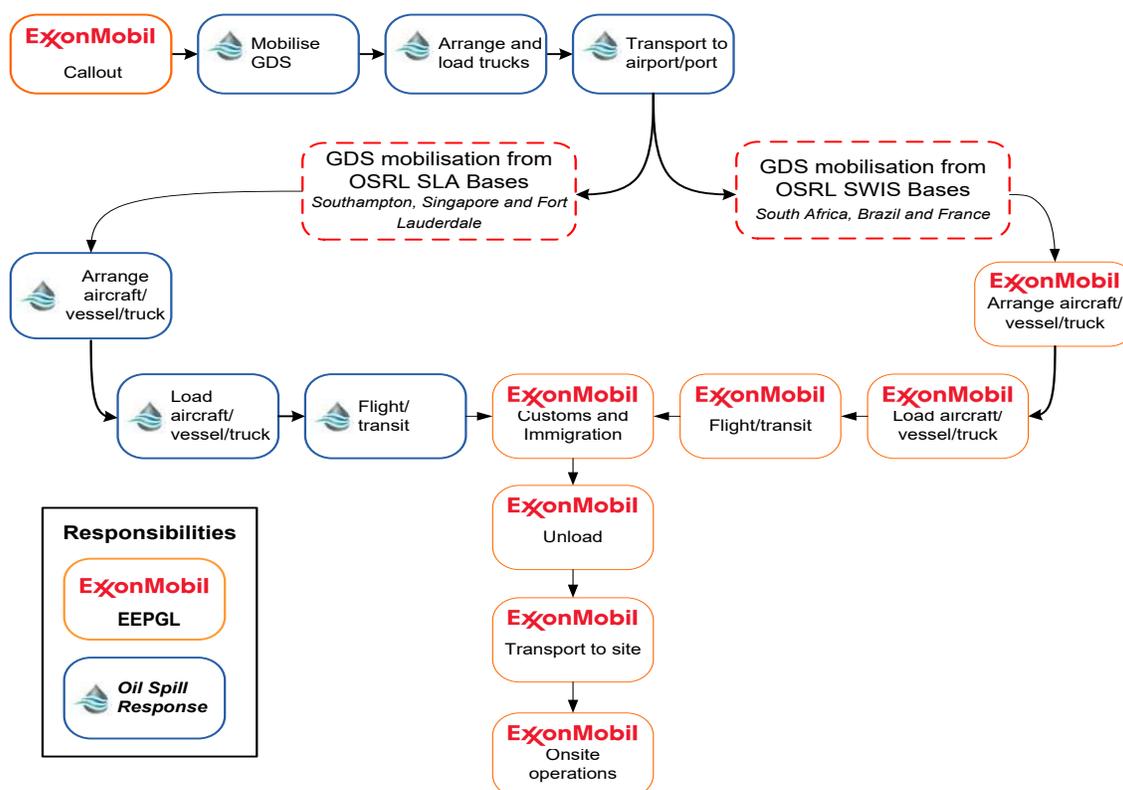


Figure 6-2: GDS Mobilization Responsibilities

## 6. Response Resources

EEPGL would mobilize the GDS through the OSRL Duty Manager. EEPGL can mobilize 100 percent of the GDS for a single incident; 5,000 m<sup>3</sup> is available to support both a subsea and/or surface response. The quantity of dispersant that is currently on hand in Georgetown will be sufficient to support the response to allow sufficient time to transport additional supply from OSRL in Ft. Lauderdale, Florida and additional GDS stockpiles. Dispersant can expect to begin arriving from Ft. Lauderdale within 2 days.

Arrival of Tier III equipment and the SLA dispersant is expected in Cheddi Jagan International Airport within 2 to 3 days of callout. The re-supply to EEPGL response operations will be arranged between EEPGL and the dispersant manufacturers.

EEPGL will be responsible for designating the preferred port, arranging the airplane/vessel (in the case of a subsea well response), accepting the dispersant at the port, coordinating customs clearance, in-country logistics, and confirming the authorized use of dispersant for the specific incident application with the EPA. The OSRL Duty Manager will advise the operator of the logistical requirements of the GDS.

### 6.3.7 Subsea Well Response

EEPGL has access to the OSRL SWIS, Oceaneering, Wild Well Control, Trendsetter Engineering, and Boots & Coots equipment.

The OSRL SWIS provides EEPGL with access to a SIRT and multiple subsea well CSS, as required. The CSS and SIRT include equipment that can be mobilized directly to the well site:

- Survey and debris clearance equipment;
- Intervention equipment;
- Dispersant hardware application system<sup>9</sup>; and
- CSSs and auxiliary equipment

SWIS holds and maintains four CSSs and two SIRTs globally:

- 15,000 psi Subsea Well Capping Stack—Norway and Brazil;
- 10,000 psi Subsea Well Capping Stack—South Africa and Singapore; and
- SIRT—Norway and Brazil

Boots & Coots well control company holds and maintains a Global Rapid Intervention Package (GRIP) in Houston, Texas (USA), for which EEPGL has a subscription. Included as part of the GRIP is a 15,000 psi Subsea Well Capping Stack. The Boots & Coots GRIP would be deployed

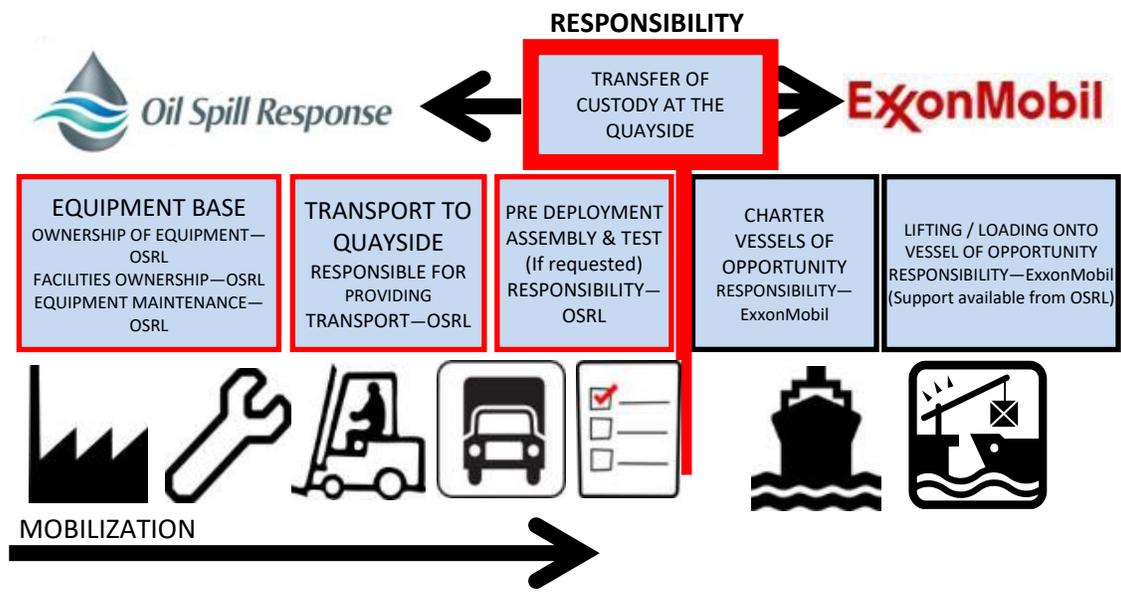
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<sup>9</sup> Dispersant must be mobilized simultaneously through the OSRL GDS service via EEPGL IMT.

**6. Response Resources**

via air to Trinidad (due to current infrastructure limitations in Guyana), then transported to Chagterms Quayside where a deployment vessel can transport it directly to the well location (see Figure 6-3).

In the event of activation for Guyana, the Boots & Coots GRIP system is considered the base plan, as it can be on the well location in 5 days. At the time the EIA was initially submitted, the response time associated with the Boots & Coots GRIP capping stack deployment was based on preliminary and conservative logistics assumptions. After establishing the subscription to the Boots & Coots GRIP system, and in conjunction with EEPGL’s capping stack study, the response time model has been refined to reflect current logistics strategies and it is now estimated that the capping stack deployment is possible within 5 days, assuming no debris removal activities are required. Once deployed, the final capping operations would occur and the well could be shut in. Therefore, oil spill modeling has been based upon a 5-day installation of the capping stack at the well for the WCD scenarios and that timing is therefore reflected in the mitigated scenarios modeling discussed herein.



**Figure 6-3: Sea Mobilization Responsibilities for OSRL and ExxonMobil**

6. Response Resources

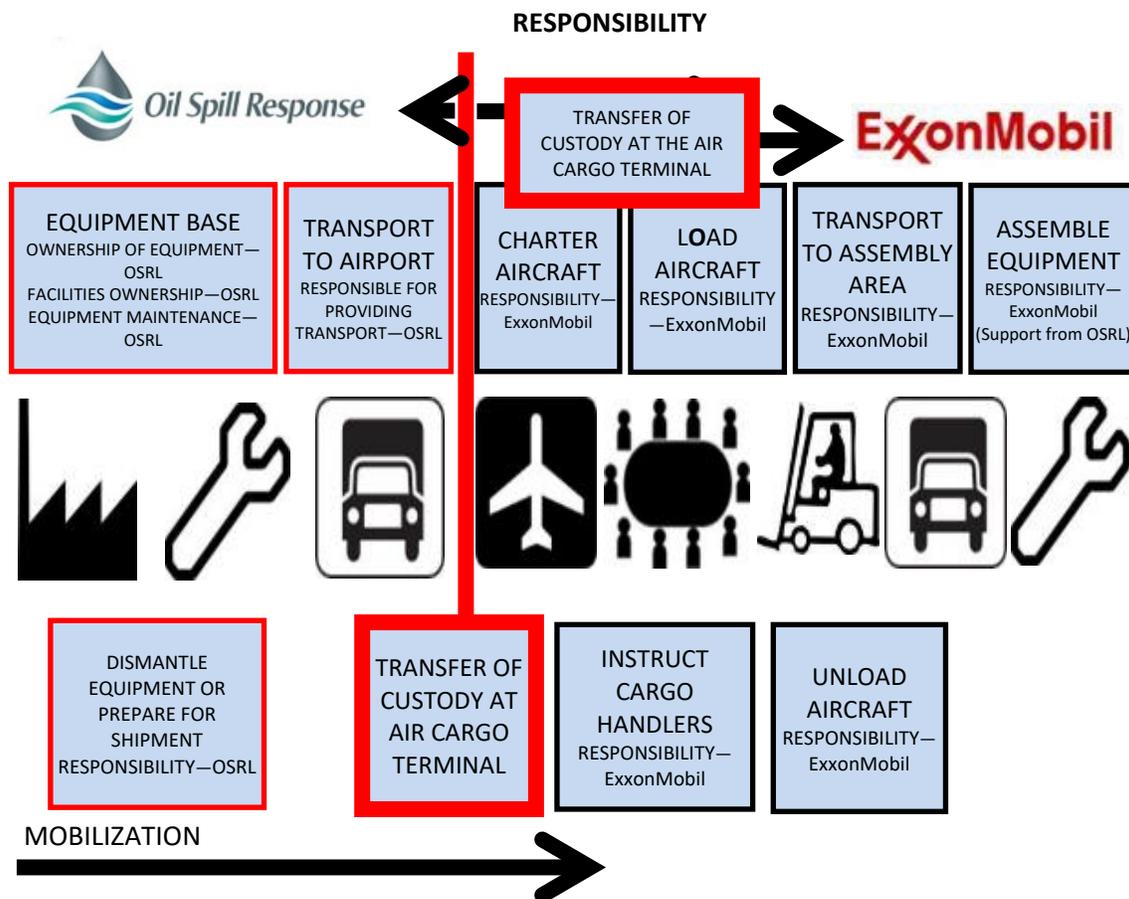
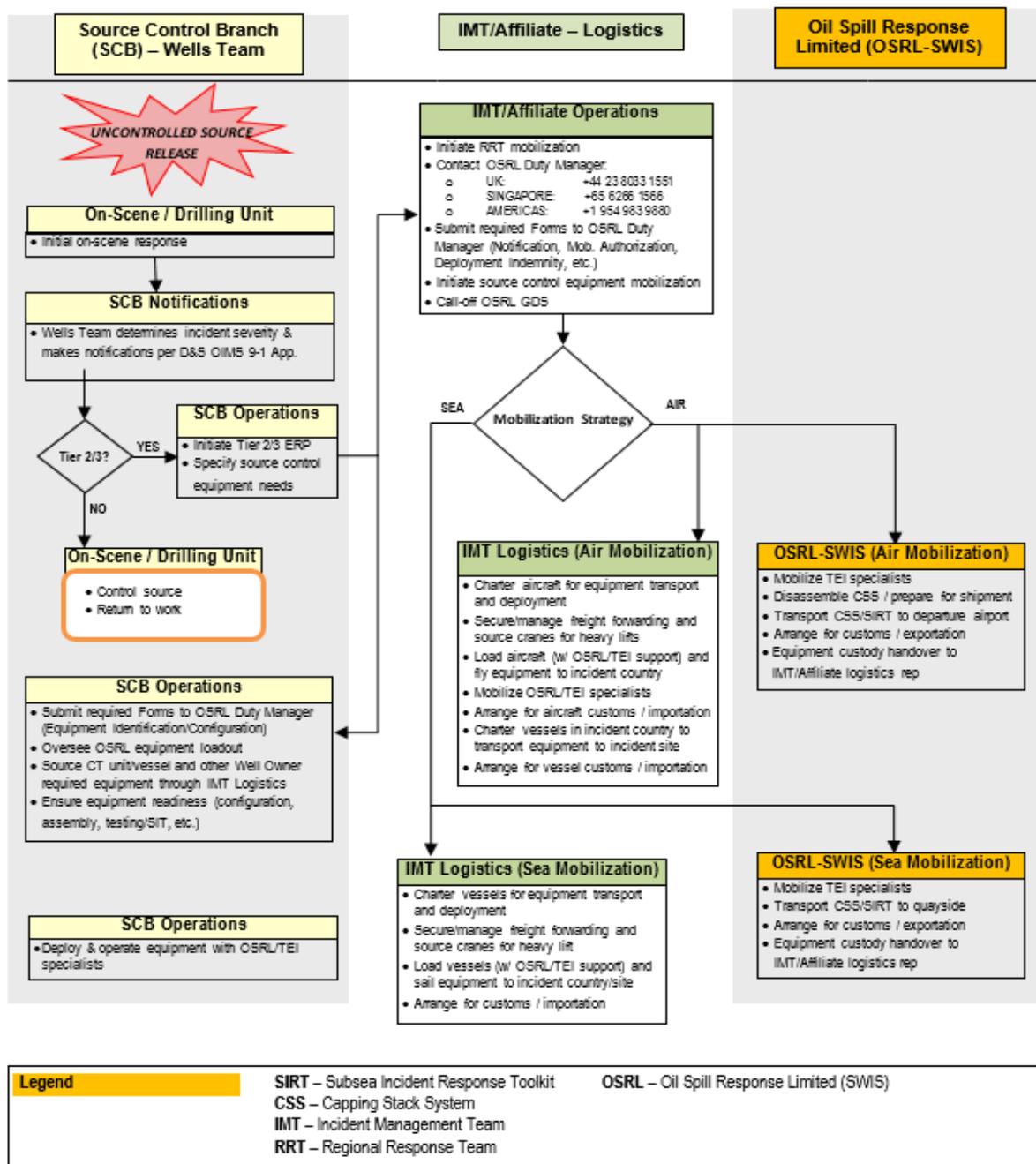


Figure 6-4: Air Mobilization Responsibilities for OSRL and ExxonMobil

ditionally, the OSRL capping stacks located in Norway and Brazil can be deployed in approximately 9 and 21 days, respectively. The Norway capping stack is air-freightable (via transport skid configured for transport by an Antonov AN124 aircraft) and its capability was demonstrated with a test flight out of the Solo Airport in late-2018. The Brazil capping stack is transported to well location by vessel. OSRL, with Company involvement, conducted a major mobilization exercise (Guyana simulation) in November 2017 which evaluated ability to export the Brazil capping stack outside of Brazil within 3 days. Results of the exercise demonstrated operational readiness of OSRL, and allowed validation of the 21-day duration that OSRL estimates it needs to have the Brazil capping stack installed in Guyana.

In order to mobilize this equipment, the following flow charts should be considered.

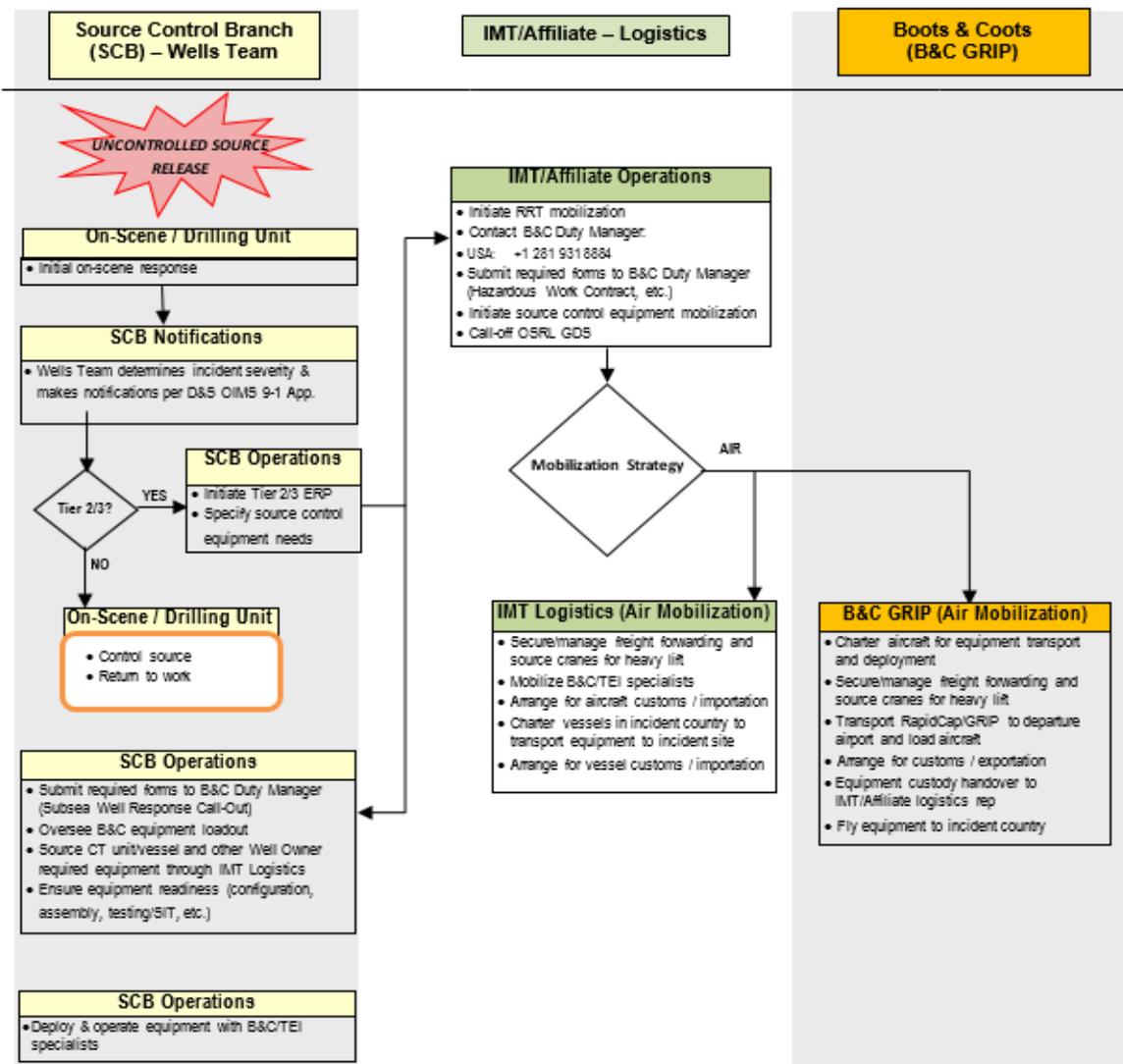
6. Response Resources



Note: Flow chart above is intended to capture the key activities associated with equipment mobilization.

Figure 6-5: OSRL-SWIS Equipment Mobilization Process

6. Response Resources



<b>Legend</b>	SIRT – Subsea Incident Response Toolkit	OSRL – Oil Spill Response Limited (SWIS)
	CSS – Capping Stack System	
	IMT – Incident Management Team	
	RRT – Regional Response Team	

*Note: Flow chart above is intended to capture the key activities associated with equipment mobilization.*

**Figure 6-6: Boots & Coots Equipment Mobilization Process**

7. Exercise and Training

## 7 EXERCISES AND TRAINING

EEPGL conducts oil spill training courses and exercises (desktop and field) for its operations in Guyana. The training, drills, and exercises familiarize response personnel with their duties and responsibilities in an oil spill. ExxonMobil conducts exercises for operations around the world. In the event of a significant release in Guyana, response experts from ExxonMobil and Tier III OSRO organizations such as OSRL would support the response to that spill from local, regional, and/or international response centers, as necessary.

### 7.1 Oil Spill Training

Training requirements depend on an individual’s role and experience. There is some overlap between the IMT and the ERT training. This is beneficial since, for example, this provides the IMT with a clear appreciation of the factors likely to affect the performance of a particular technique or piece of equipment, and at the same time gives the ERT a better understanding of the overall strategy.

Key EEPGL ERT and IMT members, which includes the RRT, will receive initial oil spill response training listed in Table 7-1 (or equivalent training such as XOM ICS 100/200 Computer Based Training (CBT)) based on their response position.

**Table 7-1: Oil Spill Response Training Course Information**

IMO Course Level	Oil Spill Incident Response Personnel	Course Outline
Level 1	ERT members	Provides training on practical aspects of oil properties, response techniques, health and safety, boom and skimmer deployment, dispersant application, use of sorbents, shoreline cleanup, debris/waste handling and disposal and wildlife casualties.
Level 2	On-Scene Commanders and Key ERT Leaders	Provides detailed training in oil spill behavior, fate and effects, spill assessment, operations planning, containment, protection and recovery, dispersant use, shoreline cleanup, site safety, storage and disposal of waste, media relations, record keeping, command and control management, communications and information, liability and compensation, response termination and post incident review/briefing.
Level 3	Key IMT members	Provides an overview of the roles and responsibilities of senior personnel in the management of oil spill incidents, cause and effect of oil spills, response policy and strategies, contingency planning, crisis management, public affairs and media relations, administration and finance and liability and compensation.

**7. Exercise and Training**

**7.2 Incident Command System Training**

Key ERT and IMT members will receive the appropriate initial ICS Training listed in Table 7-2 based on their roles and responsibilities.

**Table 7-2: ICS Training Course Information**

ICS Course Level	Oil Spill Incident Response Personnel	Course Outline
100	Tactical Response Team Members	This course is a web based course aimed at introducing the ICS, basic terminology, common responsibilities, ICS principles and features. A foundation is set that will allow personnel to function appropriately in an ICS. Completing ICS 100 is prerequisite to completing ICS 200.
200		This course is also web based that builds on the foundation information from ICS 100. ICS 200 is required for first level supervisors involved in responding to the incident at the site, Site Response Team. Completing ICS 200 is prerequisite to completing higher level ICS training. Topics covered should include: principles and features, organizational overview, incident facilities, incident resources and common responsibilities.
300	On-Scene Commanders, Key ERT Leaders and IMT	This course provides description and detail of the ICS organization and operations in supervisory roles on expanding incidents. Topics covered should include: organization and staffing, resource management, Unified Command, transfer of Command, event and incident planning, air operations and establishing incident objectives.
400		This course is designed for more Senior personnel who are expected to perform in a management capacity in the Incident Command Team or IMT. Topics covered should include: General and Command staff, major incident management, multi-agency coordination and ICS for executives.

**7.3 Oil Spill Exercises**

Oil spill response exercises test incident response personnel function and responsibilities. They improve oil spill incident response team’s skills and awareness, and provide management with an opportunity to assess equipment, measure performance, obtain feedback from participants, update and correct the contingency plans, and give a clear message about the Company’s commitment to oil spill prevention and response.

An exercise schedule is determined based upon local needs annually by the EEPGL Management team, which is approved by the EEPGL Country Manager or designated representative. A suggested guideline including schedule and type of oil spill exercise is outlined in Table 7-3.

7. Exercise and Training

Table 7-3: Oil Spill Exercise Overview and Schedule

Exercise Type	Description and Purpose	Frequency
OSRP Orientation	A contingency plan orientation exercise is a workshop which focuses on familiarizing the ERT and IMT with their roles, procedures and responsibilities in an oil spill. The aim is to review each section of the plan, encourage discussion, and by using local knowledge and expertise, make useful and practical improvements to the plan where required.	Upon assignment of ERT/IMT member
Notification and Callout Exercise	A notification exercise practices the procedures to alert and call out the ERT and IMT. They are normally conducted over the telephone or radio, depending on the source of initial oil spill report. They test communications systems, the availability of personnel, travel options and the ability to transmit information quickly and accurately. This type of exercise will typically last 1-2 hours and can be held at any time of the day or night.	Quarterly
Practical Oil Spill Equipment Deployment Exercise	Simple deployment exercises give personnel a chance to become familiar with equipment, or they may be a part of a detailed emergency response scenario, where maps, messages, real-time weather and other factors are included. The exercise is designed to test or evaluate the capability of equipment, personnel, or functional teams within the oil spill response. In deployment exercises, the level of difficulty can be varied by increasing the pace of the simulation or by increasing the complexity of the decision-making and coordination needs. A deployment exercise would typically last from 4-8 hours.	Semi-annually
IMT Tabletop Exercise	A tabletop exercise uses a simulated oil spill to test teamwork, decision-making and procedures. The exercise needs to be properly planned with a realistic scenario, clearly defined objectives for participants, exercise inputs, and a well briefed team in control of the running and debriefing of the exercise. A tabletop exercise will typically last from 2-8 hours.	Annually
Full-scale Incident Management Exercises	Full-scale exercises provide a realistic simulation by combining all of the elements of the tabletop exercise (maps, communications, etc.) and the deployment of related personnel and equipment. This complexity requires the response to be more coordinated than in basic tabletop or deployment exercises. The effort and expense in organizing a realistic full scale exercise means that it is recommended that they be run only once every two years or so. It may also be cost effective to run full-scale exercises in partnership with other organizations within the region and the ESG. Full-scale exercises can create a very intense learning environment that tests cooperation, communications, decision making, resource allocation and documentation. People involved in full-scale incident management exercises should have attended earlier tabletop exercises. Organizing a realistic full-scale exercise could take many months, and requires an experienced planner and a large support team to run the exercise. The full scale exercise will generally last at least one day and often carry on overnight into a second or third day.	Every 3 Years <sup>a</sup>

**7. Exercise and Training**

Exercise Type	Description and Purpose	Frequency
Joint Exercises (e.g., with other Operators or Regulators)	Joint exercises provide a realistic simulation by combining the full scale oil spill response equipment deployment and tabletop incident management to handle a major spill scenario. The spill scenario involves major consequences to a very wide range of resources, threatening national interests and requiring national and regional cooperation and coordination. Joint exercise involves very wide range of personnel from many different organizations, possibly in various locations, together with a range of equipment deployment opportunity. This exercise is designed to build confidence in EEPGL's preparedness to effectively and efficiently deal with oil spills at all scales. This will also enhance the cooperation among the government and industry at national and regional level in responding to major and/or trans-boundary spills. A joint exercise will generally last at least one day and may carry on overnight into a second or third day.	Every 3 Years <sup>a</sup>

<sup>a</sup> Covers exploration and production operations.

8. References

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## **APPENDIX A – SPILL MODELING CONCEPTS AND APPLICATIONS**

This appendix describes the modeling methodology and attributes necessary to conduct plausible oil spill models for the identified unplanned hydrocarbon release scenarios.

### **A.1. Modeling Overview**

Understanding spill trajectory and fate or the ultimate disposition of the spill volume in terms of location and condition is fundamental to spill response strategy and to ensuring that spill, response equipment is located appropriately.

### **A.2. OILMAPDEEP Model**

OILMAPDeep<sup>10</sup> is comprised of multiple integrated model components used to predict the dynamics of the release of oil and gas to the water column from a deep-water subsea loss-of-well-control. The integrated system is primarily focused on predicting the dynamics of the plume and resulting intrusion layer, the dissolution of gas, formation of hydrates, and the oil droplet size distribution and concentrations. OILMAPDeep is focused on predicting the near-field dynamics of the release. Output from OILMAPDeep can then be utilized as input to the SIMAP spill model, which predicts the far field transport, fate, exposure, and effects of the release.

OILMAPDeep includes components to calculate the plume and oil droplet sizes. The plume model predicts the characteristics of the plume resulting from the oil and gas release, including its orientation, radius, velocity, entrainment rate, and oil and gas concentrations as a function of distance from the release location and the trapping height / depth (height is measured from the seabed and depth from the water surface). The trapping depth is the location where plume buoyancy is dissipated by entrainment and gas dissolution, which results in rapid radial spreading of the plume. The oil droplet size model predicts the oil droplet size distribution.

### **A.3. SIMAP Model**

SIMAP, developed by RPS, is a fully three-dimensional and time-varying oil spill model system capable of analyzing in two modes: stochastic or deterministic mode. It uses wind data, current data, and transport and weathering algorithms to calculate the mass of oil components in various environmental compartments (water surface, shoreline, water column, atmosphere, sediments, etc.), oil pathway over time (trajectory), surface oil distribution, and concentrations of the oil components in water and sediments as a result of a spill. SIMAP was derived from the physical fates and biological effects sub-models in the Natural Resource Damage Assessment (NRDA) Models for Coastal and Marine and Great Lakes Environments, which were developed

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<sup>10</sup> [RPS Group](#)

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for the U.S. Department of the Interior as the basis of Comprehensive Environmental Response, Compensation and Liability Act of 1980 NRDA regulations for Type A assessments (Reed et al. 1995, French-McCay et al. 1996). SIMAP contains physical fate and biological effects models, which estimate exposure and impact on each habitat and species (or species group) in the area of the spill. Environmental, geographical, physical-chemical, and biological databases supply required information to the model for computation of fates and effects. The technical documentation for SIMAP is in French McCay 2002, French McCay 2003, French McCay 2004, French McCay et al. 2004, French McCay 2009, and French McCay 2016.

SIMAP runs in one of two modes: stochastic mode—where hundreds of simulations are made by varying inputs within a set of probability distributions, as well as in deterministic mode—where individual spills are simulated to examine representative or “worst case” 95<sup>th</sup> percentile scenarios of interest for examining impacts to particular resources.

### A.4. Spill Modeling Approach

#### A.4.1. Fate and Trajectory

Fate (weathering) and trajectory (movement) models were used to simulate oil transport and predict the changes the oil undergoes as it interacts with water, air, and land. The models were used to simulate spill events using the best available characterization of the wind and hydrodynamic (marine currents) forces that drive oil movement. The models quantify the potential consequences from a spill, which can then be used to guide response planning and prioritize response asset deployment. There are typically two modes under which the models can be used: (1) the **stochastic** (statistical) mode examines *numerous simulated releases* from the same point utilizing historical data for wind and currents; and, (2) the **deterministic** mode examines a *single release* utilizing a subset of historical wind and hydrodynamic data from the range of potential data, or utilizing forecast data for an ongoing or future event (e.g., worst case or 95<sup>th</sup> percentile scenarios of interest).

The coastal sensitivity maps used to identify and characterize the resources / receptors with the potential to be impacted by a spill based on the modeling results were based on the Liza Phase 2 Project and Payara Development Project Environmental Impact Assessments (EIAs).

#### A.4.2. Metocean Conditions

Currents in the upper water column off the Guyana coast are strong and flow toward the northwest along the coast of South America over the entire year. The Guiana Current is part of the regional flow between South America, Africa, and the Caribbean Sea, extending from Guyana to the Caribbean.

EEPGL has deployed and maintained a series of deep water current profile moorings and meteorological station buoys in the Stabroek Block, offshore of Guyana (RPS 2016; RPS

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2017a, b, c). Processed final data sets of the observations were available for the first four mooring and buoy deployments spanning March 2016 through September 2017. There were five moorings deployed originally, four of which were instrumented.

Wind observations from the meteorological station buoys were compared to the U.S. Navy Global Environmental Management (NAVGEM) model prediction and current observations were compared to the Hybrid Coordinate Ocean Model (HYCOM) model predictions previously utilized in modeling analyses.

The SAT-OCEAN current model used in the oil spill modeling analysis is based on the HYCOM that includes 3D current speeds in a  $4^{\circ} \times 4^{\circ}$  grid over the Stabroek Block region ( $56^{\circ}$ - $60^{\circ}$ W,  $7^{\circ}$ - $11^{\circ}$ N). The horizontal resolution of the model is  $1/64^{\circ}$ , and the model defines current speed and direction on 64 vertical layers through the water column. The time series data set defines 3D currents at a 3-hour interval for the 10 years between 2005 and 2014. The data from the SAT-OCEAN current model were calibrated by current data measured at a location offshore Guyana ( $8.08^{\circ}$ N,  $56.95^{\circ}$ W) during 2015. Considering the extent of the historical record and calibration with measured data, these data are appropriately representative of the region and capture expected variability in the current forcing.

The objective of the model-to-observations comparison was to assess whether the hydrodynamic models are capable of capturing the important characteristics of the wind forcing (speed and direction frequency distribution) and the current speeds and circulation patterns (primarily the higher currents associated with the fluctuation of the Guiana Current or the passage of North Brazil Current (NBC) rings). An analysis of the previously used historical data and the measured data determined that the data were similar enough that utilization of the existing historical wind and current data utilized for Liza Phase 1 spill modeling were appropriate for the Liza Phase 2 and Payara spill modeling.

### **A.5. Spill Modeling Scenarios**

A series of stochastic and deterministic model simulations were run to determine the fate of the oil released for three different products (marine diesel, crude oil, wellbore fluids) for various scenarios at an offshore location during two different seasons.

Unmitigated loss-of-well-control scenarios consist of an assumed 30-days of oil and gas discharge at the wellhead. The loss-of-well-control scenarios were simulated using the OILMAPDeep model to determine the discharge plume geometry, define the oil droplet sizes, and provide inputs for the SIMAP model simulations. All loss-of-well-control scenario simulations were run for the identified discharge period plus an additional number of identified days after oil discharge ceased.

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**A.6. Exposure Thresholds**

Minimum oil thickness thresholds are used in the SIMAP model in the determination of the probability of oil contamination. The thresholds are specific to the type of impact being considered, either environmental or socioeconomic, and they are used in the calculation of oiling probability to determine if oil is present in a quantity sufficient to cause a particular impact.

Floating oil thickness is of interest because it can determine if mechanical recovery is possible and because different surface slick thicknesses will have different effects on waterfowl and other animals at the sea surface. Surface oil is often expressed in units of grams per square meter ( $g/m^2$ ), where  $1 g/m^2$  corresponds to an oil layer that is approximately 1 micron ( $\mu m$ ) thick. Table A-1 lists approximate thickness and mass per unit area ranges for surface oil of varying appearance. Dull brown sheens are about 1  $\mu m$  thick. Rainbow sheens are about 0.2-0.8  $g/m^2$  (0.2-0.8  $\mu m$  thick) and silver sheens are 0.05-0.2  $g/m^2$  (0.05-0.2  $\mu m$  thick; NRC 1985). Crude and heavy fuel oil greater than 1 millimeter (mm) thick appears as black oil. Light fuels and diesel greater than 1 mm thick are not black in appearance, but appear brown or reddish. Floating oil will not always have these appearances; however, as weathered oil could be in the form of scattered floating tar balls and tar mats where currents converge.

A typical approach to using oil spill models in oil spill response planning is to first apply the stochastic model to determine the probability and timing for the spill scenarios of interest. The stochastic approach captures variability in the trajectories by simulating hundreds of individual spills and generating a map that is a *composite* of all of the trajectories, and provides a *probability footprint* showing the most likely path for a given spill scenario. Spill scenarios are typically modeled in stochastic mode to provide composite footprints to estimate probability that a specific area would be impacted by the spill and timing of arrival of the spill at a particular area for each season or wind regime in the region.

**Table A-1: Oil Thickness ( $\mu m$ ) and Appearance on Water**

Minimum	Maximum	Appearance
0.05	0.2	Colorless and silver sheen
0.2	0.8	Rainbow sheen
1	4	Dull brown sheen
10	100	Dark brown sheen
1,000	10,000	Black oil

Source: NRC 1985

The SIMAP model uses specific oil thickness thresholds for calculating the probability or likelihood of the presence of oil on the sea surface or shoreline. Oil thickness thresholds defining the minimum value for expected potential effects to the sea surface and shoreline are listed in Table A-2. Socio-economic thresholds were used in all modeling for this project (1  $\mu m$  for surface oiling and 1  $\mu m$  for shoreline oiling). All predictions of the probability of shoreline oiling and sea surface contamination are based on these oil thickness thresholds.

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**Table A-2: Oil Thickness Thresholds for Sea Surface and Shoreline Oiling**

Threshold Type	Threshold (Mass/Unit Area)	Threshold (Thickness)	Rationale (Socioeconomic, Environmental)
Oil on Water Surface	1.0 g/m <sup>2</sup>	1.0 µm, 0.001 mm	A conservative environmental threshold for consideration of sublethal effects on birds, marine mammals, and sea turtles from floating oil.
Oil on Shoreline	1.0 g/m <sup>2</sup>	1.0 µm, 0.001 mm	A conservative socioeconomic/ response threshold. This is a threshold for potential effects on socioeconomic resource uses, as this amount of oil may trigger the need for shoreline cleanup on amenity beaches, and affect shoreline recreation and tourism.

**A.7. Overview of US GoM Worst Case Discharge Requirements**

The US Bureau of Safety and Environmental Enforcement’s (BSEE) Oil Spill Preparedness Division (OSPD) is responsible for developing and administering regulations that oversee the oil industry’s preparedness to contain, recover, and remove oil discharges from offshore facilities in US waters. The US Gulf of Mexico (GoM) has been the predominant region for US offshore oil production and all new exploration requires the determination of a Worst Case Discharge (WCD). Regulations require Operators of these offshore facilities to submit an Oil Spill Response Plan (OSRP) that identifies the procedures and contracted spill response resources necessary to respond, to the maximum extent practicable, to their WCD. In the case of most offshore exploration or production facilities, their WCD scenario will be the maximum foreseeable daily flow of oil from their facility, commonly referred to as a “well blowout” or “loss-of-well-control.”

BSEE guidelines on WCD are published in the US Department of Interior BSEE Worst Case Discharge Analysis (Volume I, February 2016). Although WCD modeling results “present an extremely dire representation of the potential for contact between the discharged oil and the environment, they do provide a working baseline of datum that will be useful for further analysis” (BSEE, 2016).

The US Bureau of Ocean Energy Management (BOEM) defines the WCD as the single highest *daily flow rate* of liquid hydrocarbon during an uncontrolled wellbore flow event (i.e., the average daily flow rate on the day that the highest rate occurs, under worst-case conditions). It is neither the total volume spilled over the duration of the event, nor the maximum possible flow rate that would result from high-side reservoir parameters. It is a single value for the expected flow rate calculated under worst-case wellbore conditions using expected reservoir properties. The main purpose of a WCD calculation is to support oil spill response planning. The duration of the WCD release is typically 30-days unless shutting in the well with a capping stack or other technology is expected to occur earlier. Gemini Solutions, Inc. (GSI) is the predominant vendor for WCD calculations provided to BSEE in the Gulf of Mexico region.

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The estimate of flow rate from any wellbore normally begins with an inflow/outflow assessment. The inflow performance relationship (IPR) is determined by one of several possible methods, such as Darcy's Law for steady-state radial flow, the use of a numerical reservoir simulator, etc. This requires knowledge of the zones capable of flow, the rock and fluid properties of those zones, and the wellbore configuration. The result is an equation that describes the liquid flow vs. the flowing bottom-hole pressure (BHP) in the well. An outflow correlation is used to calculate the pressure drop in the well from reservoir to surface at various flow rates, which is then used to calculate the flowing BHPs.

The flow rate and associated flowing BHP, is determined from the intersection of these two equations. The method chosen, between analytical techniques and numerical simulation depend on the amount of data available and the understanding of the reservoir. This can be quite different when drilling exploration / appraisal wells vs. development / production wells, and so, different methods may be employed. The tool selection should depend on the data available, the level of understanding, and also on the complexities of the reservoir. In most cases, the various tools and methods will yield similar results for the same set of reservoir and wellbore properties.

EEPGL has engaged GSI to provide WCD estimates for the Development Projects (e.g., Payara, Yellowtail). The WCD values represent an *open well condition in which no flow restrictions or well control technologies such as blow out preventers are in operation*. Although modeling of this scenario supports oil spill response planning, it represents an operational condition that is highly unlikely to be encountered during drilling operations. However, EEPGL's response strategy - inclusive of a capping stack - is robust and would be adequate to cover the WCD. In a more representative scenario, apart from BOPs on the wellhead, there would be drill string, tubing, and/or other equipment in the wellbore during a well control event, which would partially constrain and restrict flow from the reservoir.

### A.7.1. Overview of US GoM WCD Modeling Approach for Payara Development Project

EEPGL contracted with GSI to calculate WCD rates for the Payara Development Projects using the US GoM practice as requested by the Guyana Department of Energy (DE).

EEPGL provided GSI with technical information on six targeted Payara reservoirs, and GSI has input this information into its WCD simulation program. The WCD simulation program employs radial models built to analyze the WCD rate for vertical sands penetrated by open hole sections, and horizontal / high-angle well models were built to model the target sands. As summarized below, GSI calculated six reservoir-specific WCDs ranging from 25,151 to 202,192 bbl per day (BPD) for the identified reservoirs. The GSI WCD calculation letter and detailed report for Payara is included in **Appendix C**.

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Summary of WCD Results						
Well	Length ft	Length meters	OOIP MMBO	WCD bbl/day	MaxCap Press psia	Comments
R5W	3,530	1,076	104	133,042	4,765	Horizontal
R4W Target	3,654	1,113	183	202,192	5,160	Horizontal
R4WTop	82	25	221	49,105	6,183	Top section vertical well
LizaDeep	4,659	1,420	154	146,049	6,660	Horizontal
PC_P6	2,818	859	347	189,300	6,366	Horizontal
P_37_1_Shallow	39	12	108	33,404	5,493	Top section vertical well
P_37_1_Target	2,475	754	127	175,142	5,180	Horizontal
P6_20_3_Shallow	43	13	70	25,151	5,695	Top section vertical well
P6_20_3_Target	2,725	831	254	184,562	5,947	Horizontal

**Figure A-1: Summary of WCD Study Results for Payara**

**A.7.2. Application of GSI Worse Case Discharge Modeling for Yellowtail Development Project**

Following the submittal of the Payara EIA, WCD modeling was undertaken to evaluate potential discharge rates resulting from a loss of source control assuming a given set of formation properties and wellbore conditions. To conduct this work, Gemini Solutions, Inc. (GSI) was contracted to perform WCD modeling for a representative Payara development well. Previous WCD modeling for Payara had evaluated a ‘traditional’ WCD scenario, which assumes an uncontrolled flow event occurs without the drill string in the hole. The assumed absence of any flow restriction in the wellbore for this calculation method produces a theoretical maximum discharge rate estimate for the well, which is likely to be unrealistically high relative to actual discharge rates under more representative conditions. This iteration of WCD modeling for Payara evaluated a ‘credible’ WCD scenario, which assumes an uncontrolled flow event occurs with the drill string in the hole and thus only annular flow transpires. Operationally, this is a more realistic scenario as well control events are more likely to take place while drilling or tripping as opposed to when the drill string is out of the hole. As a result, the ‘credible’ WCD scenario offers a more feasible result. Nonetheless, modeling was completed for both WCD scenarios to represent a range of potential discharge outcomes. In each case, best estimate formation rock and fluid properties (e.g., permeability, pressure, temperature, API gravity, viscosity) were assumed.

In this case, GSI completed the modeling assuming a 9-1/2” hole section penetration of a single target sand for a representative Payara wellbore and drill string design. The results of this WCD modeling are summarized in Table A-3 below:

**A. Spill Modeling Concepts and Applications**

**Table A-3: GSI WCD Modeling Results**

WCD Scenario	Drill String Configuration	Modeled Initial Discharge Rate
Payara 'Most Credible'	Drill string in hole (annular flow only)	~82,500 bpd
Payara 'Traditional'	No drill string in hole (unrestricted flow)	~202,200 bpd

NOTE: Rates reflect initial discharge rate within a variable flow rate schedule and decline over the release period.

As shown in Table A-3, the Payara 'credible' WCD rate is ~60% lower than the Payara 'traditional' WCD rate. Note that the discharge rates provided reflect the initial discharge rate within a variable flow rate schedule and decline gradually over the course of the release period until the well is capped.

For the Yellowtail Development Project, the Most Credible Worse Case Discharge was set at 88,728 bpd and the 'traditional' Worse Case Discharge as 177,157 bpd.

**A.8. References**

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**A. Spill Modeling Concepts and Applications**

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**A. Spill Modeling Concepts and Applications**

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**B. Development Projects Modeled Results**

**APPENDIX B – DEVELOPMENT PROJECTS MODELED RESULTS**

This appendix summarizes the Payara and Yellowtail Development Projects stochastic and deterministic modeled results and provides a description with results for the oil spill modeling conducted. As indicated in Table 3-2: Modeled Scenarios by Development Project Assets for Liza Phase 1, Liza Phase 2, and Payara, various surface releases (i.e., 50 and 250 BBL marine diesel; 50, 250, and 2500 BBL crude oil) were modeled. As the locations of the projects and the volumes for the surface releases did not create discernable differences in the modeling done for earlier projects, these hypothetical releases were not carried out for the Yellowtail Development Project. However, wellhead most credible WCD and ‘traditional’ WCD were carried out and are presented in Section B.2, Yellowtail Oil Spill Modeling.

**B.1. Payara Oil Spill Modeling**

**B.1.1. Payara Oil Properties**

The physical and chemical properties of the oil are used by the OILMAPDEEP and SIMAP models in calculations of the transport and fate of the spill. The oil used in the models is medium crude that can incorporate water when spilled, and increase both the volume and viscosity of the spilled oil. Assessment of this type of oil indicated that while it can take on water, it will not emulsify quickly as some heavier crude oils. This will serve to keep the oil relatively non-viscous for many hours depending on spill and environmental conditions, which improves the window of opportunity for oil spill response. The oil characterization utilized in this modeling study was determined from a chemical analysis of the oil collected in the field. The dispersibility of the oil was determined using a field sample of the oil in a laboratory test measuring dispersibility of the oil after weathering. Table B-1 lists some of the properties of the Payara oil used in the model simulations. It should be noted that the oil properties used in Payara, Liza Phase 2, and Liza Phase 1 modeling were slightly different based on the characteristics of oil samples. This is reflected in some of the modeling results when compared side-by-side.

**Table B-1: Properties of the Crude Oil Used in the Spill Modeling**

Density (g/cm <sup>3</sup> at 15°C)	Viscosity	API Gravity	Pour Point (°C)	Maximum Water Content (%)
0.896	109.6 @4.4°C	26.5	-3.0	85

°C = degrees Celsius; API = American Petroleum Institute; cP = centipoise; g/cm<sup>3</sup> = grams per cubic centimeter

**B. Development Projects Modeled Results**

**B.1.2. Payara Stochastic Modeling Results—Unmitigated**

Stochastic simulations provide insight into the probable behavior of potential oil spills in response to temporally and spatially-varying meteorological and oceanographic conditions in the study area. The stochastic model computes surface trajectories for an ensemble of hundreds of individual cases for each spill scenario, thus sampling the variability in regional and seasonal wind and current forcing by starting the simulation at different dates within the timeframe of interest. Thus, the stochastic results represent sensitivity to the environmental variability, as each trajectory experiences a different set of wind and current conditions that occur based on the model start date.

The stochastic analysis provides two types of information: 1) the footprint of sea surface areas that might be oiled and the associated probability of oil contamination; and 2) the shortest time required for oil to reach any point within the areas predicted to be oiled. The areas and probabilities of oil contamination are generated by a statistical analysis of all the individual stochastic runs. It is important to note that a single run will encounter only a relatively small portion of this footprint. In addition, the simulations provide shoreline oil contamination data expressed in terms of minimum and average times for oil to reach shore, and the percentage of simulations in which oil is predicted to reach shore.

The SIMAP model was used to predict the probability of oil contamination on the water surface and shoreline for spills occurring in two seasons corresponding to seasonal wind regimes. Results from the SIMAP stochastic modeling are provided in maps depicting the probability and timing of oil contamination on the water surface and maps depicting the probability and timing of oil contamination on the shoreline. Output from the selected spill events is provided as a map of the spill trajectory and as oil mass balance graphs showing the time history of oil volume in the environment.

Surface oil is predicted to travel towards the northwest in all scenarios during both the summer and winter seasons, although the trajectory with the potential to produce coastal impacts in Guyana and Venezuela is more likely to occur in the winter season. For those simulations predicted to reach the shoreline, the probability of shoreline oiling tends to be highest on the coast of Trinidad and Tobago due to the predominant current flow through the Stabroek Block and into the Caribbean Sea. Probabilities of shoreline oiling range between 5 and >90% on the coast of Trinidad and Tobago. Lower shoreline oiling probabilities (5-30%) are predicted as far north as Martinique and as far west as Colombia. The time of first arrival of oil on shore for spill events ranked as the 95th percentile ranges from 5 to 9 days. Differences in release volumes, as well as seasonal wind speed and direction, result in a wide range in sea surface contamination by oil (10 km<sup>2</sup> and 1,285,994 km<sup>2</sup>) and shoreline length oiled (0 km though 1,355 km). For larger spill volumes, strong easterly winds (predominantly during winter) result in significant shoreline oiling in Trinidad and Tobago, Venezuela, Aruba, Bonaire, and Curacao, while lower wind speeds in summer would allow the surface plume to be transported further to the north and into a portion of the Caribbean Sea, oiling shorelines in Trinidad and Tobago, the southern Lesser Antilles, and the western Greater Antilles.



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B.1.4. Payara Marine Diesel (December through May)

Payara Water Surface Results —50 Barrel Scenario (Unmitigated)

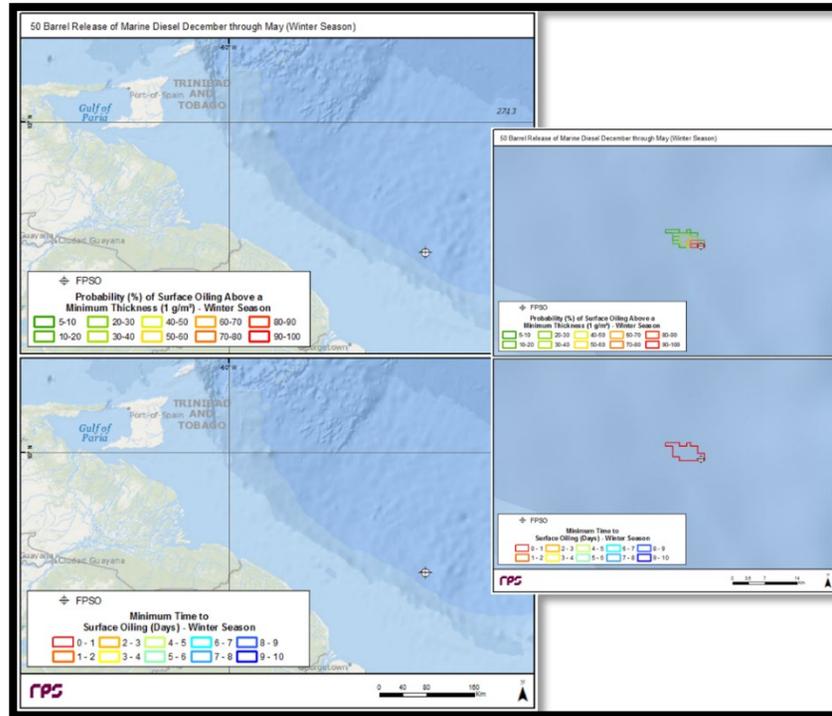


Figure B-3: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 50 bbl release of Marine Diesel. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

Payara Water Surface Results —250 Barrel Scenario (Unmitigated)

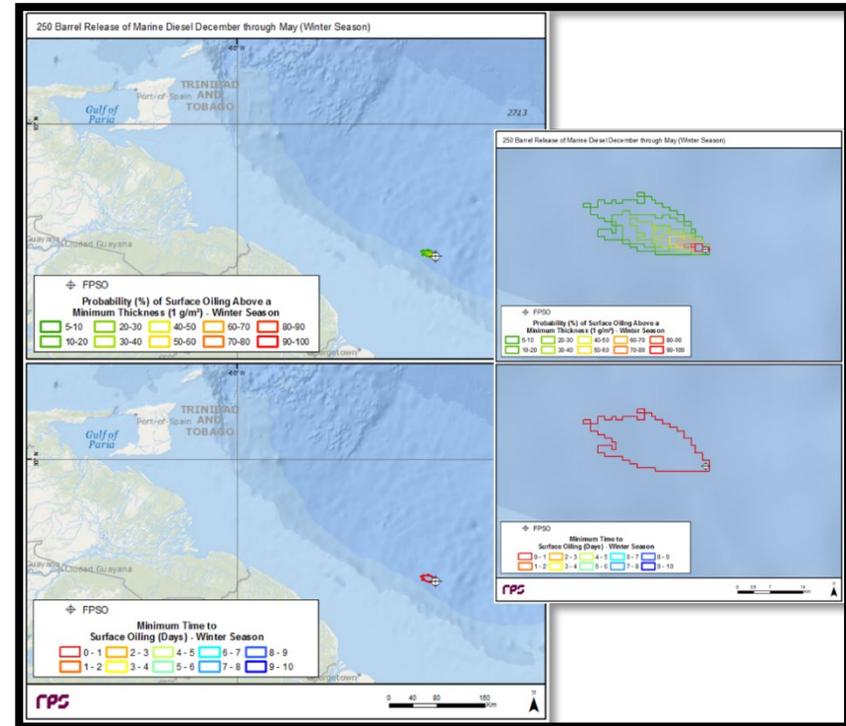


Figure B-4: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 250 bbl release of Marine Diesel. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.



B. Development Projects Modeled Results

B.1.6. Payara Crude Oil (December through May)

Payara Water Surface Results —50 Barrel Scenario (Unmitigated)

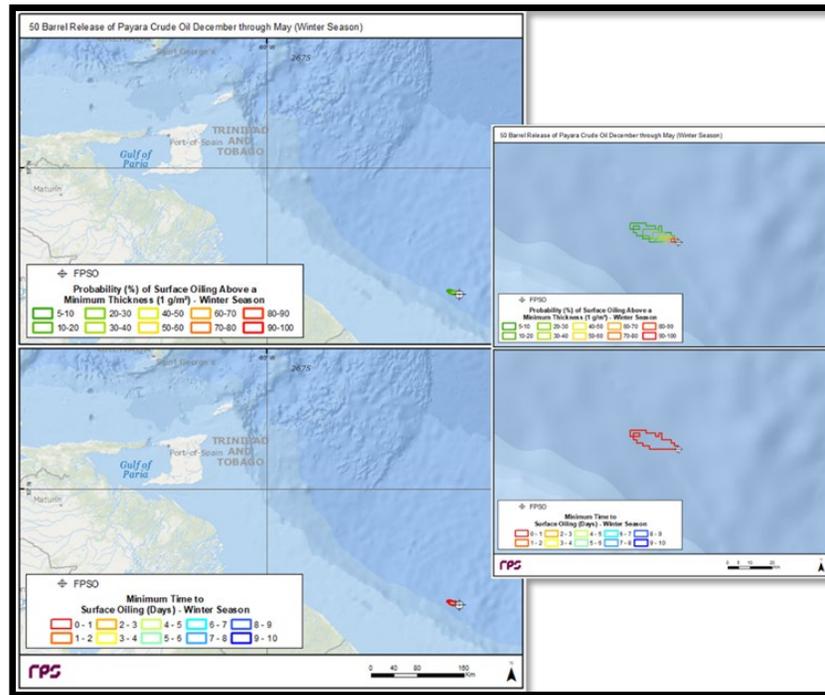


Figure B-7: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 50 bbl release of Crude Oil. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

Payara Water Surface Results —2,500 Barrel Scenario (Unmitigated)

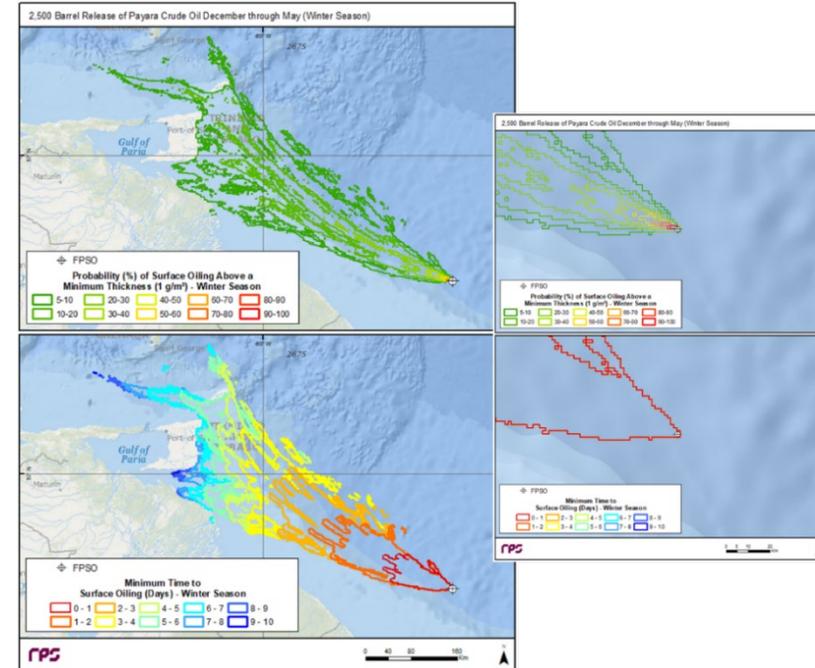


Figure B-8: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 2,500 bbl release of Crude Oil. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

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B.1.7. Payara Wellbore Fluids (June through November)

Payara Water Surface Results —Maximum WCD: 202,192 BPD Scenario for 30 Days (Unmitigated)

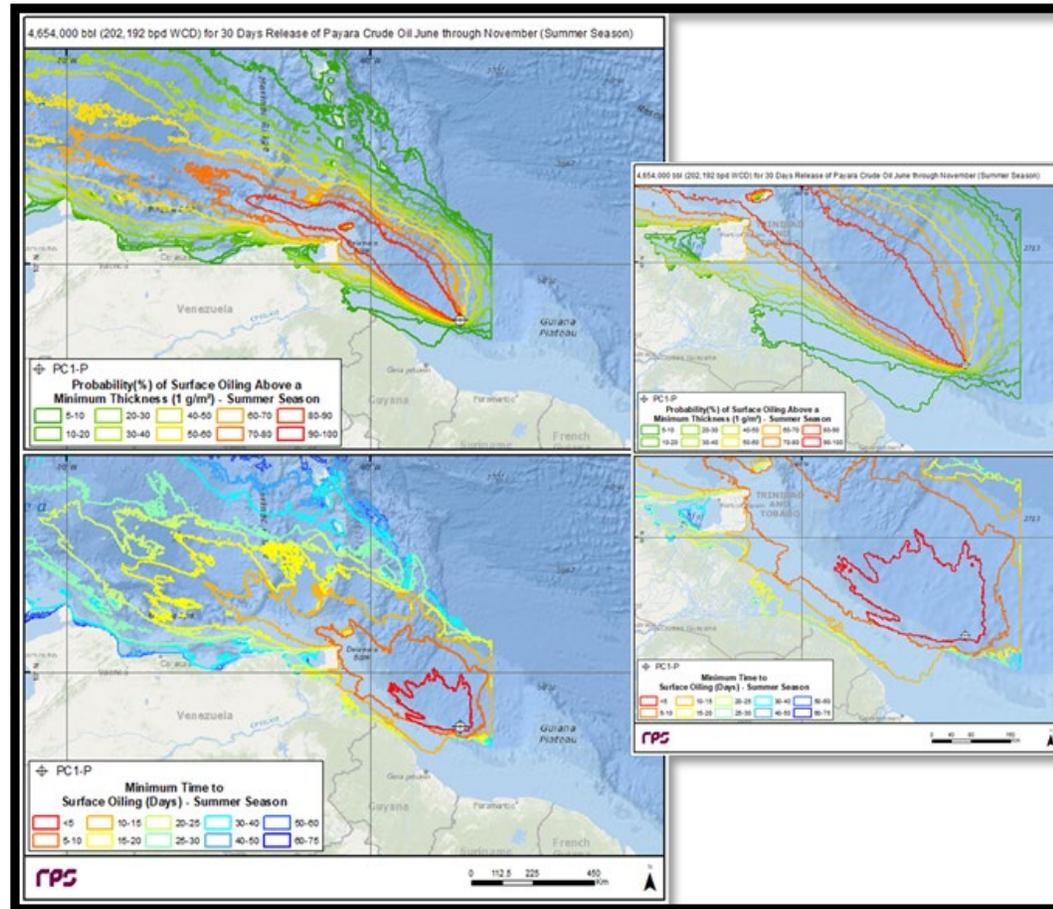


Figure B-9: Top Panel—Probability of surface oiling above a minimum thickness of 1  $\mu\text{m}$  from June through November for a 202,192 bbl/day release (Maximum WCD) of Crude Oil. Bottom Panel—Minimum time for surface oil thickness to exceed 1  $\mu\text{m}$ . Inset Panel—Detail.

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B.1.8. Payara Wellbore Fluids (December through May)

Payara Water Surface Results —Maximum WCD: 202,192 BPD Scenario for 30 Days (Unmitigated)

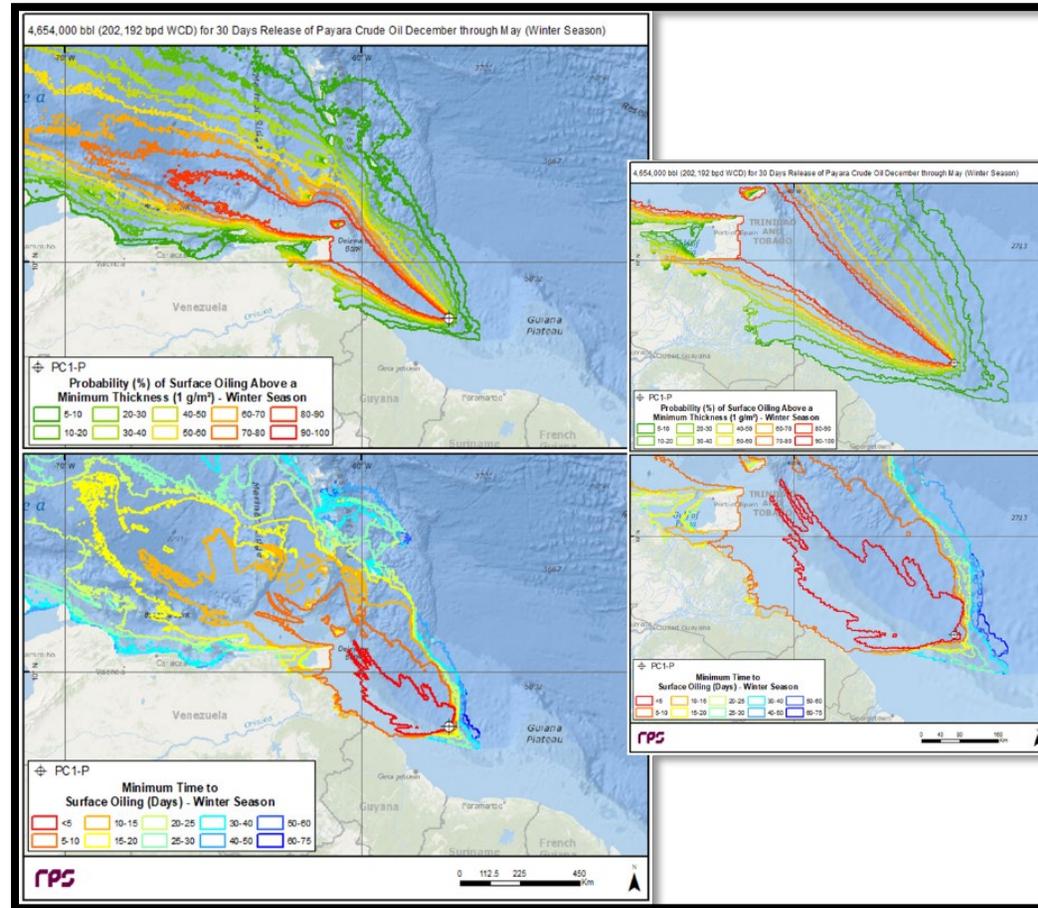


Figure B-10: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 202,192 bbl/day release (Maximum WCD) of Crude Oil for 30-day release. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

**B. Development Projects Modeled Results**

**B.1.9. Payara Deterministic Model Results – Unmitigated and Mitigated**

For each stochastic scenario, one deterministic trajectory and fate simulation is run to investigate a specific “worst-case” spill event that could potentially occur using the same combination of winds and current forcing used in the corresponding stochastic simulation from which it was identified. The worst-case scenario is selected based on the degree of shoreline oil contamination. Different parameters or indicators can be used to compare and assess the degree of shoreline oil contamination, for example “time to reach the coast”, “oil volume to reach the coast”, or “total length of oiled coastline”. Individual spill events simulated in each stochastic scenario were selected based on their rank according to the shortest time to reach shore during each season. A single deterministic spill event ranked as the 95th percentile for the shortest time to reach shore was then selected from each stochastic scenario. These spill events represent meteorological and oceanographic conditions that result in the near minimum time for shoreline oiling to occur. There were five stochastic scenarios in which fewer than five deterministic simulations (5%) were predicted to reach shore. For these scenarios, individual spill events simulated in each stochastic scenario were selected based on their rank according to the maximum water surface area oiled. Therefore, a single deterministic spill event ranked as the 95th percentile water surface area oiled was selected for these scenarios.

The time of first arrival of oil on shore for the spill events ranked as the 95<sup>th</sup> percentile ranges from 7 to 10 days. Differences in seasonal wind speed and direction, and variable release volumes result in a wide range in sea surface exposure to oil (10 km<sup>2</sup> and 1,285,994 km<sup>2</sup>) and shoreline length oiled (0 km though 1,355 km). Strong easterly winds result in significant shoreline oiling in Trinidad and Tobago, while allowing additional surface oil transport to the northwest of Trinidad and Tobago into the Caribbean Sea, for larger volume spills.

Response measures were simulated for the summer and winter 2,500 bbl crude surface release, and the 202,192 BPD Maximum WCD loss-of-well-control scenario. The Maximum WCD value of 202,192 BPD represents the highest daily release rate (i.e., on Day 1). This volume decreases on a daily basis, such that the Maximum WCD release scenario discharges 4,654,000 bbl over the 30-day unmitigated release and 940,275 bbl over the 5-day mitigated release. Response measures reflected in the mitigated scenario included a capping stack applied to the well head after 5 days, dispersants applied aerially and by boat, burning, and mechanical removal. Response measures resulted in a reduction of shoreline oiling and a reduction in the surface area of oil contamination to water. Scenarios for the 50 bbl, 250 bbl, and 2,500 bbl surface releases were modeled for 10 days. Scenarios for the mitigated 202,192 BPD Maximum WCD scenario were modeled for 54 days.

At the time the Payara EIA was originally submitted, the response time associated with the Boots & Coots GRIP capping stack deployment was based on preliminary and conservative logistics assumptions. After establishing the subscription to the Boots & Coots GRIP system, and in conjunction with the ongoing capping stack study, the response time model has been refined to reflect current logistics strategies and it is now estimated that the capping stack deployment is possible within 5 days, assuming no debris removal activities are required. Once

**B. Development Projects Modeled Results**

deployed, final capping operations would occur and the well could be shut in. The WCD releases that were analyzed would represent some of the largest offshore releases in the history of the industry. The responses that were applied to them represent credible responses in terms of both timing and scope. If a release of this magnitude occurred, the response would be monitored for performance and would be scaled-up as necessary to minimize shoreline impacts in the Caribbean. Additional response services would be initially sourced from ExxonMobil's OSR vendors in the nearby Gulf of Mexico region and would extend beyond that region, as needed. Releases of this magnitude are very rare and the response that was applied to them in the response modeling provides insights and comparisons among the various projects regarding additional needs that would be needed should such an unlikely event occur. The summaries of mass balances at the end of the simulations are presented in Table B-2.

**Table B-2: Representative worst -case scenario mass balance at the end of the simulation as percent (%) of the total column of oil released.**

Scenario	Surface	Water Column	Ashore	Evaporated	Degradation
Payara FPSO 50 bbl Marine Diesel Release—Summer Season	3.9	2.6	0.0	90.1	3.4
Payara FPSO 50 bbl Marine Diesel Release—Winter Season	<0.1	29.8	0.0	65.5	4.6
Payara FPSO 250 bbl Marine Diesel Release—Summer Season	1.1	20.5	0.0	75.2	3.2
Payara FPSO 250 bbl Marine Diesel Release—Winter Season	0.0	29.9	0.0	65.5	4.6
Payara FPSO 50 bbl Payara Crude Release—Summer Season	60.6	1.9	5.3	26.5	5.7
Payara FPSO 50 bbl Payara Crude Release—Winter Season	10.7	0.2	41.1	42.6	5.4
Payara FPSO 2,500 bbl Payara Crude Release—Summer Season	52.9	0.2	16.1	25.3	5.6
Payara FPSO 2,500 bbl Payara Crude Release—Winter Season	69.2	0.0	0.6	24.7	5.5
<i>Mitigated</i> Payara FPSO 2,500 bbl Payara Crude Release—Summer Season	0.0	62.4	0.0	23.4	13.7
<i>Mitigated</i> Payara FPSO 2,500 bbl Payara Crude Release—Winter Season	0.0	62.6	0.0	23.4	13.9
Payara Wellhead 4,654,000 bbl (202,192 bpd) Payara Crude Release—Summer Season (Maximum WCD)	45.5	2.1	2.0	13.7	36.1
Payara Wellhead 4,654,000 bbl (202,192 bpd) Payara Crude Release—Winter Season (Maximum WCD)	44.2	2.1	3.4	13.7	36.1

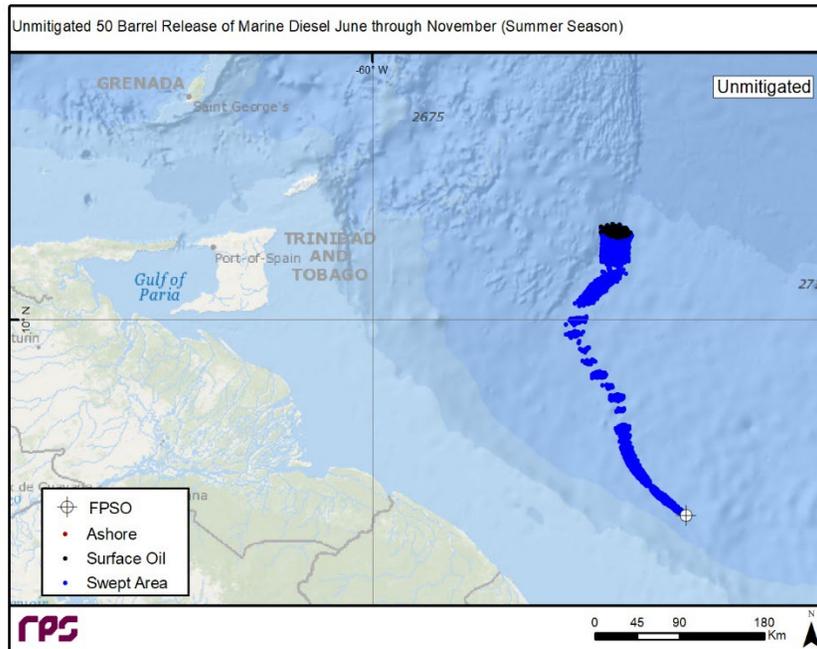
**B. Development Projects Modeled Results**

Scenario	Surface	Water Column	Ashore	Evaporated	Degradation
<i>Mitigated</i> Payara Wellhead 940,275 bbl (202,192 bpd) Payara Crude Release—Summer Season (Maximum WCD)	2.4	30.0	1.1	7.1	56.8
<i>Mitigated</i> Payara Wellhead 940,275 bbl (202,192 bpd) Payara Crude Release—Winter Season (Maximum WCD)	4.7	27.4	2.9	7.3	55.8

**B. Development Projects Modeled Results**

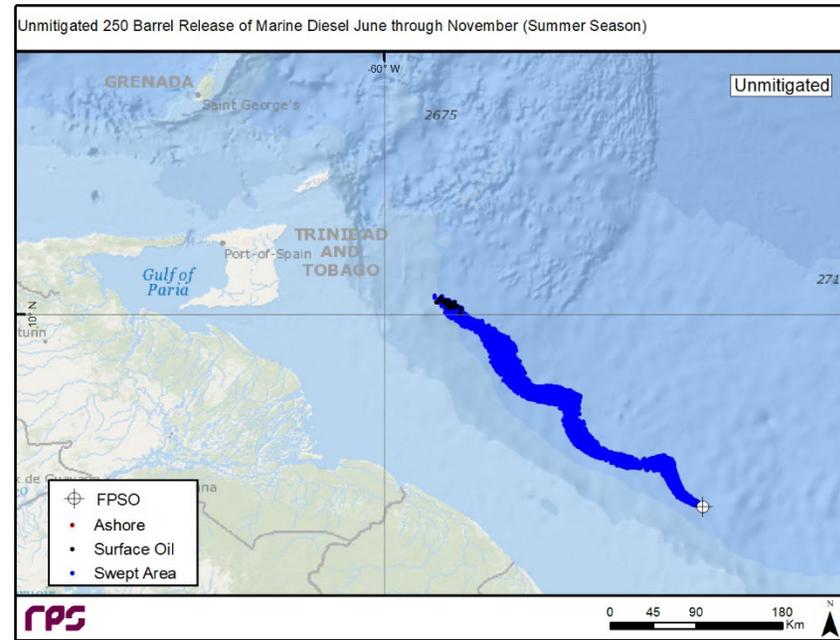
**B.1.10. Payara Marine Diesel (June through November)**

**Payara 50 Barrel Scenario (Unmitigated)**



**Figure B-11: Unmitigated area swept results for the 95th percentile surface area oiled 50 bbl Marine Diesel release during Jun-Nov season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red (none in this scenario).**

**Payara 250 Barrel Marine Diesel Scenario (Unmitigated)**



**Figure B-12: Area swept results for the 95th percentile surface area oiled 250 bbl Marine Diesel release during Jun-Nov season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red (none in this scenario).**

B. Development Projects Modeled Results

B.1.11. Payara Marine Diesel (December through May)

Payara 50 Barrel Scenario (Unmitigated)

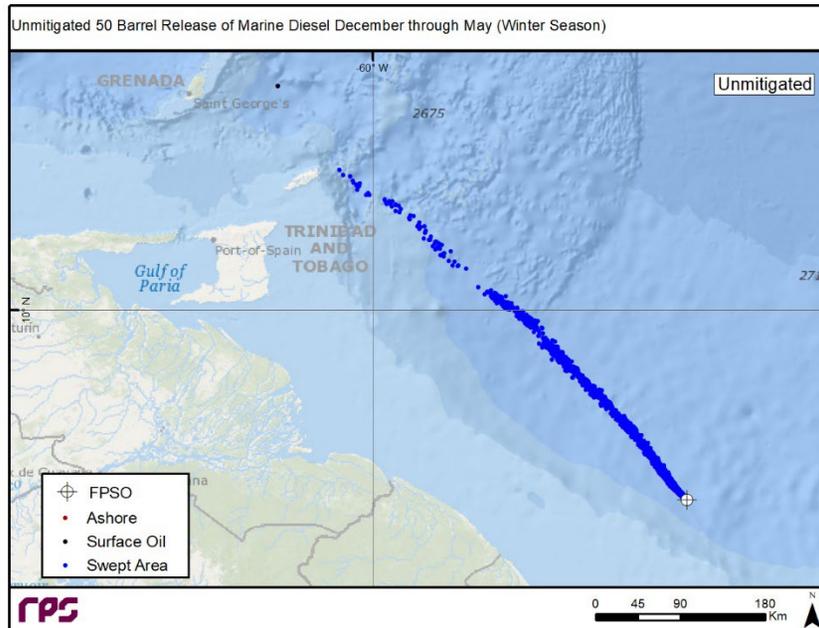


Figure B-13: Unmitigated area swept results for the 95th percentile surface area oiled 50 bbl Marine Diesel release during Dec-May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red (none in this scenario).

Payara 250 Barrel Marine Diesel Scenario (Unmitigated)

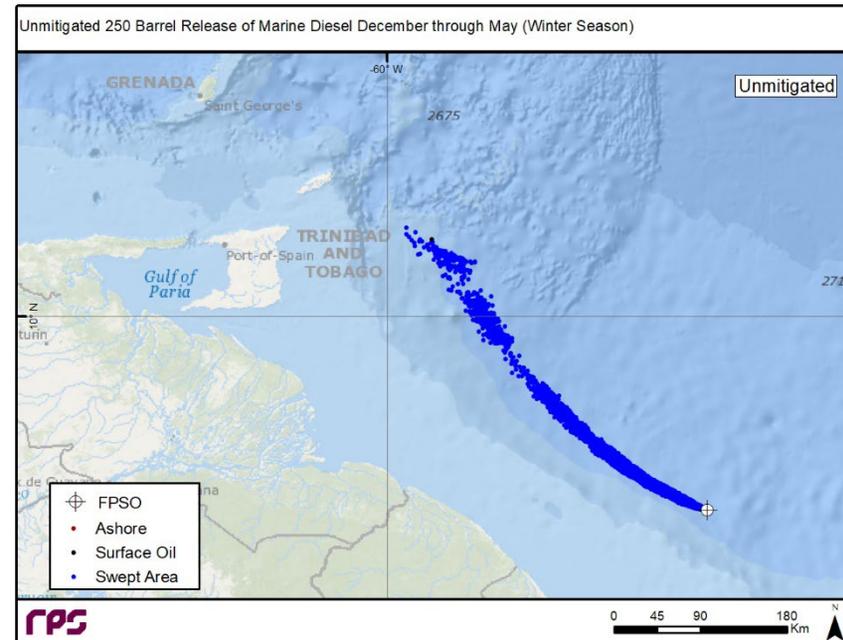


Figure B-14: Unmitigated area swept results for the 95th percentile surface area oiled 250 bbl Marine Diesel release during Dec-May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red (none in this scenario).

B. Development Projects Modeled Results

B.1.12. Payara Crude Oil (June through November)

Payara 50 Barrel Scenario (Unmitigated)

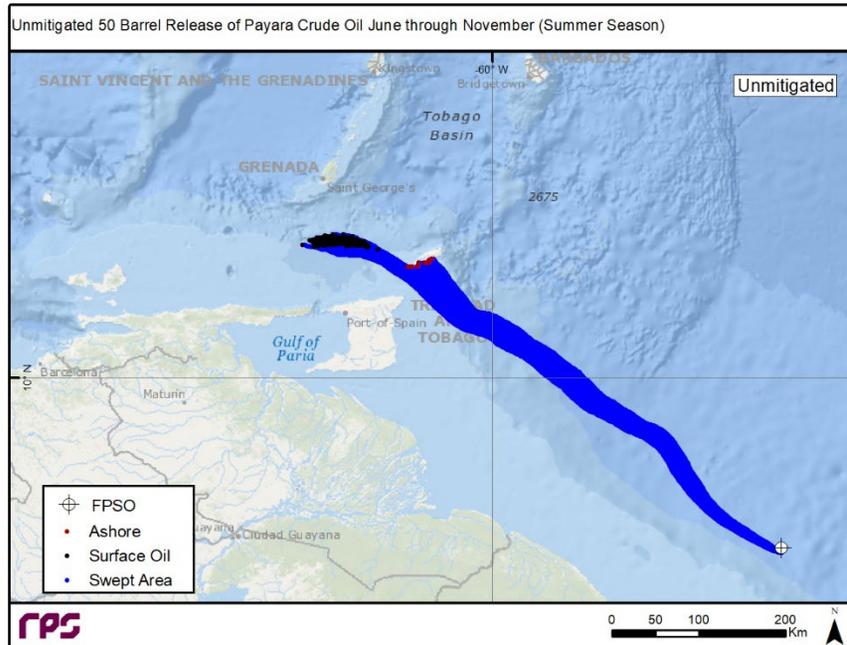


Figure B-15: Unmitigated area swept results for the 95th percentile minimum time to shoreline 50 bbl Crude Oil release during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red.

Payara 2,500 Barrel Crude Oil Scenario (Unmitigated)

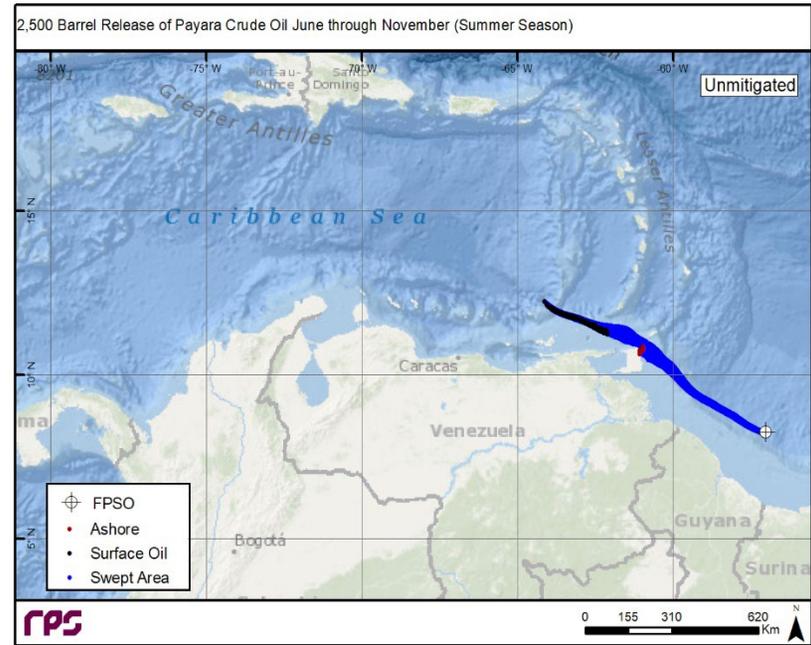
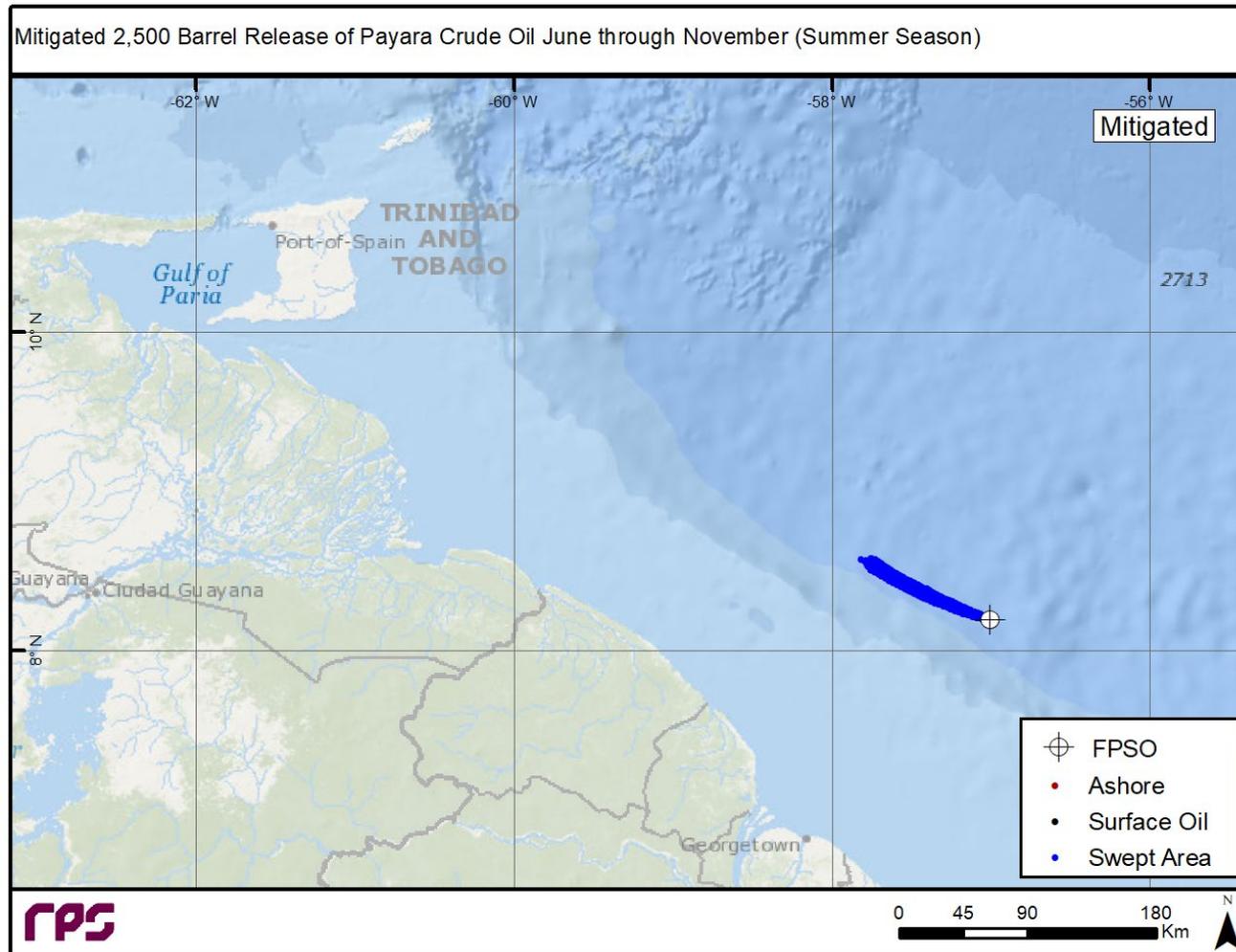


Figure B-16: Unmitigated area swept results for the 95th percentile minimum time to shoreline 2,500 bbl Crude Oil release during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red.

**B. Development Projects Modeled Results**

**Payara 2,500 Barrel Crude Oil Scenario (Mitigated)**



**Figure B-17: Mitigated area swept results for the 95th percentile minimum time to shoreline 2,500 bbl Crude Oil release during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black (none in this scenario), and shoreline oiling is displayed in red (none in this scenario).**

B. Development Projects Modeled Results

B.1.13. Payara Crude Oil (December through May)

Payara 50 Barrel Crude Oil Scenario (Unmitigated)

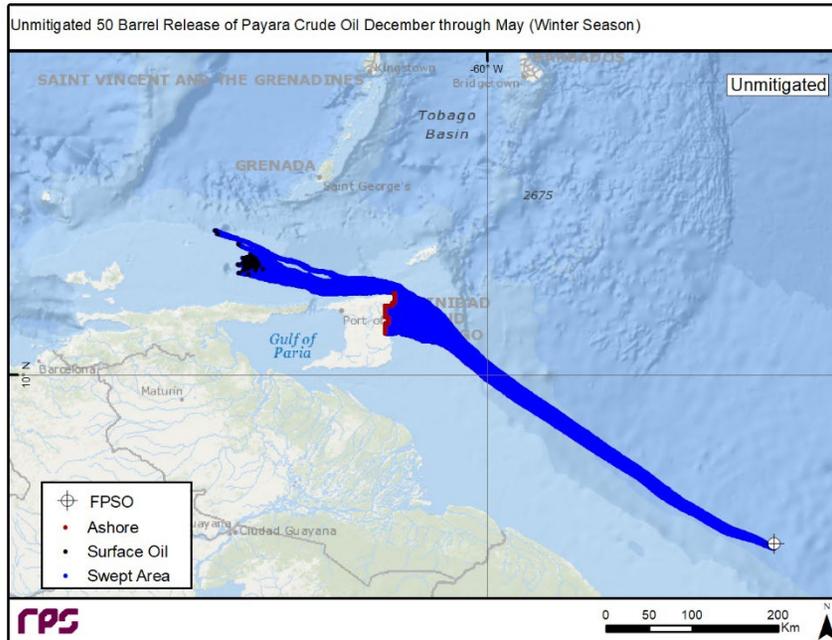


Figure B-18: Unmitigated area swept results for the 95th percentile minimum time to shoreline 50 bbl Crude Oil release during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red.

Payara 2,500 Barrel Crude Oil Scenario (Unmitigated)

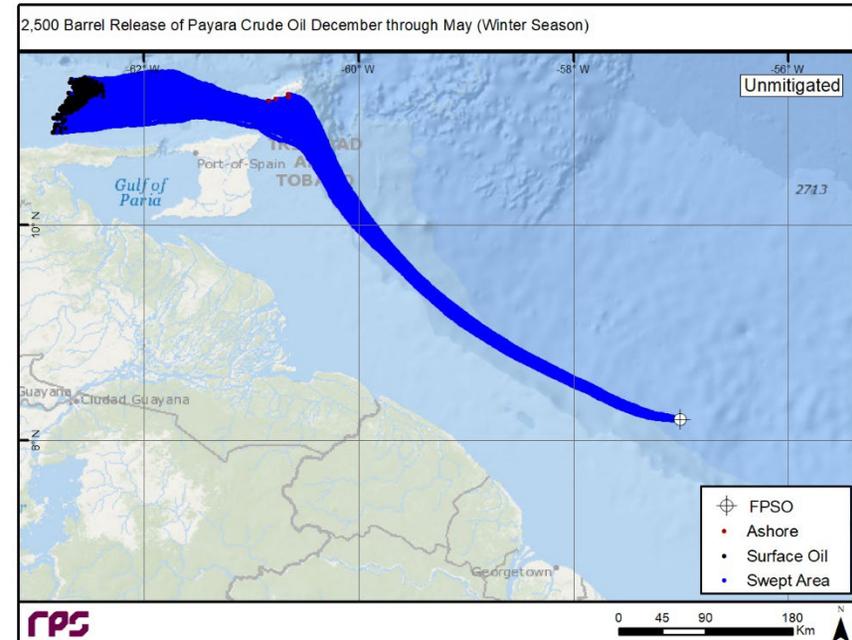


Figure B-19: Unmitigated area swept results for the 95th percentile minimum time to shoreline 2,500 bbl Crude Oil release during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red.

B. Development Projects Modeled Results

Payara 2,500 Barrel Crude Oil Scenario (Mitigated)

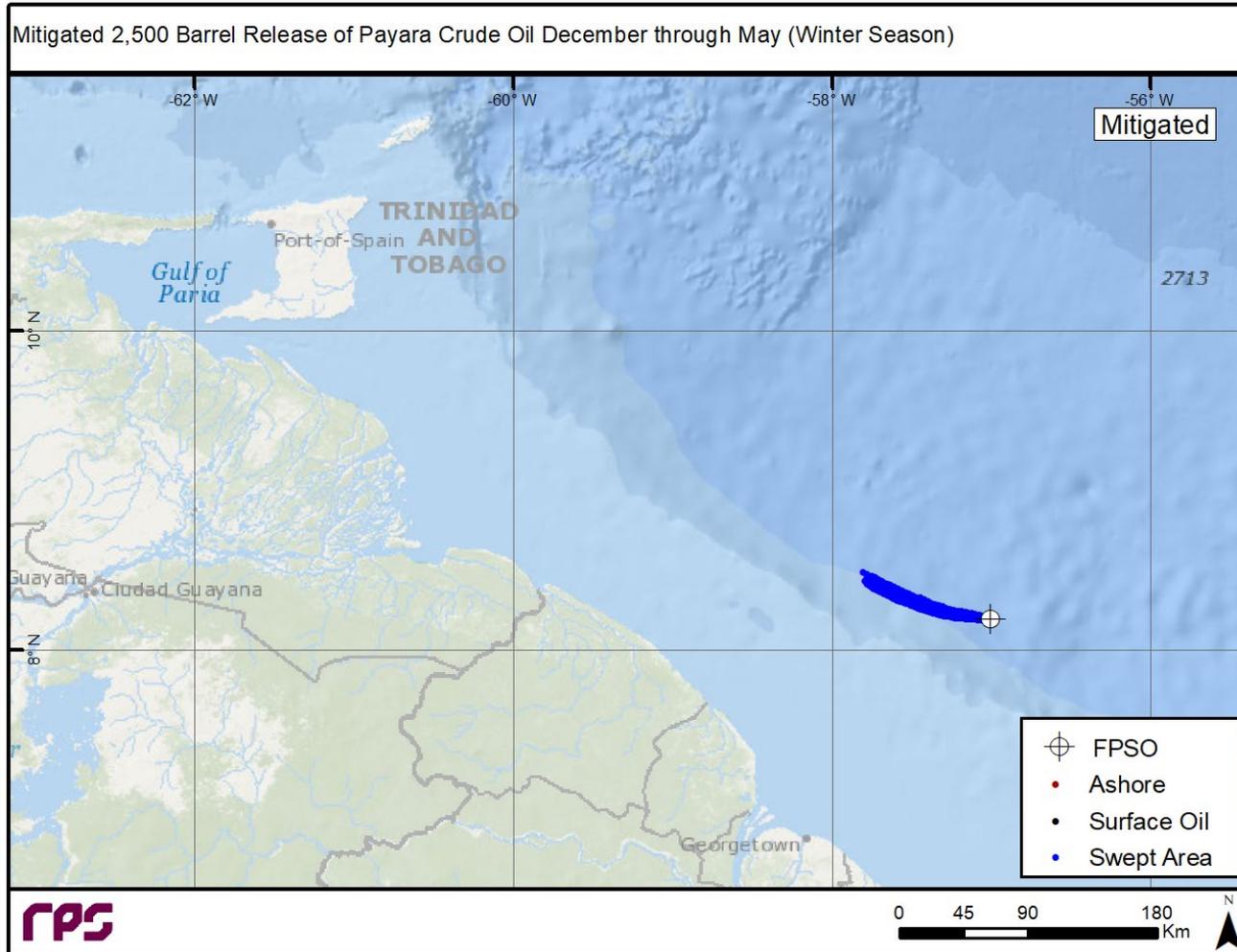
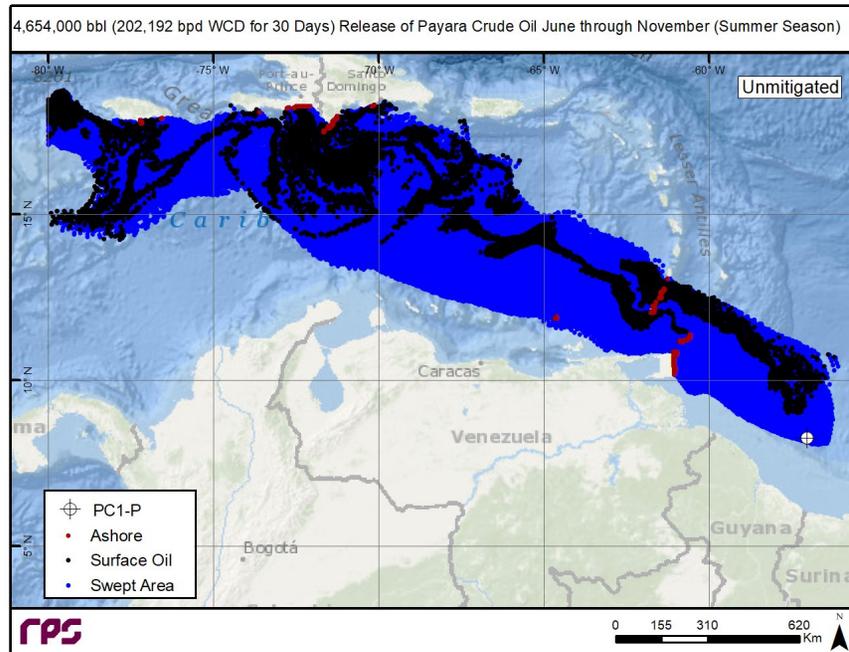


Figure B-20: Mitigated area swept results for the 95th percentile minimum time to shoreline 2,500 bbl Crude Oil release during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black (none in this scenario), and shoreline oiling is displayed in red (none in this scenario).

**B. Development Projects Modeled Results**

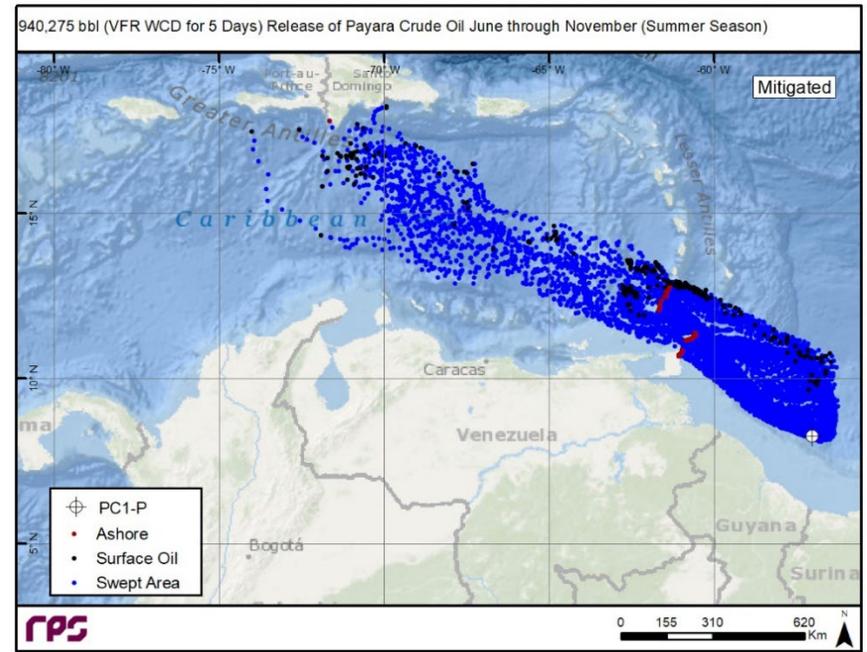
**B.1.14. Payara Wellbore Fluids (June through November)**

**Payara Maximum WCD: 202,192 BPD Crude Oil Scenario for 30 Days (Unmitigated)**



**Figure B-21: Unmitigated area swept results for the 95th percentile minimum time to shoreline 202,192 bbl/day Crude Oil release (Maximum WCD) for 30 days during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 54-day scenario are presented in black, and shoreline oiling is displayed in red.**

**Payara Maximum WCD: 202,192 BPD Crude Oil Scenario for 5 Days (Mitigated)**



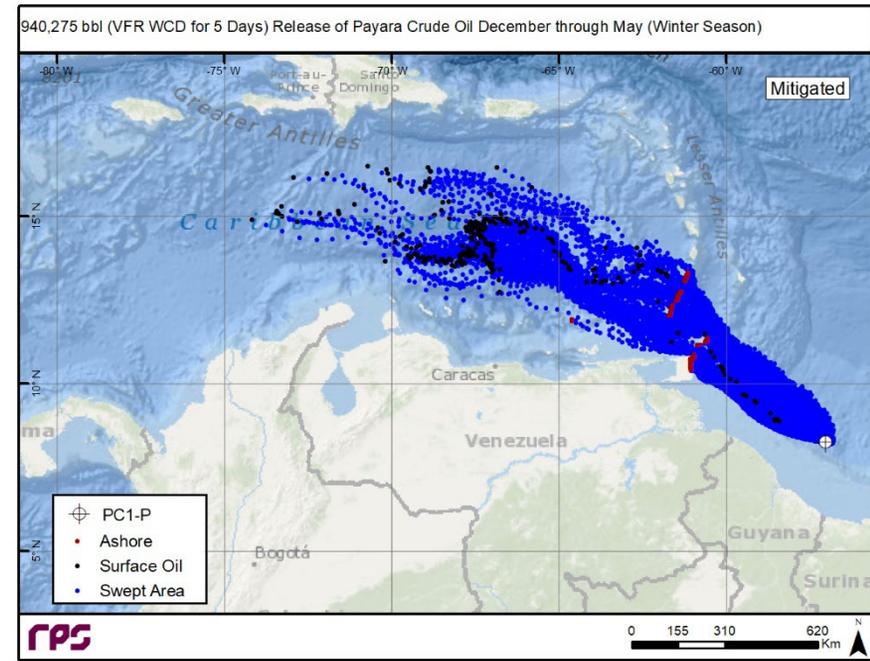
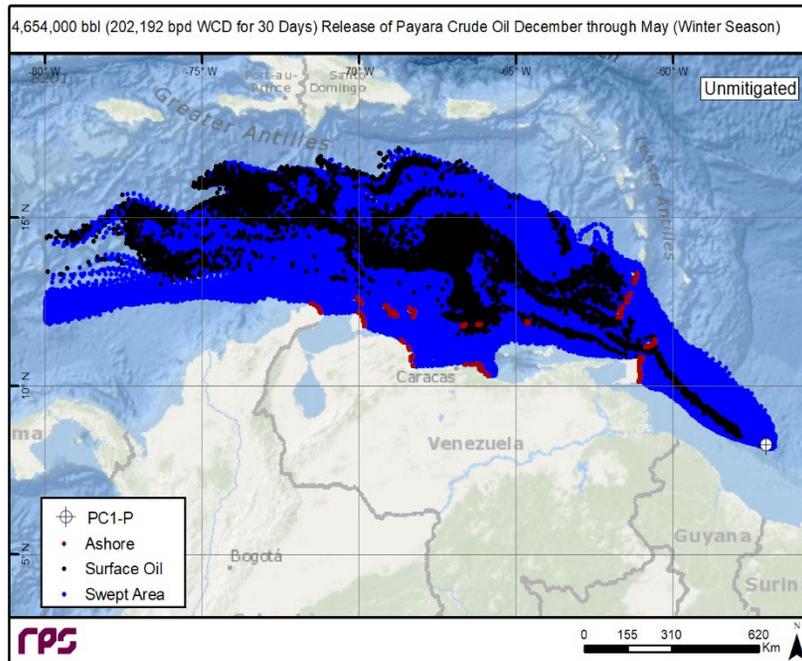
**Figure B-22: Mitigated area swept results for the 95th percentile minimum time to shoreline 202,192 bbl/day Crude Oil release (Maximum WCD) for 5 days during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 54-day scenario are presented in black, and shoreline oiling is displayed in red.**

**B. Development Projects Modeled Results**

**B.1.15. Payara Wellbore Fluids (December through May)**

**Payara Maximum WCD: 202,192 BPD Crude Oil Scenario for 30 Days (Unmitigated)**

**Payara Maximum WCD: 202,192 Barrel per Day Scenario for 5 Days (Mitigated)**



**Figure B-23: Unmitigated area swept results for the 95th percentile minimum time to shoreline 202,192 bbl/day Crude Oil release (Maximum WCD) for 30 days during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 54-day scenario are presented in black, and shoreline oiling is displayed in red.**

**Figure B-24: Mitigated area swept results for the 95th percentile minimum time to shoreline 202,192 bbl/day Crude Oil release (Maximum WCD) for 5 days during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 54-day scenario are presented in black, and shoreline oiling is displayed in red.**

**B. Development Projects Modeled Results**

**B.2. Yellowtail Oil Spill Modeling**

**B.2.1. Yellowtail Oil Properties**

The transport and weathering of spilled oil are dependent on chemical and physical oil properties such as boiling point distribution, tendency to form stable or meso-stable water-in-oil emulsions, and oil viscosity. Table B-3 summarizes the characteristics of the hydrocarbon product, a Medium Crude Oil, used for this study. The client provided RPS with detailed information regarding the oil properties of the products and RPS assumed a proxy/generic oil to define any additional properties necessary to run the oil spill model. These properties were based on characterizations from the Environmental Technology Centre of Environment Canada.

**Table B-3: Properties of the Crude Oil Used in the Yellowtail Spill Modeling**

Density (g/cm <sup>3</sup> at 15°C)	Viscosity	API Gravity	Pour Point (°C)	Maximum Water Content (%)
0.8558	11 @ 15°C	32.5	-24.0	31

°C = degrees Celsius; API = American Petroleum Institute; cP = centipoise; g/cm<sup>3</sup> = grams per cubic centimeter

**B.2.2. Introduction**

RPS Ocean Science was contracted by Esso Exploration & Production Guyana Ltd. to assess the trajectory and fate of releases using RPS’ SIMAP model in the offshore waters of Guyana both without and with spill response mitigation. This modeling is a continuation of previous modeling for offshore Guyana in the Payara Prospect and in the Liza prospect, completed for Phase 1 and Phase 2. This summary presents the results of the most credible worst-case discharge (Most Credible WCD) and worst-case discharge (WCD) components of the oil spill modeling for the Yellowtail discharge location.

Consistent with Spill Modeling Concepts outlined in **Appendix A**, four hypothetical spill scenarios were modeled by RPS. The spill scenarios include 30-day loss-of-well-control of a Medium Crude oil modeled for 45 days. The model simulations were run using environmental conditions corresponding to different regimes in the summer (June through November) and winter (December through May) seasons defined in the analysis of long-term wind data at the spill site. Individual spill events were selected from these results based on shoreline exposure to oil. Spill events were selected based on a high WCD in both summer and winter seasons. The loss-of-well-control scenarios were simulated using the OILMAPDeep model to determine the discharge plume geometry, define the oil droplet sizes and provide inputs for the SIMAP model simulations.

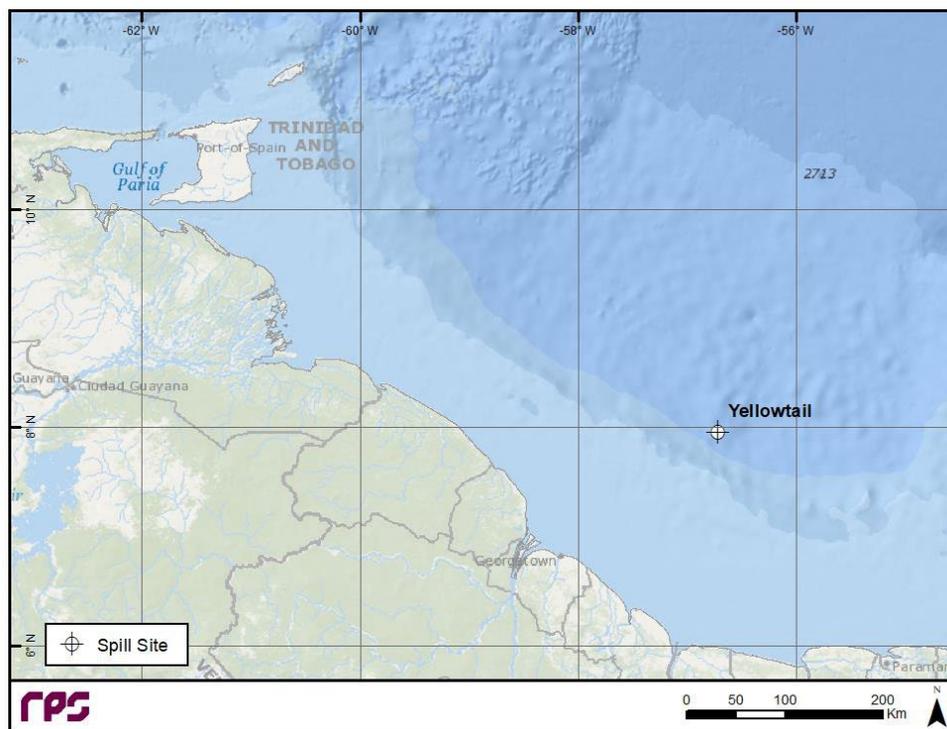
**B. Development Projects Modeled Results**

**B.2.3. Model Scenarios**

One site within the Yellowtail Prospect in the Stabroek Block (Yellowtail wellhead) was used for all spill scenarios. The site is located offshore from Guyana, roughly 195 km from the coastline. Table B-4 lists the spill location coordinates, and the figure below is a map showing the site location.

**Table B-4: Location used for spill modeling in the Yellowtail prospect (Stabroek Block)**

Site Location	Latitude (N)	Longitude (W)
Yellowtail	7.9571	56.7161



**B.2.4. Yellowtail Stochastic Modeling Results – Unmitigated**

Although explained above as part of the Payara Stochastic Modeling Results, it is important to understand the value of this type of modeling and what is provided. Stochastic simulations provide insight into the probable behavior of potential oil spills in response to temporally and spatially-varying meteorological and oceanographic conditions in the study area. The stochastic analysis provides two types of information: 1) the footprint of sea surface areas that might be oiled and the associated probability of oil contamination; and 2) the shortest time required for oil to reach any point within the areas predicted to be oiled. The areas and probabilities of oil contamination are generated by a statistical analysis of all the individual stochastic runs. It is important to note that a single run will encounter only a relatively small portion of this footprint.

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**B. Development Projects Modeled Results**

In addition, the simulations provide shoreline oil contamination data expressed in terms of minimum and average times for oil to reach shore, and the percentage of simulations in which oil is predicted to reach shore.

The trajectory of spills at discharge sites from the Yellowtail well head is driven largely by the strong northwest flowing currents running parallel to the South American coast. The easterly and east-northeasterly winds drive oil ashore, but in general are not strong enough to overcome the transport by currents.

Surface oil is predicted to travel towards the northwest in all scenarios during both the summer and winter seasons in the Most Credible WCD and the WCD. These large volume releases in both summer and winter months are predicted to have a greater than 90% probability of reaching the shoreline.

The probability of oil contamination on the shoreline tends to be highest on the coast of Trinidad and Tobago, particularly during the winter months, because of the predominant current flow through the Stabroek Block and into the Caribbean. Lower shoreline oiling probabilities (<20%) are predicted as far north as Haiti and the Dominican Republic as far west as Colombia. Winter season spills generally show a higher oil stranding probability due to the faster currents and northeasterly winds prevalent during the winter. For the 30-day 88,728 bpd WCD loss-of-well-control scenarios of Medium Crude in the summer season (June – November), surface oil reaches the coast in some segments exceeding 90% probability, with the highest probabilities (>80%) primarily along the coast of Trinidad and Tobago and lower probabilities (<20%) as along Guyana and as far west as Venezuela and as far north as the Dominican Republic.

For the 30-day 88,728 bpd Most Credible WCD loss-of-well-control scenarios of Medium Crude in the winter season (December – May), the surface oil exposure footprint (above the 1  $\mu\text{m}$  threshold) exceeding 50% predicted probability extends from the spill site approximately 1,200 km to the northwest.

For the 30-day 177,157 bpd WCD loss-of-well-control scenarios of Medium Crude in the summer season (June – November), surface oil reaches the coast in segments exceeding 90% probability, with the highest probabilities (>80%) primarily along the coast of Trinidad and Tobago and lower probabilities (<20%) as far west as Colombia and as far north as Martinique.

B. Development Projects Modeled Results

B.3. Yellowtail Wellhead Crude (Most Credible WCD Release) – Summer

Water Surface Results —Most Credible WCD: 88,728 BPD Scenario for 30 Days (Unmitigated)

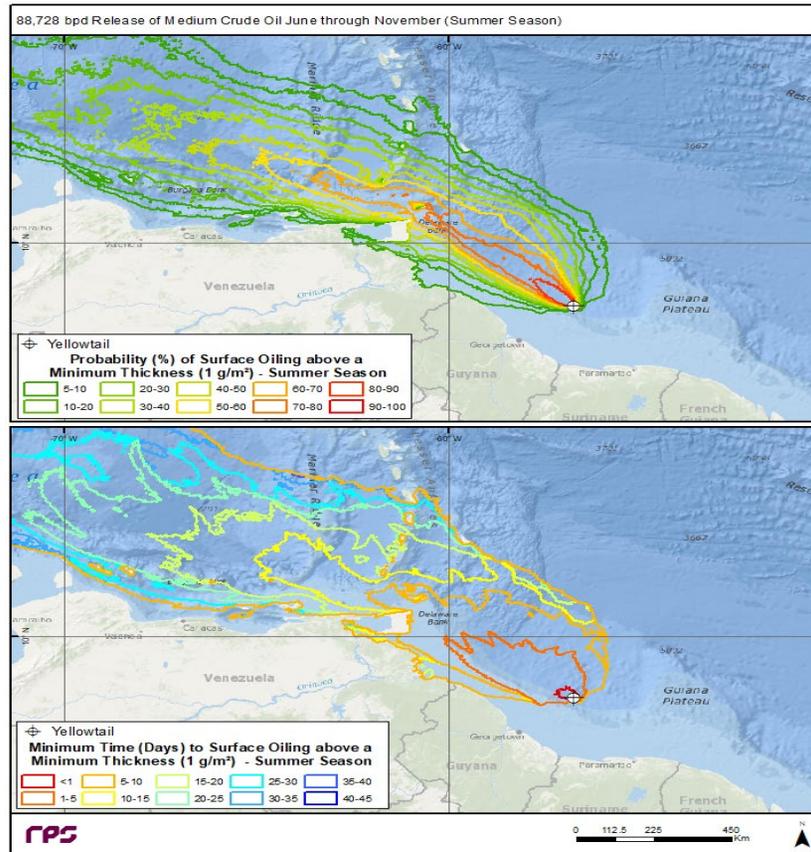


Figure B-25: Top panel displays probability of surface oil contamination  $\geq 1 \mu\text{m}$  ( $1 \text{ g/m}^2$  on average over the grid cell) during the summer season for a 88,728 BPD Most Credible WCD 30-day spill of Medium Crude at the Yellowtail wellhead. Bottom panel displays minimum time for surface oil to exceed  $1 \mu\text{m}$ .

Water Surface Results —Most Credible WCD: 88,728 BPD Scenario for 30 Days (Unmitigated) – DETAILED VIEW

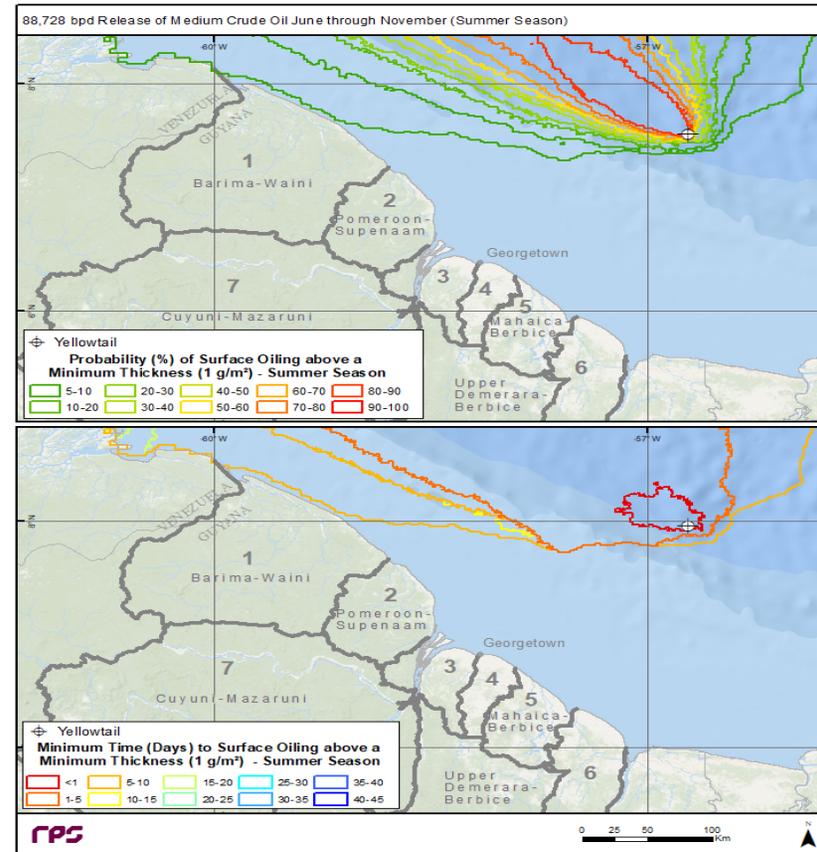


Figure B-26: Top panel displays probability of surface oil contamination  $\geq 1 \mu\text{m}$  ( $1 \text{ g/m}^2$  on average over the grid cell) during the summer season for a 88,728 BPD Most Credible WCD 30-day spill of Medium Crude at the Yellowtail wellhead. Bottom panel displays minimum time for surface oil to exceed  $1 \mu\text{m}$ .

B. Development Projects Modeled Results

B.4. Yellowtail Wellhead Crude (Most Credible WCD Release) – Winter

Water Surface Results —Most Credible WCD: 88,728 BPD  
Scenario for 30 Days (Unmitigated)

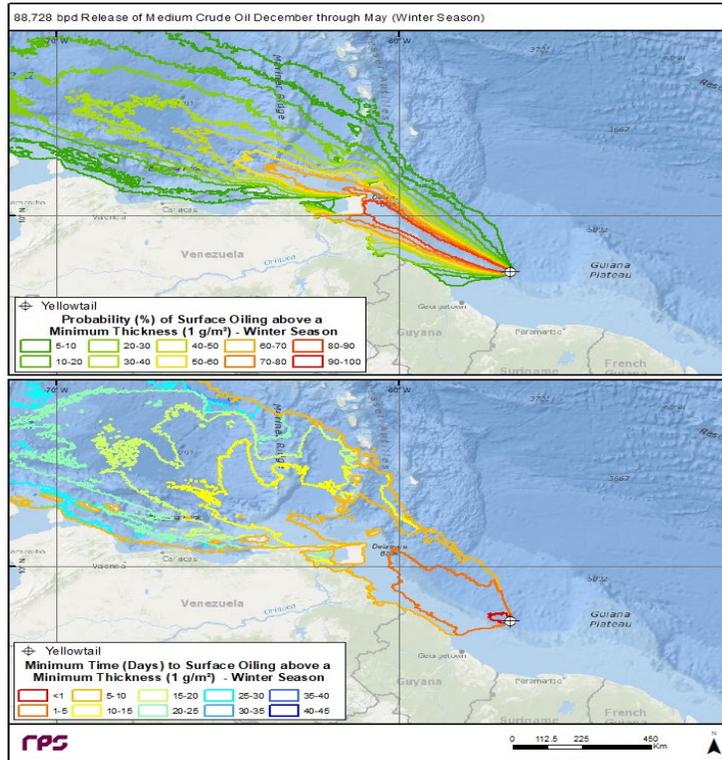


Figure B-27: Top panel displays probability of surface oil contamination  $\geq 1 \mu\text{m}$  ( $1 \text{ g/m}^2$  on average over the grid cell) during the winter season for a 88,728 BPD Most Credible WCD 30-day spill of Medium Crude at the Yellowtail wellhead. Bottom panel displays minimum time for surface oil to exceed  $1 \mu\text{m}$ .

Water Surface Results —Most Credible WCD: 88,728 BPD  
Scenario for 30 Days (Unmitigated) – DETAILED VIEW

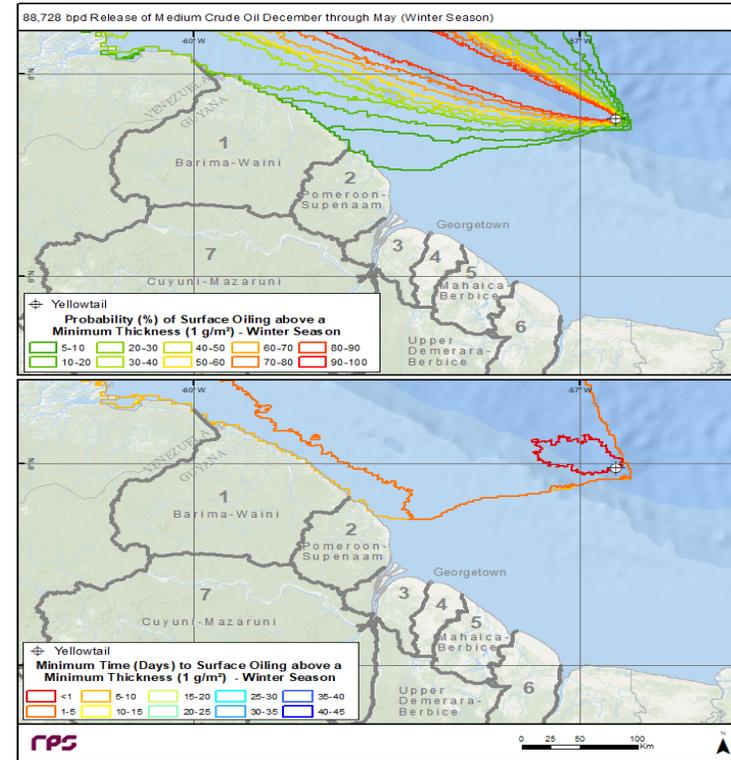


Figure B-28: Top panel displays probability of surface oil contamination  $\geq 1 \mu\text{m}$  ( $1 \text{ g/m}^2$  on average over the grid cell) during the winter season for a 88,728 BPD Most Credible WCD 30-day spill of Medium Crude at the Yellowtail wellhead. Bottom panel displays minimum time for surface oil to exceed  $1 \mu\text{m}$ .

B. Development Projects Modeled Results

B.5. Yellowtail Wellhead Crude (WCD Release) – Summer

Water Surface Results —WCD: 177,157 BPD Scenario for 30 Days (Unmitigated)

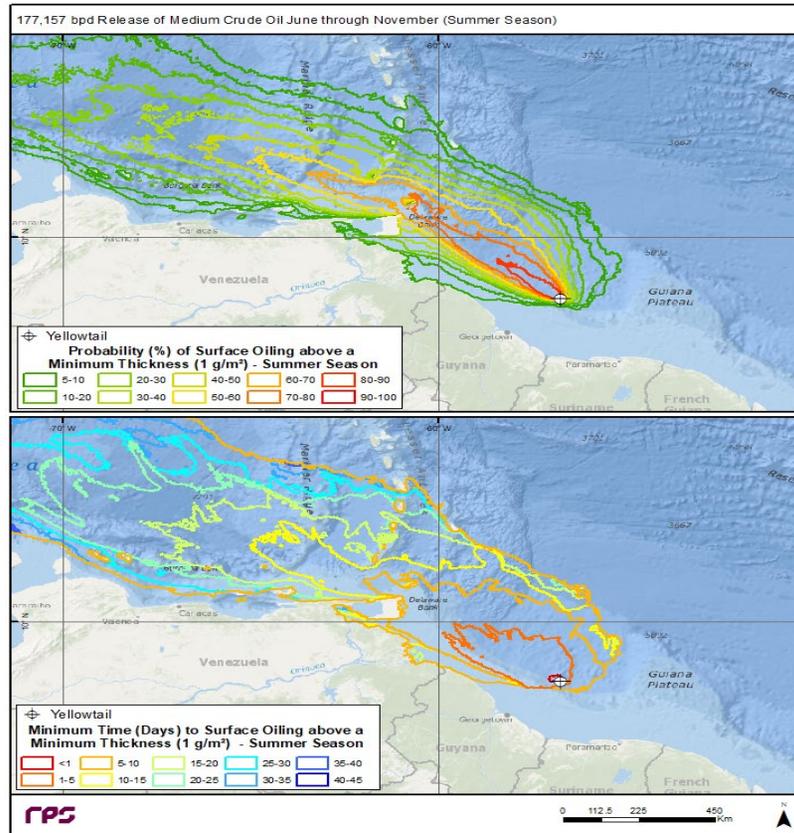


Figure B-29: Top panel displays probability of surface oil contamination  $\geq 1 \mu\text{m}$  ( $1 \text{ g/m}^2$  on average over the grid cell) during the summer season for a 177,157 BPD WCD 30-day spill of Medium Crude at the Yellowtail wellhead. Bottom panel displays minimum time for surface oil to exceed  $1 \mu\text{m}$ .

Water Surface Results — WCD: 177,157 BPD Scenario for 30 Days (Unmitigated) – DETAILED VIEW

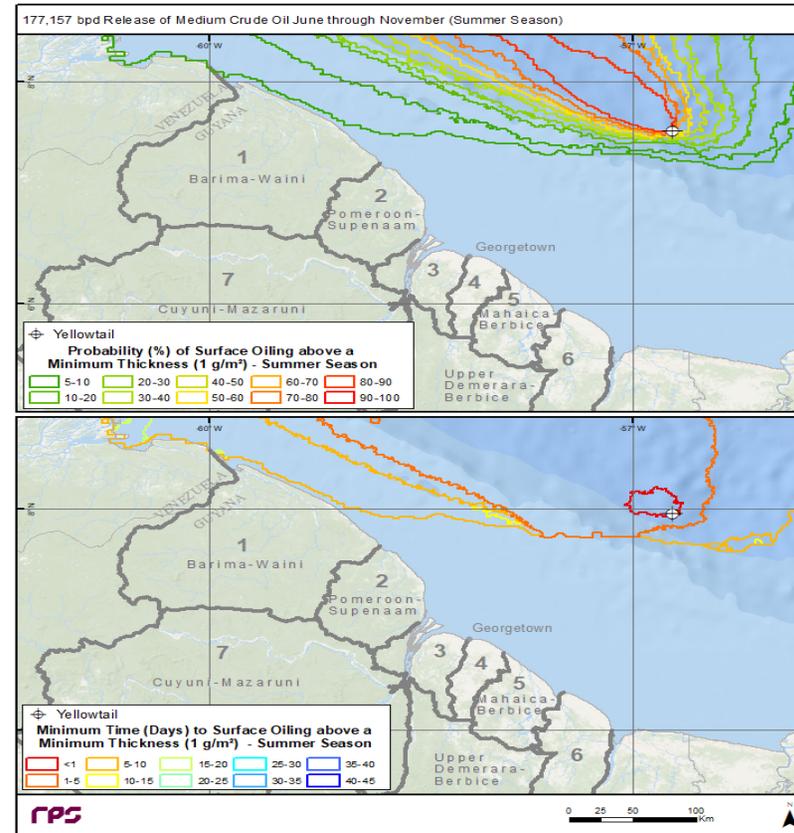


Figure B-30: Top panel displays probability of surface oil contamination  $\geq 1 \mu\text{m}$  ( $1 \text{ g/m}^2$  on average over the grid cell) during the summer season for a 177,157 BPD WCD 30-day spill of Medium Crude at the Yellowtail wellhead. Bottom panel displays minimum time for surface oil to exceed  $1 \mu\text{m}$ .

B. Development Projects Modeled Results

B.6. Yellowtail Wellhead Crude (WCD Release) – Winter

Water Surface Results—WCD: 177,157 BPD Scenario for 30 Days (Unmitigated)

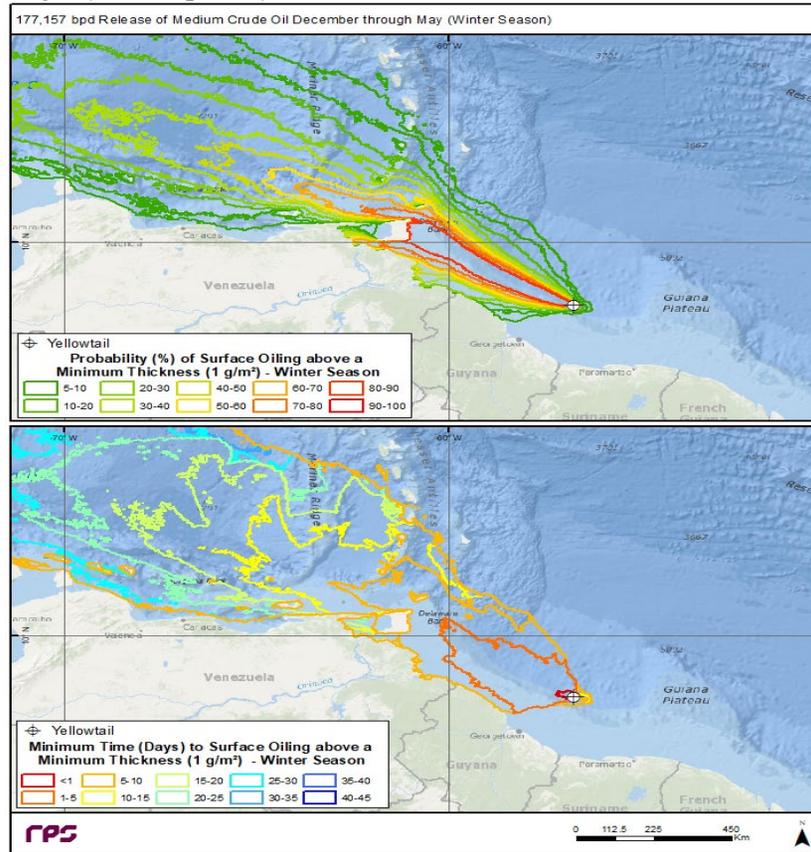


Figure B-31: Top panel displays probability of surface oil contamination  $\geq 1 \mu\text{m}$  ( $1 \text{ g/m}^2$  on average over the grid cell) during the winter season for a 177,157 BPD WCD 30-day spill of Medium Crude at the Yellowtail wellhead. Bottom panel displays minimum time for surface oil to exceed  $1 \mu\text{m}$ .

Water Surface Results—WCD: 177,157 BPD Scenario for 30 Days (Unmitigated) – DETAILED VIEW

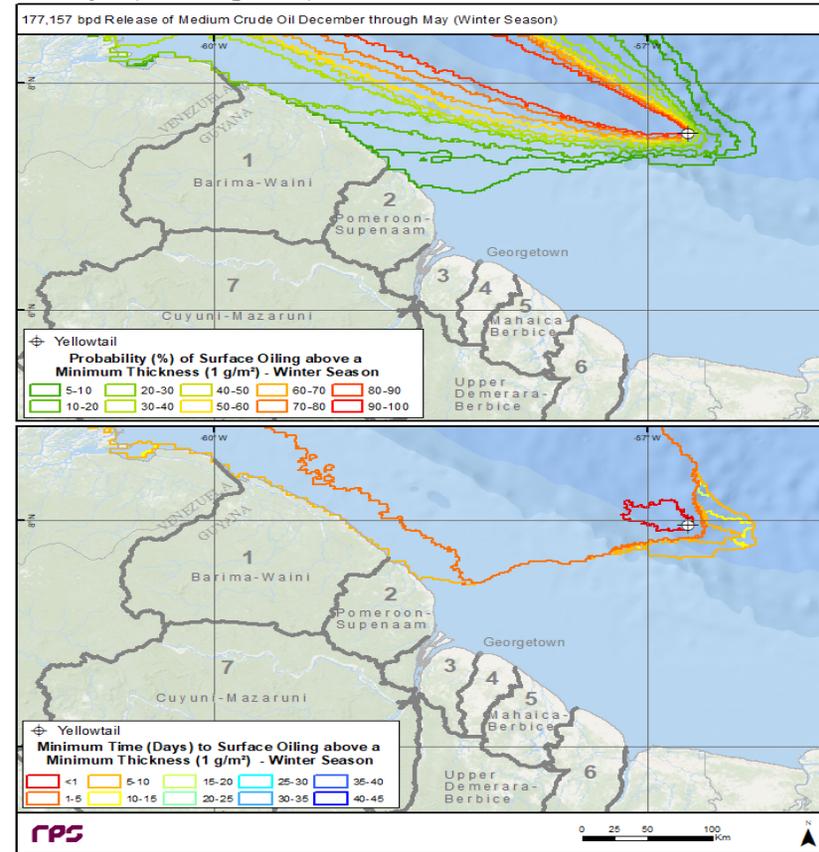


Figure B-32: Top panel displays probability of surface oil contamination  $\geq 1 \mu\text{m}$  ( $1 \text{ g/m}^2$  on average over the grid cell) during the winter season for a 177,157 BPD WCD 30-day spill of Medium Crude at the Yellowtail wellhead. Bottom panel displays minimum time for surface oil to exceed  $1 \mu\text{m}$ .

**B. Development Projects Modeled Results**

**B.7. Yellowtail Deterministic Model Results – Unmitigated and Mitigated**

Each individual spill event simulated in a stochastic scenario produces a unique spill trajectory. Depending on environmental conditions at the time of release, surface oil may be transported directly to shore or carried offshore, resulting in different effects. The 95th percentile spill events for minimum time to shore were selected from all stochastic spill scenarios simulated in each season for those stochastic scenarios with a greater than 5% probability of reaching shore. The model results are presented in maps and oiled shorelines depicted on the maps are determined by the presence of any oil amount regardless of a thickness threshold.

A summary of the mass balance at the end of the 45-day simulations in percent of released mass is provided in Table B-5. The predicted time of first arrival of oil on shore for the spill events ranked as the 95th percentile WCDs ranged from 6.5 to 8.5 days so oil is expected to be weathered by landfall. Depending on the scenario, the total oil ashore ranges from 0.0 to 8.6 km<sup>2</sup> for mitigated and 6.2 to 12.1 km<sup>2</sup> for unmitigated. Strong northwesterly transport resulted in significant shoreline oiling in Trinidad and Tobago, while allowing additional surface oil transport to the northwest of Trinidad and Tobago into the Caribbean Sea, making contact with the Greater Antilles for larger volume spills.

Response measures were performed on the summer and winter Most Credible WCD and WCD loss-of-well-control scenarios. Response measures included a capping stack applied after 5.5 days to the well head, dispersants applied at the well head, dispersants applied aurally and by boat, burning, and mechanical removal. Dispersants applied at the wellhead were effective in reducing the size of the oil droplets, leading to greater entrainment in the water column compared to the unmitigated cases. Response measures resulted in a reduction of shoreline oiling and a reduction in oil contamination to water surface area for both modeled scenarios.

**B. Development Projects Modeled Results**

**Table B-5: Representative worst -case scenario mass balance at the end of the simulation as percent (%) of the total column of oil released.**

Scenario	Surface	Water Column	Ashore	Evaporated	Degradation	Sediment
Yellowtail Wellhead 2,661,840 bbl (88,728 bpd Most Credible WCD) Medium Crude Release – Summer Season	51.6	2.0	6.2	32.9	7.3	<0.1
Yellowtail Wellhead 2,661,840 bbl (88,728 bpd Most Credible WCD) Medium Crude Release – Winter Season	45.7	5.8	8.1	31.5	8.2	<0.1
Yellowtail Wellhead 5,314,710 bbl (177,157 bpd WCD) Medium Crude Release – Summer Season	48.8	3.4	6.3	27.2	14.2	<0.1
Yellowtail Wellhead 5,314,710 bbl (177,157 bpd WCD) Medium Crude Release – Winter Season	42.4	3.2	12.1	28.9	13.3	<0.1
<i>Mitigated</i> Yellowtail Wellhead 488,004 bbl (88,728 bpd Most Credible WCD) Medium Crude Release – Summer Season	<0.1	34.0	0	11.5	50.1	<0.1
<i>Mitigated</i> Yellowtail Wellhead 488,004 bbl (88,728 bpd Most Credible WCD) Medium Crude Release – Winter Season	<0.1	33.7	0	11.7	50.4	<0.1
<i>Mitigated</i> Yellowtail Wellhead 974,364 bbl (177,157 bpd WCD) Medium Crude Release – Summer Season	<0.1	33.7	<0.1	10.0	54.9	<0.1
<i>Mitigated</i> Yellowtail Wellhead 974,364 bbl (177,157 bpd WCD) Medium Crude Release – Winter Season	<0.1	28.4	8.6	10.2	50.2	<0.1

B. Development Projects Modeled Results

B.8. Yellowtail Wellhead Crude (Most Credible WCD Release) - Summer

Most Credible WCD: 88,728 BPD Scenario with 30 days release with 45-day model simulation (Unmitigated)

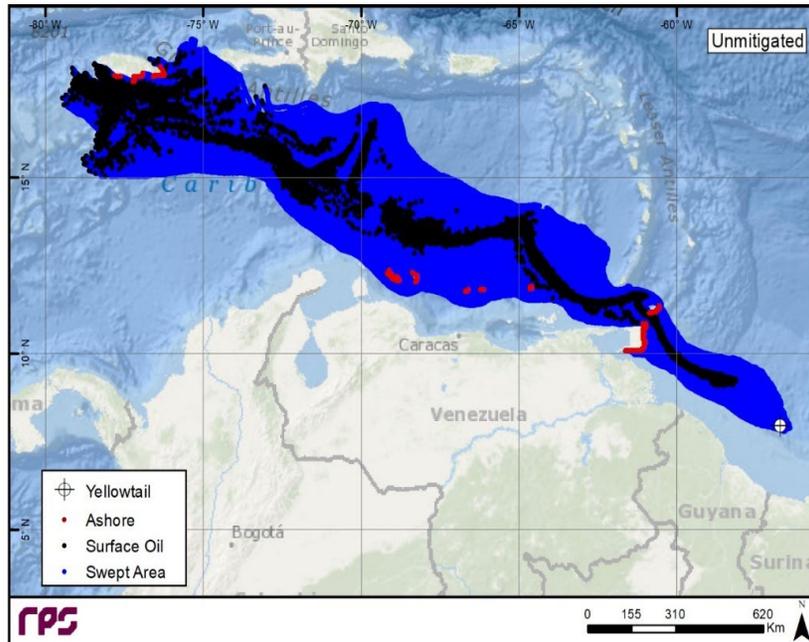


Figure B-33: Area swept by surface oil throughout 45-day model simulation for a 95th percentile minimum time to shore scenario for a 88,728 BPD Most Credible WCD spill of Medium Crude at the Yellowtail wellhead during summer season. Blue area represents surface area swept. Black points represent surface oil remaining at the end of the simulation. Red points represent shoreline oil remaining at the end of the simulation.

Most Credible WCD: 88,728 BPD Scenario with 5.5 days release with 45-day model simulation (Mitigated)

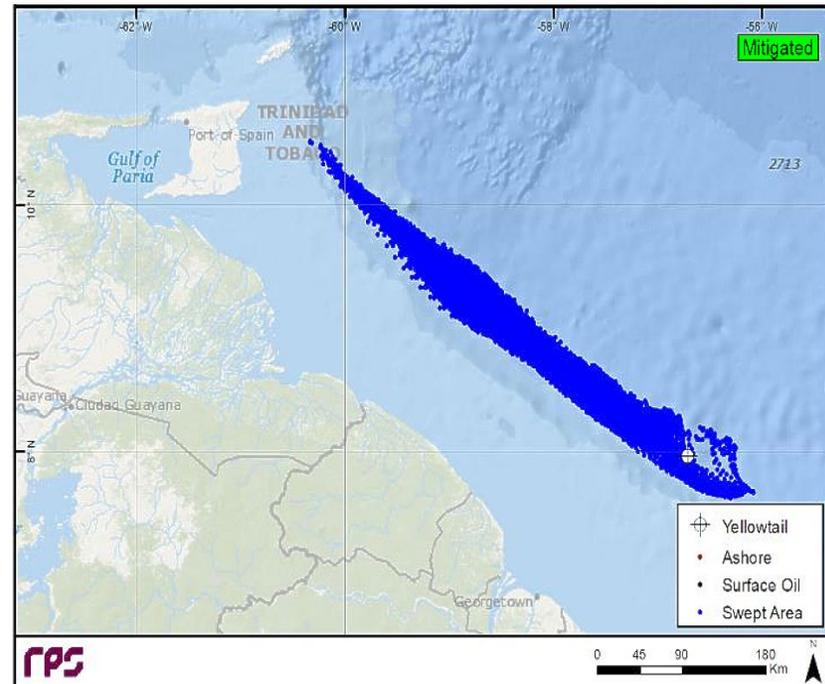


Figure B-34: Area swept results for the mitigated 95th percentile time to shore scenario for the 88,728 BPD Most Credible WCD for 5.5 Days release of Medium Crude Oil at the Yellowtail wellhead during summer season. Blue area represents surface area swept. Black points represent surface oil remaining at the end of the simulation. Red points represent shoreline oil remaining at the end of the simulation.

B. Development Projects Modeled Results

B.9. Yellowtail Wellhead Crude (Most Credible WCD Release) - Winter

Most Credible WCD: 88,728 BPD Scenario with 30 days release with 45-day model simulation (Unmitigated)

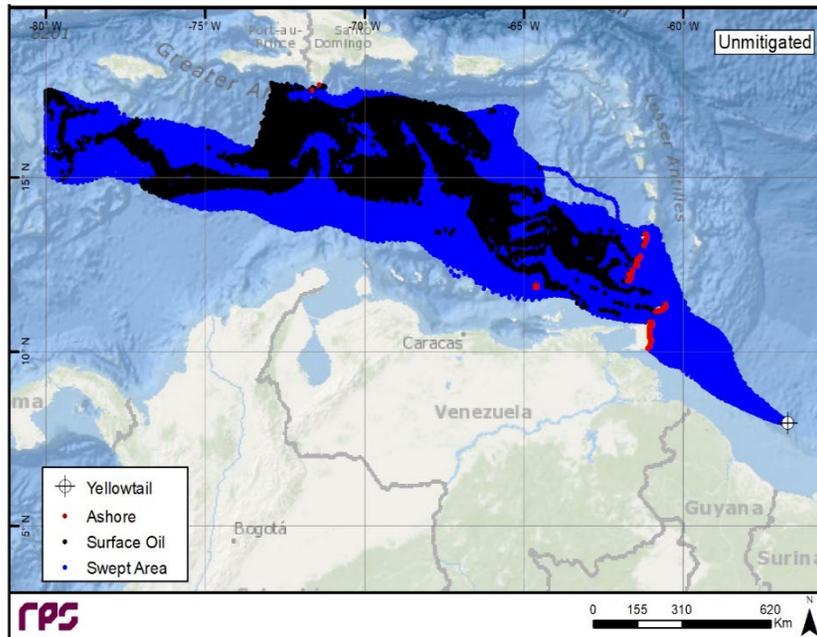


Figure B-35: Area swept by surface oil throughout 45-day model simulation for a 95th percentile minimum time to shore scenario for a 88,728 BPD Most Credible WCD) spill of Medium Crude at the Yellowtail wellhead during winter season. Blue area represents surface area swept. Black points represent surface oil remaining at the end of the simulation. Red points represent shoreline oil remaining at the end of the simulation.

Most Credible WCD: 88,728 BPD Scenario with 5.5 days release with 45-day model simulation (Mitigated)

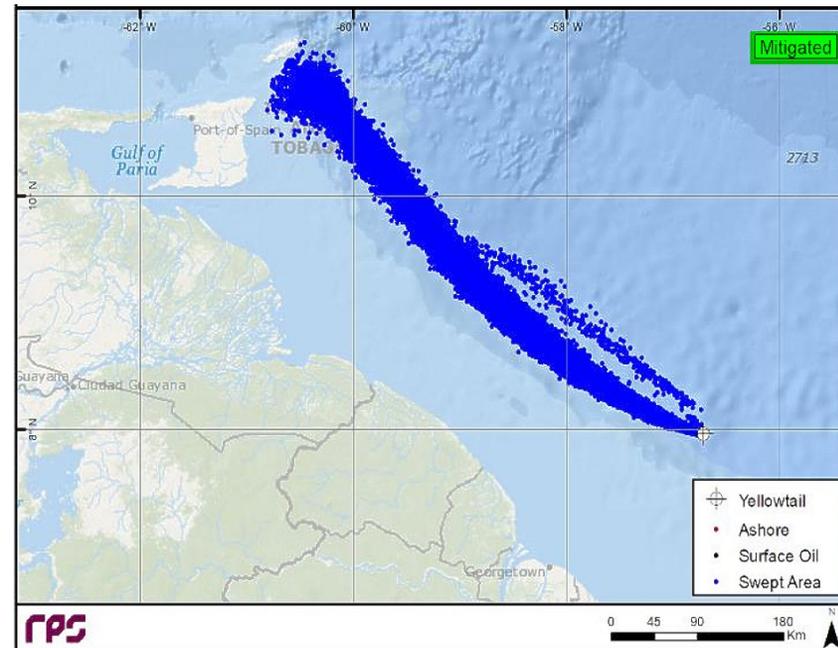


Figure B-36: Area swept results for the mitigated 95th percentile time to shore scenario for the 88,728 BPD Most Credible WCD for 5.5 Days release of Medium Crude Oil at the Yellowtail wellhead during winter season. Blue area represents surface area swept. Black points represent surface oil remaining at the end of the simulation. Red points represent shoreline oil remaining at the end of the simulation.

B. Development Projects Modeled Results

B.10. Yellowtail Wellhead Crude WCD Release - Summer

WCD: 177,157 BPD scenario with 30 days release with 45-day model simulation (Unmitigated)

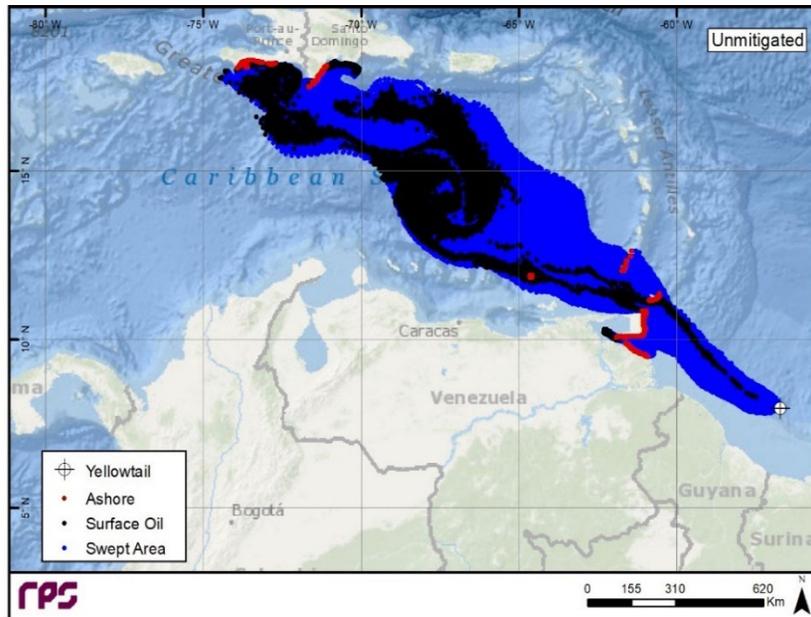


Figure B-37: Area swept by surface oil throughout 45-day model simulation for a 95th percentile minimum time to shore scenario for a 177,157 BPD WCD spill of Medium Crude at the Yellowtail wellhead during summer season. Blue area represents surface area swept. Black points represent surface oil remaining at the end of the simulation. Red points represent shoreline oil remaining at the end of the simulation

WCD: 177,157 BPD scenario with 5.5 days release with 45-day model simulation (Mitigated)

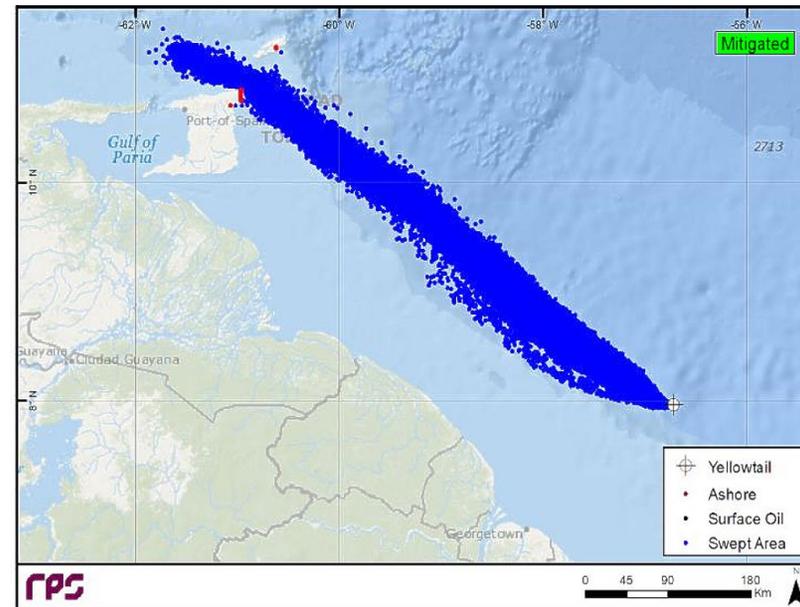
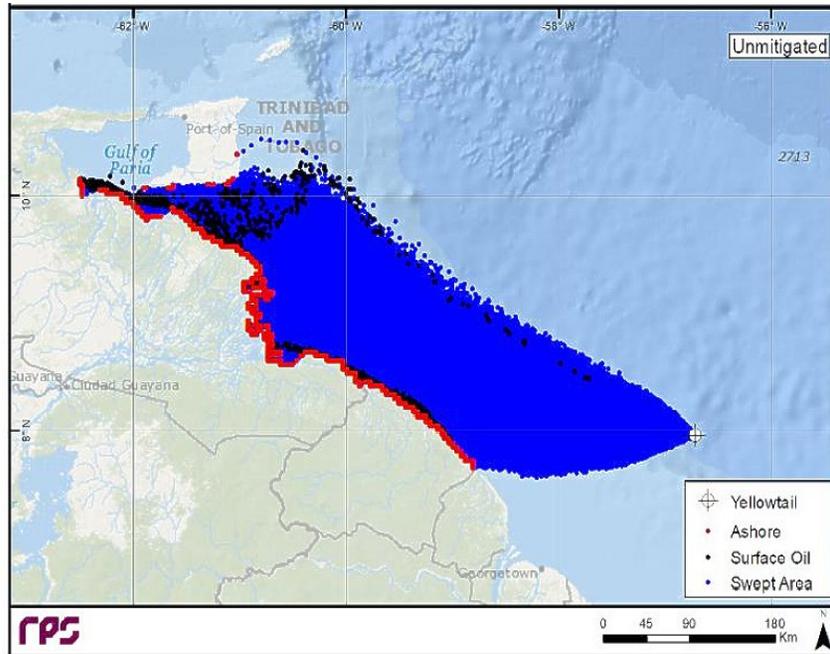


Figure B-38: Area swept results for the mitigated 95th percentile time to shore scenario for the 177,157 BPD WCD for 5.5 Days release of Medium Crude Oil at the Yellowtail wellhead during summer season. Blue area represents surface area swept. Black points represent surface oil remaining at the end of the simulation.

**B. Development Projects Modeled Results**

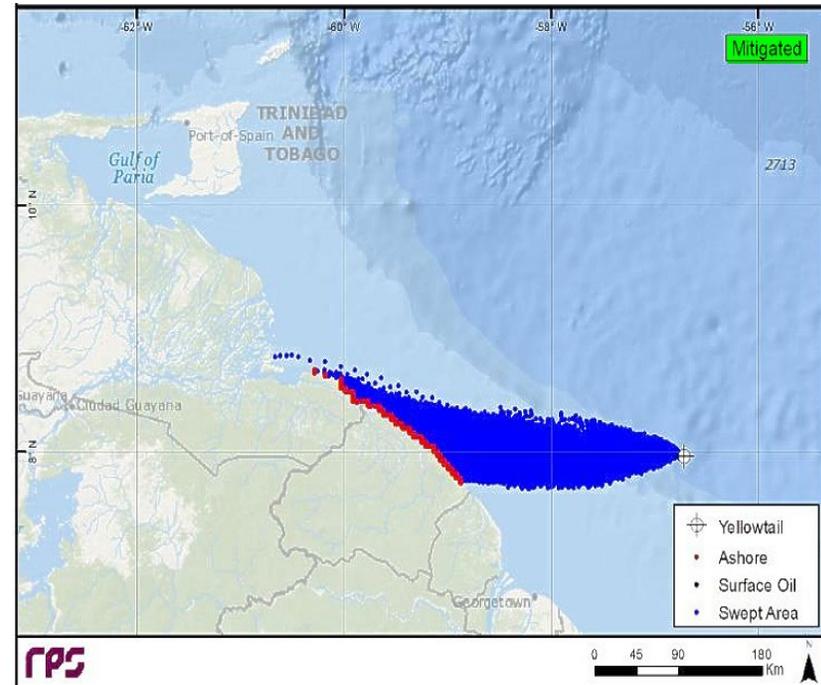
**B.11. Yellowtail Wellhead Medium WCD Release - Winter**

WCD: 177,157 BPD scenario **with 30 days** release with 45-day model simulation (Unmitigated)



**Figure B-39: Area swept by surface oil throughout 45-day model simulation for a 95th percentile minimum time to shore scenario for a 177,157 BPD WCD spill of Medium Crude at the Yellowtail wellhead during winter season. Blue area represents surface area swept. Black points represent surface oil remaining at the end of the simulation. Red points represent shoreline oil remaining at the end of the simulation**

WCD: 177,157 BPD scenario with 5.5 days release with 45-day model simulation (Mitigated)



**Figure B-40: Area swept results for the mitigated 95th percentile time to shore scenario for the 177,157 BPD WCD for 5.5 Days release of Medium Crude Oil at the Yellowtail wellhead during winter season. Blue area represents surface area swept. Black points represent surface oil remaining at the end of the simulation. Red points represent shoreline oil remaining at the end of the simulation.**

**C. WCD Modeling for Development Projects**

## **APPENDIX C – WCD MODELING FOR DEVELOPMENT PROJECTS**

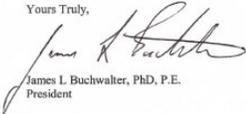
This appendix summarizes prior Development Projects deterministic modeled results and provides a description with results for the oil spill modeling conducted by Gemini Solutions Inc.

GSI Background:

- GSI completed the BP Macondo WCD study for the US government in 2011. Following the spill, GSI developed software that models WCD spill rates and well bore pressures. GSI's WCD software has been adopted by the US government and has been used in more than 1000 studies by the US government and oil companies. A summary of GSI's Macondo study can be found at the following link for the US department of interior.  
<https://www.doi.gov/sites/doi.gov/files/migrated/deepwaterhorizon/upload/FRTG-report-Appendix-E-Reservoir-Modeling-Report.pdf>
- GSI is the sole source WCD provider to the US government, as outlined in the following US government document.  
<http://www.geminisi.com/downloads/bseemerlin.pdf>
- The Merlin WCD™ simulator utilizes a discretized finite difference simulator that models black oil, volatile oil, dry gas, and gas condensate fluids. The simulator is seamlessly linked to the GSI Avalon™ nodal analysis software that builds tubing curves for the WCD application. Separate tubing curves are built and applied to the well interval above the top sand, and the well interval in the loss-of-well-control open hole section. Within the open hole section Merlin WCD™ models rates, densities, and friction changes.
- The GSI workflow and software used in the Payara WCD calculations have been adopted and sanctioned by US government agencies (BOEM and BSEE).

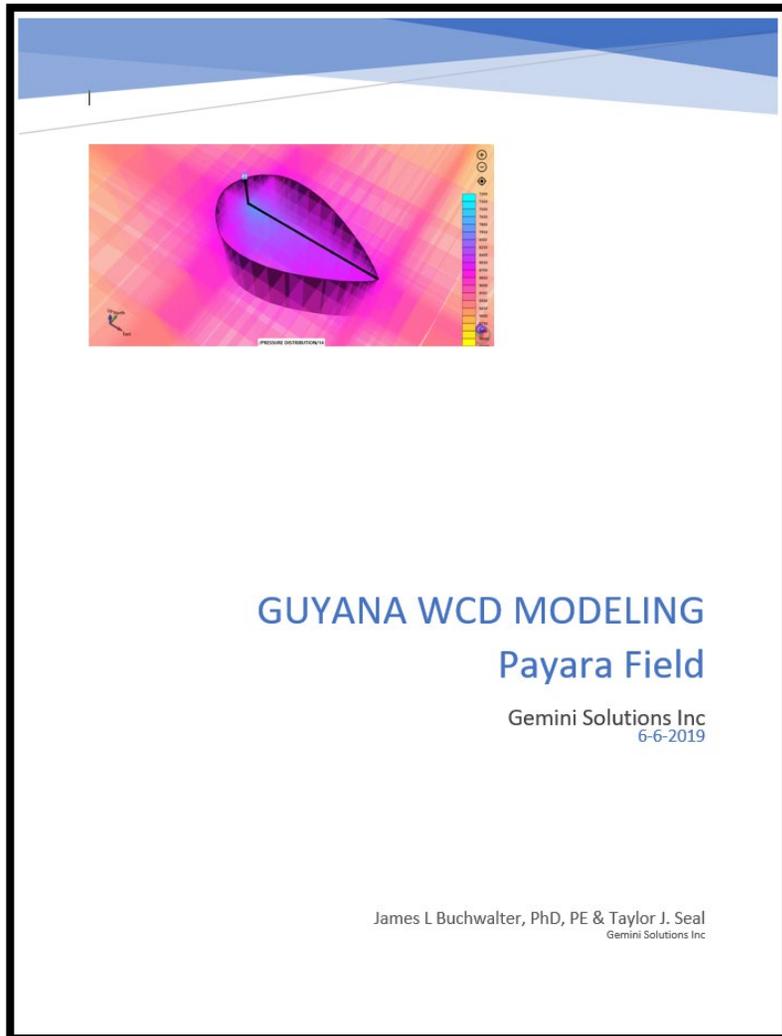
C. WCD Modeling for Development Projects

C.1. Payara - GSI WCD Summary Results & Letter

<div style="text-align: center;">  <p><b>Gemini Solutions Inc</b> Simple Interface, Advanced Features</p> <p>702 Morton Street Richmond, TX 77469 281-238-5252 <a href="http://www.geminisolutions.com">www.geminisolutions.com</a></p> </div> <p><b>Date:</b> 5/31/2019</p> <p><b>To:</b> Guyana Projects Venture Team 22777 Springwoods Village Parkway Spring, Texas, 77389</p> <p><b>From:</b> Mr. James L. Buchwalter, PhD, PE Gemini Solutions, Inc. 702 Morton Street Richmond, Texas, 77469</p> <p><b>Subject:</b> WCD Studies for Guyana – Payara project</p> <p>Gemini Solutions Inc (GSI) has completed 6 worst case discharge studies (WCD) in Guyana for the Payara project.</p> <p>For these WCD study radial models were built to study the WCD rate for the upper sands penetrated by open hole sections, and horizontal/high angle well models were built to model the target sands.</p> <p>A summary of all results is shown below for the 6 WCD wells studied.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Well</th> <th rowspan="2">Length ft</th> <th rowspan="2">Length meters</th> <th colspan="3">Summary of WCD Results</th> <th rowspan="2">Comments</th> </tr> <tr> <th>OOP MMBO</th> <th>WCD bbl/day</th> <th>MaxCap Press psia</th> </tr> </thead> <tbody> <tr> <td>RSW</td> <td>3,530</td> <td>1,076</td> <td>104</td> <td>133,043</td> <td>4,765</td> <td>Horizontal</td> </tr> <tr> <td>RAW Target</td> <td>3,654</td> <td>1,113</td> <td>183</td> <td>202,192</td> <td>5,160</td> <td>Horizontal</td> </tr> <tr> <td>RAW Top</td> <td>82</td> <td>25</td> <td>221</td> <td>49,105</td> <td>6,183</td> <td>Top section vertical well</td> </tr> <tr> <td>LizDeep</td> <td>4,659</td> <td>1,420</td> <td>154</td> <td>146,049</td> <td>6,660</td> <td>Horizontal</td> </tr> <tr> <td>PC PF</td> <td>2,818</td> <td>859</td> <td>347</td> <td>189,300</td> <td>6,366</td> <td>Horizontal</td> </tr> <tr> <td>P 27 1 Shallow</td> <td>29</td> <td>12</td> <td>108</td> <td>33,404</td> <td>5,493</td> <td>Top section vertical well</td> </tr> <tr> <td>P 27 3 Target</td> <td>2,475</td> <td>754</td> <td>127</td> <td>175,142</td> <td>5,180</td> <td>Horizontal</td> </tr> <tr> <td>P6 20 3 Shallow</td> <td>43</td> <td>13</td> <td>70</td> <td>25,151</td> <td>5,695</td> <td>Top section vertical well</td> </tr> <tr> <td>P6 20 3 Target</td> <td>2,725</td> <td>831</td> <td>254</td> <td>184,562</td> <td>5,947</td> <td>Horizontal</td> </tr> </tbody> </table> <p>Details are attached outlining the data input for each WCD study, workflows, and all results.</p> <p>A brief review of GSI experience in WCD modeling and the workflow used in these studies are included below.</p> <p>Yours Truly,</p>  <p>James L. Buchwalter, PhD, P.E. President</p>	Well	Length ft	Length meters	Summary of WCD Results			Comments	OOP MMBO	WCD bbl/day	MaxCap Press psia	RSW	3,530	1,076	104	133,043	4,765	Horizontal	RAW Target	3,654	1,113	183	202,192	5,160	Horizontal	RAW Top	82	25	221	49,105	6,183	Top section vertical well	LizDeep	4,659	1,420	154	146,049	6,660	Horizontal	PC PF	2,818	859	347	189,300	6,366	Horizontal	P 27 1 Shallow	29	12	108	33,404	5,493	Top section vertical well	P 27 3 Target	2,475	754	127	175,142	5,180	Horizontal	P6 20 3 Shallow	43	13	70	25,151	5,695	Top section vertical well	P6 20 3 Target	2,725	831	254	184,562	5,947	Horizontal	<p><b>GSI Qualifications in WCD Modeling</b></p> <p>GSI completed the BP Macondo WCD study for the US government in 2011. Following the spill GSI developed software that models WCD spill rates and well bore pressures. GSI's WCD software has been adopted by the US government and used in more than 1000 studies by the US government and oil companies.</p> <p>A summary of GSI's Macondo study can be found at the following link for the US department of interior. <a href="https://www.doi.gov/sites/doi.gov/files/migrated/deepwaterhorizon/upload/FRTG-report-Appendix-E-Reservoir-Modeling-Report.pdf">https://www.doi.gov/sites/doi.gov/files/migrated/deepwaterhorizon/upload/FRTG-report-Appendix-E-Reservoir-Modeling-Report.pdf</a></p> <p>GSI is the sole source WCD provider to the US government as outlined in the following US government document. <a href="http://www.geminisolutions.com/downloads/bseemerlin.pdf">http://www.geminisolutions.com/downloads/bseemerlin.pdf</a></p> <p>The Merlin WCD™ simulator utilizes a discretized finite difference simulator that models black oil, volatile oil, dry gas, and gas condensate fluids. The simulator is seamlessly linked to the GSI Avalon™ nodal analysis software that builds tubing curves for the WCD application. Separate tubing curves are built and applied to the well interval above the top sand, and the well interval in the blowout open hole section. Within the open hole section Merlin WCD™ models rates, densities, and friction changes.</p> <p><b>GSI Payara Field WCD Modeling Workflow</b></p> <p>The workflow and software used in the Payara WCD calculations have been adopted by US government agencies (BOEM and BSEE).</p> 
Well				Length ft	Length meters	Summary of WCD Results			Comments																																																																	
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C. WCD Modeling for Development Projects

C.1.1. Payara WCD Study Detailed Reports



Contents

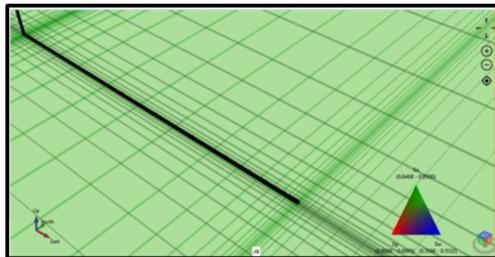
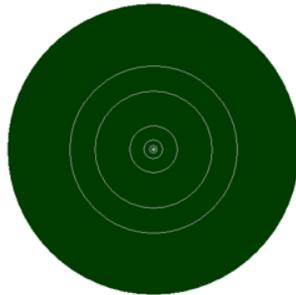
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**C. WCD Modeling for Development Projects**

**Workflow Discussion**

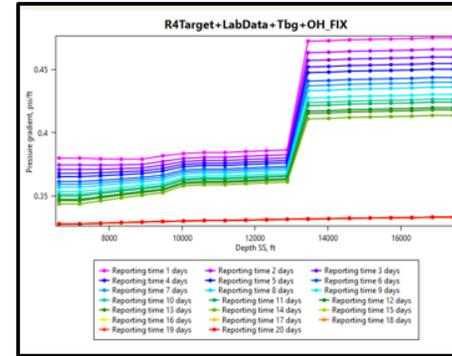
Radial models are used in vertical open hole blowout interval, and horizontal/high angle wells are used in the lower target sands. All models are built with fine grids approach 10 feet at the location of the producing wells, with cell sizes increasing by a factor of 1.5 or less in adjacent cells moving away from the well. Smaller growth factors were tested but results are almost identical. Sample grids constructed for both the radial and high angle horizontal well models are shown below.



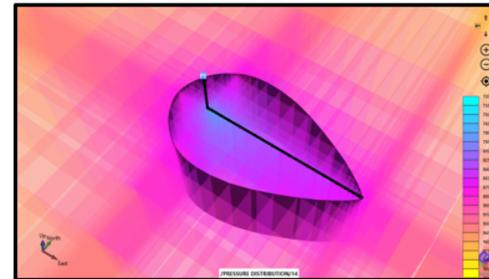
The Merlin WCD™ software includes modeling of cross flow during shut in conditions where fluids may move between producing sands after the well is capped.

For these models PVT lab reports were provided for each open hole interval.

Beggs and Brill correlation was chosen for the tubing curve correlation. A sample distribution of pressure gradient profile through the vertical wellbore depths in TVD is shown below for the R4 high angle well case. Note the gradient decrease as we move from the bottom of the well upward with a marked gradient decrease as we move to a large casing size at 13165 TVD SS. The red line at the bottom of the graph plots the gradient after the well is contained.



The plot below shows the elliptical pressure distribution around one of the target high angle/horizontal wells. Note that the pressure drop, and friction increase from the heel to the toe of the well as production increases.



**C. WCD Modeling for Development Projects**

**Input Data for WCD Modeling**

A summary for input parameters for each WCD model follows:

**Liza Deep Target Sand – Horizontal Model**

		Layer_1
Sand Top SSTVD	[ft]	19134.00
Sand Base SSTVD	[ft]	19167.00
Net Thickness TVT	[ft]	33.00
Completion here? Yes/No		Yes
Skin		0.00
Perm. Md	[mD]	300.00
Porosity	[fraction]	0.27
Water Sat.	[fraction]	0.15
Rock Compress MSips	[1/psig]	3.00
Water Salinity	[ppm]	0.00
<b>Fluids..</b>		
Initial Pressure	[psia]	10975.00
Reservoir Temp	[°F]	290.00
Fluid type Oil/Water/Gas		Oil
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	15843.05
<b>Oil data..</b>		
Bubble Point Pressure (Optional)	[psia]	5497.10
Bo/EVF @ Initial Press (Optional)	[bbl/stb]	1.9283
Bo/EVF @ Bubble Point (Optional)	[bbl/stb]	2.1190
GOR/RSI	[scf/stb]	2000.00
Oil Visc. @ Initial Press (Optional)	[cp]	0.2150
Oil Visc. @ Bubble Point (Optional)	[cp]	0.1191
Oil API	[API]	36.30
Gas Specific Grav (Rel Air)	[1/wtr]	0.82
<b>Cond data..</b>		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
<b>Relative Perm Fractions..</b>		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
<b>Kr Endpoints..</b>		
Kro		1.00
Krg		1.00
Krw		0.70

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**P6\_20\_3 Shallow Sand – Radial Model**

		Layer_1
Sand Top SSTVD	[ft]	16789.00
Sand Base SSTVD	[ft]	16832.00
Net Thickness TVT	[ft]	43.00
Completion here? Yes/No		Yes
Skin		-1.05
Perm. Md	[mD]	800.00
Porosity	[fraction]	0.28
Water Sat.	[fraction]	0.34
Rock Compress MSips	[1/psig]	3.00
Water Salinity	[ppm]	0.00
<b>Fluids..</b>		
Initial Pressure	[psia]	10066.00
Reservoir Temp	[°F]	241.00
Fluid type Oil/Water/Gas		Oil
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	1352.50
<b>Oil data..</b>		
Bubble Point Pressure (Optional)	[psia]	3295.80
Bo/EVF @ Initial Press (Optional)	[bbl/stb]	1.1919
Bo/EVF @ Bubble Point (Optional)	[bbl/stb]	1.2373
GOR/RSI	[scf/stb]	418.77
Oil Visc. @ Initial Press (Optional)	[cp]	4.5138
Oil Visc. @ Bubble Point (Optional)	[cp]	2.3631
Oil API	[API]	20.40
Gas Specific Grav (Rel Air)	[1/wtr]	0.85
<b>Cond data..</b>		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
<b>Relative Perm Fractions..</b>		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
<b>Kr Endpoints..</b>		
Kro		1.00
Krg		1.00
Krw		0.70

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**C. WCD Modeling for Development Projects**

P6\_20\_3 Target Sand – Horizontal Model

		Layer 1
Sand Top SSTVD	[ft]	17339.00
Sand Base SSTVD	[ft]	17392.00
Net Thickness TVT	[ft]	52.00
Completion here? Yes/No		Yes
Skin		0.00
Perm. Md	[mD]	400.00
Porosity	[fraction]	0.25
Water Sat.	[fraction]	0.29
Rock Compress MSips	[1/psig]	3.00
Water Salinity	[ppm]	0.00
<b>Fluids..</b>		
Initial Pressure	[psia]	10150.00
Reservoir Temp	[°F]	212.00
Fluid type Oil/Water/Gas		Oil
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	17652.78
<b>Oil data..</b>		
Bubble Point Pressure (Optional)	[psia]	5066.40
Bo/FVF @ Initial Press (Optional)	[bbl/stb]	1.5140
Bo/FVF @ Bubble Point (Optional)	[bbl/stb]	1.5827
GOR/RSI	[scf/stb]	1138.70
Oil Visc. @ Initial Press (Optional)	[cp]	0.4407
Oil Visc. @ Bubble Point (Optional)	[cp]	0.3100
Oil API	[API]	30.90
Gas Specific Grav (Rel Air)	[1/wtr]	0.80
<b>Cond data..</b>		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
<b>Relative Perm Fractions..</b>		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
<b>Kr Endpoints..</b>		
Kro		1.00
Krg		1.00
Krw		1.00

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P37\_1 Shallow Sand – Radial Model

		Layer 1	Layer 2
Sand Top SSTVD	[ft]	17169.00	17373.00
Sand Base SSTVD	[ft]	17251.00	17413.00
Net Thickness TVT	[ft]	82.00	39.00
Completion here? Yes/No		Yes	Yes
Skin		-0.66	-0.98
Perm. Md	[mD]	800.00	900.00
Porosity	[fraction]	0.28	0.30
Water Sat.	[fraction]	0.28	0.28
Rock Compress MSips	[1/psig]	3.00	3.00
Water Salinity	[ppm]	0.00	0.00
<b>Fluids..</b>			
Initial Pressure	[psia]	10066.00	10184.00
Reservoir Temp	[°F]	241.00	0.00
Fluid type Oil/Water/Gas		Water	Oil
Aquifer Size	[ac]	6703.60	0.00
Hydrocarbon Size	[ac]	0.00	2218.90
<b>Oil data..</b>			
Bubble Point Pressure (Optional)	[psia]	4165.40	0.00
Bo/FVF @ Initial Press (Optional)	[bbl/stb]	1.3333	0.0000
Bo/FVF @ Bubble Point (Optional)	[bbl/stb]	1.3952	0.0000
GOR/RSI	[scf/stb]	708.51	0.00
Oil Visc. @ Initial Press (Optional)	[cp]	1.1525	0.0000
Oil Visc. @ Bubble Point (Optional)	[cp]	0.6402	0.0000
Oil API	[API]	26.30	0.00
Gas Specific Grav (Rel Air)	[1/wtr]	0.86	0.00
<b>Cond data..</b>			
Condensate API	[API]		
Wet Gas Grav (Rel Air)	[1/wtr]		
Condensate Yield	[stb/MMscf]		
<b>Relative Perm Fractions..</b>			
Residual Oil to Gas		0.05	0.05
Residual Oil to Wat		0.15	0.15
Critical Gas		0.05	0.05
Residual Gas to Wat		0.05	
<b>Kr Endpoints..</b>			
Kro		1.00	0.05
Krg		1.00	1.00
Krw		1.00	0.70

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**c. WCD Modeling for Development Projects**

P37\_1 Target Sand – Horizontal Model

		Layer 1
Sand Top SSTVD	[ft]	17728.00
Sand Base SSTVD	[ft]	17787.00
Net Thickness TVT	[ft]	59.00
Completion here? Yes/No		Yes
Skin		0.00
Perm. Md	[mD]	900.00
Porosity	[fraction]	0.26
Water Sat.	[fraction]	0.27
Rock Compress MSips	[1/psig]	3.00
Water Salinity	[ppm]	0.00
<b>Fluids..</b>		
Initial Pressure	[psia]	10150.00
Reservoir Temp	[°F]	212.00
Fluid type Oil/Water/Gas		Oil
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	6961.89
<b>Oil data..</b>		
Bubble Point Pressure (Optional)	[psia]	5066.40
Bo/FVF @ Initial Press (Optional)	[bbl/stb]	1.5140
Bo/FVF @ Bubble Point (Optional)	[bbl/stb]	1.5827
GOR/RSI	[scf/stb]	1138.70
Oil Visc. @ Initial Press (Optional)	[cp]	0.4407
Oil Visc. @ Bubble Point (Optional)	[cp]	0.3100
Oil API	[API]	30.90
Gas Specific Grav (Rel Air)	[1/wtr]	0.80
<b>Cond data..</b>		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
<b>Relative Perm Fractions..</b>		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
<b>Kr Endpoints..</b>		
Kro		1.00
Krg		1.00
Krw		1.00

PC\_P6 Target Sand – Horizontal Model

		Layer 1
<b>Sand Name (Optional)</b>		
Sand Top SSTVD	[ft]	17815.00
Sand Base SSTVD	[ft]	17867.00
Net Thickness TVT	[ft]	52.00
Completion here? Yes/No		Yes
Skin		0.00
Perm. Md	[mD]	1000.00
Porosity	[fraction]	0.29
Water Sat.	[fraction]	0.22
Rock Compress MSips	[1/psig]	3.00
Water Salinity	[ppm]	0.00
<b>Fluids..</b>		
Initial Pressure	[psia]	10400.00
Reservoir Temp	[°F]	242.00
Fluid type Oil/Water/Gas		Oil
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	18927.45
<b>Oil data..</b>		
Bubble Point Pressure (Optional)	[psia]	5747.30
Bo/FVF @ Initial Press (Optional)	[bbl/stb]	1.5832
Bo/FVF @ Bubble Point (Optional)	[bbl/stb]	1.6520
GOR/RSI	[scf/stb]	1258.50
Oil Visc. @ Initial Press (Optional)	[cp]	0.4023
Oil Visc. @ Bubble Point (Optional)	[cp]	0.2617
Oil API	[API]	30.40
Gas Specific Grav (Rel Air)	[1/wtr]	0.78
<b>Cond data..</b>		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
<b>Relative Perm Fractions..</b>		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
<b>Kr Endpoints..</b>		
Kro		1.00
Krg		1.00
Krw		1.00

**C. WCD Modeling for Development Projects**

R4W Shallow Sand – Radial Model

		Layer 1
Sand Top SSTVD	[ft]	17178.84
Sand Base SSTVD	[ft]	17260.86
Net Thickness TVI	[ft]	82.02
Completion here? Yes/No		Yes
Skin		-1.19
Perm. Md	[mD]	800.00
Porosity	[fraction]	0.28
Water Sat.	[fraction]	0.34
Rock Compress MSips	[1/psig]	3.00
Water Salinity	[ppm]	0.00
<b>Fluids..</b>		
Initial Pressure	[psia]	10066.00
Reservoir Temp	[°F]	241.00
Fluid type Oil/Water/Gas		
Aquifer Size	[ac]	14400.00
Hydrocarbon Size	[ac]	2249.50
<b>Oil data..</b>		
Bubble Point Pressure (Optional)	[psia]	3295.80
Bo/FVF @ Initial Press (Optional)	[bbl/stb]	1.1919
Bo/FVF @ Bubble Point (Optional)	[bbl/stb]	1.2373
GOR/RSI	[scf/stb]	418.77
Oil Visc. @ Initial Press (Optional)	[cp]	4.5138
Oil Visc. @ Bubble Point (Optional)	[cp]	2.3631
Oil API	[API]	20.40
Gas Specific Grav (Rel Air)	[1/wtr]	0.85
<b>Cond data..</b>		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
<b>Relative Perm Fractions..</b>		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
<b>Kr Endpoints..</b>		
Kro		1.00
Krg		1.00
Krw		0.70

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R4W Target Sand – Horizontal Model

		Layer 1
Sand Top SSTVD	[ft]	17440.95
Sand Base SSTVD	[ft]	17506.57
Net Thickness TVI	[ft]	65.62
Completion here? Yes/No		Yes
Skin		0.00
Perm. Md	[mD]	900.00
Porosity	[fraction]	0.30
Water Sat.	[fraction]	0.28
Rock Compress MSips	[1/psig]	3.00
Water Salinity	[ppm]	0.00
<b>Fluids..</b>		
Initial Pressure	[psia]	10184.00
Reservoir Temp	[°F]	247.00
Fluid type Oil/Water/Gas		
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	6970.40
<b>Oil data..</b>		
Bubble Point Pressure (Optional)	[psia]	4165.40
Bo/FVF @ Initial Press (Optional)	[bbl/stb]	1.3330
Bo/FVF @ Bubble Point (Optional)	[bbl/stb]	1.3950
GOR/RSI	[scf/stb]	708.50
Oil Visc. @ Initial Press (Optional)	[cp]	1.1520
Oil Visc. @ Bubble Point (Optional)	[cp]	0.6400
Oil API	[API]	26.30
Gas Specific Grav (Rel Air)	[1/wtr]	0.86
<b>Cond data..</b>		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
<b>Relative Perm Fractions..</b>		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
<b>Kr Endpoints..</b>		
Kro		1.00
Krg		1.00
Krw		0.70

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**C. WCD Modeling for Development Projects**

R5W Target Sand – Horizontal Model

		Layer 1
Sand Top SSTVD	[ft]	17165.36
Sand Base SSTVD	[ft]	17214.57
Net Thickness TVT	[ft]	49.21
Completion here? Yes/No		Yes
Skin		0.00
Perm. Md	[mD]	800.00
Porosity	[fraction]	0.28
Water Sat.	[fraction]	0.34
Rock Compress MSips	[1/psig]	3.00
Water Salinity	[ppm]	0.00
<b>Fluids..</b>		
Initial Pressure	[psia]	10066.00
Reservoir Temp	[°F]	241.00
Fluid type Oil/Water/Gas		
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	5533.13
<b>Oil data..</b>		
Bubble Point Pressure (Optional)	[psia]	3295.80
Bo/FVF @ Initial Press (Optional)	[bbl/stb]	1.1916
Bo/FVF @ Bubble Point (Optional)	[bbl/stb]	1.2370
GOR/RSI	[scf/stb]	418.80
Oil Visc. @ Initial Press (Optional)	[cp]	4.5138
Oil Visc. @ Bubble Point (Optional)	[cp]	2.3631
Oil API	[API]	20.40
Gas Specific Grav (Rel Air)	[1/wtr]	0.85
<b>Cond data..</b>		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
<b>Relative Perm Fractions..</b>		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
<b>Kr Endpoints..</b>		
Kro		1.00
Krg		1.00
Krw		0.70

**WCD Results**

Summary of results for each WCD model follows. Detailed results are provided in Excel sheets included with the report.

The following results are based on the reservoir parameters listed in the previous section. The reservoir parameters provided by EEPGL represent estimates of properties consistent with available data in vicinity of the wells. Using data provided, established workflows used are appropriate for WCD calculations. In-place volumes showed below are calculated from the input parameters and may not align with volumes based on more detailed subsurface characterization informed by combination of geologic concepts and subsurface data from multiple wells and reservoirs in the field.

**c. WCD Modeling for Development Projects**

Liza Deep Target Sand – Horizontal Model

Model specifications			
Parameter	Value	Units	Notes
Kv/Kh	0.3	mD/mD	assumed
Open Hole Diam.	9.5	in.	Well Schematic
Wellbore Radius	0.396	ft	calculated
Shut-in Day	21	days	
Relief Well Day	45	days	
Growth Factor for Grid Build	1.5	unitless	smaller growth factors don't effect answers
Minimum Cell Size	10	ft	
Cased Hole Roughness	0.0018	unitless	assumed
Open Hole Roughness	0.2	unitless	assumed
Nodal Correlation	Beggs & Brill		
Tubing Vertical Length	12900	ft	Includes Open-Hole section
	3932	m	

Geology Specifications			
Parameter	Value	Units	Notes
Horizontal Well Length	4579	ft	
	1396	m	
Water Depth	6234	ft	
	1900	m	
Salt Water Gradient	0.465	psi/ft	
P @ Mudline	2899	psia	
Sand Top	19134	ft	
	5832	m	

WCD Rate (bbls/day)	146,049
Cum Oil. (M bbl) Day 45	5,245
Cap Pressure (psia) Day 22	6996.1
Max Cap Pressure (psia)	6660.7
OOIP (M bbl)	153,628
OGIP (MM cu ft)	306,948
OWIP (M bbl)	50,157

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P6\_20\_3 Shallow Sand – Radial Model

Model specifications			
Parameter	Value	Units	Notes
Kv/Kh	0.3	mD/mD	assumed
Open Hole Diam.	12.25	in.	Well Schematic
Wellbore Radius	0.510	ft	calculated
Shut-in Day	21	days	
Relief Well Day	45	days	
Growth Factor for Grid Build	1.5	unitless	smaller growth factors don't effect answers
Minimum Cell Size	10	ft	
Cased Hole Roughness	0.0018	unitless	assumed
Open Hole Roughness	0.2	unitless	assumed
Nodal Correlation	Beggs & Brill		
Tubing Vertical Length	10556	ft	To Top of Structure
	3291	m	

Geology Specifications			
Parameter	Value	Units	Notes
Water Depth	6234	ft	
	1900	m	
Salt Water Gradient	0.465	psi/ft	
P @ Mudline	2899	psia	
Oil Sand Top	16789	ft	
	5117	m	

WCD Rate (bbl/day)	25,151
Cum Oil. (M bbl) Day 45	858
Cap Pressure (psia) Day 22	5,392
Max Cap Pressure (psia)	5,695
OOIP (M bbl)	70,081
OGIP (MM cu ft)	29,153
OWIP (M bbl)	42,095

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**c. WCD Modeling for Development Projects**

P6\_20\_3 Target Sand – Horizontal Model

Model specifications			
Parameter	Value	Units	Notes
Kv/Kh	0.3	mD/mD	assumed
Open Hole Diam.	9.5	in.	Well Schematic
Wellbore Radius	0.396	ft	calculated
Shut-in Day	21	days	
Relief Well Day	45	days	
Growth Factor for Grid Build	1.5	unitless	smaller growth factors don't effect answers
Minimum Cell Size	10	ft	
Cased Hole Roughness	0.0018	unitless	assumed
Open Hole Roughness	0.2	unitless	assumed
Nodal Correlation			
Tubing Vertical Length	11105	ft	To Top of Structure
	3462	m	
Geology Specifications			
Parameter	Value	Units	Notes
Horizontal Well Length	2725	ft	TOS - Bottom of Survey
	831	m	
Water Depth	6234	ft	
	1900	m	
Salt Water Gradient	0.465	psi/ft	
P @ Mudline	2899	psia	
Oil Sand Top	17339	ft	
	5282	m	

WCD Rate (bbl/day)	184,562
Cum Oil. (Mbb) Day 45	6,323
Cap Pressure (psia) Day 22	5,575
Max Cap Pressure (psia)	5,947
OOIP (M bbl)	266,106
OGIP (MM cu ft)	302,152
OWIP (M bbl)	161,662

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P37\_1 Shallow Sand – Radial Model

Model specifications			
Parameter	Value	Units	Notes
Kv/Kh	0.3	mD/mD	assumed
Open Hole Diam.	12.25	in.	Well Schematic
Wellbore Radius	0.510	ft	calculated
Shut-in Day	21	days	
Relief Well Day	45	days	
Growth Factor for Grid Build	1.5	unitless	smaller growth factors don't effect answers
Minimum Cell Size	10	ft	
Cased Hole Roughness	0.0018	unitless	assumed
Open Hole Roughness	0.2	unitless	assumed
Nodal Correlation			
Tubing Vertical Length	10295	ft	To Top of Structure
	3209	m	
Geology Specifications			
Parameter	Value	Units	Notes
Water Depth	6873	ft	
	2095	m	
Salt Water Gradient	0.465	psi/ft	
P @ Mudline	3196	psia	
Water Sand Top	17169	ft	
	5233	m	
Oil Sand Top	17373	ft	
	5295	m	

WCD Rate (bbl/day)	33,404
Cum Oil. (Mbb) Day 45	1,295
Cap Pressure (psia) Day 22	5,418
Max Cap Pressure (psia)	5,493
OOIP (M bbl)	108,808
OGIP (MM cu ft)	76,666
OWIP (MM bbl)	1,222

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**c. WCD Modeling for Development Projects**

P37\_1 Target Sand – Horizontal Model

Model specifications			
Parameter	Value	Units	Notes
Kv/Kh	0.3	mD/mD	assumed
Open Hole Diam.	9.5	in.	Well Schematic
Wellbore Radius	0.396	ft	calculated
Shut-in Day	21	days	
Relief Well Day	45	days	
Growth Factor for Grid Build	1.5	unitless	smaller growth factors don't effect answers
Minimum Cell Size	10	ft	
Cased Hole Roughness	0.0018	unitless	assumed
Open Hole Roughness	0.2	unitless	assumed
Nodal Correlation	Beggs & Brill		
Tubing Vertical Length	10855	ft	To Top of Structure
	3384	m	

Geology Specifications			
Parameter	Value	Units	Notes
Horizontal Well Length	2475	ft	TOS - Bottom of Survey
	754	m	
Water Depth	6873	ft	
	2095	m	
Salt Water Gradient	0.465	psi/ft	
P @ Mudline	3196	psia	
Oil Sand Top	17728	ft	
	5233	m	

WCD Rate (bbl/day)	175,142
Cum Oil. (Mbb) Day 45	5,359
Cap Pressure (psia) Day 22	5,166
Max Cap Pressure (psia)	5,180
OOIP (M bbl)	127,327
OGIP (MM cuft)	144,574
OWIP (M bbl)	70,044

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PC\_P6 Target Sand – Horizontal Model

Model specifications			
Parameter	Value	Units	Notes
Kv/Kh	0.3	mD/mD	assumed
Open Hole Diam.	9.5	in.	Well Schematic
Wellbore Radius	0.396	ft	calculated
Shut-in Day	21	days	
Relief Well Day	45	days	
Growth Factor for Grid Build	1.5	unitless	smaller growth factors don't effect answers
Minimum Cell Size	10	ft	
Cased Hole Roughness	0.0018	unitless	assumed
Open Hole Roughness	0.2	unitless	assumed
Nodal Correlation	Beggs & Brill		
Tubing Vertical Length	11125	ft	in
	3391	m	

Geology Specifications			
Parameter	Value	Units	Notes
Horizontal Well Length	2818	ft	TOS - Bottom of survey
	858.9	m	
Water Depth	6677	ft	
	2035	m	
Salt Water Gradient	0.465	psi/ft	
P @ Mudline	3105	psia	
Sand Top	19134	ft	
	5832	m	

WCD Rate (bbl/day)	189,300
Cum Oil. (Mbb) Day 45	7,200
Cap Pressure (psia) Day 22	6,274
Max Cap Pressure (psia)	6,366
OOIP (M bbl)	347,597
OGIP (MM cuft)	436,147
OWIP (M bbl)	152,026

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**c. WCD Modeling for Development Projects**

R4W Shallow Sand – Radial Model

Model specifications			
Parameter	Value	Units	Notes
Kv/Kh	0.3	mD/mD	assumed
Open Hole Diam.	9.5	in.	Well Schematic
Wellbore Radius	0.396	ft	calculated
Shut-in Day	21	days	
Relief Well Day	45	days	
Growth Factor for Grid Build	1.5	unitless	smaller growth factors don't effect answers
Minimum Cell Size	10	ft	
Cased Hole Roughness	0.0018	unitless	assumed
Open Hole Roughness	0.2	unitless	assumed
Nodal Correlation	Beggs & Brill		
Tubing True Vertical Length	10555	ft	depth to top sand
	3217	m	

Geology Specifications			
Parameter	Value	Units	Notes
Sand Thickness	82	ft	
	25	m	
Water Depth	6624	ft	
	2019	m	
Salt Water Gradient	0.465	psi/ft	
P @ Mudline	3080	psia	
Sand Top	17178	ft	
	5236	m	

WCD Rate (bbl/day)	49,105
Cum Oil. (Mbbbl) Day 45	1,672
Cap Pressure (psia) Day 22	5587.4
Max Cap Pressure (psia)	6182.8
OOIP (M bbl)	221,919
OGIP (MM cu ft)	92,943
OWIP (MM bbl)	2,595

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R4W Target Sand – Horizontal Model

Model specifications			
Parameter	Value	Units	Notes
Kv/Kh	0.3	mD/mD	assumed
Open Hole Diam.	9.5	in.	Well Schematic
Wellbore Radius	0.396	ft	calculated
Shut-in Day	21	days	
Relief Well Day	45	days	
Growth Factor for Grid Build	1.5	unitless	smaller growth factors don't effect answers
Minimum Cell Size	10	ft	
Cased Hole Roughness	0.0018	unitless	assumed
Open Hole Roughness	0.2	unitless	assumed
Nodal Correlation	Beggs & Brill		
Tubing True Vertical Length	10816	ft	to top sand
	3297	m	

Geology Specifications			
Parameter	Value	Units	Notes
Length in sand	3290	ft	
	1003	m	
Water Depth	6624	ft	
	2019	m	
Salt Water Gradient	0.465	psi/ft	
P @ Mudline	3080	psia	
Sand Top	17741	ft	
	5316	m	

WCD Rate (bbl/day)	202,192
Cum Oil. (Mbbbl) Day 45	6,113
Cap Pressure (psia) Day 22	5048.6
Max Cap Pressure (psia)	5160.3
OOIP (M bbl)	183,008
OGIP (MM cu ft)	129,904
OWIP (M bbl)	92,860

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**c. WCD Modeling for Development Projects**

R5W Target Sand – Horizontal Model

Model specifications			
Parameter	Value	Units	Notes
Kv/Kh	0.3	mD/mD	assumed
Open Hole Diam.	9.5	in.	Well Schematic
Wellbore Radius	0.396	ft	calculated
Shut-in Day	21	days	
Relief Well Day	45	days	
Growth Factor for Grid Build	1.5	unitless	smaller growth factors don't effect answers
Minimum Cell Size	10	ft	
Cased Hole Roughness	0.0018	unitless	assumed
Open Hole Roughness	0.2	unitless	assumed
Nodal Correlation	Beggs & Brill		
Tubing True Vertical Length	10932	ft	to top sand
	3332	m	

Geology Specifications			
Parameter	Value	Units	Notes
Length in sand	3533	ft	
	1077	m	
Water Depth	6234	ft	
	1900	m	
Salt Water Gradient	0.465	psi/ft	
P @ Mudline	2899	psia	
Sand Top	17165	ft	
	5232	m	

WCD Rate (bbl/day)	133,042
Cum Oil. (Mbbbl) Day 45	2,801
Cap Pressure (psia) Day 22	4318.1
Max Cap Pressure (psia)	4755.5

OOIP (M bbl)	104,416
OGIP (MM bbl)	43,950
OWIP (M bbl)	62,729

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**C. WCD Modeling for Development Projects**

**C.2. References**

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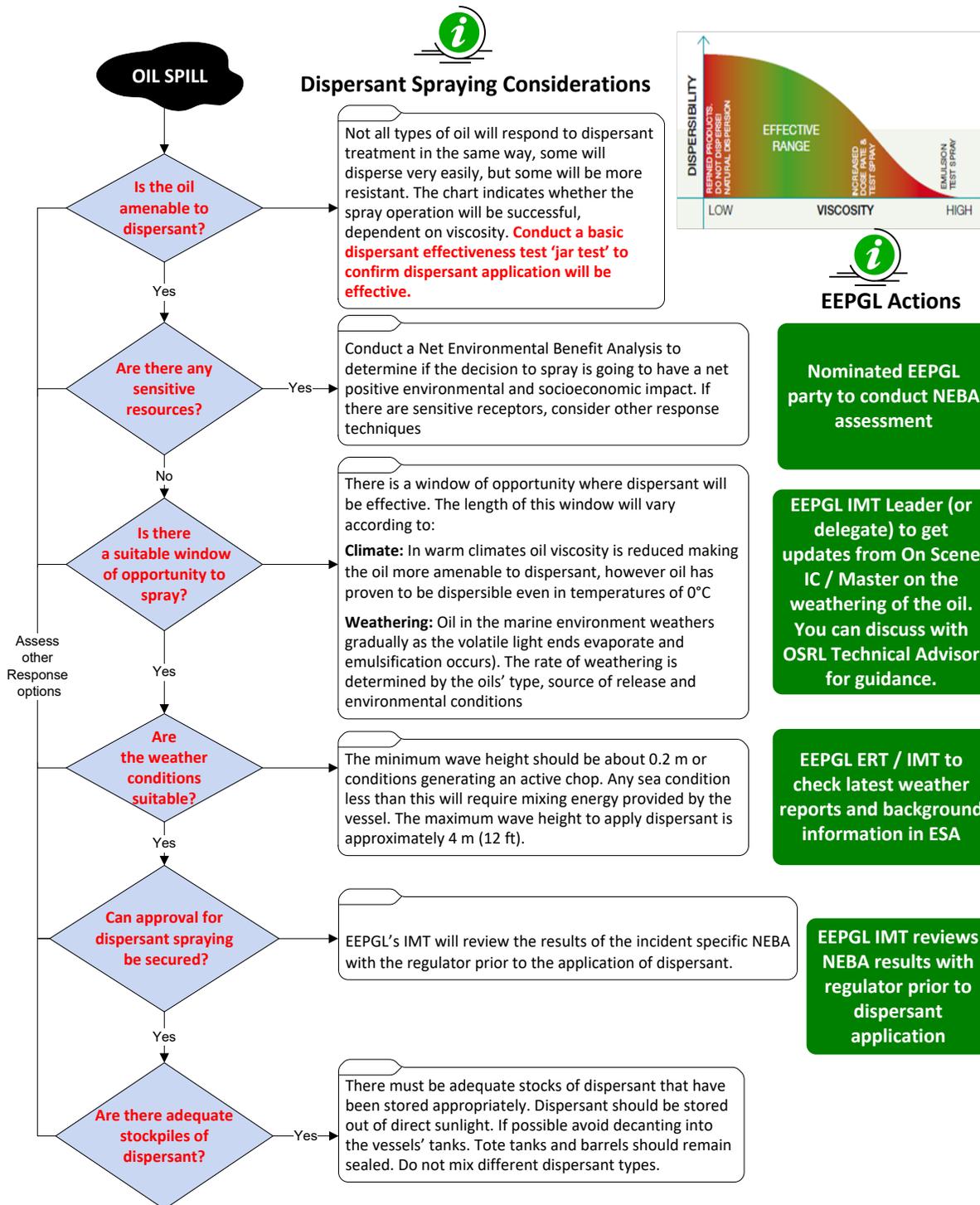
**c. WCD Modeling for Development Projects**

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D. Dispersant Information

APPENDIX D – DISPERSANT INFORMATION

D.1. Dispersant Spraying Considerations



°C = degrees Celsius; ERT = Emergency Response Team; ESA = socio-economically sensitive areas; EEPGL = Esso Exploration and Production Guyana Limited; ft = feet; IMT = Incident Management Team; IC = Incident Commander; m = meter; NEBA = Net Environmental Benefit Analysis

D. Dispersant Information

D.2. Safety Data Sheets

	<b>MATERIAL SAFETY DATA SHEET</b>		
	<table border="1" style="width: 100%;"> <tr> <td style="text-align: center;"> <b>PRODUCT</b>  <b>COREXIT® 9500</b> </td> </tr> </table>		
<b>PRODUCT</b> <b>COREXIT® 9500</b>			
<b>EMERGENCY TELEPHONE NUMBER(S)</b> (800) 424-9300 (24 Hours) CHEMTREC			
<b>1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION</b>			
PRODUCT NAME :	COREXIT® 9500		
APPLICATION :	OIL SPILL DISPERSANT		
COMPANY IDENTIFICATION :	Nalco Energy Services, L.P. P.O. Box 87 Sugar Land, Texas 77487-0087		
EMERGENCY TELEPHONE NUMBER(S) :	(800) 424-9300 (24 Hours) CHEMTREC		
NFPA 704M/HMIS RATING HEALTH: 1/1 FLAMMABILITY: 1/1 INSTABILITY: 0/0 OTHER: 0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme			
<b>2. COMPOSITION/INFORMATION ON INGREDIENTS</b>			
Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).			
	Hazardous Substance(s)	CAS NO	% (w/w)
	Distillates, petroleum, hydrotreated light	64742-47-8	10.0 - 30.0
	Propylene Glycol	57-55-8	1.0 - 5.0
	Organic sulfonic acid salt	Proprietary	10.0 - 30.0
<b>3. HAZARDS IDENTIFICATION</b>			
<b>**EMERGENCY OVERVIEW**</b>			
<b>WARNING</b> Combustible. Keep away from heat. Keep away from sources of ignition - No smoking. Keep container tightly closed. Do not get in eyes, on skin, on clothing. Do not take internally. Avoid breathing vapor. Use with adequate ventilation. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap and water. Wear suitable protective clothing. Low Fire Hazard; liquids may burn upon heating to temperatures at or above the flash point. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of sulfur (SOx) under fire conditions.			
PRIMARY ROUTES OF EXPOSURE : Eye, Skin			
HUMAN HEALTH HAZARDS - ACUTE :			
EYE CONTACT : May cause irritation with prolonged contact.			
Nalco Energy Services, L.P. P.O. Box 87 • Sugar Land, Texas 77487-0087 • (281)263-7000 For additional copies of an MSDS visit <a href="http://www.nalco.com">www.nalco.com</a> and request access 1 / 10			

D. Dispersant Information

	<b>MATERIAL SAFETY DATA SHEET</b>
	<b>PRODUCT</b> <b>COREXIT® 9500</b>
<b>EMERGENCY TELEPHONE NUMBER(S)</b> <b>(800) 424-9300 (24 Hours) CHEMTREC</b>	
<b>SKIN CONTACT :</b> May cause irritation with prolonged contact.	
<b>INGESTION :</b> Not a likely route of exposure. Can cause chemical pneumonia if aspirated into lungs following ingestion.	
<b>INHALATION :</b> Repeated or prolonged exposure may irritate the respiratory tract.	
<b>SYMPTOMS OF EXPOSURE :</b> <b>Acute :</b> A review of available data does not identify any symptoms from exposure not previously mentioned. <b>Chronic :</b> Frequent or prolonged contact with product may defat and dry the skin, leading to discomfort and dermatitis.	
<b>AGGRAVATION OF EXISTING CONDITIONS :</b> Skin contact may aggravate an existing dermatitis condition.	
<b>4.</b>	<b>FIRST AID MEASURES</b>
<b>EYE CONTACT :</b> Immediately flush with plenty of water for at least 15 minutes. If symptoms develop, seek medical advice.	
<b>SKIN CONTACT :</b> Immediately wash with plenty of soap and water. If symptoms develop, seek medical advice.	
<b>INGESTION :</b> Do not induce vomiting: contains petroleum distillates and/or aromatic solvents. If conscious, washout mouth and give water to drink. Get medical attention.	
<b>INHALATION :</b> Remove to fresh air, treat symptomatically. Get medical attention.	
<b>NOTE TO PHYSICIAN :</b> Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.	
<b>5.</b>	<b>FIRE FIGHTING MEASURES</b>
<b>FLASH POINT :</b>	181.4 °F / 83 °C ( PMCC )
<b>LOWER EXPLOSION LIMIT :</b>	Not flammable
<b>UPPER EXPLOSION LIMIT :</b>	Not flammable
<b>Nalco Energy Services, L.P. P.O. Box 87 • Sugar Land, Texas 77487-0087 • (281)263-7000</b> For additional copies of an MSDS visit <a href="http://www.nalco.com">www.nalco.com</a> and request access 2 / 10	

D. Dispersant Information

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	<b>PRODUCT</b> <b>COREXIT® 9500</b>
<b>EMERGENCY TELEPHONE NUMBER(S)</b> <b>(800) 424-9300 (24 Hours) CHEMTREC</b>	
<b>EXTINGUISHING MEDIA :</b> Alcohol foam, Carbon dioxide, Foam, Dry powder, Other extinguishing agent suitable for Class B fires, For large fires, use water spray or fog, thoroughly drenching the burning material. Water mist may be used to cool closed containers.	
<b>UNSUITABLE EXTINGUISHING MEDIA :</b> Do not use water unless flooding amounts are available.	
<b>FIRE AND EXPLOSION HAZARD :</b> Low Fire Hazard; liquids may burn upon heating to temperatures at or above the flash point. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of sulfur (SOx) under fire conditions.	
<b>SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :</b> In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.	
<b>6.</b>	<b>ACCIDENTAL RELEASE MEASURES</b>
<b>PERSONAL PRECAUTIONS :</b> Restrict access to area as appropriate until clean-up operations are complete. Stop or reduce any leaks if it is safe to do so. Ventilate spill area if possible. Do not touch spilled material. Remove sources of ignition. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.	
<b>METHODS FOR CLEANING UP :</b> <b>SMALL SPILLS:</b> Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. <b>LARGE SPILLS:</b> Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Clean contaminated surfaces with water or aqueous cleaning agents. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).	
<b>ENVIRONMENTAL PRECAUTIONS :</b> Do not contaminate surface water.	
<b>7.</b>	<b>HANDLING AND STORAGE</b>
<b>HANDLING :</b> Use with adequate ventilation. Keep the containers closed when not in use. Do not take internally. Do not get in eyes, on skin, on clothing. Have emergency equipment (for fires, spills, leaks, etc.) readily available.	
<b>STORAGE CONDITIONS :</b> Store away from heat and sources of ignition. Store separately from oxidizers. Store the containers tightly closed.	
<b>SUITABLE CONSTRUCTION MATERIAL :</b> Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.	
<hr/> <b>Nalco Energy Services, L.P.</b> P.O. Box 87 • Sugar Land, Texas 77487-0087 • (281)263-7000 For additional copies of an MSDS visit <a href="http://www.nalco.com">www.nalco.com</a> and request access 3 / 10	

**D. Dispersant Information**



**MATERIAL SAFETY DATA SHEET**

PRODUCT

**COREXIT® 9500**

EMERGENCY TELEPHONE NUMBER(S)  
(800) 424-9300 (24 Hours) CHEMTREC

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**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

**OCCUPATIONAL EXPOSURE LIMITS :**  
Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

**ACGIH/TLV :**  
Substance(s)  
Oil Mist

TWA: 5 mg/m3
STEL: 10 mg/m3

Propylene Glycol

**OSHA/PEL :**  
Substance(s)  
Oil Mist

TWA: 5 mg/m3
STEL: 10 mg/m3

Propylene Glycol

**AIHA/WEEL :**  
Substance(s)

**ENGINEERING MEASURES :**  
General ventilation is recommended.

**RESPIRATORY PROTECTION :**  
Where concentrations in air may exceed the limits given in this section, the use of a half face filter mask or air supplied breathing apparatus is recommended. A suitable filter material depends on the amount and type of chemicals being handled. Consider the use of filter type: Multi-contaminant cartridge, with a Particulate pre-filter. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

**HAND PROTECTION :**  
Nitrile gloves, PVC gloves

**SKIN PROTECTION :**  
Wear standard protective clothing.

**EYE PROTECTION :**  
Wear chemical splash goggles.

**HYGIENE RECOMMENDATIONS :**  
Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

**HUMAN EXPOSURE CHARACTERIZATION :**  
Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

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 4 / 10

**D. Dispersant Information**



**MATERIAL SAFETY DATA SHEET**

PRODUCT

**COREXIT® 9500**

EMERGENCY TELEPHONE NUMBER(S)  
(800) 424-9300 (24 Hours) CHEMTREC

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**9. PHYSICAL AND CHEMICAL PROPERTIES**

PHYSICAL STATE	Liquid
APPEARANCE	Clear Hazy Amber
ODOR	Hydrocarbon
SPECIFIC GRAVITY	0.95 @ 60 °F / 15.6 °C
DENSITY	7.91 lb/gal
SOLUBILITY IN WATER	Miscible
pH (100 %)	6.2
VISCOSITY	177 cps @ 32 °F / 0 °C 70 cps @ 60 °F / 15.6 °C @ 104 °F / 40 °C
VISCOSITY	@ 32 °F / 0 °C @ 60 °F / 15.6 °C 22.5 cst @ 104 °F / 40 °C
POUR POINT	< -71 °F / < -57 °C
BOILING POINT	296 °F / 147 °C
VAPOR PRESSURE	15.5 mm Hg @ 100 °F / 37.8 °C

Note: These physical properties are typical values for this product and are subject to change.

**10. STABILITY AND REACTIVITY**

STABILITY :  
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :  
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :  
Heat

MATERIALS TO AVOID :  
Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :  
Under fire conditions: Oxides of carbon, Oxides of sulfur

**11. TOXICOLOGICAL INFORMATION**

No toxicity studies have been conducted on this product.

SENSITIZATION :  
This product is not expected to be a sensitizer.

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**D. Dispersant Information**



**MATERIAL SAFETY DATA SHEET**

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**CARCINOGENICITY :**  
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

**HUMAN HAZARD CHARACTERIZATION :**  
Based on our hazard characterization, the potential human hazard is: Moderate

**12. ECOLOGICAL INFORMATION**

**ECOTOXICOLOGICAL EFFECTS :**

The following results are for the product.

**ACUTE INVERTEBRATE RESULTS :**

Species	Exposure	LC50	EC50	Test Descriptor
Acartia tonsa	48 hrs	34 mg/l		Product
Artemia	48 hrs	20.7 mg/l		Product

**MOBILITY :**  
The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models. If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air	Water	Soil/Sediment
<5%	10 - 30%	50 - 70%

The portion in water is expected to float on the surface.

**BIOACCUMULATION POTENTIAL**  
Component substances have a potential to bioconcentrate.

**ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION**  
Based on our hazard characterization, the potential environmental hazard is: Low  
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

If released into the environment, see CERCLA/SUPERFUND in Section 15.

**13. DISPOSAL CONSIDERATIONS**

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

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**D. Dispersant Information**

	<b>MATERIAL SAFETY DATA SHEET</b>													
	<table border="1"> <tr> <td>PRODUCT</td> </tr> <tr> <td>COREXIT® 9500</td> </tr> </table>		PRODUCT	COREXIT® 9500										
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(800) 424-9300 (24 Hours) CHEMTREC														
<p>Hazardous Waste: D018</p> <p>Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.</p>														
<b>14. TRANSPORT INFORMATION</b>														
<p>The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.</p>														
<p>LAND TRANSPORT :</p>														
<p>For Packages Less Than Or Equal To 119 Gallons:</p> <table border="0"> <tr> <td style="padding-right: 20px;">Proper Shipping Name :</td> <td>PRODUCT IS NOT REGULATED DURING TRANSPORTATION</td> </tr> </table>			Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION										
Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION													
<p>For Packages Greater Than 119 Gallons:</p> <table border="0"> <tr> <td style="padding-right: 20px;">Proper Shipping Name :</td> <td>COMBUSTIBLE LIQUID, N.O.S.</td> </tr> <tr> <td style="padding-right: 20px;">Technical Name(s) :</td> <td>PETROLEUM DISTILLATES</td> </tr> <tr> <td style="padding-right: 20px;">UN/ID No :</td> <td>NA 1993</td> </tr> <tr> <td style="padding-right: 20px;">Hazard Class - Primary :</td> <td>COMBUSTIBLE</td> </tr> <tr> <td style="padding-right: 20px;">Packing Group :</td> <td>III</td> </tr> <tr> <td style="padding-right: 20px;">Flash Point :</td> <td>83 °C / 181.4 °F</td> </tr> </table>			Proper Shipping Name :	COMBUSTIBLE LIQUID, N.O.S.	Technical Name(s) :	PETROLEUM DISTILLATES	UN/ID No :	NA 1993	Hazard Class - Primary :	COMBUSTIBLE	Packing Group :	III	Flash Point :	83 °C / 181.4 °F
Proper Shipping Name :	COMBUSTIBLE LIQUID, N.O.S.													
Technical Name(s) :	PETROLEUM DISTILLATES													
UN/ID No :	NA 1993													
Hazard Class - Primary :	COMBUSTIBLE													
Packing Group :	III													
Flash Point :	83 °C / 181.4 °F													
<p>AIR TRANSPORT (ICAO/IATA) :</p> <table border="0"> <tr> <td style="padding-right: 20px;">Proper Shipping Name :</td> <td>PRODUCT IS NOT REGULATED DURING TRANSPORTATION</td> </tr> </table>			Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION										
Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION													
<p>MARINE TRANSPORT (IMDG/IIMO) :</p> <table border="0"> <tr> <td style="padding-right: 20px;">Proper Shipping Name :</td> <td>PRODUCT IS NOT REGULATED DURING TRANSPORTATION</td> </tr> </table>			Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION										
Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION													
<b>15. REGULATORY INFORMATION</b>														
<p>NATIONAL REGULATIONS, USA :</p> <p>OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :</p> <p>Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.</p> <p>Distillates, petroleum, hydrotreated light : Irritant          Propylene Glycol : Exposure Limit, Eye irritant          Organic sulfonic acid salt : Irritant</p>														
<p>Nalco Energy Services, L.P. P.O. Box 87 • Sugar Land, Texas 77487-0087 • (281)263-7000          For additional copies of an MSDS visit <a href="http://www.nalco.com">www.nalco.com</a> and request access          7 / 10</p>														

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CERCLA/SUPERFUND, 40 CFR 117, 302 :  
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :  
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :  
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

X	Immediate (Acute) Health Hazard
-	Delayed (Chronic) Health Hazard
-	Fire Hazard
-	Sudden Release of Pressure Hazard
-	Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :  
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :  
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :  
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :  
None of the substances are specifically listed in the regulation.

Substance(s)	Citations
• Propylene Glycol	Sec. 111

CALIFORNIA PROPOSITION 65 :  
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :  
None of the substances are specifically listed in the regulation.

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**STATE RIGHT TO KNOW LAWS :**  
The following substances are disclosed for compliance with State Right to Know Laws:

Propylene Glycol	57-55-6
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**NATIONAL REGULATIONS, CANADA :**

**WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :**  
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

**WHMIS CLASSIFICATION :**  
Not considered a WHMIS controlled product.

**CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :**  
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

<b>16.</b>	<b>OTHER INFORMATION</b>
------------	--------------------------

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

- \* The human risk is: Low
- \* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

**REFERENCES**

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight® CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS® CD-ROM Version), Micromedex, Inc., Englewood, CO.

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IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

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Prepared By : Product Safety Department  
Date issued : 06/14/2005  
Version Number : 1.6

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## MATERIAL SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

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SDS # : 30033 **FINASOL OSR 51**

Date of the previous version: 2012-09-12\*\*\* Revision Date: 2012-02-22 Version 1.01

**1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING**

**1.1. Product identifier**

Product name	FINASOL OSR 51
Trade name	FINASOL OSR 51
Pure substance/mixture	Mixture

**1.2. Relevant identified uses of the substance or mixture and uses advised against**

Identified uses	dispersant.
-----------------	-------------

**1.3. Details of the supplier of the safety data sheet**

Supplier	TOTAL FLUIDES 24, cours Michelet. 92800 PUTEAUX. FRANCE Tel: +33 (0)1 41 35 40 00 Fax: +33 (0)1 41 35 82 88
----------	--

For further information, please contact

Contact Point	Service QSE : Tel : 01 41 35 33 64 / Fax : 01 41 35 33 50 Emergency number 24h/24h: +33 (0)1 41 35 65 00
E-mail Address	mfs.fds@total.com

**1.4. Emergency telephone number**

+33 1 49 00 00 49 (24h/24, 7d/7)  
Official National Emergency Telephone Number or Poison Control Center Number  
In France : - PARIS : Hôpital Fernand Widal 200, rue du Faubourg Saint-Denis 75475 Paris Cedex 10 , Tel : 01.40.05.48.48. -  
MARSEILLE : Hôpital Salvator, 249 bd Ste Marguerite 13274 Marseille cedex 5, Tel : 04.91.75.25.25. - LYON : Hôpital Hédouard  
Herriot, 5 place d'Arsonvill, 69437 Lyon cedex 3, Tel : 04.72.11.69.11. - NANCY : Hôpital central, 29 Av du Mal De Lattre de  
Tassigny, 54000 Nancy, Tel : 03.83.32.36.36 ou le SAMU : Tel ( 15 )

**2. HAZARDS IDENTIFICATION**

**2.1. Classification of the substance or mixture**

REGULATION (EC) No 1272/2008  
*For the full text of the H-Statements mentioned in this Section, see Section 2.2.*

Classification

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Revision Date: 2012-02-22Version 1.01

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Aspiration toxicity - Category 1 - H304  
Serious eye damage/eye irritation - Category 1 - H318

**DIRECTIVE 67/548/EEC or 1999/45/EC**  
*For the full text of the R-phrases mentioned in this Section, see Section 10*

**Symbol(s)**  
Xn - Harmful  
**Classification**  
Xn;R65 - Xi;R41 - R66

**2.2. Label elements**

Labelled according to: REGULATION (EC) No 1272/2008



**Signal Word**  
DANGER

**Hazard Statements**  
H304 - May be fatal if swallowed and enters airways  
H318 - Causes serious eye damage

**Precautionary Statements**  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P337 + P313 - If eye irritation persists: Get medical advice/attention  
P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection.  
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician  
P331 - Do NOT induce vomiting

**Supplemental Hazard Statements**  
EUH066 - Repeated exposure may cause skin dryness or cracking

**2.3. Other hazards**

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**Physical-Chemical Properties** Alkaline.  
Combustible liquid.  
Vapors may form explosive mixtures with air, at high temperatures.

**Properties Affecting Health** If swallowed accidentally, the product may enter the lungs due to its low viscosity and lead to the rapid development of very serious pulmonary lesions (medical survey during 48 hours) .

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

**3.2. Mixture**

Chemical Name	EC-No	REACH registration No:	CAS-No	Weight %	Classification (Dir. 67/548)	Classification (Reg. 1272/2008)
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	926-141-6	01-2119456620-43	A	60-70	Xn;R65 R66 ***	Asp. Tox. 1 (H304)
docusate sodium***	209-406-4	no data available	577-11-7	0.2-5	X;R38-41***	Skin Irrit. 2 (H315) Eye Dam. 1 (H318)

**Additional Information** 15%-30% : Non-ionic surfactants  
0.2%-5% : Anionic surfactants

For the full text of the R-phrases mentioned in this Section, see Section 16  
For the full text of the H-Statements mentioned in this Section, see Section 16.

**4. FIRST AID MEASURES**

**4.1. Description of first-aid measures**

**General advice** IN CASE OF SERIOUS OR PERSISTENT CONDITIONS, CALL A DOCTOR OR EMERGENCY MEDICAL CARE.

**Eye contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

**Skin contact** Remove contaminated clothing and shoes. Wash off immediately with plenty of water for at least 15 minutes.

**Inhalation** In case of exposure to intense concentrations of vapours, fumes or spray, transport the person away from the contaminated zone, keep warm and allow to rest.

**Ingestion** If swallowed, do not induce vomiting - seek medical advice.  
Risk of product entering the lungs on vomiting after ingestion. In this case, the casualty should be sent immediately to hospital.

**Protection of First-aiders** Use personal protective equipment.

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**4.2. Most important symptoms and effects, both acute and delayed**

Eye contact	Risk of serious damage to eyes.
Skin contact	Repeated exposure may cause skin dryness or cracking.
Inhalation	The Inhalation of vapours or aerosols may be irritating for the respiratory tract and for mucous membranes.
Ingestion	Harmful: If swallowed accidentally, the product may enter the lungs due to its low viscosity and lead to the rapid development of very serious inhalation pulmonary lesions (medical survey during 48 hours). Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May cause central nervous system depression.

**4.3. Indication of immediate medical attention and special treatment needed, if necessary**

Notes to physician	Treat symptomatically.
--------------------	------------------------

**5. FIRE-FIGHTING MEASURES**

**5.1. Extinguishing media**

Suitable Extinguishing Media	Foam. Dry powder. Carbon dioxide (CO <sub>2</sub> ). Water spray.
Unsuitable Extinguishing Media	Do not use a solid water stream as it may scatter and spread fire.

**5.2. Special hazards arising from the substance or mixture**

Special Hazard	Incomplete combustion and thermolysis may produce gases of varying toxicity such as carbon monoxide, carbon dioxide, various hydrocarbons, aldehydes and soot. These may be highly dangerous if inhaled in confined spaces or at high concentration.
----------------	--

**5.3. Advice for fire-fighters**

Special protective equipment for fire-fighters	In case of a large fire or in confined or poorly ventilated spaces, wear full fire resistant protective clothing and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Other Information	Cool containers / tanks with water spray. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

**6. ACCIDENTAL RELEASE MEASURES**

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**6.1. Personal precautions, protective equipment and emergency procedures**

General Information	Use personal protective equipment. Evacuate non-essential personnel. Ensure adequate ventilation, especially in confined areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch or walk through spilled material.
---------------------	---

**6.2. Environmental precautions**

General Information	Prevent further leakage or spillage if safe to do so. Dike to collect large liquid spills. The product should not be allowed to enter drains, water courses or the soil. Local authorities should be advised if significant spillages cannot be contained.
---------------------	--

**6.3. Methods and materials for containment and cleaning up**

Methods for cleaning up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Following product recovery, flush area with water.
-------------------------	--

**6.4. Reference to other sections**

Personal Protective Equipment	See Section 8 for more detail
Waste treatment	See section 13
Other Information	Remove all sources of ignition.

**7. HANDLING AND STORAGE**

**7.1. Precautions for safe handling**

Advice on safe handling	For personal protection see section 8. Use only in well-ventilated areas. Do not breathe vapors or spray mist. Avoid contact with skin and eyes.
Technical measures	Ensure adequate ventilation.
Prevention of fire and explosion	Handle away from any source of ignition (open flame and sparks) and heat (hot manifolds or casings). Design installations (machinery and equipment) to prevent burning product from spreading (tanks, retention systems, interceptors (traps) in drainage systems). Take precautionary measures against static discharges.

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Chemical Name	Water	Sediment	Soil	Air	STP	Oral
docusate sodium*** 577-11-7	0.0066 mg/l (fw) 0.00066 mg/l (mw) 0.066 mg/l (or)	0.653 mg/kg dw (fw) 0.0653 mg/kg dw (mw)	0.138 mg/kg dw		122 mg/l	

**8.2. Exposure controls**

Occupational Exposure Controls

**Engineering Measures**

Apply technical measures to comply with the occupational exposure limits.

**Personal Protective Equipment**

**General Information**

These recommendations apply to the product as supplied.  
If the product is used in mixtures, it is recommended that you contact the appropriate protective equipment suppliers.

**Respiratory protection**

When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

**Eye Protection**

Safety glasses with side-shields.  
If splashes are likely to occur, wear: Face-shield.

**Skin and body protection**

Wear suitable protective clothing. Protective shoes or boots.

**Hand Protection**

Hydrocarbon-proof gloves.  
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.

Environmental exposure controls

**General Information**

None in normal conditions.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

**9.1. Information on basic physical and chemical properties**

Color: dark brown To black  
Physical State @20°C: liquid  
Odor: Petroleum solvent

Property	Values	Remarks	Method
pH	6.5 - 8.5		ASTM D 1172
pH (as aqueous solution)	8	solution (10 %)	ASTM D 1172

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<b>Boiling point/boiling range</b>	180 - 240 °C 356 - 454 °F		
<b>Flash point</b>	>= 65 °C >= 149 °F		ISO 2719 ISO 2719.
<b>Evaporation rate</b>		No information available	
<b>Flammability Limits in Air</b>		No information available	
<b>Vapor Pressure</b>		No information available	
<b>Vapor density</b>		No information available	
<b>Density</b>	855 - 885 kg/m <sup>3</sup>	@ 20 °C	ISO 12185
<b>Water solubility</b>		No information available	
<b>Solubility in other solvents</b>		No information available	
<b>logPow</b>		Not applicable	
<b>Autoignition temperature</b>		No information available	
<b>Viscosity, kinematic</b>	7 - mm <sup>2</sup> /s	@ 40 °C	ISO 3104
<b>Explosive properties</b>	Not explosive		
<b>Oxidizing Properties</b>	No information available		
<b>Possibility of hazardous reactions</b>	No data available		

**9.2. Other information**

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**10. STABILITY AND REACTIVITY**

**10.1. Reactivity**

**10.2. Chemical stability**

Stability Stable under recommended storage conditions.

**10.3. Possibility of hazardous reactions**

Hazardous Reactions None under normal processing.

**10.4. Conditions to Avoid**

Conditions to Avoid Heat, flames and sparks. Take precautionary measures against static discharges.

**10.5. Incompatible Materials**

Materials to Avoid Strong acids. Oxidizing agents.

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**10.6. Hazardous Decomposition Products**

Hazardous Decomposition Products Incomplete combustion and thermolysis may produce gases of varying toxicity such as carbon monoxide, carbon dioxide, various hydrocarbons, aldehydes and soot.

**11. TOXICOLOGICAL INFORMATION**

**11.1. Information on toxicological effects**

Acute toxicity Local effects Product Information\*\*\*

Skin contact	Repeated exposure may cause skin dryness or cracking.
Eye contact	Risk of serious damage to eyes.
Inhalation	Not classified. The inhalation of vapours or aerosols may be irritating for the respiratory tract and for mucous membranes.
Ingestion	Harmful: If swallowed accidentally, the product may enter the lungs due to its low viscosity and lead to the rapid development of very serious inhalation pulmonary lesions (medical survey during 48 hours). Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May cause central nervous system depression.

Acute toxicity Component information

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	LD50 > 5000 mg/kg bw (rat - OECD 401)	LD50 (24h) > 5000 mg/kg bw (rabbit - OECD 402)	LC50 (8h) > 5000 mg/m <sup>3</sup> (vapour) (rat - OECD 403)
docosate sodium***	> 2100 mg/kg ( Rat )	> 10000 mg/kg ( Rabbit )	

Sensitization

Sensitization Not classified as a sensitizer.

Specific effects

**Carcinogenicity** Contains no ingredient listed as a carcinogen.

**Mutagenicity** Contains no ingredient listed as a mutagen.

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<b>Reproductive toxicity</b>	Contains no ingredient listed as toxic to reproduction.
<b>Repeated Dose Toxicity</b>	
<b>Target Organ Effects (STOT)</b>	
Specific target organ systemic toxicity (single exposure)	No known effect based on information supplied.
Specific target organ systemic toxicity (repeated exposure)	No known effect based on information supplied.
<b>Aspiration toxicity</b>	The fluid can enter the lungs and cause damage (chemical pneumonitis, potentially fatal).
<b>Other Information</b>	
Other adverse effects	Frequent or prolonged skin contact destroys the lipoidal cutaneous layer and may cause dermatitis.

**12. ECOLOGICAL INFORMATION**

**12.1. Toxicity**

Acute aquatic toxicity Product Information

Acute aquatic toxicity Component Information

Chemical Name	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates	Toxicity to fish	Toxicity to microorganisms
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics A	ErLS0 (72h) > 1000 mg/l (Pseudokirchneriella subcapitata - OECD 201) EbLS0 (72h) > 1000 mg/l (Pseudokirchneriella subcapitata - OECD 201) NOELR (72h) = 1000 mg/l (Pseudokirchneriella subcapitata - biomass - OECD 201) NOELR (72h) = 1000 mg/l (Pseudokirchneriella subcapitata - growth rate - OECD 201)	EL50 (48h) > 1000 mg/l (Daphnia magna - OECD 202)	LL50 (96h) > 1000 mg/l (Oncorhynchus mykiss - OECD 203)	
docosate sodium*** 577-11-7		EC50 (48h) = 6.6 mg/l Daphnia magna	LC50 (96h) = 49 mg/l Brachydanio rerio (semi-static)	

Chronic aquatic toxicity Product Information

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**Chronic aquatic toxicity Component Information**

Chemical Name	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates	Toxicity to fish	Toxicity to microorganisms
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics A		NOELR (21d) = 1,22 mg/l (Daphnia magna - QGAR Petrotox)	NOELR (28d) = 0,17 mg/l (Oncorhynchus mykiss - QGAR Petrotox)	

**Effects on terrestrial organisms**  
No information available.

**12.2. Persistence and degradability**

**General Information**  
For ∴ Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics.

Biodegradation						
Type:	Method	Sampling time	Specific effects	Values	Unit	Biodegradability
	OECD 301 F	28, days		69	%	Readily biodegradable

**12.3. Bioaccumulative potential**

**Product Information**                      The potential for bioaccumulation of the product in the environment is very low.

**logPow**    Not applicable

**Component Information**                      No information available.

**12.4. Mobility in soil**

**Soil**    Given its physical and chemical characteristics, the product is generally mobile in the ground.

**Air**    The product evaporates readily.

**Water**    soluble.

**12.5. Results of PBT and vPvB assessment**

**PBT and vPvB assessment**                      This product contains no substance considered as PBT and/or vPvB according to REACH regulation annex XIII criteria.

**12.6. Other adverse effects**

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General Information No information available.

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**13. DISPOSAL CONSIDERATIONS**

**13.1. Waste treatment methods**

Waste from Residues / Unused Products	Dispose of in accordance with the European Directives on waste and hazardous waste.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Empty containers may contain flammable or explosive vapors.
EWC Waste Disposal No.	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used.

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**14. TRANSPORT INFORMATION**

<b>ADR/RID</b>	Not regulated
<b>IMDG/IMO</b>	Not regulated
<b>ICAO/IATA</b>	Not regulated
<b>ADN</b>	
UN/ID No	UN9003
Proper shipping name	Substances with a flash-point above 60 degrees C and not more than 100 degrees C
Proper shipping name	SUBSTANCES WITH A FLASH POINT ABOVE 60°C AND NOT MORE THAN 100°C
Hazard class	9
Description	UN9003, SUBSTANCES WITH A FLASH-POINT ABOVE 60 DEGREES C AND NOT MORE THAN 100 DEGREES C (Hydrocarbons, C11-C14, n-alkanes, Isoalkanes, cyclics, < 2% aromatics), 9, MIXTURE

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**15. REGULATORY INFORMATION**

**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture**

**European Union**

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Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

**International Inventories**

Related CAS	Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics 64742-47-8
EINECS/ELINCS	-
TSCA	-
DSL	-
ENCS	-
IECSC	-
KECL	-
PICCS	-
AICS	-
NZIoC	-

**Legend**

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances  
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory  
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List  
ENCS - Japan Existing and New Chemical Substances  
IECSC - China Inventory of Existing Chemical Substances  
KECL - Korean Existing and Evaluated Chemical Substances  
PICCS - Philippines Inventory of Chemicals and Chemical Substances  
AICS - Australian Inventory of Chemical Substances  
NZIoC - New Zealand Inventory of Chemicals

**Further information**

**15.2. Chemical Safety Assessment**

Chemical Safety Assessment      Not applicable

**16. OTHER INFORMATION**

Full text of R-phrases referred to under sections 2 and 3  
R41 - Risk of serious damage to eyes  
R65 - Harmful: may cause lung damage if swallowed

Full text of H-Statements referred to under section 2 and 3  
H304 - May be fatal if swallowed and enters airways  
H318 - Causes serious eye damage

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**Abbreviations, acronyms**  
bw - body weight  
bw/day - body weight/day  
dw - dry weight  
mw - marine water  
fw - fresh water

**Legend Section 8**

-	Sensitizer	*	Skin designation
**	Hazard Designation	C:	Carcinogen
M:	Mutagen	R:	Toxic to reproduction

Revision Date: 2012-02-22  
Revision Note: (M)SDS sections updated: 3, \*\*\*  
This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

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This safety data sheet serves to complete but not to replace the technical product sheets. The information contained herein is given in good faith and is accurate to the best of knowledge at the date indicated above. It is understood by the user that any use of the product for purposes other than those for which it was designed entails potential risk. The information given herein in no way dispenses the user from knowing and applying all provisions regulating his activity. The user bears sole liability for the precautions required when using the product. The regulatory texts indicated herein are intended to aid the user to fulfill his obligations. This list is not to be considered complete and exhaustive. It is the user's responsibility to ensure that he is subject to no other obligations than those mentioned.

End of the safety data sheet

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**D. Dispersant Information**



**DASIC INTERNATIONAL LTD**

**SAFETY DATA SHEET**

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**Slickgone NS**

Revision 2  
Revision date 16-Apr-2009

1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND THE COMPANY				
Product name	Slickgone NS			
Description	Internationally approved dispersant for treating marine oil spills.			
Company	Dasic International Ltd Winchester Hill Romsey Hampshire SO51 7YD UK www.dasicinter.com			
Telephone	+44 (0)1794 512419			
Fax	+44 (0)1794 522346			
Emergency telephone number	+44 (0)1794 512419			
2. HAZARDS IDENTIFICATION.				
Main hazards	The product is classified as non hazardous. May cause degreasing of the skin. May cause irritation to eyes.			
3. COMPOSITION / INFORMATION ON INGREDIENTS.				
Hazardous Ingredients				
	Conc.	CAS	EINECS	Symbols/Risk phrases
Kerosine - odourless - distillates (petroleum), hydrotreated light	60-70%	64742-47-8	263-149-8	Xn; R63
Sodium diethylsulphosuccinate	1-10%	577-11-7		Xn; R06 Xi; R08
4. FIRST AID MEASURES				
Skin contact	Remove contaminated clothing. Wash with water. Seek medical attention if irritation or symptoms persist. Wash all contaminated clothing before reuse.			
Eye contact	Rinse immediately with plenty of water for 15 minutes holding the eyelids open. Contact lenses should be removed. Seek medical attention.			
Inhalation	Move the exposed person to fresh air. Seek medical attention if irritation or symptoms persist.			
Ingestion	DO NOT INDUCE VOMITING. Rinse mouth thoroughly. Drink 1 to 2 glasses of water. Seek medical attention.			
General Information	Potential for aspiration if swallowed.			
5. FIRE FIGHTING MEASURES				
Extinguishing media	Alcohol resistant foam, Carbon dioxide (CO2) Dry chemical. Do NOT use water jet. Cool fire exposed containers with waterspray.			
Fire hazards	Burning produces irritating, toxic and obnoxious fumes.			
Protective equipment	In case of fire and/or explosion do not breathe fumes. Self-contained breathing apparatus.			

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### Slickgone NS

Revision 2  
Revision date 16-Apr-2009

6. ACCIDENTAL RELEASE MEASURES	
<b>Personal precautions</b>	Wear suitable protective equipment. See section 8 for further information.
<b>Environmental precautions</b>	Prevent further spillage if safe. Do not allow product to enter drains. Do not flush into surface water. Do not let product contaminate subsoil. Advise local authorities if large spills cannot be contained.
<b>Clean up methods</b>	Absorb with inert, absorbent material. Transfer to suitable, labelled containers for disposal. Contact a licensed waste disposal company. Clean spillage area thoroughly with plenty of water.

7. HANDLING AND STORAGE	
<b>Handling</b>	Wear protective clothing. See section 8 for further information.
<b>Storage</b>	Keep out of the reach of children. Avoid contact with: strong oxidising agents. Keep in a cool, dry, well ventilated area.
<b>Suitable packaging</b>	Store in original container.
<b>Specific use</b>	Obtain special instructions from the supplier.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION					
<b>Exposure limits</b>					
Kerosine - odourless - distillates (petroleum), hydrotreated light	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">WEL 8-hr limit ppm:</td> <td style="width: 33%;">WEL 8-hr limit mg/m<sup>3</sup>: 1000</td> </tr> <tr> <td>WEL 15 min limit ppm:</td> <td>WEL 15 min limit mg/m<sup>3</sup>:</td> </tr> </table>	WEL 8-hr limit ppm:	WEL 8-hr limit mg/m <sup>3</sup> : 1000	WEL 15 min limit ppm:	WEL 15 min limit mg/m <sup>3</sup> :
WEL 8-hr limit ppm:	WEL 8-hr limit mg/m <sup>3</sup> : 1000				
WEL 15 min limit ppm:	WEL 15 min limit mg/m <sup>3</sup> :				
<b>Engineering measures</b>	Ensure adequate ventilation of the working area.				
<b>Respiratory protection</b>	Not normally required. Wear suitable respiratory equipment when necessary. For short periods of work a combination of charcoal filter and particulate filter is suitable.				
<b>Hand protection</b>	Chemical resistant gloves (PVC)				
<b>Eye protection</b>	Approved safety goggles. Provide eye wash station.				
<b>Protective equipment</b>	Apron (Plastic or rubber) Rubber boots.				

9. PHYSICAL AND CHEMICAL PROPERTIES	
<b>Description</b>	Viscous liquid.
<b>Colour</b>	Brown.
<b>Odour</b>	Mild.
<b>Boiling point</b>	192°C
<b>Flash point</b>	72°C
<b>Relative density</b>	0.87
<b>Water solubility</b>	slightly miscible in water.
<b>Viscosity</b>	Flow Time in 3mm ISO cup (ISO 2431) - 40

10. STABILITY AND REACTIVITY	
<b>Stability</b>	Stable under normal conditions.
<b>Conditions to avoid</b>	Burning produces irritating, toxic and obnoxious fumes.
<b>Materials to avoid</b>	Strong oxidising agents.

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### Slickgone NS

Revision 2  
 Revision date 16-Apr-2009

11. TOXICOLOGICAL INFORMATION	
Acute toxicity	Ingestion may cause nausea and vomiting.
Corrosivity	May cause irritation to eyes. May cause degreasing of the skin. Potential for aspiration if swallowed.
Repeated or prolonged exposure	Repeated or prolonged exposure may cause dermatitis.
Mutagenic effects	No mutagenic effects reported.
Carcinogenic effects	No carcinogenic effects reported.
Reproductive toxicity	No teratogenic effects reported.

12. ECOLOGICAL INFORMATION	
Degradability	The surfactant(s) contained in this preparation complies (comply) with the biodegradability criteria as laid down in Regulation (EC) No.648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.
Bioaccumulation	Does not bioaccumulate.

13. DISPOSAL CONSIDERATIONS	
General Information	Dispose of as special waste in compliance with local and national regulations.
Disposal of packaging	Dispose of in compliance with all local and national regulations.

14. TRANSPORT INFORMATION	
Further Information	The product is not classified as dangerous for carriage.

15. REGULATORY INFORMATION	
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16. OTHER INFORMATION	
Text of risk phrases in Section 3.	R36 - Irritating to eyes. R38 - Irritating to skin. R65 - Harmful: may cause lung damage if swallowed.

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D. Dispersant Information

D.3. SDS COREXIT EC9527A

	<b>SAFETY DATA SHEET</b>	
	<b>COREXIT™ EC9527A</b>	
<b>Section: 1. PRODUCT AND COMPANY IDENTIFICATION</b>		
Product name	:	COREXIT™ EC9527A
Other means of identification	:	Not applicable.
Recommended use	:	OIL SPILL DISPERSANT
Restrictions on use	:	Refer to available product literature or ask your local Sales Representative for restrictions on use and dose limits.
Company	:	COREXIT Environmental Solutions LLC 11177 S. Stadium Drive Sugar Land, Texas 77478 USA TEL: +1 (832) 851-5164
Emergency telephone number	:	(800) 424-9300 (24 Hours) CHEMTREC
Issuing date	:	08/30/2019
<b>Section: 2. HAZARDS IDENTIFICATION</b>		
<b>GHS Classification</b>		
Flammable liquids	:	Category 4
Acute toxicity (Oral)	:	Category 4
Acute toxicity (Dermal)	:	Category 4
Eye irritation	:	Category 2A
<b>GHS Label element</b>		
Hazard pictograms	:	
Signal Word	:	Warning
Hazard Statements	:	Combustible liquid Harmful if swallowed or in contact with skin Causes serious eye irritation.
Precautionary Statements	:	<b>Prevention:</b> Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Wash skin thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/ eye protection/ face protection. <b>Response:</b> IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth. IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/ attention. Wash contaminated clothing before reuse. <b>Storage:</b> Store in a well-ventilated place. Keep cool.
Other hazards	:	None known.

**D. Dispersant Information**

<b>SAFETY DATA SHEET</b>			
<b>COREXIT™ EC9527A</b>			
<b>Section: 3. COMPOSITION/INFORMATION ON INGREDIENTS</b>			
Pure substance/mixture	: Mixture		
Chemical Name		CAS-No.	Concentration: (%)
2-Butoxyethanol		111-76-2	30 - 60
Organic sulfonic acid salt		Proprietary	10 - 30
Propylene Glycol		57-55-6	1 - 5
<b>Section: 4. FIRST AID MEASURES</b>			
In case of eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.	
In case of skin contact	:	Wash off immediately with plenty of water for at least 15 minutes. Use a mild soap if available. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops and persists.	
If swallowed	:	Rinse mouth. Get medical attention if symptoms occur.	
If inhaled	:	Get medical attention if symptoms occur.	
Protection of first-aiders	:	In event of emergency assess the danger before taking action. Do not put yourself at risk of injury. If in doubt, contact emergency responders. Use personal protective equipment as required.	
Notes to physician	:	Treat symptomatically.	
Most important symptoms and effects, both acute and delayed	:	See Section 11 for more detailed information on health effects and symptoms.	
<b>Section: 5. FIREFIGHTING MEASURES</b>			
Suitable extinguishing media	:	Foam Carbon dioxide Dry powder Other extinguishing agent suitable for Class B fires For large fires, use water spray or fog, thoroughly drenching the burning material.	
Unsuitable extinguishing media	:	None known.	
Specific hazards during firefighting	:	Fire Hazard Keep away from heat and sources of ignition. Flash back possible over considerable distance.	
Hazardous combustion products	:	Decomposition products may include the following materials: Carbon oxides Sulphur oxides metal oxides	
Special protective equipment for firefighters	:	Use personal protective equipment.	
Specific extinguishing	:	Fire residues and contaminated fire extinguishing water must be disposed of in	

**D. Dispersant Information**

SAFETY DATA SHEET				
COREXIT™ EC9527A				
methods	accordance with local regulations. In the event of fire and/or explosion do not breathe fumes.			
Section: 6. ACCIDENTAL RELEASE MEASURES				
Personal precautions, protective equipment and emergency procedures	:	Ensure adequate ventilation. Remove all sources of ignition. Ensure clean-up is conducted by trained personnel only. Refer to protective measures listed in sections 7 and 8.		
Environmental precautions	:	Do not allow contact with soil, surface or ground water.		
Methods and materials for containment and cleaning up	:	Eliminate all ignition sources if safe to do so. Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Flush away traces with water.		
Section: 7. HANDLING AND STORAGE				
Advice on safe handling	:	Avoid contact with skin and eyes. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours). Do not ingest. Keep away from fire, sparks and heated surfaces. Wash hands thoroughly after handling. Use only with adequate ventilation.		
Conditions for safe storage	:	Keep away from heat and sources of ignition. Keep away from oxidizing agents. Keep out of reach of children. Keep container tightly closed. Store in suitable labelled containers.		
Suitable material	:	The following compatibility data is suggested based on similar product data and/or industry experience: Stainless Steel 316L, Hastelloy C-276, MDPE (medium density polyethylene), Nitrile, Plexiglass, TFE, HDPE (high density polyethylene), Neoprene, Aluminum, Polypropylene, Polyethylene, Carbon Steel C1018, Stainless Steel 304, FEP (encapsulated), Perfluoroelastomer, PVC, PTFE, Polytetrafluoroethylene/polypropylene copolymer, Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.		
Unsuitable material	:	The following compatibility data is suggested based on similar product data and/or industry experience: Copper, Mild steel, Brass, Nylon, Buna-N, Natural rubber, Polyurethane, Ethylene propylene, EPDM, Fluoroelastomer, Chlorosulfonated polyethylene rubber		
Section: 8. EXPOSURE CONTROLS/PERSONAL PROTECTION				
Components with workplace control parameters				
Components	CAS-No.	Form of exposure	Permissible concentration	Basis
2-Butoxyethanol	111-76-2	TWA	20 ppm	ACGIH
		TWA	5 ppm 24 mg/m3	NIOSH REL
		TWA	50 ppm 240 mg/m3	OSHA Z1
Propylene Glycol	57-55-6	TWA	10 mg/m3	AIHA WEEL

**D. Dispersant Information**

**SAFETY DATA SHEET**

**COREXIT™ EC9527A**

Engineering measures : Effective exhaust ventilation system. Maintain air concentrations below occupational exposure standards.

**Personal protective equipment**

Eye protection : Safety goggles  
Face-shield

Hand protection : Wear the following personal protective equipment:  
Standard glove type.  
Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

Skin protection : Wear suitable protective clothing.

Respiratory protection : When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice. Remove and wash contaminated clothing before re-use. Wash face, hands and any exposed skin thoroughly after handling.

**Section: 9. PHYSICAL AND CHEMICAL PROPERTIES**

Appearance : Liquid

Colour : clear

Odour : Mild

Flash point : 72.7 °C, Method: ASTM D 56, Tag closed cup, Does not sustain combustion.

pH : 6.1,(100 %), (20 °C)

Odour Threshold : no data available

Melting point/freezing point : POUR POINT: -55 °C, ASTM D-97  
POUR POINT: < -40 °C

Initial boiling point and boiling range : 171 °C

Evaporation rate : 0.1, (water=1)

Flammability (solid, gas) : no data available

Upper explosion limit : no data available

Lower explosion limit : no data available

Vapour pressure : < 5 mm Hg, (38 °C), similar to water

Relative vapour density : no data available

Relative density : 0.98 - 1.02,

Density : 0.98 - 1.02 g/cm<sup>3</sup> , 8.2 - 8.5 lb/gal

Water solubility : completely soluble

Solubility in other solvents : no data available

Partition coefficient: n-octanol/water : no data available

Auto-ignition temperature : no data available

Thermal decomposition : no data available

**D. Dispersant Information**

**SAFETY DATA SHEET**

**COREXIT™ EC9527A**

Engineering measures : Effective exhaust ventilation system. Maintain air concentrations below occupational exposure standards.

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Eye protection : Safety goggles  
Face-shield

Hand protection : Wear the following personal protective equipment:  
Standard glove type.  
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**Section: 9. PHYSICAL AND CHEMICAL PROPERTIES**

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Flash point : 72.7 °C, Method: ASTM D 56, Tag closed cup, Does not sustain combustion.

pH : 6.1,(100 %), (20 °C)

Odour Threshold : no data available

Melting point/freezing point : POUR POINT: -55 °C, ASTM D-97  
POUR POINT: < -40 °C

Initial boiling point and boiling range : 171 °C

Evaporation rate : 0.1, (water=1)

Flammability (solid, gas) : no data available

Upper explosion limit : no data available

Lower explosion limit : no data available

Vapour pressure : < 5 mm Hg, (38 °C), similar to water

Relative vapour density : no data available

Relative density : 0.98 - 1.02,

Density : 0.98 - 1.02 g/cm<sup>3</sup> , 8.2 - 8.5 lb/gal

Water solubility : completely soluble

Solubility in other solvents : no data available

Partition coefficient: n-octanol/water : no data available

Auto-ignition temperature : no data available

Thermal decomposition : no data available

D. Dispersant Information

<b>SAFETY DATA SHEET</b>	
<b>COREXIT™ EC9527A</b>	
	LC50 Common Mummichog: 81 mg/l Exposure time: 96 hrs Test substance: Product
	LC50 Pimephales promelas (fathead minnow): 316 mg/l Exposure time: 96 hrs Test substance: Product
	LC50 Common Mummichog: 92 mg/l Exposure time: 96 hrs Test substance: Product
	NOEC Turbot: 32 mg/l Exposure time: 96 hrs Test substance: Product
Toxicity to daphnia and other aquatic invertebrates	: LC50 Acartia tonsa: 23 mg/l Exposure time: 48 hrs Test substance: Product
	LC50 Mysid Shrimp (Mysidopsis bahia): 24.14 mg/l Exposure time: 48 hrs Test substance: Product
	LC50 Artemia: 40 mg/l Exposure time: 48 hrs Test substance: Product
Toxicity to algae	: EC50 Marine Algae (Skeletonema costatum): 9.4 mg/l Exposure time: 72 hrs Test substance: Product
<b>Components</b>	
Toxicity to bacteria	: 2-Butoxyethanol 463 mg/l
	Propylene Glycol > 20,000 mg/l
<b>Components</b>	
Toxicity to fish (Chronic toxicity)	: 2-Butoxyethanol NOEC: > 100 mg/l Exposure time: 21 d
	Propylene Glycol Chronic Toxicity Value: 2,500 mg/l Exposure time: 30 d
<b>Components</b>	
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	: 2-Butoxyethanol NOEC: > 100 mg/l Exposure time: 21 d
	Propylene Glycol

**D. Dispersant Information**

<b>SAFETY DATA SHEET</b>	
<b>COREXIT™ EC9527A</b>	
NOEC: 13,020 mg/l Exposure time: 7 d	
<b>Persistence and degradability</b>	
The organic portion of this preparation is expected to be readily biodegradable.	
<b>Mobility</b>	
The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.	
If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;	
Air	: <5%
Water	: 10 - 30%
Soil	: 70 - 90%
The portion in water is expected to be soluble or dispersible.	
<b>Bioaccumulative potential</b>	
Based on a review of the individual components, utilizing U.S. EPA models, this material is not expected to bioaccumulate.	
<b>Other information</b>	
no data available	
<b>Section: 13. DISPOSAL CONSIDERATIONS</b>	
If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.	
Disposal methods	: The product should not be allowed to enter drains, water courses or the soil. Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.
Disposal considerations	: Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.
<b>Section: 14. TRANSPORT INFORMATION</b>	
The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.	
<b>Land transport (DOT)</b>	
Proper shipping name	: PRODUCT IS NOT REGULATED DURING TRANSPORTATION

D. Dispersant Information

<b>SAFETY DATA SHEET</b>				
<b>COREXIT™ EC9527A</b>				
<b>Air transport (IATA)</b>				
Proper shipping name	: PRODUCT IS NOT REGULATED DURING TRANSPORTATION			
<b>Sea transport (IMDG/IMO)</b>				
Proper shipping name	: PRODUCT IS NOT REGULATED DURING TRANSPORTATION			
<b>Section: 15. REGULATORY INFORMATION</b>				
TSCA list	: Not relevant			
<b>EPCRA - Emergency Planning and Community Right-to-Know Act</b>				
<b>CERCLA Reportable Quantity</b>				
This product does not contain a RQ substance, or this product contains a substance with a RQ, however the calculated RQ exceeds the reasonably attainable upper limit.				
<b>SARA 304 Extremely Hazardous Substances Reportable Quantity</b>				
This material does not contain any components with a section 304 EHS RQ.				
<b>SARA 311/312 Hazards</b>	: Flammable (gases, aerosols, liquids, or solids) Acute toxicity (any route of exposure) Serious eye damage or eye irritation			
<b>SARA 302</b>	: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.			
<b>SARA 313</b>	: The following components are subject to reporting levels established by SARA Title III, Section 313:			
	<table border="0"> <tr> <td>2-Butoxyethanol</td> <td>111-76-2</td> <td>38.62 %</td> </tr> </table>	2-Butoxyethanol	111-76-2	38.62 %
2-Butoxyethanol	111-76-2	38.62 %		
<b>California Prop. 65</b>				
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.				
<b>INTERNATIONAL CHEMICAL CONTROL LAWS :</b>				
<b>United States TSCA Inventory</b>				
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)				
<b>Australia. Industrial Chemical (Notification and Assessment) Act</b>				
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).				
<b>Canadian Domestic Substances List (DSL)</b>				
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.				
<b>Japan. ENCS - Existing and New Chemical Substances Inventory</b>				
All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Existing and New Chemical Substances list (ENCS).				
<b>Korea. Korean Existing Chemicals Inventory (KECI)</b>				

**D. Dispersant Information**

**SAFETY DATA SHEET**

**COREXIT™ EC9527A**

All substances in this product comply with the Chemical Control Act (CCA) and are listed on the Existing Chemicals List (ECL)

**Philippines Inventory of Chemicals and Chemical Substances (PICCS)**

All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

**China Inventory of Existing Chemical Substances**

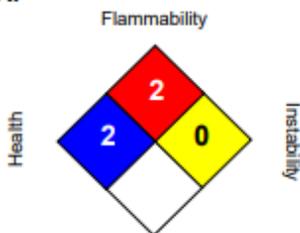
All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on or exempt from the Inventory of Existing Chemical Substances China (IECSC).

**New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand**

All substances in this product comply with the Hazardous Substances and New Organisms (HSNO) Act 1996, and are listed on or are exempt from the New Zealand Inventory of Chemicals.

**Section: 16. OTHER INFORMATION**

**NFPA:**



**HMIS III:**

<b>HEALTH</b>	<b>2</b>
<b>FLAMMABILITY</b>	<b>2</b>
<b>PHYSICAL HAZARD</b>	<b>0</b>

0 = not significant, 1 = Slight,  
2 = Moderate, 3 = High  
4 = Extreme, \* = Chronic

Revision Date : 08/30/2019  
Version Number : 0.0  
Prepared By : Regulatory Affairs

**REVISED INFORMATION:** Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

**D. Dispersant Information**

**D.4. Dispersant Use Planning Form—Initial Incident Information**

Incident Sheet for Dispersant Use Concurrence Requests				
<b>Name of Incident:</b>				
<b>Initial Time of Spill:</b>		Date ____/____/____ Month Day Year		Time: ____:____:____ 24 Hour Clock Time Zone
<b>Air Monitoring Data:</b> (Maximum reported in Source Control area of operations)				
<b>VOC:</b>		Percent LEL:		
<b>Incident Location:</b>				
Distance (miles/km) and Direction to nearest land:		Lat:	N/S Long:	E/W
Block Name:		Block Number:		
Water Depth:				
<b>Brief Description of Incident:</b>				
Incident: Pipeline ___ Transfer Operations ___ Explosion ___ Collision ___ loss-of-well-control ___ Facility Release ___ Other _____ Type of Release: Instantaneous ( ___ ) Continuous Flow ( ___ ) Did the source burn? Yes ( ___ ) No ( ___ ) Is the source still burning? Yes ( ___ ) No ( ___ ) Estimated water surface covered (square miles/square km) _____				
Event Chronology:				
<b>Oil Characteristics:</b>				
Name:	API Gravity:	GOR:	Pour Point:	Viscosity at release
Is the oil dispersible into the water column: Yes/No (circle one)				

**D. Dispersant Information**

<b>Spill Description:</b>	
Estimated Flow Rate (bpd): _____ Estimated Spill Volume: _____ Product easily emulsified? Yes (___) No (___) Product already emulsified? No (___)	
Method used for estimate:	
<b>Current On Site Weather Conditions</b>	
Sea state—wave height:	Beaufort Scale:
Wind direction and velocity (knots):	
Ceiling:	Visibility:
Five day forecast: Forecasted wind speed / direction (24 hours): _____ knots from the _____ (direction) Forecasted wind speed / direction (48 hours): _____ knots from the _____ (direction) Temperature: Air ___°F/C Water ___°F/C Dominant Current, net drifts (towards): Speed ___ knots; Direction _____	
Water Depth (fathoms ___ Feet ___ Meters _____) 0-3 (___) 4-10 (___) 11-30 (___) 31-99 (___) >100 (___)	
Other considerations: Low Visibility (___) Rip Tides (___) Whirlpools (___) Eddies (___)	
<b>Additional Data that could affect operations: (e.g., subsea currents speed and direction, oil seeps)</b>	
<b>Surface Slick/Subsurface Plume Modeling</b>	
2-D/ 3-D Model(s) used:	
Expected slick/plume trajectory and behavior:	

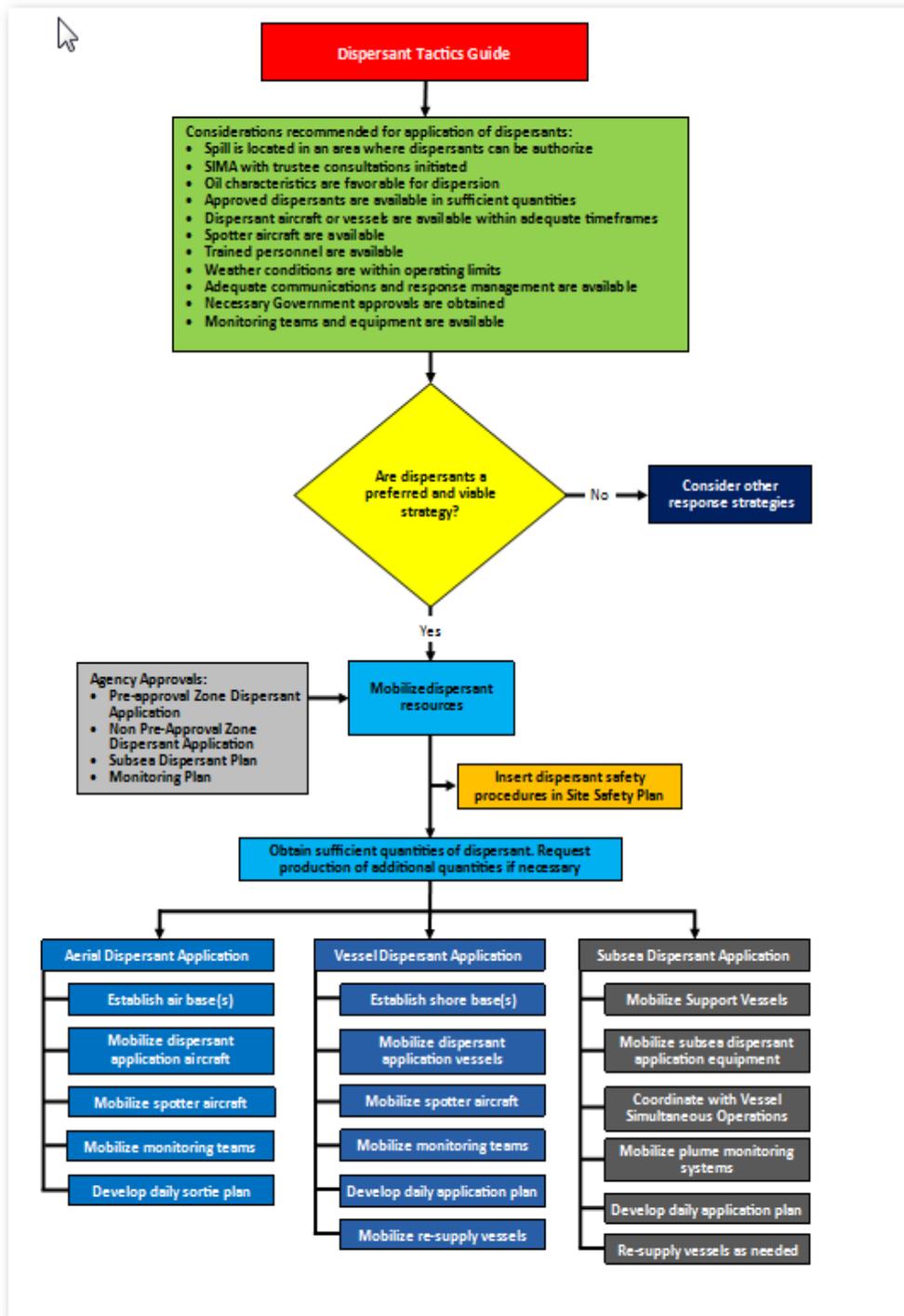
**D. Dispersant Information**

**D.5. Dispersant Use Planning Form—Application Tactics**

<b>Description</b>			
Reason(s) for requesting dispersant use: _____			
Location of area to be treated relative to the following, as shown on attached chart: Slick/Trajectory Dispersant Zone Nearest Land Wellhead/Release Point			
<b>Dispersant Operations</b>			
Name of dispersant proposed for use: _____		Application platform(s): Aerial _____ Vessel _____ Subsea _____	
Safety Plan for applicable platform(s) in place? Yes ( <input type="checkbox"/> ) No ( <input type="checkbox"/> )			
Planned time of dispersant application (as applicable): Sortie 1: Start _____ Finish _____ Sortie 2: Start _____ Finish _____ Sortie 3: Start _____ Finish _____ Sortie 4: Start _____ Finish _____ Estimate percentage of surface spill area to be treated (if known) 1-5% ( <input type="checkbox"/> ) 6-20% ( <input type="checkbox"/> ) 21-40% ( <input type="checkbox"/> ) 41-70% ( <input type="checkbox"/> ) 71-99% ( <input type="checkbox"/> ) 100% ( <input type="checkbox"/> ) Estimate percentage of subsea volume treated (if known): 1-5% ( <input type="checkbox"/> ) 6-20% ( <input type="checkbox"/> ) 21-40% ( <input type="checkbox"/> ) 41-70% ( <input type="checkbox"/> ) 71-99% ( <input type="checkbox"/> ) 100% ( <input type="checkbox"/> )			
<b>Dispersant Dosage Goals</b>			
Ratio of dispersant-to-oil (DOR): _____ Gallons per acre: _____			
<b>Dispersant Decision</b>			
Responsible Party Incident Commander _____		Approve/Concur Signature: _____	
Regulatory Agency Coordinator _____		Approve/Concur Signature: _____	
Regulatory Agency Coordinator _____		Approve/Concur Signature: _____	
Additional consultation or concurrence, if needed			
Agency/Contact	Concurrence/Consultation	Time/Date	Method (verbal/written)
_____	_____	_____	_____
_____	_____	_____	_____
<b>Points of Contact</b>			
	Name	Position	Telephone
Regulatory Agency	_____	_____	(____)____-_____
Regulatory Agency	_____	_____	(____)____-_____
Responsible Party	_____	_____	(____)____-_____
Other	_____	_____	(____)____-_____
Other	_____	_____	(____)____-_____

D. Dispersant Information

D.6. General Surface and Subsea Dispersant Guide



Note: Dispersants shall not be used except as authorized by the Guyana Environmental Protection Agency with concurrence of the officials charged with health/sensitive area responsibilities

**D. Dispersant Information**

Overview of Incident	
Describe the location and extent of spill, and spill volume (known or estimated).	
State oil type, API gravity, viscosity and pour point. (Attach SDS if available).	
State whether the spill is in a location approved for Dispersant use by Caribbean Island OPRC Plan 2012 or provide details of why use dispersant approval is required if outside of these parameters.	
State whether spill is instantaneous or continuous (include flow rate if known).	
Predicted oil spill movement (attach oil spill modeling trajectory if available).	
Predicted sub-surface dispersant plume flow (attach oil spill modeling trajectory if available).	
Distance from shoreline.	
Depth of water.	
Weather Conditions	
Are current weather conditions suitable for a dispersant application operation? Yes/No	In this section, include current and forecasted weather conditions and whether they are suitable for dispersant application
Wind (from) direction.	
Wind speed (knots).	
Current velocity (knots).	
Current (to) direction.	
Visibility (nautical miles).	
Sea state	
Dispersant Application Details	
Dispersant type (Attach SDS) What is the current Dispersant stockpile level available for the dispersant spraying operation?	In this section, describe the dispersant product to be used (name). Attach an SDS. Describe the dispersant application method, the expected amount of dispersant to be used and estimated timeline for the dispersant spraying operation.
Application Method. (Include proposed DOR, dosage rate (gpa /lpha) and maximum equipment application rate.	
Estimated Dispersant quantity to be used.	
Describe Dispersant Spraying Operational area. Include any environmental and socio-economic sensitivities in the region. Use maps / charts if available.	

**D. Dispersant Information**

Dispersant Effectiveness Monitoring Program		
Describe the level of dispersant effectiveness monitoring to be applied during the dispersant spraying operations.	State how observations will be carried out and documented. Describe how the dispersant spraying operations results will be communicated to the regulatory approvers.	
Dispersant Spraying Operation Approval Decision		
Approved	Not Approved	
Provide Additional Comments as Required	Provide Details on Why Approval was Not Granted	
Decision Makers Name and Position	Contact Details	Date and Time

**D. Dispersant Information**

**D.7. Oil Spill Response Limited (OSRL) Notification Form**

OSRL NOTIFICATION FORM			
<p><b>WARNING!</b> Ensure telephone contact has been established with OSRL's Duty Manager before using e-mail and fax communications.</p>			
			
To	Duty Manager		
Southampton Emergency Fax	+44 (0)23 8072 4314	Fort Lauderdale Emergency Fax	+1 954 987 3001
Southampton Telephone	+44 (0)23 8033 1551	Fort Lauderdale Telephone	+1 954 983 9880
Email	<a href="mailto:dutymanagers@oilspillresponse.com">dutymanagers@oilspillresponse.com</a>		
<b>Section 1</b>		<b>Obligatory Information Required -Please Complete All Details</b>	
Name of person in charge			
Position			
Company			
Contact telephone number			
Contact Mobile number			
Contact fax number			
E-mail address			
<b>Section 2</b>		<b>Spill Details</b>	
Location of spill			
Description of slick (size, direction, appearance)			
Latitude / longitude			
Situation (cross box)	<input type="checkbox"/> Land <input type="checkbox"/> River <input type="checkbox"/> Estuary <input type="checkbox"/> Coastal <input type="checkbox"/> Offshore <input type="checkbox"/> Port		
Date & time of spill	<input type="checkbox"/> GMT <input type="checkbox"/> Local		
Source of spill			
Quantity (if known)	<input type="checkbox"/> Cross box if estimate		
Spill status (cross box)	<input type="checkbox"/> On-going <input type="checkbox"/> Controlled <input type="checkbox"/> Unknown		
Action taken so far			
Product name			
Viscosity			
API / SG			
Pour point			
Asphaltene			
<b>Section 3</b>		<b>Weather</b>	
Wind speed & direction			
Sea state			
Sea temperature			
Tides			
Forecast			

**D. Dispersant Information**

Section 4	Additional Information Required —Please Complete Details if Known
Resources at risk	
Clean-up resources	
On-site / Ordered	
Nearest airport (if known)	
Runway length	
Handling facilities	
Customs	
Handling agent	
Section 5	Vessel Availability
Equipment deployed	
Recovered oil storage	
Section 6	Equipment Logistics
Transport	
Secure storage	
Port of embarkation	
Location of command centre	
Other designated contacts	
Section 7	Special Requirements of Country
Security	
Visa	
Medical advice	
Vaccinations	
Others (specify)	
Section 8	Climate Information
Section 9	Other Information

**D. Dispersant Information**

**D.8. Oil Spill Response Limited (OSRL) Mobilization Form**

**OSRL MOBILIZATION FORM**

**WARNING!** Ensure telephone contact has been established with OSRL's Duty Manager before using e-mail and fax communications.



To	Duty Manager
Southampton Emergency Fax	+44 (0)23 8072 4314
Southampton Telephone	+44 (0)23 8033 1551
Email	<a href="mailto:dutymanagers@oilspillresponse.com">dutymanagers@oilspillresponse.com</a>

**Authorizer's Details**

Subject	Mobilization of OSRL
Date	
Name	
Company	
Position	
Contact Telephone Number	
Contact Mobile Number	
Contact Email Address	
Incident Name	
Invoice Address	

I, authorize the activation of Oil Spill Response Limited and its resources in connection with the above incident under the terms of the Agreement in place between above stated Company and Oil Spill Response Limited.

Signature:	
------------	--

If OSRL personnel are to work under another party's direction please complete details below:

**Additional Details**

Name	
Company	
Position	
Contact Telephone Number	
Contact Mobile Number	
Contact Email Address	

**E. Geographical Response Plan**

## **APPENDIX E – GEOGRAPHICAL RESPONSE PLAN**

The Response Group (TRG) has generated a comprehensive Geographical Response Plan (GRP) for the coastlines of Guyana, Venezuela, and Trinidad and Tobago to support EEPGL offshore operations in the Guyana region. The geographical footprint of the GRP was based on projected impacts from the (unmitigated) stochastic modeling of well control scenario(s) and the initially impacted shorelines as outlined in this Oil Spill Response Plan (OSRP). TRG conducted a full desktop review in detail at a scale of 1:5,000 to determine any potentially impacted sensitivities along the entire coastline of Guyana.

Once the Environmental Impact Assessment (EIA) data (sourced from the Liza Phase 2 and Payara Development Projects) was received in geographic information system (GIS) format, the data were overlaid to help inform the response actions by location. Responding organizations can therefore use the GRP to review locations of sensitivities, access points, response actions, as well as resource requirements. The GRP defines the equipment needs (totals) for each division to support efficient resource ordering practices upon utilization of the plan. To further support response activities, the GRP provides an appendix containing response methods by shoreline type, to support response activities and decision-making on impacted areas outside the scope of the GRP.

The GRP is an extensive document (500+ pages) and is managed outside of the OSRP for efficiency purposes. Example maps and tables are shown in this appendix to provide users with a conceptual overview. A full suite of Geographical Strategic Response Maps will be immediately available to the response team(s) in the event of an oil spill through the Incident Action Plan software provided by TRG.

In addition to the addressing the coastlines of Guyana, Venezuela, and Trinidad and Tobago in the GRP, ExxonMobil's Regional Response Team prepared Geographical Strategic Response Maps for Grenada and St. Vincent and the Grenadines. Example maps for those countries are included in this appendix. Information from these Geographical Strategic Response Maps has been added to the Incident Action Plan Software.

E. Geographical Response Plan

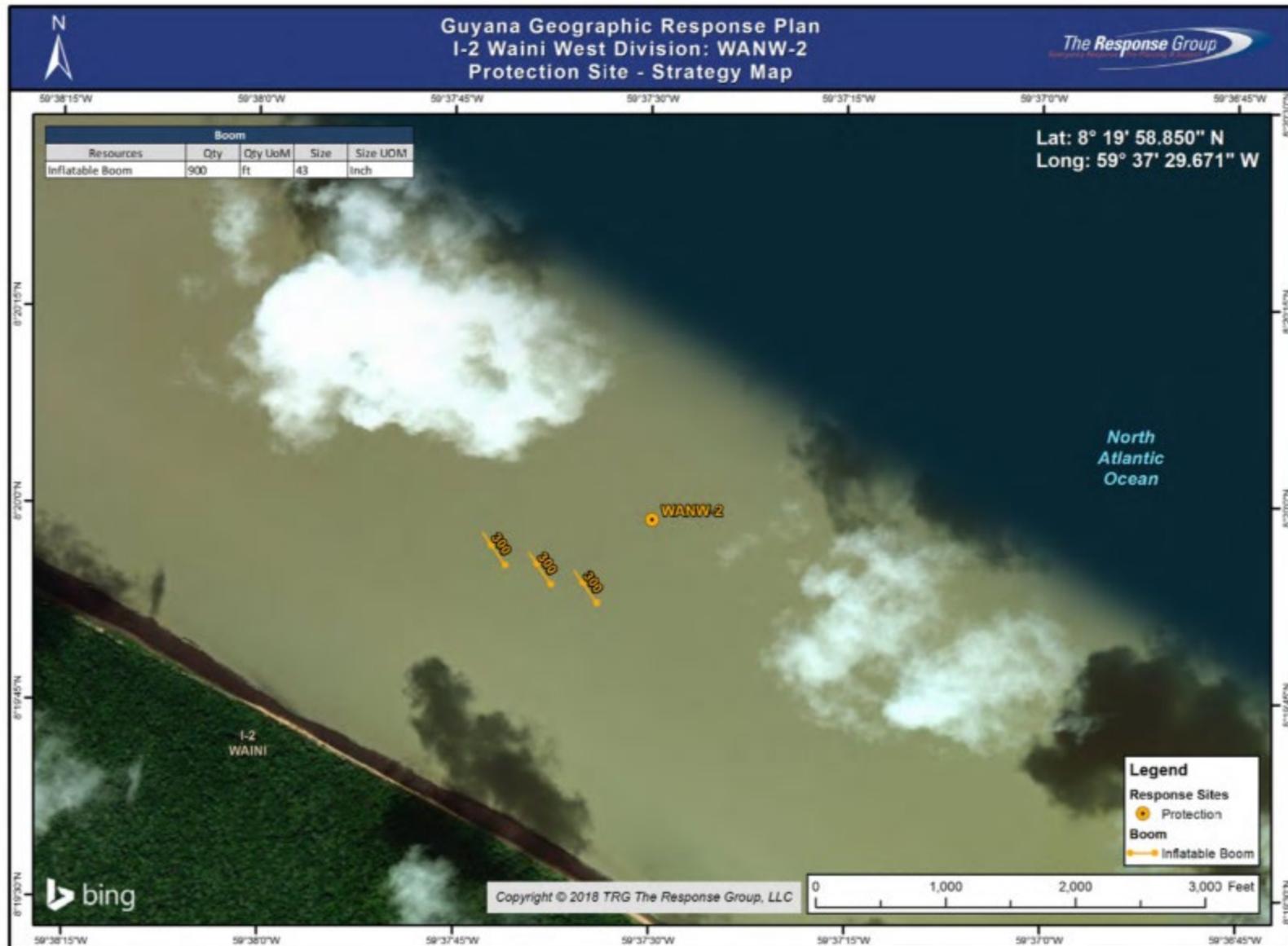
Example – Guyana Geographical Response Plan Information



E. Geographical Response Plan



E. Geographical Response Plan



**E. Geographical Response Plan**

GRP Area Maintenance			GRP Area: WANW-2	
<i>Resources Required</i>				
<i>Area Of Operation</i>	<i>Resource Kind</i>	<i>Description</i>	<i>Quantity</i>	<i>Size</i>
WANW-2	Boom Accessories	Boom Anchors	33 each	20 pound(s)
WANW-2	Boom	Inflatable Boom	900 feet	43 inch (cs)
WANW-2	Vessel	Work Boat	6 each	18 feet
WANW-2	Manpower: Operator	Boat Operator	6 each	
WANW-2	Manpower: Responder	Responder	10 each	
WANW-2	Manpower: Supervisor	Supervisor	3 each	
<i>Assignments</i>				
1 ) Deploy (3) 300 ft sections of inflatable boom in a cascade formation to deflect spilled material away from the shoreline.				
<i>Location of Work</i>				
Latitude: 8° 18' 58.850" N Longitude: 59° 37' 29.671" W				
<i>Special Environmental Considerations</i>				
Shoreline Types 10D: Scrub and Shrub Wetlands				
<h1>EXAMPLE</h1>				
GRP Area Maintenance				
INCIDENT ACTION PLAN SOFTWARE™	Printed 5/1/2018 13:21	Page 1 of 1	© TRG	

**E. Geographical Response Plan**

**Example – Trinidad and Tobago Geographical Response Plan Information**

E. Geographical Response Plan



E. Geographical Response Plan

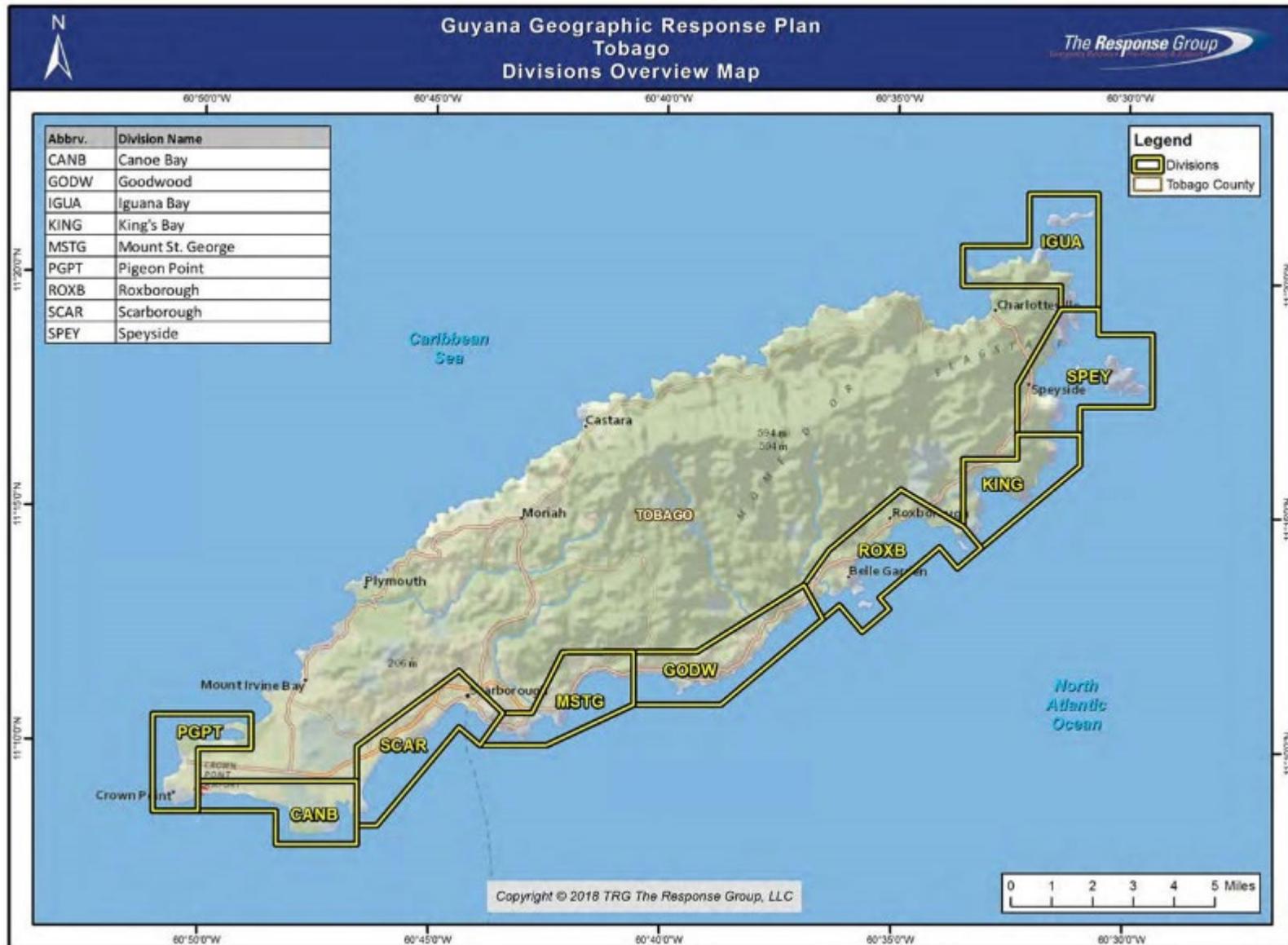


E. Geographical Response Plan

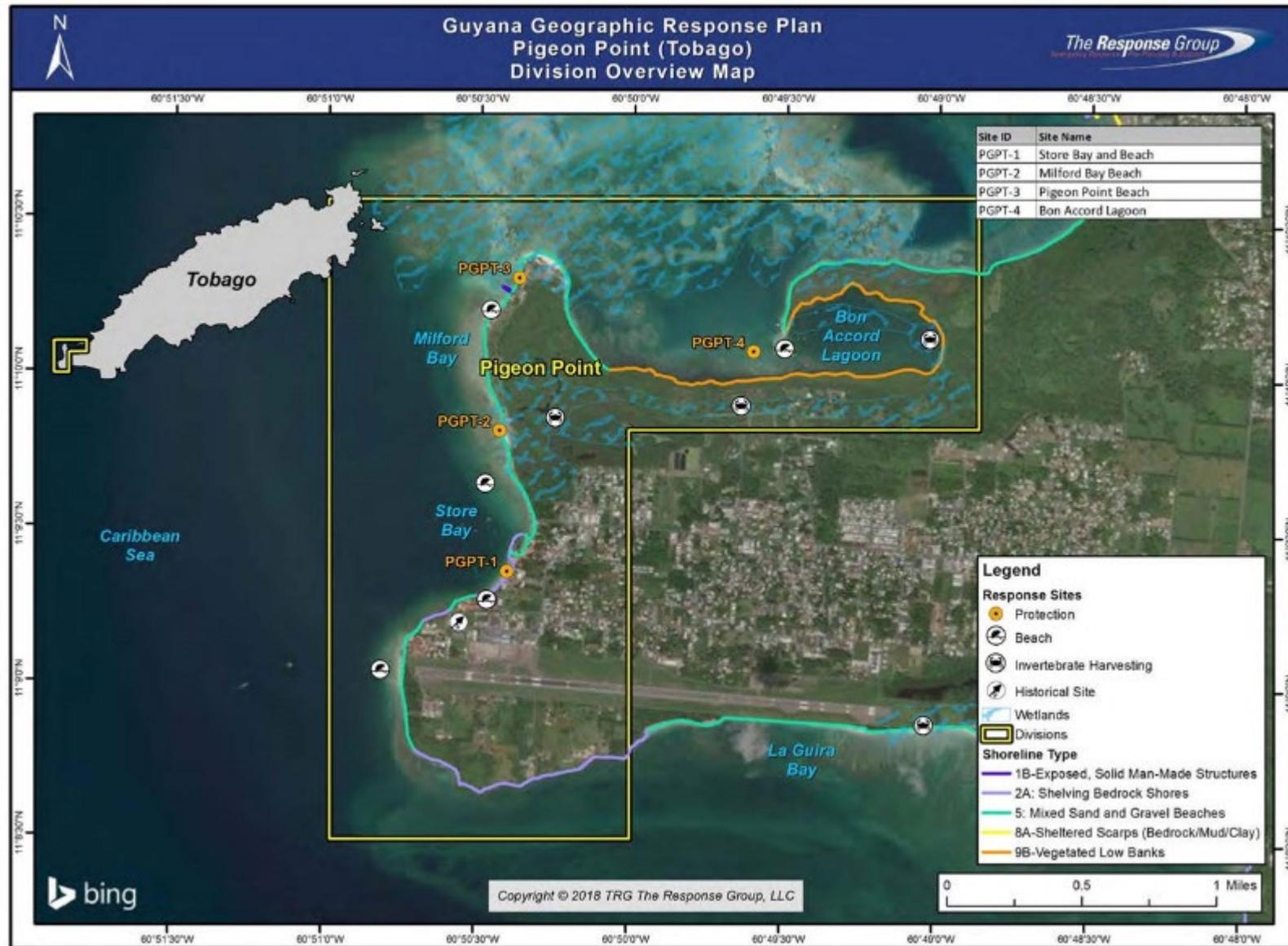
Guyana Geographic Response Plan		Mayaro Bay Division – MAYB-1 Protection Site	Plaisance South Beach / Mahaut River
<b>Site Information</b>		<b>Site Picture</b>	
<p><b>Site Name:</b> Plaisance South Beach / Mahaut River  <b>Latitude:</b> 10° 17' 20.677" N  <b>Longitude:</b> 60° 59' 54.923" W  <b>County:</b> Mayaro  <b>Country:</b> Trinidad  <b>Population Density:</b> Moderate  <b>Land Use:</b> Recreational, Residential  <b>Existing Response Support:</b>  <b>Capabilities:</b> None</p>			
<b>Access Information</b>			
<p><b>Site Access:</b> Road, ATV  <b>Road Type:</b> Light Duty  <b>Road Surface Type:</b> Paved  <b>Road Condition:</b> All Weather  <b>Access Type:</b> Public  <b>Bridge Height:</b> N/A</p>		<p>Photo 1: Looking north at the Mahaut River.</p>	
<b>Waterway Information</b>	<b>Response Information</b>	<b>Site Contact Information</b>	
<p><b>Type of Waterway:</b> Bay, River  <b>Waterway Name:</b> Mayaro Bay, Mahaut River  <b>Average Current Speed:</b> N/A  <b>Waterway Width:</b>                      Low Water: ~ 30 ft (River)                      High Water: ~ 50 ft (River)  <b>Tidally Influenced:</b> Yes  <b>Shoreline Type:</b> Mixed Sand and Gravel Beaches  <b>Bank Slope:</b> Slight  <b>Bank Height:</b> N/A</p>	<p><b>Deployment Strategy:</b> Protection  <b>Low Water:</b> Booming  <b>High Water:</b> Booming  <b>Boom Required:</b> 150 ft of Hard Boom, 250 ft of Shore Seal Boom  <b>Recovery Method:</b> N/A  <b>Tank Truck Access:</b> N/A  <b>Pump / Hose Required:</b> N/A  <b>Recommended Staging Area:</b> N/A  <b>Nearest Boat Ramp &amp; Dist.:</b> N/A</p>	<p><b>Organization:</b> N/A  <b>Phone:</b> N/A  <b>Cellular Service:</b> Good</p>	
<b>Site Description</b>		<b>Considerations</b>	
<p><b>Access Location Description:</b> This site is located along Mayaro Bay near the mouth of Mahaut River. Access to site by foot or ATV off Manzanilla / Mayaro Road.  <b>Hazards:</b> Slips, trips, and falls. Underwater hazards and currents.  <b>Obstructions / Limitations:</b> Debris along shoreline.</p>		<p><b>Associated Sensitivities:</b> Sea turtle nesting area.  <b>Strategy Considerations:</b> Mahaut River is in a residential areas as well as a potential sea turtle nesting area. Popular recreational beach and fishing area. Multiple access points to beach off Manzanilla Mayaro Road south of Pierreville. Heaviest recreational use during public holidays and school vacation (July-September) and Easter (2 weeks in April).</p>	
		Copyright © 2018 TRG The Response Group, LLC	MAYB-1



E. Geographical Response Plan



E. Geographical Response Plan



E. Geographical Response Plan

Guyana Geographic Response Plan		Pigeon Point Division – PGPT-4 Protection Site		Bon Accord Lagoon
<b>Site Information</b>		<b>Site Picture</b>		
<p><u>Site Name:</u> Bon Accord Lagoon <u>Latitude:</u> 11° 10' 5.052" N <u>Longitude:</u> 50° 49' 55.734" W <u>Country:</u> Tobago <u>Country:</u> Tobago <u>Population Density:</u> Moderate <u>Land Use:</u> Recreational, Commercial <u>Existing Response Support:</u> <u>Capabilities:</u> Boat Ramp</p>				
<b>Access Information</b>				
<p><u>Site Access:</u> Road, Boat <u>Road Type:</u> Light Duty <u>Road Surface Type:</u> Paved <u>Road Condition:</u> All Weather <u>Access Type:</u> Public <u>Bridge Height:</u> N/A</p>		<p>Photo 1: Looking East across Bon Accord Lagoon</p>		
<b>Waterway Information</b>	<b>Response Information</b>	<b>Site Contact Information</b>		
<p><u>Type of Waterway:</u> Bay <u>Waterway Name:</u> Bon Accord Lagoon <u>Average Current Speed:</u> N/A <u>Waterway Width:</u> Low Water: N/A High Water: N/A <u>Tidally Influenced:</u> Yes <u>Shoreline Type:</u> Mixed Sand and Gravel Beaches, Vegetated Low Banks <u>Bank Slope:</u> Slight <u>Bank Height:</u> N/A</p>	<p><u>Deployment Strategy:</u> Protection <u>Low Water:</u> Booming <u>High Water:</u> Booming <u>Boom Required:</u> 4,600 ft of Hard Boom <u>Recovery Method:</u> N/A <u>Tank Truck Access:</u> N/A <u>Pump / Hose Required:</u> N/A <u>Recommended Staging Area:</u> N/A <u>Nearest Boat Ramp &amp; Dist.:</u> Bon Accord Lagoon Boat Ramp</p>	<p><u>Organization:</u> N/A <u>Phone:</u> N/A <u>Cellular Service:</u> Good</p>		
<b>Site Description</b>		<b>Considerations</b>		
<p><u>Access Location Description:</u> This site is located along the shoreline of Bon Accord Lagoon between Pigeon Point and No Man's Island.</p> <p><u>Hazards:</u> Slips, trips, and falls. Underwater hazards and currents.</p> <p><u>Obstructions / Limitations:</u> Debris along shoreline including wood.</p>		<p><u>Associated Sensitivities:</u> Mangrove Trees</p> <p><u>Strategy Considerations:</u> Environmentally sensitive sheltered lagoon with mangroves lining 80% of the shoreline. Boats anchor offshore near Pigeon Pt. Beach. Small boat launch on southside of lagoon in remote area. Only access is by boat. Area is covered in sea grass beds near shore and scattered coral reefs further offshore.</p>		
		<p>Copyright © 2018 TRG The Response Group, LLC</p>		<p>PGPT-4</p>

E. Geographical Response Plan

Guyana Geographic Response Plan	Pigeon Point Division – PGPT-4 Protection Site	Bon Accord Lagoon					
Site Pictures	Strategy Map						
 <p>Photo 2: Looking North down the beach towards Pigeon Point</p>  <p>Photo 3: Looking North towards the boat ramp</p>							
Assignments							
<p>1.) Deploy a total of 3,600 ft of hard boom to protect the shoreline.                  2.) Deploy a total of 1,000 ft of hard boom across the waterway to protect Bon Accord Lagoon.</p>							
Resources Required							
Type	Description	Qty.	Size	Type	Description	Qty.	Size
Manpower: Supervisor	Supervisor	2 ea	N/A	Manpower: Responder	Responder	12 ea	N/A
Boom Accessories	Anchor Stakes	50 ea	N/A	Boom	Hard Boom	4800 ft	18 in
Manpower: Operator	Boat Operator	4 ea	N/A	Vessel	Work Boat	4 ea	20 ft
Boom Accessories	Boom Anchors	20 ea	40 lbs				



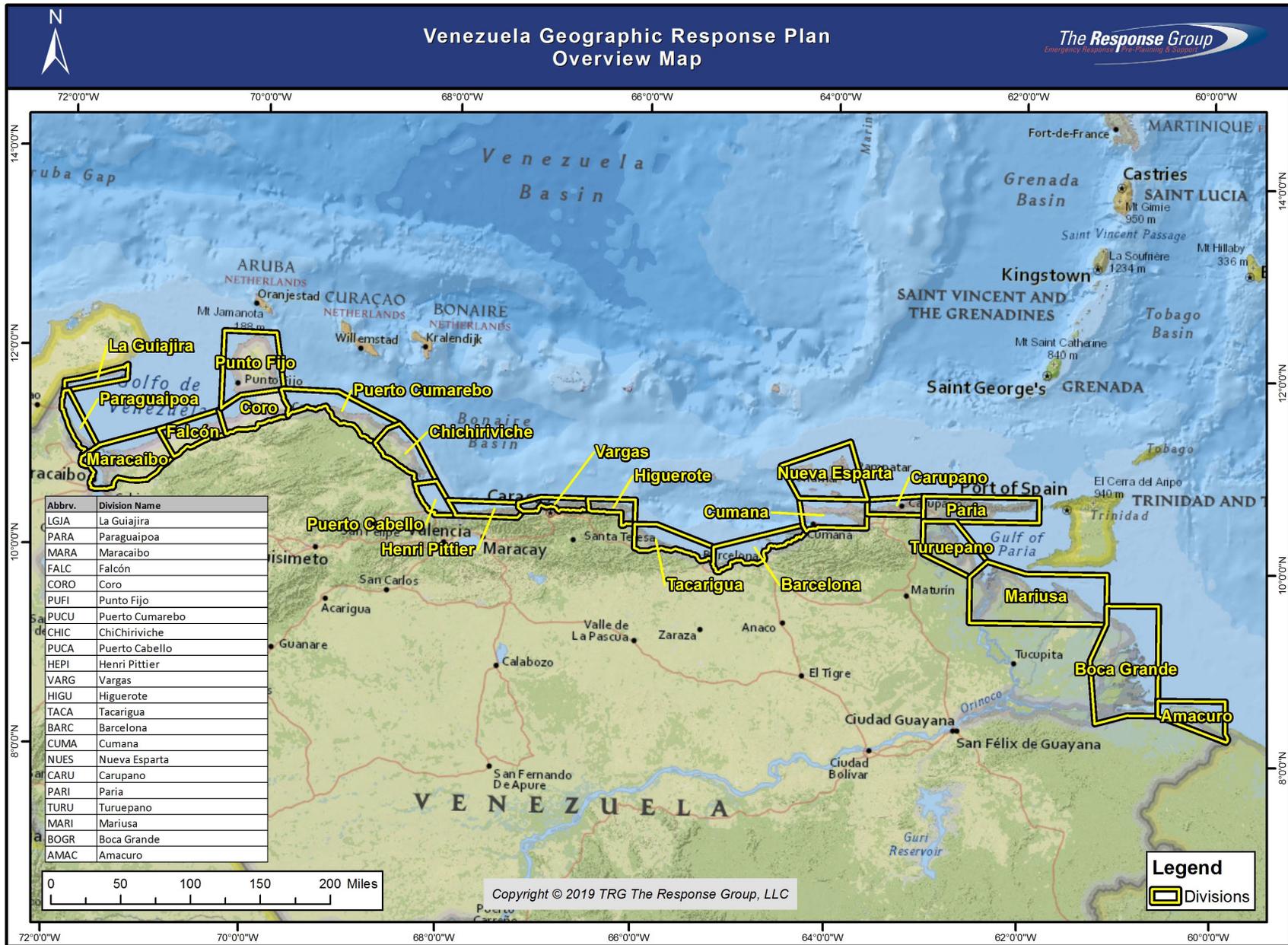
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PGPT-4

**E. Geographical Response Plan**

**Example – Venezuela Geographical Response Plan Information**

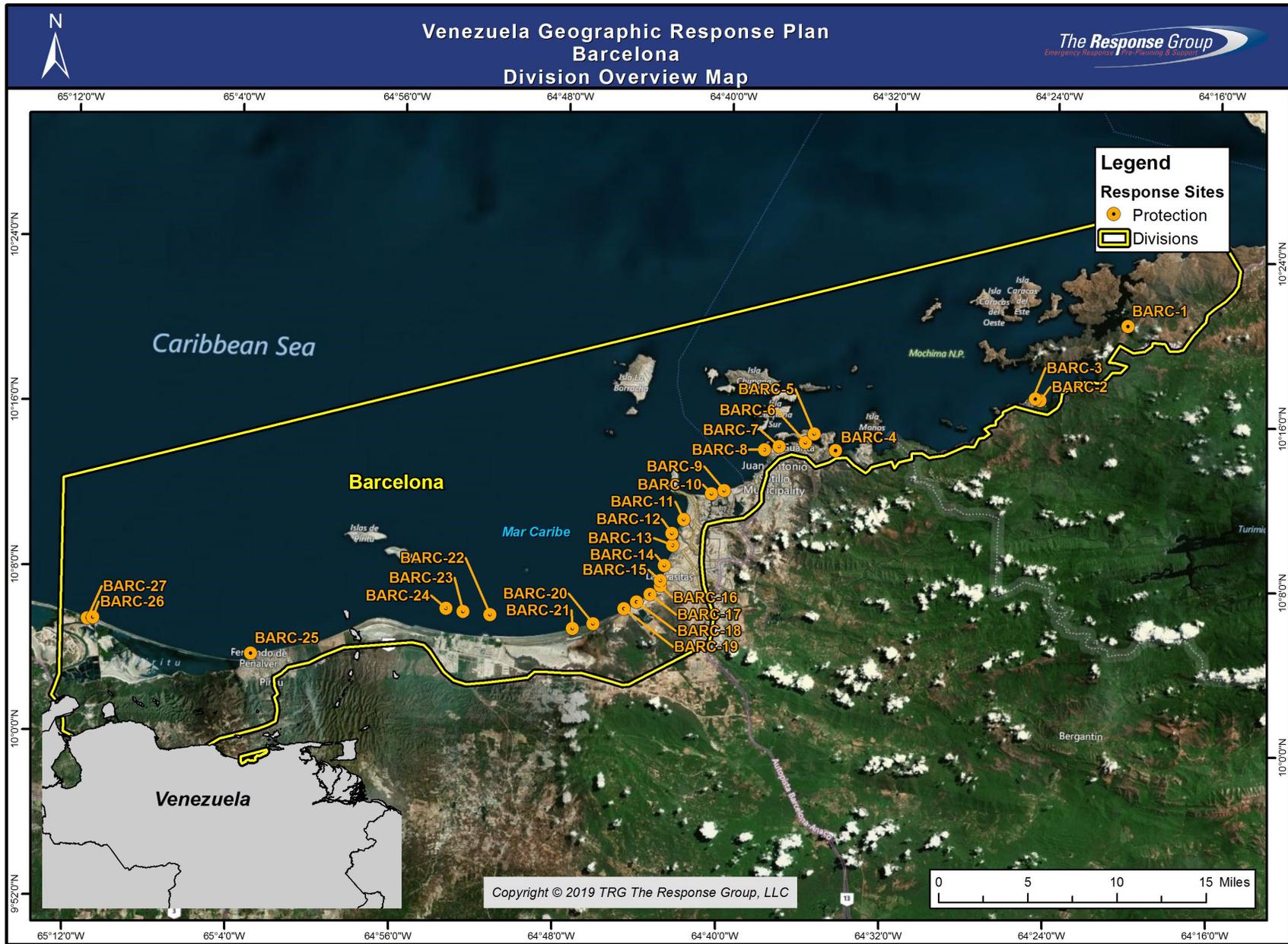
E. Geographical Response Plan



E. Geographical Response Plan



E. Geographical Response Plan



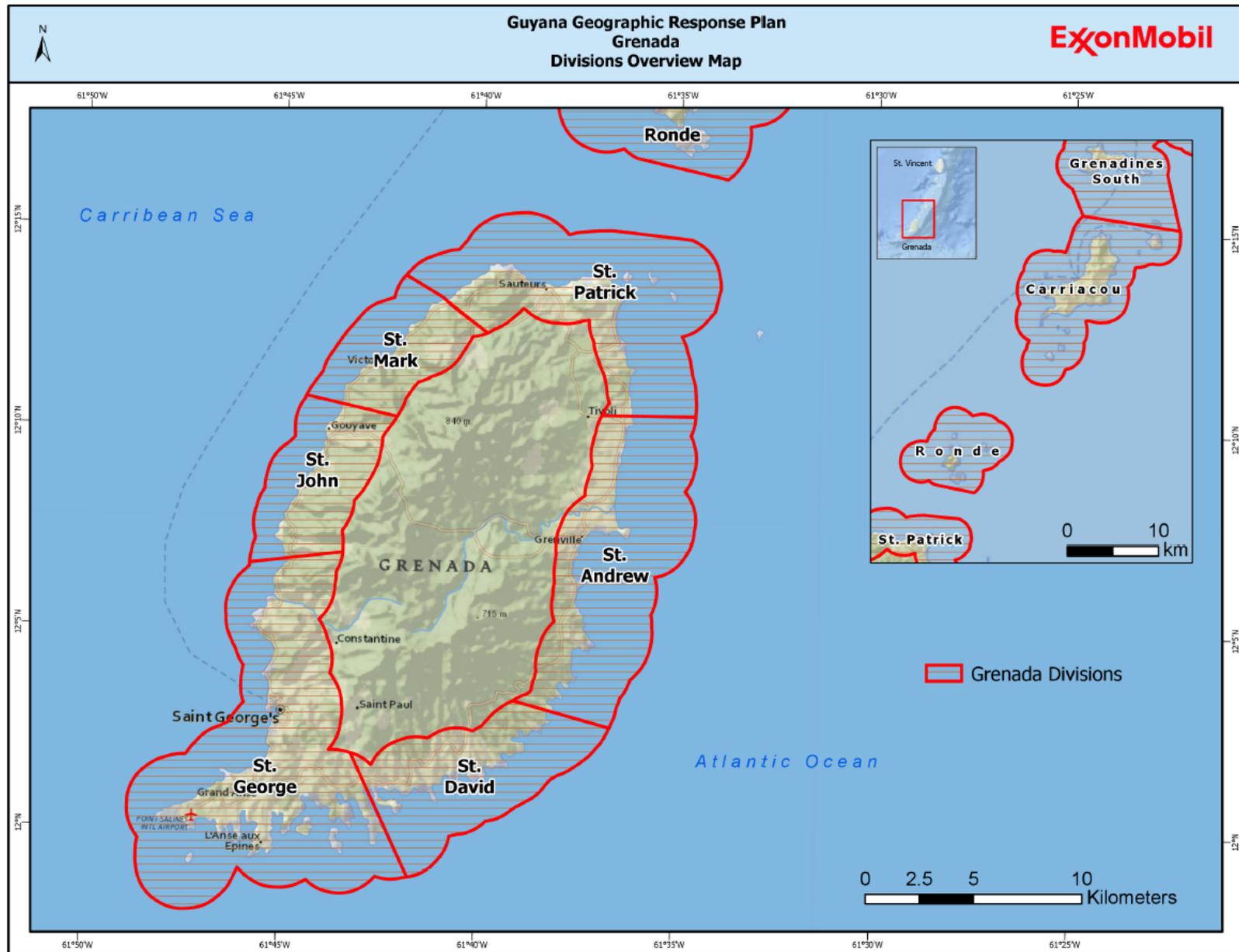
**E. Geographical Response Plan**

GRP Area Maintenance		GRP Area: BARC-3		
<i>Resources Required</i>				
<i>Area Of Operation</i>	<i>Resource Kind</i>	<i>Description</i>	<i>Quantity</i>	<i>Size</i>
BARC-3	Boom	Hard Boom	400 feet	18 inch (es)
BARC-3	Vessel	Work Boat	1 each	18 feet
BARC-3	Boom Accessories	Anchor Stakes	18 each	
BARC-3	Manpower: Responder	Responder	6 each	
BARC-3	Manpower: Supervisor	Supervisor	1 each	
BARC-3	Boom Accessories	Boom Anchors	2 each	20 pound(s)
BARC-3	Manpower: Operator	Boat Operator	1 each	
BARC-3	Boom	Shore Seal Boom	200 feet	22 inch (es)
<i>Assignments</i>				
1.) Deploy 200 ft of shore seal boom across the mouth of the waterway as indicated on the strategy map. 2.) Deploy (2) 200 ft sections of hard boom across the waterway to prevent migration upstream.				
<i>Location of Work</i>				
Latitude: 10° 17' 12.066" N Longitude: 64° 24' 51.305" W				
<i>Special Site-Specific Safety Considerations</i>				
Wear PFD when working near water. Ensure JSA is completed prior to work initiation.				
EXAMPLE				
GRP Area Maintenance				
INCIDENT ACTION PLAN SOFTWARE™	Printed 6/4/2019 20:16	Page 1 of 2	© TRG	

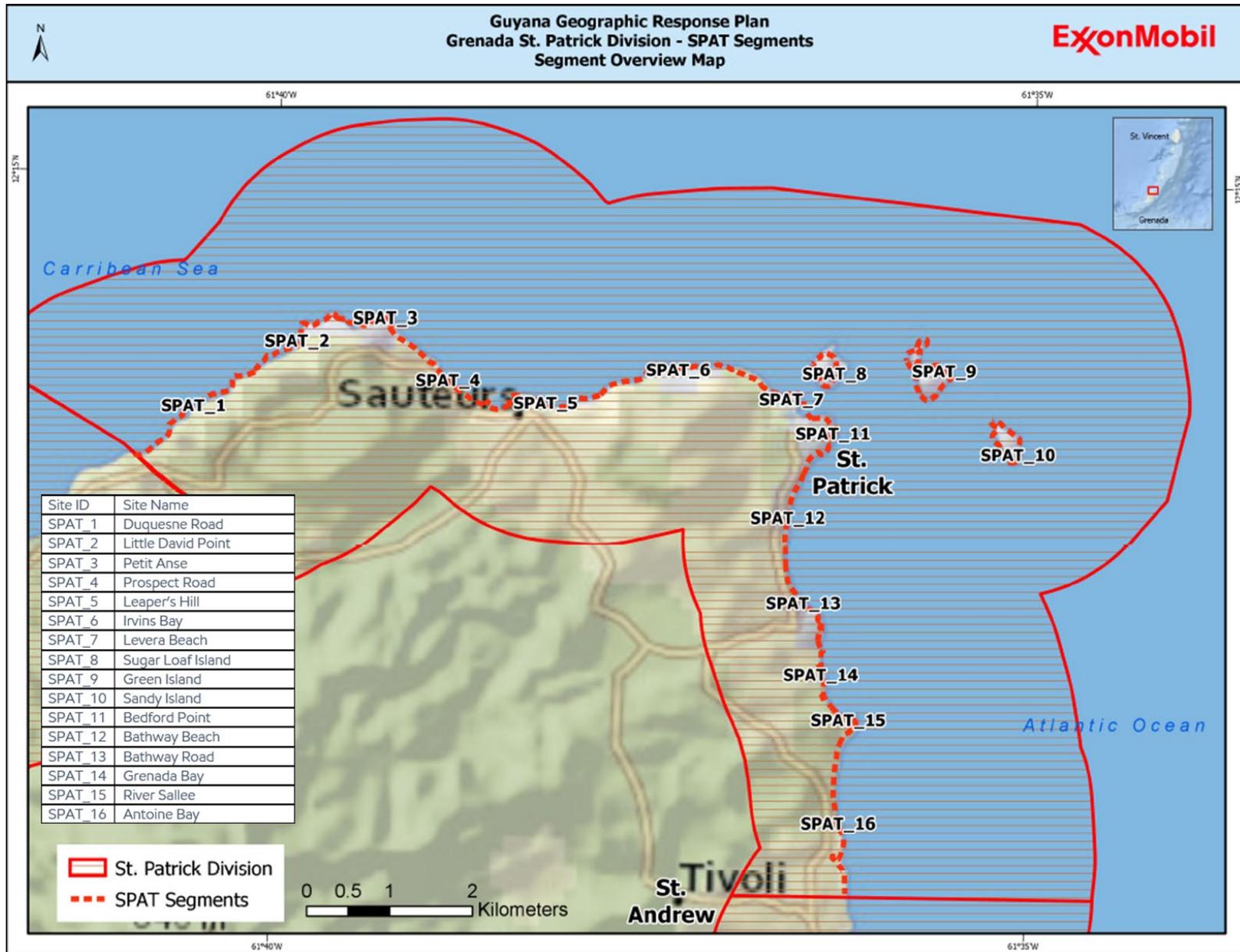
**E. Geographical Response Plan**

**Example – Grenada Geographical Strategic Response Maps**

E. Geographical Response Plan



E. Geographical Response Plan



E. Geographical Response Plan

Grenada  
Geographic Response  
Plan

St Patrick Division

SPAT-16 Segment

Segment Information

Segment Name: SPAT-16  
Start Lat, Lon:  
12.1896, -061.6036  
End Lat, Lon:  
12.1729, -061.6029  
Parish: St Patrick  
Country: Grenada  
Population Density: Light  
Land Use: Public Beach  
Existing Response Support  
Capabilities: None



Access Information

**Site Access:** Road, vehicle  
**Road Type:** Light duty  
**Road Surface Type:** mixed  
**Road Condition:** Stable, some  
tidal influence  
**Access Type:** Public  
**Bridge Height:** N/A

Waterway Information

**Type:** Open access ocean  
w/tidal inlets  
**Waterway name:** Caribbean  
Sea/Antoine Bay  
**Avg Speed:** Tidal  
**Waterway Width:** N/A  
**Tidally Influenced:** Yes  
**Shoreline Type:** Sand  
Beach/Mixed Sand, Gravel 4/5;  
Inlets: Veg. Low Banks 9B  
**Bank Slope:** Slight  
**Bank Height:** N/A

Response Information

**Deployment Strategy:** Protection  
**Low Water:** Booming  
**High Water:** Booming  
**Boom Required:**  
250m Shore Seal Boom  
100m Hard Boom  
**Recovery Method:** N/A  
**Tank Truck Access:** N/A  
**Pump / Hose Required:** N/A  
**Recommended Staging Area:**  
Rivers Restaurant  
**Nearest Boat Ramp & Dist:** N/A

Site Contact Info

**Organization:** N/A  
**Phone:** N/A  
**Cellular Service:** Yes

Site Description

**Access Location Description:** This  
protection site is located south of Bathway  
Beach at 12.1767, -61.6038  
**Hazards:** Slips, trips, falls, water hazards and  
currents  
**Obstructions/Limitations:** Debris along  
shoreline

Considerations

**Associated Sensitivities:** This segment is located  
between two marine protected areas.  
**Strategy Considerations:** Although no known sea  
turtle nesting is present on this segment, sea turtles  
are expected to be offshore

E. Geographical Response Plan

Grenada  
Geographic Response Plan  
Site Pictures

St Patrick Division

Protection Site  
SPAT-16a



Figure 1 South view on River Antoine, north of protection site SPAT-16a



Strategy Map



Assignments

1. Staging area to be established adjacent to Rivers Restaurant at 12.1763, -61.6071
2. Deploy 100-meter section of hard boom at mouth of water way at location 12.1767, -61.6038 to prevent oil from reaching inland
3. Deploy 250 meter section of shore seal boom along beach to protect waterway at location 12.1767, -61.6038 to prevent oil from reaching inland

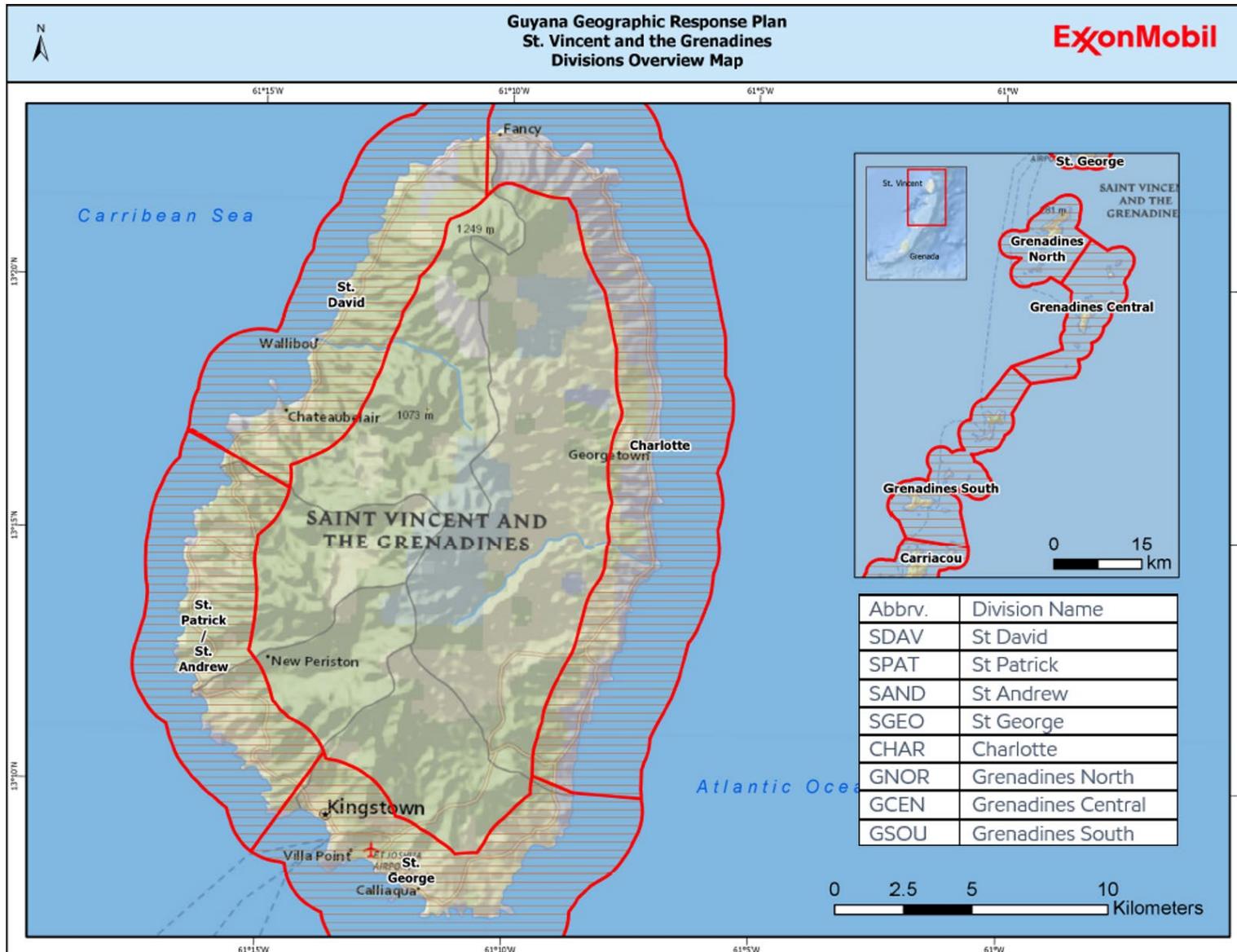
Resources Required

Type	Description	Qty	Size	Type	Description	Qty	Size
Boom Acc	Anchor Stakes	36	ea	Boom	Hard Boom	100 m	45 cm
Boom Acc	Boom Anchors	8	10 kg	Boom	Shore Seal Boom	300 m	60 cm
Personnel	Supervisor	1		Personnel	Responders	5	N/A
Boom Acc	Rope	1	1000 m				

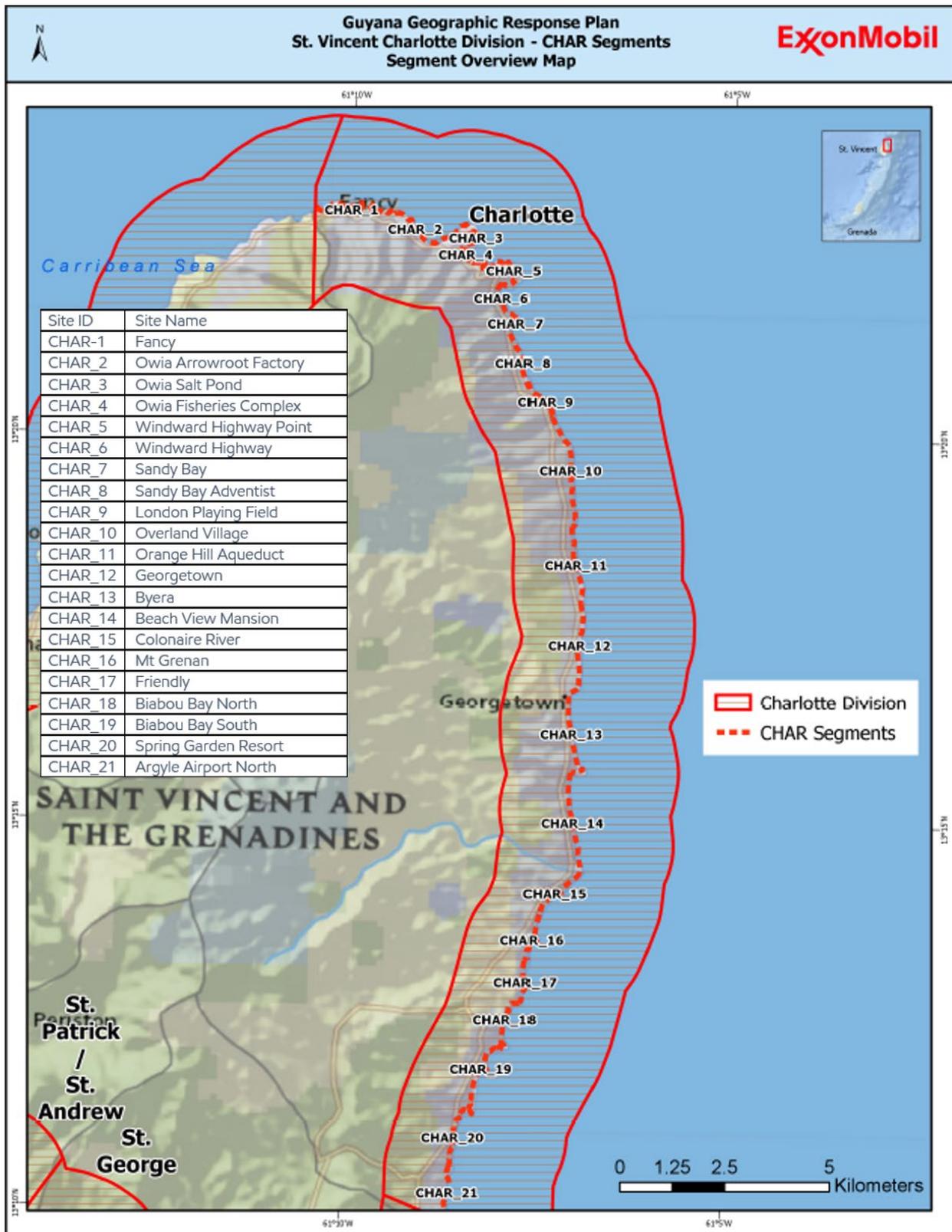
**E. Geographical Response Plan**

**Example – St. Vincent and the Grenadines Geographical Strategic Response Maps**

E. Geographical Response Plan



E. Geographical Response Plan



E. Geographical Response Plan

St Vincent & Grenadines  
Geographic Response  
Plan

Charlotte Division

Segment CHAR-03

Segment Information

Segment Name: CHAR-05  
Start Lat, Lon:  
13.3704, -61.1405  
End Lat, Lon:  
13.3658, -61.1340  
Parish: Charlotte  
Country: St Vincent &  
Grenadines  
Population Density: Moderate  
Land Use: Public Beach  
Existing Response Support  
Capabilities: None



Access Information

**Site Access:** Road, vehicle  
**Road Type:** Light duty  
**Road Surface Type:** mixed  
**Road Condition:** Stable  
**Access Type:** Public  
**Bridge Height:** N/A

Waterway Information

**Type:** Open access ocean  
w/tidal inlets  
**Waterway name:** Caribbean  
Sea  
**Avg Speed:** Tidal  
**Waterway Width:** N/A  
**Tidally Influenced:** Yes  
**Shoreline Type:** Exposed  
Rocky Cliffs 1C  
**Bank Slope:** Medium  
**Bank Height:** 3 meters

Response Information

**Deployment Strategy:** Deflection  
**Low Water:** Booming  
**High Water:** Booming  
**Boom Required:**  
400m (1m) Ocean Boom  
**Recovery Method:** N/A  
**Tank Truck Access:** N/A  
**Pump / Hose Required:** N/A  
**Recommended Staging Area:**  
Owia Fisheries Complex  
**Nearest Boat Ramp & Dist:**  
(13.3727, -61.1427)

Site Contact Info

**Organization:** OWIA Salt  
Pond Recreational Site  
**Phone:**+1 (784) 530-7890  
**Cellular Service:** Yes

Site Description

**Access Location Description:** This  
protection site is located adjacent to the Owia  
Salt Pond at 13.3756, -61.1394  
**Hazards:** Slips, trips, falls, water hazards and  
currents  
**Obstructions/Limitations:** High energy  
wave action along coastline. Restricted  
access to Coastline at Owia Salt Pond

Considerations

**Associated Sensitivities:** Owia Salt Pond  
Recreational Site  
**Strategy Considerations:** Deflection boom to be  
installed offshore to protect the Owia Salt Pond

E. Geographical Response Plan

St Vincent & Grenadines Charlotte Division  
Geographic Response  
Plan

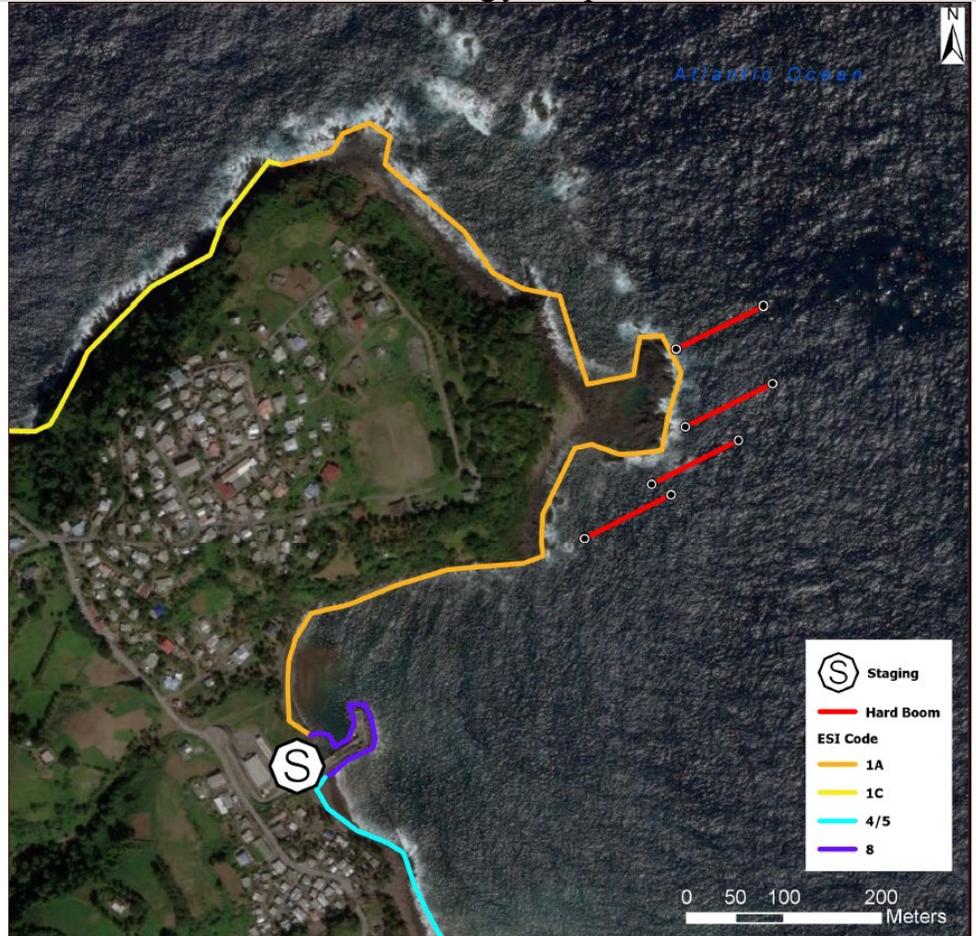
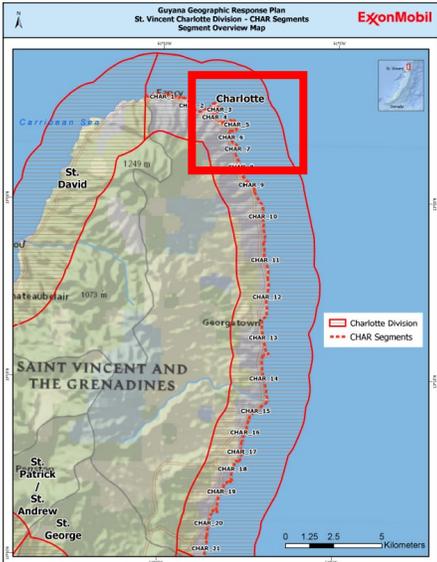
Protection Site  
CHAR-03a

Site Pictures

Strategy Map



View south from Owia Salt Ponds beach



**Assignments**

1. Staging area to be established at Owia Fisheries Complex at 13.3727, -61.1427
2. Deploy four 100 meter section of 1m ocean boom in chevron formation to protect Owia Salt Pond from oil

**Resources Required**

Type	Description	Qty	Size	Type	Description	Qty	Size
Boom Acc	Boom Anchors	15	20 kg	Boom	Ocean Boom	4x100m	1m
Personnel	Supervisor	1		Personnel	Responders	5	N/A
Boat	12m boat	1	12m				

**E. Geographical Response Plan**

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**F. Wildlife Response Plan**

## **APPENDIX F – WILDLIFE RESPONSE PLAN**

### **F.1. Introduction**

Prevention of oil spills remains the top priority for EEPGL. In the unlikely event of a spill, it is important to minimize the duration and impact of any release. Beyond essential mitigation measures, it is important to have a robust spill response capability utilizing all appropriate tools. The proper selection and use of those tools should be based on minimizing overall harm to environmental and socioeconomic resources.

#### **F.1.1. Objective**

A critical aspect of protecting wildlife is to minimize the formation of floating slicks and when formed to prevent such slicks from coming ashore driven by wind/currents. This Wildlife Response section is supplemental to the EEPGL Oil Spill Response Plan (OSRP) and is intended to serve as general guidance for wildlife response efforts which include deterrence (hazing), capture, and rehabilitation measures. The principal objectives of Wildlife Operations during a response are:

- Provide the best achievable protection of wildlife and habitats from contamination;
- Minimize injuries to wildlife and habitats from contamination;
- Minimize injuries to wildlife from the cleanup;
- Provide the best achievable capture and care for injured wildlife;
- Document adverse effects that result from the spill and cleanup; and
- Prevent injuries to responders and the public.

In the event of potential wildlife impacts, EEPGL personnel will initiate emergency response protocols which may include assistance / expertise from the ExxonMobil Regional Response Team (RRT), ExxonMobil Biomedical Sciences Inc. (EMBSI), and Sea Alarm / Oil Spill Response Limited (OSRL).

Contact numbers are listed in Table F-2. Initial wildlife response guidance is provided in Attachment F-7 of this plan.

#### **F.1.2. Potential Oil Spill Impacts on Wildlife**

Wildlife may be vulnerable to oiling depending on their behavior, food preferences, and habitat requirements. They may encounter oil in near-shore and intertidal areas, and at sea. The number of individuals and species affected by an oil spill will depend on the spill size, chemistry

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## **F. Wildlife Response Plan**

of the petroleum product spilled, meteorological and oceanographic conditions, time of year, and the location of the spill.

Many important bird and turtle habitats are located in near-shore and intertidal areas. Some mammals may scavenge for food in intertidal areas and may encounter oiled carcasses. Foraging animals may encounter and ingest oil-contaminated vegetation or other oil-contaminated food sources in coastal areas.

Seabirds are highly vulnerable to oiling since they feed and rest on the water surface. Whales and dolphins have low vulnerability to oiling as these animals tend to avoid areas that are oiled. Turtles generally have a low vulnerability to oiling, but vulnerability may increase during nesting seasons.

Exposure to oil can occur from swimming or wading through oil. Ingestion of oil may occur if an animal attempts to clean its oiled feathers or fur. Another route of oil exposure is through the consumption of oil-contaminated food or water.

General effects of oil on wildlife can be separated into physical and toxicological effects. An example of a physical effect is loss of water repellency and insulating properties of feathers when birds become oiled. As a result, the ability to thermo-regulate may be impaired or lost.

Toxicological effects of oil on wildlife include irritation of the eyes, skin, mucous membranes, lungs, and digestive tract. Organ damage and disruption of immune responses may occur. Effects of oil on wildlife reproduction may include altered breeding behavior, decreased hatching success, and decreased survival rates of the young.

### **F.1.3. Protected Species and Areas of Special Value**

Protected species and associated habitats that are at risk of oiling should be given priority protection during an oil spill response. In oiled wildlife response planning, it is important to consider:

- Input from appropriate regulatory agencies;
- Seasonality of species occurrences (breeding, nesting, and migration periods);
- Habitats important for breeding, nesting, feeding, or resting;
- Areas of high density occurrences; and
- Prioritization for protection of important habitats identified in the oil spill response plans.

Attachments F-1, F-2, F-3, and F-4 of this plan describe some of the habitats, birds, and marine reptile and mammal species at risk from oiling. In these appendices, information is provided for key sensitive periods (nesting, molting, migration, breeding, rearing).

**F. Wildlife Response Plan**

**F.1.4. Basis for Wildlife Response Plan**

Under the Guyana Environmental Protection Act, companies active in oil and gas exploration or drilling must prepare an Emergency Response Plan / Oil Spill Contingency Plan that includes provisions for rescuing and restoring plants, animals, etc. (i.e., Oiled Wildlife Response Plan, and Environmental Management or Pollution Prevention Plan). An oiled wildlife response plan provides for pre-planning for the protection of sensitive habitats and species while considering seasonal effects and behaviors. The plan facilitates the identification of protocols, and resources (equipment and personnel) necessary to respond to an incident in a timely manner. Lastly, the plan identifies the needs and capabilities necessary to reduce or avoid impacts to sensitive habitats and species during an oil spill response.

**F.1.5. Geographical Extent of Response**

The geographic area of concern for response activities for wildlife is typically defined by the extent of the influence of the Project and its alternatives; however, wildlife response for wildlife impacted by an oil spill can be provided on a regional and/or international basis as needed.

**F.2. Incident Command Structure and Activities**

This section provides a general overview of the Incident Command System (ICS) used for managing response efforts, with emphasis on wildlife response activities. The ICS is designed to provide a framework for a consistent, efficient, and effective means to train, activate, and implement EEPGL’s response resources. The ICS structure facilitates interaction with Contractors, Subcontractors, Guyana government agencies, and non-government organizations that could become involved during a response situation.

Table F-1 shows the ICS functional sections and their associated key activities.

**Table F-1: Key ICS Sections and Activities**

ICS Function	Activities
Command Staff	<ul style="list-style-type: none"> <li>• Overall Oil Spill Response Management</li> <li>• Management Liaison</li> <li>• Government Liaison</li> <li>• Community Liaison</li> <li>• Media/Public Affairs Liaison</li> <li>• Legal Support</li> <li>• Safety and Health Oversight</li> </ul>

**F. Wildlife Response Plan**

ICS Function	Activities
Operations Section	<ul style="list-style-type: none"> <li>• Oil Spill Source Control</li> <li>• Site Safety and Security</li> <li>• Surveillance</li> <li>• Dispersant Application</li> <li>• <i>In-Situ</i> Burning</li> <li>• Offshore/Near-shore Containment and Recovery</li> <li>• On Land Containment and Recovery</li> <li>• Shoreline, River, and Resource Protection</li> <li>• Pre-Impact Debris Removal</li> <li>• Shoreline Treatment and Cleanup</li> <li>• Bioremediation</li> <li>• Waste Management</li> <li>• Wildlife Deterrence, Capture, and Rehabilitation</li> </ul>
Planning Section	<ul style="list-style-type: none"> <li>• Site Characterization and Analysis</li> <li>• Documentation</li> <li>• Spill Tracking and Surveillance</li> <li>• Sensitive Areas Identification and Characterization</li> <li>• Environmental Monitoring</li> <li>• Incident Action Plan Coordination</li> <li>• Oil Spill Sampling</li> <li>• Oil Spill Response Technical Support</li> <li>• Dispersant / <i>In-Situ</i> Burning Support</li> <li>• Waste Management Support</li> <li>• Demobilization</li> </ul>
Finance and Logistics Sections	<ul style="list-style-type: none"> <li>• Transportation (Air, Water, Land)</li> <li>• Housing</li> <li>• Catering</li> <li>• Telecommunications</li> <li>• Customs Clearance</li> <li>• Security</li> <li>• Field Operations Support</li> <li>• Personnel Resourcing</li> <li>• Material Distribution</li> </ul>

The structure for the wildlife response organization is designed to fit within the ICS and allows for the integration of wildlife activities into the entire oil spill response plan (IPIECA 2004).

Wildlife response is typically managed under the Wildlife Branch of the Operations Section of the ICS and coordinated through the Environmental Unit of the Planning Section. For example, the Planning Section identifies and characterizes environmentally sensitive areas and wildlife at risk. The Operations Section is responsible for wildlife deterrence, capture, rehabilitation, and shoreline protection.

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## F. Wildlife Response Plan

See Attachment F-7 for initial response activities of the Wildlife Branch.

### F.3. Response Personnel

Only trained and qualified personnel should haze, capture, transport, and rehabilitate oiled wildlife. ExxonMobil has contracts in place with two internationally recognized oiled wildlife response organizations:

- International Bird Rescue (IBR) and
- Tri-State Bird Rescue & Research, Inc.

Experts from these two organizations, and other available international organizations, can be mobilized to Guyana within days by contacting Sea Alarm. ExxonMobil is a participant in a Global Oiled Wildlife Response System, which is monitored by Sea Alarm. Wildlife response experts who are prepared to assist ExxonMobil during an oil spill are listed in Table F-2.

This Wildlife Response section will be implemented with the assistance of trained and qualified contractors and support groups. Upon notification, contractors and trained local experts (if applicable) will mobilize equipment and trained personnel to the spill site and begin wildlife response operations. Wildlife response equipment for the initial response is available through OSRL in Fort Lauderdale, Florida, USA. Additional equipment will be brought in as needed. Wildlife response standard operational protocols can be supplied by wildlife experts at the time of response or developed ahead of time.

Response-specific wildlife cleaning facilities will be setup in Guyana and/or the region based on response needs. These facilities are set up in response to a spill's trajectory and can be operational in approximately 3-5 days depending on the remoteness of the impacted area(s). There are no wildlife rehabilitators in Guyana with oiled wildlife experience. There are also no permanent facilities for oiled wildlife rehabilitation and few organized wildlife rehabilitation programs in the country. The Karanambu Trust may be able to help should otters be affected by a spill. The Guyana Marine Conservation Society would likely be involved in marine turtle response. Several small facilities in Trinidad and Tobago are available for Tier I responses, and are listed below.

Conservation organizations in Guyana include:

- Government Ministries:
  - Environmental Protection Agency;
  - Protected Areas Commission;
  - Guyana Forestry Commission;
  - Wildlife Management Authority.
- Non-Governmental and Academic Institutions:
  - Conservation International;

**F. Wildlife Response Plan**

- Guyana Marine Conservation Society;
- Guyana Tropical Birds Society;
- Guyana Mangrove Restoration Project;
- Centre for the Study of Biological Diversity;
- School of Earth and Environmental Sciences, University of Guyana;
- Environmental Clubs of Guyana.
- Organizations in Trinidad and Tobago:
  - Wildlife Orphanage and Rehabilitation Center (Trinidad);
  - El Socorro Center for Wildlife Conservation (Trinidad);
  - Pointe-a-Pierre Wildfowl Trust (Trinidad);
  - Tobago Society for Prevention of Cruelty to Animals (Tobago).

**Table F-2: Contact Information for Wildlife Experts and Responders**

Contact	Contact Name	Contact Information	Comments
Guyana Coast Guard	Operations Center	+592-226-8488	Spill notifications
Guyana Environmental Protection Agency	Duty Officer	+592-225-5467 or +592-225-5469	Spill notifications
Guyana Ministry of Natural Resources and the Environment	Department of Governance	+592-231-2506 ministry@nre.gov.gy	Spill notifications
Harbour Master Starbroek, Georgetown	Duty Officer	+592-226-7842	Spill notifications
Guyana Marine Conservation Society	Annette Arjoon Martins, President	+592-600-7272 annette.arjoon@aslgy.com	Conservation organization
The Karanambu Trust	Diane McTurk Executive Director	www.karanambutrustandlodge.org	Giant Otter expertise
ExxonMobil Biomedical Sciences, Inc.	Richard Davi Richard Woods	+1 (908) 730-1111 richard.a.davi@exxonmobil.com richard.w.woods@exxonmobil.com	Wildlife Response Issues
Sea Alarm	Hugo Nijkamp	(Office) +322 2788 744 (Mobile) +32 494900012 (Mobile) +32 499624772 Nijkamp@sea-alarm.org	Oiled Wildlife Response facilitator

**F. Wildlife Response Plan**

Contact	Contact Name	Contact Information	Comments
OSRL	Duty Manager Fort Lauderdale, FL, USA	+1 (954) 983-9880 +44 (0)23 8033-1551 (UK)	Wildlife Response equipment
IBR	Barbara Callahan	+1 (907) 230-2492 barbara.callahan@bird-rescue.org	ExxonMobil has a contract in place with IBR
Tri-State Bird Rescue & Research, Inc., Delaware	Dr. Heidi Stout, veterinarian	Main +1 (302) 737-9543 hstout@tristatebird.org www.tristatebird.org	ExxonMobil has a contract in place with Tri-State
Wildlife Orphanage and Rehabilitation Center (Trinidad)	No contact name available	299 Queen Elizabeth Avenue Petit Valley, Trinidad and Tobago, West Indies Tel: (868) 637-3842 Email: worctrinidad@gmail.com	Oiled wildlife facility in Trinidad (25 animal capacity)
El Socorro Center for Wildlife Conservation	Gia Narinesingh Ricardo Meade	Freeport, Trinidad and Tobago +1 (868) 673-5753	Wildlife facility in Trinidad (limited capacity)
Pointe-a-Pierre Wildfowl Trust	Molly Gaskin—Trust President	St. James, Trinidad +1 (868) 658-4200 ext. 2512	Wildlife facility in Trinidad (limited capacity)

A licensed veterinarian is integral to the oiled wildlife response organization. The veterinarian, using a pre-approved decision tree, will confer with the appropriate Guyana authorities and fauna experts to decide which oiled animals should be rehabilitated and which animals should be euthanized. For those animals rehabilitated, the veterinarian administers or supervises the appropriate treatment. According to the Guyana Agriculture Ministry, there are approximately 45 active veterinarians in Guyana. Contact can be made through the Guyana Veterinary Association.

Trained and qualified personnel are essential to an oiled wildlife response. The training each person receives will depend on the task the person will perform during the response. Personnel may conduct wildlife deterrence operations or search for and capture oiled animals. Other personnel may stabilize and transport oiled animals to a treatment area. Once oiled animals arrive at the treatment area, additional personnel maintain records on the animals, clean pens, and prepare food for the animals. Qualified personnel with additional training may perform tasks such as administering fluids to dehydrated animals, take blood samples from animals, and wash oiled animals.

**F.4. Training and Health and Safety**

Worker health and safety are a priority during oiled wildlife response operations. The following is a summary of safety precautions to be considered in the development of the Wildlife Health,

**F. Wildlife Response Plan**

Safety and Environmental Plan. Additional safety plans may need to be written for operation of specialized equipment (such as propane cannons, etc.).

- Be proficient with Safety Data Sheets;
- Recognize the most common hazards are slips, trips, and falls;
- Maintain necessary immunizations, including tetanus and hepatitis;
- Observe all industrial hygiene safety precautions stated in the Safety Plan;
- Ensure proper training regarding hazards of the work task, and the proper use of personal protective equipment (PPE);
- ALWAYS work in teams; never conduct wildlife rescue work alone;
- Don't overwork;
- Keep animals at or below one's waist level to protect the face and eyes from pokes, bites, and scratches;
- Wear approved PPE, and always remove PPE and wash hands and face with soap and water or approved cleaners before eating, drinking, or smoking;
- Never eat, drink, or smoke in wildlife handling areas;
- Minimize contact with contaminated materials and inhalation of vapors even when wearing PPE;
- Keep all oil, cleaning compounds, and contaminated materials away from face, eyes, and skin;
- Ensure work areas are clean and well ventilated;
- Report all injuries and illnesses to the supervisor and/or Command Center medical staff;
- Do not work with oiled wildlife if you are ill, pregnant, have an immunosuppressive condition, or are taking medication that might affect your natural immunity.

**Reference the ExxonMobil Oil Spill Response Field Manual, Section 13 Oiled Wildlife Response**

**F.4.1. Training for Wildlife Response Personnel**

In addition to being trained in specific wildlife response tasks, wildlife response specialist personnel will be trained to recognize and prevent oil-related and physical hazards associated with wildlife response operations. Complete training will be given to a core group of specialists prior to participation in oiled wildlife response activities. Due to health and safety concerns associated with physically handling affected or injured wildlife, the majority of volunteers supporting wildlife response would be utilized in supportive roles not directly related to the

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## **F. Wildlife Response Plan**

cleaning of wildlife after receiving the required training, orientations, and deployment of Personal Protective Equipment (PPE).

### **F.4.2. Personal Protective Equipment (PPE)**

To prevent exposure to oil and injury from wildlife, workers should wear approved PPE appropriate to their task. The following is a list of recommended PPE:

- Full eye protection (goggles or safety glasses)—eye protection is required when handling animals, especially birds. Birds will peck when under stress and should be considered dangerous as they will aim for eyes;
- Oil resistant rain gear or oil protective clothing (coated Tyvek, Saranex, etc.);
- Gloves (neoprene or nitrile rubber) that are oil resistant and waterproof and provide protection against beaks and claws;
- Non-skid shoes / boots, which are oil resistant and waterproof;
- Duct tape, used to tape rain jacket sleeves to gloves and rain pants to boots;
- Ear protection (muff or ear plug type) during deterrent operations, if appropriate;
- Respiratory protection, if appropriate.

In addition, the following PPE are recommended:

- Long-sleeved shirts;
- Hat (to provide shade in hot weather);
- Change of clothes (to rest or leave in);
- Clean towel / toiletries;
- No jewelry (birds will peck at bright, shiny objects).

Clothing and equipment to protect against bites and scratches should be worn underneath the oil protective equipment whenever necessary. Respiratory protection from organic vapor hazards may be required for some operations. If respirators are used, respirator training and fit testing are required. Workers will be trained in the proper use and limitations of all PPE prior to using the equipment.

### **F.4.3. Worker Safety**

Worker safety is the primary consideration in wildlife handling. Handling and restraint techniques appropriate for specific species need to be applied by trained and experienced personnel.

## F. Wildlife Response Plan

Oiled wildlife response is often physically and emotionally stressful. Dehydration, exhaustion, and poor nutrition can affect a person's ability to assess and react to a dangerous situation. It is therefore important workers stay well hydrated and eat nutritionally sound meals. Rest is equally important. The safety of all depends on the alertness of each individual.

In addition to hazards from oil, numerous physical hazards may be associated with wildlife response activities. Workers should be aware of changing weather conditions, strong undertows in tidal areas, slick surfaces along shorelines. Personal flotation devices should be worn for all on-water and in-water operations.

### F.4.4. Zoonosis

Wildlife may carry diseases that are transmissible to people. Diseases transmitted from animals to humans are called zoonoses; they may be viral, bacterial, fungal, or parasitic. **Individuals who have immunosuppressive conditions are more susceptible to contracting zoonotic diseases.**

Zoonoses can be transmitted to humans by:

- Inhalation of particles (spores, bacteria) in the air;
- Ingestion of feces (i.e., projectile feces, poor hygiene, etc.);
- Contact with the skin.

To reduce risk of contracting a zoonotic disease, wildlife handlers should always:

- Wash hands thoroughly with soap and water after handling wildlife;
- Wash hands well before and after eating or smoking;
- Smoke, drink, or eat in designated areas only and not near wildlife;
- Clean and treat all cuts and scratches;
- Use gloves as much as possible;
- Use surgical masks as appropriate.

In addition, there is a potential health risk to poultry, farm, and domestic animals (including pets) from clothing or equipment in contact with wildlife. Return used oil spill response equipment and supplies for proper decontamination or disposal. Thoroughly wash, and disinfect as appropriate, all personal items after completing wildlife response tasks for the day.

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**F.5. Wildlife Deterrence (Hazing)**

**F.5.1. Introduction**

The primary strategy for wildlife protection is controlling the spread of spilled oil to prevent or reduce oil contamination of potentially affected species and habitats. Removal of oiled debris and contaminated food sources also protects wildlife. Another method of wildlife protection is deterrence or hazing. Hazing is the term used when a variety of deterrents are used to prevent wildlife from entering areas already oiled or areas that are in the projected pathway of the oil. Hazing should be carefully planned and executed, since hazed wildlife could move into other oiled areas.

Common hazing techniques include:

- Making noise with pyrotechnics, firearms, air horns, motorized equipment, or recorded bird alarm sounds;
- Using scare devices such as Mylar tape, helium-filled balloons, scarecrows, predator effigies in oiled areas;
- Herding wildlife using aircraft, boats, all-terrain vehicles, unmanned aerial vehicles (UAVs), or other vehicles; and
- Hazing by human presence.

Information necessary to help determine whether or not to begin hazing operations include time of year, availability of nearby uncontaminated habitat, proximity of nesting colonies and location of species in relation to the spill. The decision tree for hazing is presented in Figure F-1. Once the decision to haze is made, review the hazing plan with the Operations Section Chief, Incident Commander, and other appropriate authorities and obtain all necessary approvals, and permits (if required). Initiate deterrence activities as soon as possible. Whether or not a deterrent operation will be effective depends on the habitat, season, species, and their residency status and age. Deterrent effectiveness can decrease for birds occupying key habitat areas (established nesting colonies, important foraging areas) or during molting season.

The potential effects of human activity and disturbance on sensitive habitats should be considered prior to starting a hazing operation. For example, take care not to trample fragile vegetation by foot traffic or off-road vehicles. If pyrotechnics or gas operated cannons are used, take care to prevent igniting vegetation. Wakes from boat operations should not push floating oil further into wetlands or mangroves. If in the nesting season, consider the potential effects of hazing on bird reproduction. Young birds are more susceptible to predation if they become separated from their parents.

Each spill situation will be unique and preplanned deterrence activities are considered tentative. Consultation with local experts is advisable. Regulations should be followed regarding the purchase, possession, and discharge of firearms or explosives, including shotgun and pistol-launched pyrotechnics.

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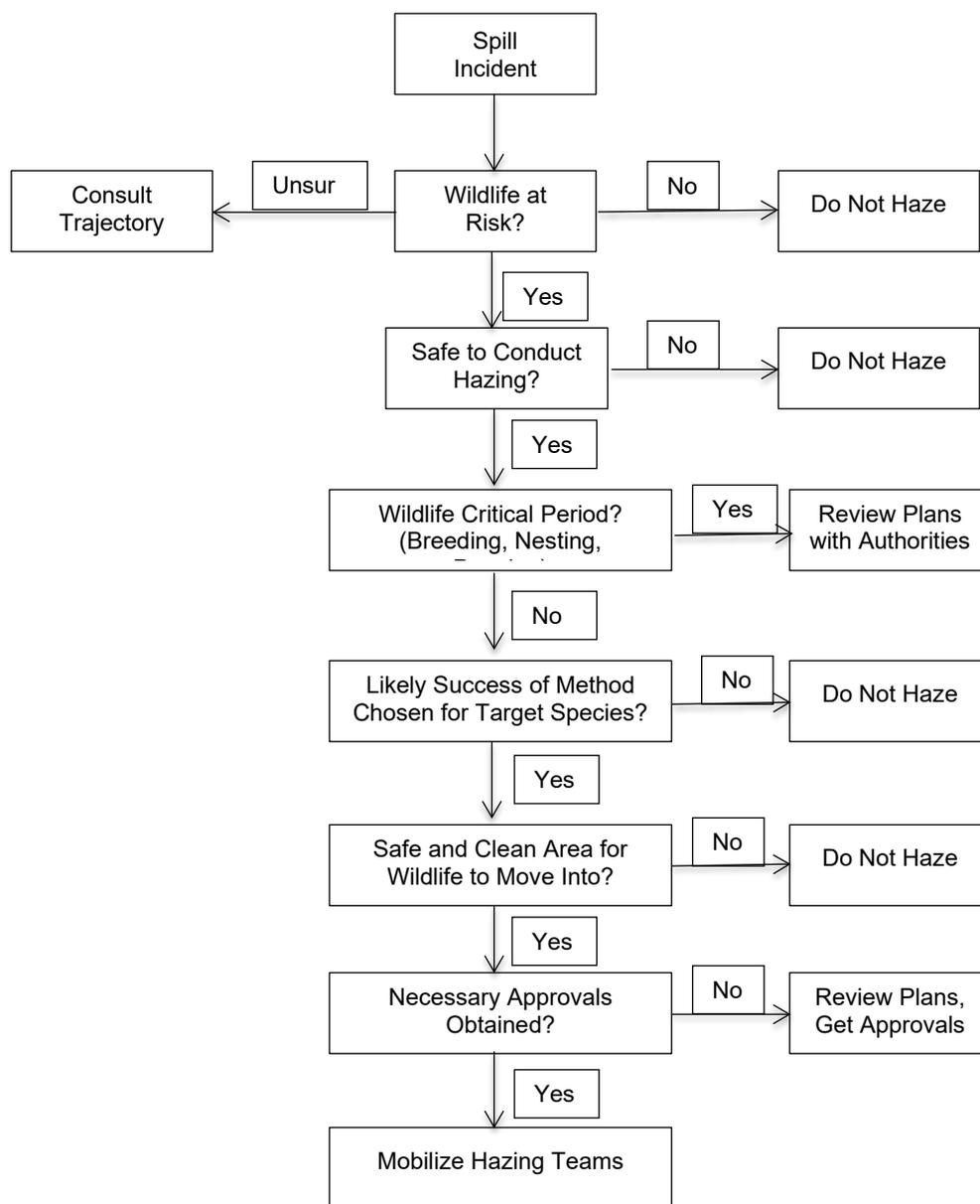
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No attempt should be made to haze oiled wildlife. Depending on the extent of oiling, wildlife already oiled may need to be captured and cleaned. Hazing is most effective if the area of concern can be hazed as continuously as possible. Avoid hazing in areas with oiled habitat or adjacent to oiled habitats where hazed wildlife could become contaminated with oil.

Habituation is the gradual decrease in response to a deterrence method due to increased familiarity and acceptance. Habituation can be minimized by using a combination of hazing methods and frequently changing the type, timing, and location of the hazing devices. It is recommended that human patrols be incorporated in hazing operations. Molting birds are not easily deterred and require a combination of different techniques.

Hazing is not generally recommended for marine mammals. Before hazing is being considered for marine mammals (whales, dolphins, seals, otters, manatees), consult the appropriate regulatory authorities and marine mammal experts. There are no established methods or data for hazing whales and dolphins.

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**Figure F-1: Hazing Decision Tree**

**F.5.2. Deterrence Methods and Equipment**

Deterrent operations should include both visual and auditory techniques. Some petroleum products are highly flammable during the first few hours after a spill, due to high concentrations of volatile oil fractions. Techniques with potential to induce sparks should be avoided in these

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situations. The effects of sound emitting devices on humans, in terms of irritation and noise, especially at night, will influence whether or not some hazing methods will be acceptable.

### **Gas-Operated Cannons**

Gas-operated cannons should only be used by trained personnel. The cannons produce a loud shotgun-like noise when discharged. Blasts are emitted at adjustable time intervals from less than one minute to as much as 30 minutes. If multiple cannons are used in an area, stagger the firing intervals. Cannons should be elevated at a 45-degree angle and preferably aimed downwind to increase effectiveness. Propane cannons are more effective for migrating and hunted species that associate danger with loud noises.

### **Pyrotechnics**

Pyrotechnic devices disturb wildlife by producing a whistling noise, explosion, and/or flash of light. Types include shotgun-launched projectiles (crackers), fireworks, and a variety of pistol-launched projectiles. Pyrotechnic devices are potentially dangerous and should only be used by trained personnel. Safety goggles and ear protection should be worn by operators. When using these devices, care must be taken not to ignite spilled oil or vegetation.

### **Aircraft**

Aircraft are often effective for deterring birds and terrestrial mammals because of the combination of loud noise and rapid approach from above. Because of their maneuverability and noise, helicopters are probably more effective than fixed-wing aircraft.

### **Unmanned Aerial Vehicles**

UAVs operate similarly to manned aircraft, but may be able to operate at lower altitudes. Typically, they operate in conjunction with ground or boat based personnel. UAVs can be used to scare off birds in flight. UAVs should be operated by trained personnel and must be approved by the Aviation Branch and appropriate government authorities.

### **Boats**

Air boats or boats propelled by outboard motors can be used to haze wildlife and marine mammals. Small, noisy, shallow draft boats have been reported to be particularly effective. Boats can be used in combination with other hazing methods (i.e., UAVs, pyrotechnics).

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**All-Terrain Vehicles**

All-terrain vehicles are moderately effective for hazing many species of wildlife. Human presence reinforces the effects of the noise and rapid movement of the vehicle.

**Air Horns**

Air horns can be used to deter wildlife. Since habituation may be rapid, it is recommended that air horns be used in combination with other deterrent methods or devices.

**Electronic Sound Generators**

Sound generators broadcast loud, intermittent electronically synthesized sounds. The units can be adjusted to the most effective range of sound patterns for the target species. Sound generators can be positioned on land, mounted on boats, or housed within floats in water. When a sound generator is deployed within a drifting slick, the potential of scaring birds directly into the oil-contaminated water is reduced.

**Balloons**

All-weather helium balloons are considered effective if frequently refilled and moved. They can be suspended from land or from floating objects in water (e.g., spill booms). They should not be located near trees or other objects that could cause puncturing.

**Human Effigies and Predator Models**

Human effigies (scarecrows) and raptor models may be effective if they appear lifelike, have motion, are moved frequently, and are used in combination with loud sounds or recorded distress calls.

Additional hazing techniques are available. The recommendation to haze will be guided by site-specific and species-specific factors present at the time of the spill, and availability of proven hazing techniques.

**F.6. Capture and Transport of Oiled Wildlife**

**F.6.1. Objective**

The sooner oiled wildlife can be captured and treated the better their chances for survival. It is helpful to plot and number oiled wildlife on maps and charts to identify search and recovery

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patterns. Reconnaissance surveys for oiled wildlife may occur in offshore and near-shore waters, shorelines in oiled areas, in addition to areas that could potentially be oiled.

Reconnaissance surveys may also be conducted at nearby feeding and nesting areas to detect oiled wildlife that may have moved away from oiled areas. The objectives of a reconnaissance survey are to: (1) evaluate the number, species, and locations of wildlife potentially affected by an oil spill; and (2) determine the feasibility to rescue oiled wildlife.

Local experts can provide information regarding special site considerations (i.e., nesting grounds, cultural or historic sites) and oiled species prioritization for capture. An effort should be made to avoid capturing birds, or other animals, not impacted by the spill, unless otherwise authorized.

Wildlife capture operations should only be conducted when weather conditions permit. Captured wildlife may be aggressive and should be regarded as potentially dangerous. Only trained individuals should undertake the capture and treatment of oiled wildlife.

### **F.6.2. Capture**

A capture team consists of two or more individuals wearing appropriate protective clothing. Capture strategies should be discussed before any attempt to capture oiled wildlife. Safety of individuals is not to be compromised for the objective of capture.

A variety of methods can be used to capture wildlife:

- Dip nets, throw nets, or mist nets can be used for small birds and mammals;
- Seine nets and net guns can be used for larger birds or turtles; and
- Capture poles can be used.

Oiled birds can be approached using boats, but it is best to allow them to reach the shore if possible. Oiled wildlife should be approached carefully so as not to further stress the animal.

Appropriate handling techniques are based on the size and species of the animal. Field personnel should be properly trained before attempting to handle oiled wildlife.

Dead wildlife should be collected to prevent other wildlife from becoming oiled as they attempt to eat the carcasses. Each carcass should be labelled, numbered, and documented on the appropriate form.

### **F.6.3. Transport**

Oiled wildlife should be transported in well ventilated containers of sufficient size for the species captured. Some species may be placed 2 or 3 to a container. Containers should be placed in an area separate from the operator of the transport vehicle to protect the operator from inhaling

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## **F. Wildlife Response Plan**

vapors. Temperature should be maintained at an adequate level to prevent hypothermia or overheating.

### **F.7. Stabilization, Rehabilitation, and Husbandry**

#### **F.7.1. Introduction**

If an oiled animal is hypothermic, dehydrated, sick, or injured, it may not survive the stress of being washed. Stabilization increases an oiled animal's chances for a successful rehabilitation and release.

#### **F.7.2. Stabilization**

A stabilization center will serve as a collection site for all oiled wildlife collected by the wildlife search teams. A field stabilization group will provide initial care in the field prior to transportation to the rehabilitation facility. Stabilization can include warming or cooling of oiled animals to stabilize body temperature, preliminary examinations and initial cleaning, and providing fluids and nutrition.

#### **F.7.3. Rehabilitation**

A suitable facility must have a large open space easily reconfigurable to accommodate the changing needs of the wildlife rehabilitation process. Contracted wildlife specialists and/or agency representatives should be consulted regarding facility requirements for optimum rehabilitation.

The following are equipment and facility considerations:

- Location with respect to location of spill;
- Anticipated number of animals;
- Types and numbers of species;
- Season / weather;
- Hot and cold water capacity;
- Electric and lighting;
- HVAC systems (good air handling necessary);
- Communications;
- Noise control;
- Waste management issues (collection and storage); and
- Appropriate holding pens (species dependent).

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Each wildlife rehabilitation facility should have a Site Safety Plan in place prior to start-up. The Site Safety Plan should include checklists for measures to avoid physical, chemical, and biological hazards, safe animal handling procedures, and other emergency procedures and contact numbers.

### **Buildings of Opportunity**

It may be possible to secure an appropriate building for oiled wildlife rehabilitation that is normally used for some other purpose but can be quickly transformed into a suitable facility. Examples may include warehouses, community centers, etc. To utilize this option will require considerable planning and contracts with building owners, suppliers and tradesmen to ensure that the facility can be up and running within hours when needed, and is able to provide the required space, water, heating and ventilation necessary to meet the goals of the wildlife plan (IPIECA 2014).

### **Mobile Facilities**

Mobile facilities are comprised of modules (trailers, containers, tents, etc.) that can be easily transported and set up wherever they are needed. Infrastructure needs may vary, and potential settings could, for example, range from a large warehouse space with water and utilities to a level field or the deck of a barge or large ship. Such facilities may be used for field operations or all phases of rehabilitation. A wide variety of examples of mobile units exist that are intended for use as specific components or as a complete oiled wildlife rehabilitation facility (IPIECA 2014).

### **F.8. Wildlife Release Considerations**

The goal in rehabilitating oiled wildlife is the release of healthy animals back into their natural environment. Release of rehabilitated wildlife requires planning in advance. Consultation with local wildlife experts, government agencies, and Incident Command is necessary to determine appropriate release sites and disposition of animals that cannot be released. Timely release is important to prevent or reduce occurrence of secondary problems associated with captivity. For wildlife that cannot be released, the options are euthanasia or placement in a long-term facility.

To be released, wildlife must exhibit:

- Normal behavior;
- Normal body weight;
- Waterproof (particularly in seabirds);

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- Normal blood values and physical exam; and
- Normal feeding.

Release sites should:

- Be free of oil contamination and not at risk of re-contamination;
- Same general geographic area or habitat of capture;
- Minimal human disturbance;
- Appropriate seasonal range for species (important for long rehabilitations); and
- Safe for response personnel.

If post-release monitoring is necessary, wildlife should be tagged or banded prior to release to aid visual observation.

**F.9. Record Keeping**

Record keeping is an important part of a wildlife rehabilitation program. Records are essential for evaluating the effectiveness of treatments and whether the rehabilitation efforts were successful. In addition, records are used to determine a spill's impact on wildlife. Records are usually divided into the following types:

- Field Survey and Wildlife Collection:
  - Document species collected, numbers, condition, location, etc.;
- Chain-of-Custody:

**F.9.1. Used to track transport and transfer of all collected animals;**

- Admission and Examination:
  - Record of admission to rehab center, initial assessments, etc.;
- Treatment:
  - Tracks treatment of individual animals, feeding, behavior, etc.;
- Necropsy:
  - For use by veterinarian for determining cause of death.

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**See additional references in Liza Phase 2 and Payara Development Project EIAs.**

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## Attachment F-1: Habitats

**Additional information on habitats in Guyana is included in the Development Projects Environmental Impact Assessments.**

### Coastal and Marine Habitats

Several habitat types are present in the network of plains and low hills that comprise Guyana's coast, including mangroves, salt to brackish lagoons, brackish herbaceous swamps, swamp woods and swamp forests. The swamps are an important source of freshwater to mangroves and other flora and fauna. The coastal mangroves are vital to Guyana's biodiversity, physical security, and economy. Guyana has relatively few beaches, but the Shell Beach Protected Area (SBPA) beaches are critically important nesting habitats for marine turtles.

Guyana's continental shelf occupies an area of 48,665 square kilometers. The average width of the continental shelf is 112.6 kilometers (NDS 1997). The shelf is widest near the Suriname and Venezuela borders, and slightly narrower near the center, north of Georgetown. The entire continental shelf, continental slope, and the adjoining portion of the abyssal plain are part of the North Brazil Large Marine Ecosystem (LME). The North Brazil LME is an oceanic habitat unit that extends from the Caribbean Sea south to the Parnaiba River in Brazil. The seagrass and shallow coral reefs that are characteristic of coastal tropical Atlantic environments elsewhere do not occur in Guyana, mainly due to high turbidity along the coast, although some low encrusting coral species (so-called "deepwater" or "coldwater" corals) do occur further offshore (ERM 2016). The substrate is generally composed almost entirely of mud and silt deposited by the North Brazil Current.

### Mangroves

Mangroves are important ecosystems to security of the biodiversity of the entire Guiana Shield region. They occupy over 81,000 hectares of Guyana's coast but the distribution of mangroves along the coast is highly dynamic, and subject to rapid change. Six of Guyana's ten geopolitical regions have mangroves but approximately 75 percent of the country's mangroves are concentrated in the Barima-Waini and Pomeroon-Supenaam regions.

There are currently three species of mangrove in Guyana: *Rhizophora mangle* (Red mangrove), *Avicennia germinans* (Black mangrove), and *Laguncularia racemosa* (White mangrove). Many invertebrates live either on or in close proximity to mangrove roots and substrate and include snails, barnacles, tunicates, mollusks, polychaete worms, oligochaete worms, small shrimps and crabs, sponges, jellyfishes, amphipods and isopods. These small organisms provide forage for birds, mammals, reptiles, amphibians, fish, and other larger crustaceans.

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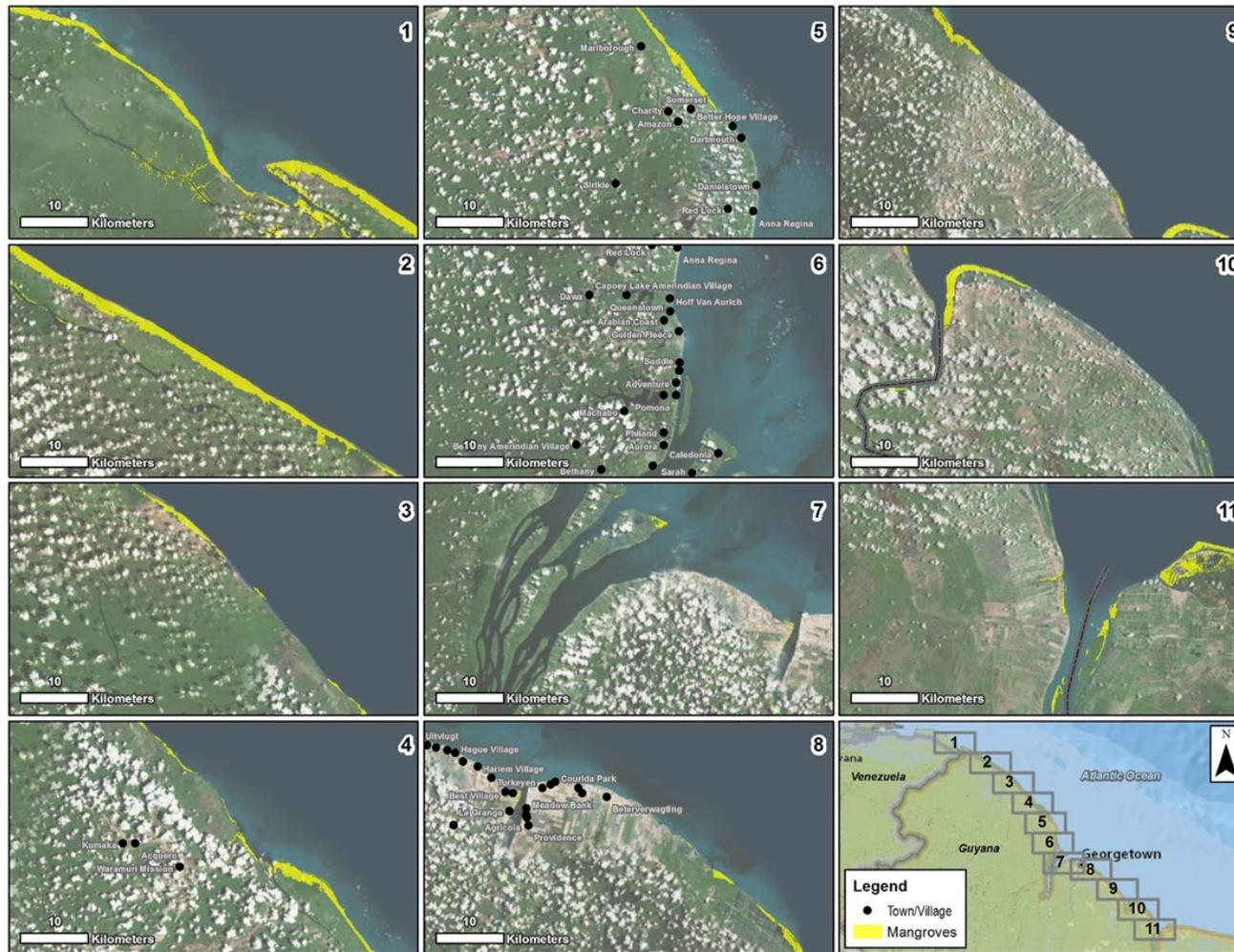


Figure F-1-1: Guyana's Coastal Mangrove Distribution

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***Mud Banks***

The 1,500-kilometer -long coast of South America between the Amazon and Orinoco River mouths is the world's muddiest coastline. Mud banks extend approximately 20 to 460 kilometers offshore to an average thickness of 20 meters, and are located seaward of the mangrove swamps that fringe much of the coastline. The mud banks are rich in invertebrate fauna, including plankton and micro-plankton assemblages, algae mats (diatoms), and benthic communities of Nematodes (worms), Tanaidacea (crustaceans), and Foraminifera (*amoeboid protists*). These small organisms provide habitat for fish species, post-larval and juvenile shrimps, and crabs, and numerous resident and migratory shore birds.

**Shell Beach**

SBPA is a protected area on Guyana's coast that could potentially be impacted by a marine oil spill. It accounts for 200,000 hectares or approximately 11 percent of Guyana's total protected areas. Figure F-1-2 provides a detailed map of SBPA and the surrounding area. It is located in northwestern Guyana and extends for almost 140 kilometers between the Waini, Baramani, and Moruka rivers and the Atlantic Ocean. Shell Beach is a dynamic area and constantly changes due to the competing effects of erosion and deposition along the shorefront. Seventy percent of the area is forested; the rest is made up of mostly swamp (28.8 percent), and sandy beaches (1.2 percent). Shell Beach supports numerous species of plants including coconut, papaya, and palm trees.

Shell Beach is not the only portion of Guyana's coast that contains mangroves; mangroves are a prominent feature along much of northwest Guyana's coastline. They are ecologically important, and are a critical natural component of Guyana's coastal defense network, protecting the low-lying inland areas of the coast from sea-level rise and saltwater intrusion during storm events.

Shell Beach is best known as a marine turtle nesting site. The composition of the substrate at Shell Beach, its geographical location, and the low human impact makes it an ideal nesting site for marine turtles. Most nesting beaches in Guyana are used by only one or two species of sea turtle but four species of sea turtle (Leatherback, Hawksbill, Olive Ridley, and Green Turtle) found in Guyana nest at Shell Beach (Pritchard 2001).

In addition to the sea turtles there are also at least four other species of turtles present within the protected area including the yellow-footed tortoise (*Geochelone denticulate*), scorpion mud turtle (*Kinosternon scorpioides*), giant river turtle (*Podocnemis expansa*), and mata mata (*Chelus fimbriata*).

Shell Beach is also known for its diverse and abundant bird population. Two biodiversity surveys undertaken within SBPA over roughly the past decade documented over 200 bird species in the Shell Beach area, including many forest interior species that occur in the inland habitats of Shell Beach (Mendonca et al. 2006; EPA et al. 2004). Many of the over 200 species documented are migrants. The most abundant coastal species recorded at and around Shell

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Beach during the two surveys included Black-bellied Whistling-duck (*Dendrocyna autumnalis*), Laughing Gull (*Larus atricilla*), Least Tern (*Sterna antillarum*), Spotted Sandpiper (*Actitis macularius*), Lesser Yellowlegs (*Tringa flavipes*), Scarlet Ibis (*Eudocimus ruber*), and Yellow-billed Tern (*Sterna superciliaris*) (Mendonca et al. 2006; EPA et al. 2004).

The Shell Beach area is also home to several species of mammals, including howler monkeys (*Alouatta* spp.), jaguars (*Panthera* spp.), and manatees (*Trichechus* sp.) (ERM 2016). Amerindian groups also inhabit the Shell Beach area and are concentrated along the areas of Almond Beach, Father's Beach, and Assakata (ERM 2016).

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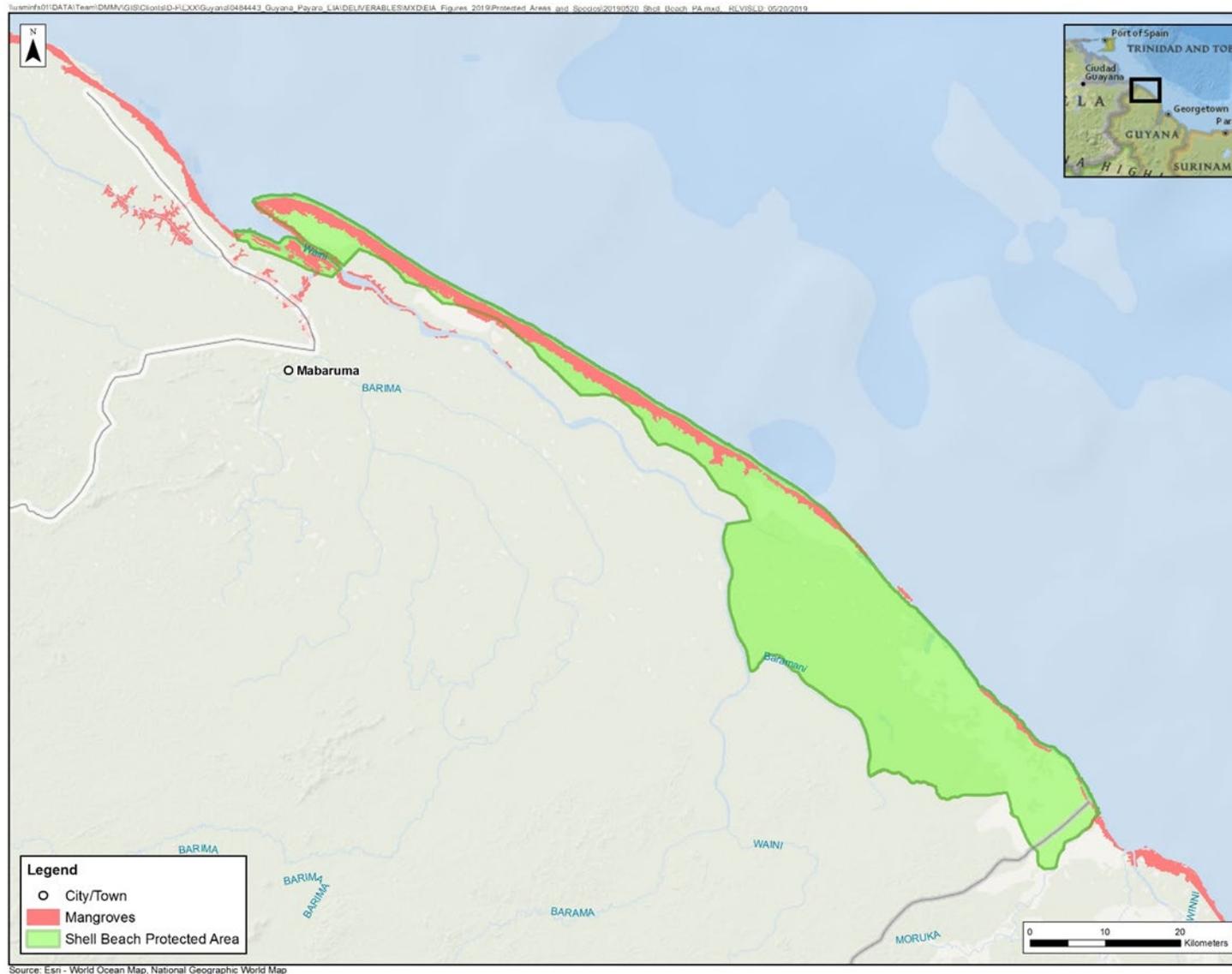


Figure F-1-2: Shell Beach Protected Area

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## Attachment F-2: Bird Species

Over 800 species of birds occur in Guyana, of which over 200 occur in coastal and/or offshore marine habitats for at least part of their life cycle. The bird groups most strongly affiliated with the coast are waterfowl, shorebirds, and colonial waterbirds.

- Waterfowl are species of birds that are ecologically dependent upon wetlands or waterbodies for their survival (e.g., ducks, geese, etc.).
- Shorebirds are found mainly on beaches and mudflats between the low and high water marks and are typically migratory, utilizing Guyana’s coastline during the course of their bi-annual migrations.
- Colonial waterbirds are birds that live near water and nest in colonies or groups (e.g., gulls, terns, ibis, herons, etc.).

Oceanic species (seabirds) such as frigatebirds and jaegers spend most of their time at sea and are less common along the coast. Thirty-five species of seabirds are known to occur in Guyana (see Table F-2-1).

**Table F-2-1: Seabird Species Known to Occur in Guyana**

Common Name	Scientific Name
Great Shearwater <sup>a, b</sup>	<i>Ardenna gravis</i>
Cory’s Shearwater <sup>a</sup>	<i>Calonectris borealis</i>
Barolo Shearwater <sup>c</sup>	<i>Puffinus baroli</i>
Audubon’s Shearwater <sup>a, b</sup>	<i>Puffinus lherminieri</i>
Wilson’s Storm-Petrel <sup>a, b</sup>	<i>Oceanites oceanicus</i>
Leach’s Storm-Petrel <sup>a, b</sup>	<i>Oceanodroma leucorhoa</i>
Brown Pelican <sup>a, b</sup>	<i>Pelecanus occidentalis</i>
Brown Booby <sup>a, b, c</sup>	<i>Sula leucogaster</i>
Masked Booby <sup>c</sup>	<i>Sula dactylatra</i>
Red-footed Booby <sup>c</sup>	<i>Sula sula</i>
Magnificent Frigatebird <sup>a, b, c</sup>	<i>Fregata magnificens</i>
White-tailed Tropicbird <sup>c</sup>	<i>Phaethon lepturus</i>
Parasitic Jaeger <sup>b, c, d</sup>	<i>Stercorarius parasiticus</i>
Pomarine Jaeger <sup>a, b, c</sup>	<i>Stercorarius pomarinus</i>
Great Skua <sup>a, b</sup>	<i>Stercorarius skua</i>
Lesser Black-backed Gull <sup>c, d</sup>	<i>Larus fuscus</i>
Laughing Gull <sup>a, b, c</sup>	<i>Leucophaeus atricilla</i>

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Common Name	Scientific Name
Brown Noddy <sup>a, c</sup>	<i>Anous stolidus</i>
Black Tern <sup>b, c, d</sup>	<i>Chlidonias niger</i>
Gull-billed Tern <sup>a, c</sup>	<i>Gelochelidon nilotica</i>
Bridled Tern <sup>c</sup>	<i>Onychoprion anaethetus</i>
Sooty Tern <sup>a</sup>	<i>Onychoprion fuscatus</i>
Black Skimmer <sup>a, c</sup>	<i>Rynchops niger</i>
Roseate Tern <sup>a, c</sup>	<i>Sterna dougalli</i>
Common Tern <sup>a, b, c</sup>	<i>Sterna hirundo</i>
Royal Tern <sup>a, b, c</sup>	<i>Thalasseus maximus</i>
Arctic Tern <sup>c</sup>	<i>Sterna paradisaea</i>
Sandwich Tern <sup>c, d</sup>	<i>Thalasseus sandvicensis</i>
Bridled Tern <sup>e</sup>	<i>Onychoprion anaethetus</i>
Manx Shearwater <sup>e</sup>	<i>Puffinus puffinus</i>
Red-billed Tropicbird <sup>e</sup>	<i>Phaethon aethereus</i>
Bulwer's Petrel <sup>e</sup>	<i>Bulweria bulwerii</i>
Band-rumped Storm Petrel <sup>e</sup>	<i>Oceanodroma castro</i>
Long-tailed Jaeger <sup>e</sup>	<i>Stercorarius longicaudus</i>
Great Black-backed Gull <sup>e</sup>	<i>Larus marinus</i>

<sup>a</sup> Braun et al. 2007

<sup>b</sup> BirdLife International 2019a

<sup>c</sup> eBird 2019a

<sup>d</sup> Sight record only (Braun et al. 2007)

<sup>e</sup> Recorded during EEPGL-commissioned marine bird surveys 2017-2019

Coastal habitats of Guyana provide ideal conditions for coastal birds, with mangrove forests providing shelter and nesting areas, mudflats providing important foraging sites, sandy beaches providing nesting habitat, and shallow water habitats providing foraging.

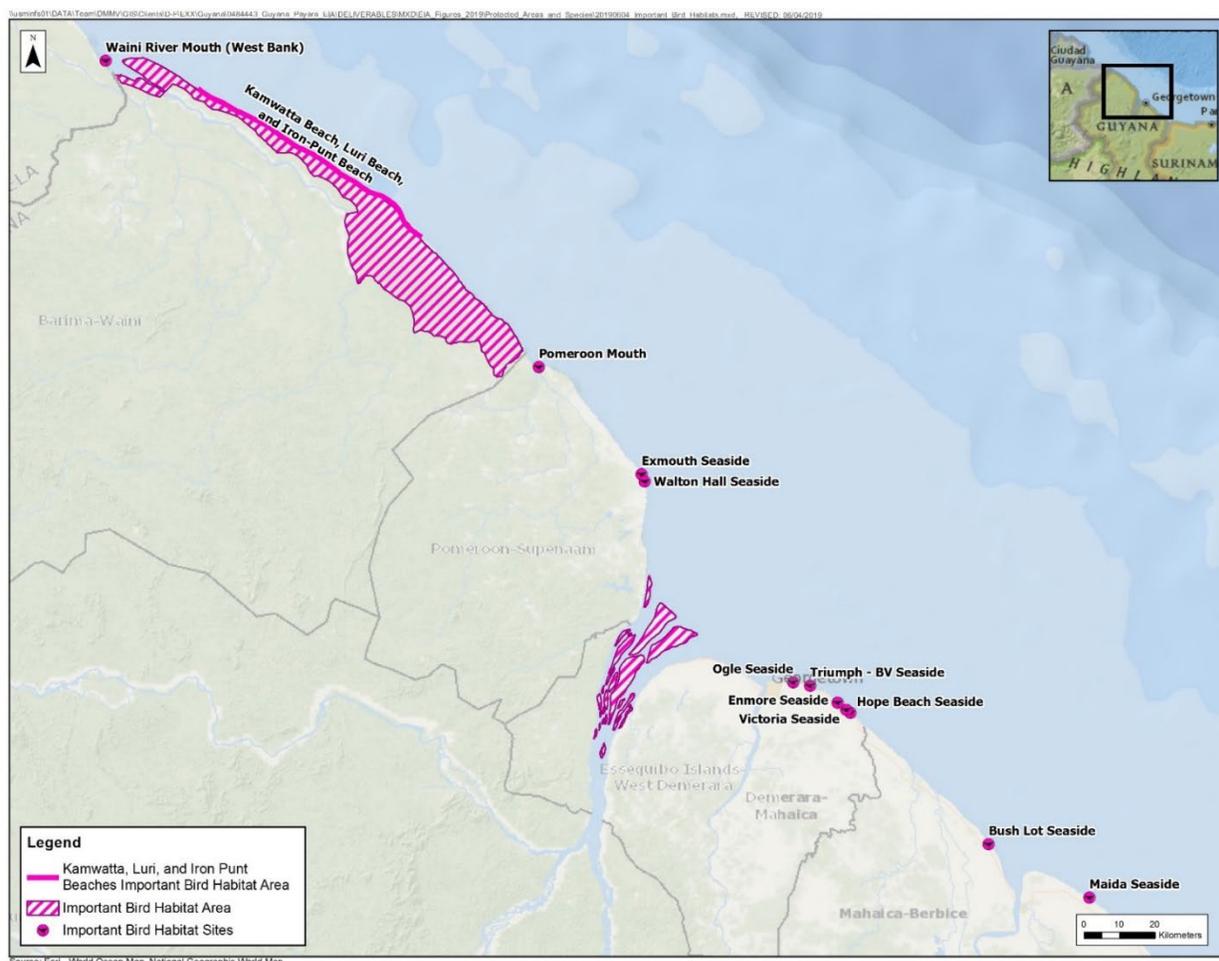
Many of Guyana's coastal bird species are migratory and so occur in Guyana on a seasonal basis, either spending the October–March (winter) season there or migrating through on their bi-annual northward and southward migrations. Guyana's coastal mangroves are noted for being wintering grounds for migratory birds including austral and Nearctic migratory species. Austral migrants breed in temperate South America during the Jun–Nov season, but spend the remainder of the year away from their breeding grounds in the tropics. Nearctic migrants migrate in the other direction, breeding in North America during the Jun–Nov season and overwintering in tropical South America. There are many more Nearctic migrants than austral migrants (globally and in Guyana) but both groups spend the non-breeding/wintering season (spanning the months from October through March) in Guyana.

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EPPGL commissioned a series of seasonal coastal bird surveys along the Guyana coast (Regions 1 through 6) between 2017 and 2019. These surveys documented 230 species of birds along the coast, including 21 species of migratory shorebirds (*Charadriidae* and *Scolopacidae* families). The most common shorebirds observed were Semipalmated Sandpiper (*Calidris pusilla*), White-rumped Sandpiper (*Calidris fuscicollis*), Lesser Yellowlegs, Sanderling (*Calidris alba*), and Greater Yellowlegs (*Tringa melanoleuca*). The most common colonial waterbirds were Snowy Egret (*Egretta thula*), Great Egret (*Ardea alba*), Little Blue Heron (*Egretta caerulea*), Scarlet Ibis, and Tricolored Heron (*Egretta tricolor*).

**Important Bird Habitats—Coastal Sites**

Fourteen coastal Important Bird Habitat (IBH) sites were identified within Regions 1 to 6 (Figure F-2-1). These IBH sites support one or more of the following: (1) predictable congregations of migratory shorebirds; (2) concentrations of roosting and/or nesting wading birds; (3) unique habitat that supports large numbers of riverine forest- and mangrove-dependent species; and (4) important nesting sites for regional endemic species or special status species.



**Figure F-2-1: Locations of Important Bird Habitats - Regions 1 -6**

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**Important Bird Areas—Offshore Sites (outside of the Stabroek Area of Operation)**

Since 2010, BirdLife International has focused its efforts on identifying Marine IBAs with specific significance to seabirds. The types of sites that qualify as Marine IBAs include seabird breeding colonies, foraging areas around breeding colonies, non-breeding (usually coastal) concentrations, migratory bottlenecks, and feeding areas for pelagic species (BirdLife International 2019b). No Marine IBAs have been identified in Guyana, but five Marine IBAs of global or regional importance to seabirds have been designated in neighboring and nearby countries that have reasonable potential, based on documented species life histories and foraging distances, to support seabirds that transit the Stabroek Block during local and regional movements to and from their breeding sites or during offshore foraging trips. Table F-2-2 summarizes information on the five IBAs and Figure F-2-2 depicts the location of these IBAs relative to the Stabroek Block.

**Table F-2-2: Marine IBAs with Importance to Seabirds that Transit the Stabroek Block**

Important Bird Area Name	Country	IBA Attributes <sup>a</sup>
Little Tobago Island	Trinidad and Tobago	This IBA supports globally important breeding populations of Red-billed Tropicbird ( <i>Phaethon aethereus</i> ) and Laughing Gull ( <i>Leucophaeus atricilla</i> ), and regionally important breeding populations of Audubon’s Shearwater ( <i>Puffinus lherminieri</i> ), Brown Booby ( <i>Sula leucogaster</i> ), Red-footed Booby ( <i>Sula sula</i> ), and Bridled Tern ( <i>Onychoprion anaethetus</i> ). Seabird population estimated at over 2,000 breeding pairs.
St. Giles Islands	Trinidad and Tobago	This IBA supports globally important breeding populations of Red-billed Tropicbird and regionally important breeding populations of Audubon’s Shearwater, Magnificent Frigatebird ( <i>Fregata magnificens</i> ), Masked Booby ( <i>Sula dactylatra</i> ), and Red-footed Booby. Other seabird species including Brown Booby and Brown Noddy ( <i>Anous stolidus</i> ) also breed there. Total seabird population estimated at over 2,000 individuals.
All Awash Island	St. Vincent and the Grenadines	This IBA supports regionally significant breeding populations of several seabird species, most notably a large breeding population of Roseate Tern ( <i>Sterna dougalli</i> ) (~475 pairs). During the non-nesting period, hundreds to thousands of seabirds forage in surrounding waters and use the island for roosting.
Battowia Island	St. Vincent and the Grenadines	This IBA supports regionally significant populations of roosting and breeding seabirds (>5,000 pairs), including Magnificent Frigatebird, Red-footed Booby, Brown Booby, and Laughing Gull.
Petit Canouan Island	St. Vincent and the Grenadines	This IBA supports regionally significant populations of breeding seabirds (>2,200 pairs) including Sooty Tern ( <i>Onychoprion fuscatus</i> ), Brown Booby, Laughing Gull, Magnificent Frigatebird, Roseate Tern, Royal Tern ( <i>Sterna maxima</i> ), and Brown Noddy.

<sup>a</sup> Sources: BirdLife International 2019a, 2019b

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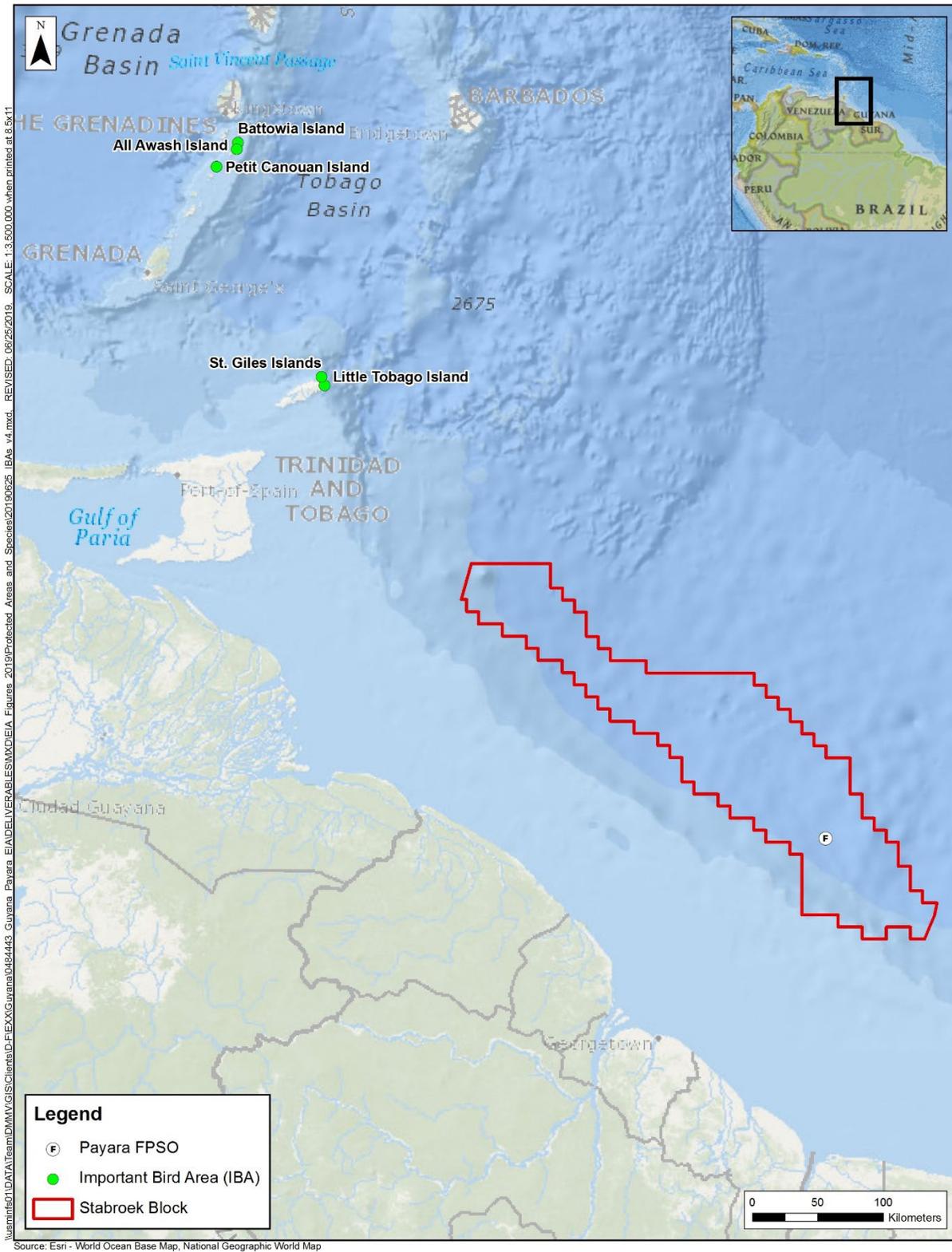


Figure F-2-2: IBAs with Importance to Seabirds Relative to Stabroek Block

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## Attachment F-3: Marine Mammals

The equatorial waters of Guyana are home to numerous species of marine mammals. The acoustic and visual monitoring that EEPGL has conducted since 2015 represents the most robust dataset developed for marine mammals offshore Guyana, but regional studies and bycatch reports provide additional insight into the composition and distribution of the marine mammal community in the vicinity of the Project. There are 31 species of marine mammals, including coastal and offshore marine mammal species, whose distributions overlap with Guyana's Exclusive Economic Zone. Table F-3-1 lists these species and denotes whether they have been observed during EEPGL survey activities conducted offshore Guyana and between the Guyana coast and the Stabroek Block since 2015.

Data collected during EEPGL activities since 2015 document that dolphins are more common than large whales offshore. Sperm whales were the most common large whale species observed offshore Guyana, accounting for more than 25 percent of the total number of marine mammal detections that could be verified to the species level since 2015. Pantropical spotted dolphin (*Stenella attenuata*), common bottlenose dolphin (*Tursiops truncatus*), spinner dolphin (*Stenella longirostris*), clymene dolphin (*Stenella clymene*), and Bryde's whale (*Balaenoptera brydei*) are the other most common species verified to the species level and together they represent over 80 percent of the observations that produced a confirmed detection of a particular species. Consistent with the EEPGL data, information published in 2015 from a survey carried out in 2012 in nearby Surinamese waters indicate that toothed whales (including dolphins, porpoises, pilot whales, and sperm whales) are more common offshore of Suriname than the baleen whales (including Bryde's and sei whales) (de Boer 2015).

Marine mammals are vulnerable to oil contamination in a variety of ways, including mortality. Marine mammals may be exposed to oil through inhalation, ingestion, and dermal pathways. Oil contamination can occur when a mammal surfaces to breathe or breach in an area with oil. Exposure to oil may harm their respiratory tissue and eyes, and increase their susceptibility to infections. The risk to marine mammals would be greatest close to the spill location, where there is a higher proportion of volatile compounds still present in and around the surface slick.

Marine mammals not directly impacted from a spill may also be impacted indirectly through food-chain related impacts, as their food resources may also be impacted. Baleen whales and the smaller toothed whales (dolphins and porpoises) that feed on small prey near the surface may be disproportionately affected because their prey will presumably be less able to avoid the negative effects of spilled oil than other species. By comparison, the medium to large cephalopods that constitute a major portion of the medium- to large-toothed whales' diets will be more able to avoid affected areas; therefore, the effects on these species would be expected to be comparatively minor.

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**Table F-3-1: Marine Mammals with Ranges that include Guyana's Coastal and Offshore Marine Territorial Waters**

Common Name	Scientific Name
Sei whale	<i>Balaenoptera borealis</i> (EN)
Bryde's whale *	<i>Balaenoptera brydei</i>
Blue whale	<i>Balaenoptera musculus</i> (EN)
Fin whale	<i>Balaenoptera physalu</i> (EN)
Short beaked common dolphin *	<i>Delphinus delphis</i> (LC)
Long-beaked common dolphin *	<i>Delphinus capensis</i>
Minke whale	<i>Balaenoptera acutorostrata</i> (LC)
North Atlantic right whale	<i>Eubalaena glacialis</i> (EN)
Pygmy killer whale *	<i>Feresa attenuate</i>
Short-finned pilot whale *	<i>Globicephala macrorhynchus</i>
Rissos dolphin *	<i>Grampus griseus</i> (LC)
Boto	<i>Inia geoffrensis</i>
Pygmy sperm whale	<i>Kogia breviceps</i>
Dwarf sperm whale	<i>Kogia simus</i>
Frasers dolphin *	<i>Lagenodelphis hosei</i> (LC)
Humpback whale	<i>Megaptera novaeangliae</i> (LC)
Blainvilles beaked whale	<i>Mesoplodon densirostris</i>
Gervais beaked whale	<i>Mesoplodon europaeus</i>
Trues beaked whale	<i>Mesoplodon mirus</i>
Melon-headed whale *	<i>Peponocephala electra</i> (LC)
Sperm whale *	<i>Physeter macrocephalus</i> (VU)
False killer whale	<i>Pseudorca crassidens</i>
Tucuxi	<i>Sotalia fluviatilis</i>
Pantropical spotted dolphin *	<i>Stenella attenuate</i> (LC)
Clymene dolphin *	<i>Stenella clymene</i>
Striped dolphin	<i>Stenella coeruleoalba</i> (LC)
Rough-toothed dolphin *	<i>Steno bredanensis</i> (LC)
Spinner dolphin *	<i>Stenella longirostris</i>
Atlantic spotted dolphin *	<i>Stenella frontalis</i>
West Indian manatee	<i>Trichechus manatus</i>
Common bottlenose dolphin *	<i>Tursiops truncatus</i>

EN = Endangered; LC = Least Concerned; VU = Vulnerable

Note: species marked with an asterisk (\*) were confirmed sighted during EEPGL activities 2015-2019.

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## Attachment F-4: Marine Reptiles

Five marine turtle species are found in Guyana and the surrounding region. Four marine turtles (green turtle [*Chelonia mydas*], leatherback turtle [*Dermochelys coriacea*], hawksbill turtle [*Eretmochelys imbricata*], and olive ridley turtle [*Lepidochelys olivacea*]) nest on Guyana’s beaches (Table F-4-1). A fifth species, loggerhead turtle (*Caretta caretta*), also occurs offshore Guyana, but rarely come ashore to nest in Guyana. In addition to relying on sandy beaches for egg-laying, marine turtles rely on healthy coral reef, seagrass, and hard-bottom habitats for food and refuge. Based on available information, post-hatchlings and juvenile green turtles are reported to feed on prey found within sargassum mats (USFWS 2018), while the other marine turtle lifestages are associated with clearer offshore waters or coral reef environments where they prey on a variety of items (Piniak and Eckert 2011).

According to available information, the primary marine turtle nesting site in Guyana is Shell Beach (e.g., Alvarez-Varas 2016). The exact locations of secondary nesting sites in Guyana change each year with coastal erosion, which either creates or destroys nesting areas, but they are generally distributed along the northwest coast between the Pomeroon River and the Waini River estuaries.

**Table F-4-1: Marine Reptiles with Ranges that include Waters Offshore Guyana**

Common Name	Scientific Name	Primary Nesting Location in Guyana
Green turtle	<i>Chelonia mydas</i>	Shell Beach
Leatherback turtle	<i>Dermochelys coriacea</i>	Shell Beach
Hawksbill turtle	<i>Eretmochelys imbricata</i>	Almond Beach
Olive Ridley turtle	<i>Lepidochelys olivacea</i>	Shell Beach
Loggerhead turtle	<i>Caretta caretta</i>	Rare

Leatherback and green turtles commonly nest on Guyana’s beaches followed by olive ridley and hawksbill turtles, which nest infrequently. According to the Center for Rural Empowerment and the Environment, the primary nesting season for the leatherback, green, hawksbill, and olive ridley turtles in Guyana (Shell Beach) is February to August; nesting occurs at night (PAC 2014).

When not nesting or in the immediate pre- or post-nesting periods, adult marine turtles are highly pelagic and migratory, inhabiting offshore environments over vast areas. During the nesting season, most turtles remain relatively close to nesting beaches (Shillinger et al. 2010; Bond and James 2017) because they often return to nesting beaches multiple times to lay additional eggs (multiple clutches). Available data on immediate post-nesting movements of adult marine turtles in Guyana from satellite tracking studies indicate that leatherback and green turtles remained offshore of Shell Beach and in Guyana’s territorial waters for several weeks

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after nesting before moving offshore (Sea Turtle Conservancy 2012). After nesting, marine turtles are highly migratory, making extensive trips to and from foraging areas.

Several aspects of marine turtle biology place them at particular risk across all of their life stages. Marine turtles nest on sandy beaches. If such beaches were to become oiled, the laid eggs may be contaminated from oil entering the nest or adult turtles picking up oil and depositing it in the nest as they cross the beach. The eggs are susceptible to oil through absorption, which can inhibit their development. Besides oiling of nests, newly hatched turtles can be exposed to oil after emerging from their nests and crossing an oiled beach on their way to the water. All life stages of marine turtles (hatchlings, juvenile, sub-adults, and adults) can be exposed to oil through inhalation, ingestion, and dermal contact with varying effects (USFWS 1982; Mitchelmore et al. 2017).

Several aspects of marine turtle behavior compound their biological susceptibility to oil:

- Lack of avoidance behavior—there is no evidence that marine turtles will avoid areas of oil contamination (NOAA 2010);
- Indiscriminate feeding—marine turtles have a habit of ingesting floating objects (NOAA 2010; Schuyler et al. 2012), which can include the ingestion of oil-fouled food and floating tar balls they mistake for food; and
- Large pre-dive inhalations—if turtles surface to breathe in a fresh slick, the oil can impact their eyes and damage their airways and/or lungs, especially with their large pre-dive breaths, which can introduce airborne toxins deep into their respiratory system (NOAA 2010). This risk will be greatest in areas where fresh oil is present that has high levels of aromatic compounds and volatiles directly above the slick.

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## Attachment F-5: Marine Finfish

Guyana’s marine fish community inhabits a large and ecologically diverse marine area consisting of shallow, turbid, coastal waters as well as the deep, clear, open ocean. Various life stages of finfish use different habitats at different periods during their life cycle, which shows the ecological connectivity among the various marine environments (e.g., mangroves, estuaries, and offshore zones). Several species that occur in the inshore and offshore zones as adults are dependent on coastal mangroves and estuaries as juveniles, particularly drums, croakers, marine catfishes, and snappers. Catfishes are found in mangroves, estuaries, and oceanic waters as adults. A few species may be found in the ocean, but prefer mangrove estuaries, such as snook and tarpon (MOA 2013). Further offshore, near the interface of the turbid North Brazil Current with oceanic water, the fish community is more complex, consisting of pelagic, highly migratory species (tuna, jacks, and mackerels) in the upper water column and snappers and groupers in the demersal zone (lowest section of the water column, near the seafloor) (MOA 2013). Sharks are generally found across the continental shelf, but a few species are highly migratory, such as the mako shark.

A total of 31 fish species were recorded during EEPGL-commissioned fish surveys conducted offshore Guyana within the continental shelf and deepwater environments in 2017 through 2019 (Table F-5-1). The survey data indicate that compared to the shallower environments of the continental shelf, Guyana’s deepwater environment appears to have low fish abundance and species diversity. The surveys also documented the importance of the continental shelf as a nursery area for sharks.

On the continental shelf, sea catfishes, including gillbacker catfish (*Sciades parkeri*), curass (*Sciades proops*), highwaterman catfish (*Hypophthalmus edentatus*), and several croakers/seatrouts, including bangamary (*Macrodon ancylodon*), white bashaw (*Cynoscion acoupa*), and sea trout (*Cynoscion virescens*), were all prevalent at depths of 10 to 15 meters (approximately 33 to 49 feet). The snappers and grunts, represented chiefly by banded grunt (*Conodon nobilis*), Caesar grunt (*Haemulon carbonarium*), mutton snapper (*Lutjanus analis*), lane snapper (*Lutjanus synagris*), and southern red snapper, occurred deeper, primarily between 45 and 60 meters (approximately 148 to 197 feet).

**Table F-5-1: Fish Species Observed in the Stabroek Block and between the Stabroek Block and the Guyana Shore during EEPGL -Commission ed PSO Activities Since 2015**

Common Name	Scientific Name	IUCN Status <sup>a</sup>
Atlantic bonito	<i>Sarda sarda</i>	LC
Atlantic flying fish	<i>Chellopogon melanurus</i>	LC
Atlantic tripletail	<i>Lobotes surinamensis</i>	LC
bar jack	<i>Caranx ruber</i>	LC
blackfin tuna	<i>Thunnus atlanticus</i>	LC
blackwing flying fish	<i>Hirundichthys rondeletii</i>	LC

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Common Name	Scientific Name	IUCN Status <sup>a</sup>
blue marlin	<i>Makaira nigricans</i>	VU
clearwing flying fish	<i>Cypselurus comatus</i>	LC
Eelpout	<i>Lycodonus sp.</i>	—
four-wing flying fish	<i>Hirundichthys affinis</i>	LC
jack crevalle	<i>Caranx hippos</i>	LC
king mackerel	<i>Scomberomorus cavalla</i>	LC
largehead hairtail	<i>Trichiurus lepturus</i>	LC
little tunny	<i>Euthynnus alletteratus</i>	LC
dolphinfish/mahi-mahi	<i>Coryphaena hippurus</i>	LC
manta ray	<i>Mobula sp.</i>	—
marginated flying fish	<i>Cheilopogon cyanopterus</i>	LC
ocean sunfish	<i>Mola mola</i>	VU
planehead filefish	<i>Stephanolepis hispidus</i>	LC
Porcupinefish	<i>Diodon hystrix</i>	LC
rainbow runner	<i>Elagatis bipinnulata</i>	LC
sailfish	<i>Istiophrous albicans</i>	LC
skipjack tuna	<i>Katsuwonus pelamis</i>	LC
smalleye smoothhound	<i>Mustelus higmani</i>	LC
southern red snapper	<i>Lutjanus purpureus</i>	—
swordfish	<i>Xiphias gladius</i>	LC
unidentified grenadiers	<i>Macrouridae</i>	—
unidentified skates and rays	<i>Rajiformes</i>	—
tiger shark	<i>Galeocerdo cuvier</i>	NT
tripodfish	<i>Bathypterois sp.</i>	DD-LC
yellowfin tuna	<i>Thunnus albacares</i>	NT

DD-LC = Data Deficient-Least Concern; LC = Least Concern; NT = Near Threatened; VU = Vulnerable

<sup>a</sup> IUCN status is given as “—” for multi-species groups, or taxa for which a species-specific identification could not be made.

Potential impacts on marine fish from a marine oil spill are related to both water column concentrations of, and the duration of exposure to, dissolved hydrocarbons (primarily PAHs). Contamination in the water column changes rapidly in space and time, such that potentially harmful exposure levels are typically brief (i.e., typically measured in hours), except in the case of an ongoing release such as a loss-of-well-control event or slow leak from a vessel. Exposure to microscopic oil droplets may impact aquatic biota either mechanically (especially for filter

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feeders) or as a conduit for exposure to semi-soluble hydrocarbons (which might be taken up in the gills or digestive tract via dissolution from the micro-droplets).

Fish are generally only slightly impacted by oil spills because of their limited exposure to surface slicks and the dispersed oil being rapidly diluted to very low concentrations in open water environments. Fish may also actively avoid oil, as they can detect hydrocarbons in the water. Juvenile life stages of marine fish tend to be more susceptible to impacts from oil spills than adults.

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## Attachment F-6: Marine Fisheries

There are four main types of marine fisheries in Guyana (MOA 2013) that can be defined by the species targeted, gear types used, and the depth of water where the fishery takes place.

Table F-6-1 summarizes the characteristics of these fisheries.

**Table F-6-1: Primary Characteristics of Marine Fisheries in Guyana**

Type of Fishery	Species	Gear	Depth
Industrial	Seabob, shrimps, and prawns	Trawls	Primarily between 13-16 m, but can occur from 0-75 m
Semi-industrial	Red snapper and vermillion snapper	Fish traps and lines	Edge of continental shelf
Artisanal	Mixed finfish and shrimp	Gillnets, seines, and others	0–18 m
Shark	Various	Trawls, gillnets, and hook and line	Throughout the continental shelf waters

Pelagic fisheries have traditionally been underexploited in Guyana, but tuna, such as yellowfin tuna (*Thunnus albacares*) and skipjack tuna (*Katsuwonus pelamis*), have recently been identified as a potential oceanic target species of commercial interest. The seabob and shrimp fisheries operate the entire length of the Guyanese coast, but fishing operations associated with these sectors tend to be concentrated on the inner portion of the continental shelf (see Figure F-6-1).

Guyana’s marine finfish community exemplifies the ecological connectivity among the mangroves, estuaries, and offshore zones, because many fish species are dependent on different habitats at specific life stages or occur in more than one habitat type. Several species that occur in the inshore and offshore zones as adults are dependent on coastal mangroves as juveniles, particularly drums, croakers, and snappers. Catfishes occur in the mangroves, estuaries, and oceanic waters as adults (ERM 2016). As a result, impacts in these areas may also have an impact on the fishery.

The Guyana Fisheries Department (a division of the Guyana Ministry of Agriculture), should be consulted on any potential impacts of an unplanned release.

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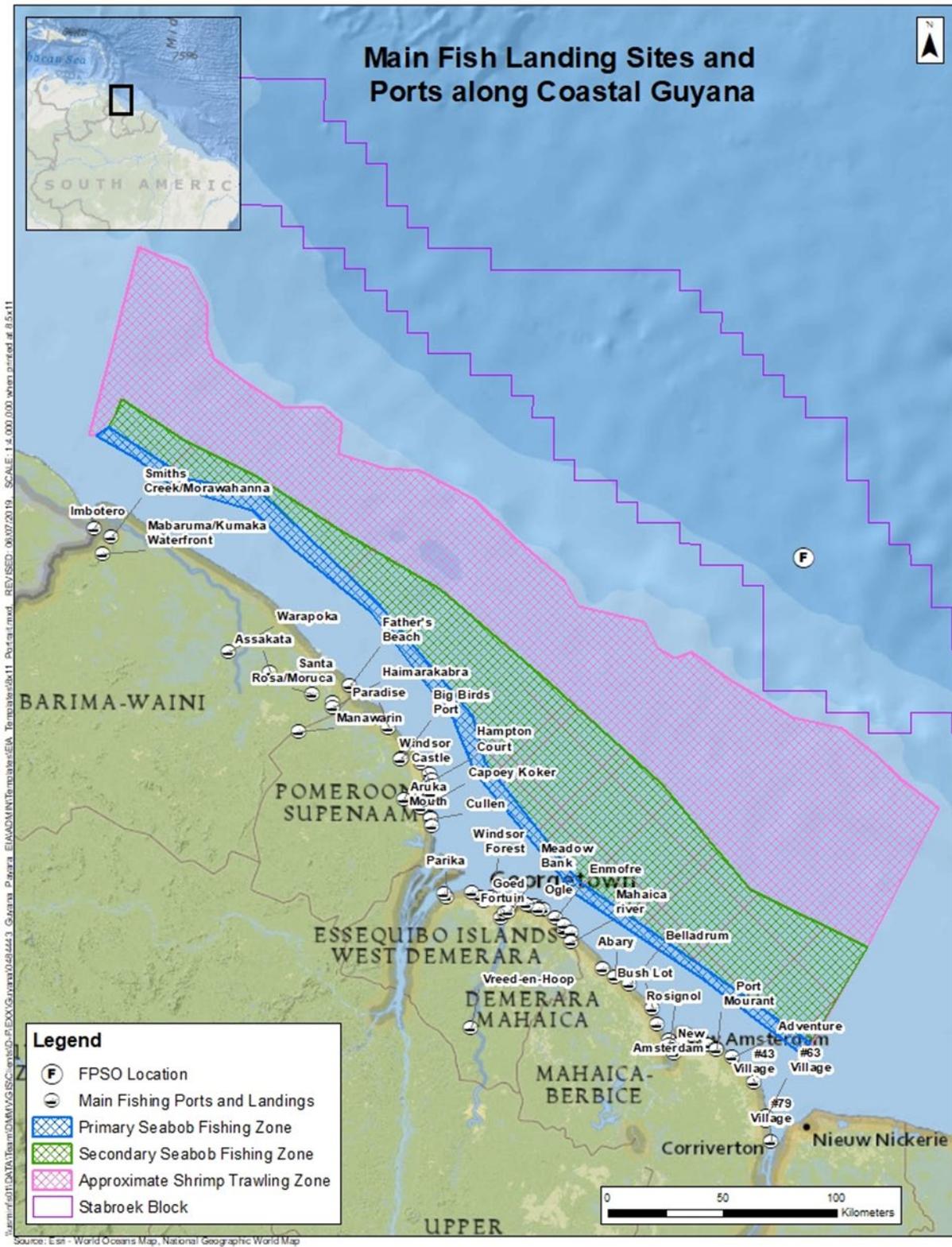


Figure F-6-1: Fishing Zones , Ports , and Landing Sites

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## **Attachment F-7: Wildlife Branch Guidance**

In the early hours of a spill response it is important to quickly estimate the scale of the event (relative to potential animal impacts) as best as possible and order the equipment and personnel. Estimating size and ordering resources should be the first priority as it will take some time to mobilize and deploy resources.

- Wildlife Branch Objectives:
  - Develop a Wildlife Plan for inclusion in the Incident Action Plan (IAP);
  - Identify and mobilize equipment/facilities;
  - Identify and mobilize personnel and support;
  - Complete notifications: internal and external (phone list); and
  - Maintain communication: internal and external.
- Staffing/Positions (depending on response level):
  - Branch Director:
    - Leads Wildlife Branch, develops incident specific wildlife plan.
  - Deputy Branch Director:
    - Backup to the Director, compiles wildlife plan info, manages wildlife branch deadlines.
  - Wildlife Reconnaissance Group Supervisor:
    - Develops land, water, air reconnaissance plans;
    - Coordinates activities with Land, Water, and Air Operations.
  - Bird Recovery and Rehabilitation Group Supervisor:
    - Coordinates bird handling issues, protocols, and hazing activities.
  - Marine Mammal Recovery and Rehabilitation Group Supervisor:
    - Develops and coordinates capture, handling, and rehabilitation of marine mammals;
    - Develop and coordinate efforts for handling marine reptiles.
  - Wildlife Volunteer Coordinator:
    - If necessary, will coordinate training, use, and deployment of volunteers for wildlife collection and rehab activities.
  - Liaison:
    - Will coordinate communication between Environmental Unit in Planning, Joint Information Center (JIC), etc., and the Wildlife Branch in Operations;

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- Assist in maintaining communication with government agencies, non-governmental organizations, and other involved parties.
- IAP software specialist:
  - Enter forms into the IAP;
  - Assist in getting maps and updating the Common Operating Picture.
- Documentation tracker (for larger events).

**Initial Steps (complete these in this order and on Day 1 when possible):**

- Notify Command (as appropriate) that Wildlife Branch is up/running and making plans:
  - Notify Operations Section Chief;
  - Notify Environmental Unit;
  - Notify interested agencies, parties, or organizations.
- Begin Unit Log (ICS 214).
- Identify Branch staff and assignments. Use the list of positions and tasks above to identify tasks and who will be doing them. Remember, the number of personnel expands and contracts as appropriate to the event so it may be one person doing everything or there may be a full contingent of staff. (Provide an organization chart (ICS 207) and contact information to resources).
- Estimate equipment (facility) and personnel needed based on the estimated number and types of animals anticipated. Lean toward over-responding as it is easier to send resources back than not have resources when needed.
- Identify deployment locations for equipment and personnel. Equipment locations need to be available for a long enough time to handle entire (anticipated) response AND rehabilitation to avoid having to move during the process.
- Develop reconnaissance plan or “animal location” needs (on Day 1 this will be a very brief plan, if one at all). Coordinate with EU and Flight Operations, etc.
- Develop search and collection and transportation plans (Day 1 there may not be formal plans, Day 2 will). Identify search areas, number of crews, support needs, etc. (ICS 204 and ICS 204a).
- Develop a wildlife rehabilitation plan.
- Begin drafting the Wildlife Plan for inclusion in the IAP. Templates are on the RRT SharePoint page.
- Provide an Oiled Wildlife Statement to the JIC, listing phone numbers for reporting oiled wildlife and warning the public to stay away from oiled wildlife. A template is available on the RRT SharePoint page.

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**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

**APPENDIX G – SUMMARY OF SPILL PREVENTION, MITIGATION MEASURES AND EMBEDDED CONTROLS**

The following table is considered a *representative list* of embedded controls and spill prevention measures utilized on a Floating Production, Storage, and Offloading (FPSO) Development Project, inclusive of drilling operations. These controls and measures are not necessarily applicable to every EEPGL operation or asset.

**Table G-1: Example Controls & Spill Prevention Measures**

#	Embedded Control / Spill Prevention Measure
1	Monitoring and control of the FPSO production operations will be performed by an Integrated Control and Safety System (ICSS). Located in the main control room of the FPSO, the ICSS will include process shutdown, emergency shutdown, and fire and gas systems to protect the facilities and personnel. These systems will interface to a public address and general alarm system (PA/GA) to provide distinct audible and visual alarm notification. The ICSS includes the Process Control System (PCS), Safety Instrumented System (SIS), the Fire and Gas (F&G) system, the Alarm Management System (AMS), the Operator graphics / consoles; and the third-party interfaces to packaged systems (such as compressors, subsea, and marine, among others).
2	Telecommunications equipment will be installed on the FPSO to enable safe operation of the facilities in normal and emergency conditions. This equipment will allow communication with the shorebase, support vessels, helicopters, and tankers as well as communication on the FPSO.
3	The FPSO cargo tanks will be blanketed with inert gas. A tank vent system will be provided to release vapor and inert gas from the cargo tanks to a safe location, toward the bow of the FPSO, to prevent an overpressure event in the tanks.
4	The marine cargo system supports the following routine activities: Flushing of the crude oil offloading export hose; Emergency and temporary ballasting of FPSO cargo tanks with seawater; and Inspection and maintenance of FPSO cargo tanks and piping systems between offloading operations.
5	FPSO safety systems will include: Firewater System—The firewater system will have one pump each located at the fore and aft ends of the FPSO, with one pump serving as a redundant backup. Fire and Gas Detection Systems—Fire and smoke detectors will be located throughout the topsides and living quarters and will be wired centrally with alarms sounding in the central control room (CCR), which will activate the general alarm system on the FPSO. Gas detectors will be placed in areas where gas might be released or could accumulate. Blanket Gas Generation—To prevent fires, the cargo tanks will be operated with an inert gas blanket at all times except during tank entry. The inert gas for cargo tanks will be supplied by an inert gas system utilizing flue gas from the marine boilers. To provide gas blanketing for other spaces, including the methanol and xylene tanks, inert gas will be provided by routing compressed air through the nitrogen membrane package.

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
6	All chemicals will be stored, either at the shorebase(s) or on the drill ship or FPSO, in appropriate storage containers with either secondary containment or appropriate drainage control.
7	<p>With respect to prevention of spills of hydrocarbons and chemicals during the drilling stage:</p> <ul style="list-style-type: none"> <li>Change liquid hydrocarbon transfer hoses periodically;</li> <li>Utilize dry-break connections on liquid hydrocarbon bulk transfer hoses;</li> <li>Utilize a liquid hydrocarbon checklist before bulk transfers;</li> <li>Perform required inspections and testing of equipment prior to deployment/installation;</li> <li>Utilize certified Blowout Prevention (BOP) equipment;</li> <li>Regularly test certified BOP equipment and other spill prevention equipment;</li> <li>Utilize dynamically overbalanced drilling fluids to control wells while drilling;</li> <li>Perform operational training certification (including well control training) for drill ship supervisors and engineers;</li> <li>Regularly audit field operations on the drill ships, FPSO, and shorebase(s) to ensure application of designed safeguards; and</li> <li>Controls for mitigating a failure of the dynamic positioning system on the drill ships and maintain station keeping, which include:                             <ul style="list-style-type: none"> <li>○ Use of a Class 3 Dynamic Positioning (DP) system, which includes numerous redundancies;</li> <li>○ Rigorous personnel qualifications and training;</li> <li>○ Seatrials and acceptance criteria;</li> <li>○ Continuous DP proving trials;</li> <li>○ System Failure Mode and Effects Analysis;</li> <li>○ Continuous DP failure consequence analysis; and</li> <li>○ Establishment of well-specific operations guidelines.</li> </ul> </li> </ul>
8	Maintain marine safety exclusion zones with a 500-meter (m) (~1,640-foot [ft]) radius around drill ships and major installation vessels to prevent unauthorized vessels from entering areas with an elevated risk of collision.
9	Ensure offloading activities are supervised by a designated Mooring Master, according to the conditions of the sea. The conditions and characteristics of the export tankers will be assessed by the Mooring Master and reported to the Offshore Field Manager prior to commencing offloading operations.
10	Utilize support tugs to aid tankers in maintaining station during approach/departure from FPSO and during offloading operations.
11	Utilize breakaway couplers on offloading hose that would stop the flow of oil from FPSO during an emergency disconnect scenario.
12	Utilize a load monitoring system in the FPSO control room to support FPSO offloading.
13	Use leak detection controls during FPSO offloading (e.g., for breach of floating hose, instrumentation/procedures to perform volumetric checks).
14	Utilize marine safety exclusion zone of 2 nautical miles around the FPSO to prevent unauthorized vessels from entering areas with an elevated risk of collision.

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
15	Regularly inspect and service shorebase cranes and construction equipment to mitigate the potential for spills and reduce air emissions to the extent reasonably practicable.
16	Utilize secondary containment for bulk fuel storage, drilling fluids, and hazardous materials, where practicable.
17	Regularly check pipes, storage tanks, and other equipment associated with storage or transfer of hydrocarbons/chemicals for leaks.
18	Perform regular audits of field operations on the drill ships, FPSO, and shorebases to ensure application of designed safeguards.
19	Observe standard international and local navigation procedures in and around the Georgetown Harbour and Demerara River, as well as best ship-keeping and navigation practices while at sea.
20	Maintain an OSRP to ensure an effective response to an oil spill, including maintaining the equipment and other resources specified in the OSRP and conducting periodic training and drills.
21	EEPGL is using the most appropriate industry-proven technology in developing the Project in terms of well drilling, drilling fluids, equipment selection, development concepts, and environmental management.
22	Adhere to the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, which confirms the right of coastal member states to take specific actions when necessary to prevent pollution from oil following a maritime casualty. This convention would protect Guyana's rights to respond to an oil spill if such an event were to occur.
23	Adhere to the International Convention on Civil Liability for Oil Pollution Damage, which establishes vessel owners' liability for damages caused by pollution from oil spills and provides for compensation would be available where oil pollution damage was caused by maritime casualties involving oil tankers. This convention would not apply directly to EEPGL's activities, but would apply to potential spills from tankers that had received oil from the FPSO.
24	Adhere to the International Convention on Oil Pollution Preparedness, Response and Cooperation, which establishes measures for dealing with marine oil pollution incidents. This convention requires ships to have a Shipboard Oil Pollution Emergency Plan (SOPEP).
25	The Company and its affiliates (including EEPGL) are committed to conducting business in a manner that is compatible with the environmental and socioeconomic needs of the communities in which it operates, and that protects the safety, security, and health of its employees, those involved with its operations, its customers, and the public. These commitments are documented in its Safety, Security, Health, Environmental, and Product Safety policies. These policies are put into practice through a disciplined management framework called OIMS. EEPGL's OIMS Framework establishes common expectations used by Company affiliates worldwide for addressing risks inherent in its business. The term Operations Integrity (OI) is used to address all aspects of its business that can impact personnel and process safety, occupational safety, security, occupational health, and environmental performance. Application of the OIMS Framework is required across all Company affiliates, with particular emphasis on design, construction, and operations. Management is responsible for ensuring that management systems that satisfy the OIMS Framework are in place. Implementation is consistent with the risks associated with the business activities being planned and performed.

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
26	The interaction between the EIA team and the design and decision-making process was one of the key areas in which the EIA influenced how the Project would be developed. It included involvement in defining the Project and identifying those activities with the potential to cause physical, biological, or socioeconomic impacts. Project planning, decision making, and refinement of the Project description continued throughout the assessment process in view of identified impacts and proposed mitigation measures. During the EIA process, there was extensive communication between the impact assessment team and the Project design team with regard to identifying alternatives, potential impacts, and mitigation measures.
27	Hydrocarbon releases under various nearshore spill scenarios would all be small and under control quickly, and would be managed with locally available spill control equipment.
28	A small Tier 1 offshore hydrocarbon release under various offshore scenarios would be quickly controlled and contained because of the relatively small volumes and the ready access to spill control equipment.
29	Oil spill modeling and coastal sensitivity mapping have been conducted to identify and characterize the resources/receptors with the potential to be exposed to oil.
30	Oil spill modeling was used to simulate spill events using the best available characterization of the wind and hydrodynamic (marine currents) forces that drive oil transport, and quantify the potential consequences from a spill, which can then be used to guide response planning and prioritize response asset deployment.
31	<p>Coastal sensitivity mapping was conducted for the coastal area identified in the oil spill modeling as having the potential to be contacted by hydrocarbons as a result of any of the deterministic modeling of an unmitigated Tier III Marine Oil Spill. The mapping included characterization of the following resources and receptors:</p> <p>Environmental—protected areas, mangroves, shoreline types, seagrass beds, coral reefs, important coastal fish habitats, important coastal bird habitats, and other sensitive habitats; and</p> <p>Socioeconomic—coastal and/or indigenous peoples communities (e.g., locations, demographics, and socioeconomic characteristics), shoreline- and coastal-dependent commercial and artisanal activities (e.g., fishing, foraging, hunting, agriculture, and grazing), industrial activities and infrastructure (e.g., water intake facilities, ports), and traditional and cultural practices.</p> <p>This information enables EEPGL to prioritize the mobilization of emergency response resources (manpower and equipment) to those areas most sensitive to a spill.</p>
32	Regarding spill prevention controls associated with well control release, EEPGL's well control philosophy is focused on spill prevention using safety and risk management systems, management of change procedures, global standards, and trained experienced personnel. EEPGL has a mature OIMS that emphasizes attention to safety, well control, and environmental protection. Measures to avoid any loss of well control include proper preparation for wells (well design, well control equipment inspection and testing), automatic detecting of the influx of reservoir fluids entering the well during drilling, the use of physical barriers including BOPs, personnel training and proficiency drills for well control, and the use of dynamically overbalanced drilling fluids to control pressures within the well.

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
33	Regarding spill prevention controls associated with FPSO offloading, the major spill prevention controls associated with FPSO offloading include: FPSO and tanker collision avoidance controls; use of a certified engineered floating double carcass hose system; use of emergency disconnect controls on the floating double carcass hose system; use of load monitoring systems in FPSO control room; and use of leak detection controls including infrared leak detection, flood lighting for night operations, and volumetric checks during offloading.
34	EEPGL has a detailed Oil Spill Response Plan (OSRP) in place, which is included as part of the Project's Environmental and Socioeconomic Management Plan (ESMP), to ensure an effective response to an oil spill, if one were to occur. The OSRP: Describes the response measures appropriate to the magnitude and complexity of a spill incident; Clearly delineates the responsibilities of each entity that would take part in a response; Describes how EEPGL and its contractors would mobilize local oil spill response resources, which would be complemented by the regional and international resources provided by its oil spill response contractors; and Describes the EEPGL process for notifying the government of Guyana with respect to mobilizing its resources.
35	During offloading of crude oil for export, the offloading tanker must approach at a controlled, safe speed within about 120 m (~390 ft) of the FPSO. To minimize the risk of collision during the approach to the FPSO and during offloading, EEPGL will utilize a Mooring Master onboard the offloading tanker. The Mooring Master will guide the offloading tanker to the FPSO for offloading, remain on board during offloading, and then guide the offloading tanker away from the FPSO upon completion of offloading. Up to three assistance tugs will assist in positioning the offloading tanker during the approach to the FPSO to maintain a safe separation from the FPSO. During offloading, these tugs along with a hawser (taunt line connecting the FPSO and tanker) will help ensure the offloading tanker maintains a safe distance from the FPSO at all times. Offloading will only occur when weather and sea conditions allow for safe operations. If the environmental conditions prior to the commencement of offloading are not suitable, the tanker will standby at a safe distance away until conditions are within acceptable limits. If unexpected adverse weather (e.g., a squall) occurs during offloading operations, the offloading operation will be stopped, and the tanker disconnected and moved away from the FPSO until conditions are again within approved safe limits.
36	A number of controls will be implemented to prevent collision near shore between a Project supply vessel and another (non-Project) vessel or structure (e.g., due to navigation error or temporary loss of power). EEPGL has comprehensive contractor selection guidelines to ensure contractors are qualified and have robust safety, health, and environmental management systems. EEPGL will provide active oversight over its contractors to verify they are complying with its requirements. Contractors are required to regularly inspect their vessels, which address marine safety and maintenance considerations and reduces the risk of a vessel losing power or steering capability. In addition, vessels operating within the Georgetown Harbour or other coastal areas will be adhering to speed restrictions and navigation aids.
37	EEPGL will utilize a Simultaneous Operations procedure to safely manage Project marine vessels that are performing work in the same vicinity of each other, which will include considerations to avoid vessel collisions.
38	Marine vessels will have industry-proven station-keeping systems (e.g., FPSO mooring system, dynamic position systems on drill ships) to maintain station in the offshore environment.
39	A Wildlife Response Program would be established at the onset of an oil release from a large Marine Oil Spill to minimize impacts on ecological balance and ecosystems.

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
40	The coastal sensitivity mapping that supports the OSRP includes mangroves as a sensitive coastal resource and in the unlikely event of an oil spill; EEPGL will deploy emergency response equipment to protect these sensitive resources, as appropriate.
41	A claims process would be established at the onset of a large Marine Oil Spill incident to compensate for loss of sustenance and income (e.g., fisherfolk for loss of harvest due to regional fisheries closures) that were attributed to the oil spill.
42	<p>Implementation of the OSRP would help minimize transboundary impacts just as it would minimize impacts within the Guyana Exclusive Economic Zone (EEZ). In response to a spill, EEPGL will work with representatives for the respective countries to be prepared for the unlikely event of a spill by:</p> <ul style="list-style-type: none"> <li>• Establishing operations and communication protocols between different command posts.</li> <li>• Creating a transboundary workgroup to manage waste from a product release—including identifying waste-handling locations in the impacted region and managing commercial and legal issues.</li> <li>• Identifying places of refuge in the impacted region where vessels experiencing mechanical issues could go for repairs and assistance.</li> <li>• Determining how EEPGL and the impacted regional stakeholders can work together to allow equipment and personnel to move to assist in a spill response outside the Guyana EEZ.</li> <li>• Assigning or accepting financial liability and establishing a claims process during a response to a transboundary event.</li> <li>• Informing local communities regarding response planning.</li> </ul>
43	Implement an ESMP, which describes the measures EEPGL will implement to manage the Project’s potential environmental and socioeconomic risks and reduce impacts to the environment and communities.
44	EEPGL will perform regular oil spill response drills, simulations, and exercises, document the availability of appropriate response equipment on board the FPSO, and demonstrate that offsite equipment could be mobilized for a timely response.
45	The Project will issue Notices to Mariners via MARAD, the Trawler’s Association, and fishing co-ops for movements of major marine vessels (including the FPSO, drill ship, and installation vessels) to aid them in avoiding areas with concentrations of Project vessels and/or where marine safety exclusion zones are active.
46	The Project will augment ongoing stakeholder engagement process (along with relevant authorities) to identify commercial cargo, commercial fishing, and subsistence fishing vessel operators who might not ordinarily receive Notices to Mariners, and where possible, communicate with them regarding major vessel movements and marine safety exclusion zones.
47	Promptly remove damaged Project vessels (associated with any vessel incidents) to minimize impacts on marine use, transportation, and safety.

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
48	Implement the OSRP in the unlikely event of an oil spill, including: <ul style="list-style-type: none"> <li>• Conducting air quality monitoring during emergency response;</li> <li>• Require use of appropriate PPE by response workers;</li> <li>• Implementing a Wildlife Oil Response Program, as needed; and</li> <li>• Implement a claims process for damage caused by an oil spill, as needed.</li> </ul>
49	EEPGL will proactively obtain additional support and resources to reduce the impact of a spill in the unlikely event it shows potential to exceed Tier I capabilities. The Emergency Response Team (ERT) will manage Tier I spill responses using the site-specific Emergency Response Plan (ERP) and resources located on vessels and in port facilities in Guyana and Trinidad. Such resources as well as dispersant application from vessels will also be used for larger Tier II spills until supplemental oil spill response resources arrive on-scene. For incidents that may exceed Tier I capabilities, EEPGL would notify Oil Spill Response Limited (OSRL), to provide immediate incident management support as well as OSRL's global oil spill technical response teams and equipment.
50	Given the limited resources in-country, company will consider setting up a cooperative with a regional Oil Spill Response Organization to support Tier II+ oil spill response prior to offshore execution. Until the viability of a regional capability is determined, EEPGL will rely on external world-class capabilities from Tier III centers located around the world.
51	The EEPGL OSRP is supported by the EEPGL ERP which provides a structured and systematic process for responding to incidents, and outlines plans and procedures for engagement between the incident site, EEPGL, and ExxonMobil management and the relevant authorities in Guyana.
52	EEPGL will initiate a systematic search with vessels and aircraft (weather permitting) to locate the spill and determine its coordinates. EEPGL will estimate spill size and movement using coordinates, photographs, drawings, and other information received from vessels, aircraft and satellite imagery. Spotters will photograph the spill from aircraft as often as necessary for operational purposes, and determine its movement based on existing reference points, such as vessels and familiar shoreline features. Modeling of the oil release may be utilized to predict the oil slick's surface movement or trajectory. Modeling will help to identify shorelines that may be at risk from oil stranding, predict the probable timing of that stranding, and provide information regarding how the oil is changing with time.
53	In the event of a release, EEPGL and ExxonMobil technical experts will complete a revised NEBA in real-time predicated on the current metocean conditions, location and nature of the release for review and discussion with the Guyana EPA and Civil Defense Commission (CDC) as soon as practical.
54	During EEPGL's operations, the on-site ERT will endeavor to contain any spill at the source, whether it be onshore (shorebase or port) or onboard a vessel (i.e., PSV, FSV, installation, drillship, tug, tanker or FPSO) and minimize any impacts to the environment, using the equipment available at the worksite. In the event of an on-water release, EEPGL will ensure the required notifications are made, initial response actions are implemented and monitor the incident and consider all appropriate response strategies, including containment and recovery as well as dispersants to appropriately respond to the incident.

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
55	<p>If released oil is predicted to reach a shoreline, EEPGL will continue to leverage all available resources to stop the release at the source, utilizing provided containment, mechanical recovery, open burning, surface and subsurface dispersant application. EEPGL will also consider and evaluate shoreline protection measures (based on consultation with the appropriate government authorities) and outcomes from the NEBA to identify the combination of key response strategies that would be appropriate, given the specific situation, fate, and trajectory of the oil spill and weather conditions. Local regulatory approval and the ExxonMobil Oil Spill Dispersant Guidelines will govern the application of dispersants.</p>
56	<p>EEPGL will use the NEBA process as a key input to the overall Incident Response Planning. NEBA compares the impacts of available response options, and selects the option or combination of options that minimizes overall harm to environmental and socioeconomic resources. The use of NEBA will ensure that EEPGL selects the most appropriate response techniques available to minimize overall environmental impact based on the conditions and sensitivities of an actual incident.</p>
57	<p>EEPGL will respond to a release as far offshore as possible, using all appropriate tools and tactics to minimize shoreline impact. In consultation with the Guyana EPA, EEPGL will develop Incident Response Plans that could respond with aeri ally applied dispersants, which can be quickly deployed and treat large surface areas rapidly and efficiently.</p>
58	<p>The safety of responders also needs to be considered in the evaluation of response strategies. Response tactics depend upon a variety of environmental conditions:</p> <ul style="list-style-type: none"> <li>• Implement subsea dispersant application as soon as possible, if warranted, to treat most if not all oil spilled at the source before it encounters surface water resources;</li> <li>• Deploy in situ burning equipment to burn thick oil near the source;</li> <li>• Continue to use aeri ally applied dispersant as an initial, and in some cases, primary response tool for oil further from the source where mechanical recovery/in situ burn operations are less effective;</li> <li>• Utilize aerial dispersant application during calm seas on emulsified oil; and</li> <li>• Outfit vessels of opportunity (VOO) with dispersant delivery and mechanical containment and recovery systems to provide a fleet of vessels that can be a line of defense against surface oil approaching shorelines.</li> <li>• Shoreline protection and cleanup may be potentially needed for some scenarios, in which case, sensitive shorelines will receive prioritization for protective booming.</li> </ul>

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
58	<p>Utilize surveillance and monitoring teams, which can fulfill the following response objectives in the waters offshore Guyana and as needed beyond the Guyana EEZ if required by the scale of the incident:</p> <ul style="list-style-type: none"> <li>• Verify oil spill scale and location;</li> <li>• Monitor effectiveness of applied response strategies;</li> <li>• Visually quantify spill volume;</li> <li>• Direct operations—dispersant application, containment and recovery, shoreline assessment, in situ burning; and</li> <li>• Monitor wildlife.</li> </ul>
59	<p>At a minimum, surveillance and monitoring personnel will take visual observations, and vessel owners/operators will implement their Emergency Response/Shipboard Oil Pollution Emergency Plan (SOPEP), deploying the Tier I response equipment they have onboard.</p>
60	<p>For Tier II or Tier III incidents, EEPGL will scale up to a full surveillance plan using helicopters, fixed wing aircraft and satellite imagery.</p>
61	<p>The Incident Management Team (IMT) will assign an Air Operations Branch as part of the Operations Section for large or complex incidents. The Air Operations Branch will coordinate aerial support according to operational needs and document operational assignments in an ICS-220 Air Operations Summary form, which will be included in the Incident Action Plan.</p>
62	<p>To assist the natural dispersion process techniques such as prop washing or water hoses can be implemented to introduce energy and agitate the hydrocarbons, thereby assisting with the break up of a surface slick and promoting biodegradation.</p>
63	<p>For operational spills: Shorebases in Guyana and Trinidad have site-specific ERPs and are equipped with Tier I spill response kits; Vessels maintain a SOPEP and associated equipment onboard the vessel.</p>
64	<p>EEPGL will use harbor containment and recovery should a PSV or FSV release hydrocarbons in Port. The harbor response team will employ a strategy that considers tides, currents, wind, vessel traffic, and local infrastructure and stakeholder input. EEPGL will deploy equipment available on site and in the Port (such as or similar to the equipment and trained personnel at the Guyana Fuel Terminals and resources held by NRC for Trinidad) immediately following a release.</p>
65	<p>EEPGL will implement a shoreline response if released hydrocarbons show the potential to affect a shoreline, prioritizing environmentally or socio-economically sensitive areas. This will consist of using vessel dispersant application to prevent approaching slicks from impacting socio-economically sensitive areas and using shoreline booming to protect sensitive areas and provide collection points for hydrocarbon recovery.</p>
66	<p>EEPGL will only apply dispersants if there is a direct advantage to protecting environmental or socio-economical sensitivities (determined using NEBA) and they have obtained regulatory approval per the protocols described in the OSRP.</p>

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
67	Vessel mounted systems will be used to apply dispersant in small-scale incidents and aircraft will apply dispersant on large oil slicks. Dispersant (and associated vessel spray equipment) will be kept at the shorebase or other easily accessible location where it can be easily loaded on vessels for application. OSRL will conduct aerial dispersant application and will likely base the operation out of the Georgetown airport. In the unlikely event of a loss-of-well-control, dispersant is injected subsea at the wellhead location on the seafloor using specialized equipment and remote operated vehicles (ROVs).
68	EEPGL will use the Dispersant Spraying Considerations Flowchart as a guide for whether to use dispersants. Dispersant will be applied according to manufacturers' guidelines and the operating procedures of the spray applicators. Dispersant use will require Guyana EPA approval prior to application. EEPGL will work with the EPA to develop a dispersant application, monitoring and evaluation strategy. Safety Data Sheets for the dispersants that might be utilized are available in <b>Appendix D</b> .
69	EEPGL will source VOOs to provide platforms for the containment and recovery systems.
70	A Wildlife Response Plan specific to Guyana has been developed to allow for a timely, coordinated and effective protection, rescue, and rehabilitation of wildlife to minimize any negative impacts of a spill. Should a wildlife response be required, EEPGL will call upon the Sea Alarm Foundation via OSRL to provide specialist advice and assistance with carrying out a response.
71	EEPGL may use in situ burning for large-scale Tier III incidents. OSRL will provide the resources required.
72	EEPGL will manage hazardous waste resulting from clean-up activities and ensure appropriate disposal.
73	The Tanker Owner/Operator will implement an ERP should any spill occur during tanker offloading and the FPSO ERP will have similar details on the surface and subsea response for a spill from either the FPSO, during tanker offloading or SURF equipment during production operations.
74	If a Tier III loss-of-well control event occurs involving the release of wellbore fluids into the sea, EEPGL will perform a site survey, conduct debris removal operations (as required), evaluate and execute well intervention options, install subsea dispersant application hardware, and mobilize and install a capping device/auxiliary equipment as required. If a relief well is required, it will be drilled to intersect the original well and address specific issues encountered in the original wellbore.
75	<p>EEPGL will utilize OSRL's Subsea Well Intervention Service (SWIS), which provides access to a Subsea Incident Response Toolkit (SIRT), Global Dispersant Stockpile (GDS) and multiple CSSs. The CSS and SIRT includes equipment that can be mobilized directly to the well site:</p> <ul style="list-style-type: none"> <li>• Survey &amp; debris clearance equipment;</li> <li>• Intervention equipment;</li> <li>• Dispersant hardware application system*; and</li> <li>• CSSs and auxiliary equipment.</li> </ul>
76	In the event of a spill, an incident-specific Decontamination Plan will be developed by EEPGL relevant to the nature and extent of the spill, to prevent further oiling through secondary contamination.

**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

#	Embedded Control / Spill Prevention Measure
77	The Tier I equipment held at EEPGL's onshore and offshore operations, including shorebases, fueling terminal, support vessels, drill ship, tankers and FPSO will be available for rapid deployment in the event of an incident.
78	Equipment and trained personnel are available through the terminals and shorebases to initiate an onshore/nearshore response to a Tier II incident. Vessel dispersant spray operations will be initiated from the PSVs and supported from the shorebases or other accessible locations as needed to supplement other Tier II response actions.
79	The Regional Response Team (RRT) can be partially or fully activated, and includes trained individuals and specialists, with assigned roles and responsibilities, who can be deployed at short notice to address a broad range of emergency situations.
80	EEPGL is a Participant member with OSRL, and therefore has immediate access to Tier III technical advice, resources and expertise 365 days a year on a 24-hour basis.
81	EEPGL has access to the GDS, which is an additional 5,000 cubic meters (m <sup>3</sup> ) of dispersant located across the OSRL bases and in France.
82	EEPGL has access to the Boots & Coots 15 PSI Subsea Well Capping Stack located in Houston, TX, USA.
83	<p>EEPGL also has access to the OSRL SWIS, Oceanering, Wild Well Control, and Trendsetter Engineering for subsea well response. SWIS holds and maintains four CSSs and two SIRTS globally:</p> <ul style="list-style-type: none"> <li>• 15k PSI Subsea Well Capping Stack—Norway and Brazil;</li> <li>• 10k PSI Subsea Well Capping Stack—South Africa and Singapore;</li> <li>• SIRT—Norway and Brazil.</li> </ul>
84	EEPGL conducts oil spill training courses and exercises (desktop and in-field) for operations offshore Guyana. The training, drills, and exercises familiarize response personnel with their duties and responsibilities in an oil spill.
85	EEPGL ERT and IMT members, which includes the RRT, will receive oil spill response training listed in the OSRP based on their response position.
86	ERT and IMT members will receive appropriate Incident Command System (ICS) Training listed in OSRP based on their roles and responsibilities.
87	EEPGL will conduct oil spill response exercises to test incident response personnel function and responsibilities, in line with OSRP.
88	EEPGL will implement a Wildlife Response Plan as a supplement to the OSRP to serve as general guidance for wildlife deterrence (hazing), capture, and rehabilitation during an oil spill response.

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**G. Summary of Spill Prevention, Mitigation Measures and Embedded Controls**

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## APPENDIX H – OIL SPILL SCENARIOS AND NET ENVIRONMENTAL BENEFIT ANALYSIS FOR SELECTION OF RESPONSE TECHNOLOGIES

**This Net Environmental Benefit Analysis (NEBA) was performed for the Payara Development Project. It should be considered a representative analysis for a Floating Production, Storage, and Offloading (FPSO) Development Project, and results would be consistent for the Liza Destiny, Liza Unity, Payara and Yellowtail Development Projects, and for exploration activities in Guyana. However, in 2022, EEPGL will be conducting a qualitative NEBA process and Spill Impact Mitigation Assessment to better inform initial decision-making and response planning in alignment with the Guidelines on implementing spill impact mitigation assessment (SIMA) (IPIECA-API-IOPG, 2015 & 2017).**

The principal objectives of oil spill response are the elimination and collection of the maximum amount of oil in order to prevent its approach to the coast and subsequent stranding on the shoreline. In case of large spills of oil, the use of all available resources for oil spill response, including mechanical recovery, burning on water, and dispersants, is recommended. The decision to use oil dispersants may utilize a NEBA. This is an analysis based upon results of modeling of the spilled oil behavior on water and the efficiency of various response technologies as well as information about the oil's environmental impact. The analysis can determine the combination of response technologies that can best prevent stranding of oil on shorelines.

Data obtained in the course of the NEBA are used to develop recommendations for the use of available response technologies. In order to conduct the modeling, various scenarios of potential oil spills on facilities are utilized. These scenarios are selected from the possible releases that represent the risk of spills from a project.

### H.1. Oil Spill Scenarios

During the development of oil spill scenarios and response measures, the following input data are taken into account:

- Locations of potential oil spills and volumes of the spills determined on the basis of the project's risks;
- Hydrodynamic and meteorological conditions that best represent the region and conservative conditions, e.g., shortest time to shoreline stranding, under which the spills take place; and
- Information on oil spill response technologies, the resources available, their performance parameters, and timing to implement them.

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## H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

### H.2. Spill Sources and Volumes

Oil spill scenarios for this NEBA were developed for the following releases:

- A Tier III worst case discharge (WCD) crude oil release from a loss of well control at a Payara well—202,192 barrels (bbl) per day (initial rate) for 30 days, for two seasons (Maximum WCD per US GoM practice)
- A Tier III crude oil release from a loss of well control at a Payara well—20,000 barrels (bbl) per day for 30 days, for two seasons
- A Tier II crude release at the FPSO resulting from a loading hose malfunction—2,500 bbl, for two seasons

This approach ensures that the NEBA results would also be applicable to any potential smaller spills. The duration of the Tier III well control releases at the FPSO was 30 days for Monitor and Observe (Unmitigated) analysis, and 5 days for the Full Response (Mitigated) analysis. The Full Response analysis considered the shut-in of the well at 5 days (based on capping stack deployment time). The model run duration for the 20,000 barrels (bbl) per day for 30 days Tier III release was 45 days. The model run duration for the Maximum WCD (202,192 bbl per day [initial rate]) Tier III release was 54 days. The duration of the release for the Tier II loading hose malfunction was less than 1 hour and the model was run for 10 days.

### Seasons of the Year and Met Ocean Conditions

A technical report commissioned by ExxonMobil Upstream Research Company (Berek et al. 2015) describes the results of an analysis of the regional wind time series data and characterizes the prevailing winds offshore Guyana for two seasons:

- Winds from the east-northeast during the months Dec–May
- Winds from the east during the months Jun–Nov

Wind data used in the oil spill model simulations were taken from two global models, Navy Operational Global Atmospheric Prediction System (NOGAPS) and Navy Global Environmental Model (NAVEM). These global models define wind speed and direction time series over the region. Data from the two models cover the same 10-year period as the hydrodynamics (2005-2014).

The hydrodynamics or currents in the upper water column off the Guyana coast are strong and flow towards the northwest along the coast of South America over the entire year. The Guiana Current is part of the regional flow between South America, Africa, and the Caribbean Sea, extending from Guyana to the Caribbean. Current data produced by the SAT-OCEAN model covering the area around the Stabroek block were used in combination with currents extracted from the U.S. Navy HYCOM global hind cast model as inputs to the spill simulations.

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## H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

### H.3. Oil Spill Response Resources and Limitations on Their Use

The following oil spill response technologies were studied:

- Monitor and Observe—This unmitigated spill has no active oil spill response measures beyond the organization of monitoring;
- Full Response—The mitigated response represents joint in-situ burning, mechanical recovery of oil, the use of dispersants at the water surface and in the sub-surface, and installation of a capping stack.

EEPGL has various oil-recovery and response equipment and vessels for recovering and removing spilled oil from the sea surface. This equipment is maintained and provided to EEPGL upon demand for spill response by OSRL and other Tier III equipment providers. These are worldwide providers of response equipment funded by the oil industry. They have a supply of oil dispersants and the appropriate equipment needed for application at the water surface by vessels and aircraft, and for subsea application at the wellhead. A list of the oil spill response resources used in the modeling simulations is presented below. This equipment list excludes any equipment intended for onshore or on land response, as this NEBA effort is only focused on offshore spill response only.

It should be noted that the referenced vessels are the same as those references in oil spill response analyses for earlier projects. This allows a direct comparison among the projects. It should also be noted that as the project increases in size and complexity, the named project-related vessels are changing and the number of vessels is increasing dramatically. If a significant incident were to occur, appropriate response vessels would be expected to be readily available. If a worst-case discharge were to occur, additional vessels and aircraft would be mobilized for a response. While the mitigated scenario modeling results for the WCD scenarios indicate the potential for shoreline impact, additional resources could further reduce the potential for those impacts.

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

**Table H-1: Equipment Used during Modeled Oil Spill Response Operations**

Location	Response type	Mechanical Oil Recovery and Burning	Dispersant Application
Downstream of FPSO	Oil Burning	Vessels-1 Project PSV and tug Vessels-2 Project PSV and tug Vessels-3 Project PSV and tug Vessels-4 VOO and other VOOs	
Water Surface Above Well	Dispersants		Project PSVs
Subsurface at Well Head	Dispersants		Project MPV
Downstream of FPSO	Aerial dispersant application		Boeing 727—1 Boeing 727—2 Hercules C-130—3
Downstream of FPSO	Mechanical Recovery	Vessels-1 VOO and other VOOs Vessels-2 VOO and other VOOs Vessels-3 VOO and other VOOs Vessels-4 VOO and other VOOs	
Well Head	Capping Stack		

MPV = Multi-purpose Vessel equipped with geo-locators and remote operated vehicle; PSV = Project Support Vessel; VOO = Vessel Of Opportunity

**H.4. Information Collected from Modeling of Oil Spill Scenarios**

The following information is collected to compare the results of the Monitor and Observe (Unmitigated) scenarios with the Full Response (Mitigated) scenarios:

- Shoreline area where oil has stranded (square meters [m<sup>2</sup>])
- Volume of oil stranded on shorelines (bbl)
- Volume of oil dispersed by aircraft (bbl)
- Volume of oil burned (bbl)
- Volume of oil recovered mechanically (bbl)
- Volume of oil evaporated (bbl)
- Volume of oil remaining on the surface of the sea (bbl)

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

**H.5. Modeling of the Behavior of Spilled Oil and Response Performance**

Modeling of oil spills was performed with the aim of assessing the efficiency of various response technologies available to EEPGL via Boots & Coots, OSRL, and other OSR vendors as necessary. The results of this assessment are the basis of the NEBA. The modeling was conducted by RPS using the SIMAP model, developed for the purpose of predicting the impact and behavior of spilled oil. This model makes it possible to quantitatively study the changes that occur with spilled oil under the action of natural factors (spreading, evaporation, dispersion). The model also predicts the possible areas of oiling of the water and the oiling of the coastal zone. Finally, the model predicts the amount of oil removed using burning, mechanical recovery, and the amount of oil dispersed using dispersants. The reliability of the model was confirmed by comparing the results obtained from modeling to actual observed oil spill behavior during actual oil and oil product spills, a list of which is presented in Table H-2.

**Table H-2: List of Spills Used to Validate the SIMAP Model**

Spill source, name of ship	Spill mass, tonnes	Duration of spill (hours)	Type of oil	Date of spill	Ambient temperature, °C
American Trader	1,317	1	Crude, Alaska	July 1980	15
Apex Houston	83	27	Crude, Alaska	January 1986	13
Puerto Rican	3,473	1	Heavy fuel oil	November 1984	14
Command	11	1	Heavy fuel oil	September 1988	14
Cape Mohican	150	16	Medium viscosity fuel oil	October 1986	13
Arco Anchorage	830	4	Crude, Alaskan	December 1985	10
Bouchard Barge #155	1,208	0.25	Heavy fuel oil	August 1980	30
Exxon Bayway	1,837	3	No. 2 fuel oil	January 1980	8
Exxon Valdez	34,800	10	Crude, Alaskan	March 1988	2
North Cape	2,682	26	No. 2 fuel oil	January 1986	2
New Carissa	252	102	No. 6 and No. 2 fuel oils	February 1988	8
Buochard Barge #120	208	3	Heavy fuel oil	April 2003	7
Macondo	600,000	2,064	Louisiana Light	April 2010	20

°C = degrees Celsius

#### H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

In preparing information for this NEBA, a number of potential oil spill scenarios (Table H-3) have been analyzed. These scenarios characterize the conditions for hypothetically more severe scenarios in terms of oil spill volumes. The selection of these scenarios with large volumes of spilled oil required the determination of the availability of equipment as well as the timing of the application of that equipment. The details of the equipment and timing follow the following strategies:

- Subsurface Well Release
  - Eliminate surfacing of oil from the wellhead with sub-surface oil dispersant injection
  - Eliminate oil at the surface of the water prior to shoreline stranding utilizing aerial oil dispersant application, in-situ burning, and on water mechanical recovery
  - Stop the flow of oil at the wellhead with a capping stack
- Surface Release of Oil
  - Eliminate oil at the surface of the water prior to shoreline stranding utilizing aerial oil dispersant application

The following demonstration of the successful response and avoidance of shoreline oiling with equipment available from Tier III oil spill response centers (e.g., Boots & Coot and OSRL) indicates that the response strategies can readily be applied to smaller Tier I and Tier II spills. The response to Tier III spills for these scenarios was discussed with Tier III representatives to ascertain the storage location, transportation needs, timing of arrival and set-up, and for the field application of specific response equipment. ExxonMobil is a Member Company of OSRL and other Tier III response centers (Boots & Coots, MWCC, MSRC, etc.) around the world. ExxonMobil and its subsidiary companies (inclusive of EEPGL) regularly exercise Tier III responses, are familiar with the types of equipment and storage locations, and evaluate the timing for response to projects around the world. OSRL, Boots & Coots and other OSR vendors' equipment availability and locations are available to Member Companies via Internet.

For each release and wind regime, the effects of various response strategies were modeled for their predicted ability to treat oil on the water surface and subsequently reducing the amount of oil stranded on shore. The response strategies included the following: Monitor and Observe or no active mitigation, and Full Response or mitigation with the combined use of in-situ burning, mechanical recovery, dispersant application both at the surface and in subsurface waters at the wellhead, and the installation of a capping stack.

The modeling provides the ability to evaluate and compare response results for a variety of quantitative parameters: oil stranded on shorelines, oil remaining on the surface of the sea, oil burned and recovered mechanically, and dispersed into the water as a result of both natural factors and after dispersant application.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

Table H-3: List of Oil Spill Scenarios Analyzed

No.	Wind regime	Spill Source	Response options	Spill mass (bbl)	Spill duration
12a	Jun-Nov	Loading Hose	Monitor and Observe	2,500	1 hour
12b	Jun-Nov	Loading Hose	Burning, Dispersants, and Mechanical Recovery	2,500	1 hour
12c	Dec-May	Loading Hose	Monitor and Observe	2,500	1 hour
12d	Dec-May	Loading Hose	Burning, Dispersants, and Mechanical Recovery	2,500	1 hour
13a	Jun-Nov	Well Control Loss	Monitor and Observe	600,000	30 Days
13b	Jun-Nov	Well Control Loss	Burning, Dispersants, and Mechanical Recovery	100,000	5 Days
13c	Dec-May	Well Control Loss	Monitor and Observe	600,000	30 Days
13d	Dec-May	Well Control Loss	Burning, Dispersants, and Mechanical Recovery	100,000	5 Days
14a	Jun-Nov	Well Control Loss (Maximum WCD)	Monitor and Observe	4,654,000	30 Days
14b	Jun-Nov	Well Control Loss (Maximum WCD)	Burning, Dispersants, and Mechanical Recovery	940,275	5 Days
14c	Dec-May	Well Control Loss (Maximum WCD)	Monitor and Observe	4,654,000	30 Days
14d	Dec-May	Well Control Loss (Maximum WCD)	Burning, Dispersants, and Mechanical Recovery	940,275	5 Days

The spill durations of Scenarios 13b, 13d, 14b, and 14d are 5 days, which corresponds to the timing to expected capping stack installation for the Boots & Coots GRIP system. As a result of that timing, the assumed volume released is reduced by 25 days of flow volume (as compared to the assumed duration of an unmitigated release).

For each set of scenarios, a comparison of predicted oil volumes was made for the following model parameters:

- Monitor and Observe—when no actions are taken to recover, remove, or disperse the oil, and it is broken down only by natural factors such as wind and waves;
- Full Response—For the subsurface loss-of-well-control scenarios, the response was comprised of in-situ burning, mechanical recovery, the use of dispersants at the water surface (aircraft and vessels) and installation of a capping stack. For the loading hose break, the response was comprised of aerial dispersant application at the water surface.

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

The SIMAP Model was used to determine the potential performance of response equipment used for in-situ burning, mechanical oil recovery, capping stack installation, and dispersant application. The potential capacities were determined for the equipment deployed and these were taken into account in the modeling analysis. The environmental limits of the various types of equipment were used to account for conditions in which the equipment could not be operated safely or effectively, e.g., at night and when wind velocities are excessively high.

**H.6. Response Conditions and Limits**

Mechanical oil recovery, surface application of dispersants with a vessel at the well site, aerial dispersant application, and subsurface dispersant application at the wellhead were simulated utilizing the capabilities presented in Table H-4 to Table H-7. The timing of the initiation of those responses is presented in Table H-8. The oil spill equipment and techniques utilized for the NEBA analysis are consistent with the equipment and techniques discussed in Sections 5 and 6 of the OSRP. The WCD releases that were analyzed would represent some of the largest offshore releases in the history of the industry. The responses that were applied to them represent credible responses in terms of both timing and scope. If a release of this magnitude occurred, the response would be monitored for performance and would be scaled-up as necessary to minimize shoreline impacts in the Caribbean. Additional services would be initially sourced from ExxonMobil’s OSR vendors in the nearby Gulf of Mexico region and would extend beyond that region, as needed. Releases of this magnitude are very rare and the response that was applied to them in the response modeling provides insights and comparisons among the various projects regarding additional needs that would be needed should such an unlikely event occur.

**Table H-4: Mechanical Recovery Parameters and Limitations**

Mechanical Recovery
Vessel based recovery using boom and skimmer systems—VOO Based operations
4 vessels conduct oil collection
Recovery rates or skimmer ratings - 200 gpm
Maximum vessel speed 15 knots
Staffed with 2 crews
Daylight operations only
Winds < 20 Knots
Waves < 1.5 m
Boom swath width 50 m
Temporary storage 25 m <sup>3</sup> (6,604.3 gal) per vessel system unloaded

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

Mechanical Recovery
Times for transit to offload and offload = 2 hours
No need to return to port nightly

gal = gallon; gpm = gallons per minute; m = meter; m<sup>3</sup> = cubic meter; VOO = vessel of opportunity

**Table H-5: In-Situ Burning Parameters and Limitations**

In-Situ Burning
Vessel based burning operations utilizing burn boom—Project vessels with VOO assist, 4 burning operations total
Maximum vessel speed 15 knots
Staffed with 2 crews
Daylight operations only
Oil weathering 24 to 72 hours
Emulsification <25% water
Burn location >3 nautical miles from well head and populated areas
Winds < 20 knots
Waves < 1.5 m
Currents—adjusted to < 1 knot with vessels and positioning
Boom swath width 50 m
Assume 2 burns/day per vessel pair, 300 bbl/burn
No need to return to port daily

m = meter; VOO = vessel of opportunity

**Table H-6: Surface Dispersant Application Parameters and Limitations**

Surface Dispersant Application
Vessel with spray arms—1 Project vessel
Dispersant spraying of oil surfacing above well-head
Staffed with 2 crews
Vessel Dispersant Capacity—Restock offshore in evening
Maximum vessel speed 20 knots
Vessel Dispersant Application Speed—Average 5 knots
Unlimited dispersant access for daylight operations

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

Surface Dispersant Application
Daylight operations only
No minimum sea state
No spraying above 35 mph wind speed
Spray arms are 6 m and attached to both sides of vessel
Desired dispersant to oil ratio (DOR) 1:20

**Table H-7: Aerial Dispersant Application Parameters and Limitations**

Aerial Dispersant Application
Boeing 727—2 identical aircraft <sup>a</sup> , and if needed a Hercules C-130
15,000 L dispersant capacity (Boeing 727), 13,000 L dispersant capacity (C-130)
Cruising speed 930 kmh (577 mph)—Boeing 727, 590 kmh (368 mph)—C-130
Dispersant Application Speed- 150 mph
DOR 1:20
Based in Trinidad
Unlimited dispersant access
Staffed with 2 crews
Daylight operations only
No minimum sea state
No spraying above 35 mph wind-speed

mph = miles per hour

<sup>a</sup> OSRL recently acquired and adapted two Boeing 727 aircraft for aerial dispersant application. While these would be the preferred option, other aerial dispersant response aircraft are available, e.g., C-130.

**Table H-8: Timing of Response Activities**

	Day	1	2	3	4	5	6	7	9	10	12	14	21
Well debris cleanup					x								
Supply vessels <sup>1</sup> with dispersant application devices		x											
Aircraft 1- Boeing 727			x										
Aircraft 2-Boeing 727					x								
Aircraft 3—C-130				x									

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

	Day	1	2	3	4	5	6	7	9	10	12	14	21
Vessel with Spray Arms							x						
Burn Boat 1							x						
Burn Boat 2							x						
Burn Boat 3								x					
Burn Boat 4								x					
Capping Stack <sup>2</sup>							x		x				x
Mechanical Boat 1										x			
Mechanical Boat 2										x			
Mechanical Boat 3											x		
Mechanical Boat 4											x		

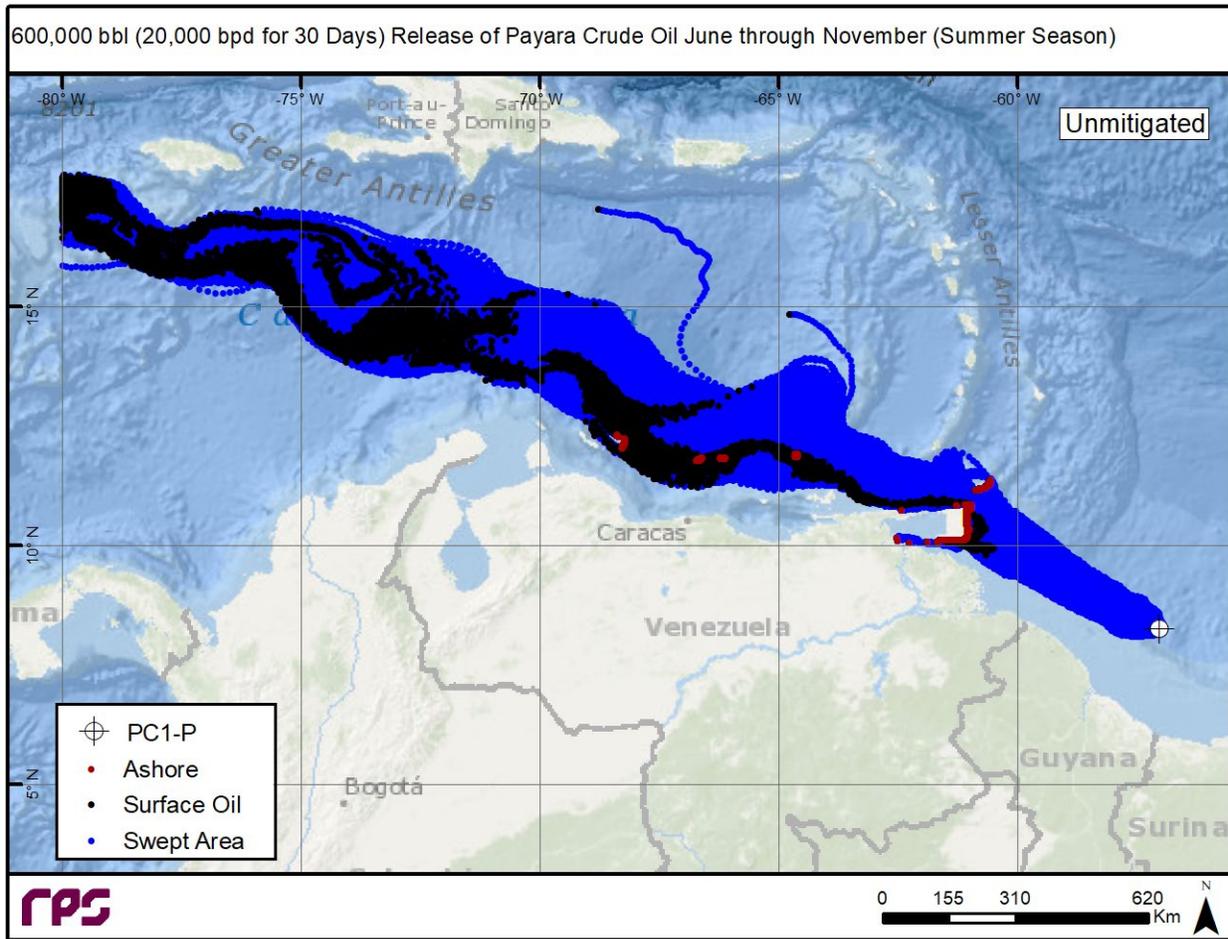
1. PSVs / FSV marine support vessels with mounted dispersant application monitors.
2. Primary resource is the Boots & Coots GRIP capping stack from Houston, which is mobilized by air/sea. Secondary resource is OSRL capping stack from Brazil, which is mobilized by sea (Day 9). Tertiary resource is capping stack from Stavanger, which is mobilized by air/sea (Day 21).

**H.7. Results of the NEBA Analysis**

The results of the NEBA analyses have been presented in the following manner:

- Maps representing the releases as “unmitigated” or Monitor and Observe only without active oil spill response measure being implemented; followed by
- Map representing the releases with “mitigation” or a Full Response with all response activities being implemented jointly;
- These are then followed by summary tables, which show the difference between these model runs and associated performance parameters for both unmitigated and mitigated releases that were depicted in the maps earlier.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies



**Figure H-1: Payara Unmitigated Wellhead 600,000 bbl (20,000 bpd) Crude Release—Summer Season. Areas colored dark blue show the sea surface area swept by oil. Red indicates where oil has stranded on the shoreline. Areas colored black show the presence of oil on the sea surface.**

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

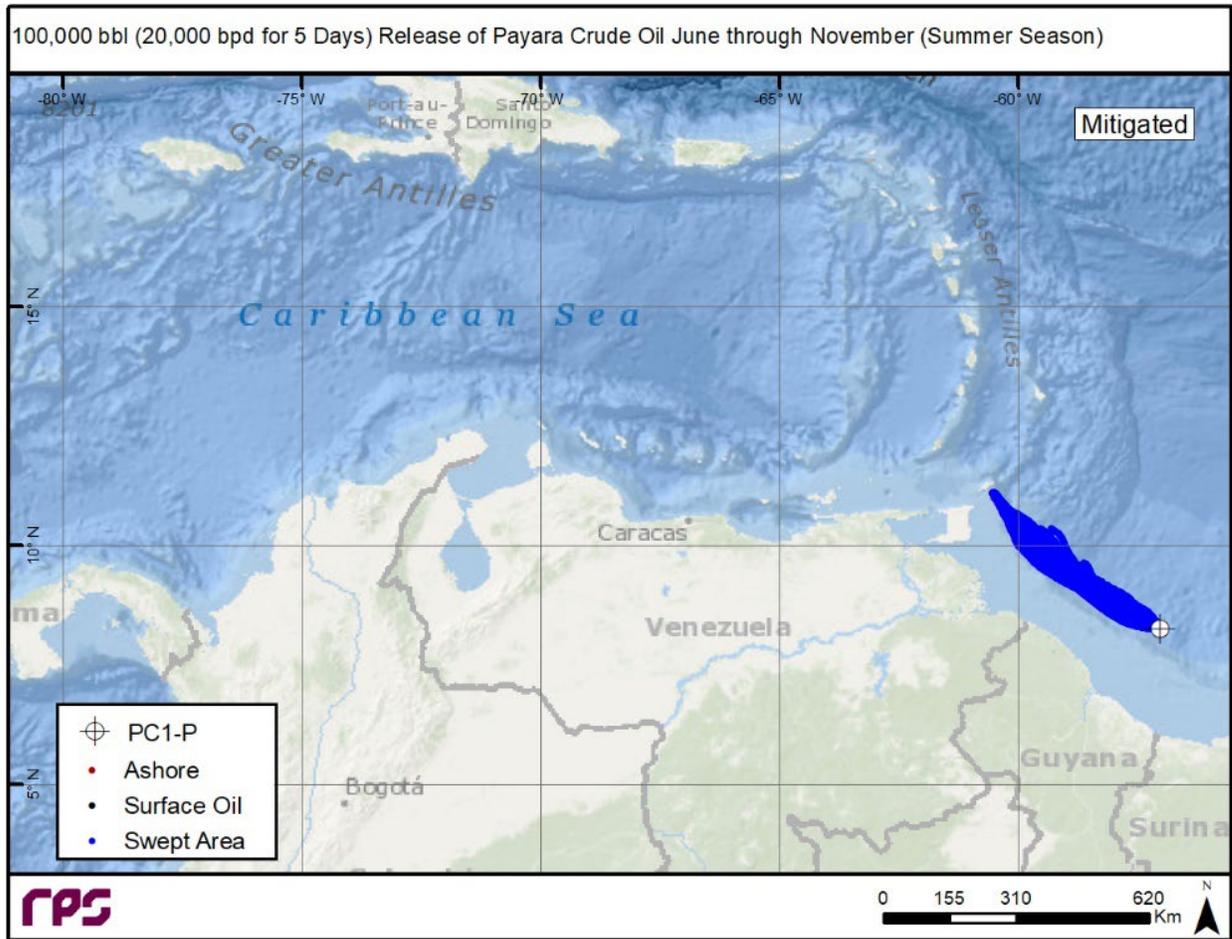


Figure H-2: Payara Mitigated Wellhead 100,000 bbl (20,000 bpd) Crude Release—Summer Season. Areas colored dark blue show the sea surface area swept by oil. There is no shoreline oiling and no surface oil remains.

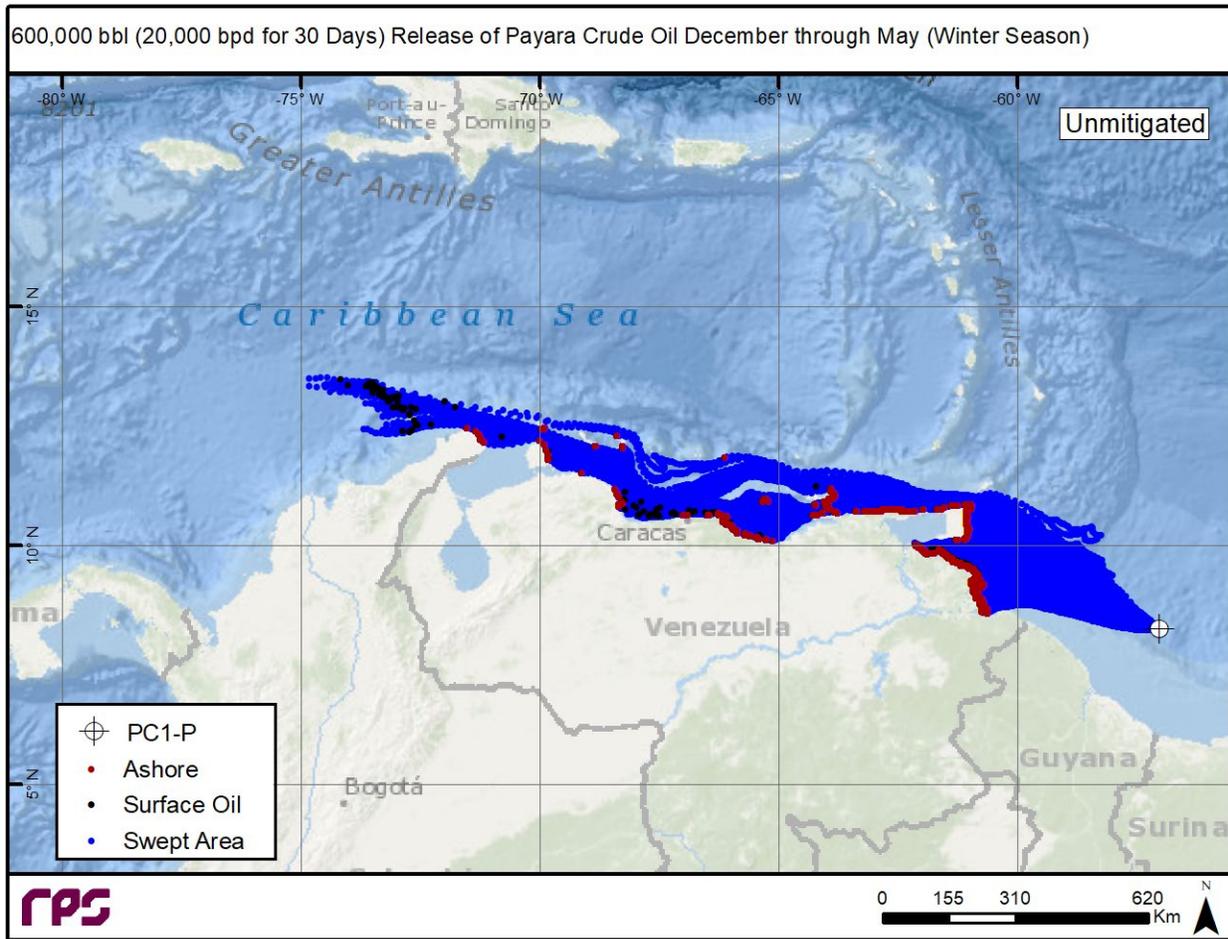
H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

**Table H-9: Comparison of Key Model Output Parameters for the Payara 20K BPD Jun-Nov Summer Season Release for Mitigated (Full Response) and Unmitigated (Monitor and Observe)**

	Monitor and Observe 600,000 bbl	Full Response <sup>a</sup> 100,000 bbl
Shoreline area oiled (km <sup>2</sup> )	10	0
Oil washed ashore (bbl)	71,224	0
Oil in water column (bbl)	5,176	39,824
Oil dispersed from vessels and aircraft (bbl)	0	78,396
Oil burned (bbl)	0	135
Oil mechanically recovered (bbl)	0	0
Oil biodegraded (bbl)	98,229	42,381
Oil evaporated (bbl)	151,165	17,659
Water surface (bbl)	264,532	0

<sup>a</sup> Full Response includes installation of a capping stack on Day 5.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies



**Figure H-3: Payara Wellhead 600,000 bbl (20,000 bpd) Unmitigated Crude Release—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Red indicates where oil has stranded on the shoreline. Areas colored black show the presence of oil on the sea surface.**

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

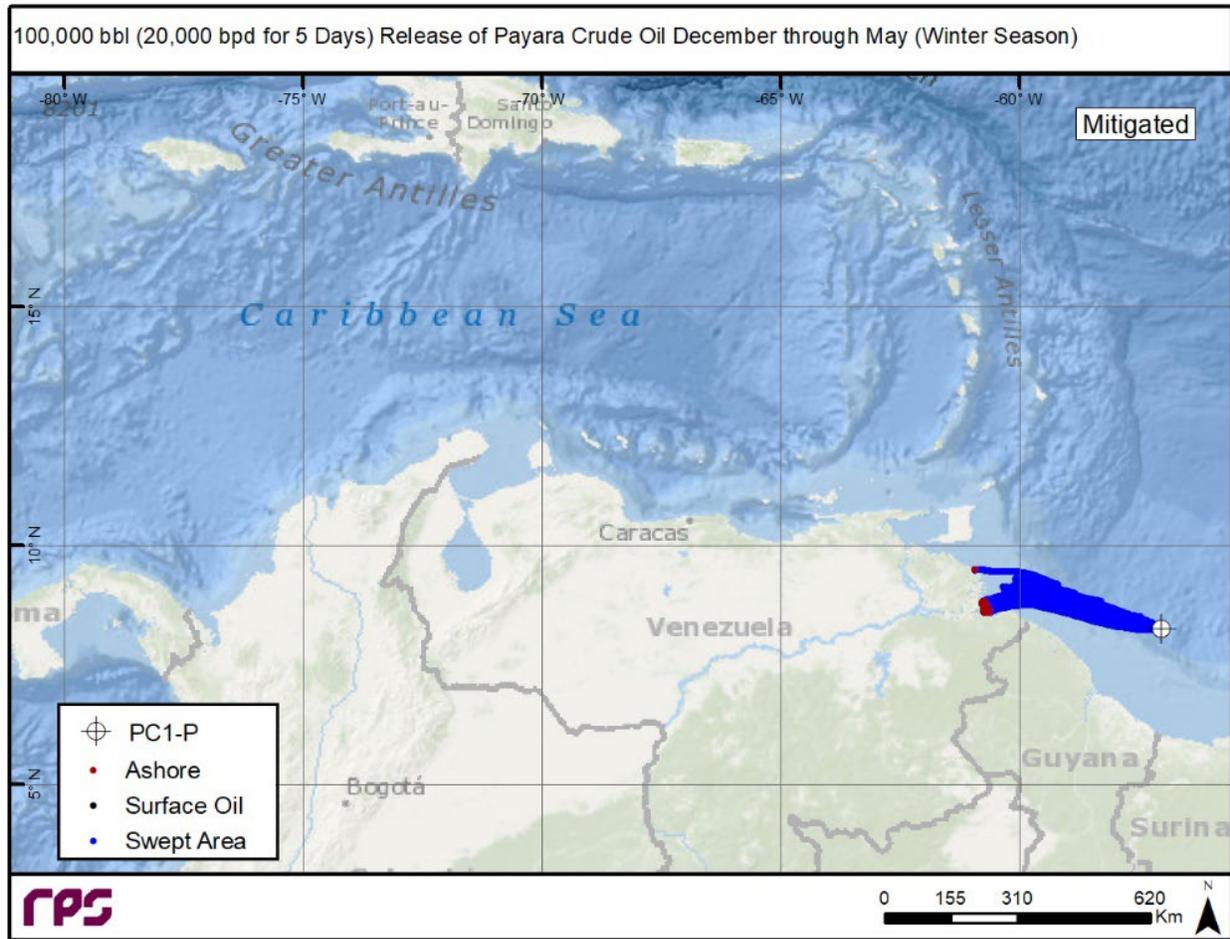


Figure H-4: Payara Mitigated Wellhead (100,000 bbl) 20,000 bpd Crude Release—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Shoreline oiling is shown in red; no surface oil remained.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

**Table H-10: Comparison of Key Model Output Parameters for the Payara 20K BPD Dec-May Winter Season Release for Mitigated (Full Response) and Unmitigated (Monitor and Observe)**

	Monitor and Observe 600,000 bbl	Full Response <sup>a</sup> 100,000 bbl
Shoreline area oiled (km <sup>2</sup> )	4	0.6
Oil washed ashore (bbl)	146,507	7,866
Oil in water column (bbl)	10,006	33,934
Oil dispersed from vessels and aircraft (bbl)	0	59,090
Oil burned (bbl)	0	125
Oil mechanically recovered (bbl)	0	4,124
Oil biodegraded (bbl)	99,851	35,107
Oil evaporated (bbl)	145,631	18,843
Water surface (bbl)	198,005	0

<sup>a</sup> Full Response includes installation of a capping stack on Day 5.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

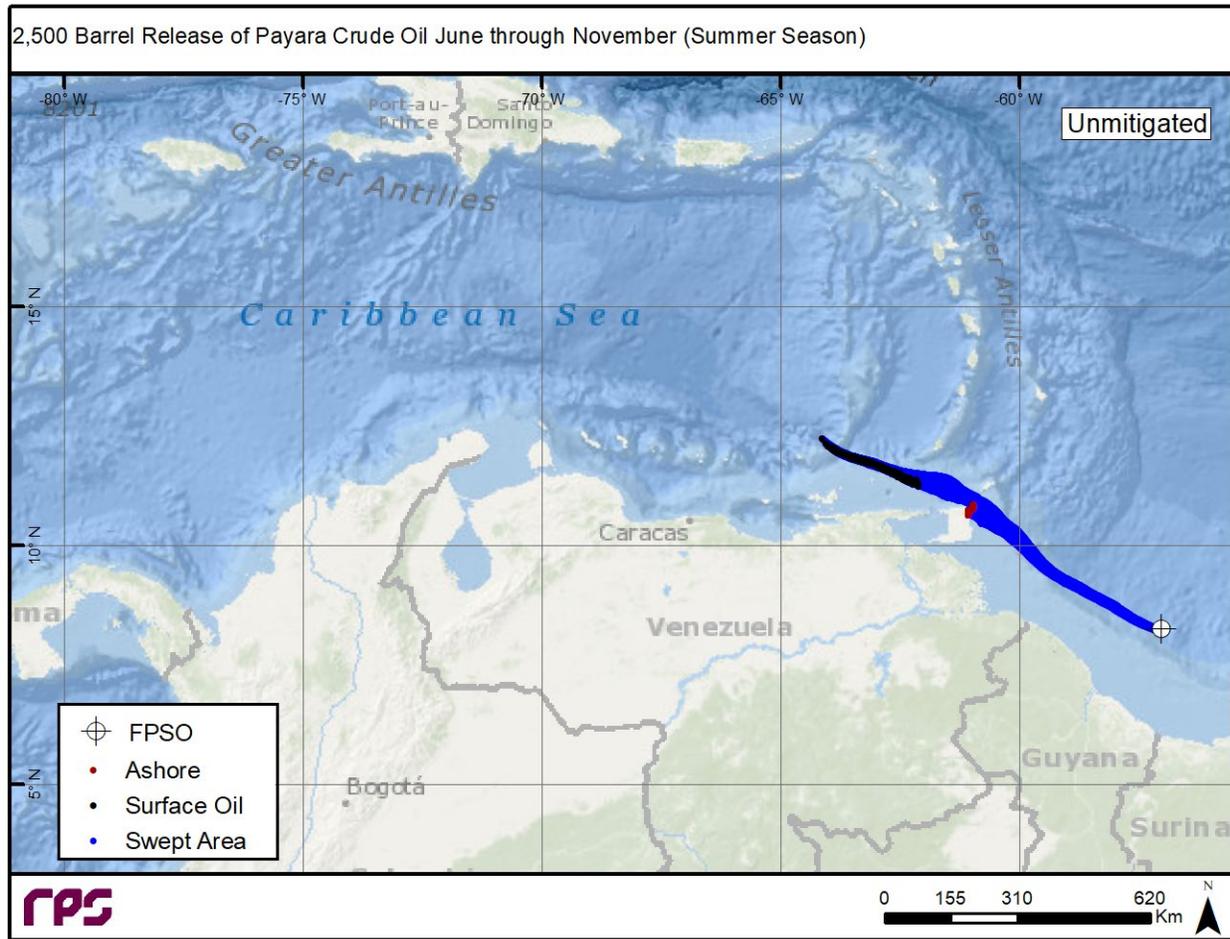


Figure H-5: Payara FPSO Unmitigated 2,500 bbl Payara Crude Release—Summer Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

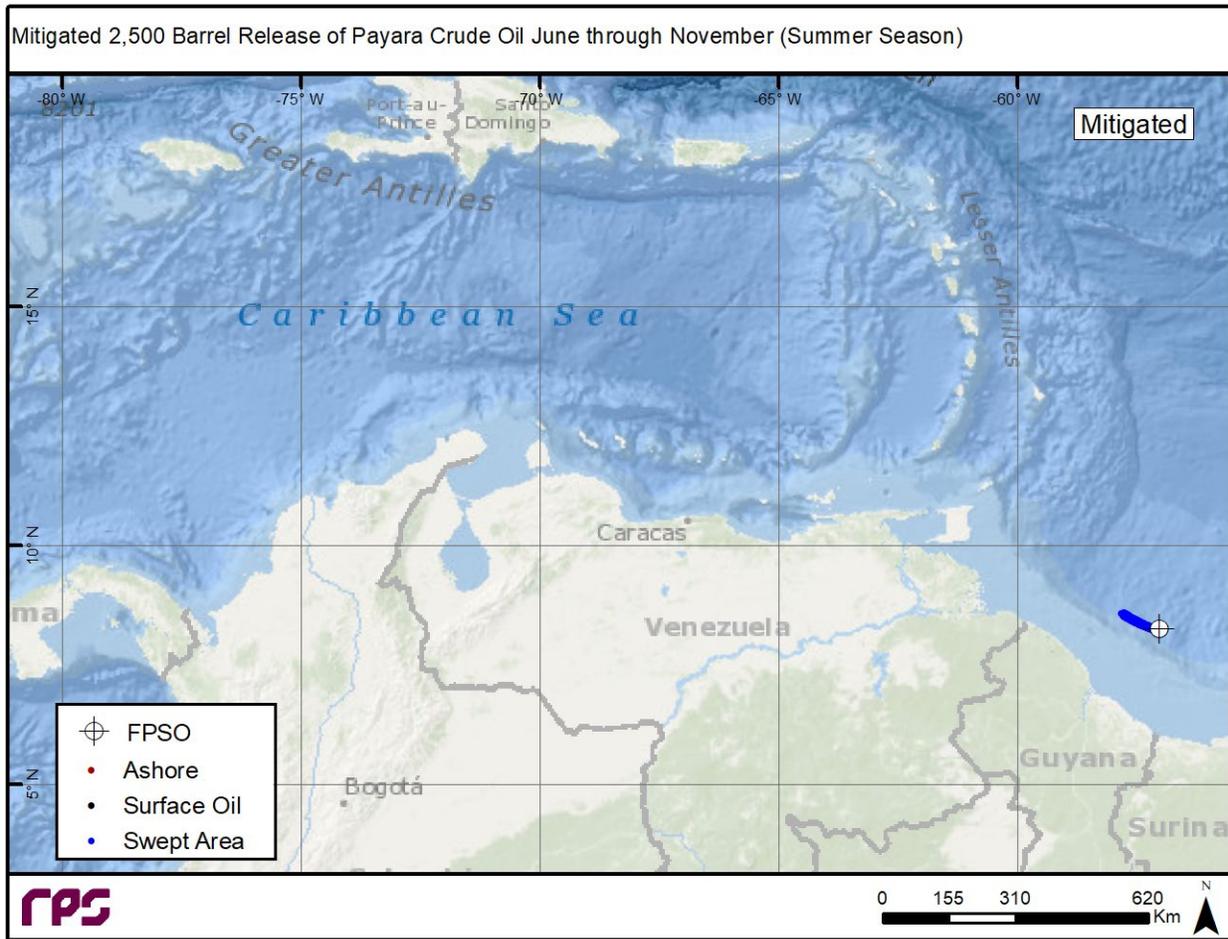


Figure H-6: Payara FPSO Mitigated 2,500 bbl Crude Release—Summer Season. Areas colored dark blue show the sea surface area swept by oil. No shoreline oiling occurred and no surface oil remained.

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

**Table H-11: Comparison of Key Model Output Parameters for the Payara 2,500 bbl Jun-Nov Summer Season Release for Mitigated and Unmitigated**

	Monitor and Observe	Full Response
Shoreline area oiled (m <sup>2</sup> )	300,000	0
Oil washed ashore (bbl)	401	0
Oil in water column (bbl)	4	1,571
Oil dispersed from aircraft (bbl)	NA	1,886
Oil burned (bbl)	NA	0
Oil mechanically recovered (bbl)	NA	0
Oil biodegraded (bbl)	139	343
Oil evaporated (bbl)	632	586

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

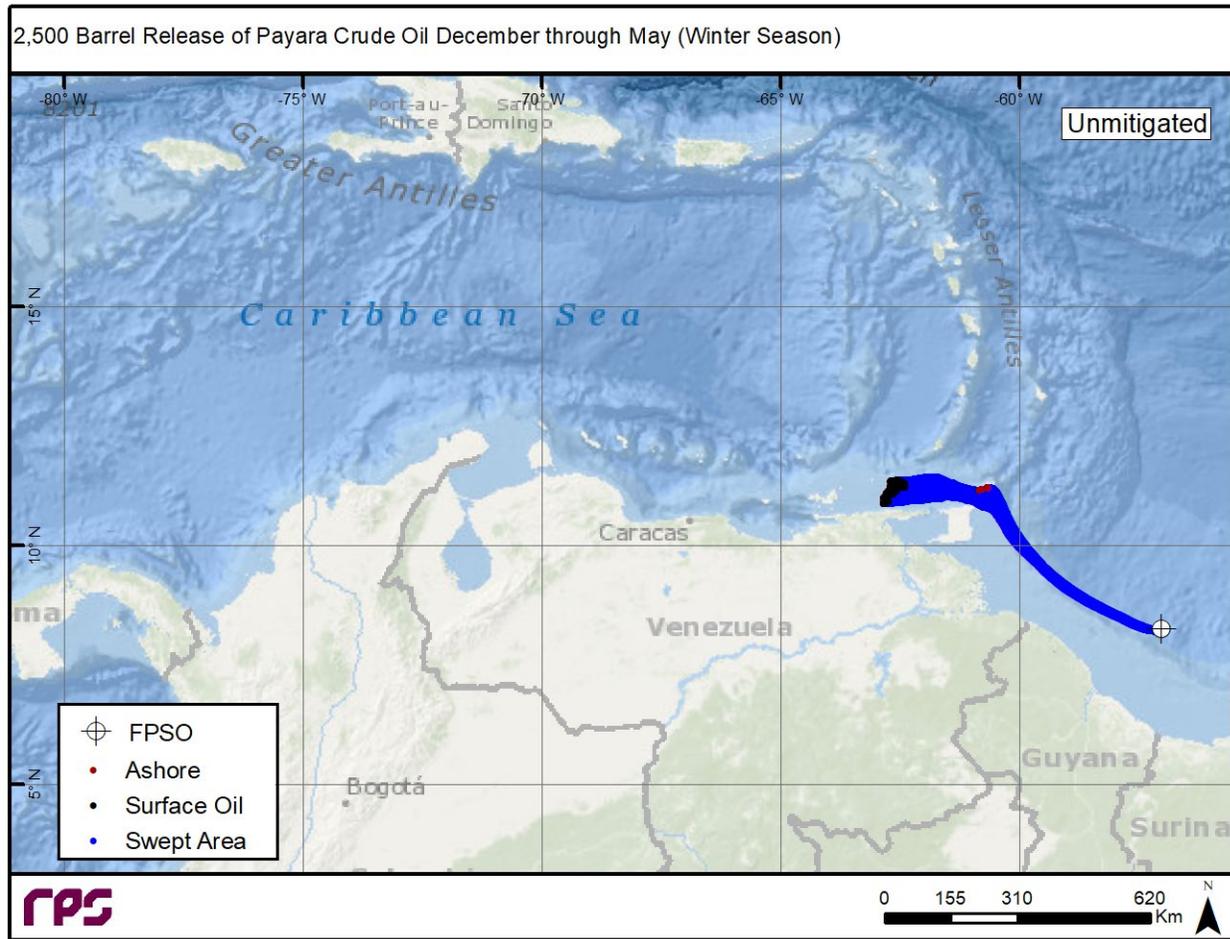


Figure H-7: Payara FPSO 2,500 bbl Unmitigated Crude Release—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

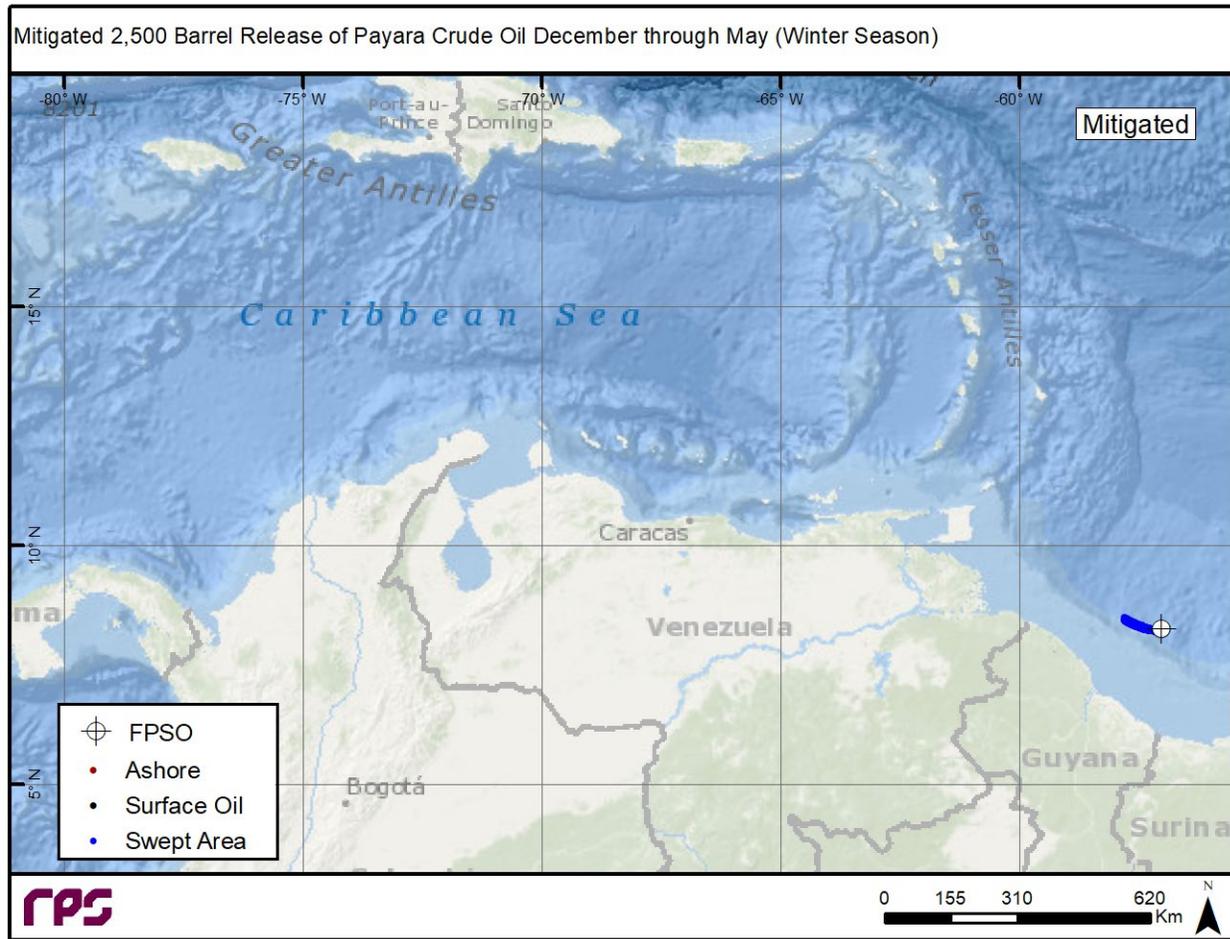


Figure H-8: Payara FPSO 2,500 bbl Mitigated Crude Release—Winter Season. Areas colored dark blue show the sea surface area swept by oil. No shoreline oiling occurred and no surface oil remained.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

**Table H-12: Comparison of Key Model Output Parameters for the Payara 2,500 bbl Dec-May Winter Season Release for Mitigated and Unmitigated**

	Monitor and Observe	Full Response
Shoreline area oiled (m <sup>2</sup> )	50,000	0
Oil washed ashore (bbl)	14	0
Oil in water column (bbl)	0.6	1,566
Oil dispersed from aircraft (bbl)	NA	1,883
Oil burned (bbl)	NA	0
Oil mechanically recovered (bbl)	NA	0
Oil biodegraded (bbl)	138	348
Oil evaporated (bbl)	617	586

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

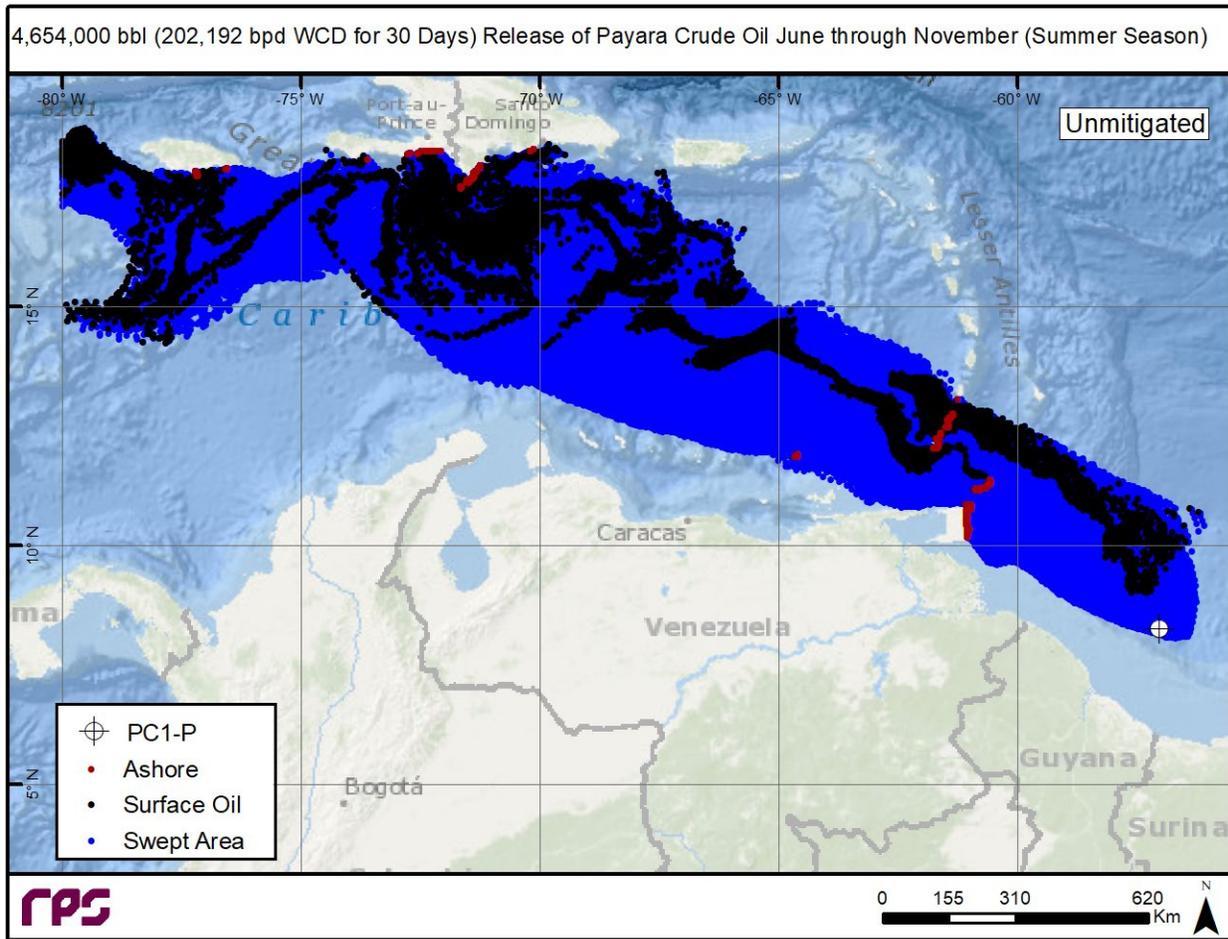


Figure H-9: Unmitigated Payara Wellhead 202,192 bbl Crude Release (Maximum WCD)—Summer Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

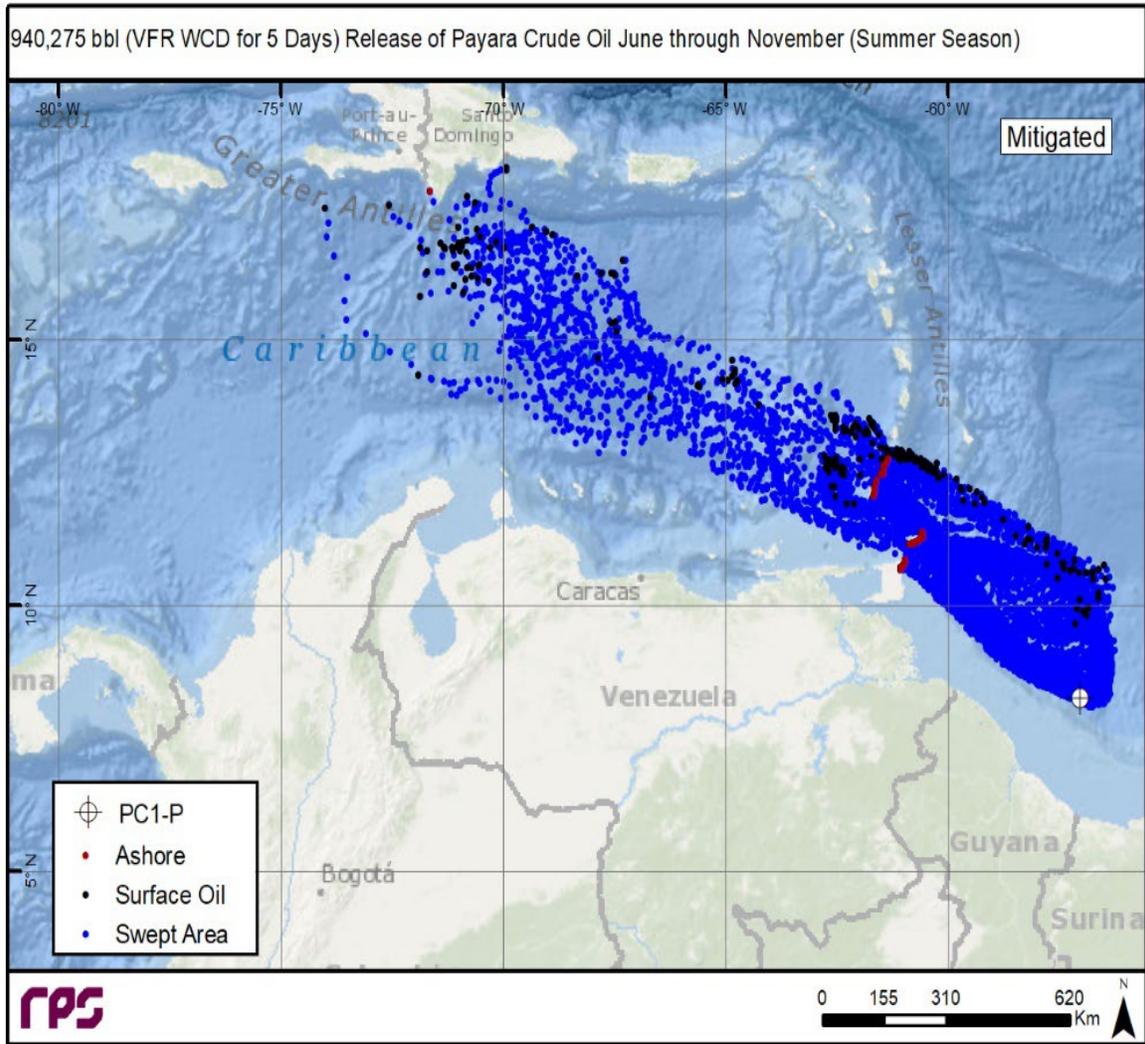


Figure H-10: Mitigated Payara Wellhead (940,275 bbl) 202,192 bbl per day Crude Release (Maximum WCD)—Summer Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

**Table H-13: Comparison of Key Model Output Parameters for the Payara 202,192 bpd (Maximum WCD) Jun to Nov Summer Season Release for Mitigated and Unmitigated**

	Monitor and Observe (4,654,000 bbl)	Full Response <sup>a</sup> (940,275 bbl)
Shoreline area oiled (km <sup>2</sup> )	4.8	0.8
Oil washed ashore (bbl)	91,614	10,426
Oil in water column (bbl)	99,209	282,396
Oil dispersed from aircraft (bbl)	NA	526,556
Oil burned (bbl)	NA	8,627
Oil mechanically recovered (bbl)	NA	13,707
Oil biodegraded (bbl)	1,681,290	534,168
Oil evaporated (bbl)	636,597	66,527
Water surface (bbl)	2,119,739	22,892

<sup>a</sup> Full Response includes installation of a capping stack on Day 5.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

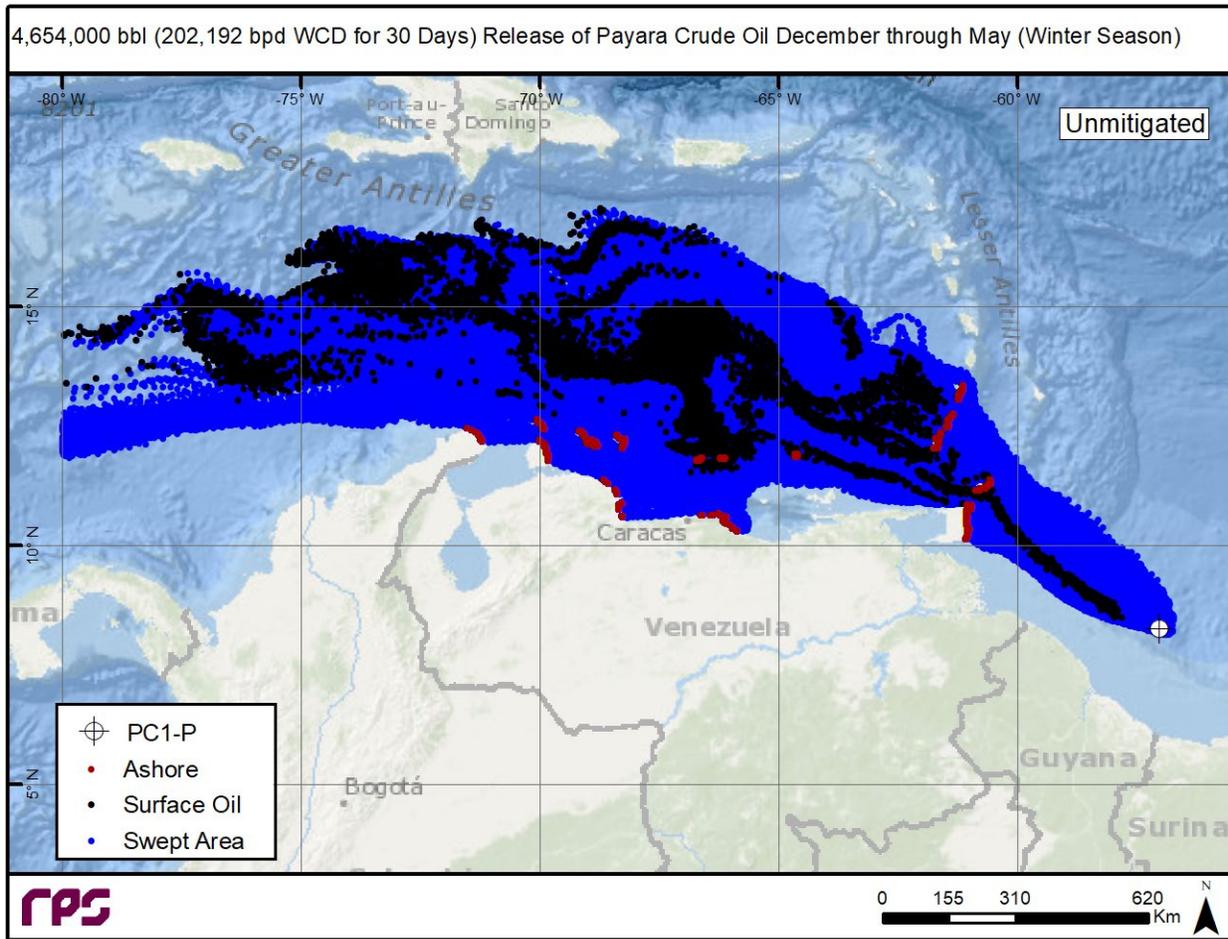


Figure H-11: Unmitigated Payara Wellhead 202,192 bbl per day Crude Release (Maximum WCD)—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

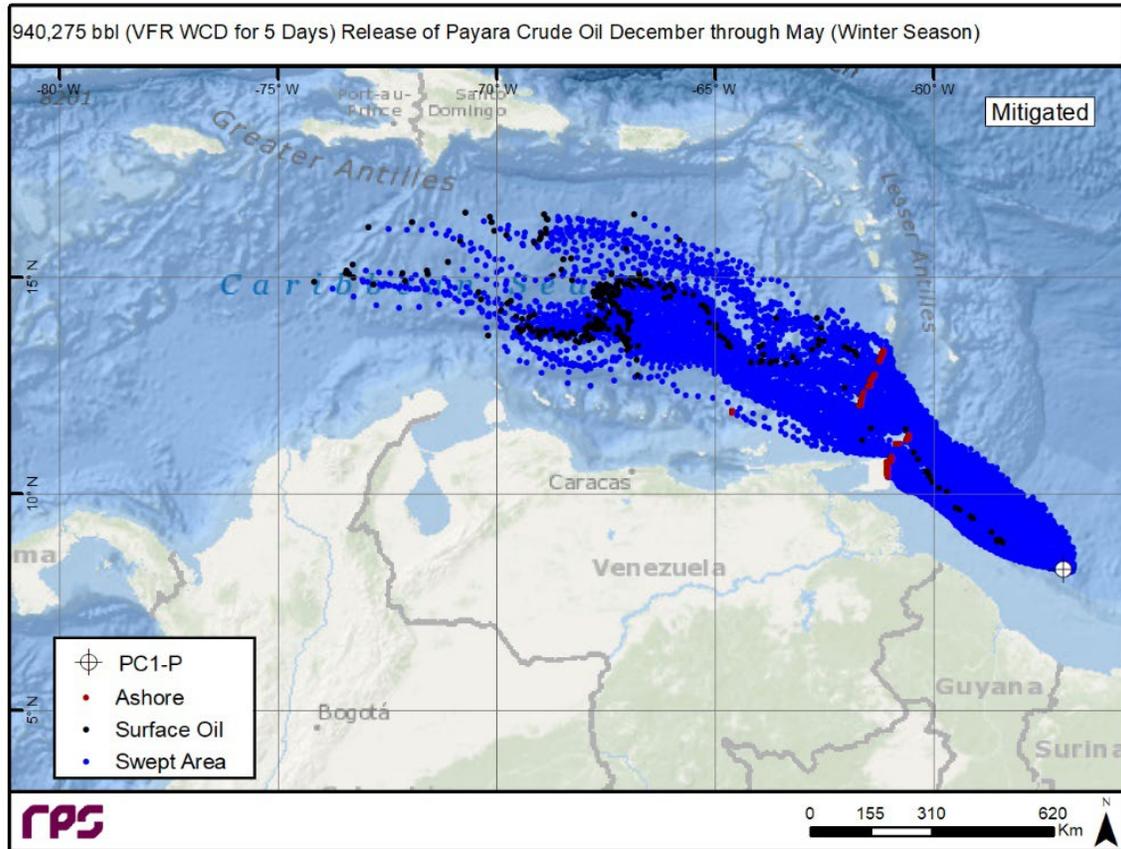


Figure H-12: Mitigated Payara Wellhead (940,275 bbl) 202,192 bbl per day Crude Release (Maximum WCD)—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies

**Table H-14: Comparison of Key Model Output Parameters for the Payara 202,192 bpd (Maximum WCD) Dec-May Winter Season Release for Mitigated and Unmitigated**

	Monitor and Observe (4,654,000 bbl)	Full Response <sup>a</sup> (940,275 bbl)
Shoreline area oiled (km <sup>2</sup> )	5.4	1.6
Oil washed ashore (bbl)	156,626	26,799
Oil in water column (bbl)	99,000	257,805
Oil dispersed from aircraft (bbl)	NA	476,143
Oil burned (bbl)	NA	8,842
Oil mechanically recovered (bbl)	NA	9,337
Oil biodegraded (bbl)	1,680,392	524,391
Oil evaporated (bbl)	638,371	68,565
Water surface (bbl)	2,055,337	44,550

<sup>a</sup> Full Response includes installation of a capping stack on Day 5.

**H.8. NEBA Summary**

The analysis of oiling parameters in the Monitor and Observe vs. Full Response oil spill responses demonstrates that the timing and response approach was effective in avoiding most shoreline impacts. The WCD releases that were analyzed would represent some of the largest offshore releases in the history of the industry. The responses that were applied to them represent credible responses in terms of both timing and scope. If a release of this magnitude occurred, the response would be monitored for performance and would be scaled-up as necessary to minimize shoreline impacts in the Caribbean. Additional services would be initially sourced from ExxonMobil’s OSR vendors in the nearby Gulf of Mexico region and would extend beyond that region, as needed. Releases of this magnitude are very rare and the response that was applied to them in the response modeling provides insights and comparisons among the various projects regarding additional needs that would be needed should such an unlikely event occur.

The reduction or elimination of shoreline impact is critical to successful spill response because oil can collect in quantities on shorelines and nearshore environments that may cause significant environmental damage and persist for years. The response to shoreline stranding may require invasive cleaning technologies to eliminate bulk oil. In some cases, these invasive technologies can be harmful and, like oiling, can produce long-lasting environmental effects.

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

A NEBA can be utilized to help understand the benefits of oil dispersant utilization in offshore waters during a response. The goal of the spill response is to shift the amount and duration of environmental effects from a higher severity to a lower severity.

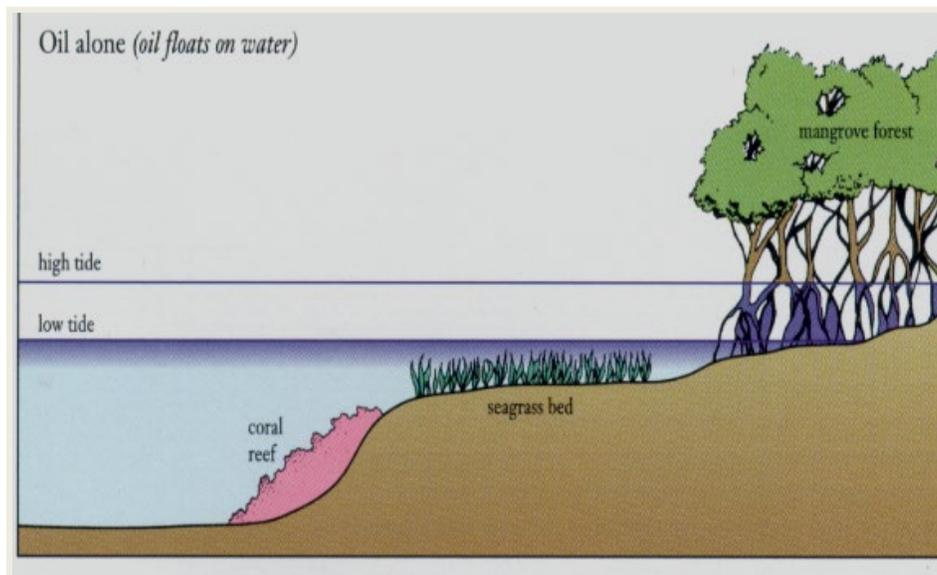
The environmental effects of an oil spill on the coastline of Guyana can be represented in Figure H-13. An unmitigated oil spill that impacts the shoreline will affect vegetation and organisms living in the intertidal zone. This is the area of the coastline between high tide and low tide. In Guyana, much of the coastline is vegetated by mangroves, an ecosystem that is rich in diversity because it provides a protective environment for fish, crabs, and shellfish. When mangrove forests are impacted by oil, the roots that are important for respiration are smothered and the plants die. The recovery time for mangroves may be decades. The recovery time for fish, crabs, and shellfish may be 1 to 3 years, however, the loss of protective habitat makes them more vulnerable to predation which ultimately affects species diversity. Therefore, the effects from an oil spill with no active mitigation are represented by the red zones in Figure H-13 modeling the oil spills with an offshore response, and demonstrating the complete avoidance of shoreline contamination, there is no need for an expanded NEBA addressing shoreline oiling. When large amounts of oil strand on shorelines and nearshore areas, the NEBA process is more complex. In these situations, the spill response must consider the effect and duration of nearshore and intertidal plants and animals. In the scenarios examined for this NEBA, oil is at the water surface with dispersed oil at higher concentrations over a short duration (e.g., several hours after oil dispersant application) in several meters of water beneath the water surface. Within 24 hours, the dispersed oil droplets are widely scattered and are at part-per-billion concentrations that are below effect levels for most organisms. The dispersed oil is then subject to the natural processes of biodegradation. In the offshore areas where these responses are taking place, the emphasis is to remove oil from the water surface as quickly as possible. The same organisms (e.g., plankton, fish eggs, and larvae) that may be affected by dispersed oil are also affected by bulk oil. The persistence of bulk oil vs. the diminishing concentrations of dispersed oil in combination with diminished effects of dispersed oil on birds, marine mammals, and fish demonstrate that offshore oil spill response including oil dispersants produces less environmental damage.

Although the use of dispersants is pre-approved, it should be noted that all oil dispersant (and in-situ burning) activities would only be carried out with the concurrence of Guyanese Regulatory Authorities for a specific spill. In consideration of that, EEPGL has provided oil spill response training, reviews of Guyana spill modeling studies, and simulated spill response exercises and decision making with a variety of Guyana Regulatory Authorities (e.g., Environmental Protection Agency, Civil Defense Commission, Coast Guard).

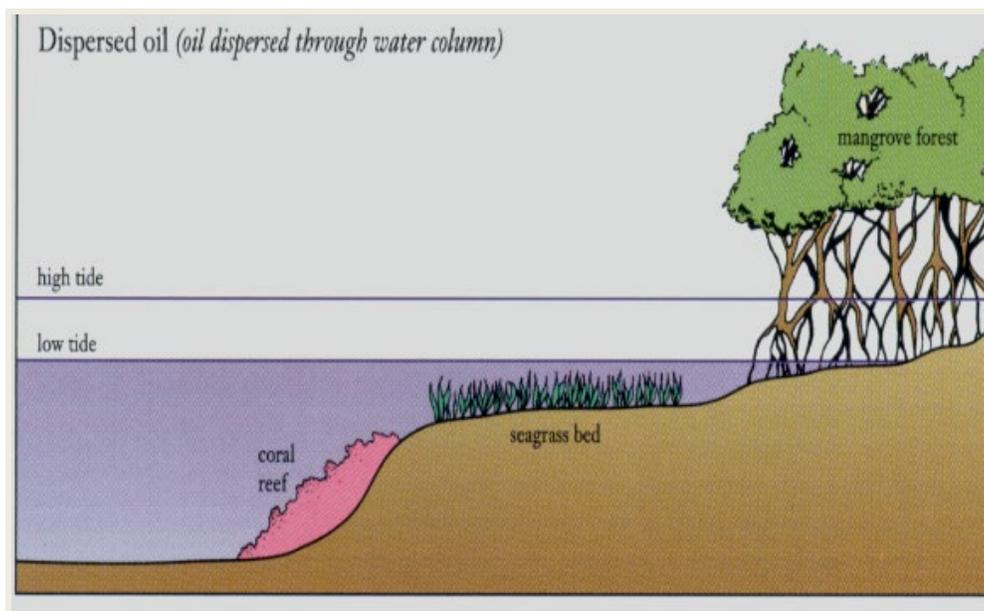
Accordingly, EEPGL will implement an oil spill response strategy which utilizes the simultaneous implementation of EEPGL's full suite of oil spill response techniques (e.g., dispersants, in-situ burning, mechanical recovery, and wellhead capping) for an offshore spill response taking place in the deeper (i.e., non-coastal) waters of Guyana, subject to any additional NEBA analysis at the time of a spill response. This approach is based upon years of spill observation and analysis from ExxonMobil and industry. Therefore, this NEBA analysis focused on the

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

concurrent utilization of the full suite of oil spill techniques, rather than on independent NEBA analyses of each individual oil spill response technique. Figure H-14 represents the shoreline affected by an oil spill that has been mitigated with dispersants in order to avoid shoreline impact.



**Figure H-13: Intertidal Zone between Low and High Tide at Risk from Floating Oil**



**Figure H-14: Shallow Sub-Tidal Zone at Risk from Dispersed Oil**

**H. Oil Spill Scenarios and Net Environmental Benefit Analysis for Selection of Response Technologies**

In this case, the spill response that includes dispersant utilization has prevented shoreline stranding in the intertidal zone so that the mangrove forests and the species inhabiting them remain intact. However, in this case, there is a trade-off between the potential effects in the intertidal zone with potential effects in the shallow sub-tidal zone below low tide. In this case, the oil that was floating on the water is now dispersed into very small droplets in the top of the water column. During the brief period, generally <1 day, when high concentrations of oil droplets are present, these sub-tidal organisms may be at risk. Therefore, nearshore shallow sub-tidal sea grass beds, fish, and other organisms that inhabit them and shallow corals may be at risk. However, the exposure times are brief and the duration of the impacts is limited. Therefore, the damages and recovery times are limited and risks are reduced (i.e., shifted to the left on the risk matrix), representing lower consequences.

This NEBA analysis examined both Tier II and Tier III releases from the Payara Development Project. This may also be applied to the Liza Phase 1 and Liza Phase 2 projects, because they are very similar and in close proximity, and as a result, the modeling and NEBA analyses would be very similar. The response analyses that were utilized in the mitigated results represent the types of equipment and timing of a response that can be mounted at this time. In the event of an actual release in the future, these presentations may serve as the underlying basis for an updated NEBA. The goal of this analysis has been to present large releases so that they would encompass the response to smaller, more probable releases. In consideration of their success in eliminating surface oiling and shoreline stranding, they represent the extent of EEPGL's full resources. EEPGL's goal is to have no spill releases at all and that remains the primary focus at all times. However, if an accidental release does occur, spill response experts and technical specialists will be available to provide NEBA updates and analyses as necessary for consideration by the corresponding Guyana authorities.

**H.9. References**

Berek, Eugene P., Fei Chen, and Guangqiang Yang. 2015. Guyana Consolidated Metocean Criteria: Version 0.0. URC.2015.041.

IPIECA-API-IOGP (2015). Response strategy development using net environmental benefit analysis (NEBA). IPIECA-IOGP Good Practice Guide Series, Oil Spill Response Joint Industry Project (OSR-JIP). IOGP Report 527. [www.oilspillresponseproject.org/wp-content/uploads/2017/01/NEBA\\_2016-2.pdf](http://www.oilspillresponseproject.org/wp-content/uploads/2017/01/NEBA_2016-2.pdf)

IPIECA-API-IOGP (2017). Guidelines on implementing Spill Impact Mitigation Assessment (SIMA). IPIECA-IOGP Good Practice Guide Series, Oil Spill Response Joint Industry Project (OSR-JIP). IOGP Report 593. <http://oilspillresponseproject.org>

I. Incident Notification Form

APPENDIX I – INCIDENT NOTIFICATION FORM

I.1. Incident Notification Form for Spills in Offshore Operations

Environmental Protection Agency



Incident Notification Form for Spills in Offshore Operations

General Information			
<p><b>Scope of document use and application:</b> The document shall be applicable to all spills amounting to <b>five (5) gallons or more</b>; however, any other spills, unwanted or accidental discharges shall be recorded and reported to the EPA on a monthly basis. The Agency shall reserve the right to request further information and investigations into incidents highlighted in the monthly reports as it deems necessary.</p> <p>An initial incident notification form must be forwarded to the Environmental Protection Agency within <b>forty-eight (48) hours</b> of spill incident. Copies of the Original Forms must be emailed to <a href="mailto:srazack@epaguyana.org">srazack@epaguyana.org</a>, <a href="mailto:jgravesande@epaguyana.org">jgravesande@epaguyana.org</a>, and <a href="mailto:epa@epaguyana.org">epa@epaguyana.org</a>. Printed copies can be sent via mail to Environmental Protection Agency, Ganges Street, Sophia, Georgetown, Guyana. A follow-up incident notification form must be submitted within <b>seventy-two (72) hours</b> of the submission of the initial notification form (a total of five days after the spill incident).</p> <p><i>Note: The EPA reserves the right to request additional documentation as deemed necessary.</i></p>			
Type of Notification: (Initial or Follow-up)			
Name of Project:		Permit Reference No.	
Permit Holder:		Contractor:	
Type of activity being undertaken:  <i>For example: installation, exploration or developmental drilling, etc.</i>		Project Location:  <i>(include GPS coordinates)</i>	
		Worksite: <i>(include GPS coordinates)</i> <i>For example: Vessel Name</i>	
Work area where incident occurred:		Equipment involved in the incident:	
Date of incident:		Date reported to EPA:	
Time incident started/discovered		Time incident Ended/contained	
Environmental Conditions at the time of Incident			
Weather	<input type="checkbox"/> Cloudy <input type="checkbox"/> Sunny	<input type="checkbox"/> Windy <input type="checkbox"/> Rainy	
Wind speed and direction			
Swell height			
Sea conditions	<input type="checkbox"/> Calm <input type="checkbox"/> Slight	<input type="checkbox"/> Moderate <input type="checkbox"/> Rough	<input type="checkbox"/> Very Rough <input type="checkbox"/> High
Light	<input type="checkbox"/> Good <input type="checkbox"/> Fair	<input type="checkbox"/> Poor <input type="checkbox"/> Natural	<input type="checkbox"/> Artificial
Situation Report			
Description of event  <i>(Give details of spill location, discharge point, apparent source and cause)</i>			

I. Incident Notification Form

Environmental Protection Agency



Incident Notification Form for Spills in Offshore Operations

<p><i>Note: Where equipment is involved as a potential cause of the spill, attach the operator's maintenance schedule, manufacturer's maintenance requirements and most recent maintenance report.</i></p>			
<p>Description of spilled substance</p> <p><i>(Include SDS as an attachment)</i></p>			
Quantity spilled	Litres	Gallons	Barrels
Description of Environmental Impact(s)			
Immediate Response Actions Taken			
Time action was taken	Action taken	Person(s) that took action <i>(include name, designation, department employed, and employer)</i>	
Root Cause Analysis <i>(To be completed as part of the follow-up submission)</i>			
Direct Cause		Root Cause(s) for each direct cause	
Preventative actions to be implemented <i>(To be completed as part of the follow-up submission)</i>			
Time Period for Implementation	Preventative action to be implemented (for each root cause mentioned)	Designated person(s) to oversee the implementation of preventative action <i>(include designation, department employed, and employer)</i>	
Other Observations/Comments			
1.			
2.			
3.			

**I. Incident Notification Form**

**Environmental Protection Agency**



**Incident Notification Form for Spills in Offshore Operations**

Limitations			
1.			
2.			
List of Attachments			
For Example: Photos, Maintenance Records, Schematics, SDS', Signed Witness Statements, etc.	1.		
	2.		
	3.		
Witnesses (if any):  (as part of follow-up notification)	Name in print:		Designation and employer of each witness:
	1.		1.
	2.		2.
Signatures			
I hereby certify that the information contained herein and attached is true and correct to the best of my knowledge, information and belief, and fully acknowledge and accept that any false or misleading information provided hereunder shall render me liable to penalties under the Environmental Protection Act, Cap. 20:05.			
Completed By (Name in print):	Signature:	Date (dd/mm/yyyy):	Designation and Employer:
Verified By (Name in print):	Signature:	Date (dd/mm/yyyy):	Designation and Employer:
Approved By (Name in print):	Signature:	Date (dd/mm/yyyy):	Designation and Employer:

**I. Incident Notification Form**

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# **COMPREHENSIVE WASTE MANAGEMENT PLAN**

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**Esso Exploration and Production Guyana  
Limited**

**Comprehensive Waste Management Plan**

**October 2021**

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## Acronyms and Abbreviations

Name	Description
<	less than
AWSL	Approved Waste Site List
CWMP or Plan	Comprehensive Waste Management Plan for EEPGL
EEPGL	Esso Exploration and Production Guyana Limited
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EPA	Guyana Environmental Protection Agency
ESMP	Environmental and Socioeconomic Management Plan
FPSO	Floating, production, storage, and offloading (vessel)
FSV	Fast supply vessel
GOCP	Guyana Office Complex Project
GMP	Garbage Management Plan
GYSBI	Guyana Shore Base Inc.
HBL	Haags Bosch Landfill
IFC	International Finance Corporation
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
LMP	Liquid mud plant
LP1	Liza Phase 1
LP2	Liza Phase 2
MARPOL	International Convention for the Prevention of Pollution by Ships, 1973, as modified by the Protocol of 1978
MPV	Multipurpose vessel
MSV	Marine support vessel
MTM	Marine transport manifest
NAF	Non-aqueous fluid
PPE	Personal protective equipment
PSV	Platform supply vessel
RCRA	Resource Conservation Recovery Act
SDS	Safety data sheet
SES	Sustainable Environmental Solutions

Name	Description
Study	Cradle to Grave Waste Analysis Study
SURF	Subsea, umbilicals, risers, and flowlines
TPH	Total petroleum hydrocarbons
TRG	Tiger Rentals Guyana
WBG	World Bank Group
WM	Waste manifest
WMP	Waste Management Plan
WPS	Waste Profile Sheet

### Table of Definitions

Term	Definition
Clinical waste (Guyana EPA Hazardous Waste Regulations 2000, Part 1, Section 2)	<p>Clinical waste means -</p> <ul style="list-style-type: none"> <li>(i) Any part of the human body including tissues and bodily fluids, but excluding fluids, extracted teeth, hair, nail clippings, and the like that are not infectious;</li> <li>(ii) Any part of the carcass of an animal infected with a communicable disease;</li> <li>(iii) Non-anatomical waste infected with communicable disease; or</li> <li>(iv) Any waste that is generated in the diagnostic, treatment, or immunization of human beings or animals and related activities that include research or autopsies. Not defined in Guyana laws or regulations.</li> </ul>
Flammable waste (Guyana EPA Hazardous Wastes Regulations 2000, Part 1, Section 2)	<p>Flammable waste means a waste that is either solid, liquid, an oxidizing substance, or an ignitable compressed gas, which, under certain conditions, may be readily combustible or may cause or contribute to fire through friction, absorption of moisture or spontaneous chemical changes and when ignited, burns so vigorously and persistently that it creates a danger.</p>
Hazardous waste (Guyana EPA Hazardous Wastes Regulations 2000, Part VI Section 36)*	<p>Guyana excludes select hazardous wastes from its hazardous waste regulations. Specifically, the following hazardous wastes are not subject to Guyana's hazardous wastes regulations:</p> <ul style="list-style-type: none"> <li>(i) hauled sewage</li> <li>(ii) waste from the operation of sewage works where such works are owned by a municipality wastes collected</li> </ul>

Term	Definition
	<p>from households or residus arising from the incineration of household wastes;</p> <p>(iii) incinerator ash resulting from the incineration of waste that is neither hazardous waste or liquid industrial waste;</p> <p>(iv) waste that is a hazardous industrial waste, hazardous waste chemical, flammable waste, corrosive waste, leachate toxic waste, or reactive waste that is generated in an amount that is less than five kilograms or otherwise accumulated in an amount less than five kilograms;</p> <p>(v) waste that is an acute hazardous chemical and that is generated in any month in an amount that is less than one kilogram or otherwise accumulated in an amount that is less than one kilogram;</p> <p>(vi) wastes that are generated in raw material, product storage or manufacturing and such waste is kept in the tank, pipeline or vessel;</p> <p>(vii) an empty container or the liner from an empty container that contained hazardous industrial waste, hazardous waste chemical, flammable waste, corrosive waste, leachate toxic waste or reactive waste;</p> <p>(viii) the residues or contaminated materials from the clean-up of a spill of less than five kilograms of waste that is hazardous industrial waste, hazardous waste chemical, flammable waste, corrosive waste, leachate toxic waste or reactive waste;</p> <p>(ix) the residues or contaminated materials from the clean-up of a spill of less than one kilogram of waste that is an acute hazardous waste chemical;</p> <p>(x) agricultural wastes including agricultural return flows and pesticide residues;</p> <p>(xi) used tyres that have been refurbished for road use,</p> <p>(xii) used oil;</p> <p>(xiii) radioactive substances;</p> <p>(xiv) point source discharges;</p> <p>(xv) residues from recycling processes,</p>

Term	Definition
	<ul style="list-style-type: none"> <li>(xvi) recovered oil;</li> <li>(xvii) oil, gas, mining, and mineral processing wastes;</li> <li>(xviii) used oil filters;</li> <li>(xix) hazardous waste generated in raw material, product storage, and process unit waste, or</li> <li>(xx) wastes that occur from normal material handling operations.</li> </ul>
Hazardous waste (Guyana EPA Hazardous Wastes Regulations 2000, Part I Section 2)*	<p>“Hazardous waste” means a waste or combination of wastes which, because of its quantity, concentration or physical, chemical or infectious characteristics, may pose a substantial hazard to human health and belong to any category contained in Schedule I of Guyana’s Environmental Protection [Hazardous Waste Management] Regulations 2000, Page16) unless they do not contain any of the characteristics contained in Schedule II of Guyana’s Environmental Protection [Hazardous Waste Management] Regulations 2000, Page17) and includes waste that is:</p> <ul style="list-style-type: none"> <li>(i) Hazardous industrial waste;</li> <li>(ii) Acute hazardous waste chemical;</li> <li>(iii) Hazardous waste chemical;</li> <li>(iv) Severely toxic waste;</li> <li>(v) Flammable waste;</li> <li>(vi) Corrosive waste;</li> <li>(vii) Reactive waste;</li> <li>(viii) Radioactive waste;</li> <li>(ix) Clinical waste; or</li> <li>(x) Leachate toxic waste or polychlorinated biphenyl waste, and includes a mixture of acute hazardous waste chemical, hazardous waste chemical, pathological waste, radioactive waste, or severely toxic waste and any other waste or hazardous material.</li> </ul>
Hazardous waste (Basel Convention, Article 1)*	Wastes that are subject to transboundary movement shall be hazardous waste for the purpose of the Basel Convention. Wastes that belong to any category contained in Annex I of the Basel Convention unless they do not possess any

Term	Definition
	of the characteristics contained in Annex III of the Basel Convention and wastes that are not covered in Annex I and do not possess any of the characteristics contained in Annex III but are defined as or considered to be, hazardous wastes by the domestic legislation of the Party of export, import or transit.
Incinerator waste (Guyana EPA Hazardous Wastes Regulations 2000, Part I Section 2)	Incinerator waste means the residue from incineration, other than incinerator ash and fly-ash.
Liquid industrial waste (Guyana EPA Hazardous Wastes Regulations 2000, Part I Section 2)	<p>Liquid industrial waste means waste that is both liquid and industrial waste but does not include:</p> <ul style="list-style-type: none"> <li>(i) Hauled sewage;</li> <li>(ii) Waste from the operation of sewage works;</li> <li>(iii) Waste from the operation of water works;</li> <li>(iv) Waste that is produced in any month in an amount less than 25 liters or otherwise accumulated in an amount less than 25 liters;</li> <li>(v) Waste directly discharged by a generator from a waste generation facility into a sewage works or sewage system;</li> <li>(vi) Waste that results directly from food processing and preparation operations, including food packaging, food preserving and restaurants;</li> <li>(vii) Drilling fluids and produced waters associated with the exploration or production of crude oil or natural gas;</li> <li>(viii) Processed organic waste; or</li> <li>(ix) Asbestos waste.</li> </ul>
Naturally occurring radioactive materials (NORM) waste	Louisiana (United States) Department of Environmental Quality's Implementation Manual for NORM (Final Draft, 1/8/21) defines NORM as "any nuclide that is radioactive in its natural physical state (i.e., not man-made), but not including source, byproduct, or special nuclear material".
Other wastes (Basel Convention, Article 1)	Wastes that belong to any category contained in Annex II of the Basel Convention that are subject to transboundary movement shall be "other

<b>Term</b>	<b>Definition</b>
	wastes” such as household waste and incinerator ash.

Note:

\*Some definitions have been edited for clarity in how they apply in the case of EEPGL’s waste streams in Guyana. Insofar as this Comprehensive Waste Management Plan (CWMP) is based on an EPA-approved waste management study as discussed herein, it’s intended to develop a waste management structure for EEPGL’s activities that goes beyond what is expressly required by Guyana law. The definitions used in some cases are tailored to this CWMP.

## **EXECUTIVE SUMMARY**

This Comprehensive Waste Management Plan (CWMP or Plan) is a cradle to grave document based on a holistic review of Esso Exploration and Production Guyana Limited's (EEPGL) maturing waste management process first developed in 2015 for EEPGL's first discovery well. This CWMP was developed pursuant to Section 5 of the Payara Development Project Environmental Permit (#20181204-PPOIX) and the Cradle to Grave Waste Analysis Study approved by the Environmental Protection Agency (EPA) on September 13, 2021. Numerous topics from the Waste Analysis Study are integrated within this Plan.

The Plan is intended to accommodate all projects (collectively "Projects") in Guyana associated with EEPGL's exploration and appraisal drilling, development drilling, installation and hook-up, commissioning, and start up, office construction, production operations, and related activities. This Plan is inclusive of Liza Phase 1 Development Project (LP1), Liza Phase 2 Development Project (LP2), Payara Development Project (Payara), Guyana Fiber Optic Cable (FOC Project), and EEPGL Guyana Office Complex Project (GOCP), as well as permitted or planned drilling projects. In addition, the Plan makes provision for Projects currently under review by the EPA, including Yellowtail and Gas to Energy. As new Projects are planned or come on stream, the Plan will be updated to address them. This Plan is an evergreen document and will be updated as needed.

This Plan, once approved, will replace and supersede previous Waste Management Plans incorporated in approved Environmental Impact Statements and permits. All current and future approved Projects will reference this Plan to avoid the duplication of Project specific plans. The Plan will provide both EEPGL and the EPA with an efficient way to understand and reference waste management practices for all EEPGL waste management activities.

A record of revisions to the Plan, once approved will be included to capture all changes to this Plan.

# 1 INTRODUCTION

This Plan is a cradle to grave, evergreen waste management plan designed to facilitate a holistic approach to waste management for EEPGL's existing and currently planned activities in Guyana. EEPGL previously submitted the Cradle to Grave Waste Analysis Study (referred to as the Study throughout the CWMP) to the EPA as the basis to develop this Plan. The Study was approved by the EPA on September 13, 2021.

This Plan incorporates and supplements certain information previously submitted in the Study and complies with EEPGL's permit requirements to develop and maintain a waste management plan. This CWMP has three (3) appendices containing detailed information supporting the Plan:

- APPENDIX A : Project Descriptions
- APPENDIX B : CWMP Attachments
- APPENDIX C : Waste Analysis Study Information

See Appendix C Section C.1 for the Study Crosswalk Table, which is a reference index showing the location of content from the Study and where it is addressed in the current CWMP.

Appendix C Section C.1 is also a reference index showing the location of content from international guidelines and where it is addressed in the current CWMP. Any material changes in EEPGL's plans and procedures for waste management in the future, or any changes based on updated legal requirements, will be reflected in the CWMP and may result in divergence with the Study over time. To the extent this Plan includes revised, updated information beyond what was included in the Study, the CWMP takes precedence.

## 2 SCOPE AND OBJECTIVE

Given the Payara permit conditions, the primary objective of this CWMP is to provide a cradle to grave plan of waste management practices associated with EEPGL's exploration and appraisal drilling, development and production activities and operations, office construction and operations, and other related onshore or offshore activities requiring a waste management plan. This Plan is inclusive of Liza Phase 1 Development Project (LP1), Liza Phase 2 Development Project (LP2), Payara Development Project (Payara), Guyana Fiber Optic Cable (FOC Project), and EEPGL Guyana Office Complex (GOCP), as well as permitted or planned drilling projects. In addition, the plan makes provision for Projects currently under review by the EPA, including Yellowtail and Gas to Energy. Projects will be added as needed in this CWMP. Key details of the Projects are included in Appendix A.

This CWMP is an evergreen document and will be updated as needed (i.e., as laws and regulations change, new waste minimization initiatives are executed, etc.). This CWMP will replace and supersede previous Waste Management Plans (WMPs). All current and future approved Projects will reference this CWMP to avoid the duplication of Project specific plans.

The scope excludes permitted effluent discharges (e.g., produced water, cooling water, seawater, freshwater; grey water; ballast, etc.) from EEPGL offshore operations which are

managed pursuant to water quality requirements, as permitted, and the Environmental and Socioeconomic Management Plan (ESMP) for Projects.

This CWMP covers the storage, handling, treatment and disposal requirements of EEPGL's wastes for the various offshore and onshore operations.

This CWMP defines the waste management philosophy; responsibilities for waste management; waste management methodology and controls for various waste types and classifications; and inspection, monitoring, auditing and reporting of waste management activities.

This CWMP has been prepared in conjunction with the ESMPs developed for use in executing EEPGL's approved and proposed Projects and outlines EEPGL's approach for the proper handling and disposal of hazardous and non-hazardous wastes.

This Plan should be read in conjunction with the Study approved by the EPA on September 13, 2021 ([Appendix C Section C.2](#)).

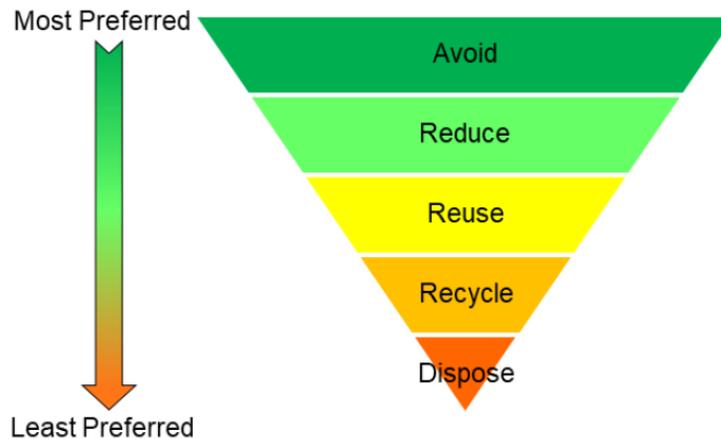
### 3 WASTE MANAGEMENT PHILOSOPHY

EEPGL's objectives for waste management are to:

- Apply the waste management hierarchy (i.e. Avoid, Reduce, Reuse, Recycle, and Dispose). Managing waste according to the waste management hierarchy reduces impacts to the environment and saves resources.
- Appropriately manage the treatment and disposal of EEPGL's waste at approved third party facilities.

This CWMP is underpinned by EEPGL's commitment to the waste management hierarchy, which is described below (Figure 3-1).

- Generation of waste should be Avoided, Prevented, or Reduced at the source whenever feasible;
- Wastes that are not Prevented should be Reused or Recycled in an environmentally safe manner, whenever feasible;
- Wastes that are not Prevented or Recycled should be Treated in an environmentally safe manner, whenever feasible; and
- Finally, any disposal of waste should be conducted in an environmental responsible manner in compliance with applicable legal requirements.

**Figure 3-1: Waste Management Hierarchy**

EEPGL's commitment to the waste management hierarchy includes waste minimization. Potential techniques (e.g. good housekeeping, technology changes, and equipment modification) to minimize wastes are shared with EEPGL's contractors for use in a contractor's permit application, contractor specific waste management plan (WMP), and training. EEPGL encourages its contractors and suppliers (e.g., of equipment, materials, goods and services) to:

- minimize packaging on products wherever possible;
- package products in recyclable materials;
- limit waste generation at each stage of its projects;
- whenever practicable, return surplus and unused materials to a vendor;
- avoid single use items where reusable items could be used;
- use biodegradable materials;
- order only what is needed;
- store products to prevent spillage or contamination; and
- keep products in good condition and clearly labeled.

Additional information on drilling fluids minimization strategy and other waste minimization strategies can be found in Section 6 of the Study ([Appendix C Section C.2](#)).

An overview of local waste management program development such as recycle infrastructures, can be found in Sections 7 and 8 of the Study ([Appendix C Section C.2](#)).

## **4 ROLES AND RESPONSIBILITIES FOR EEPGL, OWNERS/OPERATORS OF MARINE VESSELS AND WASTE SERVICE PROVIDERS**

EEPGL is the owner of this CWMP and is responsible for its implementation, maintenance, and periodic update as necessary.

Owners/operators of marine vessels (supply, support, installation vessels, drill ship, and FPSO) are responsible for the implementation, maintenance, and periodic update as necessary of their individual WMP and/or Garbage Management Plan (GMP). A WMP and/or GMP should account for appropriate and relevant sections of EEPGL's CWMP.

Waste service providers are responsible for the implementation, maintenance, and periodic update as necessary of their individual WMP. A WMP should account for the waste service provider's permit conditions. Common topics within EEPGL's CWMP and the waste service provider's WMP should be consistent such as training, waste profile sheet (WPS) data, and reporting.

General and specific roles as well as related responsibilities are outlined in Table 4-1.

**Table 4-1: Summary of Key Roles and Responsibilities for Waste Management**

Task	Waste Service Providers	Operators*	EEPGL Logistics	EEPGL E&R
<b>EEPGL's RESPONSIBILITIES</b>				
<b>Strategy</b>				
Implement collaborative relationship building workshops covering but not limited to extension of Haags Bosch Landfill life, in country lab licensing/permitting, and identification of recycling infrastructure with the Government of Guyana			S	R
<b>Plans, Procedures, and Training</b>				
Formally communicate final CWMP to EEPGL's organization and third parties	I		S	R
Confirm CWMP implementation and maintenance			S	R
Review contractor/subcontractor WMP for conformance with the CWMP	I	I	S	R
Characterize EEPGL waste streams and classify in Waste Profile Sheets (CWMP Section 6.1.3 and Appendix B Sections B.1 and B.2)	I	S	R	S
Waste manifest form stewardship (CWMP Appendix B Section B.3)	I	I	R	S
Conduct general waste management awareness training, offshore and onshore waste management training of EEPGL staff (CWMP Sections 10, 10.1 and 10.2)	I	I	S	R
<b>Compliance and Requirements</b>				
Identify the regulatory and authorization requirements and support timely applications and approvals	S	S	S	R
Require that conditions associated with EEPGL's permits/licenses are in place before carrying out work	I	S	S	R
Keep up to date with laws, regulations, conventions, standards, guidelines, and practices	I	I	S	R
Verify waste manifest and waste data input (CWMP Section 8.2)	S	S	R	R
<b>Assessments, Reporting and Monitoring</b>				
Identify qualified waste service providers for waste management (CWMP Section 9)	I	I	S	R

Task	Waste Service Providers	Operators*	EEPGL Logistics	EEPGL E&R
Submit to the EPA the annual environmental report (CWMP Section 8.2)	S	S	S	R
Verify implementation of contractor WMPs and verify that waste profiles, waste manifests, oil record book (ORB) and garbage record book (GRB) are kept on board and meet the appropriate requirements (CWMP Section 8.1)	S	S	S	R

Task	Waste Service Providers	Operators*	EEPGL Logistics	EEPGL E&R
<b>OWNERS'/OPERATORS' RESPONSIBILITIES</b>				
<b>Plans, Procedures, and Training</b>				
Update WMP based on final CWMP	I	R	S	S
Conduct and provide documentation of training on WMP (CWMP Sections 10, 10.1 and 10.2)		R	S	S
Characterize and classify wastes in Waste Profile Sheets (CWMP Appendix B Section B.1 and B.2)		R	S	S
<b>Inspections and Monitoring</b>				
Verify waste management treatment equipment and waste storage areas are maintained and inspected		R	S	S
Verify through monitoring that waste manifests are fully completed, stored and filed		R	I	I
<b>General</b>				
Verify correct identification of labeling and placarding requirements are in use (CWMP Section 6.2.1)		R	S	S
Maintain an up-to-date waste inventory		R	S	S

Task	Waste Service Providers	Operators*	EEPGL Logistics	EEPGL E&R
<b>WASTE SERVICE PROVIDERS' RESPONSIBILITIES</b>				
<b>Plans, Procedures, and Training</b>				
Implement a WMP based on permit conditions, CWMP and advice from EEPGL. WMP must be kept up to date	R		S	S
Provide a point of contact to the EEPGL Waste Management Lead	R		I	I
Conduct and document waste management training (CWMP Section 10, 10.1, 10.2)	R		S	S
<b>Compliance and Requirements</b>				
Keep copies of necessary authorizations associated with waste management activities	R		I	I
<b>Inspections and Monitoring</b>				
Spot-check and inspect loads for conformance with waste profile sheets and waste manifest forms prepared by the generator of the wastes for transport to the shorebase	R		I	I
Perform periodic self-inspections pursuant to WMP	R		I	I
Verify waste transport vehicles are inspected and placarded before they leave the shorebase or other EEPGL Project locations for recycling or disposal facilities	R		I	I
Properly inspect, maintain, and use equipment	R		I	I
<b>General</b>				
Oversee the safe offloading and transfer of waste to vehicles for final transport, storage, recycling, recovery, treatment, or disposal	R		I	I
Verify that all waste transfers are recorded in the waste manifest	R		I	I
Manage the completion of documents to record the final disposition of wastes, with copies to EEPGL and regulatory authorities as appropriate, and maintain the original records as required	R		I	I
Manage recordkeeping and reporting for the EPA	R	S	S	S

Responsible (R), Informed (I), Support (S)

\* Includes operators of FPSOs, Drill Ships, Marine Vessels, and prime Contractors supporting the offshore and onshore drilling activities, construction, installation, and commissioning of offshore and onshore facilities

Guyana and Trinidad and Tobago entities that provide services to EEPGL and its contractors are listed in Appendix B Section B.4.

## 5 WASTE MANAGEMENT—LAWS, REGULATIONS, AND GUIDELINES

The waste management activities described in this document for the various offshore and onshore operations are conducted in accordance with applicable Guyana regulations and guidelines, as well as applicable international conventions, and oil and gas standards/guidelines/practices, including EEPGL's corporate standards and practices.

Some of these conventions, standards, and guidelines are referenced in this Plan.

This Plan is developed taking into account the following Guyana laws and regulations:

1. Guyana's Environmental Protection Act of 1996;
2. Guyana Regulations made under the Environmental Protection Act 1996 (No. 11 of 1996) of 2000;
3. Guyana's Environmental Guidelines for the Transportation, Storage and Occupational Handling of Chemical/Industrial Hazardous Waste of 2011 (as applicable);
4. Guyana's Environmental Guidelines for Removal, Treatment & Disposal of Oily Sludge of 2011 (as applicable); and
5. Guyana's Environmental Guidelines for the Storage, Transportation & Occupational Handling of Biomedical Waste of 2011 (as applicable).

The Plan will be updated as needed upon issuance of any Project-specific Environmental Authorizations/Permits to reflect any specific waste management commitments, obligations, and conditions contained in those documents.

The international conventions and oil and gas standards/guidelines/practices that are relevant to EEPGL's waste management operations are identified and described in Section 3.1 of the Study ([Appendix C Section C.2](#)).

## 6 EEPGL's CRADLE-TO-GRAVE WASTE MANAGEMENT APPROACH

A cradle to grave waste management analysis is defined by the Guyana EPA as the full life cycle assessment of waste from the point of generation of a waste to the final recycling, reuse, treatment, or disposal. Waste treatment may also result in the generation of new residual wastes to be considered. The cradle-to-grave waste management process should be viewed as an evergreen process, and the processes and tools used to manage waste should be sufficiently flexible for continued application if wastes types or volumes change, as treatment technologies evolve or as Guyana's governance framework is modified.

The major elements of the cradle-to-grave waste management process are shown in Figure 6-1.

**Figure 6-1: Key Waste Management Elements**

The numerous cradle-to-grave logistical steps for offshore to onshore handling of hazardous wastes, non-hazardous waste (recycled) and non-hazardous waste (not recycled) are illustrated in Appendix B Sections B.5, B.6, and B.7.

General process flow diagrams for the various waste treatment methods are also included in Appendix B of the Study ([Appendix C Section C.2](#)).

## 6.1 Waste Generation, Waste Characterization and Classification, and Waste Profiles

### 6.1.1 Waste Generation

The first step in the cradle-to-grave waste management approach begins with the understanding and identification of the points of generation. Wastes are initially generated on the various types of vessels and infrastructure that are operating offshore (see Figure 6-2).

This CWMP is covering onshore activities as well and the points of generation for those waste streams are provided in Figure 6-3.

The general types of waste streams currently generated offshore and onshore by EEPGL and third parties are listed below however others waste streams may also be generated.

EEPGL-contracted support vessels that are currently supporting all EEPGL offshore activities are listed in Appendix C of the Study ([Appendix C Section C.2](#)).

Appendix B Section B.8 of this CWMP lists operators of the drill ships, FPSOs, and support vessels with the associated contact information.

**Figure 6-2: Vessels and Infrastructure**

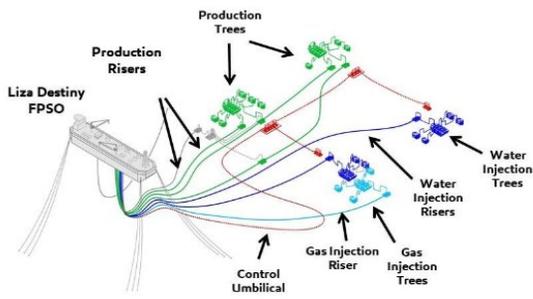
**Drill Ship Vessels**



**Installation Vessels**



**Subsea Infrastructure**



**FPSO Vessels**



**Typical Support Vessels (FSV, MPV, MSV, PSV)\***



FSV = fast support vessel; MPV = multipurpose vessel; MSV = marine support vessel; PSV = platform support vessel. Collectively, these acronyms listed are commonly referred to as Support Vessels, Logistics Vessels or Marine Supply Vessels.

**EEPGL Offshore Wastes** (typical wastes, but not limited to)

Wastes streams generated offshore generally originate from three processes:

- **Drilling Operations**—Wastes from the drilling process and rig wastes, including but not limited to:
  - drilling muds (both water-based and non-aqueous fluid [NAF]),
  - drill cuttings, waste and completion brines,
  - cement wastes (cement mix water, slurry, spaced, and drilled cement),
  - various wastewaters (deck drainage discharge, oil/water separator discharge,
  - gravel pack fluids, and
  - production well test fluids are also generated during drilling.
- **Production (FPSO)**—Waste from the production process, including:
  - chemically treated waters (including pressure maintenance wastewaters, well treatment, completion, and workover fluids),
  - produced solids, and
  - asset integrity chemical wastes (acids, solvents, de-foamers, corrosion inhibitors, scale inhibitors, subsea production control fluids, etc.).
- **Accommodations**—Food waste, household garbage, used cooking oil, medical waste, and treated sewage.

**Third Party Offshore Wastes** (typical wastes, but not limited to)

- **SURF Installation**—Wastes from the installation of subsea umbilicals, risers, and flowlines (SURF), including:
  - umbilical steel tube storage fluids,
  - leak tracer fluids, riser tensioner fluids, other control fluids, and
  - commissioning waters.
- **Support Vessels**—Wastes generated from all routine vessel operations (including drilling, installation, production, and support vessels), including:
  - waste oils (lube, hydraulic, and fuels),
  - deck and machinery space drainage waters and wastewaters,,
  - consumables (paint, aerosols, oil filters, oily rags, etc.),
  - scrap wood, scrap metal, and
  - empty containers.
- **Accommodations**—Food waste, household garbage, used cooking oil, medical waste, and treated sewage.

In addition to these offshore generated wastes, there are also a variety of wastes generated from onshore EEPGL land-based operations and onshore third party support operations.

**EEPGL Onshore Wastes (Current and Potential)** (typical wastes, but not limited to)

- EEPGL Guyana Office Complex Project (GOCP) — General/ Domestic waste, scrap metal, wood, cleared vegetation (slash and stumps), unsuitable fill (spoil)
- Duke Street Office— General/ Domestic waste, paper, cardboard
- Market Street Office and Clinic — General/ Domestic waste, medical waste, paper, cardboard
- Gas to Energy Project (Potential)— Cleared vegetation (slash and stumps), unsuitable fill (spoil), oily rags, general/domestic waste from temporary offices and camp, black and grey water from offices and camp, spent welding rods, wood, poly slings (for carrying pipe joints), spent welding rods, some oily soils from small spill clean-ups

**Third Party Onshore Wastes**

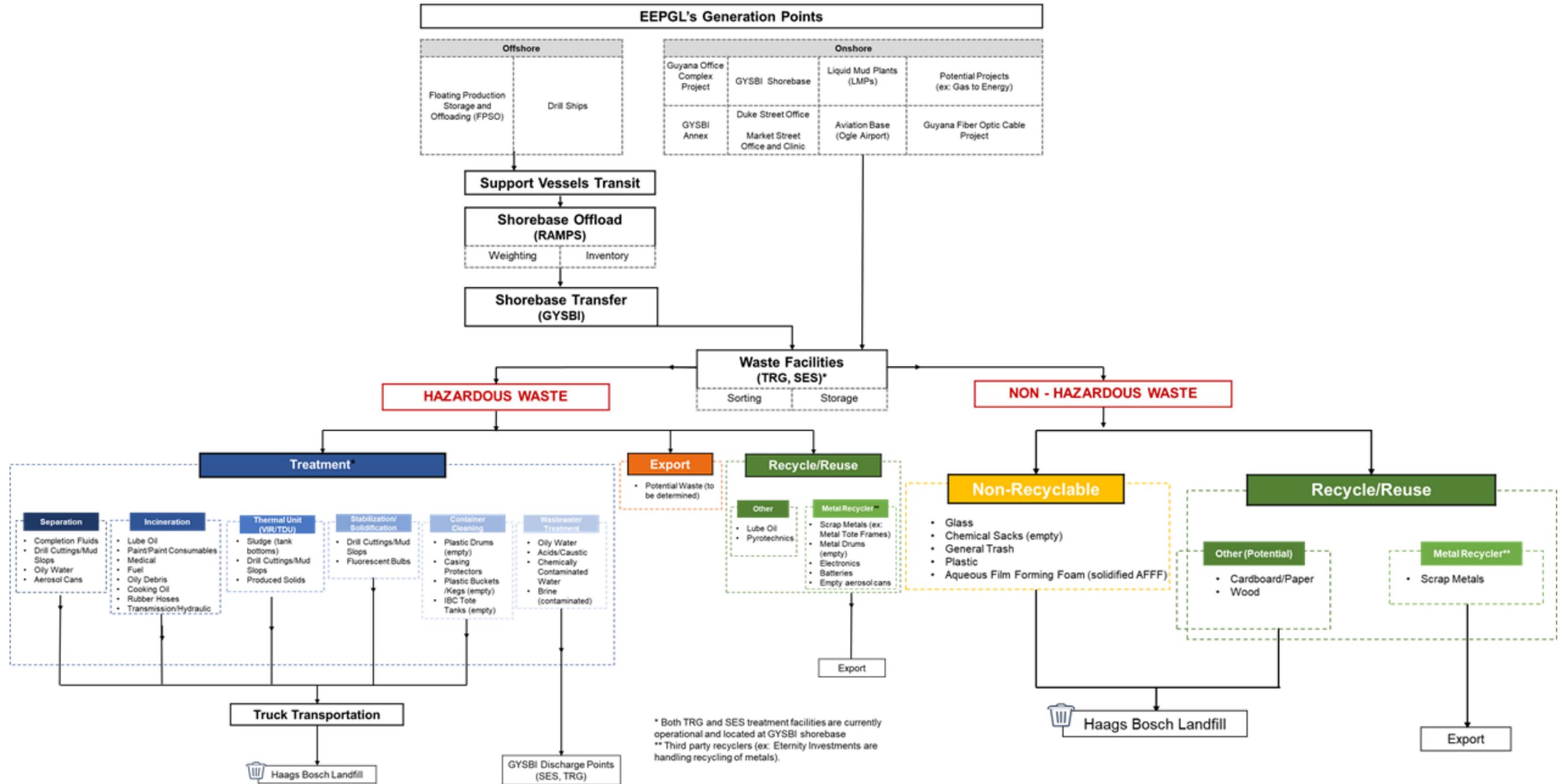
- Liquid Mud Plants (Halliburton, MI-SWACO, Baker Hughes) — Centrifuge solids, barite solids, drilling muds, contaminated rinse water
- Waste management facilities (TRG, SES)— Scrap metal, non- hazardous wastes, and treated hazardous wastes
- Guyana Shore Base Inc. (GYSBI)—Scrap wood, scrap metal, slings, oily water, and used oil.

Figure 6-3 provides a general reference for waste stream identification, overall EEPGL offshore/onshore waste generation, and downstream management.



Figure 6-3: EEPGL Generation Points Flow Diagram

**Generation Points & Reuse/Recycle/Repurpose/Disposal/Export Flow Diagram**





## 6.1.2 Waste Characterization and Classification

The various appropriate and relevant definitions contained within laws, regulations, and international conventions are listed in the Table of Definitions at the beginning of this CWMP. These definitions and hazardous waste exclusions are a precursor to the characterization and classification process.

The EPA also uses the Basel Convention on the *Control of Transboundary Movements of Hazardous Wastes and Their Disposal* to characterize and classify hazardous wastes generated in Guyana but not transported across Guyana's boundaries. Those definitions are listed in the Table of Definitions. Like Guyana, the Basel Convention excludes select wastes such as wastes that are derived from the normal operations of a ship and the discharge is covered by another international instrument (i.e., International Convention for the Prevention of Pollution by Ships, 1973, as modified by the Protocol of 1978 [MARPOL]). Radioactive wastes are excluded as well if they are subject to other international control systems that apply specifically to radioactive materials.

Waste characterization and classification is conducted to support the following management measures:

- Proper selection of appropriate personnel protective clothing and equipment to mitigate worker exposure during waste handling, storage and transportation;
- Workers are trained to manage and mitigate hazards related to waste handling, storage, and transport;
- Appropriate emergency response measures are in place in case of spill or other incident;
- Proper container selection for safe containment, handling, and transportation of waste; and
- Proper segregated storage of wastes based on incompatibility, reactivity, or other physical/chemical characteristics.

EEPGL's procedure for waste characterization begins with its existing generator and waste processing knowledge based on extensive experience in offshore developments where similar drill ships, FPSOs, and other support vessels are deployed. The procedure also considers Guyana's hazardous wastes regulations that require accurate waste characterization and classification for each waste stream.

EEPGL has identified and characterized each waste stream generated from the Projects to date. This waste characterization has included an evaluation of processes and process knowledge, review of manufacturer's Safety Data Sheets (SDS) and product specifications. Where SDS and generator knowledge is not sufficient for proper characterization of wastes, sampling and laboratory analysis is conducted so that information is available to assess the hazards for each waste, including whether they are flammable, corrosive (acid or base), reactive (oxidizer, pyrophoric, reducer), and/or toxic. Once the waste is characterized, the next step is the formal classification of the wastes.

The EEPGL waste classification considers the following:

- Guyana's Schedule I and II (lists of hazardous wastes and characteristics);
- Section 15 of Guyana's environmental authorization application;
- The EPA's Waste Manifest Form (Appendix B Section B.3);
- The EPA's Waste Profile Sheet (WPS) and instructions for completing the WPS (Appendix B Section B.2);
- The Projects' Environmental Permit conditions;
- The EPA's Environmental Guidelines (Removal, Treatment & Disposal of Oily Sludge);
- Generator knowledge;
- Waste service providers' Waste Sampling Plan;
- The EPA's [web site](#);
- The EPA's Recording and Reporting Form of Hazardous Waste Characteristics for New and Existing Operations (Appendix B Section B.9); and
- Basel Convention (Article 1, Annex I [Categories of Wastes to be Controlled], II [Categories of Wastes Requiring Special Consideration], III [List of Hazardous Characteristics], VIII [List A--Wastes Characterized as Hazardous]) (Basel Convention 1989).

Given these considerations, a hazardous or non-hazardous waste classification is established for each waste stream. Going forward, the same characterization and classification process will be used as new waste streams are generated.

The waste service provider will be consulted so that appropriate analytical methods and tests are performed. EEPGL will audit and approve labs used to analyze EEPGL's waste and other materials.

Waste sampling will be performed by properly trained personnel using the appropriate personal protective equipment (PPE). Samples will be packaged in appropriate containers and properly labeled. A chain-of-custody form must accompany samples during transport.

### 6.1.3 Waste Profiles

EEPGL has developed a waste profile for each waste stream to document the waste characterization and classification details. The purpose of the waste profile is to compile all the relevant information needed to manage waste into one document. This information is compiled into the EPA's approved WPS form (Appendix B Section B.2).

The EPA's WPS requires the completion of numerous data fields. Most of the WPSs are complemented with an SDS where applicable. For example, the WPS for Acids has corresponding SDSs for acid related materials (e.g., hydrochloric acid). However, SDSs do not exist for certain waste streams (e.g., empty drums, sacks and aerosol cans, etc.). In these cases, just the WPS will be developed.

The WPS includes information about the generator, waste classification, projected annual volume, and various waste physical characteristics and chemical properties as illustrated in Appendix B Section B.1.

To date, EEPGL has developed 35 separate waste profiles for wastes generated from both offshore and onshore operations—this includes 28 hazardous waste profiles and seven non-hazardous waste profiles. The table in Appendix B Section B.1 lists the current Waste Profiles for illustrative purposes. Profiles are evergreen and future WPSs will be kept by the generator and the waste disposal facility.

If the EPA modifies the requirements for waste manifest and profile data, or issues new requirements for hazardous waste management, the CWMP is the primary data source to add new EEPGL procedures or supplement existing EEPGL procedures.

## 6.2 Waste Storage and Transportation

### 6.2.1 Waste Container Selection and Labeling

Proper storage and waste transportation of both offshore and onshore generated wastes requires the accurate characterization and classification of each waste stream.

Based on the waste characterization and classification, appropriate containers are selected for waste storage, handling, and transportation. The container selection is based upon an evaluation of various waste characteristics, including:

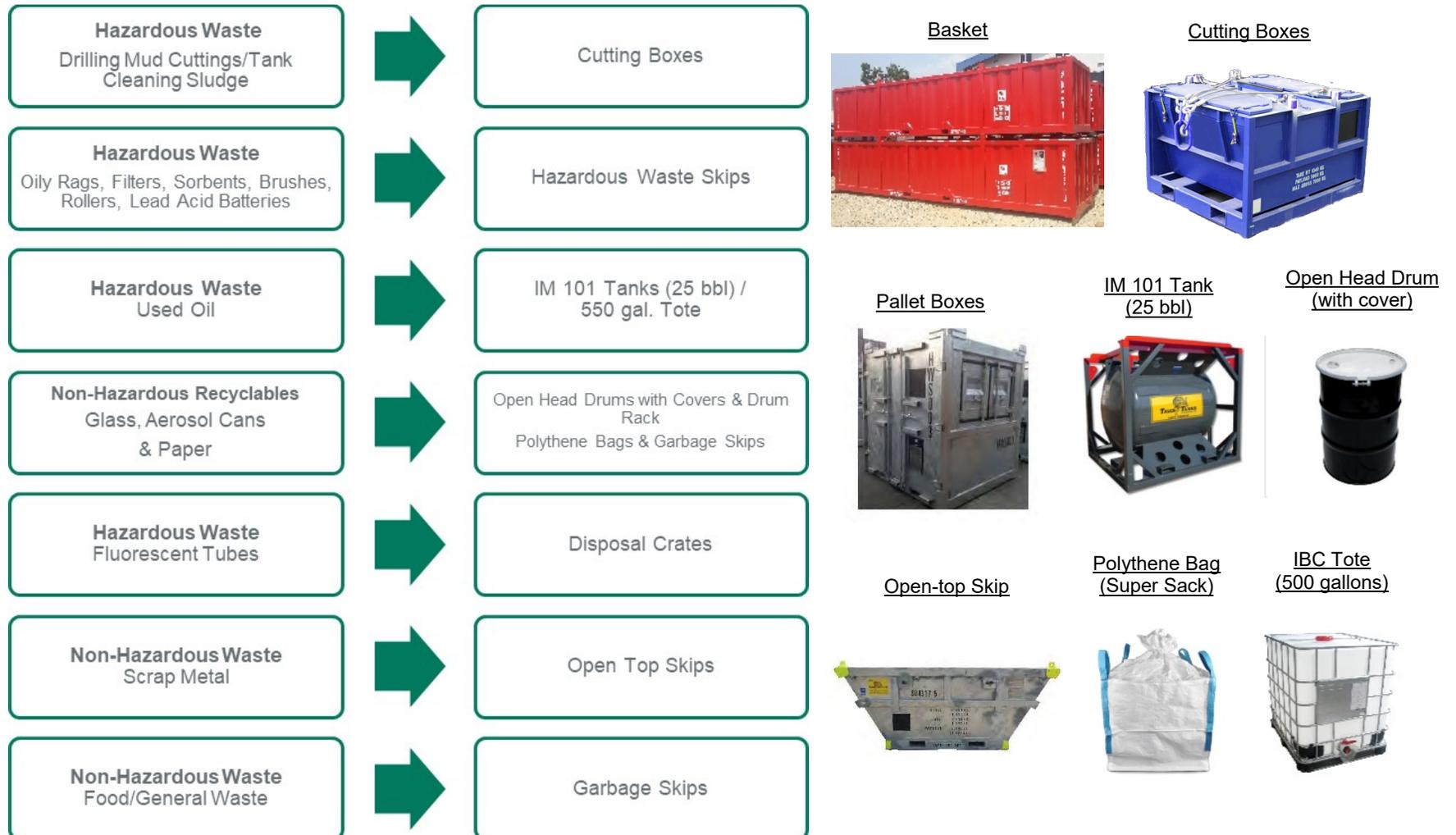
- Physical matrix (solid, liquid, sludge);
- Chemical properties (pH, density, viscosity, reactivity, flammability, etc.);
- Compatibility of wastes with container material construction and design;
- Container secondary containment requirements;
- Waste volume (large vs. small quantities); and
- Container handling requirements (e.g. crane, forklift, and truck transport compatibility).

Note that the construction and testing of packaging, intermediate bulk containers (totes), portable tanks, etc. used in the maritime shipping of dangerous goods must meet the International Maritime Dangerous Goods Code (IMDG) (2018 edition, including the most recent Amendment 39-18). However, there is currently no similar international standard employed worldwide for packaging used in the land transport of dangerous goods, although many jurisdictions throughout the world regulate packaging.

In general, each waste type is segregated into separate designated containers at the point of generation to the maximum extent possible to expedite and optimize the handling, treatment and recycling of these wastes at the onshore facilities. This approach minimizes the need for additional waste segregation and sorting onshore prior to processing. More importantly, this container segregation approach also prevents the mixing of incompatible waste types within any given container.

Figure 6-4 shows the typical containers currently used for the storage and transport of the various wastes.

Figure 6-4: Waste Storage and Transport Containers



In addition to containerized wastes, bulk spent drilling muds are stored in below deck tank compartments of the offshore supply vessels for containment during transit to shore. These below deck tank compartments are full containment structures, and are separate from the outer vessel hull, which provides a secondary containment for these tank compartments.

After the containers are filled with waste, closed, and secured, they are then staged and segregated by waste type in the designated storage areas on the drill ship, FPSO, or other vessel pending maritime transport to GYSBI. In addition, certain containers (such as bulk bags, totes, drums) will be further packaged in other sea worthy shipping containers (such as open top skips or cargo carrying units [CCUs]) to meet IMDG Code requirements prior to transfer to the support vessel.

For containers placed inside CCUs, labeling is not feasible with weather constraints (sun/rain/wind) and long periods (3-5 days) at sea. As Waste Manifests are completed in preparation for waste transport, EEPGL will rely on the Waste Manifest for the labeling and placarding as part of the initial offshore storage operation. All shipments are controlled by EEPGL during transport.

Personnel involved in the handling of hazardous wastes must recognize and understand the associated potential hazards and will be trained to a level commensurate with their job duties.

## 6.2.2 Waste Segregation and Storage

Once wastes are placed into the appropriate containers, they are moved to designated vessel storage areas pending transfer to shore. Where necessary, wastes are also segregated based on considerations of incompatibility or operational considerations regarding how they will be managed.

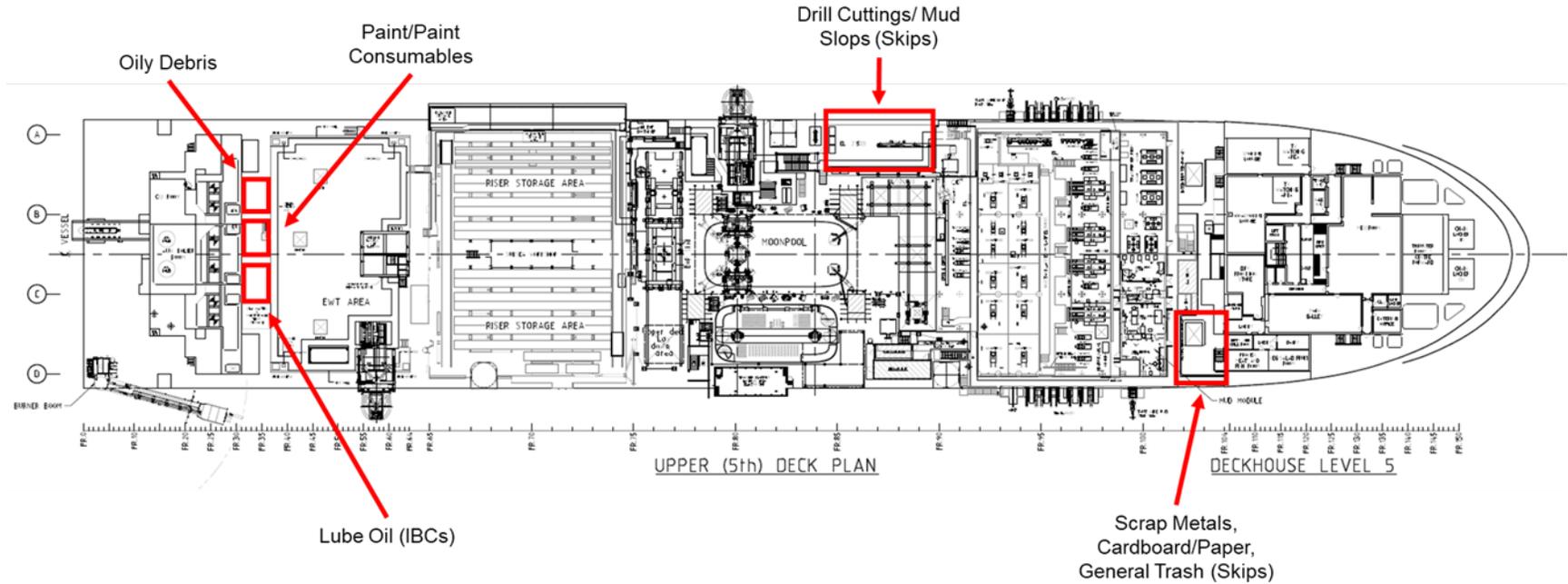
Each maritime vessel has designated waste storage areas, and these waste storage areas are often on multiple decks to facilitate operations. As per the MARPOL 73/78 and IMDG requirements, each vessel is required to have pollution control measures that are related to all operations, including waste storage operations.

The drill ships generate the most variety of offshore wastes, and therefore have the most variety of designated waste storage locations.

Section 4.2.2 of the Study ([Appendix C Section C.2](#)) illustrates the variety of onboard waste containers and waste segregation practices onboard a drill ship and FPSO.

The schematic in Figure 6-5 illustrates some of a drill ship designated waste storage locations.

Figure 6-5: Example Drill Ship Waste Storage Locations



### 6.2.3 Waste Tracking

A Waste Manifest is required documentation for both hazardous and non-hazardous waste management for cradle to grave tracking of all waste movements. Further, a separate Marine Transport Manifest is also required for tracking all ship to shore movements of materials and all wastes, including bulk spent drilling muds. Appendix B Section B.3 is an example Waste Manifest for current EEPGL operations as of February 2021 and Appendix B Section B.10 is an example of the Marine Transport Manifest used for cargo from ship to shore.

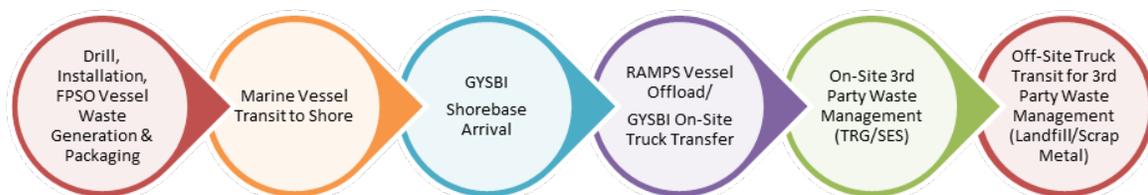
EEPGL uses a waste tracking system that allows for the tracking of the waste from initial generation through final disposal, discharge, reuse, or recycling. The information included in the manifests is maintained in a database, and EEPGL also requires that its third-party waste management facilities use a similar tracking database to show the storage, processing, and ultimate discharge, disposal, reuse, or recycle of the wastes. EEPGL then compiles and reports this information to the EPA as part of its waste summary in the annual environmental report.

In compliance with MARPOL 73/78, marine vessels, including the supply, support, and installation vessels, as well as the drill ships, and FPSOs, will maintain a Garbage Record Book and Oil Record Book (see Appendix B Sections B.11 and B.12). The Garbage Record Book can be modified to allow tracking of Project-related wastes outside the scope of the categories specified in MARPOL 73/78; therefore, this will be referred to as a Waste/Garbage Record Book in the remainder of this document.

### 6.2.4 Waste Transportation

This section presents a summary of the various steps involved in ship to shore transport, as well as onshore transport. The transport aspect is an important feature of the cradle-to-grave waste management process (see Figure 6-6).

**Figure 6-6: Cradle-to-Grave Waste Management**



The wastes generated from the drill ships, FPSO, and infrastructure operations are all subsequently off-loaded and transferred to other marine vessels for transport to shorebase.

Offshore Support Vessel Transport to Shorebase (Figure 6-7)—Support vessels used to transport waste from the offshore areas to the shorebase have the necessary licenses and approval from the Guyana authorities. Vessels transporting waste must carry both a completed

Marine Transport Manifest and a completed Waste Manifest. These documents must contain the name, description, and quantity of all wastes being transported

**Figure 6-7: Marine Support Vessel and Typical Cargo Deck Configuration**



Marine Vessel Off-Loading at Shorebase (Figure 6-8)—All offshore waste received at GYSBI (both hazardous and non-hazardous waste) is first off-loaded from the vessels by RAMPS Logistics (RAMPS) using onshore cranes. RAMPS weighs each container and also confirms the inventory during off-loading. After off-loading is complete, the waste containers are then transferred by GYSBI staff using trailers/fork lifts directly to the waste management facilities (Tiger Rentals Guyana (TRG), Sustainable Environmental Solutions (SES)) located at GYSBI, or to a temporary transit area (oily water primarily) adjacent to TRG/SES should the waste management facilities not be able to immediately receive the wastes because of operational challenges.

**Figure 6-8: Marine Support Vessels at GYSBI Shorebase**



GYSBI Onshore Transfer Operations (Figure 6-9)—TRG/SES currently handle the various containers they receive at their facility using fork lifts. The containers are stored in designated areas pending processing.

**Figure 6-9: Waste Transfer Operations at GYSBI**

GYSBI to Off-site Locations— TRG/SES currently handle treated non-hazardous wastes received or generated from its operations from GYSBI directly to the HBL for disposal. TRG/SES transport the treated wastes to HBL in bulk bags which are secured (tied/closed) to prevent tampering at the disposal site, whereas other wastes, including wood, cardboard, paper, etc. may be transported in bins. TRG/SES may also transport other wastes (batteries) to an off-site third-party metal recycling facility (Eternity Investment Inc. [EII]). All the vehicles are required to be inspected and a checklist completed to confirm road worthiness prior to engaging the waste transportation services. The TRG/SES Journey Management Plan is used to manage the transportation of waste to off-site locations. All land-based waste transport is currently done in accordance with the Guyana Environmental Guidelines for the Transportation, Storage, and Occupational Handling of Chemical/Industrial Hazardous Waste of 2011 (as applicable), as well as the Guyana Regulations made under the Environmental Protection Act 1996 (No. 11 of 1996) of 2000, and the Motor Vehicles and Road Traffic Act (Government of Guyana 1998) (applicable to both hazardous and non-hazardous waste transportation).

Other Land Waste Transport Activities— EEPGL is also involved with various land-based operations or development Projects in the Georgetown area that may require the transportation of various types of construction or operations related non-hazardous wastes (wood, construction debris, excavated soil, etc.), or possible hazardous wastes (lube oil, batteries, etc.).

A further discussion of various waste transportation aspects can be found in Section 4.2.4 of the Study ([Appendix C Section C.2](#)).

## 6.3 Waste Treatment and Disposal

Wastes generated from EEPGL offshore operations can be managed in one of two ways: 1) Wastes are managed directly on the drill ships, FPSO, or other vessels using on-board recycling, treatment, and discharge methods; or 2) Wastes are transported to onshore facilities for recycling, treatment, discharge, and disposal.

As described previously, wastes streams generated offshore generally originate from five processes (drilling operations, SURF installation, production operations [FPSO], support vessel, and accommodations).

Some offshore wastes are suitable for discharge overboard after pre-treatment, whereas others must be managed exclusively at appropriate onshore facilities for recycling, treatment, discharge, and disposal. All waste must be managed in accordance with Guyana EPA permit requirements and Guyana EPA regulations, as well as applicable international conventions, guidelines, or industry practices.

A detailed description of the waste treatment and disposal methods for both offshore and onshore waste management of the EEPGL wastes is in Section 4.3.1. (Offshore) and Section 4.3.2. (Onshore) of the Study ([Appendix C Section C.2](#)).

The best available technologies for disposal of offshore and onshore generated wastes are in the Waste Profiles Table (See Appendix B Section B.1.)

### 6.3.1 Offshore Waste Treatment Methods

All wastes generated from offshore operations are either treated and discharged offshore or sent to onshore facilities for recycling, treatment, or disposal/discharge.

The general types of EEPGL wastes currently being discharged offshore include:

- Non-aqueous fluid (NAF) mud and drill cuttings;
- Water-based mud and drill cuttings;
- Various tank wash waters, slops, and other wastewaters that pass static sheen observation;
- Bilge water that has less than (<)15 parts per million hydrocarbon oil content;
- Inert materials, including cement, barite, bentonite, calcium carbonate, gravel pack, sand, etc.;
- Food waste <25 millimeters (Figure 6-10); and
- Treated sanitary sewage.

All of these wastes are subject to some type of pre-treatment and/or monitoring prior to discharge overboard in accordance with permit requirements, international conventions, relevant international standards, or best industry practices. The pre-treatment method varies between drill ships, support vessels, installation vessel, or FPSO vessel operations, but the technologies employed are similar and are described in general in Section 4.3.1 of the Study ([Appendix C Section C.2](#)).

**Figure 6-10: Liza Destiny FPSO Food Macerator**

## 6.3.2 Onshore Waste Treatment Methods

### 6.3.2.1 Onshore Waste Management Facilities

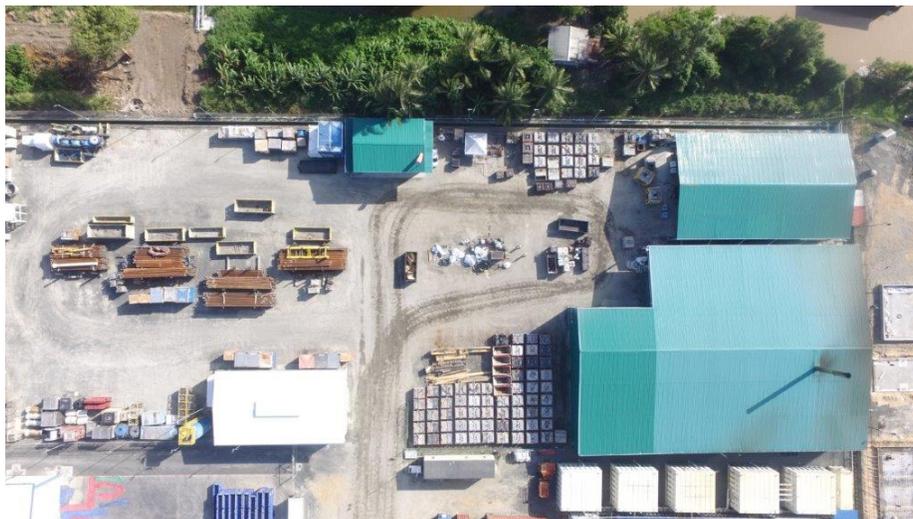
At present, there is currently a limited number of onshore Waste Service Providers of hazardous and non-hazardous waste management in Guyana. Wastes received from offshore are managed at TRG and the recently permitted SES which are located at GYSBI in Georgetown. Both of these waste management facilities have a design/processing capacity sufficient to treat and store hazardous wastes.

A description of the existing and proposed waste management service providers is provided below.

TRG (Figure 6-11)—TRG, which is located at GYSBI, is currently the primary provider of hazardous and non-hazardous waste services to EEPGL projects. TRG employs a variety of waste treatment technologies (sorting/segregation of recyclables, physical/chemical/and thermal treatment of hazardous and non-hazardous wastes) and discharges its treated fluids as permitted to the Demerara River, and sends its treated non-hazardous solid waste as well as other wastes received (including general waste, paper/cardboard, and scrap wood) to the

publicly owned and operated HBL. TRG receives wastes from EEPGL directly, as well as many other companies involved with the offshore oil and gas operations.

**Figure 6-11: TRG GYSBI Facility**



SES (Figure 6-12) – SES has constructed a new integrated waste management facility at GYSBI for managing wastes that are generated from offshore operations. The SES facility is operational and employs various hazardous and non-hazardous waste management technologies, including hot oil thermal desorption, incineration, decanter/centrifuge separation, wastewater treatment, waste shredding, container crusher/baling, and container washing operations.

Figure 6-12: SES GYSBI Facility



HBL (Figure 6-13)—The HBL, which is located in Eccles East Bank Demerara (EBD) area, is government owned under the jurisdiction of the Guyana Ministry of Local Government and Regional Development (Sanitation Management Unit) and is operated by a third-party contractor Waste Solutions Landfill Inc. (joint venture between Puran Brothers and Cevons Waste Management). The HBL is the only engineered landfill in Guyana, and started operations in early 2011. The HBL is the current destination for most municipal and commercial solid non-hazardous waste generated from the greater Georgetown area, including wastes generated from the 25-plus Neighborhood Democratic Councils between Mahaica, the Seawall, Timehri, and Parika.

All non-hazardous solid wastes generated to date from the EEPGL projects have been disposed at the HBL.

**Figure 6-13: Haags Bosch Landfill**

A description of the existing and proposed waste service providers is provided in Section 4.3.2 of the Study ([Appendix C Section C.2](#)).

### 6.3.2.2 Waste Treatment Technologies

The waste treatment technologies currently being deployed or planned are typical and have been proven effective worldwide for treating oil and gas exploration, development, and production wastes.

The following is a list of the waste management technologies currently employed by TRG.

- Wastewater Treatment
- Solidification/Stabilization Treatment of Drilling Muds and Sludge
- Thermal Desorption Treatment (Figure 6-13)
- Incineration Treatment
- Specialty Hazardous Waste Treatment
- Container Cleaning
- Segregation/Sorting/Storage

The following is a general description of the various waste management technologies currently employed for the SES operation.

- Thermal Desorption Treatment (Figure 6-14)
- Incineration Treatment (Figure 6-15)
- Separation Treatment
- Wastewater Treatment
- Container Cleaning
- Solids Reduction

**Figure 6-14: Thermal Desorption Treatment Unit**



**Figure 6-15: Incinerator unit**

A summary of the various waste treatment technologies currently used or proposed for use at each of the major Waste Service Providers is provided in Section 4.3.3 of the Study ([Appendix C Section C.2](#)).

## 7 SPILLS AND EMERGENCY RESPONSE

EEPGL, other waste generators (e.g., marine vessel owners/operators), waste transporters, and Waste Service Providers will have Emergency Response Plans to address possible emergency contingencies such as spills, fires, and explosions. These plans include specific and actionable steps for multiple scenarios. The action steps and the resources applied increase as the seriousness of the emergency or release increases. The Emergency Response Plans also include required internal and external incident communication processes and contact numbers.

EEPGL will manage hazardous wastes resulting from cleanup activities, including appropriate disposal. Large spills can typically result in significant quantities of waste in various forms:

- Recovered oil;
- Oily water mixed with recovered oil;
- Sorbent materials;
- Oiled containment boom;
- Oiled PPE;
- Oiled sediment;
- Oiled vegetation;
- Oiled debris; and
- Deceased wildlife.

Waste generated as a result of oil spill cleanup activities will be managed in accordance with this CWMP, EEPGL's Oil Spill Response Plan, EEPGL's Emergency Response Plan, Guyana National Oil Spill Contingency Plan and Guyana laws and regulations. Should a significant oil spill occur, an incident-specific WMP may be developed as part of the response.

## 8 WASTE MONITORING AND REPORTING GUIDELINES

Monitoring and reporting of waste streams and their final management are critical components to the successful implementation of this CWMP.

### 8.1 Waste Monitoring

The waste monitoring program will be facilitated by inspections conducted by EEPGL. A summary of monitoring guidelines is provided in Table 8-1.

**Table 8-1: Waste Monitoring Guidelines**

Monitoring Activity	Frequency	Originator	Documentation
Record type and quantity of each new individual waste stream offshore or onshore	Any time new waste is generated	Personnel on vessels or land based facilities	Waste/Garbage Record Book; Oil Record Book; Incinerator Log, Waste Profile Sheet and SDS
Inspect waste storage area and containers	Visual Daily	Personnel on vessels, at shorebases, and at waste service provider's facilities	Visual Daily
Document marine waste transfer	Each instance waste is transported	Personnel on vessels and at shorebases	Marine Transport Manifest (Appendix B Section B.10) and Waste Manifest (Appendix B Section B.3)

Monitoring Activity	Frequency	Originator	Documentation
Sample and perform analytical testing	As needed to properly classify waste	Waste service provider / EEPGL	Chain-of-Custody; Laboratory Analysis Results
Complete Waste Summaries	Monthly; Annually	Waste service provider / EEPGL	Monthly Waste Inventory and Annual Waste Summary Report
Complete and submit reports required per the Environmental Permit	Dependent on final permit conditions	EEPGL	EPA Recording and Reporting Form (Appendix B Section B.9), Annual Environmental Report, any other reports required by an Environmental Permit
Waste facility audits	Periodic	EEPGL	Facility review reports

## 8.2 Waste Recordkeeping and Reporting

Waste management performance will be measured against agreed-upon reporting and recordkeeping requirements including:

- Types and volumes of wastes (hazardous and non-hazardous) generated;
- Maintenance of required vessel Waste/Garbage Record Book and Oil Record Book;
- Maintenance of waste tracking logs;
- Maintenance of required incinerator logs;
- Maintenance of MTMs and WMs to document custody transfer and the final means of disposition for each recyclable material and waste;
- Preparation of waste reports required per the Environmental Permit, such as the Guyana EPA Recording and Reporting Form shown in Appendix B Section B.9;
- Maintenance of Monthly Waste Inventories;
- Preparation of Annual Waste Management Summary Report;
- Routine inspections and periodic assessments of waste service providers' facilities; and
- Maintenance of Hazardous Materials/Chemical Inventory Register and Transboundary Shipment Forms, if required. These registers and forms should be kept by EEPGL personnel at either the shorebases or EEPGL's office.

## 9 WASTE FACILITY AUDITING

ExxonMobil has a corporate level Approved Waste Site List (AWSL) Program which governs usage of third-party waste management facilities globally. Specifically, the purpose of the system is to mitigate potential Safety, Security, Health & Environment concerns associated with the recycle, treatment, storage, transfer, and disposal of Exxon Mobil Corporation and Affiliates

generated wastes globally. The third-party waste management facilities currently being used in Guyana by EEPGL are subject to the requirements of the AWSL Program.

The two facilities in Guyana currently on the AWSL are the Haags Bosch Landfill and Tiger Rentals Guyana. SES will be audited in 2021 for potential addition to the AWSL Program. Annual audits of waste management facilities will be scheduled through 2025, frequency of audits will be re-assessed post 2025 based on previous audit outcomes.

Additional details are provided in Section 4.4 of the Study ([Appendix C Section C.2](#)).

## 10 WASTE TRAINING

General training will be conducted for EEPGL personnel, contractors, and others -- as appropriate -- that will be involved with waste generation and management during the life of EEPGL's Projects. This training will cover:

- EEPGL Responsible Waste Management Practices;
- Environmental Permit waste requirements;
- Typical waste streams;
- Identification, classification, and labelling of hazardous and non-hazardous waste;
- Handling, segregation, storage, and reuse/recycle/treatment/disposal options;
- PPE requirements; and
- Waste management during normal operating conditions, as well as emergencies.

In addition to the general training, additional offshore-specific and onshore-specific waste training will be provided to the appropriate personnel.

### 10.1 Offshore Waste Management Training

EEPGL personnel and contractors working offshore will attend a training focused on waste management in the offshore environment. This training will support compliance with both Guyana laws and regulations as well as EEPGL's Responsible Waste Management Practices. Topics to be covered in these trainings will include, but are not limited to:

- Opportunities to minimize waste generation;
- Waste generation offshore and potential impacts to health, safety, and the environment;
- Specific types of hazardous and non-hazardous waste that can be generated offshore and associated risks;
- Handling, storing, and transporting wastes, with particular focus on hazardous waste to ensure safety of personnel and environment; and
- Waste tracking, monitoring, and auditing standards and practices.

## 10.2 Onshore Waste Management Training

Onshore waste management training will be conducted for EEPGL personnel and contractors as appropriate. The waste management service providers will also provide training for their waste management personnel and verify training has been performed for waste transporters. This training will support compliance with both Guyana laws and regulations as well as EEPGL's Responsible Waste Management Practices. Topics to be covered in these trainings will include, but are not limited to:

- Opportunities to minimize onshore waste generation;
- Waste generation onshore and potential impacts to health, safety, and the environment;
- Specific types of hazardous and non-hazardous wastes that can be generated onshore and associated risks;
- Handling, storing, and transporting wastes onshore, with particular focus on hazardous waste to ensure safety of personnel and the environment; and
- Waste tracking, monitoring, and auditing standards and practices.

## APPENDIX A PROJECT DESCRIPTIONS

### **Liza Phase 1, Liza Phase 2, Payara Development Projects and Yellowtail Project<sup>1</sup>**

The Liza Phase 1, Liza Phase 2, and Payara Development Projects have been permitted to develop their respective offshore resources by drilling approximately 17 subsea development wells (Liza Phase 1), up to 33 development wells (Liza Phase 2), and up to 45 to 55 development wells (Payara) in the eastern half of the Stabroek Block. The Liza Phase 1 Project Development Area (PDA), where the drilling and production operations activities will collectively occur, is a 76-square kilometer (km<sup>2</sup>) (29-square miles [mi<sup>2</sup>]) area located approximately 190 kilometers (approximately 120 miles) from the coastline. The Liza Phase 2 PDA is an approximately 80 km<sup>2</sup> (31 mi<sup>2</sup>) area located approximately 183 kilometers (114 miles) from the coastline. The Payara PDA is an approximately 95 km<sup>2</sup> (37 mi<sup>2</sup>) area located approximately 207 kilometers (128 miles) northeast from the coastline.

EEPGL is progressing plans for the Yellowtail Project, located within Stabroek Block on Guyana's Continental Shelf. Yellowtail will be located in the eastern portion of the Stabroek Block, approximately 200 kilometers from Georgetown and southeast of the current Stabroek Projects. Current plans include drilling via floating drill ship to produce oil, from approximately 45 to 55 wells. Production is expected to begin at year end 2025 with an expected field life of at least twenty years.

Each of these Projects will use an FPSO to process, store, and offload the recovered oil. Each FPSO will be connected to the wells via associated Subsea, Umbilicals, Risers, and Flowlines (SURF), which will transmit produced fluids (i.e., oil, gas, produced water) from production wells to the FPSO, as well as treated gas and water from the FPSO to injection wells.

Each of these Projects will consist of four stages, some of which may overlap: (1) Drilling; (2) Installation, Commissioning, and Start-up; (3) Production Operations; and (4) Decommissioning. Shorebases, laydown areas, warehouses, fuel supply, and waste management facilities will support all four Projects across project stages. These four Projects will share logistics, including use of marine support vessels traversing between the Stabroek Block and shorebases in Guyana or Trinidad and Tobago, and helicopters traversing between the Stabroek Block and heliport facilities in Georgetown.

These Projects will generate a variety of wastes that are hazardous and non-hazardous, which will vary over time by Project stage.

### **Guyana Fiber Optic Cable Project**

The Guyana Fiber Optic Cable Project (FOC Project), will install fiber optic communication infrastructure from the Stabroek Block to shore, enabling high-speed, low-latency communications and data transfer between EEPGL's FPSOs and shore. The network includes two landing sites

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<sup>1</sup> Any dates specified in this document are based on the current Project schedule which is subject to change. They are provided to help conceptualize anticipated duration of each stage

with terrestrial transmission to a cable landing station and then to EEPGL's new GOCP site. The FOC Project includes installation of subsea infrastructure, including optical distribution units (ODUs), located south of the Liza Phase 1 and Liza Phase 2 FPSOs, and connection of the Liza Phase 1, Liza Phase 2, and Payara FPSOs to the ODUs.

The cable will be installed using a variety of methods depending on the water depth and the on-site conditions. To protect the cable as much as possible through the fishing grounds, the cable will be plow-buried from approximately 32 kilometers (20 miles) from shore up to a water depth of 150 meters (492 feet); from this point seaward, seabed laying is sufficient and the cable will self-bury (i.e., the cable will be laid on the ocean floor and will bury itself through natural processes). For burial portions, the cable will be trenched to a depth of 1.5 meters (5 feet).

### **Guyana Office Complex Project (GOCP)**

In 2020, the development of new Guyana headquarters, referred to herein as the GOCP near Ogle Airport to accommodate EEPGL's growth and planned long-term presence began. The office campus will serve as the primary office location for EEPGL. The campus will be constructed on a greenfield 16.1 hectare (15-acre) site and will comprise two buildings and associated infrastructure. The construction is expected to be completed in 2023.

### **Gas to Energy Project**

EEPGL is currently seeking environmental authorization to construct and operate a pipeline that will transport natural gas from the Liza Phase 1 and Liza Phase 2 FPSOs to an onshore natural gas liquids processing plant (NGL Plant), from which dry gas will be supplied to a power plant. The power plant will be constructed, owned, and operated by the Government of Guyana or another entity.

The offshore pipeline will traverse approximately 220 kilometers (137 miles), connecting with the onshore pipeline at a shore landing located west of the Demerara River. The onshore pipeline will extend approximately 27 kilometers (17 miles) from the shore landing to the NGL Plant Site. The NGL Plant Site lies approximately 23 kilometers (14 miles) upriver on the west bank of the Demerara River.

### **Continued Exploration Drilling**

Exploration drilling by EEPGL is ongoing and is planned to continue to take place in the Stabroek Block and in the adjacent Canje and Kaieteur blocks, over the next several years, subject to future authorizations and continued exploration success (i.e., discoveries).

Exploration drilling will share logistics, including use of marine support vessels and shorebases in Guyana or Trinidad and Tobago, and helicopters at heliport facilities in Georgetown.

## APPENDIX B CWMP ATTACHMENTS

### B.1 Waste Profile Sheet Form with Instructions

WASTE PROFILE SHEET												
Part I												
Generator	A. GENERAL INFORMATION							WASTE PROFILE NO.				
	1. GENERATORS NAME Esso Exploration Production Guyana Limited							20140506-0015				
Waste Classification	2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana											
	3. TECHNICAL CONTACT Jimmy Street			4. TITLE Waste Management Lead		5. PHONE 623-1104						
	B. WASTE INFORMATION											
Projected Annual Volume	1. WASTE CLASSIFICATION			<input checked="" type="checkbox"/> HAZARDOUS		<input type="checkbox"/> NON-HAZARDOUS						
	3A. LISTED HAZARDOUS WASTES											
	Is this a listed waste under Annex I of the Basel Convention? Y <input type="checkbox"/> N <input type="checkbox"/>											
	If "yes" then provide waste numbers											
	Is this a listed waste under Annex VIII of the Basel Convention? Y <input type="checkbox"/> N <input type="checkbox"/>											
	If "yes" then provide all applicable waste numbers Hazardous Waste A4090											
	Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations? Y <input type="checkbox"/> N <input type="checkbox"/>											
	If "yes" then provide all applicable waste numbers Guyana EPA AG.1 Hazardous Wastes Regulations : Hazardous Waste											
	2. COMMON NAME OF WASTE Acid solutions											
	3. SITE ID/LOCATION OF WASTE GENERATION (if different than facility address above) Development & Exploration Drilling, Various wells											
Physical Characteristics	4. PROCESS GENERATING WASTE Contaminated or excess acid solutions in support of wells											
	5. PROJECTED ANNUAL VOLUME 2-10 MT		6. WASTE RECEIVING FREQUENCY		WEEKLY		MONTHLY		ONE-TIME SHIPMENT			
	7. WASTE VOLUME		CUBIC METERS		GALLONS		TONNES		OTHER (SPECIFY)			
	8. WASTE CONTAINERS		BARRELS (42 GAL.)		DRUM (55 GAL.)		CUTTINGS BOX		TANK			
Chemical Properties	9. SPECIAL HANDLING REQUIREMENTS Yes. Corrosive acid and caustic streams managed separately.											
	PART II											
	1. PHYSICAL CHARACTERISTICS											
	PHYSICAL STATE		<input type="checkbox"/> SOLID		<input checked="" type="checkbox"/> LIQUID		<input type="checkbox"/> SEMI-SOLID		<input type="checkbox"/> GAS		OTHER (SPECIFY)	
	COLOR (CHECK ONE)		Water clear to slight greenish		BOILING POINT (°C)		N/A		ODOR & STRENGTH		None/Strong	
	FLASH POINT (°C)		N/A		VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low		BTUs		N/A	
	PCBs (ppm)		N/A		TOTAL CYANIDES (ppm)		N/A		TOTAL SULFIDES (ppm)		N/A	
	2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)											
	NONE		<input checked="" type="checkbox"/>		OXIDIZER		<input type="checkbox"/>		WATER REACTIVE		<input type="checkbox"/>	
	SHOCK REACTIVE		<input type="checkbox"/>		MEDICAL/INFECT. WST		<input type="checkbox"/>		AIR REACTIVE		<input type="checkbox"/>	
EXPLOSIVE		<input type="checkbox"/>		PESTICIDE/HERBICIDE		<input type="checkbox"/>		PYROPHORIC		<input type="checkbox"/>		
REACTIVE CYANIDES		<input type="checkbox"/>		POLYMERIZABLE		<input type="checkbox"/>		REACTIVE SULFIDES		<input type="checkbox"/>		
PHENOLS		<input type="checkbox"/>		RADIOACTIVE		<input type="checkbox"/>		EXEMPT RAD		<input type="checkbox"/>		
ORGANIC PEROXIDE		<input type="checkbox"/>		ASBESTOS		<input type="checkbox"/>		THERMALLY UNSTABLE		<input type="checkbox"/>		
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)												
CAS #		CONSTITUENTS		RANGE (%) - MUST BE EQUAL OR GREATER THAN 100%		CONCENTRATION (ppm or mg/l)						
		HCL solution		25-50								
		Water		60-80								
KNOWLEDGE IS FROM												
<input type="checkbox"/> LAB ANALYSIS		<input checked="" type="checkbox"/> MSDS		<input checked="" type="checkbox"/> PROCESS/GENERATOR KNOWLEDGE								
GENERATOR CERTIFICATION: I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.												
NAME: Jimmy Street					TITLE: Waste Management Lead							
SIGNATURE:					DATE:							

## INSTRUCTIONS FOR COMPLETING WASTE PROFILE SHEET

### PART I

#### A. GENERAL INFORMATION

**WASTE PROFILE NUMBER** – A unique number assigned to this waste stream for future reference. The preferred format is Generator's Permit Reference Number + three digit profile number assigned by either the Generator or the EPA for this specific waste stream. Any variation from this format must be approved by the EPA.

Waste Stream	Description	EPA assigned Profile Number
General Trash	General/domestic trash. All uncontaminated solids other than recycleables. Includes non-macerated galley waste, cement sacks, insulation, and dry bulk hoses, etc.	001
Wood	Scrap wood, pallets, crating, etc. (pallets intended for reuse are not to be manifested as waste).	002
Scrap Metal	Uncontaminated scrap metal. Slings and straps.	003
Plastic	Scrap plastic (uncontaminated)	004
Cardboard/Paper	Scrap cardboard, paper, etc.	005
Cooking Oil	Used cooking oil	006
Glass	Glass (crushed), fiberglass, etc.	007
Medical	Medical/biological waste	008
Drill Cuttings/Mud Slops	NAF drill cuttings/mud slops	009
Oily Debris	Used absorbent pads, rags, filters, grease tubes, dope brushes, filters, etc.	010
Chemical Sacks	Empty chemical sacks	011
Casing Protectors	Casing protectors (unwashed)	012
IBC Tote Tanks	Empty IBC totes	013
Metal Drums	Empty metal drums	014
Acids/Caustic	Contaminated acid/caustic chemicals (not to be neutralized offshore)	015
Aerosol Cans	Empty aerosol cans (not punctured)	016
Fire Fighting Foams	Fire Fighting Foam	017
Batteries	All types of batteries	018
Brine	Oil/solids contaminated brine	019
Chemical Contaminated Water	Chemical contaminated water that does not meet effluent discharge limits	020
Completion Fluids	Flowback fluids with hydrocarbon or solids contamination	021
Electronics	Computers, printers, TVs, etc.	022
Fluorescent Bulbs	Fluorescent Bulbs	023
Fuel	Contaminated Diesel, gasoline, kerosene, heli-fuel, etc.	024
Lube Oil	Used motor/engine oil	025
Mercury Equipment	Equipment that contains mercury	026
Oily Water	Oil contaminated water that does not meet effluent discharge limits, sump water, etc.	027
Paint/Paint Consumables	Paint and paint consumables (brushes, rollers, etc.). Solvents.	028

Plastic Buckets, Kegs	Empty chemical contaminated plastic buckets, kegs, etc.	029
Plastic Drums	Empty plastic drums	030
Produced Solids	Hydrocarbon contaminated solids/sand from production or exploration processes	031
Pyrotechnics	Expired flares	032
Radioactive Materials	Solids/liquids or equipment contaminated by any radioactive source (including NORM)	033
Rubber Hoses	Contaminated fuel/mud hoses	034
Sludge	Sludge from tank bottoms - mostly solid	035
Transmission/Hydraulic Oil	Used hydraulic/transmission oil	036

1. GENERATOR NAME – Enter the name of the generator. (Should match official name associated with the EPA records).
2. FACILITY'S NAME & ADDRESS – Enter the name and address of generating facility.
3. TECHNICAL CONTACT – Enter the name of the person to contact for more information about this waste.
4. TITLE – Enter the Technical Contact's official title (e.g. Manager).
5. PHONE – Enter the Technical Contact's telephone number.

#### B. WASTE INFORMATION

1. WASTE CLASSIFICATION – Enter classification of waste as described in the Environmental Protection (Hazardous Waste Management) Regulations or the BASEL Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.
2. COMMON NAME OF WASTE – Enter a name that is generally descriptive of this waste (e.g., drill cuttings, paint wastes, oil-water separator sludge, PCB-contaminated dirt, etc.).
3. PROCESS GENERATING WASTE – List the specific process/operation or source that generates this waste (e.g., paint-booth spray, PCB spill, metal-plating operation, etc.).
4. PROJECTED ANNUAL GENERATIONS – The quantity of waste projected for treatment annually.
5. WASTE RECEIVING FREQUENCY – The frequency at which waste is treated/sent for treatment.
6. WASTE VOLUME – The quantity/volume of waste to be treated.
7. WASTE CONTAINERS – The container(s) in which waste is transported to Waste Treatment Plant.
8. SPECIAL HANDLING REQUIREMENTS – Any special/extra considerations to be taken when handling or transporting the waste.

## PART II

### 1. PHYSICAL CHARACTERISTICS

1. PHYSICAL STATE - If the four boxes do not apply, a description should be entered after "Other".
2. COLOR – Describe the color of the waste (e.g., blue, clear, varies, etc.).
3. BOILING POINT – For liquids, list the boiling point.
4. pH – List the pH reading/value of the waste.
5. FLASH POINT – For liquids, list the flash point, regardless of whether the waste is Ignitable or not.
6. VISCOSITY – List the viscosity of the waste.

7. BTU– This entry may be required if you request that this waste be used as a fuel substitute or if the waste is a contaminated fuel to be incinerated.
8. PCBs - Content can be expressed as either a weight percentage, or dry-weight concentration (mg/kg)
9. TOTAL CYNAIDE – Content can be expressed as either a weight percentage, or dry-weight concentration (mg/kg).
10. TOTAL SULFIDES – Content can be expressed as either a weight percentage, or dry-weight concentration (mg/kg).

## 2. HAZARDOUS & CHEMICAL PROPERTIES

Check the applicable box or boxes. Evidence must be provided to support answer(s).

### 3. CHEMICAL/MATERIAL COMPOSITION

1. CAS # - Chemical Abstract Number.
2. CONSTITUENTS – List all chemical *and material* components and contaminants.
  - *Examples of chemical components and contaminants:*
    - PCB's, methanol, oil, sodium chloride, naphthalene, gasoline, solvents, applicable Underlying Hazardous Constituents (UHCs), etc.
  - *Examples of material components and contaminants: water, dirt, sand, paint sludge, rags, etc.*
3. CONCENTRATION – Use this column for constituents of concern which do not exceed 10,000 ppm (1%). Indicate the concentration level in ppm or mg/L.
4. RANGE – For components comprising greater than or equal to 1% of the total waste stream, estimate the range (in percent) in which the component is present. The total maximum values of the components must be greater than, or equal to 100%, including chemical and material components.

LAB ANALYSIS – Attach a copy, if applicable (see Note below). Analysis must be done by an approved and certified laboratory. Laboratory approval(s) and certification(s) must be submitted with lab analysis along with the internationally recognized methodology use to conduct the analysis.

USER KNOWLEDGE - User knowledge is appropriate when it can be documented (e.g., in-out logs, published information, MSDS, process production information, etc.). There is room provided to explain “what” and “why” user knowledge is used in lieu of analysis.

CERTIFICATION - Include the PRINTED NAME of the person providing the Certification.

SIGNATURE - An authorized representative of the generator must sign and date this certification on the completed Waste Profile Sheet.

DATE – Date signed by Certifier\*.

**\* This Waste Profile Sheet (WPS) may be used for subsequent submissions of the same waste stream, for a period of one year. If a submission date is more than a year past the Certification Date listed, the generator must either re-certify the WPS, or provide a new WPS, with the current date.**

**Waste profiles must be verified by the Waste Treatment Facility to determine treatment compatibility, especially if any operational changes occur that would materially change the waste profile.**

**B.2 Waste Profiles Table**

Individual Waste Stream Profile	Description (profile)	Guyana EPA Classification (AG.1 Hazardous Wastes Regulations)	US EPA RCRA Classification	Basel Convention (Annexes I, II, VIII) Classification Standard	Best Available Technology	Comments
General Trash	General / domestic trash. All uncontaminated solids other than recycleables. Includes non-macerated galley waste, cement sacks, insulation, dry bulk hoses.	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	
Wood	Scrap wood, pallets, crating, etc. (pallets intended for reuse are not to be manifested as waste)	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	
Scrap metals	Uncontaminated scrap metal. Slings and straps.	Non-hazardous	Non-hazardous Scrap Metal exemption	N/A	Consolidation/Bulking and Recycling	
Plastic	Scrap plastic (uncontaminated)	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	
Paper	Scrap cardboard, paper	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	
Cooking Oil	Used cooking oil	Non-hazardous	Non-hazardous	N/A	Recycle or solidfy and Landfill	
Glass	Glass (crushed), fiberglass	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	

Individual Waste Stream Profile	Description (profile)	Guyana EPA Classification (AG.1 Hazardous Wastes Regulations)	US EPA RCRA Classification	Basel Convention (Annexes I, II, VIII) Classification Standard	Best Available Technology	Comments
Medical Wastes	Medical/biological waste	Hazardous (Regulations do not apply)	Biohazardous	Hazardous Waste Annex VIII (A4020); Annex I (Y1)	Incineration	
Drill Cuttings	NAF drill cuttings / mud slops	Hazardous (Regulations do not apply)	Hazardous (Exempt)	Hazardous Waste Annex VIII (A3020)	Stabilization/Thermal Desorption	
Oily Debris	Used absorbent pads, rags, filters, grease tubes, dope brushes, filters, etc.	Hazardous (Regulations do not apply)	Used Oil	Hazardous Waste Annex VIII (A4060); Annex I (Y9)	Incineration	
Chemical Sacks	Empty chemical sacks (cement sacks to be disposed of as General Trash)	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Verify empty, direct Landfill	
Casing Protectors	Casing protectors (unwashed)	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130),	Rinse and direct Landfill/ Rinsate WWTP	
IBC Tote Tanks	Empty IBC totes	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/ Rinsate WWTP	
Metal Drums	Empty metal drums	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/ Rinsate WWTP	
Acids	Contaminated acid chemicals (not to be neutralized offshore)	Hazardous	Hazardous (Exempt) D002	Hazardous Waste Annex VIII (A4090); Annex I (Y34)	Neutralize/WWTP	

Individual Waste Stream Profile	Description (profile)	Guyana EPA Classification (AG.1 Hazardous Wastes Regulations)	US EPA RCRA Classification	Basel Convention (Annexes I, II, VIII) Classification Standard	Best Available Technology	Comments
Aerosol Cans	Aerosol Cans/Not Punctured	Hazardous	Hazardous Waste D001	Hazardous Waste Annex VIII (A4130)	Puncture/Recycle/liquids Incinerated	
AFFF	Fire fighting foam	Non-hazardous	Non-hazardous	Hazardous Waste Annex VIII (A4140); Annex I (Y45)	Stabilization/Landfill	
Batteries	All types of batteries	Hazardous	Universal waste D002-D008	Hazardous Waste Annex VIII (A1160, A1170), Annex I (Y26/Y31/Y34)	Recycle	
Contaminated Brine (Profile Inactive)	Oil/solids contaminated brine	Hazardous (Regulations do not apply)	Hazardous (Exempt)	Hazardous Waste (A4060); Annex I (Y9)	N/A	This WPS has been combined with Completion Fluids WPS
Chemical Contaminated Water	Chemical contaminated water that does not meet effluent discharge limits	Hazardous (Regulations do not apply)	Hazardous (Exempt)	Hazardous Waste (A4060); Annex I (Y9)	Composite sample/WWTP/Incineration/Thermal Desorption	
Completion Fluids /Contaminated Brine	Flowback fluids, w/hydrocarbon/brine/solids contamination	Hazardous (Regulations do not apply)	Hazardous (Exempt) D018	Hazardous Waste (A4060); Annex I (Y9)	Stabilization/Thermal Desorption	

Individual Waste Stream Profile	Description (profile)	Guyana EPA Classification (AG.1 Hazardous Wastes Regulations)	US EPA RCRA Classification	Basel Convention (Annexes I, II, VIII) Classification Standard	Best Available Technology	Comments
Fluorescent Bulbs	Fluorescent Bulbs	Hazardous Waste	Universal D009	Hazardous Waste Annex VIII (A1030/A1180); Annex I (Y29)	Stabilization	
Fuel	Contaminated diesel, heli-fuel	Hazardous (Regulations do not apply)	Hazardous D001- D018	Hazardous Waste (A4060); Annex I (Y9)	Incineration/Fuel Blend	
Lube Oil	Used motor/engine oil	Hazardous (Regulations do not apply)	Used Oil Regulations	Hazardous Waste Annex VIII (A4060); Annex I (Y9)	Fuel Blend/Recycle	
Mercury (equipment) (No Waste Profile Sheet)	Equipment that contains mercury	Hazardous	D009	Annex I (Y29)	TBD	Waste stream that is not generated yet.
Oily Water	Oil contaminated water that does not meet effluent discharge limits. Contains less than 30% oil. Sump water.	Hazardous (Regulations do not apply)	Hazardous (Exempt) D018	Hazardous Waste Annex VIII (A4060); Annex I (Y9)	WWTP, Fuel Blend/Recycle	
Paint/Paint Consumables	Paint and paint consumables (brushes, rollers, etc.). Solvents.	Hazardous Waste	D001	Hazardous Waste Annex I (Y12)	Incineration	
Plastic Buckets/Kegs	Empty chemical contaminated plastic buckets, kegs	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/Rinsate WWTP	

Individual Waste Stream Profile	Description (profile)	Guyana EPA Classification (AG.1 Hazardous Wastes Regulations)	US EPA RCRA Classification	Basel Convention (Annexes I, II, VIII) Classification Standard	Best Available Technology	Comments
Plastic Drums/Empty	Empty plastic drums	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/Rinsate WWTP	
Produced Solids (No Profile Sheet)	Hydrocarbon contaminated solids/sand from production processes	Hazardous (Regulations do not apply)	Hazardous (Exempt) D018	Hazardous Waste Annex VIII (A4060); Annex I (Y9)	Thermal Desorption or Incinerate	
Pyrotechnics	Expired flares	Hazardous	D003	Annex I (Y15) or Annex A4080	Deactivate	Donated to Guyana Defence Force for training
Radioactive (NORM) (No Waste Profile Sheet)	NORM contaminated solids/liquids or equipment	Hazardous (Regulations do not apply)	NORM	TBD	Blend and landfill	Waste stream that is not generated
Rubber Hoses	Contaminated fuel/mud hoses (dry bulk hoses to be disposed of as General Trash)	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/Rinsate WWTP	
Sludge (tank bottoms) (No Profile Sheet. Suspended until further information)	Sludge from tank bottoms - mostly solid	Hazardous (Regulations do not apply)	Hazardous (Exempt) D018	Hazardous Waste Annex VIII (A4060)	Thermal Desorption or Incinerate	Waste stream that is not generated.
Hydraulic Oil / Glycol	Used hydraulic oil / transmission oil / Glycol	Hazardous (Regulations do not apply)	Used Oil Regulations	Hazardous Waste Annex VIII (A4060); Annex I (Y9)	Fuel Blend or Recycle	

Individual Waste Stream Profile	Description (profile)	Guyana EPA Classification (AG.1 Hazardous Wastes Regulations)	US EPA RCRA Classification	Basel Convention (Annexes I, II, VIII) Classification Standard	Best Available Technology	Comments
Electronics	Computers, printers, TVs, etc	Hazardous	Universal D008	Hazardous Waste Annex VIII (A1180); Annex I (Y20, Y21, Y23, Y26, Y29, Y31)	Recycle	
Mineral Oil	Drilling mud additive	Hazardous (Regulations do not apply)	Hazardous	Hazardous Waste Annex VIII (A3020); Annex I (Y8)	Thermal Desorption/Pug Mill/Fuel Blend	
Refrigerant	Cooling agent	Hazardous	Hazardous	Hazardous Waste Annex VIII (A4130); Annex I (Y41)	Recycle	Donation to Ministry of Agriculture
Caustic	Contaminated caustic chemicals (not to be neutralized offshore)	Hazardous	Hazardous (Exempt) D002	Hazardous Waste Annex VIII (A4090); Annex I (Y35)	Neutralize/WWTU	

All of EEPGL's WPSs (with SDSs where applicable) can be found in Appendix D of the Study ([Appendix C Section C.2](#)).



20	1	EA	497124	Int. Pallet Box	See Attached Waste Form	NO DRUMS	NO DRUMS	11
21	1	EA	106013	Int. Pallet Box	See Attached Waste Form	NO DRUMS	NO DRUMS	14
22	1	EA	807884	Truck Bag	See Attached Waste Form	Tiger Tanks	Tiger Tanks	18

On shipping manifest

### ESSO EXPLORATION PRODUCTION GUYANA LTD. WASTE MANIFEST FORM

Generator Information		Transporter Information:	
Generator:	Esso Exploration & Production Guyana Ltd.	Transporter:	Paradise Island
Address:	99 New Market St., Georgetown GY	Contact:	John Jacob
Contact:	Jimmy J. Street	Position:	Captain
Position:	Waste Management Lead	Phone:	xxx-xxx-xxxx
Phone:	+592-623-1104	Email:	xxx.xxxxx@xxxx.com
Email:	Jimmy.J.street@essonmobil.com		
EPA Region:	Region 4		
Regist. #:	TBD		

Originator Information		Receiving Facility Information	
Originator:	Noble Tom Madden	Facility:	Tiger Rentals Guyana
Manifest #:	120-LUZ_2W2-SMT	Regist. #:	20140506-TTUL
Well:	LUZ_2W2	Location:	LOT A, East Bank Public Rd. Houston GY
Date:	21-Jul-20	Contact:	Shane Singh
Contact:	Company Man	Position:	General Manager
Phone:	xxx-xxx-xxxx	Phone:	+592-501-0620
Email:	xxxxxx.x.xxx@essonmobil.com	Email:	ssingh@tigerrentalsguyana.com

CCU #	Waste Stream	Comment	Verified Quantity	Unit	GY Classification	GY characteristic	Physical characteristic	Chemical characteristic
M-260-50	Lube Oil	Engine Maint.	7.2	m3	Exempt			
4DR-44	Cooking oil	2bbl	0.12	m3	Exempt			
4DR-44	Batteries	1bbl	0.08	MT	Hazardous	Corrosive	Solid	Inorganic
4DR-44	Pyrotechnics	1bbl	0.1	MT	Hazardous	Explosive	Solid	Inorganic

indicator section to be filled out by Rig or FPSO

CCU #	Waste Stream	Comment	Verified Quantity	Unit	GY Classification	GY characteristic	Physical characteristic	Chemical characteristic
M-260-50	Lube Oil	Engine Maint.	7.2	m3	Exempt			
4DR-44	Cooking oil	2bbl	0.12	m3	Exempt			
4DR-44	Batteries	1bbl	0.08	MT	Hazardous	Corrosive	Solid	Inorganic
4DR-44	Pyrotechnics	1bbl	0.1	MT	Hazardous	Explosive	Solid	Inorganic
DNVBS0001	Wood		1.5	MT	Non-hazardous			
DNVBS0002	General Trash		1.8	MT	Non-hazardous			
PB 315	IBC Tote Tanks/Empty	2 empty	0.145	MT	Non-hazardous			
PB 320	Metal drums	4 empty	0.08	MT	Non-hazardous			
PB 320	Chemical sacks		0.235	MT				
25256	Drill Cuttings/Mud Slops		3.2	m3				
18209	Oily Debris		1.2	MT				
696789	IBC Tote Tanks/Empty	Do not dispose drilling tool	0.145	MT				

This information will be filled out when the waste is received and measured at the waste facility. You will receive a scanned copies once finalized on a monthly basis for your own record keeping

Add a comment to indicate quantity of waste. Use piece count only (i.e. 2 drums, 5 sacks)

If CCU contains multiple waste streams, use separate line items to capture this

Always use comment to indicate if the CCU also contains an item that is NOT to be disposed of

Refer to "Waste Streams" tab for description of each waste stream. If the waste being sent in does not conform to any of the streams in the dropdown - email/call J.Street (contact details for Generator)

Sign the Form

ORIGINATOR:		
GENERATOR:		
TRANSPORTER:		
RECEIVING FACILITY:		

Print
Sign
Date

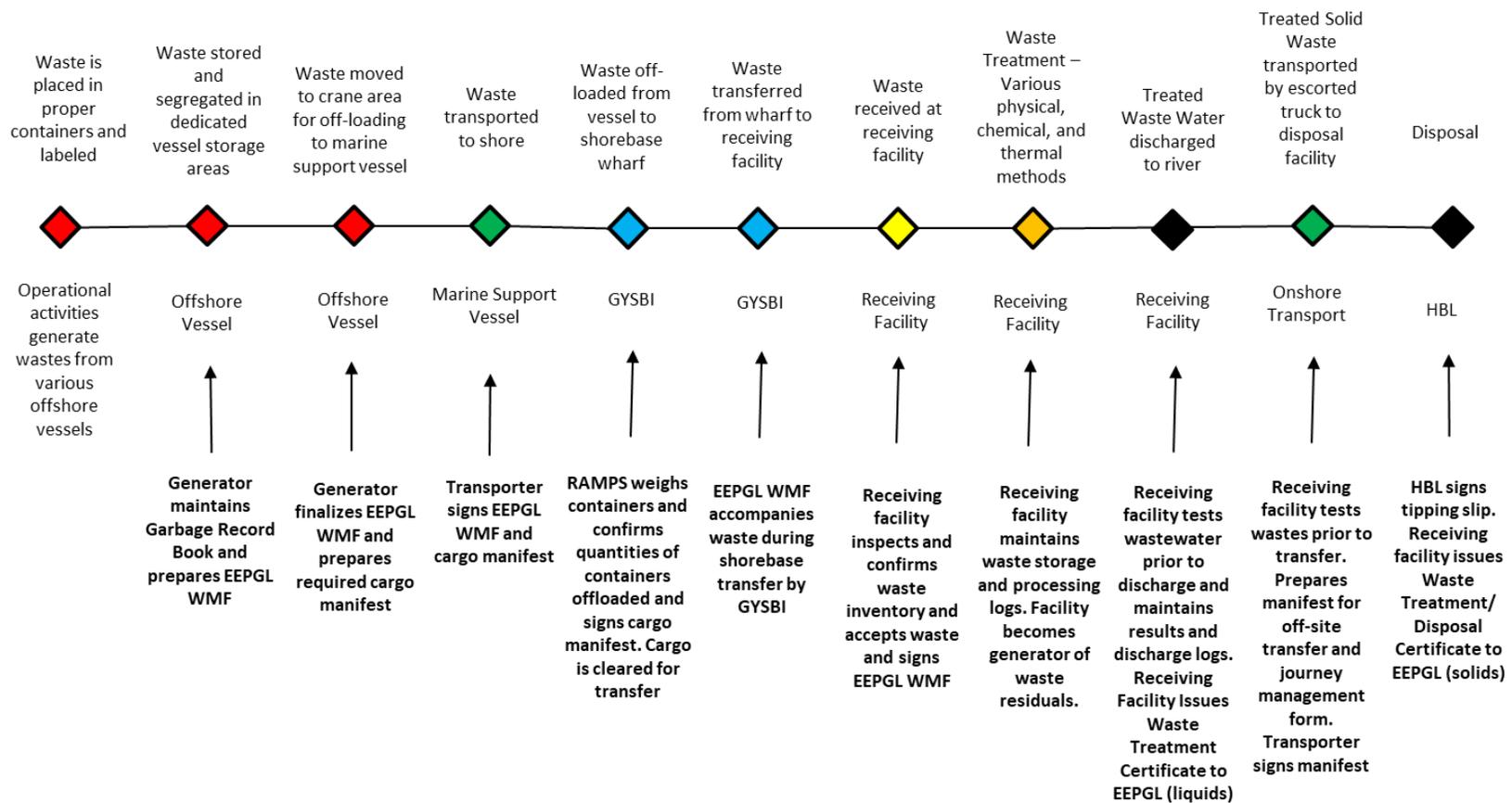
#### B.4 Approved Guyana and Trinidad and Tobago Waste Contractors and Shorebases

Country	Company	Contact Information
Guyana	Tiger Rentals Guyana (TRG)	Shane Singh – 592-608-9201 <a href="mailto:ssingh@tigerrentalsguyana.com">ssingh@tigerrentalsguyana.com</a>
Guyana	Haags Bosch Landfill (HBL)	Rufus Lewis – 592-265-2489/1239
Guyana	Guyana Shore Base (GYSBI)	Mark Edwards - 592-227-2380/2381
Guyana	Eternity Investments Inc	Stephen Bourne – 592-687-6072 <a href="mailto:stephen_bourne@eternityinvestmentinc.com">stephen_bourne@eternityinvestmentinc.com</a>
Guyana	Sustainable Environmental Solutions (SES)	Chris Clark - 592 608 8559 <a href="mailto:chris.clark@ses-gy.com">chris.clark@ses-gy.com</a>
Trinidad	Oil Mop	Jason Ross – 868-651-1306/1361
Trinidad	Enviro Care (Preysal)	Danny Maharaj – 868-680-9282
Trinidad	CamQuip	Jason Camacho – 868-222-4700 Email: <a href="mailto:jcamacho@camquip.com">jcamacho@camquip.com</a>
Trinidad	Tiger Tanks	Denis Latiff – 868-651-1544/0130
Trinidad	Chaguramas Shorebase	Natasha Fournillier – 868-607-4000/ext 1500

**B.5 Hazardous Waste Flow Diagram**

## Hazardous Waste Management— Offshore Generated Waste—Onshore Management

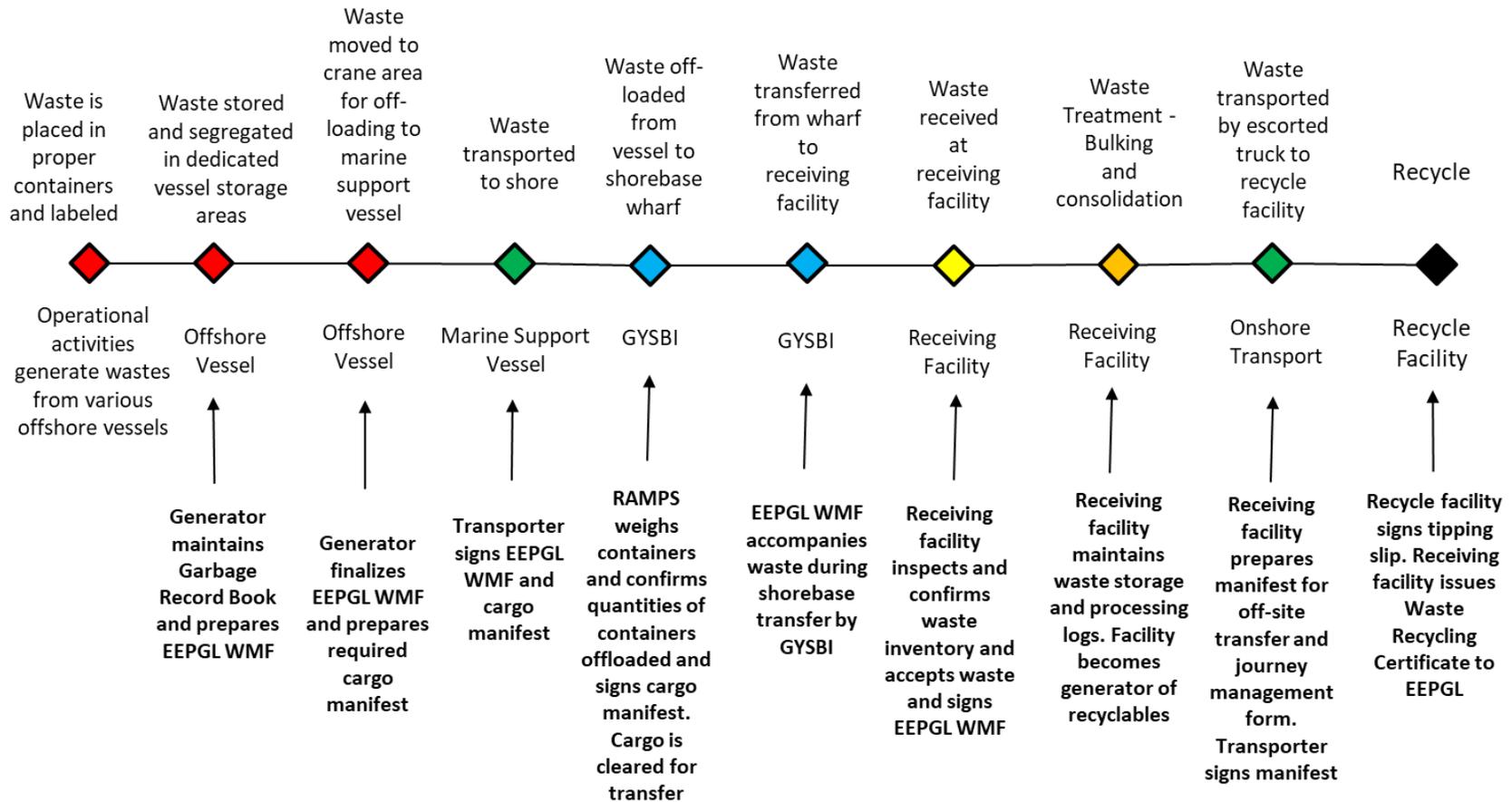
**Waste streams: Various Liquids, Solids, Sludges**



**B.6 Recyclables Flow Diagram**

**Non-Hazardous Waste Management—Recyclables Cradle to Grave  
Offshore Generated Waste—Onshore Management**

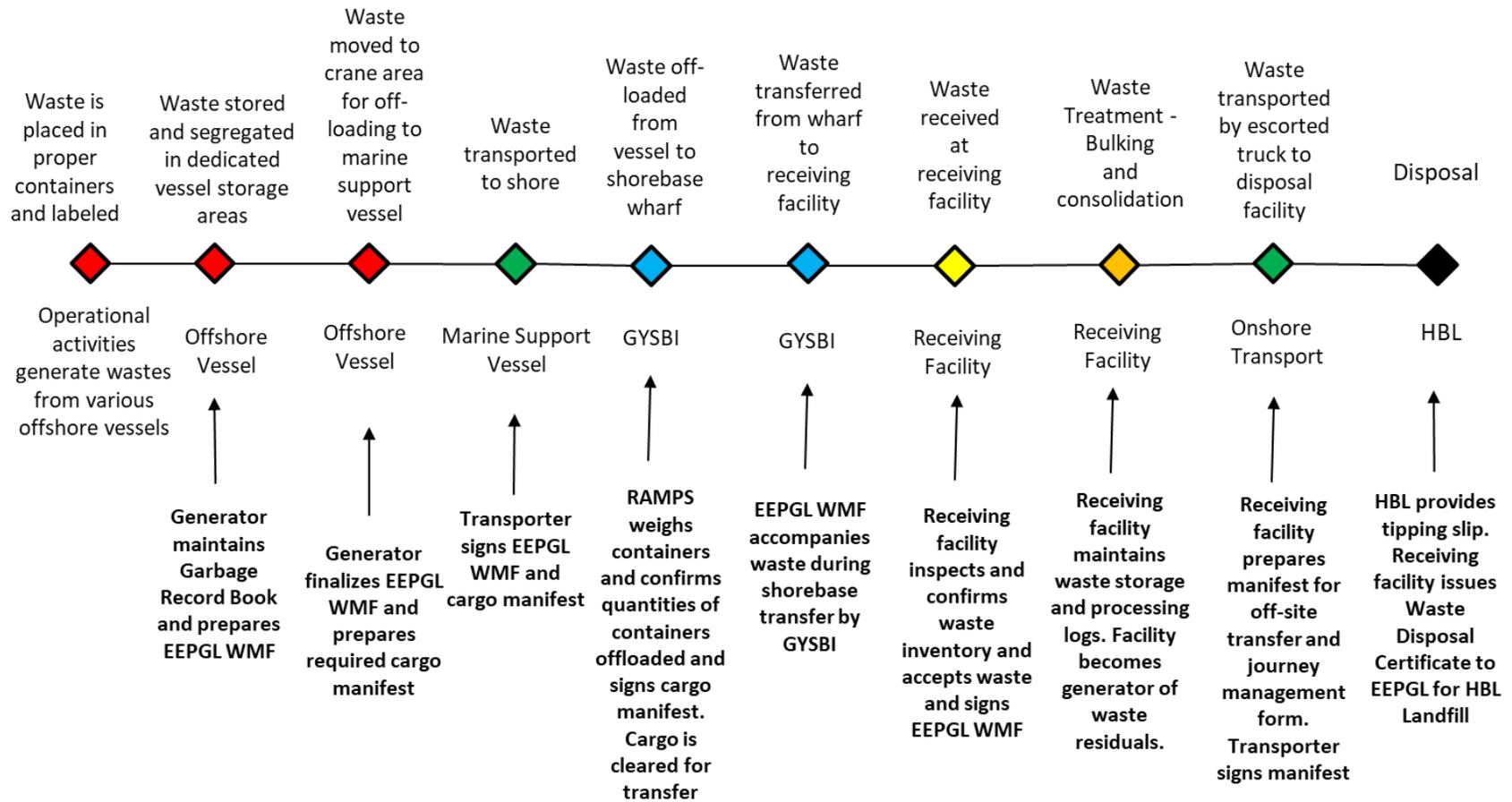
Waste streams : Scrap Metal/Batteries/Other Recyclables



**B.7 Non-Hazardous Waste Flow Diagram**

## Non-Hazardous Waste Management—Cradle to Grave Offshore Generated Waste—Onshore Management

**Waste streams: Wood; General Trash; Plastic; Glass; Cardboard/Paper**



**B.8 Operators of Marine Vessels**

Vessel	Company	Contact Information
Liza Destiny	SBM	<b>Anastasia Charanda</b> - <a href="mailto:anastasia.chandra@sbmoffshore.com">anastasia.chandra@sbmoffshore.com</a>
Noble Drill ships	Noble	<b>Bernard MacNeil – Richie Thomas</b> <a href="mailto:bernard.j.macneil@exxonmobil.com">bernard.j.macneil@exxonmobil.com</a> or <a href="mailto:richie.thomas@esso.ca">richie.thomas@esso.ca</a>
Stena Drill ships	Stena	<b>Bernard MacNeil – Richie Thomas</b> <a href="mailto:bernard.j.macneil@exxonmobil.com">bernard.j.macneil@exxonmobil.com</a> or <a href="mailto:richie.thomas@esso.ca">richie.thomas@esso.ca</a>
Installation Vessel – FDS2	Saipem	<b>Stefi Ann Moore – Kishan Madhoo – Jonathan Camarena</b> (Payara team) <a href="mailto:stefi-ann.moore@saipem.com">stefi-ann.moore@saipem.com</a> or <a href="mailto:Kishan.Madhoo@saipem.com">Kishan.Madhoo@saipem.com</a> or <a href="mailto:Jonathan.Camarena@saipem.com">Jonathan.Camarena@saipem.com</a>
Skandi Foula	DOF	<b>Stefi Ann Moore – Kishan Madhoo – Jonathan Camarena</b> (Payara team) <a href="mailto:stefi-ann.moore@saipem.com">stefi-ann.moore@saipem.com</a> or <a href="mailto:Kishan.Madhoo@saipem.com">Kishan.Madhoo@saipem.com</a> or <a href="mailto:Jonathan.Camarena@saipem.com">Jonathan.Camarena@saipem.com</a>
Installation Vessel – Constellation	Saipem	<b>Michael Harris – Andrea Sodde</b> (Liza 2 team) <a href="mailto:James.Harris2@saipem.com">James.Harris2@saipem.com</a> or <a href="mailto:Andrea.SODDE@saipem.com">Andrea.SODDE@saipem.com</a>
Pacific Leader Installation Vessel	Swire	<b>Michael Harris – Andrea Sodde</b> (Liza 2 team) <a href="mailto:James.Harris2@saipem.com">James.Harris2@saipem.com</a> or <a href="mailto:Andrea.SODDE@saipem.com">Andrea.SODDE@saipem.com</a>
Bourbon Sapphire Installation Vessel	Bourbon Offshore	<b>Michael Harris – Andrea Sodde</b> (Liza 2 team) <a href="mailto:James.Harris2@saipem.com">James.Harris2@saipem.com</a> or <a href="mailto:Andrea.SODDE@saipem.com">Andrea.SODDE@saipem.com</a>
Bourbon Diamond Installation Vessel	Bourbon Offshore	<b>Michael Harris – Andrea Sodde</b> (Liza 2 team) <a href="mailto:James.Harris2@saipem.com">James.Harris2@saipem.com</a> or <a href="mailto:Andrea.SODDE@saipem.com">Andrea.SODDE@saipem.com</a>
Chouest Support Vessels	Chouest	<b>Ann Barron</b> – <a href="mailto:ann.barron@chouest.com">ann.barron@chouest.com</a>
Bourbon Support Vessels	Bourbon	<b>Nikola Medak</b> – <a href="mailto:Nikola.MEDAK@bourbon-online.com">Nikola.MEDAK@bourbon-online.com</a>
Tidewater Support Vessels	Tidewater	<b>Ricardo Trujillo/ Terry Leonard</b> - <a href="mailto:guyanaptcapt@tdw.com">guyanaptcapt@tdw.com</a>

**B.9 EPA Hazardous Waste Recording and Reporting Form**

EPA-EMD2012HWRRF1R1

**RECORDING AND REPORTING FORM OF HAZARDOUS WASTES  
(for New and Existing Operations)****General Instructions/Requirements/Information**

The Recording and Reporting Form must be completed by the holder of an Environmental Authorization no later than forty-five days after the end of the operating year.

**Note:** The report should be prepared on activities relating to the previous calendar year.

1. This Form must be completed in BLOCK LETTERS (preferably completed electronically) and a hard copy along with any additional information requested submitted to:

**The Executive Director**  
**Environmental Protection Agency**  
**Ganges Street**  
**Sophia, Georgetown, Guyana**  
**Telephone: (592) 225-2062 / 1218 / 0506 / 6917**  
**Fax: (592) 225-5481**  
**Email: [epa@epaguyana.org](mailto:epa@epaguyana.org) Website: [www.epaguyana.org](http://www.epaguyana.org)**

2. The information provided in this form must be kept by the holder of the authorization for a period of not less than three years or for such other extended time as the Agency may determine.

**Specific Instructions for Completing Form**

3. **Block A:** Provide the Permit Reference number, the name of the Company, Project address, mailing address (if different). In this section also provide the name, designation, telephone number, email/fax of a contact person.
4. **Block B:** Provide a description of the operation process. Identify all hazardous materials/chemicals used within the operation process. Also provide the number of years the project has been operational.
5. **Block C:** Provide information on **hazardous materials/chemicals used** in the life cycle of the project. Provide the type of hazardous material/chemicals used (see attached list), its hazardous, physical and chemical characteristics (see attached list), the quantity and the type of storage e.g. containers, bags etc.
6. **Block D:** Provides information on the **hazardous wastes generated**. Provide the type of hazardous material/chemicals used (see attached list), its hazardous, physical and chemical characteristics (see attached list), the quantity and the type of storage e.g. containers, bags etc.
7. **Block E:** Once authorized all spills must be reported. Provide information on the date of incident, type and amount of waste spilled, measures taken to mitigate incident.

<b>A. IDENTIFICATION INFORMATION</b>			
Generator's Permit Reference Number:			
Company Name:			
Project Address:		Region	
Mailing Address (if Different):		Region	
<b>Contact Personnel</b>			
Name :			
Designation:			
Telephone number:			
FAX:			
Email:			
<b>B. OPERATION DETAIL</b>			
Brief description of operating process and raw materials (specifically hazardous materials and quantity) used:			
No. of Years of Operation: 1-4 years <input type="checkbox"/> 5-19 years <input type="checkbox"/> over 20 years <input type="checkbox"/>			

<b>C. HAZARDOUS MATERIALS/ CHEMICALS (All Parts of This Section Must Be Completed)</b>						
Types of Hazardous Materials/ Chemical	Hazardous Characteristics	Quantity of Hazardous Materials/Chemical		Physical Characteristics	Chemical Characteristics	Type of Storage
		Mass (kg/gallons)	Volume (m <sup>3</sup> )			
<b>D. HAZARDOUS WASTES (All Parts of this Section Must Be Completed)</b>						
Type of Hazardous Wastes generated	Hazardous Characteristics	Quantity of Hazardous Waste Generated		Physical Characteristics	Chemical Characteristics	Type of Storage
		Mass (kg/gallons)	Volume (m <sup>3</sup> )			
<b>E. SPILLS/CHEMICALS RELEASE</b>						
Date/s of Incident	Type and Approximate Amount of Waste Lost (kg/gallons)			Measures Taken to Resolve the Incident		

<b>OTHER</b>	
Data for off-site Shipment of Waste (transporter and receiver details, location of the off-site facility, etc.)	
Treatment Standard for Waste (if applicable)	
Waste Minimization Efforts (different ways used by the company to reduce the waste generated)	
Details on any Pollution Prevention Plan by the company	
Other Information (e.g. Emergency Response Plan, Occupational Handling Measures, etc.)	

**B.10 Marine Transport Manifest Example**

Esso Exploration and Production Guyana Limited				Noble Don Taylor to Georgetown, Guyana				Date:		Saturday, February 6, 2021							
Well Number:		LIZ_4i11		Transport By:		MV RUSSELL ADAMS		Manifest #:		198		LIZ_4111		MVRUA		Rev1	
Dispatched From:								Dispatched To:									
Location:		Noble Don Taylor				Location:		Georgetown, Guyana									
Attention:		Justin McMillian				Attention:		Johnny Lonsdale									
Email:		justin.c.mcmillian@exxonmobil.com				Email:		johnny.e.lonsdale@exxonmobil.com									
Attention:		Robert Perry				Attention:		Ramps Shorebase GY									
Email:		Logistics_DonTaylor@exxonmobil.com				Email:		shorebase_gy@ampslogistics.com									
Number:		NDT: 1-713-422-9372				Number:		Guy: 592-608-6636									
ETD:		2/6/2021 10:00 Hrs.				ETD:		2/7/2021 00:30 Hrs.									
Dangerous Good Mark				No				MSDS				No					
QA QC Report				No				Inspection Reports				No					
Item #	Qty	Unit	Container # / EEPGL IPES #	Supplier PN	Basket / Cargo Box			Item Type / UN # for DG	Description of Items	Unit Price in USD	Total Price in USD	Supplier	Vendor	Weight in MT	MR #	Voyage # Loaded or Backloaded	
Length	Width	Height	CARGO BELOW LOADED AT NOBLE DON TAYLOR - DISCHARGE IN GEORGETOWN														
21	1	EA	DNVBS00062		8'	6'	6'	Waste Skip	STC	\$2,500.00	\$2,500.00	Tiger Tanks	ExxonMobil	3	LIZ_4111-052	296-SMT	
	3	EA						BAGS	General Trash			Noble	Noble				
22	1	EA	DNVBS0055		8'	6'	6'	Waste Skip	STC	\$2,500.00	\$2,500.00	Tiger Tanks	ExxonMobil	3		198-RUA	
	3	EA						BAGS	General Trash			Noble	Noble				
23	1	EA	709SE-8-16		16'	8'	4'	Cargo Basket	STC	\$12,500.00	\$12,500.00	Tanks-a-lot	Noble Drilling	5.9	HA1-104	296-SMT	
	1	EA		312157					ASSY, DOOR 18-15M NXT 14IN U2BIL - RIGHT HANDED DOOR PN: 20077515 SN: 20014900-782	\$161,958.38	\$161,958.38	Noble Drilling	Noble Drilling				
30	1	EA	ARRU1075180		10'	10'	8'	50 BBL Tank	Full Waste Oil Tank	\$5,000	\$5,000	OEG	ExxonMobil	10		190-RUA	
32	1	EA	SCE163-10		8'	8'	10'	Connex Box	STC	5,000	5,000	Noble	Noble	2.2	HA1-079	180-RUA	

**B.11 Sample Waste/Garbage Record Book**

Ship's Name: \_\_\_\_\_

Official No: \_\_\_\_\_

IMO No: \_\_\_\_\_

Garbage Categories:

- Category 1: Plastics
- Category 2: Floating dunnage, lining, or packing material
- Category 3: Ground-down paper products, rags, glass, metal, bottles, crockery, etc.
- Category 4: Cargo residues, paper products, rags, glass, metal, bottles, crockery, etc.
- Category 5: Food waste
- Category 6: Incinerator ash except from plastic products which may contain toxic or heavy metal residues
- Other Releases - Treated sanitary wastewater, grey water, ballast

**NOTE: The discharge of any garbage other than food waste is prohibited in special areas. Garbage other than Category 1 transferred to reception facilities need only be listed as a total estimated amount.**

Waste Type	Date/Time	Position of the Ship	Estimated Amount of Waste Generated Solid (m3); Liquid (L)	Category 1-6	Estimated Amount of Food Waste Comminuted and Discharged (m3)	Estimated Amount Transferred to Reception Facilities or to Other Ship Solid (m3); Liquid (L)	Estimated Amount Incinerated Solid (m3); Liquid (L)	Certification / Signature
Food Waste	1/1/17; 13:00		2 m3	5	2 m3	NA	NA	
Paper Products	1/15/17; 07:30		15 m3	3	NA	NA	15 m3	
Used Oil	2/20/17; 15:20		50 L	4	NA	50 L		

Master's Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**B.12 Sample Oil Record Book Form**

Ship's Name: \_\_\_\_\_

Distinctive Number or Letters: \_\_\_\_\_

Gross Tonnage: \_\_\_\_\_

Period From: \_\_\_\_\_ To: \_\_\_\_\_

**Machinery Space Operations (All Ships) or Cargo / Ballast Operations (Oil Tankers)***(Delete that operation above which does not apply)*

Date	Code Letter	Item Number	Record of Operations / Signature of Officer in Charge

Master's Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## APPENDIX C WASTE ANALYSIS STUDY INFORMATION

### C.1 Waste Analysis Study - Terms of Reference – CWMP Crosswalk Table

Terms of Reference Section/Title	Summary	Waste Analysis Study Section	CWMP Section	WB/IFC International Guidelines Reference Section 1
1. Introduction	Purpose and objective of waste analysis study (WAS) in accordance with Payara Environmental Protection Act (EPA) Environmental Permit #20181204-PPOIX.	1		
2.1 Objective	1. Characterize EEPGL waste streams and provide waste profiles including concentration and composition based on best information available.	4.1.2	6.1.2	1.1.3 –Offshore; 1.1 – Onshore; 1.6 – General; 1.1.2, 1.1.3 – Facilities; 1.0 - Thermal
	2. Provide waste treatment flow diagrams covering each waste stream and standardized waste manifest form(s).	4.1.1	Appendix B Sections B.5, B.6, B.7	1.1.3 – Offshore; 1.1 – Onshore; 1.6 - General
	3. Evaluate EEPGL waste streams, estimated volumes, waste treatment methodologies, and waste disposal methods.	4.1.3, 4.3, 4.3.1, 4.3.2, 4.3.3, 5	Appendix B Section B.1	1.1.5 – Ports; 1.6 – General; 1.0 - Thermal
	4. Provide anticipated EEPGL waste volumes for permitted projects (Liza Phase 1, Liza Phase 2 and Payara) from 2021 - 2045 to be produced and disposed.	5	Appendix B Section B.1	1.6 - General
	5. Provide applicable international best practices and standards for the treatment, transport and disposal of waste, and auditing waste treatment providers and disposal facilities.	3.1, 4.4	9, 10	1.6 - General
	6. Conduct best available technology evaluation for all waste processing and treatment equipment and provide alternatives where necessary to identify the most appropriate industry-proven technologies, consider technical and cost feasibility, are used to process and treat each waste stream.	4.3.2, 4.3.3	Appendix B Section B.1	

Terms of Reference Section/Title	Summary	Waste Analysis Study Section	CWMP Section	WB/IFC International Guidelines Reference Section 1
	7. Develop cost/benefits analyses for third-party laboratory (ies), recycling opportunities, capacity building workshops, new landfill, vessel tank cleaning capability and drilling/mud plant waste minimization strategy and alternative technologies.	7.4, 7.3, 7.1, 7.2.1, 7.2.2, 6.1, 7.2.3	3	1.6 – General; 1.1.5 – Ports; 1.1.3 – Offshore; 1.1 - Onshore
2.2.1. Waste Stream Identification and Profiles	1. Point(s) of generation along with composition, concentration, and quantity generated.	4.1, 4.1.1, 4.1.3	6.6.1; Figure 6-3; Appendix B Section B.1	1.6 – General; 1.1.5 – Ports
	2. The steps taken to minimize the amount of waste generated from exploration and production activities.	6	3	1.6 – General; 1.1.5 – Ports; 1.1.3 – Offshore; 1.1 - Onshore
	3. A description of the procedures implemented for waste characterization and segregation.	4.1.2, 4.2.2	6.1.2, 6.2.2	1.6 – General; 1.1.3 - Offshore; 1.1-Onshore
	4. A profile of each waste stream generated which will detail the typical material composition of the waste streams, i.e. the physical and hazardous characteristics and important chemical constituents. Each waste profile will be documented on the EPA approved “Waste Profile Sheet.”	4.1.3	Appendix B Section B.1	
2.2.2. Waste Management— Waste Generation	1. Estimated waste volumes per annum for each of the waste streams identified in the document.	4.1.3		
	2. The design of storage areas on each FPSO and drill ship for waste compatibility (in cases where various waste streams may be mixed) and pollution control.	4.2.2.1, 4.2.2.2		1.6 – General; 1.1.5 – Ports
	3. A description of the pre-treatment activities, with a process flow diagram, completed by EEPGL before the materials are transported to third party waste treatment facilities.	6.2		
2.2.2. Waste Management—	1. The procedures implemented for proper packaging, labelling and storage of waste before transport.	4.2.2, 4.2.3, 4.2.4	6.2.1	1.6 – General; 1.1 – Onshore; 1.1.2, 1.1.3 - Facilities

Terms of Reference Section/Title	Summary	Waste Analysis Study Section	CWMP Section	WB/IFC International Guidelines Reference Section 1
Waste Transportation	2. The procedures implemented to ensure waste compatibility in transport containers.	4.1.2, 4.2.1, 4.2.2, 4.2.4	6.2.1	1.6 – General; 1.1.2 - Facilities
	3. A description of the waste tracking or manifest systems used by EEPGL to regulate and monitor the transportation of waste from production and exploration vessels to the onshore treatment and disposal facilities, including contingency plans.	4.2.3	6.2.3	1.6 – General; 1.1 – Onshore; 1.1.3 - Offshore
	4. Provide applicable international standards and best practices regarding waste transportation and justifications for the methods/procedures currently implemented by EEPGL.	3.1		
	5. EEPGL's storage and transportation criteria based on profile of each waste stream.	4.2.1, 4.2.2, 4.2.4		
2.2.2. Waste Management— Waste Treatment and Disposal	1. Treatment methods/technologies (for both onshore and offshore treatment), which will include a detailed technical description of each treatment process accompanied by flow diagram(s), and a profile for each waste stream.	4.3, 4.3.1, 4.3.2, 4.3.3, 4.1, 4.1.3	6.3.1, 6.3.2.2	1.6 – General; 1.1.2, 1.1.3 - Facilities
	2. If the waste stream is discharged offshore, provide waste profile along with the quantity and frequency of the discharge.	4.1, 4.1.3		
	3. If the waste stream is disposed of onshore provide a waste profile, quantity, frequency of disposal and disposal location.	4.1, 4.1.3, 4.3, 4.3.2	Appendix B Section B.1	1.6 - General
	4. The waste acceptance criteria provided to EEPGL from third party Logistics, third party waste treatment facility and the third party Landfill, as applicable.	*	6.1.2	1.1.2 - Facilities
	5. EEPGL's treatment criteria based on profile of each waste stream; Treatment method (incineration, neutralization, stabilization, etc.) selected will be based on hazardous characteristics (pH, flash point, metal content,	4.1.3, 4.3.1, 4.3.1.1, 4.3.1.2, 4.3.1.3, 4.3.1.4, 4.3.1.5, 4.3.3.1	Appendix B Section B.1	

Terms of Reference Section/Title	Summary	Waste Analysis Study Section	CWMP Section	WB/IFC International Guidelines Reference Section 1
	etc.) of each waste stream. Treatment criteria will be described for each treatment method.			
	6. EEPGL's disposal criteria based on profile of each waste stream after treatment; final disposal or discharge criteria will be recommended for each treatment method (incineration, solidification, container cleaning, etc.).	**		
	7. Provide applicable international standards and best practices regarding treatment criteria for the waste streams, and justifications for the methods/procedures employed by EEPGL, including an evaluation of the methods proposed by its Third Parties.	3.1		
	8. Contingency plan(s) for the treatment and disposal of waste should there be an unplanned event rendering the treatment and/or disposal facility inoperable.	4.3.2, 4.3.2.3, 4.3.2.4	7	1.1.6 – Offshore; 1.1 – Onshore; 1.1.2 - Facilities
	9. An evaluation of local and regional institutions or environmental laboratory services, suitably qualified and capable of conducting monitoring and verification analyses of the waste streams of the project.	7.4		
	10. The procedures implemented for the treatment and disposal of waste rejected from third party companies.	4.3.2.3, 4.3.2.4		
	11. Standards and best practices currently being adhered to, in regards to waste generation, treatment, and disposal (both onshore and offshore).	3.1, 4.1.2	10	
2.2.2. Waste Management— Waste Facilities	Existing third-party waste treatment infrastructure.	4.3.2	6.3.2.1; Figure 6-3	1.6 – General; 1.1.2, 1.1.3 - Facilities
	Additional facility for waste treatment capacity in development.	4.3.3		
	Third-party landfill infrastructure.	7.2, 7.2.1	Figure 6-3	1.6 – General; 1.1.2, 1.1.3 - Facilities

Terms of Reference Section/Title	Summary	Waste Analysis Study Section	CWMP Section	WB/IFC International Guidelines Reference Section 1
	Scrap metal recycling infrastructure.	7.2, 4.3.2.1	Figure 6-3	1.6 – General; 1.1.3 - Facilities
	Temporary waste storage areas (pre-treatment and post-treatment wastes).	4.3.2, 4.3.2.3		1.6 General; 1.1.2, 1.1.3 - Facilities
2.2.3. Auditing	EEPGL will provide templates/samples of the inspection checklist based off the approved Waste Management Plan. The completed audit can be pass/fail or risk assessed scored based on variable components. Recommendations or audit frequency are often determined by audit results.	4.4		
	The study will include an evaluation of international standards and best practices for auditing waste treatment providers and disposal facilities.	4.4	9	
	This part of the Study will also include a discussion of appropriate monitoring guidelines against which contractor performance will be reviewed.	4.4	8.1; Table 8-1	1.6 – General; 1.1.2 - Facilities
2.2.4. Anticipated Waste Volumes	A schedule of anticipated EEPGL waste volumes from permitted projects from 2021–2045 to be produced and disposed for the following items: Estimated Annual Hazardous Waste Volumes. Estimated Annual Non-hazardous Waste Volumes . Waste Estimates from third party waste management facility to landfill; these estimates will include non-hazardous waste stream volumes for direct landfill. Hazardous waste stream volumes for treatment will be coordinated with the waste treatment facility.	5  ***		1.6 – General; 1.1.5 – Ports  1.1.2 - Facilities
	EEPGL will make recommendations for Analytical Standards, and Disposal Treatment Standards based on treatment type.	4.1.2, 4.3.2		
2.2.5. Waste Management	Cost/Benefits analysis of: 1. Regulatory structure/agency capacity.	7.1		

Terms of Reference Section/Title	Summary	Waste Analysis Study Section	CWMP Section	WB/IFC International Guidelines Reference Section <sup>1</sup>
Capacity and Cost/Benefit Analysis	2. Planning collaborative design construction, and project management expertise for a new landfill.	7.2.1		
	3. Developing Vessel Tank Cleaning Capability in Guyana.	7.2.2		1.6 - General
	4. Planning of Drilling Fluids and Mud Plant Waste Minimization Strategy: System integration, Waste reduction, recycling.	6.1		1.6 - General
	5. An evaluation to determine the cost of alternative technology.	7.2.3		
	6. Reduce/reuse/recycle education and infrastructure.	7.3		
	7. Support services.	7.4		

<sup>1</sup> WB/IFC Guidelines include: General Environmental, Health and Safety Guidelines of 2007 (General); Environmental, Health and Safety Guidelines for Offshore Oil and Gas Development of 2015 (Offshore); Environmental, Health and Safety Guidelines for Onshore Oil and Gas Development of 2015 (Onshore); Environmental, Health and Safety Guidelines for Waste Management Facilities of 2007 (Facilities); Environmental, Health and Safety Guidelines for Thermal Power Plants of 2008 (Thermal) and Environmental, Health and Safety Guidelines for Ports, Harbors and Terminals of 2017 (Ports)

## **C.2 Cradle to Grave Waste Analysis Study**

Cradle to Grave Waste Analysis Study approved by the Environmental Protection Agency (EPA) on September 13, 2021.

### CRADLE TO GRAVE WASTE ANALYSIS STUDY

# **Cradle to Grave Waste Analysis Study**

Payara Project

June 2021

Esso Exploration and Production Guyana Limited

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## Acronyms and Abbreviations

<b>Name</b>	<b>Description</b>
°C	degrees Celsius
ADR	International Carriage of Dangerous Goods by Road
AFR	alternative fuels and raw materials
ANTT	National Land Transport Agency (Agências Nacionais de Transporte Terrestre)
AWSL	Approved Waste Site List
BAT	best available technology
bbl	barrels
CBA	cost / benefits analysis
CCU	cargo carrying unit
CFR	Code of Federal Regulation
Dev Well	Development Wells
DOECAP	U.S. Department of Energy Consolidated Audit Program
DOT	U.S. Department of Transportation
E&A	exploration and appraisal
E&P	exploration and production
EBD	East Bank Demerara
Ecotox	Ecotox Environmental Services Ltd.
EEPGL	Esso Exploration and Production Guyana Limited
EHS	environmental, health, and safety
EIA	Environmental Impact Assessment
EII	Eternity Investment Inc.
EPA	Guyana Environmental Protection Agency
EU	European Union
EWMSG	Environmental Waste Management Services Guyana Inc.
FPSO	floating, production, storage and offloading vessel
FSV	fast supply vessel
GSEC	Ground Structures Engineering Consultants Ltd.
GWI	Guyana Water Incorporated
GYSBI	Guyana Shore Base Inc.
HBL	Haags Bosch Landfill
HEPA	high-efficiency particulate absorbing/arrestance
HTDU	Hot Oil Thermal Desorption Unit
IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos
IBC	international bulk chemical
IFC	International Finance Corporation
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
IOGP	International Association of Oil & Gas Producers
ISO	International Organization for Standardization
IWMF	integrated waste management facility
kg	kilogram
km	kilometer
LMP	liquid mud plant
LP1	Liza Phase 1
LP2	Liza Phase 2
m <sup>2</sup>	square meters
m <sup>3</sup>	cubic meters
MARPOL 73/78	International Convention for the Prevention of Pollution by Ships, 1973, as modified by the Protocol of 1978
MEPC	Marine Environment Protection Committee

<b>Name</b>	<b>Description</b>
MIST	Microemulsion Injection and Separations Technology
MPV	multipurpose vessel
MSD	marine sanitation device
MSV	marine support vessel
MT	metric tons
MTR	waste transport manifest
NAF	non-aqueous fluid
NORM	Naturally Occurring Radioactive Material
OIW	oil in water
OIWA	oil in water analyzers
OWMS	Oilfield Waste Management Services
OWS	oily water separator
PSV	platform supply vessel
POTW	publicly owned treatment works
ppm	parts per million
RAMPS	RAMPS Logistics
RCRA	Resource Conservation and Recovery Act
SDS	safety data sheet
SES	Sustainable Environmental Services
SSH&E	Safety, Security, Health & Environment
Study	Cradle to Grave Waste Analysis Study
SURF	subsea umbilicals, risers, and flowlines
TCLP	Toxicity Characteristic Leaching Procedure
TCW	treatment, completion, and workover
TOG	total oil and grease
TOR	Terms of Reference
TPH	total petroleum hydrocarbons
TRG	Tiger Rentals Guyana
TSDF	treatment, storage, or disposal facility
U.S.	United States
UK	United Kingdom
UN	United Nations
USEPA	United States Environmental Protection Agency
VIR	vertical infrared desorption
WBG	World Bank Group
WFAA	Waste Facility Audit Association
WMP	Waste Management Plan
WMT	Waste Management Tool
WPS	Waste Profile Sheet
WRAP	Waste Receiver Assessment Program

## 1. EXECUTIVE SUMMARY

This Cradle to Grave Waste Analysis Study (Study) was conducted to provide a holistic, beginning-to-end overview of waste generation and management resulting from Esso Exploration and Production Guyana Limited's (EEPGL) projects in Guyana. The Study covers waste streams generated offshore during exploration, development and production operations, including points of generation, composition and concentrations, transportation, treatment method processes, disposal locations, anticipated disposal frequencies, and application of relevant international standards and best practices. This Study addresses each of the seven objectives set forth in Section 2.1 of the January 2021 Terms of Reference (TOR), as well as specific Study topics identified in the remaining sections of the TOR (EEPGL 2021). The methodologies used in the Study are set forth as appropriate in each section of the Study or are reflected as a part of a table or graph.

The **highlights** of the Study are as follows:

- Opening the Haags Bosch Landfill (HBL) Cell 2 will provide adequate short term disposal capacity, but a longer-term strategy needs to be evaluated and implemented. Consideration of an engineered landfill for industrial waste needs to be evaluated.
- Waste volumes will increase as a result of additional floating, production, storage and offloading (FPSO) vessels, drill ships for exploration and appraisal (E&A) and development wells (Dev Wells), liquid mud plants (LMP) and marine support vessels (MSV) tank cleaning services transitioning from Trinidad to Guyana.
- Third-party waste treatment capacity meets estimated project demands and capacity will be evaluated annually. Waste oil recycling options are needed in Guyana to address the growing volumes generated from consumer vehicles, industrial generators, marine vessels, and oil and gas industry.
- A cost/benefits analysis (CBA) for specific recycling infrastructure related to potential high volume recyclables such as wood, plastic, and cardboard/paper needs to be conducted.
- Practicable technology is currently utilized at Tiger Rentals Guyana (TRG), and additional technology improvements will be utilized at Sustainable Environmental Services (SES), which will operate an integrated waste treatment facility starting this year. SES will operate some Best Available Technology (BAT) with their treatment processes.

The **recommendations** of the Study include the following:

- Continue implementing international waste management standards and best practices in working with the Guyana Environmental Protection Agency (EPA) on updating the regulatory framework in Guyana.
- Based on Government priorities, align on issues and conduct focused CBAs and prioritize capacity building such as developing an environmental analytical laboratory in Guyana.
- Conduct workshops with relevant, multiple stakeholders to enhance collaboration with the EPA.
- The development of the Comprehensive Waste Management Plan (WMP) will account for lessons learned from data efficiency reviews, capturing waste volume estimate revisions, and suggesting potential improvement opportunities.

## 2. INTRODUCTION

EEPGL, which is the operator of the Stabroek, Canje, and Kaieteur Blocks offshore Guyana, is engaged in numerous ongoing exploration and development operations offshore, and began production of the Liza Phase 1 (LP1) Project in December 2019 with the deployment of the first FPSO vessel in Guyana. EEPGL has obtained additional Production Licenses and Environmental Permits to develop and operate the Liza Phase 2 (LP2) Project and the Payara Project, which will result in a second and third FPSO. EEPGL's various exploration and development projects result in generation of certain wastes that must be managed by EEPGL and its contractors, consistent with required WMPs and applicable regulations and industry best practices (EEPGL 2017, 2018, 2020e, 2020f, 2020g, 2020h).

## 3. STUDY OBJECTIVE AND SCOPE

This Study is developed pursuant to the requirements of the Payara EPA Environmental Permit #20181204-PPOIX dated 24 September 2020 (EPA 2020). Conditions in the EPA Environmental Permit are summarized herein.

*5.20 During the lifetime of the Project, the Permit Holder shall be responsible for stewarding and auditing the activities of all downstream subcontractors handling Project waste streams, and shall contractually require them to conduct all treatment and disposal of such waste streams in keeping with the EPA approved Waste Management Plan included within the Project EIA.*

*5.21 Within thirty (30) days of issuance of the Permit, the Permit Holder shall submit to the EPA for approval the Terms of Reference for the conduct of a "cradle to grave" waste analysis study, which must include factors related to i) environment, ii) management, iii) auditing, iv) schedule and v) cost/benefits. The "cradle to grave" waste analysis study must be submitted to the EPA for approval within sixty (60) days of the EPA's approval of the Terms of Reference.*

*5.22 The approved "cradle to grave" waste analysis study must form part of the revised Waste Management Plan which shall be submitted within one (1) month of submission of the "cradle to grave" waste analysis approved study.*

*5.23 The Revised Waste Management Plan referenced in condition 5.22 shall be implemented during the lifetime of the project.*

Given these permit conditions, the primary objective of this Study is to provide a "cradle to grave" analysis of waste management practices for the project.

Consistent with the TOR and EPA's 28 May 2021 comments on the March 2021 draft Study, this final Study:

- Characterizes EEPGL waste streams and provide waste profiles including concentration and composition based on best information available;
- Supplies a third-party waste management facility's Waste Acceptance Criteria (Appendix E), Waste Sampling Plan (Appendix F);
- References a third-party waste management facility's 2020 Annual Environmental Report that includes landfill volumes;
- Provides Safety Data Sheets (Appendix I) and analytical results for waste streams (Appendix J);

- Provides waste treatment flow diagrams covering each waste stream and standardized waste manifest form(s);
- Evaluates EEPGL waste streams, estimated volumes, waste treatment methodologies and waste disposal methods;
- Provides anticipated EEPGL waste volumes from 2021–2045 to be generated and managed;
- Provides applicable international best practices and standards for the treatment, transport and disposal of waste, and auditing waste treatment providers and disposal facilities;
- Conducts BAT evaluation for all waste processing and treatment equipment and provides alternatives where necessary to ensure the most appropriate industry-proven technologies are used to process and treat each waste stream; and
- Analyzes capacity and need for third-party laboratory(ies), recycling opportunities, capacity building workshops, new landfill, vessel tank cleaning capability and drilling/mud plant waste minimization strategy and alternative technologies; and recommends the EPA and EEPGL identify and prioritize where detailed CBAs are needed to support capacity building decisions.

EEPGL has previously submitted cradle to grave waste analysis information between June and November 2020 (EEPGL 2020b, 2020c, 2020d, 2020e). Submittals have consisted of presentations, waste and treatment equipment process flow diagrams, a Waste Management Tool (WMT), a sample Manifest form and Waste Profile Sheets (WPSs), treatment and discharge best practices, and comprehensive tables that include waste streams, volume, and treatment, all of which also serve as mechanisms of waste management capacity building. This Study includes and supplements the information previously submitted consistent with the objectives in Section 2.1 of the TOR.

See Appendix A for the TOR Requirements Crosswalk Table, which is a reference index that provides the section number(s) in this Study where each element of the TOR is addressed.

### **3.1 Waste Management—International Conventions, Regulations, Standards, Guidelines, and Best Practices**

The waste management activities described in this document for the various offshore and onshore operations are conducted in accordance with both Guyanese regulations and various applicable international conventions, regulations, standards, and guidelines/best practices, including ExxonMobil's best practices. Some of these conventions, regulations, standards, and guidelines are referenced in this report.

The various waste management operations include:

1. General Maritime Waste Management Operations;
2. Maritime Transport of Waste Operations;
3. Offshore Oil and Gas Exploration and Production (E&P) Waste Management Operations;
4. Onshore Waste Management Operations; and
5. Land Transport of Waste Operations.

The following discussion identifies and briefly describes the international conventions/regulations/standards/guidelines/best practices that are applicable to these waste management operations.

### 3.1.1 General Maritime Waste Management Operations

The primary international convention governing general maritime waste management operations (and applicable to all vessels involved with offshore operations) is the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78) (IMO 2019). MARPOL, which is an international marine environmental convention that includes regulations aimed at preventing and minimizing pollution from ships, has technical annexes:

- Annex I—Regulations for the Prevention of Pollution by Oil—this annex specifies tanker design features, treatment of bilge, ballast, and tank cleaning waters, and documentation of oily wastewater discharges.
- Annex II—Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk—this annex details discharge criteria for noxious liquids, discharge only to reception facilities, and the international bulk chemical code (IBC Code).
- Annex III—Prevention of Pollution by Harmful Substances Carried in Packaged Form—this annex contains requirements for standards on packing, marking, labeling, documentation, stowage, quantity subtraction, division and notifications for preventing pollution by harmful substances. The Annex is in line with the procedures detailed in the International Maritime Dangerous Goods (IMDG) Code, which has been expanded to include marine pollutants (IMO 2018).
- Annex IV—Prevention of Pollution by Sewage from Ships—this annex includes requirements to control pollution by sewer discharge, and also includes International Sewage Pollution Certification requirements for marine sanitation devices (MSD).
- Annex V—Prevention of Pollution by Garbage from Ships—this annex describes the various types of garbage (including food) and other marine debris that can be disposed at sea.
- Annex VI—Prevention of Air Pollution from Ships—this annex introduces requirements to regulate air pollution emitted from ships and from shipboard incineration.

In addition to MARPOL, the International Maritime Organization (IMO) Marine Environment Protection Committee (MEPC) also periodically issues resolutions that supplement the MARPOL convention. Examples of pertinent resolutions include Standard Specification for Shipboard Incinerators (resolution MEPC.244(66)) that covers the design, manufacture, performance, operation and testing of incinerators to incinerate garbage and other shipboard waste (IMO 2014); Revised Guidelines for Systems for Handling Oily Wastes in Machinery Spaces of Ships (MEPC.1/Circ.511) (IMO 2006); and Guidelines for the Development of Garbage Management Plans (resolution MEPC.220(63)) (IMO 2012).

Additional IMO/MARPOL information can be found at the following link: <https://www.imo.org/en>.

### 3.1.2 Maritime Transport of Waste Operations

Maritime transport of wastes (hazardous/dangerous) worldwide is generally governed by the IMO IMDG Code (2018 edition, including the most recent Amendment 39-18—valid through 31 May 2022).<sup>1</sup>

The IMDG Code addresses classifications of dangerous goods, packing and tank provisions, consignment procedures, construction and testing of packaging, IBCs, portable tanks, etc., and transport operations. The code also includes the dangerous goods listing. Additional details about the IMDG Code can be found at <https://www.imo.org/en/publications/Pages/IMDG%20Code.aspx>

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<sup>1</sup> The IMDG Code, 2020 Edition (including Amendment 40-20) comes into force on 1 June 2022 and may be applied voluntarily as from 1 January 2021.

This standard applies directly to the classification and packaging of dangerous goods on ships, the documentation required to track maritime transport of dangerous goods, as well as actual dangerous goods transport operations, including loading and unloading.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention 1989) was adopted on 22 March 1989. At present, the only means for transboundary movement of wastes from Guyana is via maritime transport. The Basel Convention annexes provide definitions for hazardous wastes, as well as identify operations that are understood to be disposal or recovery. The convention also identifies conditions on the import and export of hazardous wastes, including requirements for notice, consent, and tracking for movement of wastes across international boundaries. EEPGL uses the Basel Convention annexes to characterize waste streams for its WPSs. Currently, the convention is not relevant as EEPGL does not import or export hazardous wastes. See the following web link for additional information about the Basel Convention: <http://www.basel.int/>.

### **3.1.3 Offshore Oil and Gas Exploration and Production Waste Management Operations**

There are no international regulations that specifically address offshore E&P waste management operations—these activities are regulated by the relevant government entities with jurisdictions over territorial waters. For example, the United States EPA (USEPA) has promulgated Oil and Gas Extraction Effluent Guidelines and Standards (40 Code of Federal Regulation [CFR] Part 435), and these requirements are incorporated into National Pollutant Discharge Elimination System discharge permits issued for offshore oil and gas projects within 200 miles of shore.

However, there are various guidelines for environmental, health, and safety (EHS) that have been developed by entities with international interests and influence, including the following:

- World Bank Group (WBG) and International Finance Corporation (IFC) EHS Guidelines for Offshore Oil and Gas Development (2015)—This guidance document includes information relevant to exploratory and production drilling, development and production activities, offshore pipeline operations, offshore transportation, tanker loading and unloading, ancillary and support operations, and decommissioning. It also addresses potential onshore impacts that may result from offshore oil and gas activities (WBG and IFC 2015). See: <http://documents1.worldbank.org/curated/en/378221479466912449/pdf/110348-FINAL-Jun-2015-Offshore-Oil-and-Gas-EHS-Guideline-PUBLIC.pdf>.
- International Association of Oil & Gas Producers (IOGP) and International Petroleum Industry Environmental Conservation Association—Environmental Management in the Upstream Oil and Gas Industry (IOGP and IPIECA 2020)—this guidance document, which was prepared with input and feedback from the United Nations Environment Programme, details all environmental management aspects related to upstream oil and gas development, including best practice methods for identifying and mitigating environmental impacts related to offshore and onshore discharges and wastes generated from E&P activities. See: <https://www.ipieca.org/resources/good-practice/environmental-management-in-the-upstream-oil-and-gas-industry/>.
- IOGP—Managing Naturally Occurring Radioactive Material (NORM) in the oil and gas industry (2016)—this report provides guidance and general information on the management of process streams or equipment contaminated with NORM, including transport of NORM, management of NORM and permanent disposal options (IOGP and IPIECA 2016). See: <https://www.iogp.org/bookstore/product/412/>.

### 3.1.4 Onshore Waste Management Operations

Onshore waste management operations are highly variable worldwide and range from simple to complex in their technical design and implementation. There are no international regulations applicable to onshore waste management operations nor are there any international treatment standards, as these waste management operations are regulated by the relevant government entities with jurisdictions. For example, dozens of industrialized nations throughout North America, Europe, and Asia have promulgated treatment standards applicable to waste management operations, such as the United States (U.S.) Resource Conservation and Recovery Act (RCRA) regulations (<https://www.epa.gov/rcra>), which include treatment standards and limits for a wide variety of waste treatment processes and discharges (USEPA Undated); and the European Union (EU) emission and efficiency standards for waste treatment BAT Reference Document for Waste Treatment ([https://eur-lex.europa.eu/eli/dec\\_impl/2018/1147/oj](https://eur-lex.europa.eu/eli/dec_impl/2018/1147/oj)) (European Commission 2018). However, there are various guidelines for EHS for onshore waste management operations that have been developed by entities with international interests and influence, including the following:

- WBG and IFC EHS Guidelines (2007)—this guidance document is a technical reference document with general examples of Good International Industry Practice. These guidelines are referenced by the industry specific guidelines, and include waste management aspects, including wastewater and ambient water quality, hazardous materials management and waste management (WBG and IFC 2007a). See: <https://www.ifc.org/wps/wcm/connect/29f5137d-6e17-4660-b1f9-02bf561935e5/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES&CVID=jOWim3p>.
- WBG and IFC EHS Guidelines for Onshore Oil and Gas Development (2007)—this guidance document includes sections on the impacts and management of wastewater/effluent discharges and solid and liquid waste management (WBG and IFC 2007b). See: <http://documents1.worldbank.org/curated/en/858751486372860509/pdf/112103-ENGLISH-Onshore-Oil-and-Gas-Development-PUBLIC.pdf>.
- WBG and IFC EHS Guidelines for Waste Management Facilities (2007)—this guidance document provides additional specific guidelines regarding waste classification, waste receipt, unloading, processing and storage, and various treatment technologies, including performance indicators and monitoring approaches. This document covers the most common commercial methods of waste management. It does not cover other activities such as the management of radioactive wastes, co-incineration at combustion plants, or deep well injection (WBG and IFC 2007c). See: <https://www.ifc.org/wps/wcm/connect/5b05bf0e-1726-42b1-b7c9-33c7b46ddda8/Final%2B-%2BWaste%2BManagement%2BFacilities.pdf?MOD=AJPERES&CVID=jqeDbH3&id=1323162538174>.
- IOGP—Guidelines for Waste Management—with special focus on areas with limited infrastructure (2008)—this report provides guidance and general information on waste management in areas with less established oil and gas industry activity (IOGP 2008). See: <https://www.iogp.org/bookstore/product/guidelines-for-waste-management-with-special-focus-on-areas-with-limited-infrastructure/>.

### 3.1.5 Land Transport of Waste Operations

There is currently no international standard accepted worldwide addressing the land transport of dangerous goods (including hazardous wastes and materials) which are similar to the IMDG standards established for international maritime transport of dangerous goods. However, the United Nations (UN) Recommendations on the Transport of Dangerous Goods are contained in the UN Model Regulations, which are prepared by the Subcommittee of Experts on the Transport of Dangerous Goods of the United Nations Economic and Social Council. These recommendations have been adopted by some, but not all

nation states. See the following link for details about the most recent version of these UN Model Regulations (Rev. 21 [2019]): <https://unece.org/rev-21-2019><https://unece.org/rev-21-2019>.

Land transport laws and regulations have been widely established worldwide by countries and unions to manage the risks posed by the transportation of dangerous goods. For reference, the following are examples of three land transport laws/regulation schemes currently in use regarding the transport of dangerous goods:

- EU—Dangerous goods transport in the EU is regulated under EU Directive 2008/68—Inland Transport of Dangerous Goods (transport by road, rail, and inland waterways) (European Commission 2008). The road transport aspect of this directive is based on the International Carriage of Dangerous Goods by Road (ADR) Agreement (formally known as the Agreement of 30 September 1957 concerning the International Carriage of Dangerous Goods by Road), the most recent version of which entered into force on 1 January 2021 (UNECE 2021). See: <https://unece.org/transportdangerous-goods/adr-2021-files>.

Annex A of the agreement includes provisions regarding classification, packaging and labeling, consignment, and carriage, loading, unloading, and handling of dangerous goods/hazardous materials. Annex B include the provisions concerning the transport equipment and transport operations of dangerous goods/hazardous materials. The ADR regulations are currently adopted by all EU and other European countries, as well as a few non-EU countries, including French Guiana, Nigeria, Tunisia, Morocco, Western Sahara, Russia, Turkey, Azerbaijan, Georgia, Kazakhstan, and Tajikistan.

- U.S.—Hazardous waste transport in the U.S. is regulated under RCRA Subtitle C, PART 263—STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE. See: <https://www.ecfr.gov/cgi-bin/text-idx?SID=a416df9b39e7a05fc0a655078320d627&mc=true&node=pt40.26.263&rgn=div5>.

These regulations define a hazardous waste transporter as any person engaged in the off-site transportation of the hazardous waste within the U.S. Off-site transportation of hazardous waste includes shipments from a hazardous waste generator's facility or property to another treatment, storage, or disposal facility (TSDF). The federal RCRA regulations have adopted portions of the U.S. Department of Transportation (DOT) regulations for the safe transport of DOT classified hazardous materials. The DOT references include requirements for labeling, marking, placarding, container requirements, and spill response requirements. Finally, individual states, and even some local municipalities within the U.S. also have their own waste transport regulations, which are allowed to be stricter, but not less restrictive, than the federal regulations. Many of the state and local regulations also formally regulate non-hazardous waste transport.

- Brazil—The transportation of dangerous goods in Brazil is regulated under the National Land Transport Agency (ANTT—Agências Nacionais de Transporte Terrestre). On 14 December 2016, ANTT approved Resolution 5.232 adopting the United Nations Recommendations on the Transport of Dangerous Goods. The transport of dangerous goods in Brazil is further regulated by IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos) Normative Instruction 05/2012, which regulates federal and interstate maritime and interstate highway transport activity. Under this instruction, companies must obtain an environmental authorization for the transportation of dangerous products whenever such transportation encompasses more than one state. In addition, activity specifically within the boundaries of any of the Brazilian states must follow the regulations established by the respective state environmental agency. The IBAMA normative instruction references the ANTT requirements for land transport.

The Brazil Ministry of Environment also recently enacted Ordinance No. 280/2020 (June 2020) which established the waste transport manifest (MTR) and the National Solid Waste Inventory. Ordinance No. 280/2020 determines that the solid waste generators must register the handling of their waste in the MTR, establishing to all members of the chain (generator, transporter, temporary storage, if applicable, and the final receiver) the obligation to certify, successively, the generation, storage, transport and receipt of solid waste until its environmentally adequate final destination.

#### 4. EEPGL'S CRADLE TO GRAVE WASTE MANAGEMENT APPROACH

A cradle to grave waste management analysis is defined by the EPA as the full life cycle assessment of waste from the point of generation of a waste or material to the final recycling, reuse, treatment, or disposal. Waste treatment may also result in the generation of new residual wastes to be considered. The cradle to grave waste management process should be viewed as an evergreen process, and the processes and tools used to manage waste should be sufficiently flexible for continued application if wastes types or volumes change, treatment technologies evolve or Guyana's governance framework is modified.

This section steps through each major phase in the waste management process as shown on Figure 4-1.

**Figure 4-1: Key Waste Management Elements**



In addition, this section also describes the auditing process for the waste treatment and disposal operations.

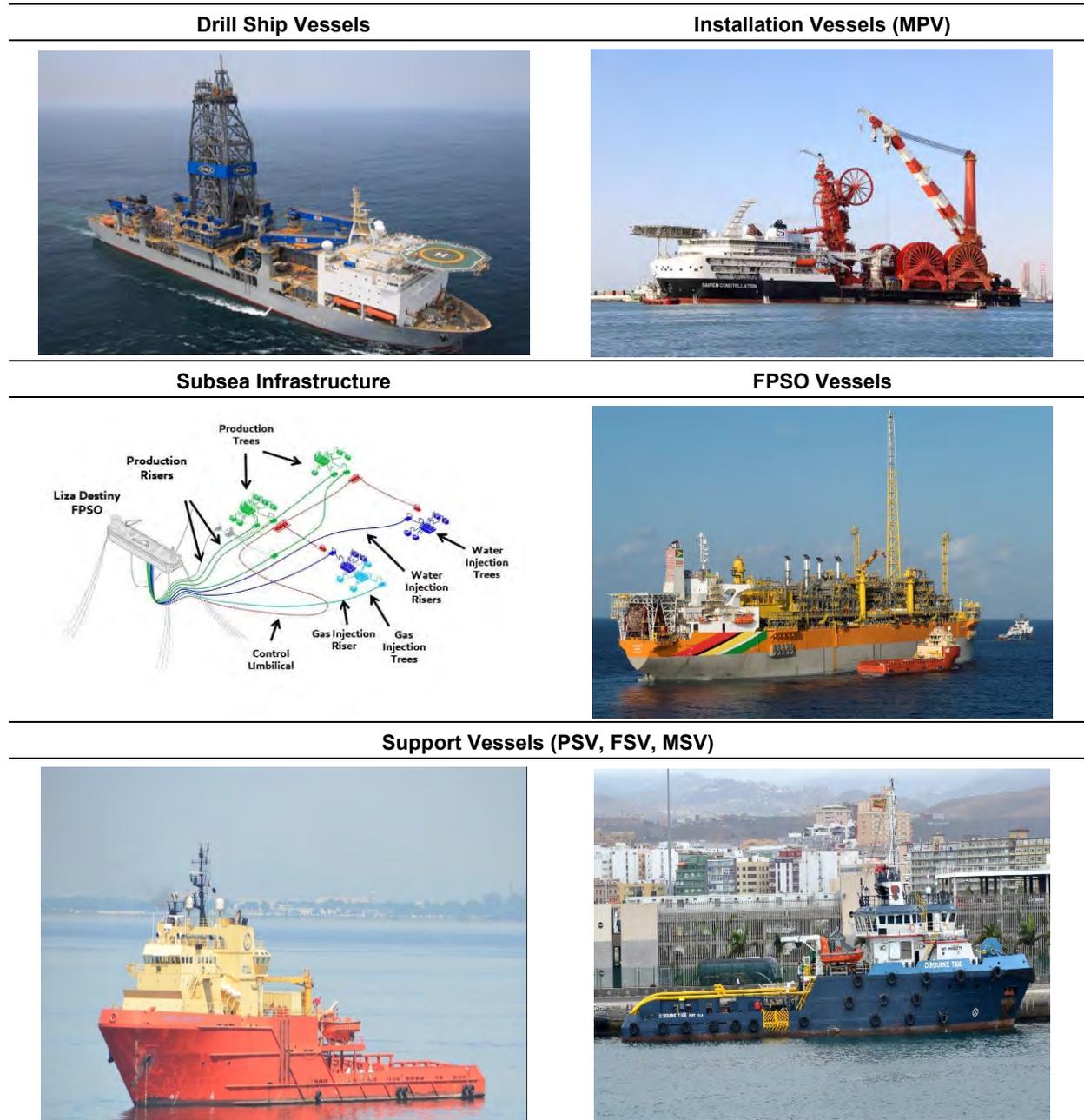
The numerous cradle to grave logistical steps for offshore to onshore handling of hazardous wastes, non-hazardous waste (recycled) and non-hazardous waste (not recycled) are illustrated in Appendix B (Cradle to Grave Logistics Flow Diagrams, Tiger Rentals Guyana (TRG) and Sustainable Environmental Solutions (SES) Waste Treatment Process Flow Diagrams). General process flow diagrams for the various waste treatment methods are also included in this appendix. In addition to the tables, graphs, schematics, diagrams, and photos included below, additional detailed information is contained in the appendices attached to this Study.

#### 4.1 Waste Generation, Waste Stream Characterization and Classification, and Waste Profiles

##### 4.1.1 Waste Generation

The cradle to grave waste management approach begins with understanding and identifying points of generation. Wastes are initially generated on the various types of vessels and infrastructure that are operating offshore (see Figure 4-2).

**Figure 4-2: Vessels and Infrastructure**



FSV = fast supply vessel; MPV = multipurpose vessel; MSV = marine support vessel; PSV = platform supply vessel

Appendix C, Marine Vessels Table, lists EEPGL-contracted marine vessels that have historically or are currently supporting all EEPGL offshore activities.

Wastes streams generated offshore generally originate from five processes:

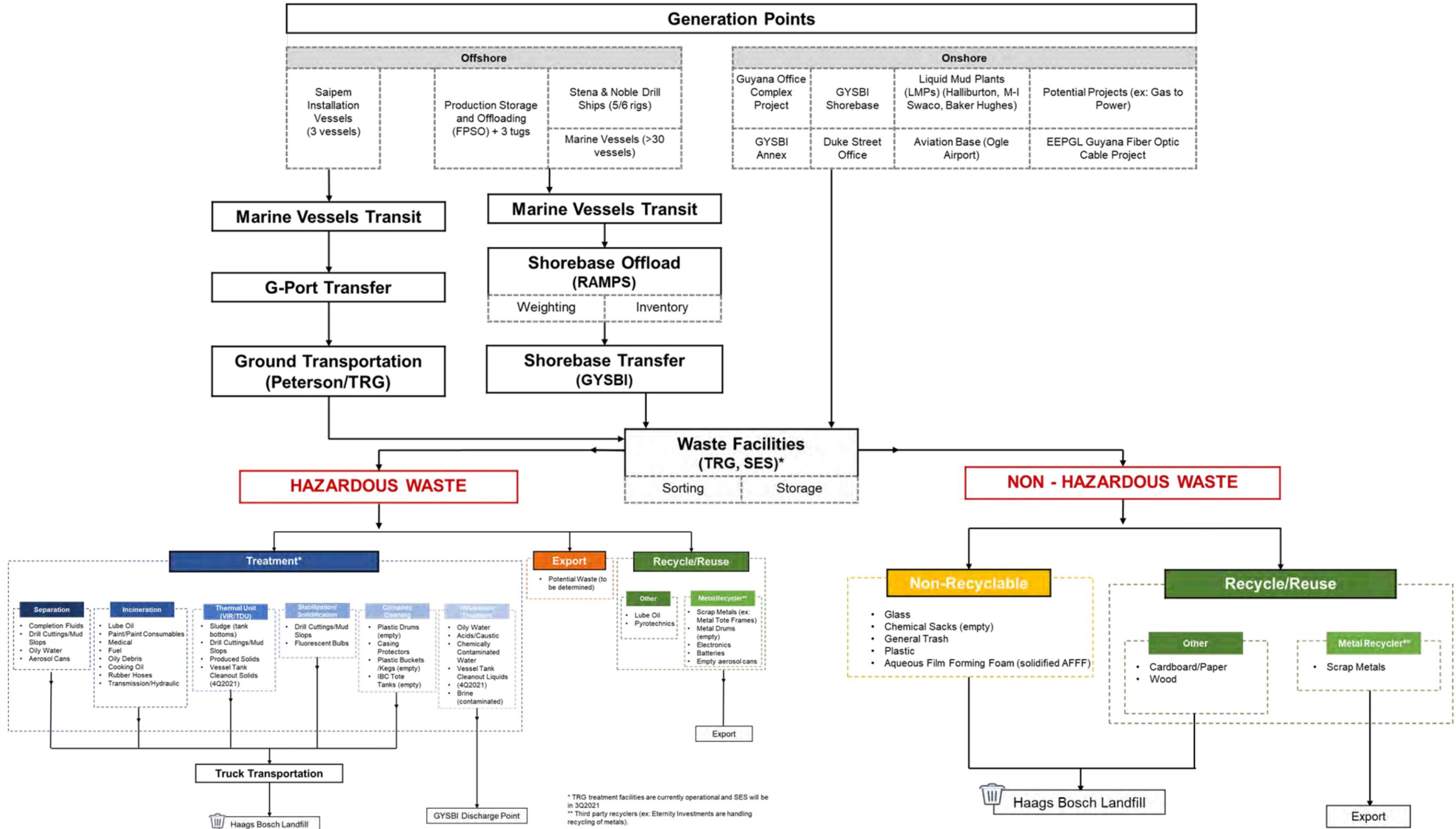
- Drilling—Wastes from the drilling process and rig wastes, including drilling muds (both water-based and non-aqueous fluid [NAF]), drill cuttings, waste and completion brines, cement wastes (cement mix water, slurry, spaced, and drilled cement), various wastewaters (deck drainage discharge, oil/water separator discharge, surface cleaning spacer (pipe cleaner) discharge, displaced interface pills discharge (i.e., small quantities of specialized drilling fluid—less than 200 barrels [bbl] for each “pill”), and gravel pack fluids). Production well test fluids are also generated during drilling.
- Installation—Wastes from the installation of subsea umbilicals, risers, and flowlines (SURF), including umbilical steel tube storage fluids, leak tracer fluids, riser tensioner fluids, other control fluids, and commissioning waters, including produced water.
- Production (FPSO)—Waste from the production process, including produced water, chemically treated waters (including pressure maintenance wastewaters, well treatment, completion, and workover [TCW] fluids), produced solids, utility/fire wastewaters (including cooling water and potable water processing brines), and asset integrity chemical wastes (acids, solvents, de-foamers, corrosion inhibitors, scale inhibitors, subsea production control fluids, etc.).
- Marine—Wastes generated from all routine vessel operations (including drilling, installation, production, and support vessels), including waste oils (lube, hydraulic, and fuels), tank cleaning sludges and wastewaters, deck and machinery space drainage waters, ballast and bilge water, cooling water, incinerator ash, consumables (paint, aerosols, oil filters, oily rags, etc.), scrap wood, scrap metal, empty containers.
- Accommodations—Food waste, household garbage, used cooking oil, medical waste, treated sewage.

In addition to these offshore generated wastes, there are also a variety of wastes generated from onshore support operations, including those of the shorebases, LMPs, waste management facilities, and other land-based operations.

Figure 4-3 provides a general reference for waste stream identification, overall offshore/onshore waste generation, and downstream management.



Figure 4-3: Generation Point Flow Diagram





#### **4.1.2 Waste Characterization and Classification**

Waste characterization and classification is conducted to ensure:

- Proper selection of appropriate personnel protective clothing and equipment to mitigate worker hazards during waste handling, storage and transportation;
- Workers are trained to manage and mitigate hazards related to waste handling, storage, and transport;
- Appropriate emergency response measures are in place in case of spill or accident;
- Proper container selection for safe containment, handling, and transportation of waste; and
- Proper segregated storage of wastes based on incompatibility, reactivity, or other physical/chemical characteristics.

EEPGL's procedure for waste characterization begins with its existing generator and waste processing knowledge based on extensive experience in offshore developments where similar drill ships, FPSOs, and other marine vessels are deployed. The procedure also considers Guyana's Environmental Protection (Hazardous Wastes Management) Regulations 2000 that require accurate waste characterization and classification for each waste stream.

EEPGL has identified and characterized each waste stream generated from the project to date. This waste characterization has included an evaluation of processes and process knowledge, review of manufacturer's safety data sheets (SDSs) and product specifications. Where SDS and generator knowledge is not sufficient for proper characterization of wastes, sampling and laboratory analysis is conducted to ensure that information is available to assess the hazards for each waste, including whether they are flammable, corrosive (acid or base), reactive (oxidizer, pyrophoric, reducer), and/or toxic. Note that all waste analysis required to support waste characterization and classification to date has been conducted in Trinidad, as there is no current analytical provider in Guyana. However, this laboratory capability in country may be further developed in the future. Once the waste is characterized, the next step is the formal classification of the wastes. The EEPGL waste classification considers the following:

- Guyana's Schedule I and II (lists of hazardous wastes and characteristics);
- Guyana's environmental authorization application (Section 15);
- EPA's Waste Manifest form (Appendix D);
- EPA's WPS and EPA Instructions for completing WPS (Appendix D) ;
- EPA Environmental Permits (Section 5.16);
- EPA's Recording and Reporting Form of Hazardous Waste Characteristics (New and Existing Operations); and
- Basel Convention (Annex I [Categories of Wastes to be Controlled], II [Categories of Wastes Requiring Special Consideration], III [List of Hazardous Characteristics], VIII [List A—Wastes Characterized as Hazardous]) (Basel Convention 1989).

Given these considerations, a hazardous or non-hazardous waste classification is established for each waste stream. Going forward, the same characterization and classification process will be used as new waste streams are generated.

EEPGL and contractor procedures/practices for waste characterization and classification are integrated within existing EEPGL WMPs and contractor WMPs.

### **4.1.3 Waste Profiles**

EEPGL has developed a waste profile for each waste stream to document the waste characterization and classification details. The purpose of the waste profile is to compile all the relevant information needed to manage waste into one document. This information is compiled into EPA's approved WPS.

The EPA's WPS requires the completion of numerous data fields. Those sections of the WPS relevant for the Study are pointed out below. Most of the WPSs are complemented with an SDS where applicable. For example, the WPS for Acids has corresponding SDSs for acid related materials (e.g., hydrochloric acid). However, SDSs do not exist for certain waste streams (e.g., empty drums, sacks and aerosol cans, etc.).

The WPS includes information about the generator, waste classification, projected annual volume, and various waste physical characteristics and chemical properties as illustrated in the Figure 4-4 with red arrows pointing to the specific information.

To date, EEPGL has developed 35 separate waste profiles for wastes generated from both offshore and onshore operations—this includes 28 hazardous waste profiles and 7 non-hazardous waste profiles. As used in this Study, the term “treated non-hazardous waste” means waste that was once hazardous but, after treatment, has been rendered non-hazardous.

In addition, EEPGL has developed a WMT that will also be available to the EPA. EEPGL's WMT was developed to store and maintain data and procedures. The WMT contains the Waste Profiles Table, Waste Profile Form with its SDS link, Waste Manifest Form, and Permitted Effluent Discharge Table, along with other items associated with procedures (e.g., Profile instruction, Manifest instructions). As the EPA modifies the requirements for manifest and profile data, or issues new requirements for hazardous waste management, the WMT is the primary data source to add new EEPGL procedures or supplement existing EEPGL procedures. The WMT is then used to support revisions and updates to WMPs.

EEPGL's WPSs (with SDSs, where applicable) and the WMT are included in Appendix D.

Figure 4-4: Waste Profile Sheet

WASTE PROFILE SHEET									
Part I									
A. GENERAL INFORMATION							WASTE PROFILE NO.		
1. GENERATORS NAME Esso Exploration Production Guyana Limited							20140506-0015		
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana									
3. TECHNICAL CONTACT Jimmy Street				4. TITLE Waste Management Lead		5. PHONE 623-1104			
B. WASTE INFORMATION									
1. WASTE CLASSIFICATION			<input checked="" type="checkbox"/> HAZARDOUS			<input type="checkbox"/> NON-HAZARDOUS			
1A. LISTED HAZARDOUS WASTES									
Is this a listed waste under Annex I of the Basel Convention? Y <input type="checkbox"/> N <input type="checkbox"/>									
If "yes" then provide waste numbers									
Is this a listed waste under Annex VIII of the Basel Convention? Y <input type="checkbox"/> N <input type="checkbox"/>									
If "yes" then provide all applicable waste numbers									
Hazardous Waste A4050									
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations? Y <input type="checkbox"/> N <input type="checkbox"/>									
If "yes" then provide all applicable waste numbers									
Guyana EPA AG.1 Hazardous Wastes Regulations : Hazardous Waste									
2. COMMON NAME OF WASTE Acid solutions									
3. SITE ID/LOCATION OF WASTE GENERATION (if different than facility address above) Development & Exploration Drilling, Various wells									
4. PROCESS GENERATING WASTE Contaminated or excess acid solutions in support of wells									
5. PROJECTED ANNUAL VOLUME		6. WASTE RECEIVING FREQUENCY		WEEKLY		MONTHLY		ONE TIME SHIPMENT	
2-10 MT				<input type="checkbox"/>		<input type="checkbox"/>		<input checked="" type="checkbox"/>	
7. WASTE VOLUME		CUBIC METERS		GALLONS		TONNES		OTHER (As SPECIFY)	
								BBLS	
8. WASTE CONTAINERS		BARRELS (42 GAL.)		DRUM (55 GAL.)		CUTTINGS BOX		OTHER (SPECIFY)	
								TANK	
9. SPECIAL HANDLING REQUIREMENTS Yes. Corrosive acid and caustic streams managed separately.									
PART II									
1. PHYSICAL CHARACTERISTICS									
PHYSICAL STATE (CHECK ONE)									
SOLID		<input checked="" type="checkbox"/>		LIQUID		<input type="checkbox"/>		SEMI-SOLID	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		GAS	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		OTHER (SPECIFY)	
COLOR		Water clear to slight greenish		BOILING POINT (°C)		N/A			
ODOR & STRENGTH		None/Strong		pH		0-2 (Acidic)			
FLASH POINT (°C)		N/A		VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low			
BTUs		N/A		TOTAL CYANIDES (ppm)		N/A			
PCBr (ppm)		N/A		TOTAL SULFIDES (ppm)		N/A			
2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)									
NONE		<input checked="" type="checkbox"/>		OXIDIZER		<input type="checkbox"/>			
WATER REACTIVE		<input type="checkbox"/>		IGNITABLE		<input type="checkbox"/>			
SHOCK REACTIVE		<input type="checkbox"/>		MEDICAL/INFECT. WST		<input type="checkbox"/>			
AIR REACTIVE		<input type="checkbox"/>		DIOXINS		<input type="checkbox"/>			
EXPLOSIVE		<input type="checkbox"/>		PESTICIDE/HERBICIDE		<input type="checkbox"/>			
PYROPHORIC		<input type="checkbox"/>		POLYMERIZABLE		<input type="checkbox"/>			
REACTIVE CYANIDES		<input type="checkbox"/>		RADIOACTIVE		<input type="checkbox"/>			
REACTIVE SULFIDES		<input type="checkbox"/>		EXEMPT RAD		<input type="checkbox"/>			
PHENOLS		<input type="checkbox"/>		ASBESTOS		<input type="checkbox"/>			
ORGANIC PEROXIDE		<input type="checkbox"/>		THERMALLY UNSTABLE		<input type="checkbox"/>			
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)									
CAS #		CONSTITUENTS		RANGE (%) - MUST BE EQUAL OR GREATER THAN 100%		CONCENTRATION (ppm or mg/L)			
		HCl solution		25-50					
		Water		60-80					
KNOWLEDGE IS FROM <input type="checkbox"/> LAB ANALYSIS <input checked="" type="checkbox"/> MSDS <input checked="" type="checkbox"/> PROCESS/GENERATOR KNOWLEDGE									
GENERATOR CERTIFICATION: I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.									
NAME: Jimmy Street					TITLE: Waste Management Lead				
SIGNATURE:					DATE:				

## 4.2 Waste Storage and Transportation

### 4.2.1 Waste Container Selection

Proper storage and waste transportation of both offshore and onshore generated wastes requires the accurate characterization and classification of each waste stream.

Based on the waste characterization and classification, appropriate containers are selected for waste storage, handling, and transportation. The container selection is based upon an evaluation of various waste characteristics, including:

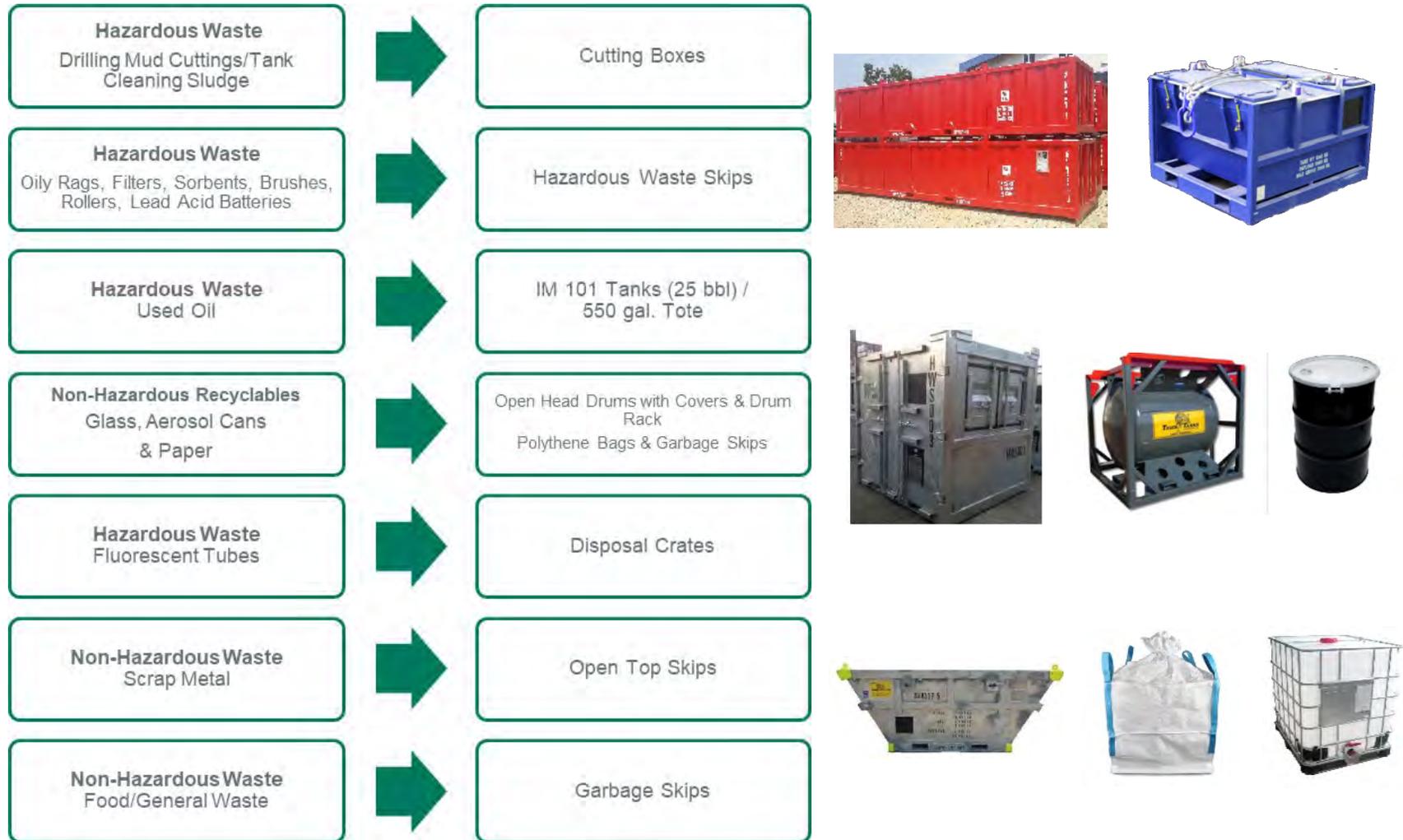
- Physical matrix (solid, liquid, sludge), chemical properties (pH, density, viscosity, reactivity, flammability, etc.);
- Compatibility of wastes with container material construction and design;
- Container secondary containment requirements, waste volume (large vs. small quantities); and
- Container handling requirements (crane, forklift, and truck transport compatibility).

Note that the construction and testing of packaging, intermediate bulk containers (totes), portable tanks, etc. used in the maritime shipping of dangerous goods must meet the IMDG Code (2018 edition, including the most recent Amendment 39-18). However, there is currently no similar international standard employed worldwide for packaging used in the land transport of dangerous goods, although many jurisdictions throughout the world regulate packaging.

In general, each waste type is generally segregated into separate designated containers at the point of generation to the maximum extent possible to expedite and optimize the handling, treatment and recycling of these wastes at the onshore facilities. This approach minimizes the need for additional waste segregation and sorting onshore prior to processing. More importantly, this container segregation approach also prevents the mixing of incompatible waste types within any given container.

Figure 4-5 shows the typical containers currently used for the storage and transport of the various wastes:

**Figure 4-5: Typical Waste Storage and Transport Containers**



In addition to containerized wastes, bulk spent drilling muds are stored in below deck tank compartments of the offshore supply vessels for containment during transit to shore. These below deck tank compartments are full containment structures, and are separate from the outer vessel hull, which provides a secondary containment for these tank compartments.

After the containers are filled with waste and are closed and secured, they are then staged and segregated by waste type in the designated storage areas on the drill ship, FPSO, or other vessel pending maritime transport to Guyana Shore Base Inc. (GYSBI) or the G-Port shorebase. In addition, certain containers (such as bulk bags, totes, drums) will be further packaged in other sea worthy shipping containers (such as open top skips or cargo carrying unit [CCUs]) to meet IMDG Code requirements prior to transfer to the support vessel for transport.

All containers are marked with the appropriate waste classification, hazard, and tracking labels as appropriate as part of the initial offshore storage operation, and manifests are completed in preparation for waste transport. Labels/placards are used as required by the IMDG Code for carriage of dangerous goods in packaged form.

#### 4.2.2 Waste Segregation and Storage

Once wastes are placed into the appropriate containers, they are moved to designated vessel storage areas pending transfer to shore. Where necessary, wastes are also segregated based on considerations of incompatibility or operational considerations regarding how they will be managed. Figures 4-6 and 4-7 illustrate the variety of onboard waste containers and waste segregation practices onboard a drill ship and FPSO.

**Figure 4-6: Non-Hazardous Waste Bins**



**Figure 4-7: Onboard Waste Containers and Waste Segregation Practices**



Each maritime vessel has designated waste storage areas, and these waste storage areas are often on multiple decks to facilitate operations. As per the MARPOL 73/78 and IMDG requirements, each vessel is required to have pollution control measures that are related to all operations, including waste storage operations.

The drill ships generate the most variety of offshore wastes, and therefore have the most variety of designated waste storage locations. The following is a brief description of the Stena and Noble drill ship waste storage operations.

#### 4.2.2.1 Stena Drill Ship Waste Storage Description

The following are key features related to waste storage on the Stena drill ships:

- Main fixed storage areas as they can and do move as they are loaded and unloaded from the drill ship. The exact position is subject to change. These units are safely stored side by side due to the nature of the transportation skids.
- Spills on board will ultimately lead to a lower deck (Deck 4), which is banded via the drains system and then directed into holding tanks to allow natural separation and decanting.
- Deck crews inspect and ensure containers are secure on arrival on board and prior to back loading. Doors / Hatches / Drain Plugs are checked as secured. In the case of open topped waste skips for wood, scrap metals, and plastics, drains are open while on board due to rain but are closed again before shipping.
- All drains from all decks are collected to deck drain tanks to prevent spills / leaks from being released to over the side of the drill ship. Most drum storage areas and some bulk paint stores have additional fixed metal kick plate fitted all around as a secondary bund. Within machinery and other internal spaces all products are within banded storage areas.
- Storage for solid wastes are metal offshore containers positioned on metal decks. Storage for liquid hazardous wastes are on metal platforms or within enclosed areas with secondary containment.
- There are no barriers to prevent access to hazardous waste containers on main deck, just signage. This is to encourage use of the facility as everybody on board is authorized to dispose of waste appropriately.

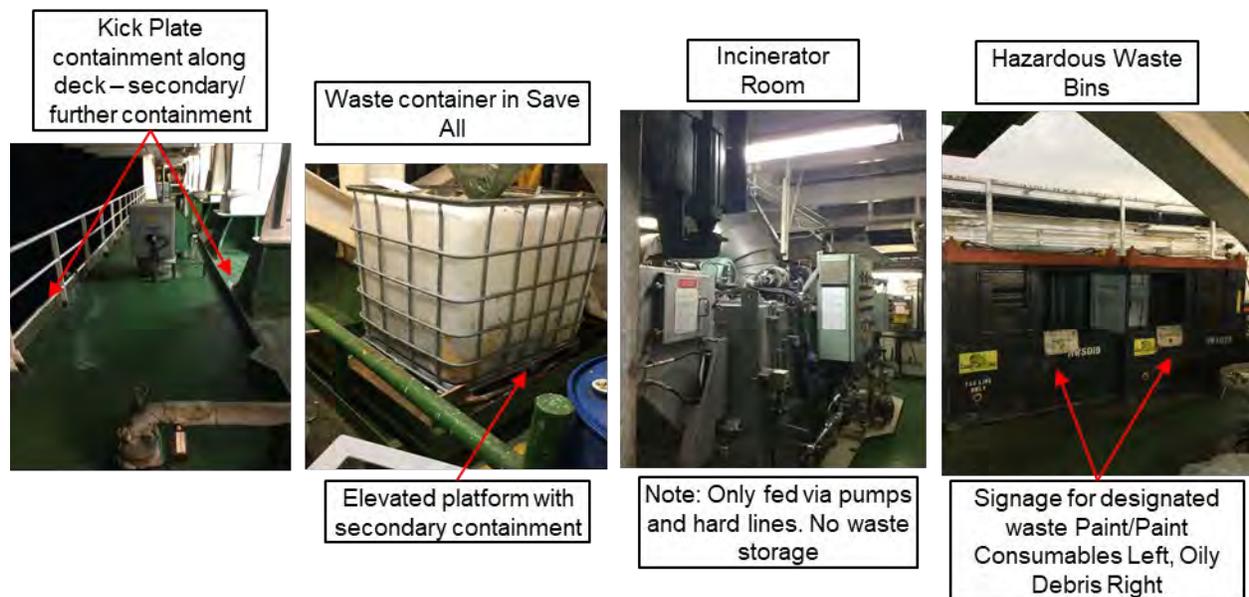
- Hazardous waste containers are primarily covered by the decks above. Where applicable and covering is not available, containers with hazardous waste are covered/closed.

**Figure 4-8: Scrap Metal Waste Bins**



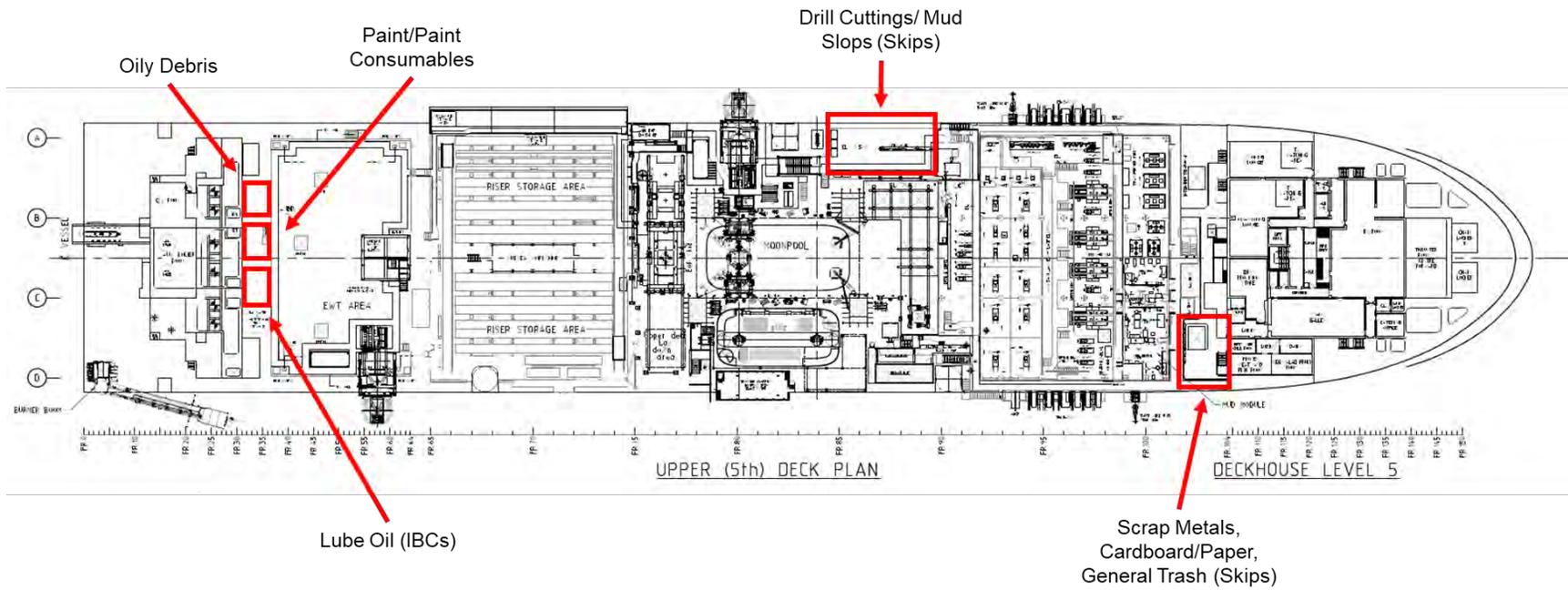
Figure 4-9 depicts typical Stena waste storage operations.

**Figure 4-9: Typical Stena Waste Storage Operations**



Further, the schematic in Figure 4-10 illustrates some of the designated Stena waste storage locations.

Figure 4-10: Example Stena Waste Storage Locations



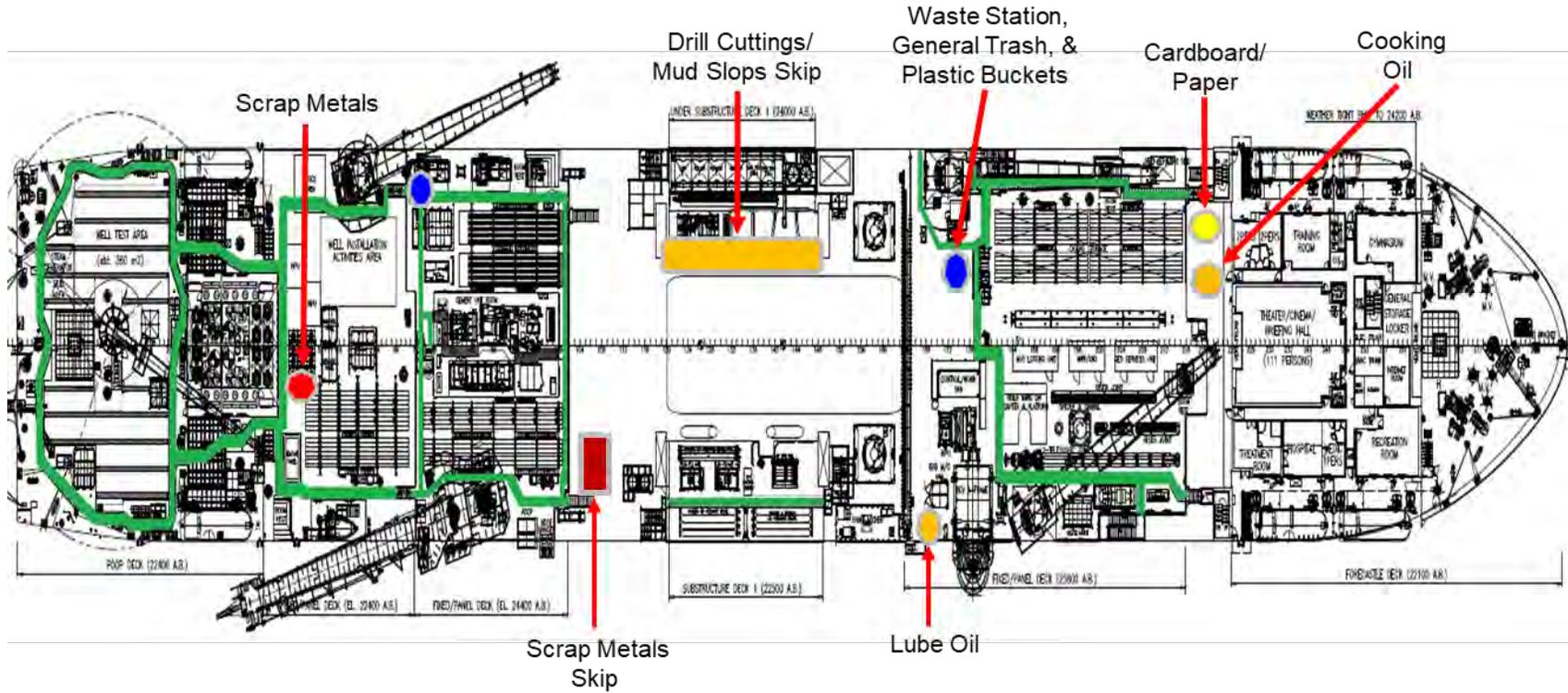
#### 4.2.2.2 Noble Drill Ship Waste Storage Description

The following are key features related to waste storage on the Noble drill ships:

- Noble drill ships use waste stream information sheets that list various pollution control measures appropriate for each waste stream, including storage and accumulation requirements.
- Certain wastes must be stored in a dry area with a curbed solid deck with a secondary method of containment.
- Certain wastes are required to be stored in a hazardous designated area, away from heat or flames with a curbed solid deck with a secondary method of containment.
- Certain wastes require that containers be tightly closed in a designated dry, cool, and well-ventilated area either panned or within a curbed solid deck.
- All equipment or areas where and water and petroleum sources may come in contact shall be equipped with pollution pans and containment that can be accessibly drained.
- Containers are to be panned or stored over a solid deck curbed area along with proper identification and beginning date of accumulation.
- Oily wastes are required to be stored within a curbed solid deck in a non-flammable environment with lid or opening always to be fastened down and secure.

The schematic in Figure 4-11 illustrates some of the Noble drill ship designated waste storage locations:

Figure 4-11: Example Noble Drill Ship Waste Storage Locations



### 4.2.3 Waste Tracking

Waste manifests are required documentation for both hazardous and non-hazardous waste management for cradle-to-grave tracking of all waste movements. Further, a separate marine transport manifest is also required for tracking all ship to shore movements of all wastes and other materials, including bulk spent drilling muds. Figure 4-12 is an example waste manifest for current EEPGL operations from February 2021 and Figure 4-13 is example of the marine transport manifest used for cargo from the same ship journey.

**Figure 4-12: Waste Manifest Example**

REV 0.1 ESSO EXPLORATION PRODUCTION GUYANA LTD.  
WASTE MANIFEST FORM

Generator Information				Transporter Information:			
Generator:	Esso Exploration & Production Guyana Ltd.			Transporter:	MV Russell Adams		
Address:	99 New Market St., Georgetown GY			Contact:	Igor Melnichuk		
Contact:	Jimmy J. Street			Position:	Master		
Position:	Waste Management Lead			Phone:	985-377-0948		
Phone:	+592-623-1104			Email:	<a href="mailto:mvrusselladams@choquest.com">mvrusselladams@choquest.com</a>		
Email:	<a href="mailto:jimmy.j.street@exxonmobil.com">jimmy.j.street@exxonmobil.com</a>						
EPA Region:	Region 4						
Regist. #:	T8D						
Originator Information				Receiving Facility Information			
Originator:	Noble Don Taylor			Facility:	Tiger Rentals Guyana		
Manifest #:	198-LIZ_4i11-MVRUA-Russell-2021-02-06-NDT To GT			Regist. #:	20140506-TTTUL		
Well:	LIZ_4i11			Location:	LOT A, East Bank Public Rd. Houston GY		
Date:	7-Feb-21			Contact:	Shane Singh		
Contact:	Anna Layne			Position:	General Manager		
Phone:	1-713-4299-372			Phone:	+592-501-0620		
Email:	<a href="mailto:Logistics-DonTaylor@exxonobil.com">Logistics-DonTaylor@exxonobil.com</a>			Email:	<a href="mailto:ssingh@tigerrentalsguyana.com">ssingh@tigerrentalsguyana.com</a>		

CCU #	Waste Stream	Comment	Verified Quantity	Unit	GY Classification	GY Characteristic	Physical Characteristic	Chemical Characteristic
DNVB50062	General Trash	3 bags General Trash	3	m3	Non-hazardous			
DNVB50055	General Trash	3 bags General Trash	3	m3	Non-hazardous			
ARRU1075180	Oily Water	Waste Oil			Hazardous	Toxic	Liquid	Organic
248402	Casing Protectors		8	m3	Hazardous	Toxic	Solid	Organic
AMH297	Metal Drums/Empty	RHEMOD RESIDUE	4		Hazardous	Toxic	Liquid	Organic
AMH270	IBC Tote Tanks/Empty	LE SUPERMUL RESIDUE	2		Hazardous	Toxic	Liquid	Organic
AMH274	IBC Tote Tanks/Empty	LE SUPERMUL RESIDUE	2		Hazardous	Toxic	Liquid	Organic
AMH293	IBC Tote Tanks/Empty	LE SUPERMUL RESIDUE	1		Hazardous	Toxic	Liquid	Organic
AMF753	IBC Tote Tanks/Empty	LE SUPERMUL RESIDUE	2		Hazardous	Toxic	Liquid	Organic
AORU71-01213	Drill Cuttings/Mud Slops				Hazardous	Toxic	Liquid	Organic
805884-9	General Trash		3	m3	Non-hazardous			
AMH293	Metal Drums/Empty	RHEMOD RESIDUE	4		Hazardous	Toxic	Liquid	Organic
805884-9	Plastic				Non-hazardous			
			1	m3				

ORIGINATOR: \_\_\_\_\_  
 GENERATOR: \_\_\_\_\_  
 TRANSPORTER: \_\_\_\_\_  
 RECEIVING FACILITY: \_\_\_\_\_

Print
Sign
Date

Figure 4-13: Marine Transport Manifest Example

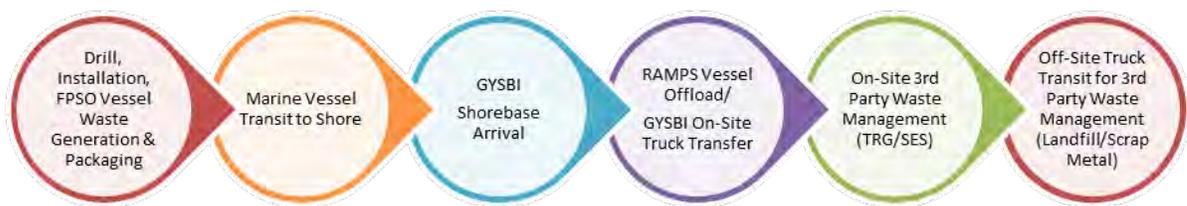
Esso Exploration and Production Guyana Limited				Noble Don Taylor to Georgetown, Guyana				Date:		Saturday, February 6, 2021						
Well Number:		LIZ_4i11		Transport By:		MV RUSSELL ADAMS		Manifest #:		198	LIZ_4111	MVRUA	Rev1			
Dispatched From:								Dispatched To:								
Location:		Noble Don Taylor		Location:		Georgetown, Guyana										
Attention:		Justin McMillian		Attention:		Johnny Lonsdale										
Email:		justin.c.mcmillian@exxonMobil.com		Email:		johnny.e.lonsdale@exxonmobil.com										
Attention:		Robert Perry		Attention:		Ramps Shorebase GY										
Email:		Logistics_DonTaylor@exxonmobil.com		Email:		shorebase_gy@rampslogistics.com										
Number:		NDT: 1-713-422-9372		Number:		Guy: 592-608-6636										
ETD:		2/6/2021 10:00 Hrs.		ETD:		2/7/2021 00:30 Hrs.										
Dangerous Good Mark				No				MSDS				No				
QA QC Report				No				Inspection Reports				No				
Item #	Qty	Unit	Container # / EEPGL IPES #	Supplier PN	Basket/ Cargo Box			Item Type/ UN # for DG	Description of Items	Unit Price in USD	Total Price in USD	Supplier	Vendor	Weight in MT	MR #	Voyage # Loaded or Backloaded
<b>CARGO BELOW LOADED AT NOBLE DON TAYLOR - DISCHARGE IN GEORGETOWN</b>																
21	1	EA	DNVBS00062		8'	6'	6'	Waste Skip	STC	\$2,500.00	\$2,500.00	Tiger Tanks	ExxonMobil	3	LIZ_4i11-052	296-SMT
	3	EA						BAGS	General Trash			Noble	Noble			
22	1	EA	DNVBS00055		8'	6'	6'	Waste Skip	STC	\$2,500.00	\$2,500.00	Tiger Tanks	ExxonMobil	3		198-RUA
	3	EA						BAGS	General Trash			Noble	Noble			
23	1	EA	709SE-8-16		16'	8'	4'	Cargo Basket	STC	\$12,500.00	\$12,500.00	Tanks-a-lot	Noble Drilling	5.9	HA1-104	296-SMT
	1	EA		312157					ASSY, DOOR 18-15M NXT 14 IN U2BIL - RIGHT HANDED DOOR PN: 20077515 SN: 20014900-782	\$161,958.38	\$161,958.38	Noble Drilling	Noble Drilling			
30	1	EA	ARRU1075180		10'	10'	8'	50 BBL Tank	Full Waste Oil Tank	\$5,000	\$5,000	OEG	ExxonMobil	10		190-RUA
32	1	EA	SCE163-10		8'	8'	10'	Connex Box	STC	5,000	5,000	Noble	Noble	2.2	HA1-079	180-RUA

EEPGL uses a waste tracking system that allows for the tracking of the waste from initial generation through final disposal, discharge, reuse, or recycling. The information included in the manifests is maintained in a database, and EEPGL also requires that its third-party waste management facilities (TRG and, eventually, SES) use a similar tracking database to show the storage, processing, and ultimate discharge, disposal, reuse, or recycle of the wastes and materials. EEPGL then compiles and reports this information to the EPA as part of annual waste summary reporting requirements.

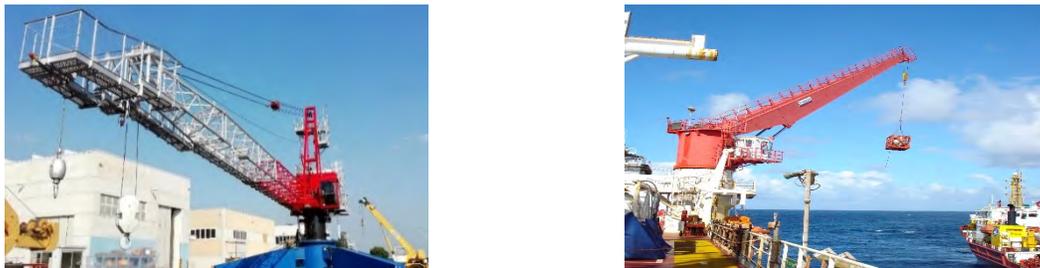
#### 4.2.4 Waste Transportation

This section presents a summary of the various waste transportation aspects, including the various steps involved in ship to shore transport, as well as onshore transport. The transport aspect is an important feature of the cradle to grave waste management process (see Figure 4-14).

**Figure 4-14: Cradle to Grave Waste Management**



**Figure 4-15: Drill Ship/FPSO Transfer of Support Vessel Example**



The wastes generated from the drill ships, FPSO, and infrastructure operations are all subsequently off-loaded and transferred to other marine vessels for transport to the GYSBI (most wastes) or G-Port shorebase (installation vessel wastes and certain spent mud wastes destined for the Halliburton and Baker Hughes LMPs).

**Figure 4-16: Marine Support Vessel and Typical Cargo Deck Configuration**



Offshore Marine Vessel Transport to Shorebases—Marine vessels used to transport waste from the offshore areas to the shore base have the necessary licenses and approval from the Guyana authorities. All containers are required to be packed and secured according to the IMDG Code requirements, which include provisions for dangerous goods loading/stowage plans, considering ship stability, safety, and emergency preparedness. Crews on the vessels that transport dangerous goods (hazardous waste) must have training in basic emergency response, as well as have dangerous goods training as per the requirements of the IMDG Code. There also must be adequate emergency response equipment (spill and containment equipment) deployed onboard in the event of an incident. Further, crews must know safe practice to load/unload the cargo unit (containers) carrying the IMDG product, as well as how to handle the dangerous goods when the ship is under voyage. Vessels transporting waste must carry both a completed marine transport manifest and a completed Waste Manifest. These documents must contain the name, description, and quantity of all wastes being transported. EEPGL will confirm through periodic inspections that vessel waste shipments meet the appropriate requirements and that vessel crews have completed and documented compliance with the minimum training requirements.

**Figure 4-17: Marine Vessels at GYSBI Shorebase**



Marine Vessel Off-Loading at Shorebases—All offshore waste received at GYSBI (both hazardous and non-hazardous waste) is first off-loaded from the vessels by RAMPS Logistics (RAMPS) using onshore cranes. RAMPS weighs each container and also confirms the inventory during off-loading. Bulk spent drilling muds are off-loaded at shorebases using hoses and pipelines which connect directly to the Schlumberger/MI-Swaco LMP facility tank storage infrastructure. After off-loading is complete, the waste containers are then transferred by GYSBI staff using trailers/fork lifts directly to the waste management

facilities located at GYSBI (TRG, SES), or to a temporary transit area (oily water primarily) adjacent to TRG/SES should TRG/SES not be able to immediately receive the wastes because of operational challenges. RAMPS and GYSBI staff must have training in basic emergency response related to the off-loading of the containers and transfer to the waste management facilities. EEPGL confirms through periodic inspections that RAMPS and GYSBI staff also have completed and documented compliance with the minimum training requirements. Wastes received at the G-Port shorebase are off-loaded by G-Port contractor staff for conveyance to the LMPs (Halliburton and Baker Hughes), or transported by Peterson Integrated Logistics to the TRG GYSBI location (installation vessel waste only).

**Figure 4-18: Waste Transport at GYSBI**



GYSBI Onshore Transfer Operations—TRG currently handles the various containers it receives at its facility using fork lifts. The containers are stored in designated areas pending processing. It is anticipated that SES, once operational later in 2021, will also use fork lifts to move containers to the operational areas once received. All TRG staff have specialized in-house training in emergency response and spill protection as it relates to its waste management operations—SES staff will also have this training once that facility is operational, as this training is routine for employees of waste management facilities. EEPGL periodically audits the TRG operation to determine if TRG staff have completed and documented compliance with the training requirements—similar audits will be done for the SES operation in the future.

**Figure 4-19: GYSBI Transfer Operations**



GYSBI to Off-site Locations—TRG currently transports treated non-hazardous wastes received or generated from its operations from GYSBI directly to the HBL for disposal. TRG transports the treated wastes to HBL in bulk bags which are secured (tied/closed) to prevent tampering at the disposal site, whereas other wastes, including wood, cardboard, paper, etc. may be transported in bins. TRG may also transport other wastes (batteries) to an off-site third-party metal recycling facility (Eternity Investment Inc. [EII]). All TRG vehicles are required to be inspected and a checklist completed to ensure road worthiness prior to engaging the waste transportation services. The TRG Journey Management Plan is used to manage the transportation of waste to off-site locations. All land-based waste transport is currently done in accordance with the Guyana Environmental Guidelines for the Transportation, Storage, and Occupational Handling of Chemical/Industrial Hazardous Waste (EPA 2011), as well as the Environmental Protection (Hazardous Wastes Management) Regulations (Government of Guyana 2000), and the Motor Vehicles and Road Traffic Act (Government of Guyana 1998) (applicable to both hazardous and non-hazardous waste transportation).

Other Land Waste Transport Activities—The onshore LMPs currently arrange with TRG to transport their wastes from the GYSBI and G-Port locations to the TRG facility for treatment. Saipem (installation vessels) also currently arranges with Peterson Integrated Logistics for TRG to transport their wastes from the G-Port shorebase to the TRG facility for treatment.

EEPGL is also involved with various land-based operation or development projects in the Georgetown area (including the EEPGL Guyana Fiber Optic Cable Project, Guyana Office Complex Project, future Gas to Energy Project, etc.) that may require the transportation of various types of construction or operations related non-hazardous wastes (wood, construction debris, excavated soil, etc.), or potentially hazardous wastes (lube oil, batteries, etc.). Any transporters contracted for hazardous waste transport will be required to have prior permission (valid Permit) from the EPA for transport of hazardous waste as well as any other permissions that may be required under the Motor Vehicles and Road Traffic Act, 1998 (applicable to both hazardous and non-hazardous waste transportation).

### 4.3 Waste Treatment and Disposal

Wastes generated from EEPGL offshore operations can be managed in one of two ways: 1) Wastes are managed directly on the drill ships, FPSO, or other vessels using on-board recycling, treatment, and discharge methods; or 2) Wastes are transported to onshore facilities for recycling, treatment, and discharge/disposal.

As described previously, wastes streams generated offshore generally originate from five processes:

- **Drilling**—Wastes from the drilling process and rig wastes, including drilling muds (both water-based and NAF), drill cuttings, waste and completion brines, cement wastes (cement mix water, slurry, spaced, and drilled cement), various wastewaters (deck drainage discharge, oil/water separator discharge, surface cleaning spacer [pipe cleaner] discharge, displaced interface pills discharge [i.e., small quantities of specialized drilling fluid—less than 200 bbl for each “pill”, and gravel pack fluids). Production well test fluids are also generated during drilling.
- **Installation**—Wastes from the installation of SURF, including umbilical steel tube storage fluids, leak tracer fluids, riser tensioner fluids, other control fluids, and commissioning waters, including produced water.
- **Production (FPSO)**—Waste from the production process, including produced water, chemically treated waters (including pressure maintenance wastewaters, well TCW fluids), produced solids, utility/fire wastewaters (including cooling water and potable water processing brines), and asset

integrity chemical wastes (acids, solvents, de-foamers, corrosion inhibitors, scale inhibitors, subsea production control fluids, etc.).

- Marine—Wastes generated from all routine vessel operations (including drilling, installation, production, and support vessels), including waste oils (lube, hydraulic, and fuels), tank cleaning sludges and wastewaters, deck and machinery space drainage waters, ballast and bilge water, cooling water, incinerator ash, consumables (paint, aerosols, oil filters, oily rags, etc.), scrap wood, scrap metal, empty containers.
- Accommodations—Food waste, household garbage, used cooking oil, medical waste, treated sewage.

See Appendix D for the WPSs for all offshore generated wastes. For reference, see 2020 LP1 and LP2 Annual Environmental Report (EEPGL 2020a), which provides quantities of wastes generated from offshore operations in 2020.

Some of these wastes listed above are suitable for discharge overboard after pre-treatment, whereas others must be managed exclusively at appropriate onshore facilities for recycling, treatment, or disposal/discharge. All waste and effluents must be managed in accordance with the LP1, LP2, and Payara Permit requirements and Guyana EPA regulations, and must conform with international conventions (MARPOL 73/78 [IMO 2019], Basel Convention [Basel Convention 1989], Cartagena Convention [UNEP Undated]), international best practices (IOGP, IFC EHS General Introduction Guidelines and Offshore Oil and Gas Development Guidelines, IMO, etc.).

The following is a description of the waste treatment and disposal methods for both offshore and onshore waste management of the EEPGL wastes. Process flow diagrams for some of the treatment methods employed are also included in Appendix B for further reference.

#### **4.3.1 Offshore Waste Management Methods**

All wastes generated from offshore operations are either treated and discharged offshore or sent to onshore facilities for recycling, treatment, or disposal/discharge.

The general types of EEPGL wastes currently being discharged offshore include:

- NAF mud and drill cuttings;
- Water-based mud and drill cuttings;
- Various tank wash waters, slops, and other wastewaters that pass static sheen or other tests;
- Bilge water that have <15 parts per million (ppm) hydrocarbon oil content;
- Produced water;
- Inert materials, including cement, barite, bentonite, calcium carbonate, gravel pack, sand, etc.;
- Food waste <25 millimeters; and
- Treated sewage.

However, all of these wastes are subject to some type of pre-treatment and/or monitoring prior to discharge overboard in accordance with permit requirements, international conventions, relevant international standards, or best industry practices. The pre-treatment method varies between Noble drill ships vs. Stena drill ships or the installation/FPSO vessel operations, but the technologies employed are similar and are described in general in the next sections.

A small number of specific wastes are also treated offshore using thermal destruction technology. These include production well test fluids and certain other hydrocarbon based wastes (such as oily sludges, engine oils, lube oils, etc.). Production well test fluids (reservoir fluids) are generated from a temporary production test performed to investigate how a newly drilled well will perform when it is subject to various flow conditions. The well test fluids are treated on the drill ships using a flare boom, which is a burner attached to a boom located downwind of the drill ship. Combustion may be initiated using diesel or similar fuel to ignite the mixture to ensure complete combustion of well test fluids. However, only certain drill ships (Noble Don Taylor and Stena Carron) have the equipment required to perform well testing, including the fluid combustion. The use of a flare boom can last for several hours to several days, and is usually intermittent during the well test. All well test flaring must meet the requirements of the permits.

**Figure 4-20: Example of Drill Ship Well Test Flaring**

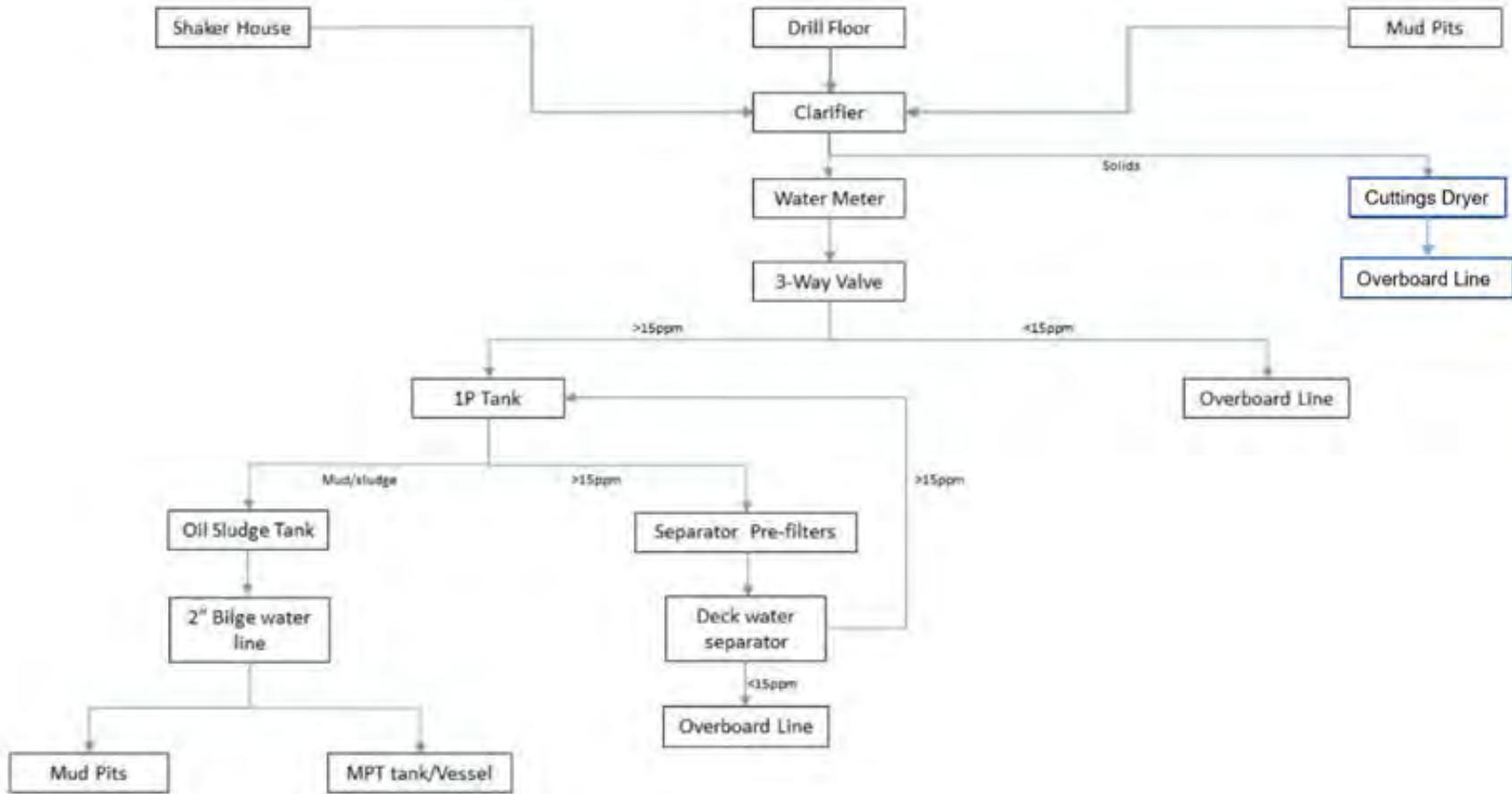


Other hydrocarbon impacted wastes, including oily sludges, may also be treated offshore on vessels which are equipped with incinerator units. Any incinerator employed for use offshore must have an IMO type approval certification consistent with IMO and MARPOL 73/78 requirements for shipboard incinerators. Further description of these incinerator operations are described in the following sections.

#### **4.3.1.1 Noble Drill Ship**

There are currently several Noble drilling ships operating offshore in support of EEPGL efforts, and all are generally designed the same with respect to the offshore management of drilling wastes. Figure 4-21 is a general flow diagram illustrating how drilling wastes are managed offshore on the Noble drill ships.

Figure 4-21: Noble Drill Ships Drilling Wastes Management



The following sections provide additional details about the waste management technologies employed.

Initial Solids Separation—Initial physical separation of the drill cuttings returned from the borehole by the drilling mud is conducted using angled vibratory screen equipment known as shale shakers to remove solids >100 microns in size. The separated drilling mud is then recycled and reused in the drilling operations.

**Figure 4-22: Shale Shaker**

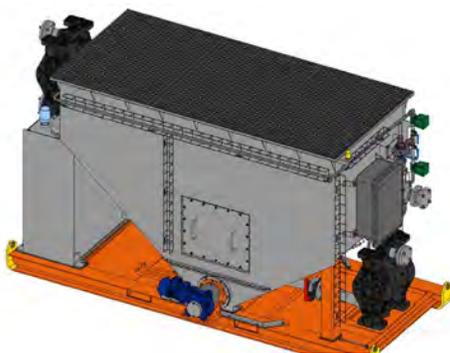


Note that this treatment process is only applicable for drilling mud and cuttings returned to the drill ship. At the very start of drilling operations, when the structural pipe casing (0.91 m diameter pipe) and conductor pipe casing (0.71 m diameter pipe) are being installed through the overlying non-oil bearing stratigraphy immediately below the seabed, the water-based drilling mud and cuttings are not returned to the drill ship. This drilling mud and cuttings are discharged directly at the seabed.

Clarification—Fluids/solids originating from the shaker operation as well as overflow fluids from mud system tanks are directed to a multiphase clarifier or Boss solid separator for secondary separation of solids and fluids. Clarifiers use lamella style plate settlers, which are a series of inclined plates which allow for solids to gravity settle and drop into a basin for collection. A Boss solid separator employs a patented process that also uses plates combined with fluid velocity controls to separate solids from fluids. The fluids and solids are then further managed using separate processes. Note that there is no oil separation in this step.

**Figure 4-23: Clarification**

**Clarifier**



**Boss Solids Separator**



Automated Fluids Screening—Oil in water analyzers (OIWA) are used to measure hydrocarbon concentration in the fluids separated by the clarifier/separator as well as from deck drain areas. Measurement is continuous during any waste processing activities. If the fluid concentration is <15 ppm it can be discharged overboard with no further treatment. However, if the concentration is >15 ppm the fluid is directed to other onboard storage tanks for storage prior to further treatment in oil/water separators.

Fluids Oil/Water Separator—Fluids containing >15 ppm hydrocarbons are processed through separator pre-filters (to further remove solids) and then an oily water separator (OWS) to further remove hydrocarbons. The oil/water separator employs parallel plates that allow oil to separate and rise out of the hydraulic flow path through the device for recovery, and the remaining liquid is then recovered for discharged. If the effluent is <15 ppm, fluid can be discharged overboard. The frequency of discharge can be continuous or batch based on operational requirements. The Noble drill ships have multiple OWS units to manage various wastewaters, including bilge water, contaminated deck water, and the clarifier wastewaters. Residual fluids which cannot be treated to below the 15 ppm threshold are placed into tote (1,000 liter) containers or tanks for transfer onshore for further treatment. Further, oils recovered from the separators are either recycled into the mud process (if sufficient quality), or are also placed into containers or tanks for transfer onshore. Note that all vessels have an International Oil Pollution Prevention Certificate which gives details of all oily water separation and filtering equipment and also the associated monitoring equipment required under the MARPOL convention.

**Figure 4-24: Fluids Oil / Separator**

**Oily Water Separator**



**Pre-filters**



Drill Cuttings/Solids Treatment—Solids recovered from the clarifier are further processed using a cuttings dryer system. Cuttings dryer systems use centrifugal force (up to 500+ G's—gravitational force equivalent) to recover NAF from the cuttings. Screen bowls in the unit trap wet solids and the solids are accelerated so that the liquids are forced through the screen openings and the solids are extracted by angled flights. NAF can be further recovered from this process and recycled back into the active mud system. If the recovered cuttings meet the discharge requirements (NAF retention on cuttings less than 6.9 percent by weight as per USEPA 40 CFR § 435.13—Effluent limitations representing the degree of effluent reduction attainable by the application of the economically achievable BAT), the dried cuttings are then mixed with seawater and are discharged to the sea a few meters below the water surface. The frequency of overboard discharge can be continuous or batch depending on operational considerations. Cuttings which exceed this requirement are either re-treated or transferred onshore for further treatment. The frequency of cuttings sampling and analysis is based on the requirements of USEPA Method 1674.

Oily sludges/solids recovered from the main storage tanks are either recycled into the mud system, or are transferred onshore for further treatment.

**Figure 4-25: Cuttings Dryer**



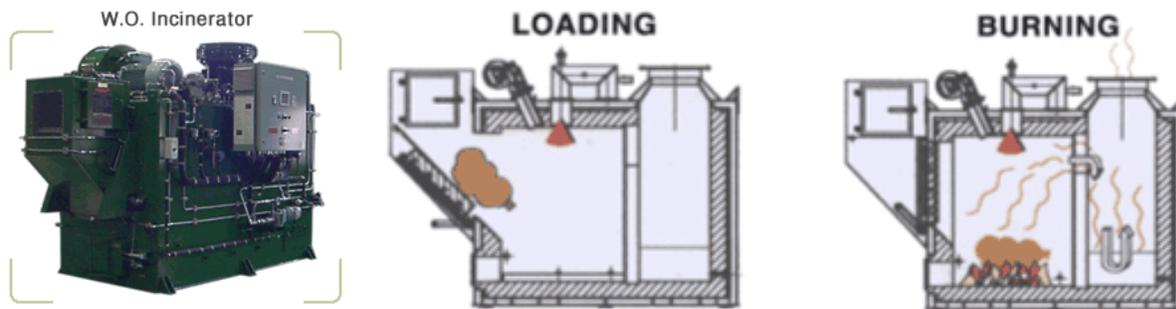
Gravity Settlement and Separation—Various other wastes, including waste brine, slops containing used drilling fluids, tank cleaning sludges and wash waters, and TCW fluids and can be stored temporarily in cutting boxes or designated pits on the drill ships or other vessels and allowed to settle and separate using gravity. If feasible, liquids are then decanted and processed in the OWS systems. The remaining wastes are then subject to static sheen testing (USEPA Method 1617—a method used as a compliance test for the “no discharge of free oil” requirement for discharges) to determine if they can be discharged overboard—otherwise, they are transferred onshore for treatment and disposal. This waste treatment process is done in batches based on operational requirements. Static sheen testing is conducted prior to discharge.

#### 4.3.1.2 *Stena Drill Ship*

The Stena drill ships employ the same general solids separation, drill cuttings processing, and gravity settlement and separation technology as the Noble drill ships, but do not employ OIWA or OWS systems for fluids management. Therefore, static sheen tests are used for all fluid management decisions to determine what fluid wastes are appropriate for discharge overboard. Fluid wastes with >15 ppm hydrocarbon content are transferred onshore for treatment or disposal, or may also be treated offshore in the Stena drill ship onboard incinerators (certain fluids only).

Incineration—The Stena drill ships currently deployed in Guyana employ onboard Hyundai-Atlas Waste Oil Incinerators (Type MAXI NG150 SL WS) for the offshore treatment of certain fluids (oily water, lube oil) and solid wastes (sludges). These are designated shipboard incinerators with an IMO type approval certification consistent with IMO and MARPOL 73/78 requirements for shipboard incinerators. The incinerators have a capacity to treat a maximum of 150 kilograms (kg)/hour of solid waste and 99 kg/hour of liquid waste, and its fuel source is marine diesel oil. The incinerators have a primary and two secondary combustion chambers and operate at a temperature of 850 to 950°C. The primary chamber is designed to burn the wastes, and the secondary chambers (two in series) are designed to burn the combustion gases with a 1 to 2 second retention time. Flue gases are subject to shock cooling to control emissions. Incinerator ash (non-hazardous) is transferred onshore for treatment and disposal. Incinerator operations are conducted in batch mode based on operational requirements.

**Figure 4-26: Incineration**



#### 4.3.1.3 Installation Vessels

The installation vessel operations generate specific waste streams related to the installation of the subsea drill centers and related flowlines and risers (pipelines), as well as umbilicals that provide power, control, and chemicals to the drill centers. The risers and umbilicals are connected to the FPSO. Saipem is currently contracted for the offshore installation efforts, and operates/manages the installation and related support vessels. There are several waste streams that are discharged overboard, including ballast water, cooling water, bilge water, sanitary waste (after treatment), food waste, and some commissioning waters (which may contain biocides, oxygen scavengers and corrosion inhibitors). Most hazardous and non-hazardous wastes generated offshore are transferred onshore for treatment and disposal, except for medical wastes and certain spent oils, lubes, and chemicals which are incinerated offshore in accordance with IMO and MARPOL 73/78 requirements for shipboard incinerators. Saipem also operates a Hyundai-Atlas Waste Oil Incinerator (Type MAXI NG150 SL WS), which is certified to meet the requirements of MARPOL 73/78, Annex VI.

#### 4.3.1.4 Floating Production Storage and Offloading Vessels

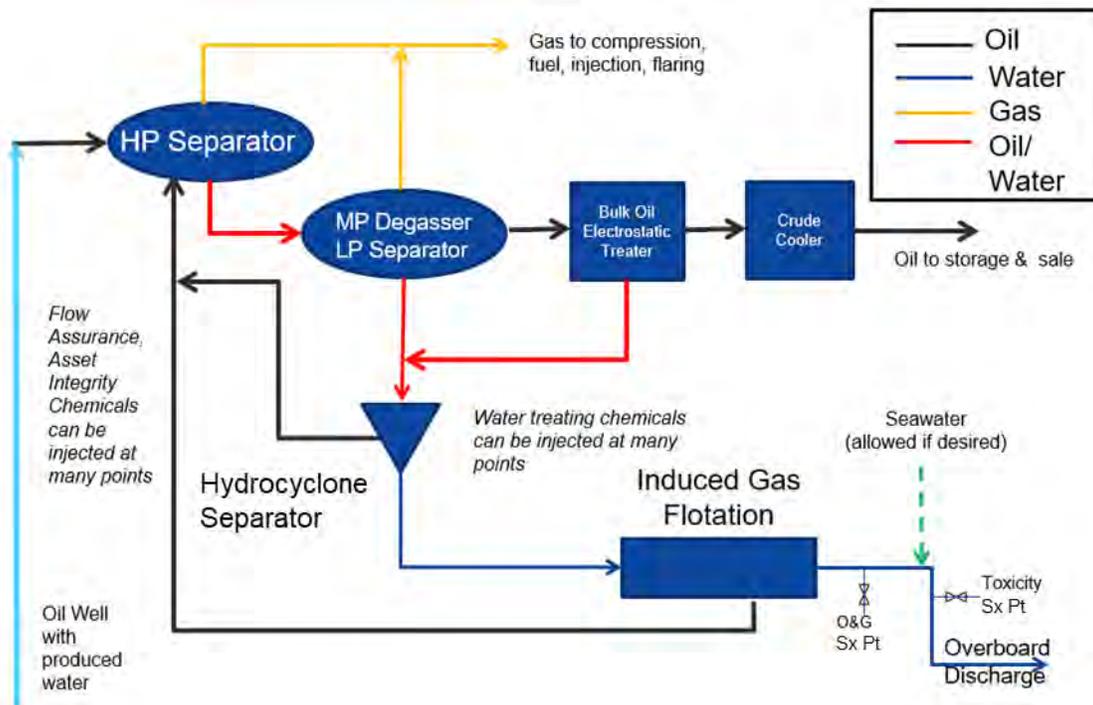
The FPSO vessel operations generate specific waste streams related to the production, storage, and off-loading operations that are discharged overboard, including produced water, and potable water treatment wastewaters. FPSO vessel operations also generate routine marine vessel waste streams that are discharged overboard, including deck drain wastewaters (after oil-water separator treatment), grey and blackwater, food waste, ballast water, cooling water. Most hazardous and non-hazardous wastes generated offshore are transferred onshore for treatment and disposal, except certain spent oils, lubes, and chemicals which are incinerated offshore in accordance with IMO and MARPOL 73/78 requirements for shipboard incinerators. The Liza Destiny FPSO operates a TeamTec AS shipboard incinerator which is certified to meet the requirements of MARPOL 73/78, Annex VI (IMO 2019).

Oily Waste Pre-treatment – Sludges and oily debris are generated from the FPSO operations related to the periodic cleaning of the various onboard oil/water separators and the produced water treatment process (separator and induced gas flotation operations). These wastes can be stored temporarily in skips or other containers on the FPSO and then are allowed to settle and separate using gravity. If feasible, liquids are then decanted and processed back with the incoming crude oil through the high pressure separator on the FPSO. The remaining solid/sludge wastes are then properly packaged and transferred onshore for treatment and disposal. This waste pre-treatment process is done in batches based on operational requirements.

Produced Water Treatment—Produced water is the residual byproduct of the extraction of oil. After the fluids are pumped from the well, they are initially processed through separators which separate the oil, water, and natural gas. The resulting oily water mixture is further treated in a hydrocyclone separator for additional oil separation, and then the produced water is further treated using induced gas flotation technology for final polishing and oil removal prior to being discharged overboard. Off specification fluids are directed to holding tanks for re-treatment. The system is designed to produce a discharge that does not exceed 42 ppm of oil in water (OIW) on a daily basis, or 29 ppm on a monthly average.

Produced water processing is conducted continuously or batch mode based on operational requirements of volumes of produced water received. There is an onboard auto sampler that measures OIW, and there is also an onboard permanent laboratory with technicians that monitor quality.

**Figure 4-27: Typical Produced Water Source and Treatment**



Potable Water Treatment—The FPSO is equipped with seawater treatment plant for the production of low sulfate water using nano filtration membrane technology and the production of potable process water using desalination reverse osmosis technology. A concentrated brine effluent is generated from the water treatment process that is discharged overboard. Potable water treatment is continuous in operation.

**Figure 4-28: Typical Reverse Osmosis Unit**



Cooling Water Management—Cooling water is the largest quantity discharge from the FPSO (as well as from the drill ships). Large quantities of seawater are continuously used by the offshore vessels in their cooling systems as a heat exchange medium to cool down various equipment, including power generators and other processing equipment. The cooling system generally involves a once-through circuit, where seawater is drawn in from intakes, passed through the system, and discharged as a thermal waste stream back into the sea. The cooling water may be dosed with biocide chemicals (such as hypochlorite—chlorine bleach) prior to use to prevent biofouling of the pipe work and heat exchangers. These chemicals are continuously dosed into the seawater at the intake and in other locations. This dosing results in a residual chlorine concentration in the cooling water that is discharged to the sea. Temperature control to meet discharge requirements involves cooler water blending or additional heat exchangers. Cooling water is discharged below the sea surface to assist with dilution and dispersion of the cooling water plume.

Food Waste Treatment—For FPSOs located >12 nautical miles from shore, food wastes can be treated through a shredder or a macerator and pass through a 25-millimeter mesh screen prior to overboard discharge. Food waste discharge must be visually monitored to ensure there are no floating solids after treatment. Food waste treatment is conducted in batch mode when required. Liza Destiny's macerator is manufactured by Hoover Ferguson.

Figure 4-29: Liza Destiny FPSO Food Macerator



#### 4.3.1.5 All Vessels

All vessels have food and sanitary wastewater that is treated and discharged overboard as described below.

Sanitary Waste Treatment—Sanitary wastewaters (including grey water and blackwater) and sludges are treated prior to discharge. Macerators (sewage waste grinders) are used for treatment prior to discharge from vessels with less than 10 personnel. However, all vessels with more than 10 personnel are equipped with an MSD. MSDs use various technologies, including sewage oxidation using electrochemical cells, or traditional biological treatment methods that include coarse screening, aeration, clarification, and settling. All MSDs also use disinfection chemicals as part of the final process prior to discharge overboard. In accordance with MARPOL 73/78 requirements, vessels are required to have an International Sewage Pollution Certificate that requires periodic renewal surveys. Sanitary waste treatment is continuous in operation.

**Figure 4-30: Sanitary Waste Treatment**

**Macerator**



**Electrochemical MSD**



**Biological MSC**



**Food Waste Treatment**—For vessels located >12 nautical miles from shore, food wastes can be treated through a shredder or a macerator and pass through a 25-millimeter mesh screen prior to overboard discharge. Food waste discharge must be visually monitored to ensure there are no floating solids after treatment. Food waste treatment is conducted in batch mode when required.

**Figure 4-31: Shipboard Food Shredder**



### **4.3.2 Onshore Waste Management Facilities**

At present, there is currently a limited number of onshore waste service providers of hazardous and non-hazardous waste management in Guyana. A description of the existing and proposed waste management service providers is provided below. The EPA has advised that Guyana hazardous waste regulations will be revised such that onshore facilities will be subject to RCRA-like hazardous waste regulations. Accordingly, waste service providers' operations may be impacted. One of the major revisions to these regulations will be the adoption of RCRA-like disposal treatment standards.

#### 4.3.2.1 Existing Waste Management Facilities

**TRG**—TRG, which is located at GYSBI, is currently the primary provider of hazardous and non-hazardous waste services to EEPGL projects. TRG employs a variety of waste treatment technologies (sorting/segregation of recyclables, physical/chemical/and thermal treatment of hazardous and non-hazardous wastes) and discharges its treated fluids as permitted to the Demerara River, and sends its treated non-hazardous solid waste as well as other wastes received (including general waste, paper/cardboard, and scrap wood) to the publicly owned and operated HBL. TRG receives wastes from EEPGL directly, as well as many other companies involved with the offshore oil E&P operations.

**Figure 4-32: TRG GYSBI Facility**



**HBL**—The HBL, which is located in Eccles East Bank Demerara (EBD) area, is government owned under the jurisdiction of the Guyana Ministry of Local Government and Regional Development (Sanitation Management Unit) and is operated by a third-party contractor Waste Solutions Landfill Inc. (joint venture between Puran Brothers and Cevons Waste Management). The HBL is the only engineered sanitary landfill in Guyana, and started operations in early 2011. The HBL is the current destination for most municipal and commercial solid non-hazardous waste generated from the greater Georgetown area, including wastes generated from the 25-plus Neighborhood Democratic Councils between Mahaica, the Seawall, Timehri, and Parika. All non-hazardous solid wastes generated to date from the EEPGL projects have been disposed at the HBL. The original disposal cell (Cell 1) is at 99 percent capacity, and Cell 2 started operations in late March 2021. At current disposal rates, Cell 2 will have approximately 4 to 6 years of disposal capacity. The facility currently receives approximately 500 tons of waste per day.

**Figure 4-33: Haags Bosch Landfill**



Eternity Investment Inc.—EII, which was established in 2009, is a scrap metal consolidation and exporting facility, which also accepts and manages lead acid batteries and electronic waste. EII is currently the only facility authorized by the EPA to manage electronic wastes. The main scrap yard for the facility is located in a sparsely developed area of Madewini near the Cheddi Jagan International Airport. The company receives non-ferrous (including lead acid batteries), ferrous, and electronic waste scrap, and then sorts and consolidates these materials. These materials are then packaged in sea going containers and exported to buyers worldwide. Historically, materials have been exported to the U.S., Malaysia, Korea, Vietnam, Spain, and Belgium. EII receives scrap metal from throughout Guyana.

**Figure 4-34: EII Madewini Scrap Yard**



Liquid Mud Plants (LMPs)—There are currently three onshore drilling services providers that operate cement and drilling fluids facilities, also known as a LMP, including Schlumberger Guyana, Inc./MI-Swaco (located at GYSBI [blue]), Halliburton Guyana, Inc. (located at G-Port at the mouth of the Demerara River red), and Baker Hughes Guyana Inc. (also located at G-Port [yellow]). The LMPs manufacture drilling fluids (mud) for the offshore operations, but also receive spent fluids (mud) from the offshore operations for onshore reconditioning. The used drilling mud is reclaimed using mechanical (centrifugation) and chemical processes, and the reconditioned muds are then returned to the drilling ships for use in new drilling operations. However, the LMPs also generate hazardous and non-hazardous wastes from their reconditioning operations, including fluids, cuttings and other solids recovered from the used drilling muds, as well as other operational wastes (wastewaters, oily rags, garbage, etc.). These residual wastes are currently being managed by TRG. The LMPs only receive drilling mud wastes from the offshore drill ships.

**Figure 4-35: Liquid Mud Plants**

Schlumberger Guyana, Inc./MI-Swaco at GYSBI (blue)

Halliburton Guyana, Inc. (red) and Baker Hughes Guyana Inc. at G-Port (yellow)



#### 4.3.2.2 Planned Waste Management Facilities

Sustainable Environmental Solutions Guyana, Inc. (SES) is currently constructing a new integrated waste management facility (IWMF) at GYSBI for managing wastes that are generated from offshore operations and is expected to be operational in July 2021. The SES facility will employ various hazardous and non-hazardous waste management technologies, including hot oil thermal desorption, incineration, decanter/centrifuge separation, wastewater treatment, waste shredding, container crusher/baling, and container washing operations.

**Figure 4-36: SES GYSBI Facility (under construction)**



Oilfield Waste Management Services (OWMS) submitted a permit application to the EPA in 2020 for the construction of a 5,000 square meters (m<sup>2</sup>) drilling waste processing plant in the Little Diamond EBD area (located approximately 5 kilometers (km) south of GYSBI). OWMS will employ thermal desorption separator (hammer mill) technology to treat drilling muds. Oil and water recovered from the process are proposed to be recycled in the formulation of new drilling muds, and the solids are proposed to be used in the bitumen manufacturing process or sent to the HBL. It is unknown when the OWMS plant will become operational.

Environmental Waste Management Services Guyana Inc. (EWMSG) submitted a permit application in late 2020 for the construction and operation of a waste treatment (bioremediation) facility for mud sludge generated from activities in the Oil and Gas sector. The proposed location of the facility is at Lots 21 and

22, Block XXV111 Zone Plantation Friendship, EBD area. According to the EPA Public Notice issued in December 2020, the operation will involve the development of two treatment ponds lined with High Density Polyethylene (HDPE) Geomembrane liners and contained by 91.4cm high berms. In addition, four existing structures will be repaired and developed into administrative units, laboratories, storage areas, and homes for caretakers. A screen will be constructed to separate the office area from the treatment ponds. The status of this application is not currently known, and it is also unknown when the EWMSG facility would become operational.

GYSBI currently operates a steel pipe warehouse, storage, and handling operation at its Annex location which involves the washing of virgin steel pipe prior to transfer to the wharf and loading onto the vessels for offshore transit. The non-hazardous wastewater from this washing operation is currently collected and treated in on-site evaporators—there is no discharge of this wastewater. This location is being considered as part of a feasibility assessment for developing a new Protectors Grinding and Pelletizing to exclusively and specifically manage used plastic drill pipe thread protectors that are generated from the pipe handling operations. Pipe thread protectors are designed to protect the critical threads of the steel pipes during storage, handling, and transport, and tens of thousands of these metal reinforced plastic caps will be generated as a result of offshore well installation operations. These used plastic caps will first be subject to grinding to separate the plastic and metal parts, and the plastic will then be melted and pelletized and returned to the original manufacturer as a raw material for the production of new plastic caps. The recovered metal will also be recycled. Although being considered, it is uncertain when this type of facility would move forward at this location.

**Figure 4-37: GYSBI Annex**



#### 4.3.2.3 Temporary Oily Water Transit Facility

At present, most wastes received from offshore are currently held at GYSBI pending processing at the permitted TRG/SES (future) locations at GYSBI, except for spent drilling fluids which may be stored at the LMPs pending reconditioning (GYSBI and G-Port). However, given the increased demand for space at GYSBI and increased workload for TRG/SES (future), EEPGL has developed an alternative temporary transit area that is identified as the GYSBI Sliver Plot. This area can be used for the transiting of oily waters in the event of TRG/SES (future) workload challenges or unplanned shutdown. The GYSBI Sliver Plot is located immediately adjacent to the SES location and approximately 100 meters northeast of the current TRG GYSBI location. The GYSBI Sliver Plot (approximately 1,500 m<sup>2</sup> in area) currently holds eleven (11) 500 bbl frac tanks with secondary containment to support these backup operations.

**Figure 4-38: GYSBI Sliver Plot**



#### *4.3.2.4 Proposed Emergency Waste Storage Facility*

All non-hazardous wastes managed at TRG are currently stored at TRG pending off-site transfer to the HBL for final disposal. TRG currently transports these wastes every 1 to 2 days to the HBL once a complete truckload of waste has accumulated. However, TRG has very limited space available for non-hazardous waste storage. Therefore, any unplanned shutdown or operational challenges at the HBL could disrupt TRG operations.

EEPGL has developed a contingency option that identifies an additional location (GYSBI Annex Plot 4) that can be used for emergency storage of solid (no-free liquid) treated non-hazardous waste in the event of an unplanned shutdown or operational challenges at the HBL (i.e., the landfill cannot accept wastes because of weather or other operational challenges). The GYSBI Annex Plot 4 site is located on the east side of East Bank Public Road approximately 1 km southeast of the GYSBI entrance, and encompasses an area of approximately 40,000 m<sup>2</sup>. This area could be used for the emergency storage of up to 1,000 tonnes (at a minimum) of treated non-hazardous waste pending the resumption of routine HBL operations.

**Figure 4-39: GYSBI Annex Plot 4 Location**



In addition to the options for these additional storage locations, contingency planning involving the potential export of hazardous waste (under Basel Convention) and non-hazardous wastes is also under development.

### 4.3.3 Current and Future Waste Treatment Technologies

The following is a summary of the various waste treatment technologies currently used or proposed for use at each of the major waste service providers. The existing technologies currently being deployed or planned are typical and have been proven effective worldwide for treating oil and gas exploration, development, and production wastes. These physical, chemical, and thermal treatment technologies are consistent with those described in the WBG and IFC EHS Guidelines for Waste Management Facilities (WBG and IFC 2007c).

#### 4.3.3.1 Tiger Rentals Guyana Inc.

The following is a brief description of the waste management technologies currently employed by TRG.

Wastewater Treatment—The oily wastewater treatment system employs an oil-water separator, which is followed by filtration (sand, particulate and carbon filters). Treated wastewater is also dosed with bleach prior to batch discharge to address coliform concentrations should they be present. This unit can process approximately 50 bbl per day.

The wastewater discharge is covered under the facility environmental permit—the permit does not specify a frequency of sampling, but each treated wastewater batch is tested prior to discharge. Samples are analyzed for pH, total petroleum hydrocarbons (TPH), total suspended solids, biological oxygen, and fecal coliforms. Once the analyses are received and are reviewed to be within the discharge limits, the treated wastewater is discharge through the GYSBI outfall and into the adjacent Demerara River. In general, it takes about 12 hours to discharge an entire 500 bbl frac tank. Treated wastewaters can also be used for container cleaning at TRG, or as make up water for the incinerator scrubber system (oil or chlorine free water only).

**Figure 4-40: TRG Wastewater Treatment**

**Oil-Water Separator**



**Filtration Units**



Solidification/Stabilization Treatment of Drilling Muds and Sludge—The solidification/ stabilization process involves the use of a pug mill to mix cement with the drilling muds and sludges to solidify and stabilize the material prior to off-site transfer for landfill disposal. There are currently two pug mill units in operation and combined these units can treat approximately two bbl of waste per hour. A small excavator is used to load cement and sludges into the pug mill for mixing. The treated wastes are then loaded into bulk bags (also known as supersacks and constructed of woven polypropylene) for curing under cover prior to off-site

transfer for disposal. Treated wastes are also periodically tested for TPH, total oil and grease (TOG), and the Toxicity Characteristic Leaching Procedure (TCLP) extractable metals content (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and zinc—USEPA SW-846 Test Method 1311—RCRA 8 metals [USEPA 1992]) to ensure they have been rendered non-hazardous in the solidification/stabilization process. Wastes are re-treated if they do not pass the referenced USEPA standard.

TRG has updated the Sampling Plan (revised April 2021) to include sampling frequencies and volume parameters.

- Incineration is composite sampled at minimum every (3) Mega bags or 5 metric tons (MT).
- The Pug Mill is composite sampled every (18) Mega bags or 25 MT.
- The Wastewater is batch treated and sampled prior to every discharge.

The frequency and volume are usually based on waste stream variation and treatment technology.

**Figure 4-41: Pug Mill Operations**



Thermal Desorption Treatment—Thermal desorption treatment of oily sludges, drill cutting, tank cleaning sludges, produced solids etc. is conducted using a vertical infrared desorption (VIR) unit. The VIR utilizes infrared heating elements to heat the waste (100 to 350 degrees Celsius [°C]) and thermally desorb the contaminants. The contaminants (primarily hydrocarbons) evaporate and are then vented through a thermal oxidizer system (900 to 1,200°C) for destruction of the volatilized contaminants and other off-gases. However, some liquids may also remain after the completion of VIR treatment, and these are subject to collection and further treatment in the wastewater treatment plant or treatment in the pug mill. The VIR unit at TRG can process approximately 100 bbl of waste per week.

Wastes are loaded into the refractory lined VIR unit (30 cubic meters [m<sup>3</sup>] capacity) with an excavator, and then the infrared heating elements are inserted and the unit sealed in preparation for treatment. The contaminated solids are batch treated, and the batch treatment can last from 12 to 72 hours (depending on moisture content and oil content). After treatment, the wastes are loaded into bulk bags and stored pending transport to the landfill for final disposal. Treated wastes are also subject to periodic composite batch sampling and testing for TPH, TOG, and TCLP extractable metals to ensure they have been rendered non-hazardous in the thermal desorption process.

**Figure 4-42: Thermal Desorption Treatment**



Incineration Treatment—Certain hazardous wastes, including oily rags, spent solvents, paint cans, brushes, biomedical wastes, etc., are treated in an incinerator unit. The incinerator unit is a single hearth unit with the main burner temperature set at 450 to 500°C, and the secondary burner temperature set at 850 to 900°C. The incinerator has an air pollution control system that consists of the secondary combustion unit, a rapid quench system, and a wet scrubber for gas emission neutralization prior to stack discharge. The water in the wet scrubber is recirculated within the scrubber system, with a portion of the liquid ultimately evaporating daily as steam as part of the stack discharge. New water needs to be added as needed to the process to maintain the proper operation of the wet scrubber. In summary, there is no effluent or discharge from the wet scrubber system.

This unit generally operates 12 hours per day, and can treat approximately 1,500 kg/day. The incinerator fuel source is diesel fuel.

Wastes are manually loaded into the burning chamber in quantities of approximately 150 kg, and additional charges are added when the burning appears to be complete and only ashes are left (a visual observation only). When charges are added, the main burner is turned off, and an additional charge is manually added to the hearth. All the ashes are removed after the unit has cooled down after the 12 hour operating period. This cool down takes approximately 2 hours. Wastes are then unloaded and placed into bulk bags and stored pending transport to the landfill for disposal. Treated wastes are also periodically tested for TPH, TOG, and TCLP extractable metals to ensure they have been rendered non-hazardous in the incineration process.

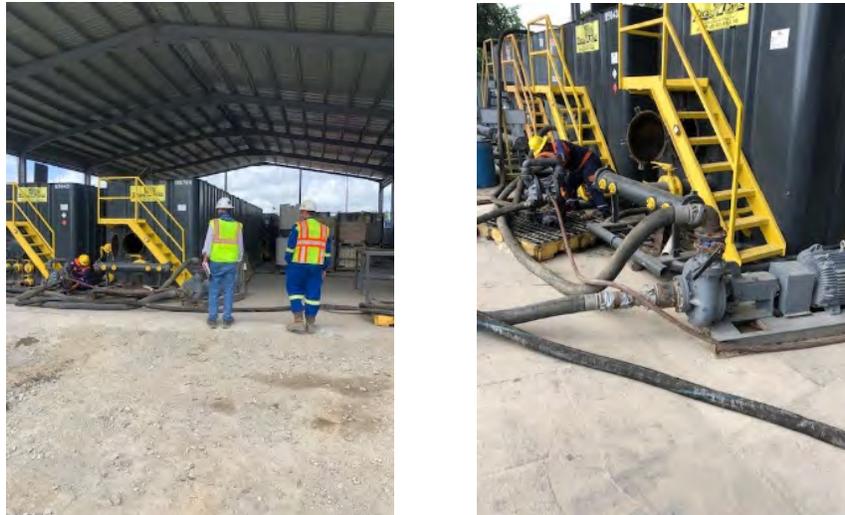
**Figure 4-43: Incineration**



Separation Treatment—The separation of oily wastewaters is currently being done on-site using frac tank storage and gravity separation techniques. The wastewaters are stored in the frac tanks and the liquids

are allowed to separate over a time (a period of days). The oil fraction is then siphoned off the top for treatment, and the remaining wastewaters are treated accordingly.

**Figure 4-44: Frac Tank Storage**



Specialty Hazardous Waste Treatment—TRG operates two specialty hazardous waste treatment units—a fluorescent bulb crusher unit (Bulb Eater Brand) requires manual loading of lamps, which are then crushed in the unit. The unit has a side-mounted 4-stage filter system that includes both high-efficiency particulate absorbing/arrestance (HEPA) and carbon filters to neutralize mercury vapors released during crushing. Metal and glass from the unit are then recycled (metal) or disposed (glass) as non-hazardous waste at the landfill, and the air filters are stabilized in the pug mill prior to landfill disposal. The aerosol can processing unit requires manual loading, and the unit punctures the cans and allows the liquids to collect in a steel 205L drum. The vapors are directed through a coalescing filter/carbon cartridge to capture emissions. The recovered liquids are then incinerated on-site.

**Figure 4-45: Specialty Waste Treatment**

**Aerosol Can Unit**



**Bulb Crush Unit**



Container Cleaning—TRG conducts cleaning of the various containers being used for waste containment and transport (including CCU, IBC, 205 liter drums (plastic and metal), and other containers). Pressure washers are the primary tool used for cleaning operations. Solids and liquids recovered from the container cleaning operation are treated in the other on-site waste treatment processes, and the containers are returned to service. Containers which cannot be reused are crushed (metal) or cut (plastics) prior to disposal or recycling (metal).

**Figure 4-46: Drum Crusher**



Segregation/Sorting/Storage—TRG maintains a separate non-hazardous waste storage and processing area where non-hazardous wastes are manually sorted and segregated pending off-site transfer for further recycling or disposal. This area is used to manage glass, paper, plastic, scrap metal, etc.). The only operations conducted are consolidation, bulking, and size reduction for ease of transport.

**Figure 4-47: Non-hazardous Waste Operations Area**



Landfill Disposal—TRG transports treated non-hazardous solids from its waste processing operations and other sorted non-hazardous wastes (garbage) received from offshore operations to the government owned and operated HBL for landfill disposal.

The HBL is the only engineered sanitary landfill in Guyana, and the two cells constructed to date include a leachate collection layer that was placed over the thick section of native clay subsoils (>20 meters thick) at the site. Leachate is collected within the leachate collection system which includes two facultative ponds (aerobic zone near the surface and anaerobic zone at depth) and two stabilization ponds (aerobic), prior to discharge to drainage ditches which discharge to the river (3 km distant). Cell 2 has also been constructed with air vents to promote a semi-aerobic decomposition of the waste (Fukuoka Method) in the future.

Wastes received at the landfill site are off-loaded into the active disposal cell, and the wastes are periodically covered with soil or other waste. Although there is no formal waste processing conducted at this facility, there is informal waste processing being conducted by recyclers (i.e., waste pickers) who are authorized to recover items from the landfill site for recycling. The recyclers recover, recycle or reuse anything with value from the inbound waste shipments (including food wastes) after the wastes are off-loaded and spread out by the heavy equipment at the working face area. There is currently no segregation of the TRG waste from other municipal solid waste disposed at the landfill site.

**Figure 4-48: Landfill Disposal**

**Working Face Disposal Area**



**Recycler Recovery Operations**



**Leachate Treatment Pond**



#### *4.3.3.2 Sustainable Environmental Solutions Guyana Inc.*

SES is currently developing an IWMF at GYSBI that is expected to be operational in July 2021. The facility is designed to manage both hazardous and non-hazardous wastes that are generated from offshore operations, and will include thermal desorption, incineration, separation (decanter/centrifuge), wastewater treatment, container cleaning, and solids reduction (shredding and crushing) technology. The general flow diagram for the SES IWMF operations is shown in Figure 4-49.

The following is a general description of the various waste management technologies proposed for the SES operation.

Thermal Desorption Treatment—The planned high temperature thermal desorption unit (NOV Hot Oil Thermal Desorption Unit [HTDU] Model 500) is designed for the treatment of hazardous oil based drilling wastes with up to 80 percent liquid content. The HTDU Model 500 can process up to 2 tons of wet cuttings per hour and can operate 24 hours per day/7 days per week, with periodic maintenance shut downs (5 to 7 day duration) required every quarter.

Figure 4-49: SES IWMF Operations Flow Diagram

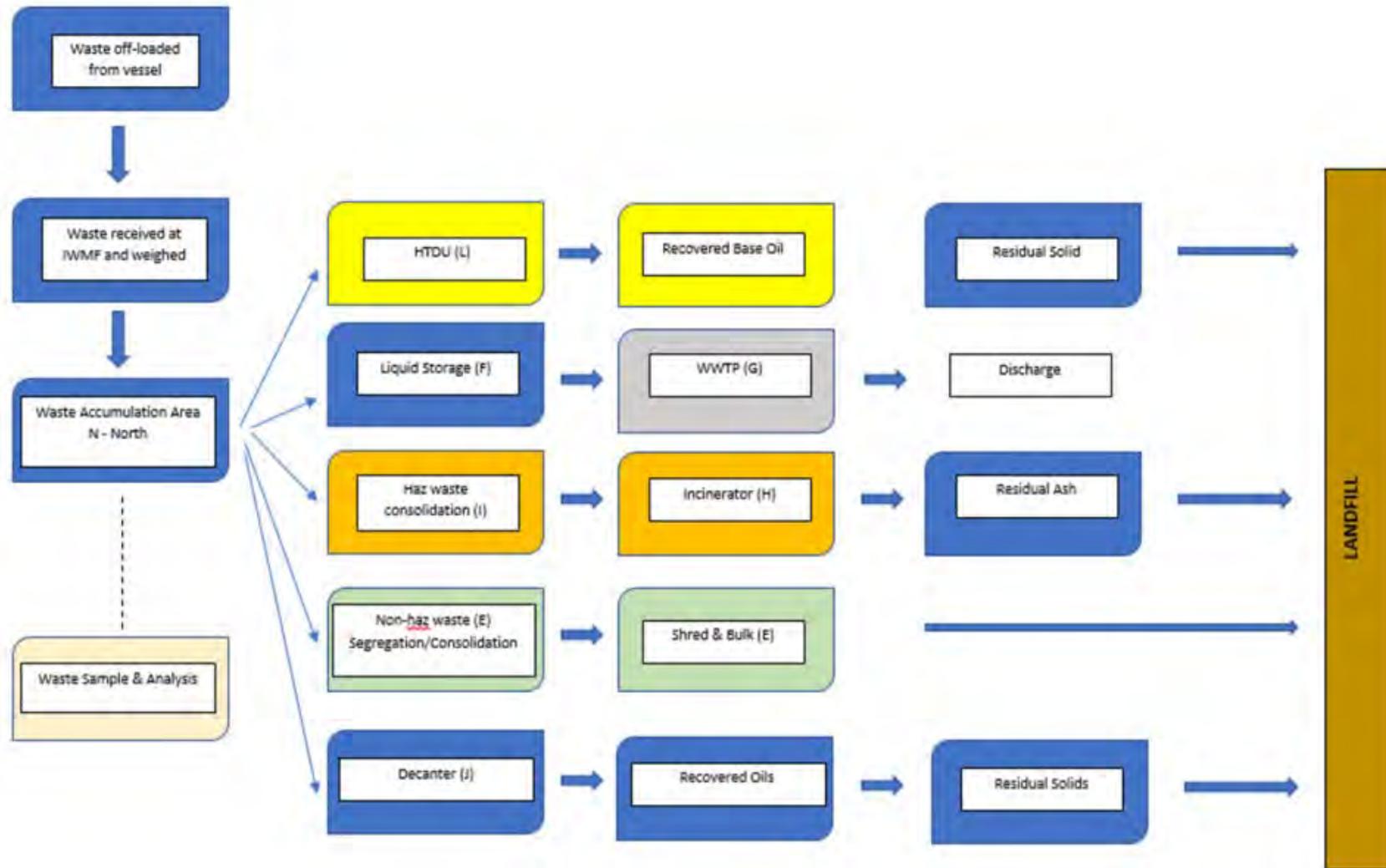
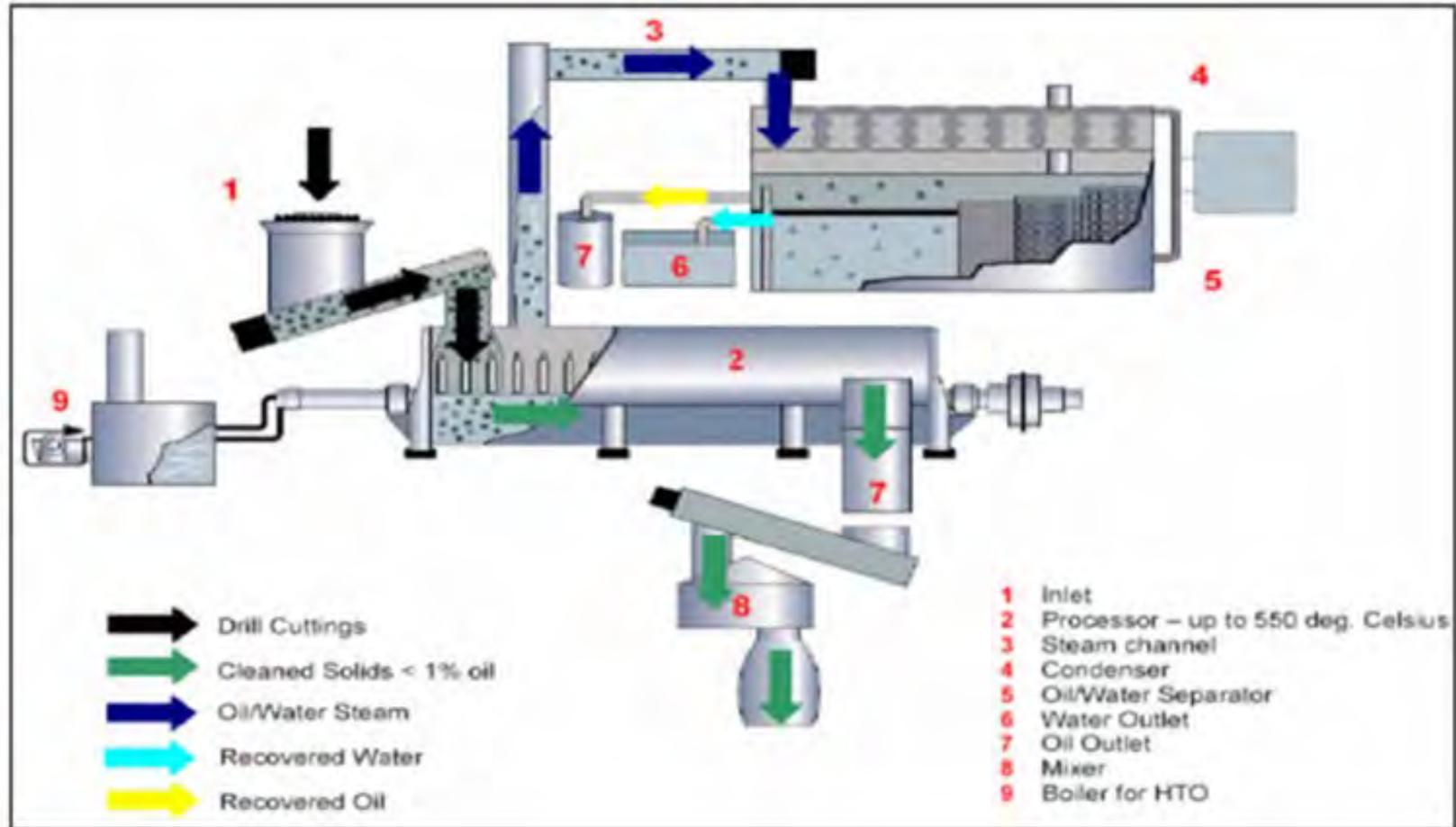


Figure 4-50: Thermal Desorption Treatment



Wastes will originally be received in an unloading pit, and then transferred to open top steel storage tanks that are located within a covered structure to protect from wind and rain. The contents of the tanks will be mixed with an overhead traverse crane, and then will be loaded with a clamshell bucket into the HTDU. The HTDU employs desorption by heating and mixing of sludge in a deoxygenated atmosphere, and heat transmission oil, heated in an adjacent boiler system, is used to heat the HTDU up to 550°C. The thermal treatment evaporates the water and hydrocarbons, which are then treated in a condenser unit and oil/water separator.

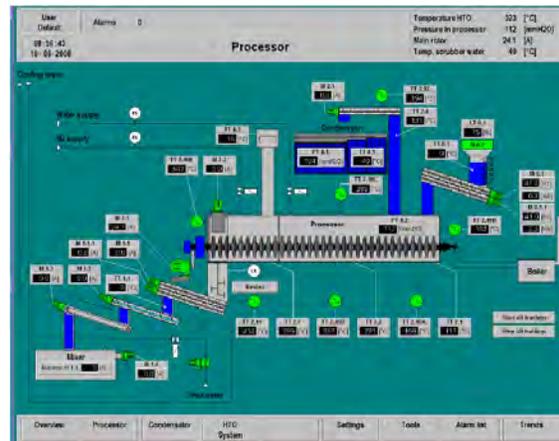
Non-condensable gases are treated in a gas dryer and burner. The oil is recovered and reused in the manufacture of new drilling fluids, and the recovered water is used in the HDTU quencher unit or used to rehydrate the treated solids. The dry solids are cooled and rehydrated, and then are packaged in bulk bags for testing prior to transport to the landfill for disposal. All HTDU operations will be computer monitored and controlled.

**Figure 4-51: HTDU Unit and Operations**

**Typical HTDU Unit**



**Typical HTDU Control Screen**



**Incineration Treatment**—The planned incinerator unit is designed to treat both liquid and solid hazardous wastes. An Addfield C200 incinerator is proposed for installation. The incinerator is a single hearth unit with a burning chamber capacity of 200 kg/hour. The unit is proposed to have a pneumatic operated automatically sequenced ram feeder unit, which minimizes the amount of manual waste handling associated with the incinerator loading.

This incinerator has two burning chamber—the primary chamber will operate in excess of 700°C and secondary chamber will operate at greater than 1,100°C to ensure complete destruction of gases prior to stack discharge. No additional air emissions controls beyond the secondary chamber are currently specified to be installed on this unit. Ash is removed after each burning episode, placed in bulk bags, and stored pending approval sampling and transfer to the landfill for disposal. All incinerator operations are controlled with a programmable logic controller based control system to provide fully automated monitoring and control of the plant.

**Figure 4-52: Addfield C200 Incinerator**



Separation Treatment—The planned decanter/centrifuge unit is part of the SAS Environmental MIST (Microemulsion Injection and Separations Technology) system, which is a separation technology which separates liquids from solids. This unit is designed for the treatment of hazardous waste streams that are 70 to 80 percent liquid with up to 10 to 25 percent oil content. The MIST system has blending tanks to optimize the feedstock (proper mixture of solids and liquids), prior to separation, and then unit uses a decanter and centrifuge to produce a mixture of oil and water, and dry solids. The recovered liquids are treated in the wastewater treatment system, and the solids are subject to further thermal treatment or stored in bulk bags pending approval sampling and landfill disposal.

**Figure 4-53: SAS Environmental MIST System**



Wastewater Treatment—The planned wastewater treatment unit is designed to treat petroleum and chemical containing wastewaters. The treatment process will include:

- A coarse screen;
- Initial oil/water separation employing gravity separation;
- Top skimmer for oil recovery;
- A two phase oil flotation unit (dissolved air flotation);

- A pH adjustment unit;
- A second oil/water separator;
- A final pH adjustment unit; and
- Final polishing with a reverse osmosis unit as required prior to discharge to the GYSBI channel for discharge to the river.

**Figure 4-54: Example Wastewater Treatment Unit**



Container Cleaning—The planned container washing unit is designed to wash and clean the various containers being used for waste containment and transport (including CCU, IBC, 205 liter drums (plastic and metal), and other containers). Solids and liquids recovered from the container cleaning operation are treated in the other on-site waste treatment processes, and the containers are returned to service. Containers which cannot be reused are crushed or shredded prior to disposal or recycling (metal).

**Figure 4-55: Container Washing Unit**

**IBC Wash Unit**

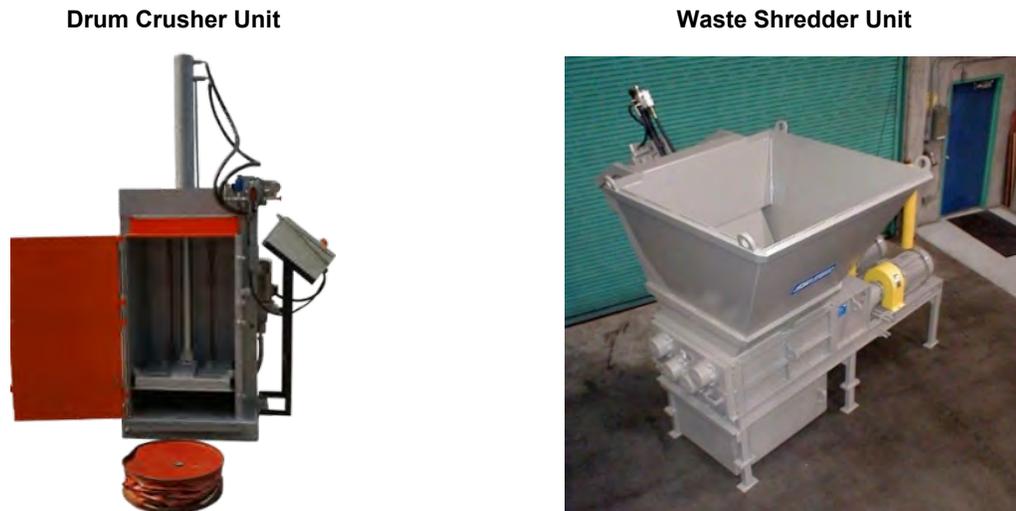


**Drum Wash Unit**



Solids Reduction—The IWMF will also have shredder equipment for size reduction of non-hazardous wastes (bulk wood and plastics), as well as a drum crusher (for metal and plastic drums up to 210 liters in size). The purpose of these solids reduction measures is to reduce the overall volume of wastes to optimize handling, transport, and disposal of the wastes.

**Figure 4-56: Solids Reduction Measures**

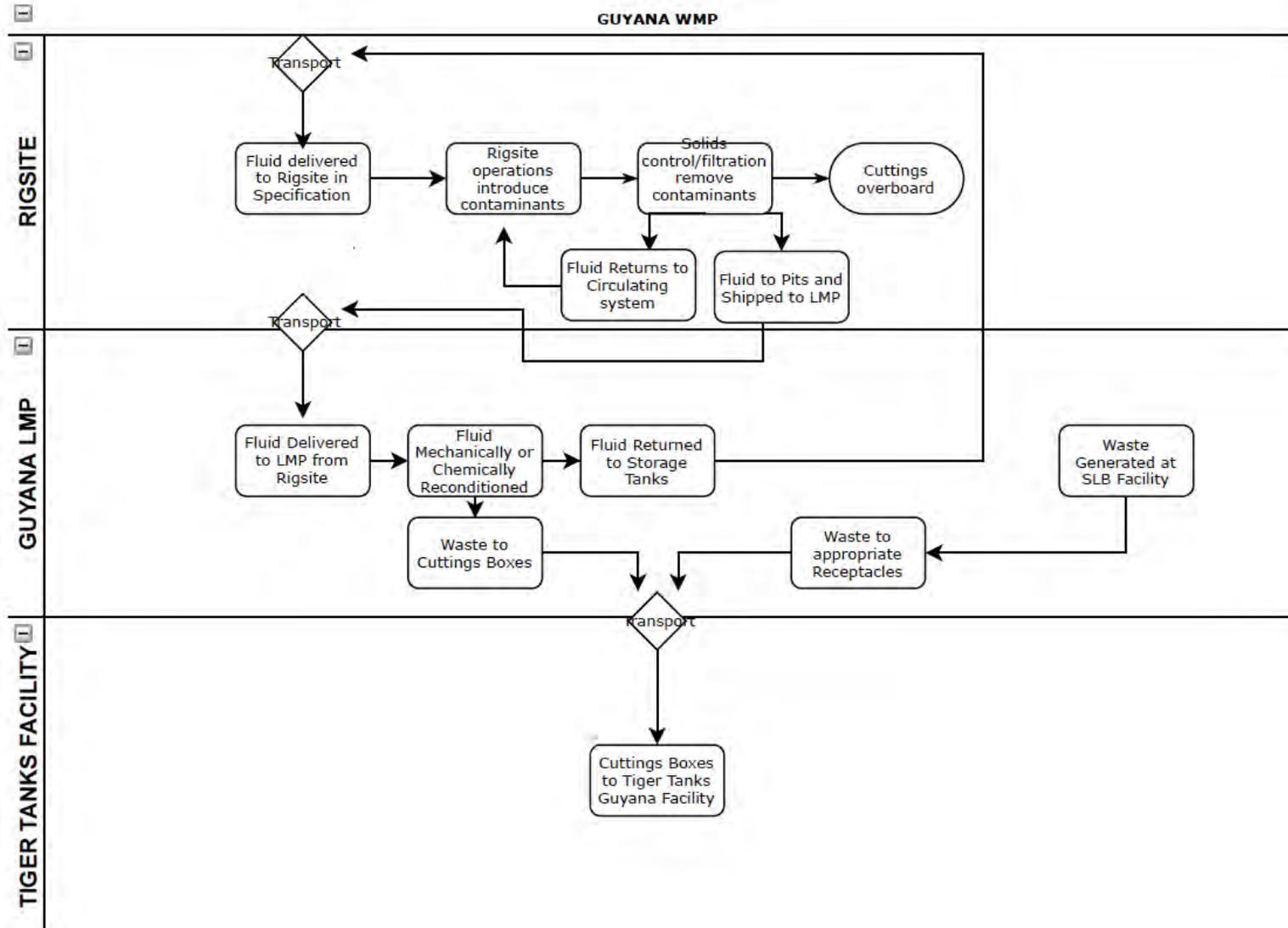


#### 4.3.3.3 *Liquid Mud Plant*

The LMPs currently operating to support EEPGL offshore drilling operations (Halliburton, Schlumberger/MI-Swaco, and Baker Hughes) are the EPA-permitted facilities which manage drill ship fluids for reconditioning. Each LMP has its own Emergency Preparedness Plan, WMP, and annual reporting requirements regarding waste management as required by their respective EPA Operation Permit. Each of these LMPs has its own proprietary reconditioning technologies and processes for managing the drill ship fluids, but all generate wastes from their operations that are currently being managed by TRG. Some of these wastes including spent drilling muds (fluids) and cuttings recovered from the reconditioning processes.

Figure 4-57 is an example workflow diagram of how all of the LMPs generally manage the drill ship fluids and their reconditioning processes.

Figure 4-57: Example Liquid Mud Plant Workflow Diagram



Source: Schlumberger WMP, January 2019

## 4.4 Waste Facility Auditing

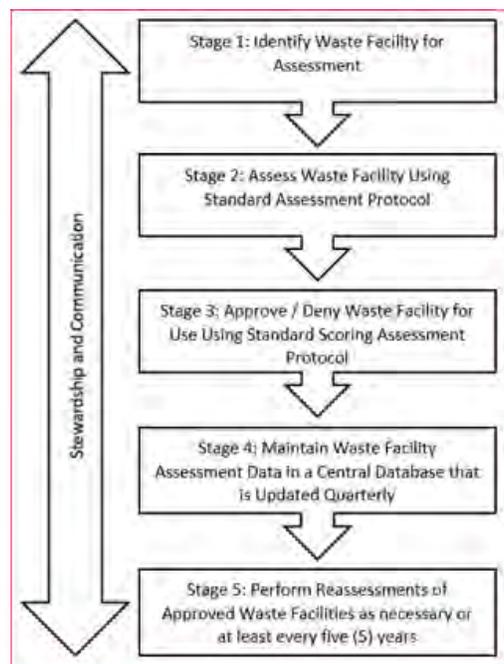
ExxonMobil has a corporate level Approved Waste Site List (AWSL) Program which governs usage of third-party waste management facilities globally. Specifically, the purpose of the system is to mitigate potential Safety, Security, Health & Environment (SSH&E) concerns associated with the recycle, treatment, storage, transfer, and disposal of Exxon Mobil Corporation and Affiliates generated wastes globally. The third-party waste management facilities currently being used in Guyana by EEPGL are subject to the requirements of the AWSL Program.

The AWSL Program requirements take into account the level of risk associated with hazards of the waste, the technology used, and the operation of the facility itself. The AWSL Program is used to monitor and assess third-party waste management facilities. The program uses a clear and consistent documented process by which waste management facilities are assessed and selected.

The AWSL Program waste facility assessment protocol consists of two (2) independent aspects that include information gathering and scoring. The protocol examines ten different technical and non-technical categories of a waste management facility. The categories are:

- Facility operations
- Regulatory compliance
- Management / management systems
- Location
- Security
- Facility Design
- Site geology/groundwater
- Community Relations
- Financials / insurance

**Figure 4-58: AWSL Program Audit Process**



Information gathering is the first aspect of the protocol and involves a site visit, the use of a standard questionnaire (see Appendix G, Waste Facility Assessment Questionnaire) to gather and document information for each of the ten categories, and the gathering of additional supplemental documentation provided by the waste facility or obtained from other publicly available sources. Photographs from the site visit are also part of the documentation required. In special circumstances (i.e., travel restrictions due to a pandemic or other just causes) and actual site visit may be replaced with a virtual inspection or hybrid audit.

The scoring aspect is the second part of the protocol that involves the assignment of a score for each of the ten categories. Examples of aspects identified in the audit that can affect the scoring in the various categories include:

- Recent community activity, including sponsoring community programs or community complaints or opposition;
- Proximity to sensitive environments (wetlands, residences, etc.);
- Safety record (poor to excellent);
- Waste inventory (limited to excessive);
- Experience for key management/technical staff (minimal to extensive);
- Extent of containment measures (inadequate to complete);
- Frequency of regulatory inspections (never to full time) ;
- Scope and frequency of training or inspection programs (minimal to extensive);
- Historical or visible air, soil, water contamination, or lack thereof;
- Owner's financial equity/investment (minimal to high);
- Scope of safety programs (minimal to comprehensive);
- Pollution insurance coverage (none to comprehensive);
- Security/control measures (lacking to fully secure);
- Housekeeping (poor to excellent);
- Audit cooperation (minimum to maximum);
- Maintenance/facility condition (poor to good);
- Technology deficiencies (e.g., lack of air pollution controls, undersized equipment, incomplete treatment, etc.) or attributes (e.g., secondary containment, automated monitoring, computer controls, etc.);
- Record keeping (none to comprehensive);
- Regulatory compliance issues, violations, fines;
- Staffing (insufficient to more than sufficient); and
- Media coverage (negative to positive).

Based on the scoring assessment, a facility is categorized with a rating of GOOD, FAIR, or POOR as defined below:

- GOOD Rating—the facility is approved for use and added to the AWSL.
- FAIR Rating—the facility is only approved for use with appropriate regional management documented endorsement.
- POOR Rating—the facility is prohibited from use, unless it is specifically required by a regulatory authority.

The rating assigned to a specific facility is based on what is referred to as a “balanced risk” approach that considers all the aspects. The criterion for a specific facility rating is based on the overall facility score (represented by the sum of the 10 category scores) and whether or not the score is above or below the GOOD, FAIR, or POOR scoring thresholds. Individual category scores are not necessarily the determining factors, just the overall facility score.

Facilities that have been assessed and approved will have subsequent periodic assessments to keep apprised of potential changing conditions in the technology applications, regulatory environment and compliance, facility financial situation, and changing economic conditions. Once the facility is approved, subsequent assessments are conducted at least every 5 years with the following exceptions:

- The ExxonMobil Business Line sponsor (in the case of Guyana, EEPGL) may request a more frequent assessment schedule.
- Facilities with a FAIR rating will be subject to more frequent assessments (every 1 to 2 years) based on Business Line use.
- Facilities with concerns such as change of ownership to a company, worsening of company financials, key management turnover, environmental concerns, severe SSH&E incident (fire, explosion, severe injury, etc.), changes in technology, or expansion may be subject to additional audits at a shorter cycle.

In Guyana, the TRG facility located at GYSBI and the HBL facility are currently supporting EEPGL operations. Both have been subject to assessment previously under the AWSL Program, with an initial assessment audit conducted in June 2018, and a follow-up audit conducted in September 2019. Additional AWSL Program audits of these two facilities, as well as audits of the new SES GYSBI facility (planned to commence operation in July 2021) and other potential waste management facilities supporting the EEPGL operations (including metals recycler EII) are scheduled to be conducted later in 2021. The frequency of future audits of these facilities will be assessed based on the 2021 audit findings.

The documented AWSL Program waste facility assessment process used by ExxonMobil was developed exclusively on enterprise and risk management experience gained over the last 20+ years—ExxonMobil currently tracks and assesses over 2000 waste management facilities worldwide as part of its AWSL Program. This program has been developed over time based on operational experience and is currently managed by the ExxonMobil Operational Excellence Safety, Security, Health & Environment Group.

Note that there are currently no international standards for auditing waste treatment providers and disposal facilities that would be directly applicable to facilities operating in Guyana. However, there are various auditing best practice aspects that have been developed as described by the following resources—some of the best practice aspects described in these references (such as types of records to review and the physical features to inspect), are part of the ExxonMobil AWSL Program:

- Protocol for Conducting Environmental Compliance Audits Regulated under Subtitle D of RCRA (Non-Hazardous Wastes)—USEPA—Issued March 2000—USEPA Publication 300-B-00-001—

Protocol for Conducting Environmental Compliance Audits of Facilities Regulated under Subtitle D of RCRA (USEPA 2000)—[www.epa.gov/sites/production/files/documents/apcol-rcrad.pdf](http://www.epa.gov/sites/production/files/documents/apcol-rcrad.pdf)

- Protocol for Conducting Environmental Compliance Audits of Treatment, Storage, and Disposal Facilities under RCRA (Hazardous Wastes)—USEPA—Issued December 1998—USEPA/USEPA Publication 305-B-98-006—Protocol for Conducting Environmental Compliance Audits of Treatment, Storage and Disposal Facilities under RCRA (USEPA 1998) [www.epa.gov/sites/production/files/documents/apcol-rcratsdf.pdf](http://www.epa.gov/sites/production/files/documents/apcol-rcratsdf.pdf).
- Treatment Storage and Disposal Facility Audit Program Plan and Reference Guide (DOECAP 2020)—U.S. Department of Energy Consolidated Audit Program (DOECAP)—issued July 2020—DOECAP TSDF Finding Trends (projectenhancement.com)—<https://doecapasp.projectenhancement.com/Presentations/Week-1-2020/TSDF%20Audit%20Program%20Plan%20and%20Reference%20Guide.pdf>.
- CHWMEG Inc.—CHWMEG is a U.S.-based non-profit trade association comprised of manufacturing, and similar industrial organizations that has developed a Facility Review Program that develops reports to obtain critical environmental, operational, and financial information relating to facilities that treat, dispose, recycle, and/or store manufactured wastes and spent materials worldwide. CHWMEG has developed a comprehensive review protocol, questionnaire, and data management system that serves as the framework for the CHWMEG report. The CHWMEG report considers all aspects of each facility including its history, setting, design, operations, management, and financial strength. The focus is on environmental risk and the inherently associated financial risk. To date, CHWMEG has conducted over 5,600 reviews of 2,049 unique waste management facilities in 55 countries. See CHWMEG: Globally Promoting Responsible Waste Stewardship for details. [www.chwmeg.org](http://www.chwmeg.org).
- Waste Facility Audit Association—WFAA was established in 1993 and is a United Kingdom (UK)-based nonprofit association of companies that assists members in obtaining authoritative information on UK, Irish, and mainland Europe waste management facilities through commissioning and sharing independent audits. They have developed an audit protocols to assist their members with risk assessment. See WFAA for details. [www.wfaa.eu/wordpress/](http://www.wfaa.eu/wordpress/).
- Waste Receiver Assessment Program—WRAP was established in Canada in 1999 by a consortium of upstream oil and gas producers to develop a protocol and assessment program to determine the liability and risk associated with sending wastes to third-party waste management facilities. The reports include a description of the assessment process, a facility description, plot plans, facility photographs, observations and findings, a detailed assessment scoring protocol, and the overall facility rating. See WRAP for details. [www.wrapaudit.com](http://www.wrapaudit.com).
- Environmental, Health & Safety Audit Center (Center)—Established in March 2016, the Center is a service to auditors working in the EHS field and who are members of The Institute of Internal Auditors. The mission of the Center is to advance the professional practice of EHS auditing through thought leadership, education, professional guidance, and advocacy. Activities in support of this mission include, but are not limited to, providing:
  - A comprehensive certification program, including the Certified Professional Environmental Auditor® and the Certified Process Safety Auditor®;
  - Beneficial, cost-effective training tailored to EHS auditors; educational products and research; and
  - Deliver relevant insights, perspectives, and content dedicated to EHS auditing.

See [www.theiia.org/centers/ehsac/Pages/welcome.aspx](http://www.theiia.org/centers/ehsac/Pages/welcome.aspx) for more information.

## 5. ESTIMATED WASTE VOLUMES

This section includes a comprehensive forecast for waste volume estimates expected to be generated during the period 2021–2046. These volumes include total wastes, total hazardous wastes, and total non-hazardous wastes that are to be generated. This forecast is exclusively for waste volumes that will be managed onshore in Guyana. Offshore effluents are excluded from the 2021–2046 forecast as the TOR for this Study focuses primarily on waste generation, transport, treatment, disposal, waste facilities, and auditing. EEPGL’s Annual Environmental Report submitted to EPA includes an Effluents Summary for drill ships, logistics vessels, FPSO, FPSO support vessels, and installation vessels. The summary also provides associated effluent volumes. EEPGL suggests that a more accurate and representative basis for forecasting effluents is through the factoring of the number of drill ships, logistics vessels, FPSOs, FPSO support vessels, and installation vessels”.

To date, LP1 has been fully developed and is operating, LP2 is currently under development, and the Payara Project has also been recently approved. Additional exploration drilling associated with the approved 25 E&A Wells is also underway. The scope of the current and approved projects includes the following:

### Approved Scope

- LP1—17 operating wells and 1 FPSO (14 wells completed—FPSO in operation);
- LP2—30 Dev Wells and 1 FPSO (4 wells completed and subsea installation underway);
- Payara—41 Dev Wells and 1 FPSO (well drilling to commence later in 2021—no FPSO operations to date); and
- E&A Operations—25 E&A Wells (well drilling underway).

The theoretical waste projections are based on the approved project scope and theoretical additional project activity that have not yet been approved. The scope of the theoretical projects includes the following:

### Theoretical Scope

- 8 FPSOs
- 281 Dev Wells
- 111 E&A Wells

The following major EEPGL project related activities were considered as part of this waste volume forecast and include contractor assets/activities/facilities as well as approved future projects:

- E&A Wells
- Dev Wells
- Drill Ships (Stena, Noble)
- FPSOs (SBM)
- Installation & Hook Up marine vessels (Saipem)
- Logistics Vessels (SEACOR, Chouest, others)
- LMPs (Halliburton, Schlumberger Guyana, Inc./M-I Swaco, Baker Hughes)

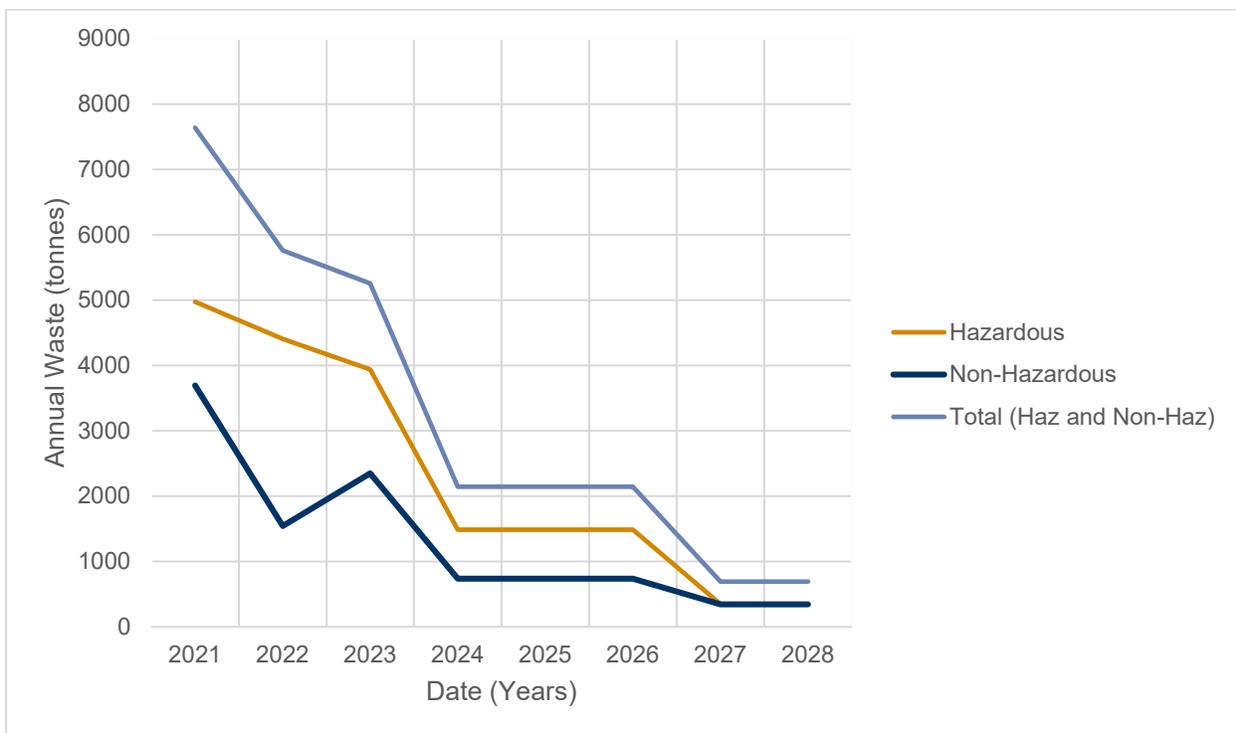
Figures 5-3 and 5-4 show the period of 2021 through 2046 and are provided to satisfy EPA requirements as described in the TOR. These graphs are waste projections based on theoretical scope. Note the longer-term forecast of waste volumes is uncertain for the period beyond 2028.

Figure 5-1 shows projected total volumes of hazardous and non-hazardous wastes, and Figure 5-2 summarizes projected total waste volumes by waste generating source. The total waste volume

anticipated for 2021 is approximately 8,000 tonnes and includes all hazardous and non-hazardous wastes from LP1 operations, continued full field development efforts for LP2, and the 25 E&A drilling efforts. Approximately 6,000 tonnes/year of total wastes are projected to be generated in both 2022 and 2023 as LP2 drilling winds down and the Payara Project continues its development drilling activities. For reference, approximately 5,000 tonnes of total waste were generated during 2020 from LP1, and the start of LP2 activities along with other exploration activities.

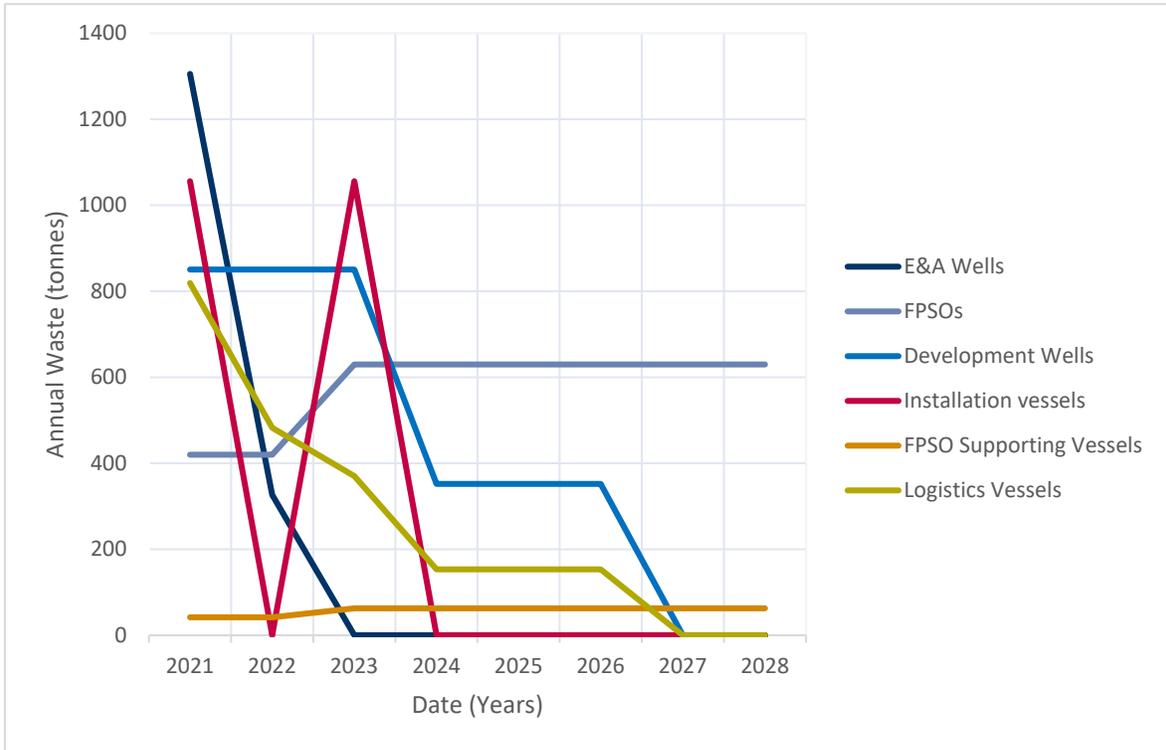
The drill ships routinely generate the most waste among the various types of vessels and the FPSO operations are estimated to generate 200 to 250 tonnes of wastes annually per FPSO.

**Figure 5-1: Projected Waste Volumes 2021–2028**  
**Total Waste by Type**  
**Offshore Generation/Onshore Management**  
**Approved Projects**



Note: Includes all waste sources besides EEPGL Guyana Fiber Optic Cable Project and Guyana Campus Office Project

**Figure 5-2: Projected Total Waste Volumes 2021–2028**  
**Total Waste by Source**  
**Offshore Generation/Onshore Management**  
**Approved Projects**

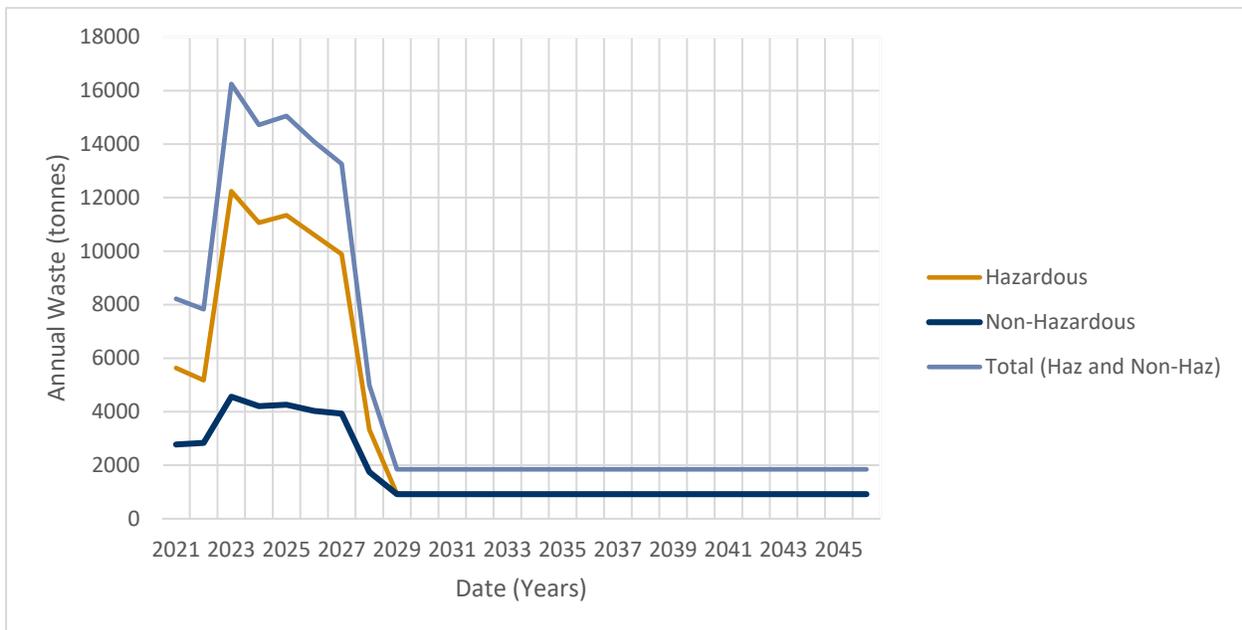


Notes: Includes hazardous and non-hazardous waste. See Appendix C, Marine Vessels Tables, for more information.

Figure 5-3 forecasts estimated waste volumes between 2021 and 2046 (total volumes for hazardous and non-hazardous wastes) and Figure 5-4 provides projected total waste volumes by waste generating source within this same timeframe. The increase of waste volumes observed in the 2023 timeframe is due to theoretical increases from further development of Guyana resources. As noted above, these longer-term forecasts of waste volumes are uncertain beyond 2028 as the potential future projects outlook is unclear.

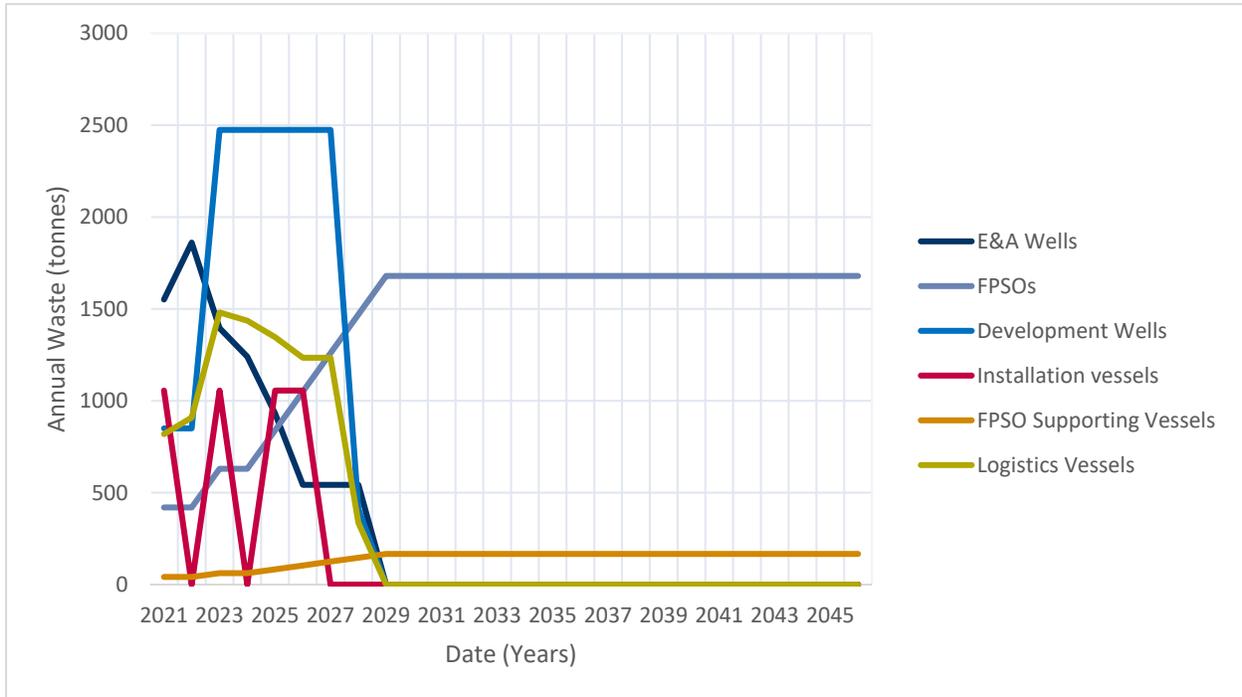
Please refer to Appendix H, which provides a comprehensive methodology for these waste estimates over time combined with detailed assumptions used to generate these volume estimates.

**Figure 5-3: Projected Waste Volumes 2021–2046**  
**Total Waste by Type**  
**Offshore Generation/Onshore Management**  
**Approved & Theoretical Projects**



Note: Includes all waste sources

**Figure 5-4: Projected Waste Volumes 2021–2046**  
**Total Waste by Source**  
**Offshore Generation/Onshore Management**  
**Approved & Theoretical Projects**



Notes: Includes hazardous and non-hazardous waste. See Appendix C, Marine Vessels Tables, for more information.

## 6. WASTE MINIMIZATION STRATEGY

EE EGL and its contractors have implemented a number of steps to minimize the generation of waste that requires treatment and disposal. This section includes the discussion of the following:

- Drilling Fluids and Mud Plant Minimization Strategy
- Other Waste Minimization Strategies

### 6.1 Drilling Fluids Minimization Strategy

EE EGL’s use of drilling fluids and LMP operations are expected to increase substantially during the 2021–2023 time period given the potential that six drill ships may be operating concurrently. As a result, drilling fluid management will be a key focus area for waste minimization of drilling fluids, which has historically been one of the largest waste streams requiring treatment and disposal.

Drilling fluids are already recycled and reused to the maximum extent possible, and three LMPs have been established in Guyana to support the offshore drilling operations. Further, a new integrated two-prong approach drilling fluids strategy has been implemented which will further result in a reduction of Dev Well and exploration well drilling fluid wastes. This approach streamlines the NAF processes, reduces waste at source, increases drilling fluid re-utilization, and greatly reduces dilution (which can increase waste volumes). The overall environmental benefits are multi-faceted, including but not limited to the following areas:

- Fewer tank rentals needed to contain wastes;
- Fewer boat trips/boat cleaning needed to transport wastes;
- Simpler and faster displacement/filtration with fewer interfaces;
- Less pit cleaning and waste generation at the rig between systems; and
- Less onshore-based waste processing (especially slop).

The integrated, two-pronged approach for drilling fluids can be summarized as follows:

- For the Dev Wells, the fluids are envisioned to be fine-grind barite for both 17 ½-inch and 12 ¼-inch intervals and MicroDense for the 8 1/2-inch interval. Any excess MicroDense mud will be either reclaimed or reused, or incorporated into the 12 ½-inch system. These systems are going to be fully compatible across any Dev Wells service providers, so no excessive cleaning or whole mud removal will be required.
- For the exploration wells, there will be a single, fine-grind barite system. This will reduce the type of systems across the field to only three, compatible across all the service providers, and allow for reuse of drilling fluids to the maximum extent possible.

Advantages of this new fluid formulations and the unified fluid approach across all LMP providers are:

- More reuse and recycling of drilling fluids;
- Fewer tank cleaning (rigs and vessels) requirements because of more options for fluid reuse resulting in reduced cleaning wastewater volumes; and
- Fewer vessels will be needed to support operations, which also results in less tank cleanings and reduced cleaning wastewater volumes.

## 6.2 Other Waste Minimization Strategies

- Waste Minimization during Development Drilling
  - Noble Drilling's waste minimization activities include reducing small volume plastic water bottles with 5 gallon water jugs so as to decrease annual domestic waste sent ashore for disposal or recycling.
  - Drill cuttings/mud slops are continually separated on drill ships to recover mud for reuse.
- Waste Minimization during FPSO Production Operations
  - FPSO waste minimization activities include substituting small volume plastic water bottles with 5-gallon water jugs so as to decrease annual domestic waste sent ashore for disposal or recycling in addition to issuing water bottles to each individuals on board the FPSO.
  - Plastic tapes, disposable shoe covers and single use ear plugs are prohibited onboard the FPSO.
  - Bar soap distribution has stopped and the use of soap/shampoo dispensers has been instituted.
  - Domestic waste is reduced by replacing plastic cutlery with metal, ceramic, and glass cutlery and using less plastic packaging for food, laundry, and beverages.
  - Sludge (tank bottoms) is pre-treated by de-watering and the remaining hydrocarbon liquids recovered for further crude oil processing.
  - Oily debris is pre-treated by gravity draining to decrease liquid content and any remaining hydrocarbon liquids recovered for further crude oil processing.

- Hazardous Waste Minimization by Waste Treatment
  - Most hazardous waste streams are rendered suitable for land disposal through use of treatment services provided by waste treatment facilities
  - TRG's Environmental Management Plan, dated February 2018, describes the processes used to treat hazardous waste so as to reduce volumes and render them non-hazardous prior to landfill disposal. Permit applications for each treatment process utilized by TRG may also detail TRG's waste minimization initiatives. SES is in the process of permitting its hazardous waste facility with permit applications for each of its processes and potential waste minimization efforts.
- Waste Minimization by Reuse and Recycle/Recovery
  - Scrap metals, batteries, and electronics are currently handled at EII.

**Figure 6-1: Liza Destiny FPSO 5-Gallon Water Dispenser**



**Figure 6-2: Liza Destiny FPSO Individual Water Bottle**



**Figure 6-3: Noble Tom Madden Drill Ship 5-Gallon Water Dispenser**



## **7. WASTE MANAGEMENT PROGRAM DEVELOPMENT AND COST / BENEFITS ANALYSIS**

### **7.1 Regulatory Agency Waste Management Knowledge Development**

In 2017, EEPGL conducted waste management workshops in collaboration with the EPA and the Ministry of Communities to expand the knowledge base for all shareholders associated with EEPGL projects as part of a capacity building effort. Numerous topics were included in the workshops. The primary workshop topics included:

- Integrated waste management
- Waste definition
- Life cycle perspective
- Waste hierarchy
- Recycle/reuse/repurpose/prevention
- Disposal technologies
- Collection of waste data
- Landfill design, engineering, maintenance, monitoring
- Landfill site investigation/selection
- Open waste piles
- Upgrading of open waste piles
- Leachate management
- Health and safety measures
- HBL data
- HBL funding
- Material recovery
- Waste pickers

Further discussions with the EPA and Ministry of Communities took place in 1Q2020 for the planning of additional capacity building waste management workshops. A workshop was planned initially for March 2020, but was subsequently postponed because of the COVID-19 pandemic. This workshop was subsequently held 16 to 17 March 2021 and focused on the presentation of EEPGL's current cradle to grave management of wastes generated from the offshore E&P operations.

Additional workshops are expected to be planned during the remainder of 2021. Suggested timing is one workshop per quarter, however, the scope and scheduling of the workshops may continue to be impacted by the continuing COVID-19 pandemic.

Since 2020, the EPA has been developing a draft on Requirements for Hazardous and Non-Hazardous Waste Management, which will eventually become part of revised waste regulations. The evolution of these draft requirements, along with feedback/questions/concerns from the March 2021 workshop and this Study are likely to influence the selection of topics for future waste management knowledge sharing and capacity building workshops.

EEPGL recommends the next collaborative workshop follow and address the EPA's draft Requirements for Hazardous and Non-Hazardous Waste Management. The remaining 2021 workshop topics could be based on the EPA priorities developed following their review of this Study and could include the following topics:

- Environmental laboratory capacity in Georgetown;
- Landfill operations, including expanded HBL environmental monitoring, additional HBL landfill disposal cell development, dedicated industrial waste cells, or new landfill development at another location in the Georgetown area;
- An expanded review of the recommended standards for analytical methods and disposal treatment standards for common waste streams generated by Guyana industries;
- Waste treatment processes utilized by TRG and SES; and
- Develop focused CBA process/methodology and identify waste management issues for prioritization for application of a CBA.

Depending upon the topic, EEPGL recommends the participation of key stakeholders in the remaining 2021 workshops, such as the Ministry of Local Government and Regional Development, TRG, SES, HBL, non-oil/gas industries, and subject matter experts.

## **7.2 Waste Facility Infrastructure Development**

Existing and near future planned waste facility infrastructure in Guyana is expected to meet the near term requirements for offshore oil and gas development over the next 2 to 3 years. Further, the existing waste facility infrastructure at TRG and SES can also be expanded to include more waste treatment and processing units to meet project needs. However, there are several areas where the existing or near future planned waste facility infrastructure may become potentially limited in meeting future waste management needs of Guyana. These aspects are discussed in the following sections.

### **7.2.1 Landfill Infrastructure**

At present, the HBL is the only engineered landfill in Guyana for the disposal of municipal solid waste and non-hazardous commercial/industrial wastes. The original cell (Cell 1) started receiving wastes in 2011 and is currently at 99 percent capacity. Cell 2 became operational in March 2021. The landfill currently receives approximately 500 tonnes of waste per day, including about 30 to 35 tonnes per day of residual wastes generated from EEPGL projects. However, with an increase in offshore activity expected, along with potential for growth in other industrial and commercial sectors, the quantity of wastes going to the HBL will increase going forward.

At current disposal rates, Cell 2 is expected to last for approximately 4 to 6 years. This estimated life span of Cell 2 depends upon how much the waste volumes received at the landfill increase with the expanded economic development expected in the Georgetown area over the next five years. There remain two additional cells at the site (Cell 3 and Cell 4) for future development. Each cell is 6.5 hectares in size and could be anticipated to last for 5 to 6 years each.

The currently available landfill capacity certainly appears sufficient for the short term (2 to 3 years) with Cell 2 having entered service in March 2021, even considering the forecasted growth in waste volumes from industrial use. Presuming Cells 3 and 4 would be constructed, the future HBL landfill capacity also appears reasonable for the long term (up to 10 years). However, there are several development aspects related to the HBL that may impact future operations. New housing, commercial, and industrial developments continue to be developed in the Eccles area in the vicinity of the landfill. In general, landfills and residential development are not perceived as compatible land uses in light of the potential for odors, traffic, and smoke from fires. At HBL, the nearest residences are currently 500 meters distant. Further, a new roadway is currently under construction nearby the landfill site which will serve as a main connector to the East Bank- East Coast Road Linkage Project. The new roadways are expected to create new

access for housing and other economic activities in the nearby areas that were previously inaccessible. The new roadways will also increase traffic in the area.

These competing land uses and expansion of residential and commercial areas create uncertainty as to whether the HBL will be a sustainable location in the future. Consequently, new landfill development in the region may be appropriate for consideration going forward. The potential for further expansion of HBL and/or the development of a new landfill is a likely candidate for a detailed CBA.

### **7.2.2 Vessel Tank Cleaning Capabilities**

At present, all marine vessel tank cleaning operations are conducted in Trinidad. The cleaning process employed in Trinidad is manual and generates large volumes of washwater and solids. Material recovered from tank cleaning services will be evaluated for reuse at LMPs. Tank cleaning waste streams that are unable to be reclaimed will be evaluated for treatment. However, there is a Tender currently underway in Guyana to provide tank cleaning services locally using technologies that minimize generation of waste.

The need for MSV tank cleaning services in Guyana is part of the strategy for LMP operations in Guyana. The operation of three LMPs in Georgetown to support offshore operations efficiently requires co-located tank cleaning services. The expected startup for MSV tank cleaning capabilities in Guyana is 3Q-4Q 2021.

The tank cleaning system selected for Guyana includes a solids removal system and washwater reuse technology. The solids removal system and water reuse technology selected will reduce the waste generated from tank cleaning. The waste stream volumes generated are expected to be treated by the Wastewater Treatment System and Thermal Desorption Unit at SES.

The addition of MSV tank cleaning capacity is considered necessary infrastructure to efficiently support additional LMPs in Guyana. For this reason, conducting a detailed CBA for tank cleaning infrastructure is unnecessary insofar as the benefits of establishing a more efficient and more environmentally responsible vessel tank cleaning operation would be expected to outweigh any costs associated with the operation.

### **7.2.3 Alternative Waste Management Technologies**

The existing technologies currently being deployed or planned are conventional, practicable, and in some cases BAT for managing oil and gas exploration, development, and production wastes. The existing capacity of these technologies can be expanded in the future to meet EEPGL project needs. However, there are alternative, larger scale waste management technologies available and potentially feasible, which could combine oil and gas treatment with the larger scale treatment of other municipal, commercial, and industrial wastes that will be generated in Guyana as its economy continues to develop and grow. Such technologies are discussed below.

Municipal Wastewater Treatment—Municipal wastewater treatment plants (also known as publicly owned treatment works [POTW]) are employed worldwide for the treatment of sanitary wastewaters, and many also have pre-treatment programs which allow for the discharge of certain commercial and industrial wastewaters. For example, many POTWs receive leachate directly from municipal landfill sites for treatment, as well as industrial wastewaters, including non-saline oily waters (such as those generated from EEPGL operations), after some level of pre-treatment, such as oil/water separation, pH adjustment, etc. Municipal wastewater treatment technology is proven and reliable, as are typical pre-treatment technologies. The cost of the construction, operation, and maintenance of these systems is also well established. The two main factors affecting cost include the size of the system (daily flow rate) and the

effluent quality discharge requirements, which determine the selection of the various treatment components.

There is currently no formal municipal wastewater treatment infrastructure in the Georgetown area. Wastewater is collected in a sewerage system and ultimately discharged without further treatment into adjacent waterways.

Guyana Water Incorporated (GWI) is responsible for water and wastewater management in the Georgetown area. GWI's new strategic plan for 2021–2025 includes an investment program for wastewater treatment plants. Two new wastewater treatment plants are proposed—one for the Georgetown Sewerage System and one for the Tucville Sewerage System. A small pilot system is currently being operated at the Tucville sewer station. The pilot scale treatment process (5 m<sup>3</sup>/day vs. actual volume of 600 m<sup>3</sup>/day) includes physical treatment by screening and grit removal, biological treatment using an up-flow anaerobic sludge blanket reactor followed by a constructed wetland and ultraviolet disinfection. This pilot test is being developed to provide design information for a full scale wastewater treatment plant.

The oil and gas development and production wastes best suited for treatment in a POTW system include oily washwaters, wastewaters from oil/water separators, and sanitary wastewaters. Further, leachate generated from HBL, which receives treated solid wastes, would be suitable for POTW treatment. The primary benefits of the use of a POTW for treatment of these wastes are 1) a reduction in the number of separate river discharge points that need to be regulated and monitored; and 2) more consistent treatment of wastewaters to ensure compliance with discharge standards.

Any future municipal wastewater treatment planning efforts should consider provisions to accept commercial and industrial wastewaters for treatment, including the development of pre-treatment programs to ensure that commercial and industrial wastewaters have no material impacts on the municipal wastewater treatment systems.

Cement Manufacturing/Alternative Fuels and Raw Materials (AFR)—Cement manufacturers worldwide have implemented AFR programs which use waste materials, including used tires, used oil, oily wastewaters, organic chemical wastes, and other wastes with calorific or elemental value into the cement production process. This waste co-processing and the use of AFR is intended to substitute the use of traditional kiln fuels (such as coal or diesel fuel) as well as certain raw materials (shale, clay, etc.) in the cement manufacturing process, which uses high-temperature kilns to produce the cement clinker product. For example, as of 2019, over 70 percent of cement plants in the USA use some type of alternative fuel—40 plants used tire derived fuel, 15 plants used waste oil fuel, 11 plants used solvents as fuel, and 62 plants used some other material. Some examples of the 'other' types of fuels used by plants are engineered fuels, refuse derived fuels, agriwaste, biomass, carpet, plastics, rice hulls, sawdust, textile waste, and wood. Alternative fuels are also currently being used in cement plants in Brazil, Chile, Ecuador, Colombia, and Argentina. The primary benefit of waste co-processing is that there are no residuals generated from the process (compared to incineration, which generates ash), and that cement kilns offer superior waste destruction performance given the high temperatures (>1,400°C) used in the cement manufacturing process.

There is currently no cement manufacturing in Guyana—at present, all cement is imported in bulk. Historically, a cement manufacturing operation was started up in December 2014 but ceased operations in October 2017. As recently as January 2019 a new concrete mixing plant was commissioned by TCL Guyana/CEMEX, but this new plant relies on imported cement manufactured abroad. At the press conference announcing the new concrete plant, the Guyana Minister of Finance and the Guyana Manufacturing and Services Association urged TCL Guyana/CEMEX to explore the idea of manufacturing cement in Guyana given the future growth potential for construction in Guyana.

Currently, the largest barriers to the establishment of cement manufacturing in Guyana are lack of primary raw materials (limestone) and the high cost of energy, as cement manufacturing requires a high energy input. There are no extensive limestone deposits located in northern Guyana, so all bulk limestone materials would have to be imported from the Caribbean Region. Furthermore, there is currently no reliable low cost energy available to support cement manufacturing. Consequently, under the current scenario, cement manufacturing in Guyana does not appear feasible.

However, the proposed Gas to Power Project offers up the potential to change cement manufacturing economics in Guyana. It is possible that low cost energy resulting from the proposed Gas to Power Project could off-set the high costs of importing raw materials from the distant Caribbean Region. This could make the prospect of cement manufacturing in Guyana more feasible. However, the overall feasibility of such an endeavor would require a detailed economic analysis as well as the interest of a multi-national cement manufacturer.

The oil and gas development and production wastes best suited for treatment in cement co-processing include all drill cuttings (alternative raw material), oily sludges, oily rags, contaminated packaging, and other hydrocarbon wastes (alternative fuels). The primary benefits of the use of cement co-processing for treatment of these wastes are (1) reliable and effective treatment of hydrocarbon based hazardous wastes; (2) the elimination of all landfill disposal of residual wastes; and (3) more consistent treatment of waste.

Any future cement manufacturing planning efforts should consider provisions for waste co-processing and the use of AFR.

Waste Oil Recycling—The recycling of waste oil (also known as used oil, black oil, lube oil, etc.) for recovery and reuse is a common waste recycling initiative worldwide. Waste oil from vehicles, equipment, vessels, cooking, etc. is collected and can be treated using various recycling methods depending on the use of the recovered oil product. Simple recycle treatment processes may involve filtering and removal of water content to produce a recycled oil product that can be used for an alternative fuel for industrial boilers, asphalt/bitumen plants, etc. More sophisticated oil recycle treatment processes can include the physical, chemical, and thermal treatment (re-refining) to produce new lubricating oil products. Cooking oils can also be recycled and converted to biodiesel. Waste oil recycling technology is proven and reliable.

The cost of the construction, operation, and maintenance of these systems is also well established. The main factors affecting cost of a waste oil recycling facility include the size of the system (weekly/monthly quantities of waste oil received, which dictate storage capacity design) and the intended quality of the recovered oil product, which determines the selection of the various recycling components (filtration, separation, heating, dehydration, evaporation, condensing, etc.). The overall feasibility of a waste oil recycling system is also dependent on a reliably available volume of base stock, as well as having a sustainable demand for the recovered oil product.

Guyana does not currently have a formal waste oil collection and recycling program. Waste oils are informally collected and reused in various industries, including the logging industry which uses the waste oil for fuel and chainsaw lubrication.

However, there is some history of waste oil recycling in Guyana. Used frying oil was used as a component of a biodiesel product produced from 2006–2013 in the Wauna Region 1 area. More recently in December 2017 a proposal was submitted to the City of Georgetown for the construction of a mini used oil refinery (10 bbl per day capacity), although it appears that proposal never moved forward with construction. Finally, used oils have also been used by the bauxite industry for alternative fuel in processing equipment.

Current barriers to the successful development of a waste oil recycling operation in Guyana include the high cost of capital required to initially establish an oil recycling facility, lack of local expertise for refinery operations, and lengthy time frame and effort that would be required to establish a supply chain of waste oil suppliers (vehicle maintenance garages, industrial entities, etc.) to generate a sustainable volume of waste oil to support recycling operations. A market for recycled oil finished product is also not apparent in Guyana, although there may be a market for recovered product overseas.

Despite these barriers, however, a small scale waste oil recycling facility could be feasible under government support and initiatives—e.g., collecting waste oil fees to fund investment and operations, or government mandates or requirements for waste oil recycling. Government paid incentives to promote waste oil recycling is another option. As an example of government initiatives, consumers in British Columbia Canada are charged an “environmental handling fee (eco-fee)” when purchasing oil, and garages are paid for every liter of waste oil they place into recycling. See the following web link for more details: [www.usedoilrecycling.com/bc](http://www.usedoilrecycling.com/bc)

The equipment for recycling can be readily scaled up with increased demand should the supply chain be established for both sustainable volumes of waste oil inbound as well as outbound product sold to customers. The oil and gas development and production wastes best suited for recycling in a waste oil operation would primarily include spent lube and other equipment oils. The primary benefits of the use of waste oil recycling for the recovery and reuse of these wastes are the reliable and effective recycling of hazardous waste oils into a new product, which results in reduction in waste.

### **7.3 Reduce / Reuse / Recycle Education and Infrastructure**

Guyana currently has very limited reuse/recycle infrastructure. Since EEPGL projects started, infrastructure for paper/cardboard, wood, aluminum cans, and plastics has not been sustainable. Scrap metals recyclers have come and gone. EEPGL has used various paper/cardboard and scrap metal recyclers.

ExxonMobil was the first energy company to join The Recycling Partnership, a nonprofit organization dedicated to increasing recycling in the U.S. ExxonMobil has committed \$1.5 million to this organization to help develop sustainable solutions and support activities.

An initial collaboration step for EEPGL and the EPA could be to develop a plan leveraging The Recycling Partnership’s tools, resources, and information. During the drafting process for this section of the Waste Study, EEPGL used The Recycling Partnership’s website for grounding on these broad topics. EEPGL began with a review of the Recycling 101 document for Guyana relevance. The document acknowledges that recycling is not the same everywhere but provides commonality and across the board awareness such as all recyclables being empty and dry. The Recycling Partnership’s website includes:

- Recycle Campaign Builder
- Engage Your Residents
- Material Decision Tools
- Assessment Tool
- Tracking & Measurement
- Recycling Social Media Kit
- Grants
- Blogs
- Newsletter
- Leader Forum
- Approaches for Recycling Partnership Initiatives

Other U.S. websites with funding options for education and infrastructure are Resource Recycling (<https://resource-recycling.com/recycling/>) and California (Cal) Recycle (<https://www.calrecycle.ca.gov>). These websites offer case studies, perspectives associated with consumers, government and business, schedules for educational conferences, and recycling for plastics and electronics.

Given the breadth of this section's topics, EEPGL recommends a workshop on infrastructure with additional planning input from the EPA, Ministry of Communities, TRG, Sustainable Environmental Solutions, Waste Solutions Landfill Inc., a leading Caribbean or South American recycle think tank, a Guyana waste transporter, an EPA-approved Guyana recycler, Administrative Region 4, Guyana legislative sponsors and other stakeholders to be nominated by the Government of Guyana. An appropriately scaled qualitative CBA would be a key agenda item for the workshop.

## 7.4 Third-Party Analytical Laboratories

In Guyana, EEPGL reviewed four laboratories that are in operation performing various degrees of analytical services, or have future planned operations.

**Kaizen (Georgetown)** has a small lab with limited testing capability (no solid waste) with a small staff of approximately eight people for executing testing and other functions of this business.

**University of Guyana (Georgetown)** has multiple analytical instruments but no laboratory. The analytical instruments are not currently available for commercial purposes nor on a routine basis. Staffing may be limited to two people.

**Ecotox Environmental Services Ltd. (Ecotox)** is a Trinidad based environmental testing and consultancy service that is considering the establishment of an environmental laboratory operation in Guyana. Ecotox currently provides all of the analytical services to TRG and EEPGL for its waste management programs—however all samples must be shipped via air to Trinidad for analysis, and this adds delays to obtaining time critical analytical results. However, Ecotox is in a startup mode and currently has no building or laboratory, nor a staff. Ecotox may not be ready for offering services for another five years.

**Ground Structures Engineering Consultants Ltd. (GSEC)** has an existing geotechnical laboratory, but it is not currently equipped for environmental testing and is essentially in a startup mode. GSEC may not be ready for offering services for another five years.

A laboratory service company that does pharmaceutical and U.S. Federal Drug Administration testing has expressed interest in developing environmental testing capabilities. They have the experience in managing a laboratory, acquired a location, and are in the process of procuring equipment. Identifying the testing protocols and equipment needs are the next steps.

Currently, suitable analytical testing is available in Trinidad but use of a Trinidad laboratory extends the timeline for completion of test results along with attendant challenges associated with transport of samples.

In order for Guyana laboratories to be fit for purpose and have the ability to service Guyana industry, the following criteria is often used for determining and developing capability/capacity:

- Established analytical methods for all appropriate solid and liquid waste streams;
- Appropriately sized laboratory;
- Correct analytical equipment for offshore, nearshore and onshore environments;
- Analytical equipment can accommodate analytical methodology;
- Access to capital for a rapid startup in Guyana;
- Adequately staffed with a strong Quality Assurance and Contracting Team for commercialization;

- Data integrity assurance framework in place;
- Knowledge of quality roadmap and timing;
- International Organization for Standardization (ISO) certification or on track for ISO certification;
- Robust training budget for ISO certification and renewal;
- No affiliation with Guyana industries needing laboratory services; and
- More than one laboratory for backup capacity and ability to confirm or rerun test results.

EEPGL suggests an economic feasibility study be considered to determine if a commercial environmental laboratory in Guyana is a sustainable business with respect to supply and demand. Economic feasibility studies consider the following factors:

- Estimated startup cost for land purchase/lease, Greenfield construction or retrofit, equipment, staff labor, training budget, maintenance, sparing, and certification;
- Local technical staffing availability in Guyana;
- Customer demand and pricing considerations;
- Type and number of Guyana industries requiring 3rd party analytical services; and
- Government regulations that require environmental monitoring.

Other options to the development of a commercial environmental laboratory includes the expansion of the existing University of Guyana laboratory to provide additional analytical services to commercial customers, or the development of an EPA owned and operated laboratory that can provide analytical services to support its environmental protection needs.

EEPGL recommends further collaboration with the EPA and potential stakeholders on the feasibility of expanding environmental testing services in Guyana to support commercial and government environmental data needs.

## **8. COST / BENEFITS ANALYSIS POST-STUDY RECOMMENDATIONS**

As an element of considering potential capacity building, new infrastructure, and alternative technologies, this Study has identified certain benefits that could be achieved by implementing such actions, identified potential challenges to the same, and indicated where monetary cost information might be available. CBAs provide an approach to weigh various benefits of certain waste management activities with costs resulting from implementation of that action. In some cases, costs and benefits can be expressed in monetary terms, but in other cases, a qualitative approach may be more appropriate, using other evidence of costs and benefits and considering how those costs and benefits relate to one another. Appropriate CBAs (quantitative or qualitative) should be designed based on the waste management activity, considering areas necessary to support economic growth and that are a priority for the Government of Guyana.

EEPGL recommends the following approach to conducting CBAs:

- Identify issues for prioritization to conduct focused CBA;
- Consider focusing CBA on issues such as Industrial landfill, additional landfill site selection and construction, recycling of wood, plastic, Environmental testing laboratory, Guyana University Environmental Testing collaboration, Oil recycling;
- Based on Government priorities, align on issues and conduct CBA consistent with agreed execution plan; and
- Conduct additional workshops to enhance collaboration with industries and stakeholders.

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## **APPENDIX A    TERMS OF REFERENCE REQUIREMENTS CROSSWALK TABLE**

Terms of Reference Section/Title	Summary	Waste Analysis Study Section
1. Introduction	Purpose and waste analysis study (WAS) objective in accordance with Payara EPA Environmental Permit #20181204-PPOIX	1
2.1 Objective	1. Characterize EEPGL waste streams and provide waste profiles including concentration and composition based on best information available.	4.1.2
	2. Provide waste treatment flow diagrams covering each waste stream and standardized waste manifest form(s).	4.1.1
	3. Evaluate EEPGL waste streams, estimated volumes, waste treatment methodologies, and waste disposal methods.	4.1.3, 4.3, 4.3.1, 4.3.2, 4.3.3, 5
	4. Provide anticipated EEPGL waste volumes for permitted projects (Liza Phase 1, Liza Phase 2 and Payara) from 2021 - 2045 to be produced and disposed.	5
	5. Provide applicable international best practices and standards for the treatment, transport and disposal of waste, and auditing waste treatment providers and disposal facilities.	3.1, 4.4
	6. Conduct best available technology (BAT) evaluation for all waste processing and treatment equipment and provide alternatives where necessary to ensure the most appropriate industry-proven technologies are used to process and treat each waste stream; and	4.3.2, 4.3.3
	7. Develop cost/benefits analyses for third-party laboratory (ies), recycling opportunities, capacity building workshops, new landfill, vessel tank cleaning capability and drilling/mud plant waste minimization strategy and alternative technologies.	7.4, 7.3, 7.1, 7.2.1, 7.2.2, 6.1, 7.2.3
2.2.1. Waste Stream Identification and Profiles	1. Point(s) of generation along with composition, concentration, and quantity generated.	4.1, 4.1.1, 4.1.3
	2. The steps taken to minimize the amount of waste generated from exploration and production activities.	6
	3. A description of the procedures implemented for waste characterization and segregation; and	4.1.2, 4.2.2
	4. A profile of each waste stream generated which will detail the typical material composition of the waste streams, i.e. the physical and hazardous characteristics and important chemical constituents. Each waste profile will be documented on the EPA approved "Waste Profile Sheet."	4.1.3
2.2.2. Waste Management—Waste Generation	1. Estimated waste volumes per annum for each of the waste streams identified in the document.	4.1.3
	2. The design of storage areas on each FPSO and drill ship to ensure waste compatibility (in cases where various waste streams may be mixed) and pollution control; and	4.2.2.1, 4.2.2.2
	3. A description of the pre-treatment activities, with a process flow diagram, completed by EEPGL before the materials are transported to third party waste treatment facilities.	6.2
2.2.2. Waste Management—Waste Transportation	1. The procedures implemented to ensure proper packaging, labelling and storage of waste before transport.	4.2.2, 4.2.3, 4.2.4
	2. The procedures implemented to ensure waste compatibility in transport containers.	4.1.2, 4.2.1, 4.2.2, 4.2.4
	3. A description of the waste tracking or manifest systems used by EEPGL to regulate and monitor the transportation of waste	4.2.3

Terms of Reference Section/Title	Summary	Waste Analysis Study Section
	from production and exploration vessels to the onshore treatment and disposal facilities, including contingency plans.	
	4. Provide applicable international standards and best practices regarding waste transportation and justifications for the methods/procedures currently implemented by EEPGL; and	3.1
	5. EEPGL's storage and transportation criteria based on profile of each waste stream.	4.2.1, 4.2.2, 4.2.4
2.2.2. Waste Management—Waste Treatment and Disposal	1. Treatment methods/technologies (for both onshore and offshore treatment), which will include a detailed technical description of each treatment process accompanied by flow diagram(s), and a profile for each waste stream.	4.3, 4.3.1, 4.3.2, 4.3.3, 4.1, 4.1.3
	2. If the waste stream is discharged offshore, provide waste profile along with the quantity and frequency of the discharge.	4.1, 4.1.3
	3. If the waste stream is disposed of onshore provide a waste profile, quantity, frequency of disposal and disposal location.	4.1, 4.1.3, 4.3, 4.3.2
	4. The waste acceptance criteria provided to EEPGL from third party Logistics, third party waste treatment facility and the third party Landfill, as applicable.	*
	5. EEPGL's treatment criteria based on profile of each waste stream; Treatment method (incineration, neutralization, stabilization, etc.) selected will be based on hazardous characteristics (pH, flash point, metal content, etc.) of each waste stream. Treatment criteria will be described for each treatment method.	4.1.3, 4.3.1, 4.3.1.1, 4.3.1.2, 4.3.1.3, 4.3.1.4, 4.3.1.5, 4.3.3.1
	6. EEPGL's disposal criteria based on profile of each waste stream after treatment; final disposal or discharge criteria will be recommended for each treatment method (incineration, solidification, container cleaning, etc.)	**
	7. Provide applicable international standards and best practices regarding treatment criteria for the waste streams, and justifications for the methods/procedures employed by EEPGL, including an evaluation of the methods proposed by its Third Parties.	3.1
	8. Contingency plan(s) for the treatment and disposal of waste should there be an unplanned event rendering the treatment and/or disposal facility inoperable; and	4.3.2, 4.3.2.3, 4.3.2.4
	9. An evaluation of local and regional institutions or environmental laboratory services, suitably qualified and capable of conducting monitoring and verification analyses of the waste streams of the project.	7.4
	10. The procedures implemented for the treatment and disposal of waste rejected from third party companies; and	4.3.2.3, 4.3.2.4
	11. Standards and best practices currently being adhered to, in regards to waste generation, treatment, and disposal (both onshore and offshore).	3.1, 4.1.2
2.2.2. Waste Management—Waste Facilities	Existing third party waste treatment infrastructure	4.3.2
	Additional facility for waste treatment capacity in development	4.3.3
	Third party Landfill infrastructure	7.2, 7.2.1
	Scrap metal recycling infrastructure	7.2, 4.3.2.1

Terms of Reference Section/Title	Summary	Waste Analysis Study Section
	Temporary waste storage areas (pre-treatment and post-treatment wastes)	4.3.2, 4.3.2.3
2.2.3. Auditing	EEPGL will provide templates/samples of the inspection checklist based off the approved Waste Management Plan. The completed audit can be pass/fail or risk assessed scored based on variable components. Recommendations or audit frequency are often determined by audit results.	4.4
	The study will include an evaluation of international standards and best practices for auditing waste treatment providers and disposal facilities.	4.4
	This part of the Study will also include a discussion of appropriate monitoring guidelines against which contractor performance will be reviewed.	4.4
2.2.4. Anticipated Waste Volumes	A schedule of anticipated EEPGL waste volumes from permitted projects from 2021–2045 to be produced and disposed for the following items: <ul style="list-style-type: none"> <li>▪ Estimated Annual Hazardous Waste Volumes</li> <li>▪ Estimated Annual Non-hazardous Waste Volumes</li> <li>▪ Waste Estimates from third party waste management facility to landfill; these estimates will include non-hazardous waste stream volumes for direct landfill. Hazardous waste stream volumes for treatment will be coordinated with the waste treatment facility.</li> </ul>	5  ***
	<ul style="list-style-type: none"> <li>▪ EEPGL will make recommendations for Analytical Standards, and Disposal Treatment Standards based on treatment type.</li> </ul>	4.1.2, 4.3.2
2.2.5. Waste Management Capacity and Cost/Benefit Analysis	Cost/Benefits analysis of:	7.1
	1. Regulatory structure/agency capacity	
	2. Planning collaborative design construction, and project management expertise for a new landfill	7.2.1
	3. Developing Vessel Tank Cleaning Capability in Guyana	7.2.2
	4. Planning of Drilling Fluids and Mud Plant Waste Minimization Strategy: System integration, Waste reduction, recycling	6.1
	5. An evaluation to determine the cost of alternative technology	7.2.3
	6. Reduce/reuse/recycle education and infrastructure	7.3
7. Support services	7.4	

EEPGL = Esso Exploration and Production Guyana Limited; EPA = Guyana Environmental Protection Agency; FPSO = floating, production, storage and offloading vessel

**Notes:**

\* EEPGL has been working in collaboration with Tiger Rentals Guyana (TRG) on a draft Waste Acceptance Criteria 2021. The criteria have been finalized by TRG and the EPA. EEPGL anticipates using it to support the management of hazardous waste. The TRG Waste Sampling and Analytical Process 2021 has also been finalized by TRG and EPA.

\*\* EEPGL is ensuring effective management of waste generated by EEPGL Projects as required by the EPA's issued environmental permits through extensive interaction with TRG and Sustainable Environmental Services (SES) on disposal criteria for each EEPGL approved Waste Profile Sheets.

\*\*\* EEPGL does not itself have the necessary information to estimate the amount of Project waste sent to the landfill. TRG advised EEPGL it filed a confidential 2020 Annual Environmental Report with EPA that included actual waste volumes from third parties sent to Haags Bosch Landfill (HBL).

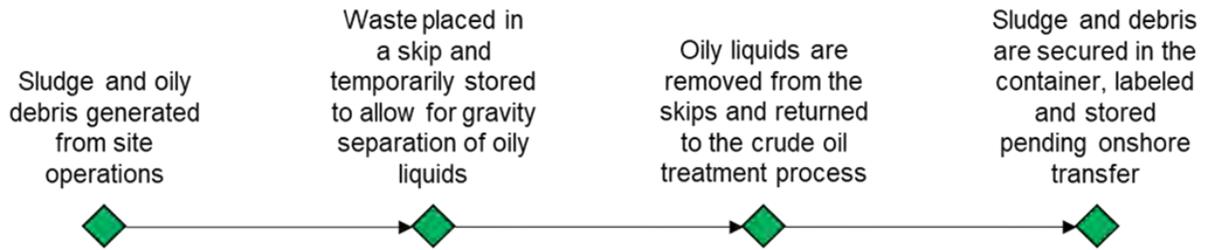
## References

- TRG (Tiger Rentals Guyana). 2020. Confidential 2020 Annual Environmental Report (Recording and Reporting Form of Industry and Waste Management).
- TRG (Tiger Rentals Guyana). 2021a. Waste Management/Waste Acceptance Criteria—February 2021, Document Number QOP 8.1/5.
- TRG (Tiger Rentals Guyana). 2021b. Waste Sampling and Analytical Process (Waste Sampling Plan)—April 2021, Document Number QHSEOP 8.1/6.

## **APPENDIX B**

- **Pre-treatment Process Flow Diagram**
- **Cradle to Grave Logistics Flow Diagrams**
- **TRG Waste Treatment Process Flow Diagrams**
- **SES Waste Treatment Process Flow Diagrams**

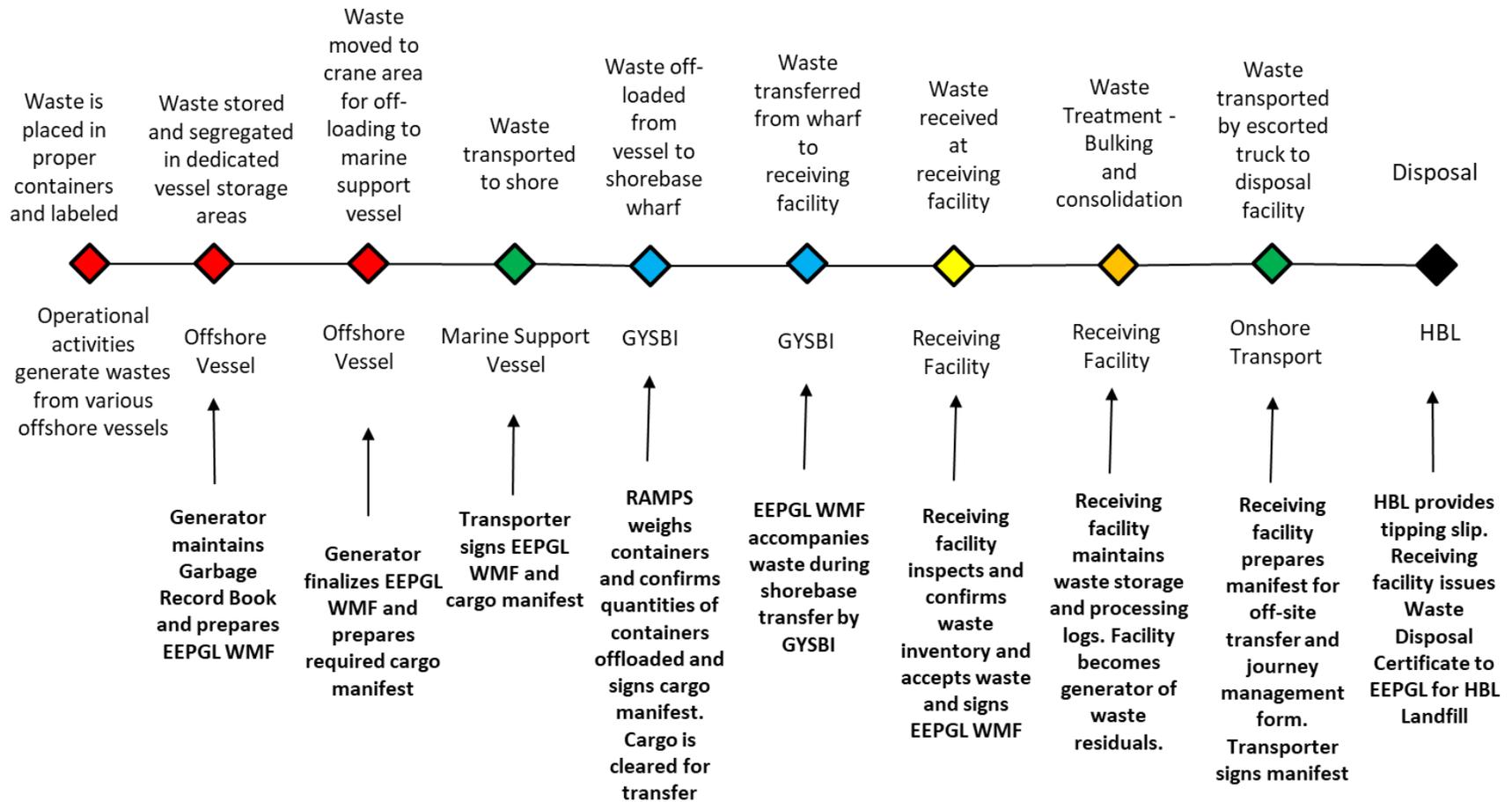
## Pre-treatment Process Flow Diagram



## Cradle to Grave Logistics Flow Diagrams

## Non-Hazardous Waste Management—Cradle to Grave Offshore Generated Waste—Onshore Management

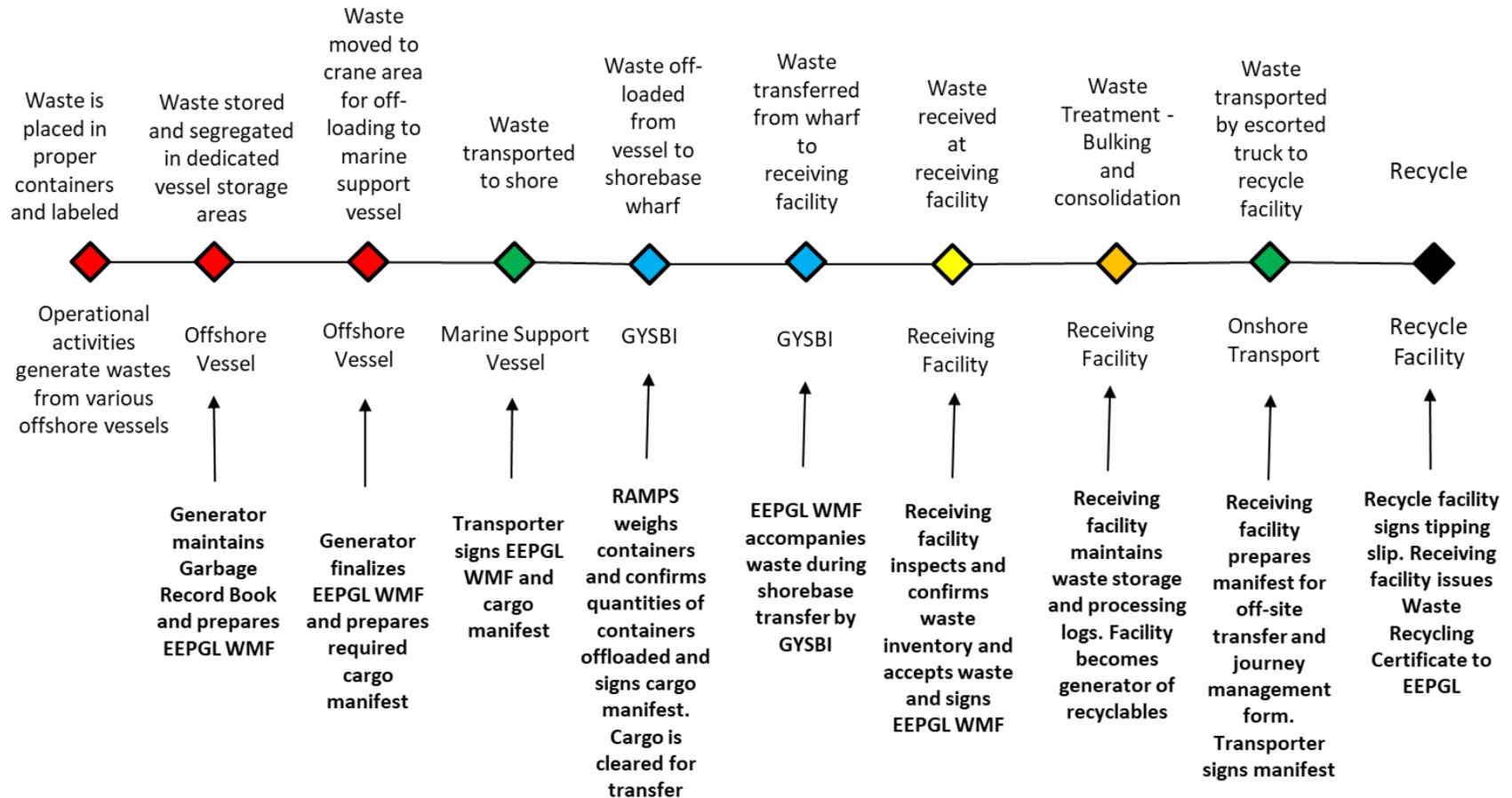
Waste streams: Wood; General Trash; Plastic; Glass; Cardboard/Paper



EEPGL = Esso Exploration and Production Guyana Limited; GYSBI = Guyana Shore Base Inc.; HBL = Haags Bosch Landfill; RAMPS = RAMPS Logistics; WMF = Waste Management Form

## Non-Hazardous Waste Management—Recyclables Cradle to Grave Offshore Generated Waste—Onshore Management

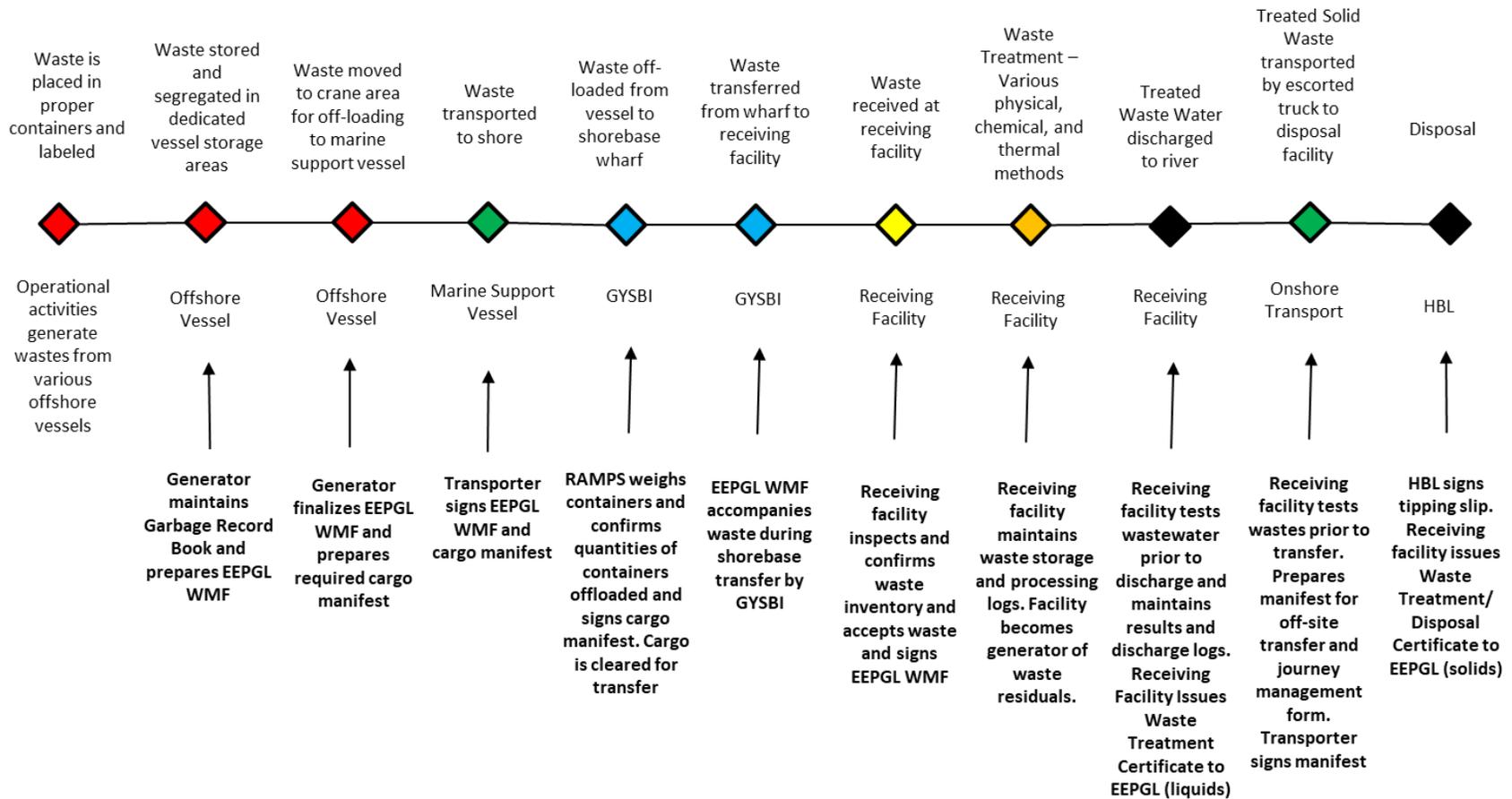
**Waste streams : Scrap Metal/Batteries/Other Recyclables**



EEPGL = Esso Exploration and Production Guyana Limited; GYSBI = Guyana Shore Base Inc.; RAMPS = RAMPS Logistics; WMF = Waste Management Form

## Hazardous Waste Management— Offshore Generated Waste—Onshore Management

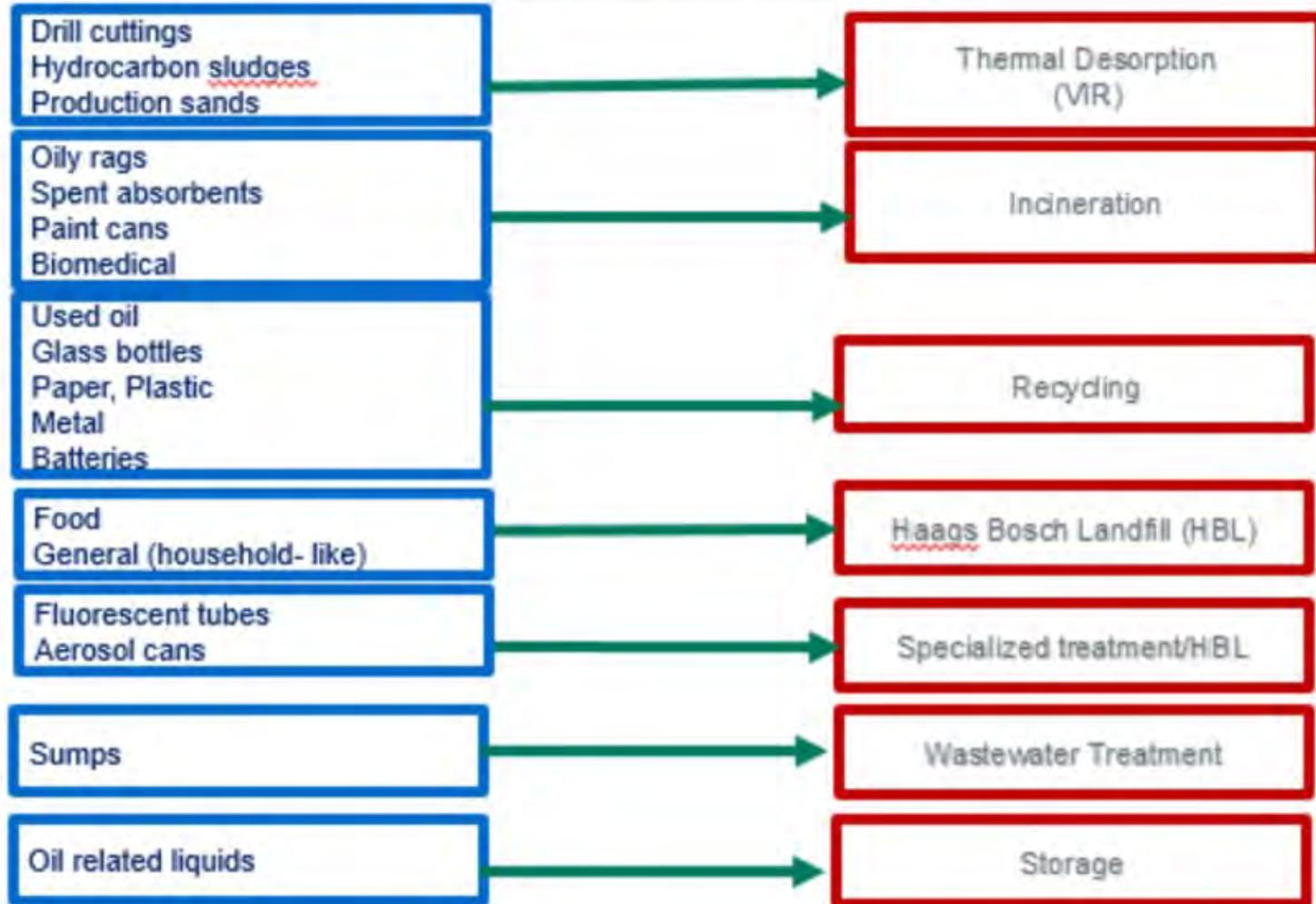
Waste streams: Various Liquids, Solids, Sludges



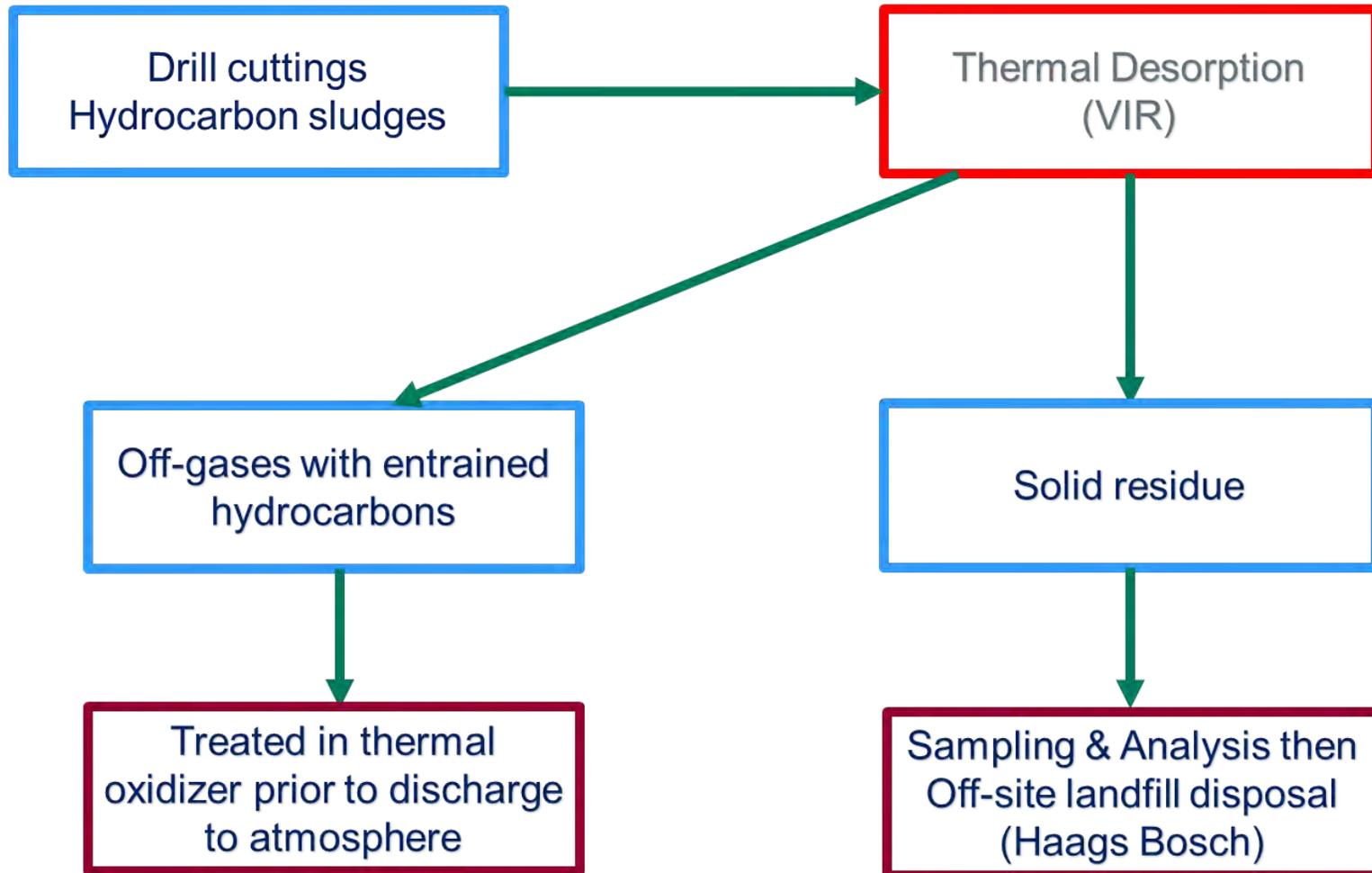
EEPGL = Esso Exploration and Production Guyana Limited; GYSBI = Guyana Shore Base Inc.; RAMPS = RAMPS Logistics; WMF = Waste Management Form

## TRG Waste Treatment Process Flow Diagrams

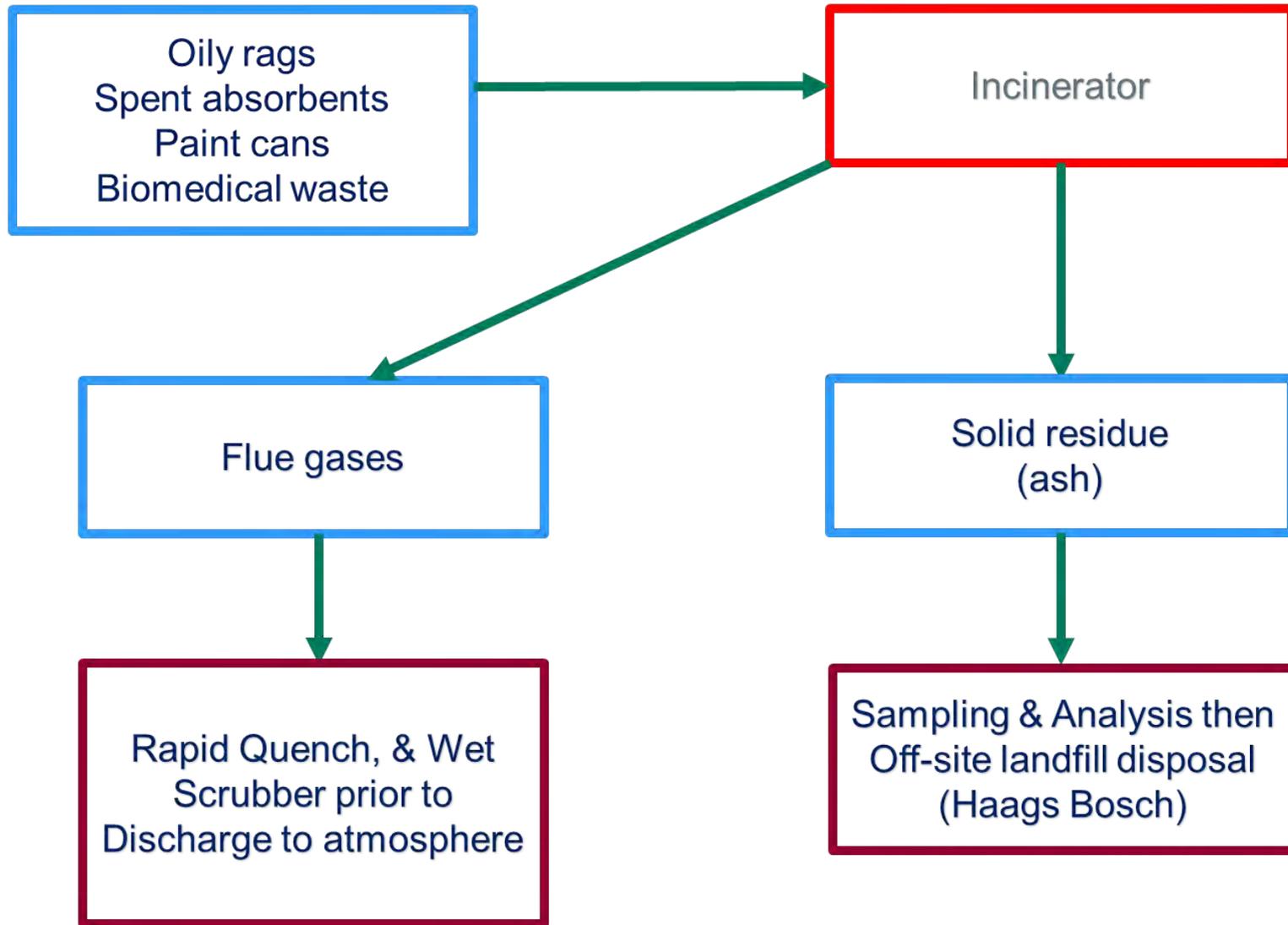
# TRG Waste Treatment Technologies



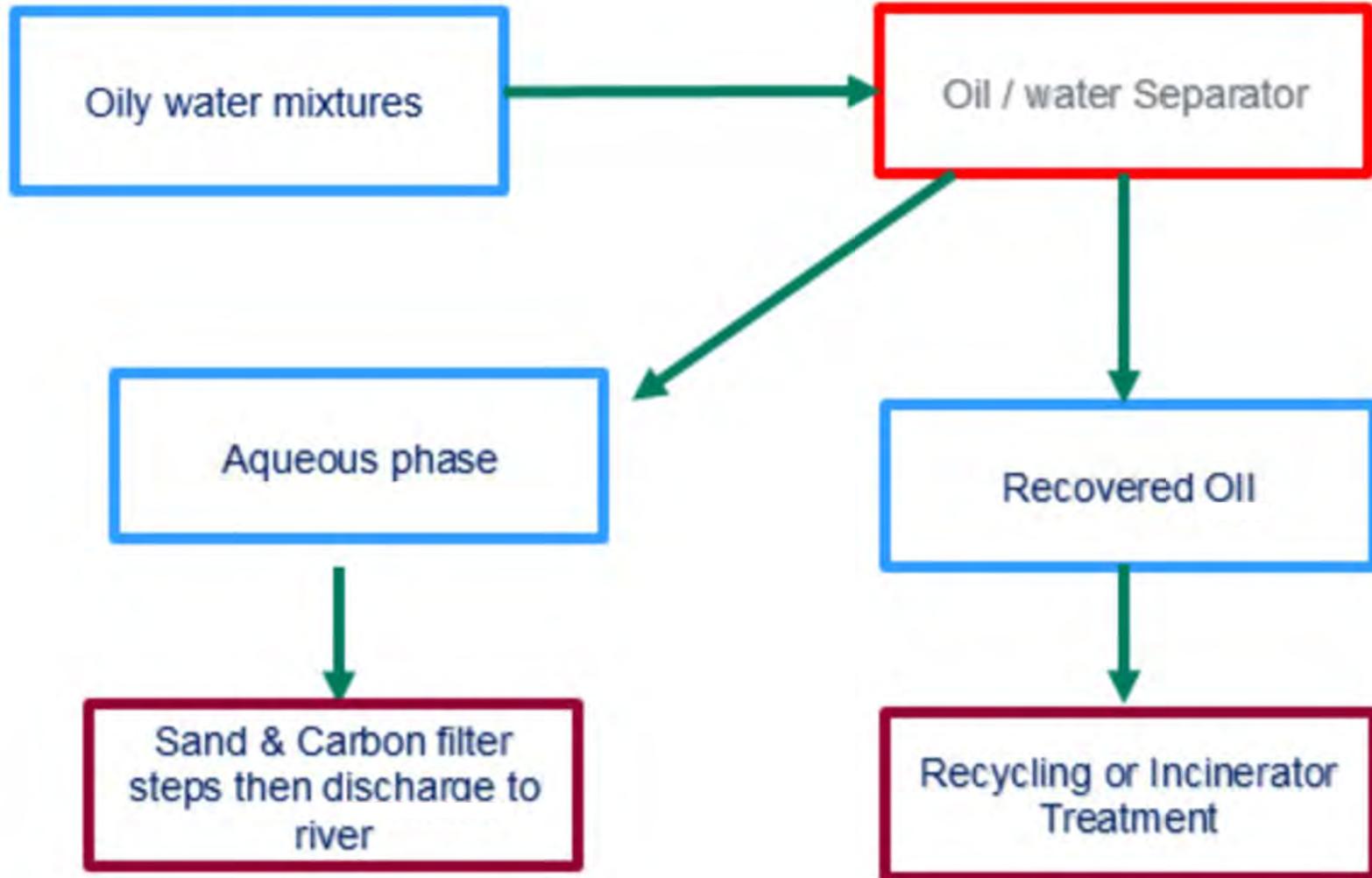
# VIR Desorption Unit



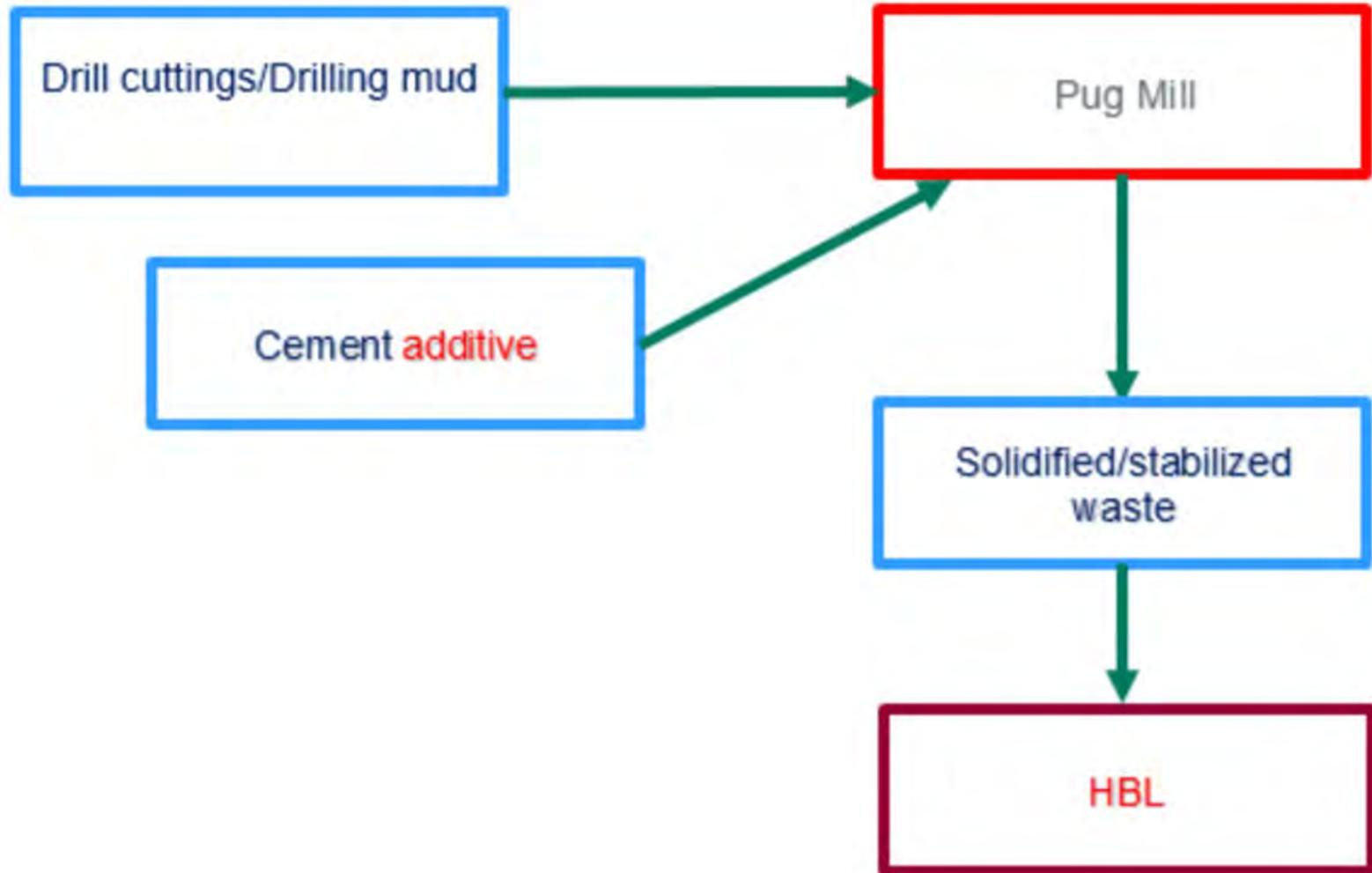
# Incinerator



# Oil/Water Separator

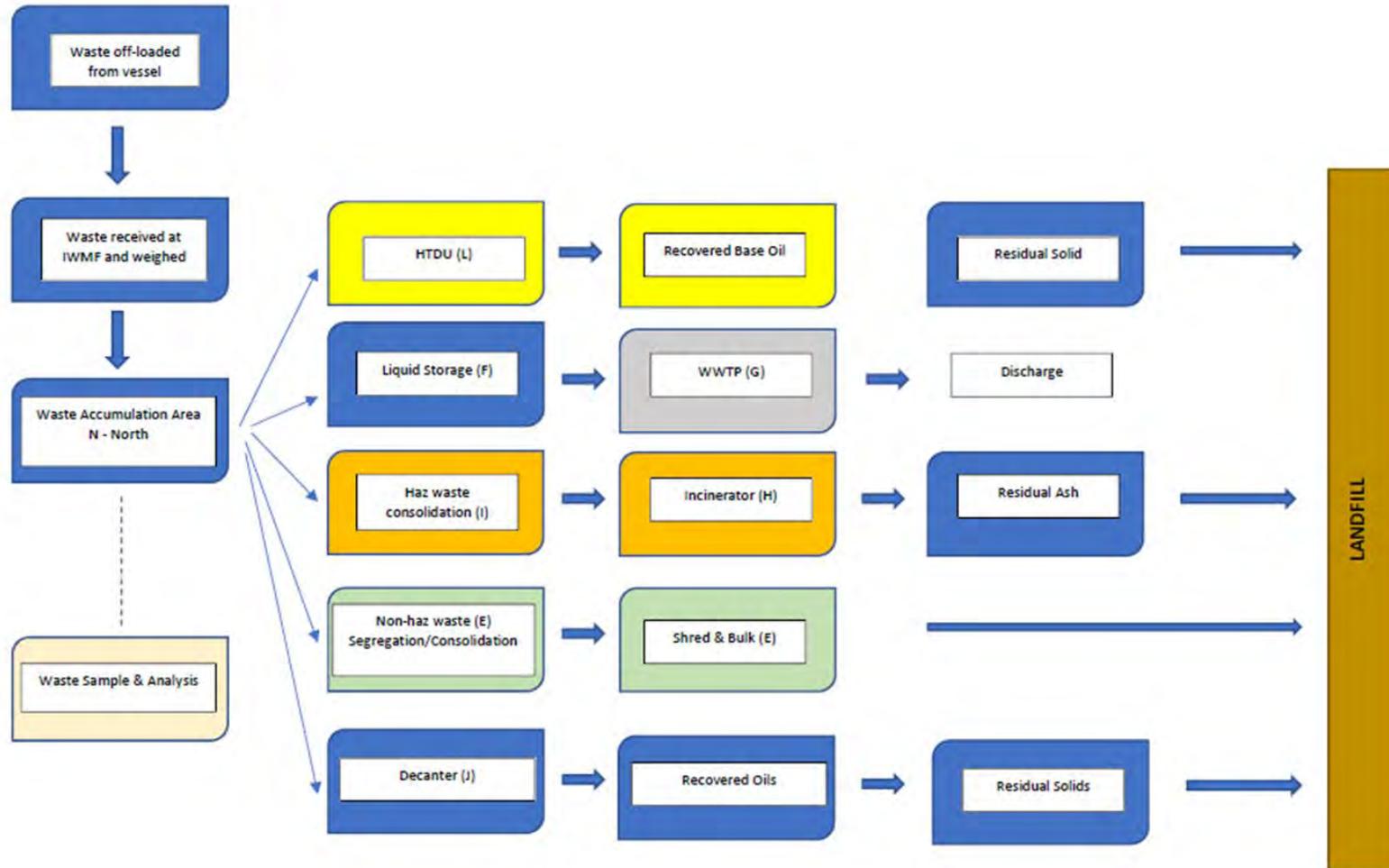


# Solidification

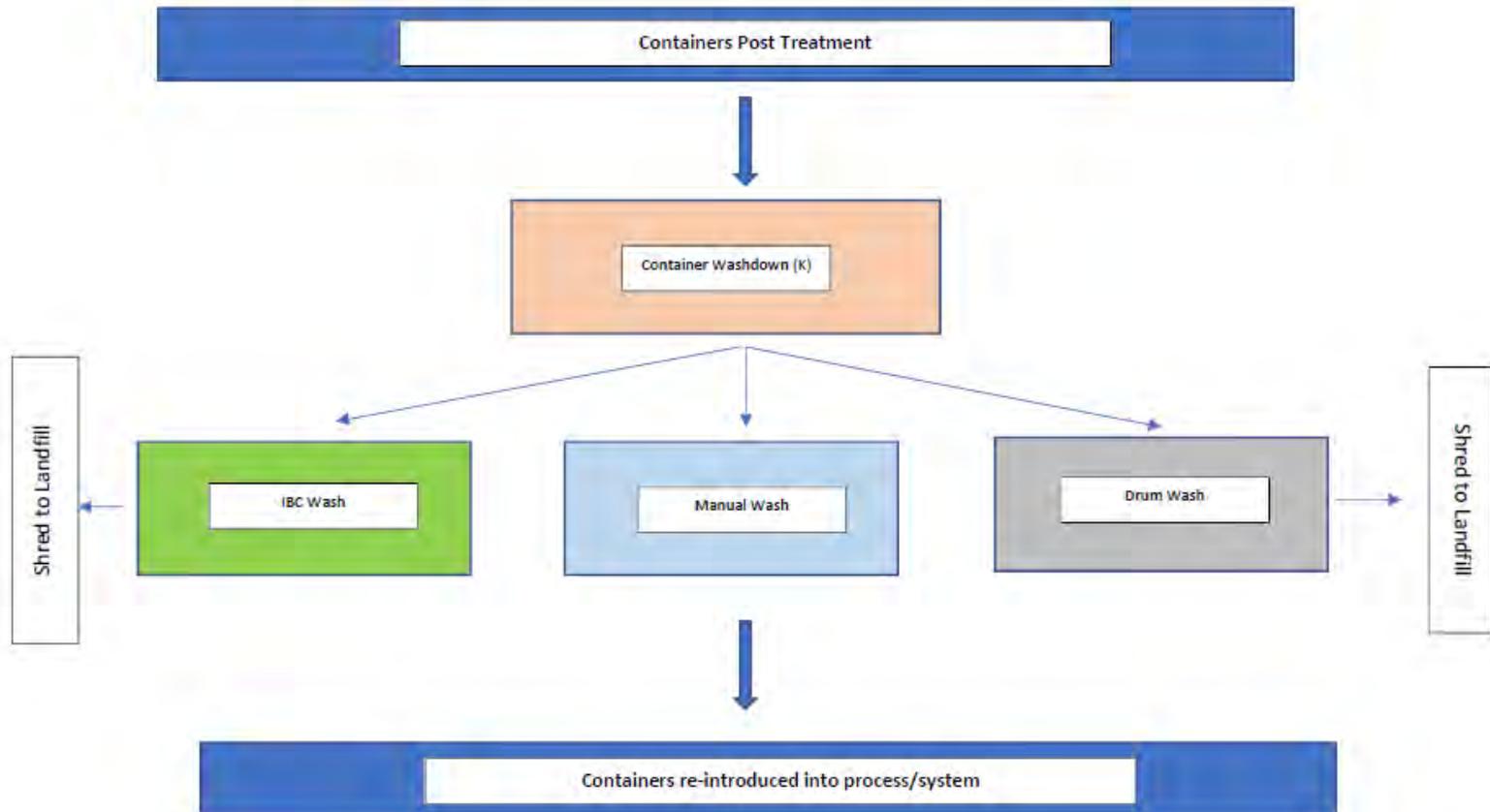


## SES Waste Treatment Process Flow Diagrams

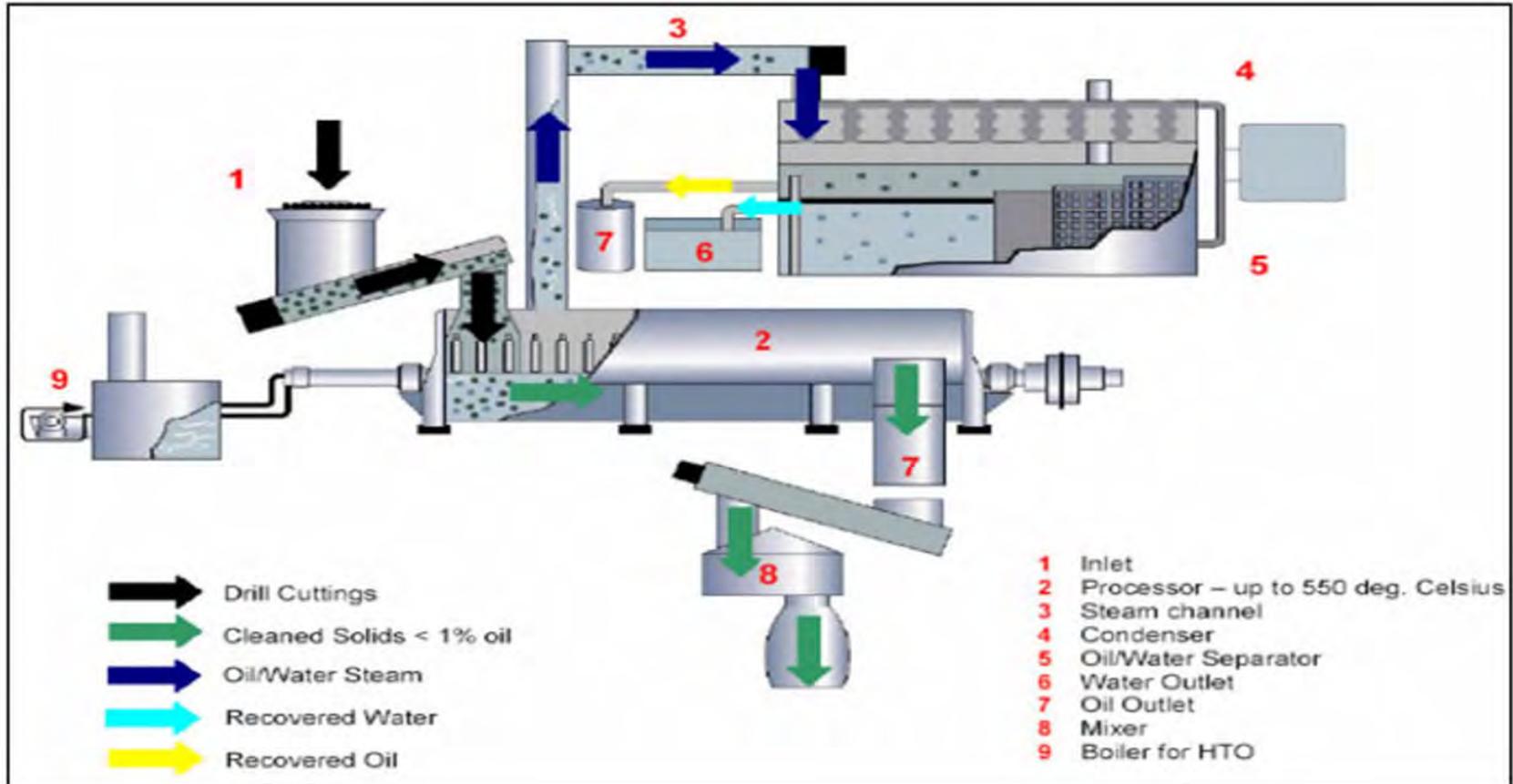
SES Integrated Waste Management Facility Flow Diagram (1)



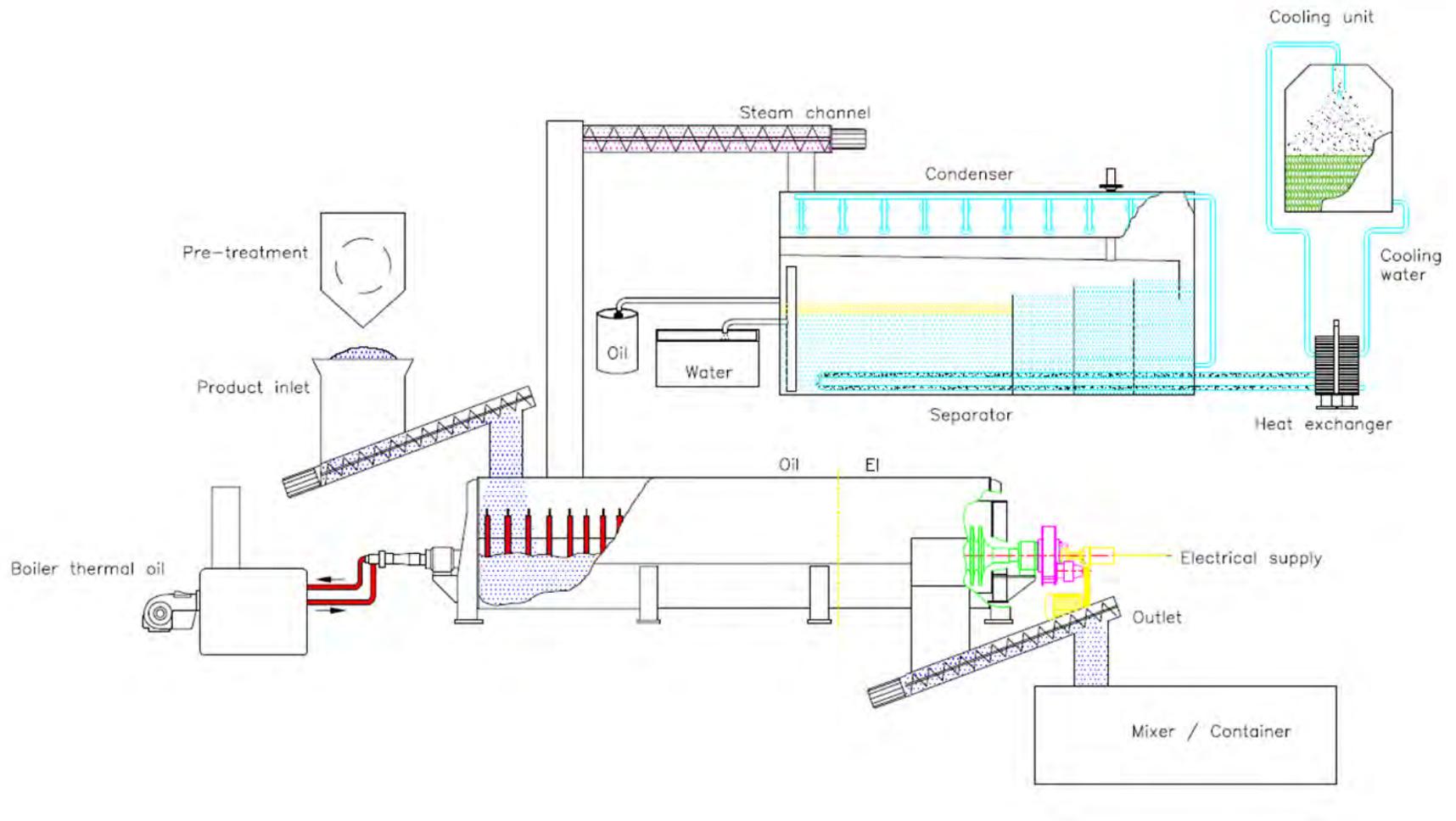
SES Integrated Waste Management Facility Flow Diagram (2)



### High Temperature Thermal Desorption



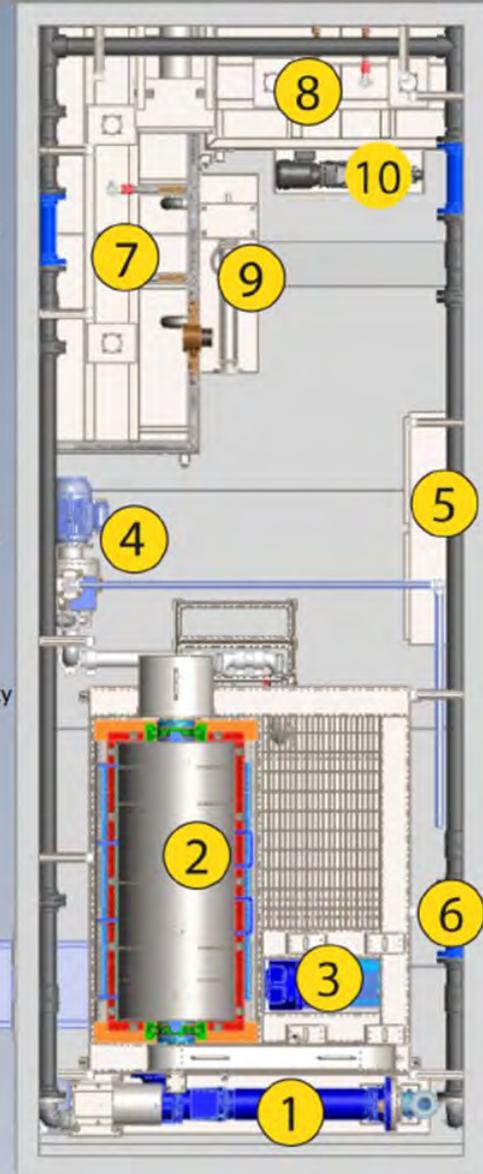
## High Temperature Thermal Desorption



# Microemulsion Injection & Separations Technology

## 20' MIST System Main Components

1. 200-GPM Progressive Cavity Feed Pump
2. Decanter Centrifuge
3. 14" Shafted Screw Conveyor Gear Box and Motor
4. Dilution Tank Manifold
5. Control Panel with Touch Screen Interface
6. Static In-line Mixer (3)
7. Additional Chemistry Partitioned Tank
8. SAS SlopTreat / SAS SludgeTreat Partitioned Tank
9. Additional Chemistry Progressive Cavity Feed Pump
10. SAS SlopTreat / SAS SludgeTreat Progressive Cavity Feed Pump
11. 14" Solids Discharge Screw Conveyor (Shipped Separately)





## **Wastewater Treatment Plant (WWTP)**

### **General**

The water treatment unit for oil contaminated water is designed to treat the water which contains variable amounts of oil. The process is designed to adapt automatically according to the oil level in the inlet water and the oil which removed from the water can be recycled for other purposes.

### **Storage**

Above ground steel wastewater storage tanks will provide the buffer tank storage requirements for all wastewater received at the facility.

### **Process description**

- In first phase a coarse screen is used for separating the mud and soil from inlet water stream.
- Second phase is the natural separation of the oil and water which will happen in inlet storage tank. On the bottom of the tank an industrial skimmer will skim the floating oil from the surface and this oil is discharged to the separation unit.
- In third phase the water is led to the two-phase flotation unit where the oil is separated in two different flotation units. During this process phase the pH is adjusted to match the optimal coagulation pH-value. The oil from the first flotation phase will be discharged to the oil/water separator.
- After the flotation unit the pH will be adjusted and the water is either discharged to the drain or to the nature or if the water contains salts, then the water is directed thru reverse osmosis unit.

### **Treatment**

WWTP unit for oily waters will remove oil and other impurities from the water stream. After processing the heavy metals and salts are reduced to such levels that the water is acceptable to discharge to the nature or to the drain. After the treatment, the pH-level is adjusted between 6.5 to 9.



The C200 is a high capacity clinical incinerator, designed to handle waste such as hazardous, laboratory or pharmaceutical. Having a front-loading design, enabling a safe and easy method for continuous loading of waste.

Biosecurity is a growing concern for hospitals across the globe, the implementation of an Addfield C200 can improve your ability to safely destroy contaminated waste.

The following information details the many features, specifications and optional equipment associated with our C200 incinerator.

### Machine Specification

External L x W x H (mm)	3750 x 4955 x 3900/7400
Internal L x W x H (mm)	3035 x 1353 Ø
Chamber Volume (m³)	4.35
Weight (approx tonnes)	12
Nominal Burn Rate	<200
Thermal Capacity (kW)	740
Power Supply 50/60 hz	220 - 250v
Door Aperture	1340 Ø
Control Panel	PLC
Fuel Types	Diesel, LPG, N-Gas
Fire Brick (Alumina)	42.5%
Insulation Fire Brick	Grade E23

\*We reserve the right to change the specification, dimensions and quality of materials from time to time, so long as the alteration is minor or an improvement to the said product.

### Primary Chamber

- Fully insulated internal refractory lining, constructed from high grade refractory brick ensuring a self-supporting, interlocking arrangement.
- Fully interlocked, manually operated, access door.
- Waste ignition burner, temperature controlled on-off, complete with internal air fans.
- Combustion burner, temperature controlled on-off, complete with internal air fans.
- Primary combustion burner air fans with automatically controlled distribution to their designated area.
- One temperature sensor mounting points.

### Secondary Chamber

- Fully insulated internal refractory lining, constructed from low thermal mass insulation.
- Secondary chamber burnout burner, temperature controlled on-off, complete with internal air fans.
- Integrated combustion burner air fans with automatically controlled distribution to their designated area.
- All combustion fuel pipework.
- All electrical components.
- One temperature sensor mounting point at the base of the exit flue ensuring the chamber reaches the necessary 1100°C minimum.

### Waste Type

	Clinical Waste	✓
	Treated Waste	✓
	Anatomical Waste	✓
	Cytotoxic & Cytostatic Waste	✓
	Offensive/hygiene Waste	✓
	Medicinal Waste	✓
	Domestic (municipal) Waste	✓

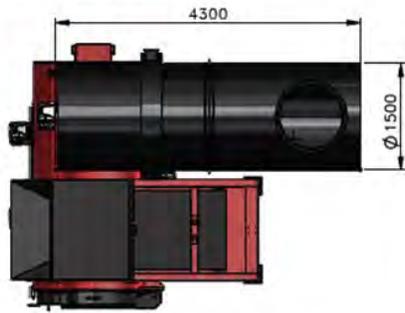


Addfield Environmental Systems Limited  
Unit 9 | Zone 4 | Burntwood Business Park  
Staffordshire | WS7 3XD | United Kingdom

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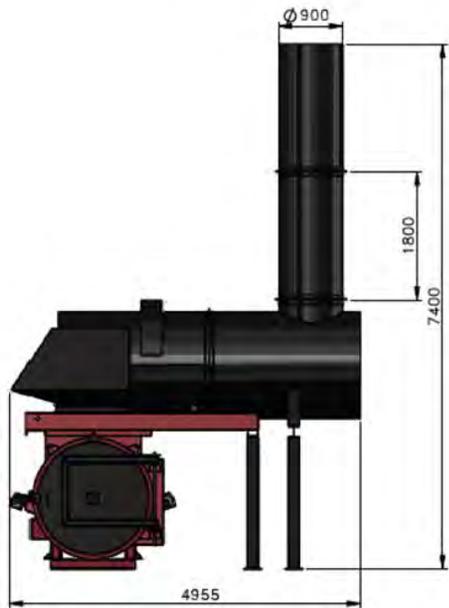
\*SHOWN WITH OPTIONAL HOPPER



PLAN VIEW



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW



THIRD ANGLE PROJECTION  
(UNLESS STATED OTHERWISE)

MATERIAL:

N/A

FINISH:

N/A

TOLERANCES  
(UNLESS STATED OTHERWISE)

WHOLE NUMBERS ±1.00

1 DECIMAL PLACE ±0.10

2 DECIMAL PLACE ±0.05

ANGLES ±0.50°

WEIGHT:

**addfield**  
Incinerate • Cremate

T: +44 (0)1543 571 280  
F: +44 (0)1543 571 175  
E: sales@addfield.com  
www.addfield.com

Addfield Environmental Systems LT  
Unit 9, Zone 4  
Burntwood Business Park  
Staffordshire  
WS7 3XD

DRAWN BY: AS

DATE CREATED: 21/05/2019

PROJECT:

C200 WITH TOP LOADER

TITLE:

C200 WITH TOP LOADER  
GA

## **APPENDIX C MARINE VESSELS TABLE**

<b>Vessel</b>	<b>Type</b>
Roger White	PSV
Sanibel Island	PSV
Horn Island	PSV
Paradise Island	PSV
Robert Adams	PSV
Oryx	PSV
Clarence Triche	PSV
Kirt Chouest	PSV
Springbok	PSV
Emily D. McCall	FSV
Murray	PSV
Mixteca	PSV
Amazon	MPV
Russell Adams	PSV
Jack Edwards	PSV
Gary Rook	PSV
Congo	PSV
Nile	PSV
Charlie Comeaux	PSV
Holiday	PSV
FDS2	MPV
Constellation	MPV
C-installer	MPV
Guyana - Hero	MPV
Demerara	PSV
Murray	PSV
Michael Crombie McCall	FSV
Ted Smith	PSV
Russell Bouziga	MPV

FSV=fast support vessel; PSV=platform support vessel; MPV=multipurpose vessel. Collectively, these acronyms listed are commonly referred to as Logistics Vessels or Marine Supply Vessels.

## **APPENDIX D**

- **Waste Profile Sheets**
- **Waste Profiles Table**
- **Disposal Criteria Tables**
- **Blank EPA Waste Profile**
- **Waste Profile Instructions**
- **Waste Manifest Form**
- **Waste Manifest Instructions**
- **Permitted Effluents Discharge Table**

## Waste Profile Sheets





WASTE PROFILE SHEET												
Part I												
<b>A. GENERAL INFORMATION</b>						WASTE PROFILE NO. 20140506-003						
1. GENERATORS NAME Esso Exploration Production Guyana Limited												
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana												
3. TECHNICAL CONTACT Jimmy Street				4. TITLE Waste Management Lead				5. PHONE 623-1104				
B. WASTE INFORMATION												
1. WASTE CLASSIFICATION			<input type="checkbox"/> HAZARDOUS			<input checked="" type="checkbox"/> NON-HAZARDOUS						
1A. LISTED HAZARDOUS WASTES												
Is this a listed waste under Annex I of the Basel Convention?      Y <input type="checkbox"/> N <input checked="" type="checkbox"/>												
If "yes" then provide waste numbers												
Is this a listed waste under Annex VIII of the Basel Convention?      Y <input type="checkbox"/> N <input checked="" type="checkbox"/>												
If "yes" then provide all applicable waste numbers												
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?      Y <input type="checkbox"/> N <input checked="" type="checkbox"/>												
If "yes" then provide all applicable waste numbers												
2. COMMON NAME OF WASTE Scrap Metal												
3. SITE ID/LOCATION OF WASTE GENERATION Drill rigs, FPSO and Shorebase												
4. PROCESS GENERATING WASTE Items and articles no longer used for their intended purpose (Scrap metal, steel, aluminum, crushed drums, tote frames, punctured aerosol cans, cables, straps, and various other metal items)												
5. PROJECTED ANNUAL VOLUME 500 - 1000 MT			6. WASTE RECEIVING FREQUENCY			<input checked="" type="checkbox"/> WEEKLY		<input type="checkbox"/> MONTHLY		<input type="checkbox"/> ONE-TIME SHIPMENT		OTHER (SPECIFY)
7. WASTE VOLUME			CUBIC METERS			GALLONS			<input checked="" type="checkbox"/> TONNES		OTHER (SPECIFY)	
8. WASTE CONTAINERS			BARRELS (42 GAL.)			DRUM (55 GAL.)			CUTTINGS BOX		OTHER (SPECIFY)	
									BINS			
9. SPECIAL HANDLING REQUIREMENTS No												
PART II												
1. PHYSICAL CHARACTERISTICS												
PHYSICAL STATE		<input checked="" type="checkbox"/> SOLID		<input type="checkbox"/> LIQUID		<input type="checkbox"/> SEMI-SOLID		<input type="checkbox"/> GAS		OTHER (SPECIFY)		
COLOR		Multi		BOILING POINT (°C)		N/A		ODOR & STRENGTH		None		
FLASH POINT (°C)		N/A		VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low		BTUs		N/A		
PCBs (ppm)		N/A		TOTAL CYANIDES (ppm)		N/A		TOTAL SULFIDES (ppm)		N/A		
2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)												
NONE		<input checked="" type="checkbox"/>		OXIDIZER		<input type="checkbox"/>		WATER REACTIVE		<input type="checkbox"/>		
SHOCK REACTIVE		<input type="checkbox"/>		IGNITABLE		<input type="checkbox"/>		MEDICAL/INFECT. WST		<input type="checkbox"/>		
AIR REACTIVE		<input type="checkbox"/>		DIOXINS		<input type="checkbox"/>		EXPLOSIVE		<input type="checkbox"/>		
PYROPHORIC		<input type="checkbox"/>		PESTICIDE/HERBICIDE		<input type="checkbox"/>		POLYMERIZABLE		<input type="checkbox"/>		
REACTIVE CYANIDES		<input type="checkbox"/>		RADIOACTIVE		<input type="checkbox"/>		REACTIVE SULFIDES		<input type="checkbox"/>		
PHENOLS		<input type="checkbox"/>		EXEMPT RAD		<input type="checkbox"/>		ORGANIC PEROXIDE		<input type="checkbox"/>		
THERMALLY UNSTABLE		<input type="checkbox"/>										
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)												
CAS #		CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED				CONCENTRATION (ppm or mg/L)			
		Scrap metal			95 - 100							
		Paper, cardboard, plastic, rubber, wood			0 - 5							
KNOWLEDGE IS FROM		<input type="checkbox"/> LAB ANALYSIS		<input type="checkbox"/> MSDS		<input checked="" type="checkbox"/> PROCESS/GENERATOR KNOWLEDGE						
COMMENTS :												
GENERATOR CERTIFICATION: I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.												
NAME: Jimmy Street						TITLE: Waste Management Lead						
SIGNATURE: 						DATE: 03/18/2021						





WASTE PROFILE SHEET												
Part I												
<b>A. GENERAL INFORMATION</b>							WASTE PROFILE NO. 20140506-006					
1. GENERATORS NAME Esso Exploration Production Guyana Limited												
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana												
3. TECHNICAL CONTACT Jimmy Street				4. TITLE Waste Management Lead			5. PHONE 623-1104					
<b>B. WASTE INFORMATION</b>												
1. WASTE CLASSIFICATION		<input type="checkbox"/>	HAZARDOUS		<input checked="" type="checkbox"/>	NON-HAZARDOUS						
<b>1A. LISTED HAZARDOUS WASTES</b>												
Is this a listed waste under Annex I of the Basel Convention?      Y <input type="checkbox"/> N <input checked="" type="checkbox"/>												
If "yes" then provide waste numbers												
Is this a listed waste under Annex VIII of the Basel Convention?      Y <input type="checkbox"/> N <input checked="" type="checkbox"/>												
If "yes" then provide all applicable waste numbers												
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?      Y <input type="checkbox"/> N <input checked="" type="checkbox"/>												
If "yes" then provide all applicable waste numbers												
2. COMMON NAME OF WASTE Cooking oil												
3. SITE ID/LOCATION OF WASTE GENERATION Drilling rigs and FPSO												
4. PROCESS GENERATING WASTE Various used cooking oils (peanut, canola, corn, vegetable oil)												
5. PROJECTED ANNUAL VOLUME 15-25 MT		6. WASTE RECEIVING FREQUENCY		<input type="checkbox"/>	WEEKLY	<input checked="" type="checkbox"/>	MONTHLY	<input type="checkbox"/>	ONE-TIME SHIPMENT	<input type="checkbox"/>	OTHER (SPECIFY)	
7. WASTE VOLUME		<input type="checkbox"/>	CUBIC METERS	<input checked="" type="checkbox"/>	GALLONS	<input type="checkbox"/>	TONNES	<input type="checkbox"/>	OTHER (SPECIFY)			
8. WASTE CONTAINERS		<input type="checkbox"/>	BARRELS (42 GAL.)	<input checked="" type="checkbox"/>	DRUM (55 GAL.)	<input type="checkbox"/>	CUTTINGS BOX	<input type="checkbox"/>	OTHER (SPECIFY)			
9. SPECIAL HANDLING REQUIREMENTS No												
PART II												
<b>1. PHYSICAL CHARACTERISTICS</b>												
PHYSICAL (CHECK ONE)	STATE	<input type="checkbox"/>	SOLID	<input checked="" type="checkbox"/>	LIQUID	<input type="checkbox"/>	SEMI- SOLID	<input type="checkbox"/>	GAS	<input type="checkbox"/>	OTHER (SPECIFY)	
COLOR	Multi		BOILING POINT (°C)		N/A							
ODOR & STRENGTH	Mild		pH		N/A							
FLASH POINT (°C)	N/A		VISCOSITY		<input type="checkbox"/>	Solid	<input type="checkbox"/>	High	<input type="checkbox"/>	Medium	<input type="checkbox"/>	Low
BTUs	N/A		TOTAL CYNAIDES (ppm)		N/A							
PCBs (ppm)	N/A		TOTAL SULFIDES (ppm)		N/A							
<b>2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)</b>												
NONE	<input checked="" type="checkbox"/>		OXIDIZER		<input type="checkbox"/>							
WATER REACTIVE	<input type="checkbox"/>		IGNITABLE		<input type="checkbox"/>							
SHOCK REACTIVE	<input type="checkbox"/>		MEDICAL/INFECT. WST		<input type="checkbox"/>							
AIR REACTIVE	<input type="checkbox"/>		DIOXINS		<input type="checkbox"/>							
EXPLOSIVE	<input type="checkbox"/>		PESTICIDE/HERBICIDE		<input type="checkbox"/>							
PYROPHORIC	<input type="checkbox"/>		POLYMERIZABLE		<input type="checkbox"/>							
REACTIVE CYANIDES	<input type="checkbox"/>		RADIOACTIVE		<input type="checkbox"/>							
REACTIVE SULFIDES	<input type="checkbox"/>		EXEMPT RAD		<input type="checkbox"/>							
PHENOLS	<input type="checkbox"/>		ASBESTOS		<input type="checkbox"/>							
ORGANIC PEROXIDE	<input type="checkbox"/>		THERMALLY UNSTABLE		<input type="checkbox"/>							
<b>3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)</b>												
CAS #	CONSTITUENTS		RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED				CONCENTRATION (ppm or mg/L)					
	Used cooking oils		0 - 100									
	Food, paper		0 - 5									
KNOWLEDGE IS FROM		<input type="checkbox"/>	LAB ANALYSIS		<input type="checkbox"/>	MSDS	<input checked="" type="checkbox"/>	PROCESS/GENERATOR KNOWLEDGE				
<b>COMMENTS :</b> The frequency of receipt of cooking oil varies. The annual expected volume is estimated at 15-25 MT per year.												
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.												
NAME: Jimmy Street					TITLE: Waste Management Lead							
SIGNATURE: 					DATE: 03/18/2021							



WASTE PROFILE SHEET												
Part I												
<b>A. GENERAL INFORMATION</b>					<b>WASTE PROFILE NO.</b> 20140506-008							
1. GENERATORS NAME Esso Exploration Production Guyana Limited												
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana												
3. TECHNICAL CONTACT Jimmy Street			4. TITLE Waste Management Lead			5. PHONE 623-1104						
<b>B. WASTE INFORMATION</b>												
1. WASTE CLASSIFICATION		<input checked="" type="checkbox"/>	HAZARDOUS			<input type="checkbox"/>	NON-HAZARDOUS					
<b>1A. LISTED HAZARDOUS WASTES</b>												
Is this a listed waste under Annex I of the Basel Convention?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>												
If "yes" then provide waste numbers      Y1												
Is this a listed waste under Annex VIII of the Basel Convention?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>												
If "yes" then provide all applicable waste numbers      Hazardous Waste A4020												
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>												
If "yes" then provide all applicable waste numbers      Guyana EPA AG.1 Hazardous Wastes Regulations Part VII, 36, (xiii) : Regulations do not apply												
2. COMMON NAME OF WASTE Medical Waste												
3. SITE ID/LOCATION OF WASTE GENERATION Drilling rigs, FPSO and Shore base												
4. PROCESS GENERATING WASTE Medical waste contaminated with blood or bodily fluids (bandages, needles, syringes, pads, wrappings, medicines, sharps)												
5. PROJECTED ANNUAL VOLUME 0.5-1 MT		6. WASTE RECEIVING FREQUENCY		<input type="checkbox"/>	WEEKLY	<input checked="" type="checkbox"/>	MONTHLY	<input type="checkbox"/>	ONE-TIME SHIPMENT	<input type="checkbox"/>	OTHER (SPECIFY)	
7. WASTE VOLUME		<input type="checkbox"/>	CUBIC METERS	<input type="checkbox"/>	GALLONS	<input checked="" type="checkbox"/>	TONNES	<input type="checkbox"/>	OTHER (SPECIFY)			
8. WASTE CONTAINERS		<input type="checkbox"/>	BARRELS (42 GAL.)	<input type="checkbox"/>	DRUM (55 GAL.)	<input type="checkbox"/>	CUTTINGS BOX	<input checked="" type="checkbox"/>	OTHER (Toolbox)			
9. SPECIAL HANDLING REQUIREMENTS Yes. Handling hazards should reflect Sharps and biological contact.												
PART II												
<b>1. PHYSICAL CHARACTERISTICS</b>												
PHYSICAL STATE (CHECK ONE)	<input checked="" type="checkbox"/>	SOLID	<input type="checkbox"/>	LIQUID	<input type="checkbox"/>	SEMI-SOLID	<input type="checkbox"/>	GAS	<input type="checkbox"/>	OTHER (SPECIFY)		
COLOR	Multi			BOILING POINT (°C)	N/A							
ODOR & STRENGTH	None			pH	N/A							
FLASH POINT (°C)	N/A			VISCOSITY	<input type="checkbox"/>	Solid	<input type="checkbox"/>	High	<input type="checkbox"/>	Medium	<input type="checkbox"/>	Low
BTUs	N/A			TOTAL CYANIDES	N/A							
PCBs (ppm)	N/A			TOTAL SULFIDES (ppm)	N/A							
<b>2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)</b>												
NONE	<input type="checkbox"/>	OXIDIZER	<input type="checkbox"/>									
WATER REACTIVE	<input type="checkbox"/>	IGNITABLE	<input type="checkbox"/>									
SHOCK REACTIVE	<input type="checkbox"/>	MEDICAL/INFECT. WST	<input checked="" type="checkbox"/>									
AIR REACTIVE	<input type="checkbox"/>	DIOXINS	<input type="checkbox"/>									
EXPLOSIVE	<input type="checkbox"/>	PESTICIDE/HERBICIDE	<input type="checkbox"/>									
PYROPHORIC	<input type="checkbox"/>	POLYMERIZABLE	<input type="checkbox"/>									
REACTIVE CYANIDES	<input type="checkbox"/>	RADIOACTIVE	<input type="checkbox"/>									
REACTIVE SULFIDES	<input type="checkbox"/>	EXEMPT RAD	<input type="checkbox"/>									
PHENOLS	<input type="checkbox"/>	ASBESTOS	<input type="checkbox"/>									
ORGANIC PEROXIDE	<input type="checkbox"/>	THERMALLY UNSTABLE	<input type="checkbox"/>									
<b>3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)</b>												
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED			CONCENTRATION (ppm or mg/L)					
	Medical waste (sharps, needles, bodily fluids, blood)			90 - 100								
	Paper, plastic, metal, lids, labels			5-10								
KNOWLEDGE IS FROM		<input type="checkbox"/>	LAB ANALYSIS	<input type="checkbox"/>	MSDS	<input checked="" type="checkbox"/>	PROCESS/GENERATOR KNOWLEDGE					
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.												
NAME: Jimmy Street					TITLE: Waste Management Lead							
SIGNATURE 					DATE: 03/18/2021							

WASTE PROFILE SHEET											
Part I											
<b>A. GENERAL INFORMATION</b>							WASTE PROFILE NO. 20140506-009				
1. GENERATORS NAME Esso Exploration Production Guyana Limited											
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana											
3. TECHNICAL CONTACT Jimmy Street				4. TITLE Waste Management Lead		5. PHONE 623-1104					
<b>B. WASTE INFORMATION</b>											
1. WASTE CLASSIFICATION			<input checked="" type="checkbox"/> HAZARDOUS			<input type="checkbox"/> NON-HAZARDOUS					
<b>1A. LISTED HAZARDOUS WASTES</b>											
Is this a listed waste under Annex I of the Basel Convention?      Y <input type="checkbox"/> N <input checked="" type="checkbox"/>											
If "yes" then provide waste numbers											
Is this a listed waste under Annex VIII of the Basel Convention?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>											
If "yes" then provide all applicable waste numbers      A3020											
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>											
If "yes" then provide all applicable waste numbers      Guyana EPA AG.1 Hazardous Wastes Regulations Part VII, 36, (xvii) (xviii) : Regulations do not apply.											
2. COMMON NAME OF WASTE Drill cuttings/Mud slops											
3. SITE ID/LOCATION OF WASTE GENERATION Stena Carron, Noble Bob Douglas, Noble Don Taylor and Noble Tom Madden drill ships											
4. PROCESS GENERATING WASTE NAF Drill cuttings / mud slops from well exploration and development											
5. PROJECTED ANNUAL VOLUME 2600-3000 BBLs			6. WASTE RECEIVING FREQUENCY		<input checked="" type="checkbox"/> WEEKLY	<input type="checkbox"/> MONTHLY	<input type="checkbox"/> ONE-TIME SHIPMENT	OTHER (SPECIFY)			
7. WASTE VOLUME		<input type="checkbox"/> CUBIC METERS	<input type="checkbox"/> GALLONS		<input type="checkbox"/> TONNES		<input type="checkbox"/> BBLs	OTHER (SPECIFY)			
8. WASTE CONTAINERS		<input type="checkbox"/> BARRELS (42 GAL.)	<input type="checkbox"/> DRUM (55 GAL.)		<input checked="" type="checkbox"/> CUTTINGS BOX	<input type="checkbox"/>		OTHER (SPECIFY)			
9. SPECIAL HANDLING REQUIREMENTS Yes											
PART II											
<b>1. PHYSICAL CHARACTERISTICS</b>											
PHYSICAL STATE (CHECK ONE)	<input checked="" type="checkbox"/>	SOLID	<input checked="" type="checkbox"/>	LIQUID	<input checked="" type="checkbox"/>	SEMI-SOLID	<input type="checkbox"/>	GAS	<input type="checkbox"/>	OTHER (SPECIFY)	
COLOR		Earthen with oil and water			BOILING POINT (°C)		N/A				
ODOR & STRENGTH		Mild			pH		Neutral				
FLASH POINT (°C)		N/A			VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low				
BTUs		N/A			TOTAL CYANIDES (ppm)		N/A				
PCBs (ppm)		N/A			TOTAL SULFIDES (ppm)		N/A				
<b>2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)</b>											
NONE	<input checked="" type="checkbox"/>	OXIDIZER	<input type="checkbox"/>	WATER REACTIVE	<input type="checkbox"/>	IGNITABLE	<input type="checkbox"/>	SHOCK REACTIVE	<input type="checkbox"/>	MEDICAL/INFECT. WST	<input type="checkbox"/>
AIR REACTIVE	<input type="checkbox"/>	DIOXINS	<input type="checkbox"/>	EXPLOSIVE	<input type="checkbox"/>	PESTICIDE/HERBICIDE	<input type="checkbox"/>	PYROPHORIC	<input type="checkbox"/>	POLYMERIZABLE	<input type="checkbox"/>
REACTIVE CYANIDES	<input type="checkbox"/>	RADIOACTIVE	<input type="checkbox"/>	REACTIVE SULFIDES	<input type="checkbox"/>	EXEMPT RAD	<input type="checkbox"/>	PHENOLS	<input type="checkbox"/>	ASBESTOS	<input type="checkbox"/>
ORGANIC PEROXIDE	<input type="checkbox"/>	THERMALLY UNSTABLE	<input type="checkbox"/>								
<b>3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)</b>											
CAS #	CONSTITUENTS				RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED			CONCENTRATION (ppm or mg/L)			
	Escaid 110				44						
	Water				14						
	Barite				32						
	Calcium Chloride				5						
	Lime							<1			
	EMI 1926							<1			
	RETHIK							<1			
	VG PLUS				<2						
	ECOTROL RD							<1			
	SUREMUL				<3						
KNOWLEDGE IS FROM			<input checked="" type="checkbox"/>	LAB ANALYSIS		<input checked="" type="checkbox"/>	MSDS	<input checked="" type="checkbox"/>	PROCESS/GENERATOR KNOWLEDGE		
<b>COMMENTS :</b> Hazardous and chemical properties of Section 2 of the Waste Profile Sheet do not have regulatory limits using the Basel convention criteria. This waste stream is considered a mixture and the characteristics of this mixture doesn't appear to exhibit specific hazardous properties. Analytical received, the analysis has been added to this profile.											
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.											
NAME: Jimmy Street					TITLE: Waste Management Lead						
SIGNATURE: 					DATE: 06/26/2021						

WASTE PROFILE SHEET									
Part I									
<b>A. GENERAL INFORMATION</b>					<b>WASTE PROFILE NO.</b> 20140506-010				
1. GENERATORS NAME Esso Exploration Production Guyana Limited									
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana									
3. TECHNICAL CONTACT Jimmy Street			4. TITLE Waste Management Lead		5. PHONE 623-1104				
B. WASTE INFORMATION									
1. WASTE CLASSIFICATION		<input checked="" type="checkbox"/> HAZARDOUS		<input type="checkbox"/> NON-HAZARDOUS					
1A. LISTED HAZARDOUS WASTES									
Is this a listed waste under Annex I of the Basel Convention?				Y <input checked="" type="checkbox"/>   N <input type="checkbox"/>					
If "yes" then provide waste numbers				Y9					
Is this a listed waste under Annex VIII of the Basel Convention?				Y <input checked="" type="checkbox"/>   N <input type="checkbox"/>					
If "yes" then provide all applicable waste numbers				A4060					
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?				Y <input checked="" type="checkbox"/>   N <input type="checkbox"/>					
If "yes" then provide all applicable waste numbers				Guyana EPA AG.1 Hazardous Wastes Regulations Part VII, 36, (viii) : Regulations do not apply					
2. COMMON NAME OF WASTE Oily Debris									
3. SITE ID/LOCATION OF WASTE GENERATION Exploration & Development Drilling, FPSO and Shorebase									
4. PROCESS GENERATING WASTE Various articles or other items that have crude oil or lubricating oil contamination and are no longer used for intended purpose									
5. PROJECTED ANNUAL VOLUME 75-100 MT		6. WASTE RECEIVING FREQUENCY		<input checked="" type="checkbox"/> WEEKLY	<input type="checkbox"/> MONTHLY	<input type="checkbox"/> ONE-TIME SHIPMENT	OTHER (SPECIFY)		
7. WASTE VOLUME		CUBIC METERS		GALLONS		TONNES		OTHER (SPECIFY)	
8. WASTE CONTAINERS		BARRELS (42 GAL.)		DRUM (55 GAL.)		CUTTINGS BOX		OTHER (BAGS)	
9. SPECIAL HANDLING REQUIREMENTS No									
PART II									
1. PHYSICAL CHARACTERISTICS									
PHYSICAL (CHECK ONE)	STATE	<input checked="" type="checkbox"/> SOLID	<input type="checkbox"/> LIQUID	<input type="checkbox"/> SEMI-SOLID	<input type="checkbox"/> GAS	OTHER (SPECIFY)			
COLOR		Multi colored		BOLING POINT (°C)		N/A			
ODOR & STRENGTH		Mild		pH		N/A			
FLASH POINT (°C)		N/A		VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low			
BTUs		N/A		TOTAL CYNAIDES (ppm)		N/A			
PCBs (ppm)		N/A		TOTAL SULFIDES (ppm)		N/A			
2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)									
NONE		<input checked="" type="checkbox"/>		OXIDIZER		<input type="checkbox"/>			
WATER REACTIVE		<input type="checkbox"/>		IGNITABLE		<input type="checkbox"/>			
SHOCK REACTIVE		<input type="checkbox"/>		MEDICAL/INFECT. WST		<input type="checkbox"/>			
AIR REACTIVE		<input type="checkbox"/>		DIOXINS		<input type="checkbox"/>			
EXPLOSIVE		<input type="checkbox"/>		PESTICIDE/HERBICIDE		<input type="checkbox"/>			
PYROPHORIC		<input type="checkbox"/>		POLYMERIZABLE		<input type="checkbox"/>			
REACTIVE CYANIDES		<input type="checkbox"/>		RADIOACTIVE		<input type="checkbox"/>			
REACTIVE SULFIDES		<input type="checkbox"/>		EXEMPT RAD		<input type="checkbox"/>			
PHENOLS		<input type="checkbox"/>		ASBESTOS		<input type="checkbox"/>			
ORGANIC PEROXIDE		<input type="checkbox"/>		THERMALLY UNSTABLE		<input type="checkbox"/>			
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)									
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED			CONCENTRATION (ppm or mg/L)		
	Oily absorbent pads, rags, filters, grease tubes, dope brushes, gloves, personnel protective equipment, paper, plastic and wood			0-100					
KNOWLEDGE IS FROM									
<input type="checkbox"/> LAB ANALYSIS		<input type="checkbox"/> MSDS		<input checked="" type="checkbox"/> PROCESS/GENERATOR KNOWLEDGE					
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.									
NAME: Jimmy Street				TITLE: Waste Management Lead					
SIGNATURE: 				DATE: 03/18/2021					









WASTE PROFILE SHEET												
Part I												
<b>A. GENERAL INFORMATION</b>					<b>WASTE PROFILE NO.</b> 20140506-0015							
1. GENERATORS NAME Esso Exploration Production Guyana Limited												
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana												
3. TECHNICAL CONTACT Jimmy Street			4. TITLE Waste Management Lead			5. PHONE 623-1104						
<b>B. WASTE INFORMATION</b>												
1. WASTE CLASSIFICATION		<input checked="" type="checkbox"/>	HAZARDOUS			<input type="checkbox"/>	NON-HAZARDOUS					
<b>1A. LISTED HAZARDOUS WASTES</b>												
Is this a listed waste under Annex I of the Basel Convention?				Y <input checked="" type="checkbox"/>		N <input type="checkbox"/>						
If "yes" then provide waste numbers				Y34								
Is this a listed waste under Annex VIII of the Basel Convention?				Y <input checked="" type="checkbox"/>		N <input type="checkbox"/>						
If "yes" then provide all applicable waste numbers				A4090								
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?				Y <input checked="" type="checkbox"/>		N <input type="checkbox"/>						
If "yes" then provide all applicable waste numbers				Guyana EPA AG.1 Hazardous Wastes Regulations : Hazardous Waste								
2. COMMON NAME OF WASTE Acid solutions												
3. SITE ID/LOCATION OF WASTE GENERATION (if different than facility address above) Development & Exploration Drilling. Various wells												
4. PROCESS GENERATING WASTE Contaminated or excess acid solutions in support of wells												
5. PROJECTED ANNUAL VOLUME 2-10 MT		6. WASTE RECEIVING FREQUENCY		<input type="checkbox"/>	WEEKLY	<input type="checkbox"/>	MONTHLY	<input type="checkbox"/>	ONE-TIME SHIPMENT	<input checked="" type="checkbox"/>	OTHER (As needed)	
7. WASTE VOLUME		<input type="checkbox"/>	CUBIC METERS		<input type="checkbox"/>	GALLONS		<input type="checkbox"/>	TONNES		<input type="checkbox"/>	OTHER (SPECIFY)
8. WASTE CONTAINERS		<input type="checkbox"/>	BARRELS (42 GAL.)		<input type="checkbox"/>	DRUM (55 GAL.)		<input type="checkbox"/>	CUTTINGS BOX		<input type="checkbox"/>	OTHER (SPECIFY)
		<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>	TANK		<input type="checkbox"/>	OTHER (SPECIFY)
9. SPECIAL HANDLING REQUIREMENTS Yes. Corrosive acid and caustic streams managed separately.												
PART II												
<b>1. PHYSICAL CHARACTERISTICS</b>												
PHYSICAL (CHECK ONE)	STATE	<input type="checkbox"/>	SOLID	<input checked="" type="checkbox"/>	LIQUID	<input type="checkbox"/>	SEMI- SOLID	<input type="checkbox"/>	GAS	<input type="checkbox"/>	OTHER (SPECIFY)	
COLOR	Water clear to slight greenish				BOILING POINT (°C)	N/A						
ODOR & STRENGTH	None/Strong				pH	0-2 (Acidic)						
FLASH POINT (°C)	N/A				VISCOSITY	<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low						
BTUs	N/A				TOTAL CYANIDES (ppm)	N/A						
PCBs (ppm)	N/A				TOTAL SULFIDES (ppm)	N/A						
<b>2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)</b>												
NONE	<input checked="" type="checkbox"/>				OXIDIZER	<input type="checkbox"/>						
WATER REACTIVE	<input type="checkbox"/>				IGNITABLE	<input type="checkbox"/>						
SHOCK REACTIVE	<input type="checkbox"/>				MEDICAL/INFECT. WST	<input type="checkbox"/>						
AIR REACTIVE	<input type="checkbox"/>				DIOXINS	<input type="checkbox"/>						
EXPLOSIVE	<input type="checkbox"/>				PESTICIDE/HERBICIDE	<input type="checkbox"/>						
PYROPHORIC	<input type="checkbox"/>				POLYMERIZABLE	<input type="checkbox"/>						
REACTIVE CYANIDES	<input type="checkbox"/>				RADIOACTIVE	<input type="checkbox"/>						
REACTIVE SULFIDES	<input type="checkbox"/>				EXEMPT RAD	<input type="checkbox"/>						
PHENOLS	<input type="checkbox"/>				ASBESTOS	<input type="checkbox"/>						
ORGANIC PEROXIDE	<input type="checkbox"/>				THERMALLY UNSTABLE	<input type="checkbox"/>						
<b>3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)</b>												
CAS #	CONSTITUENTS				RANGE (%) - MUST BE EQUAL OR GREATER THAN 100%				CONCENTRATION (ppm or mg/L)			
	HCL solution				25-50							
	Water				60-80							
KNOWLEDGE IS FROM		<input type="checkbox"/>	LAB ANALYSIS		<input checked="" type="checkbox"/>	MSDS	<input checked="" type="checkbox"/>	PROCESS/GENERATOR KNOWLEDGE				
<b>COMMENTS :</b> The corrosivity hazard is related to the pH as identified in Section 1 of EPA's Waste Profile Sheet form. Corrosivity and Toxicity are not options that are available in Section 2 of EPA's Waste Profile Sheet form. EEPGL is unaware of a standard for toxicity characterization.												
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.												
NAME: Jimmy Street					TITLE: Waste Management Lead							
SIGNATURE: 					DATE: 06/26/2021							



WASTE PROFILE SHEET											
Part I											
<b>A. GENERAL INFORMATION</b>						WASTE PROFILE NO. 20140506-0017					
1. GENERATORS NAME Esso Exploration Production Guyana Limited											
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana											
3. TECHNICAL CONTACT Jimmy Street			4. TITLE Waste Management Lead			5. PHONE 623-1104					
<b>B. WASTE INFORMATION</b>											
1. WASTE CLASSIFICATION		<input checked="" type="checkbox"/> HAZARDOUS		<input type="checkbox"/> NON-HAZARDOUS							
<b>1A. LISTED HAZARDOUS WASTES</b>											
Is this a listed waste under Annex I of the Basel Convention?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>											
If "yes" then provide waste numbers      Y45											
Is this a listed waste under Annex VIII of the Basel Convention?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>											
If "yes" then provide all applicable waste numbers      A4140											
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?      Y <input type="checkbox"/> N <input checked="" type="checkbox"/>											
If "yes" then provide all applicable waste numbers											
2. COMMON NAME OF WASTE Fire Fighting Foam (or AFFF - Aqueous Film Forming Foam)											
3. SITE ID/LOCATION OF WASTE GENERATION Drilling rigs, FPSO and Shorebase											
4. PROCESS GENERATING WASTE Outdated firefighting foam (time-expired)											
5. PROJECTED ANNUAL VOLUME 0.1-0.5 MT		6. WASTE RECEIVING FREQUENCY		<input type="checkbox"/> WEEKLY	<input type="checkbox"/> MONTHLY	<input type="checkbox"/> ONE-TIME SHIPMENT	<input checked="" type="checkbox"/>	OTHER (As needed)			
7. WASTE VOLUME		<input checked="" type="checkbox"/> CUBIC METERS		<input type="checkbox"/> GALLONS		<input type="checkbox"/> TONNES		OTHER (SPECIFY)			
8. WASTE CONTAINERS		<input type="checkbox"/> BARRELS (42 GAL.)		<input checked="" type="checkbox"/> DRUM (55 GAL.)		<input type="checkbox"/> CUTTINGS BOX		OTHER (SPECIFY)			
9. SPECIAL HANDLING REQUIREMENTS No											
PART II											
<b>1. PHYSICAL CHARACTERISTICS</b>											
PHYSICAL STATE (CHECK ONE)	<input type="checkbox"/> SOLID	<input checked="" type="checkbox"/>	<input type="checkbox"/> LIQUID	<input type="checkbox"/> SEMI-SOLID	<input type="checkbox"/> GAS	OTHER (SPECIFY)					
COLOR		Light yellow		BOILING POINT (°C)		N/A					
ODOR & STRENGTH		None		pH		8.5					
FLASH POINT (°C)		N/A		VISCOSITY		<input type="checkbox"/> Solid		<input type="checkbox"/> High		<input checked="" type="checkbox"/> Medium	<input type="checkbox"/> Low
BTUs		N/A		TOTAL CYANIDES (ppm)		N/A					
PCBs (ppm)		N/A		TOTAL SULFIDES (ppm)		N/A					
<b>2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)</b>											
NONE		<input checked="" type="checkbox"/>		OXIDIZER		<input type="checkbox"/>					
WATER REACTIVE		<input type="checkbox"/>		IGNITABLE		<input type="checkbox"/>					
SHOCK REACTIVE		<input type="checkbox"/>		MEDICAL/INFECT. WST		<input type="checkbox"/>					
AIR REACTIVE		<input type="checkbox"/>		DIOXINS		<input type="checkbox"/>					
EXPLOSIVE		<input type="checkbox"/>		PESTICIDE/HERBICIDE		<input type="checkbox"/>					
PYROPHORIC		<input type="checkbox"/>		POLYMERIZABLE		<input type="checkbox"/>					
REACTIVE CYANIDES		<input type="checkbox"/>		RADIOACTIVE		<input type="checkbox"/>					
REACTIVE SULFIDES		<input type="checkbox"/>		EXEMPT RAD		<input type="checkbox"/>					
PHENOLS		<input type="checkbox"/>		ASBESTOS		<input type="checkbox"/>					
ORGANIC PEROXIDE		<input type="checkbox"/>		THERMALLY UNSTABLE		<input type="checkbox"/>					
<b>3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)</b>											
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED			CONCENTRATION (ppm or mg/L)				
	Ansilite 1 % AFFF			10-40							
	Water			60-80							
KNOWLEDGE IS FROM		<input type="checkbox"/> LAB ANALYSIS		<input checked="" type="checkbox"/> MSDS		<input checked="" type="checkbox"/> PROCESS/GENERATOR KNOWLEDGE					
COMMENTS : Regulations regarding AFFF are changing based on new data. The current SDS doesn't reflect the hazardous and chemical properties listed in section 2.											
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.											
NAME: Jimmy Street				TITLE: Waste Management Lead							
SIGNATURE: 				DATE: 06/26/2021							



WASTE PROFILE SHEET										
Part I										
<b>A. GENERAL INFORMATION</b>							WASTE PROFILE NO.			
							20140506-0019			
1. GENERATORS NAME Esso Exploration Production Guyana Limited										
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana										
3. TECHNICAL CONTACT Jimmy Street				4. TITLE Waste Management Lead		5. PHONE 623-1104				
B. WASTE INFORMATION										
1. WASTE CLASSIFICATION			<input checked="" type="checkbox"/> HAZARDOUS			<input type="checkbox"/> NON-HAZARDOUS				
1A. LISTED HAZARDOUS WASTES										
Is this a listed waste under Annex I of the Basel Convention? Y <input checked="" type="checkbox"/> N <input type="checkbox"/>										
If "yes" then provide waste numbers Y9										
Is this a listed waste under Annex VIII of the Basel Convention? Y <input checked="" type="checkbox"/> N <input type="checkbox"/>										
If "yes" then provide all applicable waste numbers A4060										
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations? Y <input checked="" type="checkbox"/> N <input type="checkbox"/>										
If "yes" then provide all applicable waste numbers Guyana EPA AG.1 Hazardous Waste Regulations Part VII, 36, (xviii) : Regulations do not apply										
2. COMMON NAME OF WASTE Brine (Oil/solids contaminated brine)										
3. SITE ID/LOCATION OF WASTE GENERATION Exploration & Development Drilling operations.										
4. PROCESS GENERATING WASTE Wells Completion and Workover. Flowback fluids with hydrocarbon or solids contamination.										
5. PROJECTED ANNUAL 100-150 CUBIC METERS			6. WASTE RECEIVING FREQUENCY		WEEKLY	MONTHLY	ONE-TIME SHIPMENT	<input checked="" type="checkbox"/>	OTHER (As)	
7. WASTE VOLUME			CUBIC METERS		GALLONS		TONNES		OTHER (SPECIFY)	
8. WASTE CONTAINERS			BARRELS (42 GAL.)		DRUM (55 GAL.)		CUTTINGS BOX		TANKS	
9. SPECIAL HANDLING REQUIREMENTS Yes										
PART II										
1. PHYSICAL CHARACTERISTICS										
PHYSICAL STATE (CHECK ONE)	<input type="checkbox"/>	SOLID	<input checked="" type="checkbox"/>	LIQUID	<input type="checkbox"/>	SEMI-SOLID	<input type="checkbox"/>	OTHER (SPECIFY)		
COLOR	Grey - Dark			BOILING POINT (°C)						
ODOR & STRENGTH	Mild			pH						
FLASH POINT (°C)	N/A			VISCOSITY	Solid	High	Medium	Low		
BTUS	N/A			PCBs (ppm)	N/A					
2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK ONE)										
NONE	<input checked="" type="checkbox"/>	OXIDIZER	<input type="checkbox"/>	IGNITABLE	<input type="checkbox"/>	MEDICAL/INFECT. WST	<input type="checkbox"/>	DIOXINS	<input type="checkbox"/>	
WATER REACTIVE	<input type="checkbox"/>	EXPLOSIVE	<input type="checkbox"/>	PESTICIDE/HERBICIDE	<input type="checkbox"/>	POLYMERIZABLE	<input type="checkbox"/>	RADIOACTIVE	<input type="checkbox"/>	
SHOCK REACTIVE	<input type="checkbox"/>	PYROPHORIC	<input type="checkbox"/>	REACTIVE CYANIDES	<input type="checkbox"/>	REACTIVE SULFIDES	<input type="checkbox"/>	PHENOLS	<input type="checkbox"/>	
AIR REACTIVE	<input type="checkbox"/>	REACTIVE SULFIDES	<input type="checkbox"/>	PHENOLS	<input type="checkbox"/>	ORGANIC PEROXIDE	<input type="checkbox"/>	THERMALLY UNSTABLE	<input type="checkbox"/>	
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)										
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED			CONCENTRATION (ppm or mg/L)			
	Brine			40-60						
	NADF (see below) :			40-60						
	Escaid 110			44						
	Water			14						
	Barite			32						
	Calcium Chloride			5						
	Lime						<1			
	EMI 1926						<1			
	RETHIK						<1			
	VG PLUS			<2						
	ECOTROL RD						<1			
	SUREMUL			<3						
KNOWLEDGE IS FROM		<input type="checkbox"/>	LAB ANALYSIS		<input checked="" type="checkbox"/>	MSDS	<input checked="" type="checkbox"/>	PROCESS/GENERATOR KNOWLEDGE		
Comments : The Contaminated Brine Waste Profile Sheet (ID 019) has been combined with Completion Fluids (ID 021) Waste Profile Sheet. The SDS are located in Waste Profile Sheet (ID 021). This stream is generated through the transition of fluids of the wells. Large variation of percentage of waste streams is due to completion of wells with Brine, Crude Oil and NADF in container.										
GENERATOR CERTIFICATION: I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.										
NAME: Jimmy Street					TITLE: Waste Management Lead					
SIGNATURE: 					DATE: 06/26/2021					

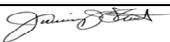


**WASTE PROFILE SHEET**

**Part I**

<b>A. GENERAL INFORMATION</b>		<b>WASTE PROFILE NO.</b> 20140506-0021	
1. GENERATORS NAME Esso Exploration Production Guyana Limited			
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana			
3. TECHNICAL CONTACT Jimmy Street	4. TITLE Waste Management Lead	5. PHONE 623-1104	
<b>B. WASTE INFORMATION</b>			
1. WASTE CLASSIFICATION	<input checked="" type="checkbox"/> HAZARDOUS	<input type="checkbox"/> NON-HAZARDOUS	
<b>1A. LISTED HAZARDOUS WASTES</b>			
Is this a listed waste under Annex I of the Basel Convention? Y <input checked="" type="checkbox"/> N <input type="checkbox"/>			
If "yes" then provide waste numbers Y9			
Is this a listed waste under Annex VIII of the Basel Convention? Y <input checked="" type="checkbox"/> N <input type="checkbox"/>			
If "yes" then provide all applicable waste numbers Hazardous Waste A4060			
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations? Y <input checked="" type="checkbox"/> N <input type="checkbox"/>			
If "yes" then provide all applicable waste numbers Guyana EPA AG.1 Hazardous Waste Regulations Part VII, 36, (xviii) : Regulations do not apply.			
2. COMMON NAME OF WASTE Completion Fluids / Contaminated Brine			
3. SITE ID/LOCATION OF WASTE GENERATION Drilling operations, Installation and Hook-Up supporting FPSO.			
4. PROCESS GENERATING WASTE Wells Completion and Workover. Flowback fluids with hydrocarbon or solids contamination.			
5. PROJECTED ANNUAL VOLUME 200-250 CUBIC METERS	6. WASTE RECEIVING FREQUENCY	<input type="checkbox"/> WEEKLY	<input checked="" type="checkbox"/> MONTHLY
		<input type="checkbox"/> ONE-TIME SHIPMENT	<input checked="" type="checkbox"/> OTHER (As generated)
7. WASTE VOLUME	CUBIC METERS	GALLONS	TONNES
			BBLs OTHER (SPECIFY)
8. WASTE CONTAINERS	BARRELS (42 GAL.)	DRUM (55 GAL.)	CUTTINGS BOX
			TANKS OTHER (SPECIFY)
9. SPECIAL HANDLING REQUIREMENTS Yes			

**PART II**

<b>1. PHYSICAL CHARACTERISTICS</b>									
PHYSICAL STATE (CHECK ONE)	<input type="checkbox"/> SOLID	<input checked="" type="checkbox"/> LIQUID	<input type="checkbox"/> SEMI-SOLID	<input type="checkbox"/> GAS	<input type="checkbox"/> OTHER (SPECIFY)				
COLOR	Tan - Dark		BOILING POINT (°C)	N/A					
ODOR & STRENGTH	Mild		pH	8					
FLASH POINT (°C)	99		VISCOSITY	<input type="checkbox"/> Solid	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input checked="" type="checkbox"/> Low		
BTUs	N/A		TOTAL CYANIDES (ppm)	N/A					
PCBs (ppm)	N/A		TOTAL SULFIDES (ppm)	N/A					
<b>2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)</b>									
NONE	<input checked="" type="checkbox"/>	OXIDIZER	<input type="checkbox"/>						
WATER REACTIVE	<input type="checkbox"/>	IGNITABLE	<input type="checkbox"/>						
SHOCK REACTIVE	<input type="checkbox"/>	MEDICAL/INFECT. WST	<input type="checkbox"/>						
AIR REACTIVE	<input type="checkbox"/>	DIOXINS	<input type="checkbox"/>						
EXPLOSIVE	<input type="checkbox"/>	PESTICIDE/HERBICIDE	<input type="checkbox"/>						
PYROPHORIC	<input type="checkbox"/>	POLYMERIZABLE	<input type="checkbox"/>						
REACTIVE CYANIDES	<input type="checkbox"/>	RADIOACTIVE	<input type="checkbox"/>						
REACTIVE SULFIDES	<input type="checkbox"/>	EXEMPT RAD	<input type="checkbox"/>						
PHENOLS	<input type="checkbox"/>	ASBESTOS	<input type="checkbox"/>						
ORGANIC PEROXIDE	<input type="checkbox"/>	THERMALLY UNSTABLE	<input type="checkbox"/>						
<b>3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)</b>									
CAS #	CONSTITUENTS		RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED	CONCENTRATION (ppm or mg/L)					
	Brine		10-95						
	Crude oil		10-50						
	Non Aqueous Drilling Fluids (composition of NADF see below) :		10-95						
	Escaid 110		44						
	Water		14						
	Barite		32						
	Calcium Chloride		5						
	Lime			<1					
	EMI 1926			<1					
	RETHIK			<1					
	VG PLUS		<2						
	ECOTROL RD			<1					
	SUREMUL		<3						
KNOWLEDGE IS FROM	<input checked="" type="checkbox"/> LAB ANALYSIS	<input type="checkbox"/> MSDS	<input checked="" type="checkbox"/> PROCESS/GENERATOR KNOWLEDGE						
<b>COMMENTS :</b> The Contaminated Brine Waste Profile Sheet (ID 019) has been combined with the Completion Fluids (ID 021) Waste Profile Sheet. The ID Number for the combined waste streams is 021. This stream is generated through the transition of fluids of the wells. Large variation of percentage of waste streams is due to completion of wells with Brine, Crude Oil and NADF in container.									
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.									
NAME: Jimmy Street			TITLE: Waste Management Lead						
SIGNATURE: 			DATE: 06/26/2021						



WASTE PROFILE SHEET									
Part I									
<b>A. GENERAL INFORMATION</b>						<b>WASTE PROFILE NO.</b> 20140506-0024			
1. GENERATORS NAME Esso Exploration Production Guyana Limited									
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana									
3. TECHNICAL CONTACT Jimmy Street			4. TITLE Waste Management Lead			5. PHONE 623-1104			
B. WASTE INFORMATION									
1. WASTE CLASSIFICATION		<input checked="" type="checkbox"/> HAZARDOUS			<input type="checkbox"/> NON-HAZARDOUS				
1A. LISTED HAZARDOUS WASTES									
Is this a listed waste under Annex I of the Basel Convention?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>									
If "yes" then provide waste numbers      Y9									
Is this a listed waste under Annex VIII of the Basel Convention?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>									
If "yes" then provide all applicable waste numbers      Hazardous Waste A4060									
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>									
If "yes" then provide all applicable waste numbers      Guyana EPA AG.1 Hazardous Wastes Regulations Part VII, 36, (xiii) : Regulations do not apply									
2. COMMON NAME OF WASTE Fuel (contaminated)									
3. SITE ID/LOCATION OF WASTE GENERATION Drilling rigs, FPSO and Shore base									
4. PROCESS GENERATING WASTE Contaminated diesel from heavy equipment and heli fuel from helicopter operations with water									
5. PROJECTED ANNUAL VOLUME 8-10 MT		6. WASTE RECEIVING FREQUENCY		<input type="checkbox"/> WEEKLY <input checked="" type="checkbox"/> MONTHLY		<input type="checkbox"/> ONE-TIME SHIPMENT		OTHER (SPECIFY)	
7. WASTE VOLUME		CUBIC METERS		GALLONS		TONNES		OTHER (SPECIFY)	
8. WASTE CONTAINERS		BARRELS (42 GAL.)		DRUM (55 GAL.)		CUTTINGS BOX		OTHER (TOTES)	
9. SPECIAL HANDLING REQUIREMENTS No									
PART II									
1. PHYSICAL CHARACTERISTICS									
PHYSICAL STATE (CHECK ONE)		<input type="checkbox"/> SOLID <input checked="" type="checkbox"/> LIQUID		<input type="checkbox"/> SEMI-SOLID		<input type="checkbox"/> GAS		OTHER (SPECIFY)	
COLOR		Brown / Dark		BOLING POINT (°C)		N/A			
ODOR & STRENGTH		Petroleum odor		pH		N/A			
FLASH POINT (°C)		38		VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low			
BTUs		N/A		TOTAL CYNAIDES (ppm)		N/A			
PCBs (ppm)		N/A		TOTAL SULFIDES (ppm)		N/A			
2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)									
NONE		<input type="checkbox"/>		OXIDIZER		<input type="checkbox"/>			
WATER REACTIVE		<input type="checkbox"/>		IGNITABLE		<input checked="" type="checkbox"/>			
SHOCK REACTIVE		<input type="checkbox"/>		MEDICAL/INFECT. WST		<input type="checkbox"/>			
AIR REACTIVE		<input type="checkbox"/>		DIOXINS		<input type="checkbox"/>			
EXPLOSIVE		<input type="checkbox"/>		PESTICIDE/HERBICIDE		<input type="checkbox"/>			
PYROPHORIC		<input type="checkbox"/>		POLYMERIZABLE		<input type="checkbox"/>			
REACTIVE CYANIDES		<input type="checkbox"/>		RADIOACTIVE		<input type="checkbox"/>			
REACTIVE SULFIDES		<input type="checkbox"/>		EXEMPT RAD		<input type="checkbox"/>			
PHENOLS		<input type="checkbox"/>		ASBESTOS		<input type="checkbox"/>			
ORGANIC PEROXIDE		<input type="checkbox"/>		THERMALLY UNSTABLE		<input type="checkbox"/>			
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)									
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED			CONCENTRATION (ppm or mg/L)		
	Contaminated helifuel / diesel			75-95					
	Water			5-25					
KNOWLEDGE IS FROM <input type="checkbox"/> LAB ANALYSIS <input checked="" type="checkbox"/> MSDS <input checked="" type="checkbox"/> PROCESS/GENERATOR KNOWLEDGE									
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.									
NAME: Jimmy Street					TITLE: Waste Management Lead				
SIGNATURE: 					DATE: 03/18/2021				



WASTE PROFILE SHEET											
Part I											
<b>A. GENERAL INFORMATION</b>					WASTE PROFILE NO. 20140506-0027						
1. GENERATORS NAME Esso Exploration Production Guyana Limited											
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana											
3. TECHNICAL CONTACT Jimmy Street			4. TITLE Waste Management Lead			5. PHONE 623-1104					
B. WASTE INFORMATION											
1. WASTE CLASSIFICATION			<input checked="" type="checkbox"/> HAZARDOUS			<input type="checkbox"/> NON-HAZARDOUS					
1A. LISTED HAZARDOUS WASTES											
Is this a listed waste under Annex I of the Basel Convention?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>											
If "yes" then provide waste numbers      Y9											
Is this a listed waste under Annex VIII of the Basel Convention?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>											
If "yes" then provide all applicable waste numbers      Hazardous Waste A4060											
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?      Y <input checked="" type="checkbox"/> N <input type="checkbox"/>											
If "yes" then provide all applicable waste numbers      Guyana EPA AG.1 Hazardous Wastes Regulations Part VII, 36, (xvii) (xviii) : Regulations do not apply.											
2. COMMON NAME OF WASTE Oily Water											
3. SITE ID/LOCATION OF WASTE GENERATION Drilling operations, installation activities and FPSO											
4. PROCESS GENERATING WASTE Oil & Water separator, deck wash, sump water and effluents in excess of discharge limits											
5. PROJECTED ANNUAL VOLUME 500-1000 MT		6. WASTE RECEIVING FREQUENCY		<input type="checkbox"/> WEEKLY		<input checked="" type="checkbox"/> MONTHLY		<input type="checkbox"/> ONE-TIME SHIPMENT		<input type="checkbox"/> OTHER (SPECIFY)	
7. WASTE VOLUME		CUBIC METERS		GALLONS		TONNES		<input type="checkbox"/> BBLs		<input type="checkbox"/> OTHER (SPECIFY)	
8. WASTE CONTAINERS		BARRELS (42 GAL.)		DRUM (55 GAL.)		CUTTINGS BOX		<input type="checkbox"/> Tanks		<input type="checkbox"/> OTHER (SPECIFY)	
9. SPECIAL HANDLING REQUIREMENTS No											
PART II											
1. PHYSICAL CHARACTERISTICS											
PHYSICAL (CHECK ONE)	STATE	<input type="checkbox"/>	SOLID	<input checked="" type="checkbox"/>	LIQUID	<input type="checkbox"/>	SEMI- SOLID	<input type="checkbox"/>	GAS	<input type="checkbox"/>	OTHER (SPECIFY)
COLOR		Brown			BOILING POINT (°C)		N/A				
ODOR & STRENGTH		Mild			pH		8-9				
FLASH POINT (°C)		87-96			VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low				
BTUs		N/A			TOTAL CYNAIDES (ppm)		N/A				
PCBs (ppm)		N/A			TOTAL SULFIDES (ppm)		N/A				
2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)											
NONE		<input checked="" type="checkbox"/>			OXIDIZER		<input type="checkbox"/>				
WATER REACTIVE		<input type="checkbox"/>			IGNITABLE		<input type="checkbox"/>				
SHOCK REACTIVE		<input type="checkbox"/>			MEDICAL/INFECT. WST		<input type="checkbox"/>				
AIR REACTIVE		<input type="checkbox"/>			DIOXINS		<input type="checkbox"/>				
EXPLOSIVE		<input type="checkbox"/>			PESTICIDE/HERBICIDE		<input type="checkbox"/>				
PYROPHORIC		<input type="checkbox"/>			POLYMERIZABLE		<input type="checkbox"/>				
REACTIVE CYANIDES		<input type="checkbox"/>			RADIOACTIVE		<input type="checkbox"/>				
REACTIVE SULFIDES		<input type="checkbox"/>			EXEMPT RAD		<input type="checkbox"/>				
PHENOLS		<input type="checkbox"/>			ASBESTOS		<input type="checkbox"/>				
ORGANIC PEROXIDE		<input type="checkbox"/>			THERMALLY UNSTABLE		<input type="checkbox"/>				
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)											
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED			CONCENTRATION (ppm or mg/L)				
	Water			10-90							
	Hydrocarbons			3-90							
	Sediment			0-5							
KNOWLEDGE IS FROM <input checked="" type="checkbox"/> LAB ANALYSIS <input type="checkbox"/> MSDS <input checked="" type="checkbox"/> PROCESS/GENERATOR KNOWLEDGE											
COMMENTS : The Waste Profile Sheet has been edited to include the flashpoint and the pH from analytical data. The ignitibility characteristic is not representative for a mixture of oil and water based on two analyses conducted on representative oily water samples. These analytical results have been attached to the Waste Profile Sheet.											
GENERATOR CERTIFICATION: I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.											
NAME: Jimmy Street					TITLE: Waste Management Lead						
SIGNATURE: 					DATE: 06/26/2021						

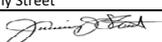
WASTE PROFILE SHEET									
Part I									
<b>A. GENERAL INFORMATION</b>							WASTE PROFILE NO. 20140506-0028		
1. GENERATORS NAME Esso Exploration Production Guyana Limited									
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana									
3. TECHNICAL CONTACT Jimmy Street				4. TITLE Waste Management Lead			5. PHONE 623-1104		
B. WASTE INFORMATION									
1. WASTE CLASSIFICATION			<input checked="" type="checkbox"/> HAZARDOUS			<input type="checkbox"/> NON-HAZARDOUS			
1A. LISTED HAZARDOUS WASTES									
Is this a listed waste under Annex I of the Basel Convention?				Y <input checked="" type="checkbox"/>		N <input type="checkbox"/>			
If "yes" then provide waste numbers				Y12					
Is this a listed waste under Annex VIII of the Basel Convention?				Y <input type="checkbox"/>		N <input checked="" type="checkbox"/>			
If "yes" then provide all applicable waste numbers									
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?				Y <input checked="" type="checkbox"/>		N <input type="checkbox"/>			
If "yes" then provide all applicable waste numbers				Guyana EPA AG.1 Hazardous Wastes Regulations : Hazardous Waste					
2. COMMON NAME OF WASTE Paint/Paint Consumables									
3. SITE ID/LOCATION OF WASTE GENERATION Drilling rigs, FPSO and Shorebase									
4. PROCESS GENERATING WASTE Maintenance painting and cleaning activities associated with operations or equipments									
5. PROJECTED ANNUAL VOLUME 10-15 MT			6. WASTE RECEIVING FREQUENCY		<input type="checkbox"/> WEEKLY	<input checked="" type="checkbox"/> MONTHLY	<input type="checkbox"/> ONE-TIME SHIPMENT	OTHER (SPECIFY)	
7. WASTE VOLUME		CUBIC METERS		GALLONS		TONNES		OTHER (SPECIFY)	
						<input checked="" type="checkbox"/>			
8. WASTE CONTAINERS		BARRELS (42 GAL.)		DRUM (55 GAL.)		CUTTINGS BOX		OTHER (SPECIFY)	
		<input checked="" type="checkbox"/>							
9. SPECIAL HANDLING REQUIREMENTS No									
PART II									
1. PHYSICAL CHARACTERISTICS									
PHYSICAL STATE (CHECK ONE)		<input checked="" type="checkbox"/> SOLID	<input type="checkbox"/> LIQUID	<input type="checkbox"/> SEMI-SOLID	<input type="checkbox"/> GAS	OTHER (SPECIFY)			
COLOR		N/A		BOILING POINT (°C)		N/A			
ODOR & STRENGTH		Mild		pH		N/A			
FLASH POINT (°C)		27		VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low			
BTUs		N/A		TOTAL CYANIDES (ppm)		N/A			
PCBs (ppm)		N/A		TOTAL SULFIDES (ppm)		N/A			
2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)									
NONE			OXIDIZER			<input type="checkbox"/>			
WATER REACTIVE			IGNITABLE			<input checked="" type="checkbox"/>			
SHOCK REACTIVE			MEDICAL/INFECT. WST			<input type="checkbox"/>			
AIR REACTIVE			DIOXINS			<input type="checkbox"/>			
EXPLOSIVE			PESTICIDE/HERBICIDE			<input type="checkbox"/>			
PYROPHORIC			POLYMERIZABLE			<input type="checkbox"/>			
REACTIVE CYANIDES			RADIOACTIVE			<input type="checkbox"/>			
REACTIVE SULFIDES			EXEMPT RAD			<input type="checkbox"/>			
PHENOLS			ASBESTOS			<input type="checkbox"/>			
ORGANIC PEROXIDE			THERMALLY UNSTABLE			<input type="checkbox"/>			
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)									
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED			CONCENTRATION (ppm or mg/L)		
	Paint/Paint Consumables (brushes, rollers, paint chips, etc.. )			70-90					
	Solvents consumables (rags, rollers, etc...)			60-90					
KNOWLEDGE IS FROM		<input type="checkbox"/> LAB ANALYSIS		<input checked="" type="checkbox"/> MSDS		<input checked="" type="checkbox"/> PROCESS/GENERATOR KNOWLEDGE			
COMMENTS : The primary hazard associated with paints in a liquid form is ignitability. Ignitability is now checked in Section 2 of the Waste Profile Sheet.									
GENERATOR CERTIFICATION: I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.									
NAME: Jimmy Street					TITLE: Waste Management Lead				
SIGNATURE: 					DATE: 06/26/2021				









WASTE PROFILE SHEET									
Part I									
<b>A. GENERAL INFORMATION</b>							<b>WASTE PROFILE NO.</b>		
							20140506-0036		
1. GENERATORS NAME Esso Exploration Production Guyana Limited									
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana									
3. TECHNICAL CONTACT Jimmy Street				4. TITLE Waste Management Lead		5. PHONE 623-1104			
B. WASTE INFORMATION									
1. WASTE CLASSIFICATION			<input checked="" type="checkbox"/> HAZARDOUS			<input type="checkbox"/> NON-HAZARDOUS			
1A. LISTED HAZARDOUS WASTES									
Is this a listed waste under Annex I of the Basel Convention?							Y <input checked="" type="checkbox"/>	N <input type="checkbox"/>	
If "yes" then provide waste numbers							Y9		
Is this a listed waste under Annex VIII of the Basel Convention?							Y <input checked="" type="checkbox"/>	N <input type="checkbox"/>	
If "yes" then provide all applicable waste numbers							A4060		
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?							Y <input type="checkbox"/>	N <input checked="" type="checkbox"/>	
If "yes" then provide all applicable waste numbers									
2. COMMON NAME OF WASTE Hydraulic Oil / Glycol									
3. SITE ID/LOCATION OF WASTE GENERATION Drilling rigs, FPSO and Shore base									
4. PROCESS GENERATING WASTE Used hydraulic/transmission oil from maintenance activities associated with Drilling rigs, FPSO and Shore base									
5. PROJECTED ANNUAL VOLUME 2-4 MT			6. WASTE RECEIVING FREQUENCY		<input type="checkbox"/>	WEEKLY	<input checked="" type="checkbox"/>	MONTHLY	<input type="checkbox"/>
7. WASTE VOLUME			CUBIC METERS		<input type="checkbox"/>	GALLONS		<input checked="" type="checkbox"/>	TONNES
8. WASTE CONTAINERS			BARRELS (42 GAL.)		<input checked="" type="checkbox"/>	DRUM (55 GAL.)		<input type="checkbox"/>	CUTTINGS BOX
9. SPECIAL HANDLING REQUIREMENTS			No						
PART II									
1. PHYSICAL CHARACTERISTICS									
PHYSICAL STATE		<input type="checkbox"/>	SOLID	<input checked="" type="checkbox"/>	LIQUID	<input type="checkbox"/>	SEMI-SOLID	<input type="checkbox"/>	GAS
<b>(CHECK ONE)</b>		OTHER (SPECIFY)							
COLOR		Amber - Brown - Dark Brown			BOILING POINT (°C)		N/A		
ODOR & STRENGTH		Mild			pH		N/A		
FLASH POINT (°C)		≥ 200 Celsius			VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low		
BTUs		N/A			TOTAL CYANIDES (ppm)		N/A		
PCBs (ppm)		N/A			TOTAL SULFIDES (ppm)		N/A		
2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)									
NONE		<input checked="" type="checkbox"/>			OXIDIZER		<input type="checkbox"/>		
WATER REACTIVE		<input type="checkbox"/>			IGNITABLE		<input type="checkbox"/>		
SHOCK REACTIVE		<input type="checkbox"/>			MEDICAL/INFECT. WST		<input type="checkbox"/>		
AIR REACTIVE		<input type="checkbox"/>			DIOXINS		<input type="checkbox"/>		
EXPLOSIVE		<input type="checkbox"/>			PESTICIDE/HERBICIDE		<input type="checkbox"/>		
PYROPHORIC		<input type="checkbox"/>			POLYMERIZABLE		<input type="checkbox"/>		
REACTIVE CYANIDES		<input type="checkbox"/>			RADIOACTIVE		<input type="checkbox"/>		
REACTIVE SULFIDES		<input type="checkbox"/>			EXEMPT RAD		<input type="checkbox"/>		
PHENOLS		<input type="checkbox"/>			ASBESTOS		<input type="checkbox"/>		
ORGANIC PEROXIDE		<input type="checkbox"/>			THERMALLY UNSTABLE		<input type="checkbox"/>		
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)									
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED			CONCENTRATION (ppm or mg/L)		
	Used or spent glycol/hydraulic oil			90-100					
	Water			0-10					
KNOWLEDGE IS FROM									
<input type="checkbox"/>		LAB ANALYSIS		<input checked="" type="checkbox"/>	MSDS		<input checked="" type="checkbox"/>	PROCESS/GENERATOR KNOWLEDGE	
<b>COMMENTS:</b> Used oils are typically recycled or used in alternative fuels. Hydraulic Oil SDS does not reflect any hazardous characteristic that classified this waste stream as hazardous. Two SDS for Glycol have been added to this waste stream. EEPGL will sample RCRA 8 heavy metals for this waste stream and the results will be included in the Waste Profile Sheet.									
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.									
NAME: Jimmy Street					TITLE: Waste Management Lead				
SIGNATURE 					DATE: 06/26/2021				





WASTE PROFILE SHEET											
Part I											
<b>A. GENERAL INFORMATION</b>								<b>WASTE PROFILE NO.</b> 20140506-0039			
1. GENERATORS NAME Esso Exploration Production Guyana Limited											
2. FACILITY'S NAME & ADDRESS GYSBI Shorebase, Georgetown, Guyana											
3. TECHNICAL CONTACT Jimmy Street				4. TITLE Waste Management Lead			5. PHONE 623-1104				
<b>B. WASTE INFORMATION</b>											
1. WASTE CLASSIFICATION		<input checked="" type="checkbox"/>		HAZARDOUS			<input type="checkbox"/>		NON-HAZARDOUS		
<b>1A. LISTED HAZARDOUS WASTES</b>											
Is this a listed waste under Annex I of the Basel Convention?				Y <input checked="" type="checkbox"/>		N <input type="checkbox"/>					
If "yes" then provide waste numbers				Y41							
Is this a listed waste under Annex VIII of the Basel Convention?				Y <input checked="" type="checkbox"/>		N <input type="checkbox"/>					
If "yes" then provide all applicable waste numbers				Hazardous Waste A4130							
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations?				Y <input checked="" type="checkbox"/>		N <input type="checkbox"/>					
If "yes" then provide all applicable waste numbers				Guyana EPA AG.1 Hazardous Wastes Regulations : Hazardous Waste							
2. COMMON NAME OF WASTE Refrigerants											
3. SITE ID/LOCATION OF WASTE GENERATION Exploration & Development Drilling and FPSO											
4. PROCESS GENERATING WASTE Used in various cooling systems. Refrigerants that need to be replaced											
5. PROJECTED ANNUAL VOLUME 0.09-0.1 MT			6. WASTE RECEIVING FREQUENCY		<input type="checkbox"/>		WEEKLY		<input type="checkbox"/>		
7. WASTE VOLUME			CUBIC METERS		<input type="checkbox"/>		GALLONS		<input type="checkbox"/>		
8. WASTE CONTAINERS			BARRELS (42 GAL.)		<input type="checkbox"/>		DRUM (55 GAL.)		<input type="checkbox"/>		
9. SPECIAL HANDLING REQUIREMENTS			Keep valves tightly closed. Store in cool dry well ventilated place.								
PART II											
<b>1. PHYSICAL CHARACTERISTICS</b>											
PHYSICAL STATE (CHECK ONE)		<input type="checkbox"/>		SOLID		<input type="checkbox"/>		LIQUID		<input type="checkbox"/>	
COLOR		Clear colourless liquid and vapour				BOILING POINT (°C)		-26.2°C			
ODOR & STRENGTH		Slight, ether-like.				pH		N/A			
FLASH POINT (°C)		N/A				VISCOSITY		<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low			
BTUs		N/A				TOTAL CYNAIDES (ppm)		N/A			
PCBs (ppm)		N/A				TOTAL SULFIDES (ppm)		N/A			
<b>2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)</b>											
NONE		<input checked="" type="checkbox"/>		OXIDIZER		<input type="checkbox"/>					
WATER REACTIVE		<input type="checkbox"/>		IGNITABLE		<input type="checkbox"/>					
SHOCK REACTIVE		<input type="checkbox"/>		MEDICAL/INFECT. WST		<input type="checkbox"/>					
AIR REACTIVE		<input type="checkbox"/>		DIOXINS		<input type="checkbox"/>					
EXPLOSIVE		<input type="checkbox"/>		PESTICIDE/HERBICIDE		<input type="checkbox"/>					
PYROPHORIC		<input type="checkbox"/>		POLYMERIZABLE		<input type="checkbox"/>					
REACTIVE CYANIDES		<input type="checkbox"/>		RADIOACTIVE		<input type="checkbox"/>					
REACTIVE SULFIDES		<input type="checkbox"/>		EXEMPT RAD		<input type="checkbox"/>					
PHENOLS		<input type="checkbox"/>		ASBESTOS		<input type="checkbox"/>					
ORGANIC PEROXIDE		<input type="checkbox"/>		THERMALLY UNSTABLE		<input type="checkbox"/>					
<b>3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)</b>											
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100% WHEN TOTALED				CONCENTRATION (ppm or mg/L)			
	Tetrafluoroethane			99.9%							
KNOWLEDGE IS FROM		<input type="checkbox"/>		LAB ANALYSIS		<input checked="" type="checkbox"/>		MSDS		<input checked="" type="checkbox"/>	
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED											
NAME: Jimmy Street						TITLE: Waste Management Lead					
SIGNATURE: 						DATE: 05/20/2021					



**Waste Profiles Table**

Guyana EPA Waste Profile No.	Individual Waste Stream Profile	Description (profile)	Guyana EPA Classification (AG.1 Hazardous Wastes Regulations)	US EPA RCRA Classification	Basel Convention (Annexes I, II, VIII) Classification Standard	Best Available Technology (BAT)	Comments
20140506-001	<a href="#">General Trash</a>	General / domestic trash. All uncontaminated solids other than recycleables. Includes non-macerated galley waste, cement sacks, insulation, dry bulk hoses.	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	
20140506-002	<a href="#">Wood</a>	Scrap wood, pallets, crating, etc. (pallets intended for reuse are not to be manifested as waste)	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	
20140506-003	<a href="#">Scrap metals</a>	Uncontaminated scrap metal. Slings and straps.	Non-hazardous	Non-hazardous Scrap Metal exemption	N/A	Consolidation/Bulking and Recycling	
20140506-004	<a href="#">Plastic</a>	Scrap plastic (uncontaminated)	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	
20140506-005	<a href="#">Paper</a>	Scrap cardboard, paper	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	
20140506-006	<a href="#">Cooking Oil</a>	Used cooking oil	Non-hazardous	Non-hazardous	N/A	Recycle or solidify and Landfill	
20140506-007	<a href="#">Glass</a>	Glass (crushed), fiberglass	Non-hazardous	Non-hazardous	N/A	Consolidation/Bulking and direct Landfill	
20140506-008	<a href="#">Medical Wastes</a>	Medical/biological waste	Hazardous (Regulations do not apply)	Biohazardous	Hazardous Waste Annex VIII (A4020) ; Annex I (Y1)	Incineration	
20140506-009	<a href="#">Drill Cuttings</a>	NAF drill cuttings / mud slops	Hazardous (Regulations do not apply)	Hazardous (Exempt)	Hazardous Waste Annex VIII (A3020)	Stabilization/Thermal Desorption	Analytical received, the analysis has been added to the Waste Profile Sheet (Drill Cuttings/Mud Slops)
20140506-010	<a href="#">Oily Debris</a>	Used absorbent pads, rags, filters, grease tubes, dope brushes, filters, etc.	Hazardous (Regulations do not apply)	Used Oil	Hazardous Waste Annex VIII (A4060) ; Annex I (Y9)	Incineration	
20140506-011	<a href="#">Chemical Sacks</a>	Empty chemical sacks (cement sacks to be disposed of as General Trash)	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Verify empty, direct Landfill	
20140506-012	<a href="#">Casing Protectors</a>	Casing protectors (unwashed)	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130),	Rinse and direct Landfill/ Rinsate WWTP	
20140506-013	<a href="#">IBC Tote Tanks</a>	Empty IBC totes	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/ Rinsate WWTP	
20140506-014	<a href="#">Metal Drums</a>	Empty metal drums	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/ Rinsate WWTP	

Guyana EPA Waste Profile No.	Individual Waste Stream Profile	Description (profile)	Guyana EPA Classification (AG.1 Hazardous Wastes Regulations)	US EPA RCRA Classification	Basel Convention (Annexes I, II, VIII) Classification Standard	Best Available Technology (BAT)	Comments
20140506-015	<a href="#">Acids</a>	Contaminated acid chemicals (not to be neutralized offshore)	Hazardous	Hazardous (Exempt) D002	Hazardous Waste Annex VIII (A4090); Annex I (Y34)	Neutralize/WWTP	
20140506-016	<a href="#">Aerosol Cans</a>	Aerosol Cans/Not Punctured	Hazardous	Hazardous Waste D001	Hazardous Waste Annex VIII (A4130)	Puncture/Recycle/liquids Incinerated	
20140506-017	<a href="#">AFFF</a>	Fire fighting foam	Non-hazardous	Non-hazardous	Hazardous Waste Annex VIII (A4140); Annex I (Y45)	Stabilization/Landfill	
20140506-018	<a href="#">Batteries</a>	All types of batteries	Hazardous	Universal waste D002-D008	Hazardous Waste Annex VIII (A1160, A1170), Annex I (Y26/Y31/Y34)	Recycle	
20140506-019 (Profile Inactive)	<a href="#">Contaminated Brine</a>	Oil/solids contaminated brine	Hazardous (Regulations do not apply)	Hazardous (Exempt)	Hazardous Waste (A4060); Annex I (Y9)	N/A	The Contaminated Brine Waste Profile Sheet (ID 019) has been combined with Completion Fluids (ID 021) Waste Profile Sheet.
20140506-020	<a href="#">Chemical Contaminated Water</a>	Chemical contaminated water that does not meet effluent discharge limits	Hazardous (Regulations do not apply)	Hazardous (Exempt)	Hazardous Waste (A4060); Annex I (Y9)	Composite sample/WWTP/Incineration/Thermal Desorption	
20140506-021	<a href="#">Completion Fluids /Contaminated Brine</a>	Flowback fluids, w/hydrocarbon/brine/solids contamination	Hazardous (Regulations do not apply)	Hazardous (Exempt) D018	Hazardous Waste (A4060); Annex I (Y9)	Stabilization/Thermal Desorption	Analytical received, the analysis has been added to the Waste Profile Sheet.
20140506-023	<a href="#">Fluorescent Bulbs</a>	Fluorescent Bulbs	Hazardous Waste	Universal D009	Hazardous Waste Annex VIII (A1030/A1180); Annex I (Y29)	Stabilization	
20140506-024	<a href="#">Fuel</a>	Contaminated diesel, heli-fuel	Hazardous (Regulations do not apply)	Hazardous D001- D018	Hazardous Waste (A4060); Annex I (Y9)	Incineration/Fuel Blend	
200140506-025	<a href="#">Lube Oil</a>	Used motor/engine oil	Hazardous (Regulations do not apply)	Used Oil Regulations	Hazardous Waste Annex VIII (A4060); Annex I (Y9)	Fuel Blend/Recycle	Analytical for RCRA 8 has been sent to the lab.
20140506-026 (Profile on hold)	Mercury (equipment)	Equipment that contains mercury	Hazardous	D009	Annex I (Y29)	TBD	No Waste Profile Sheet. Waste stream that is not generated yet.
20140506-027	<a href="#">Oily Water</a>	Oil contaminated water that does not meet effluent discharge limits. Contains less than 30% oil. Sump water.	Hazardous (Regulations do not apply)	Hazardous (Exempt) D018	Hazardous Waste Annex VIII (A4060); Annex I (Y9)	WWTP, Fuel Blend/Recycle	Analytical received, the analyses have been added to the Waste Profile Sheet.
20140506-028	<a href="#">Paint/Paint Consumables</a>	Paint and paint consumables (brushes, rollers, etc.). Solvents.	Hazardous Waste	D001	Hazardous Waste Annex I (Y12)	Incineration	
20140506-029	<a href="#">Plastic Buckets/Kegs</a>	Empty chemical contaminated plastic buckets, kegs	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/Rinsate WWTP	

Guyana EPA Waste Profile No.	Individual Waste Stream Profile	Description (profile)	Guyana EPA Classification (AG.1 Hazardous Wastes Regulations)	US EPA RCRA Classification	Basel Convention (Annexes I, II, VIII) Classification Standard	Best Available Technology (BAT)	Comments
20140506-030	<a href="#">Plastic Drums/Empty</a>	Empty plastic drums	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/Rinsate WWTP	
20140506-031	<a href="#">Produced Solids</a>	Hydrocarbon contaminated solids/sand from production processes	Hazardous (Regulations do not apply)	Hazardous (Exempt) D018	Hazardous Waste Annex VIII (A4060); Annex I (Y9)	Thermal Desorption or Incinerate	Analytical received, the analysis has been added to the Waste Profile Sheet (Produced Sand)
20140506-032 (No Profile Sheet)	Pyrotechnics	Expired flares	Hazardous	D003	Annex I (Y15) or Annex A4080	Deactivate	Donated to Guyana Defence Force for training
20140506-033 (No Profile Sheet)	Radioactive (NORM)	NORM contaminated solids/liquids or equipment	Hazardous (Regulations do not apply)	NORM	TBD	Blend and landfill	Waste stream that is not generated
20140506-034	<a href="#">Rubber Hoses</a>	Contaminated fuel/mud hoses (dry bulk hoses to be disposed of as General Trash)	Hazardous (Regulations do not apply)	Hazardous (Exempt) RCRA Empty	Hazardous Waste Annex VIII (A4130)	Rinse and direct Landfill/Rinsate WWTP	
20140506-035 (No Profile Sheet)	Sludge (tank bottoms)	Sludge from tank bottoms - mostly solid	Hazardous (Regulations do not apply)	Hazardous (Exempt) D018	Hazardous Waste Annex VIII (A4060)	Thermal Desorption or Incinerate	Waste stream that is not generated (suspended until further information).
20140506-036	<a href="#">Hydraulic Oil / Glycol</a>	Used hydraulic oil / transmission oil / Glycol	Hazardous (Regulations do not apply)	Used Oil Regulations	Hazardous Waste Annex VIII (A4060); Annex I (Y9)	Fuel Blend or Recycle	EEPGL will sample RCRA 8 for this waste stream and the results will be included in the Waste Profile Sheet.
20140506-037	<a href="#">Electronics</a>	Computers, printers, TVs, etc	Hazardous	Universal D008	Hazardous Waste Annex VIII (A1180); Annex I (Y20, Y21, Y23, Y26, Y29, Y31)	Recycle	
20140506-038	Mineral Oil	Drilling mud additive	Hazardous (Regulations do not apply)	Hazardous	Hazardous Waste Annex VIII (A3020); Annex I (Y8)	Thermal Desorption/Pug Mill/Fuel Blend	
20140506-039	Refrigerant	Cooling agent	Hazardous	Hazardous	Hazardous Waste Annex VIII (A4130); Annex I (Y41)	Recycle	Donation to Ministry of Agriculture
20140506-040	<a href="#">Caustic</a>	Contaminated caustic chemicals (not to be neutralized offshore)	Hazardous	Hazardous (Exempt) D002	Hazardous Waste Annex VIII (A4090); Annex I (Y35)	Neutralize/WWTU	



**Disposal Criteria Tables**

<b>Treatment Processes</b>	<b>Treatment Disposal Limits</b>	
<b>Empty Container Rinsing</b>	<b>RCRA Metals</b>	<b>Limits</b>
Rinse container and collect rinsate then wastewater treatment	Arsenic	5.0 mg/l (100 mg/kg)
<b>Wastewater Treatment</b>	Barium	100 mg/l (2000 mg/kg)
pH, Total Suspended Solid (TSS), Total Petroleum Hydrocarbon (TPH), BOD/COD, Total Fecal Coliforms	Cadmium	1.0 mg/l (20 mg/kg)
<b>Aerosol Can Unit</b>	Chromium	5.0 mg/l (100 mg/kg)
Puncture and recycled can	Lead	5.0 mg/l (100 mg/kg)
Collect liquids and incinerate	Mercury	0.2 mg/l (4 mg/kg)
<b>Incineration</b>	Selenium	1.0 mg/l (20 mg/kg)
RCRA 8 Metals	Silver	5.0 mg/l (100 mg/kg)
<b>Thermal Desorption</b>	<b>Organic Compounds (Benzene)</b>	0.5 mg/l (20 mg/kg)
RCRA 8 Metals and TPH	<b>TPH (Solids)</b>	<10,000 mg/kg
<b>Pug Mill / Stabilization</b>	<b>pH</b>	5.0-9.0
RCRA 8 Metals and TPH	<b>TSS</b>	< 100 mg/l
<b>Bulb Crush Unit</b>	<b>TPH (wastewater)</b>	< 40 mg/l
Crushed bulbs	<b>Temperature</b>	< 40 C
Stabilized drums content with cement and landfill	<b>BOD/COD</b>	< 50 mg/l
RCRA 8 Metals	<b>Total Fecal Coliforms</b>	< 400 MPN per 100 ml

**Blank EPA Waste Profile**

WASTE PROFILE SHEET													
Part I													
<b>A. GENERAL INFORMATION</b>						<b>WASTE PROFILE NO.</b>							
1. GENERATORS NAME													
2. FACILITY'S NAME & ADDRESS													
3. TECHNICAL CONTACT				4. TITLE				5. PHONE					
B. WASTE INFORMATION													
1. WASTE CLASSIFICATION			<input type="checkbox"/> HAZARDOUS			<input type="checkbox"/> NON-HAZARDOUS							
1A. LISTED HAZARDOUS WASTES													
Is this a listed waste under Annex I of the Basel Convention? Y <input type="checkbox"/> N <input type="checkbox"/>													
If "yes" then provide waste numbers													
Is this a listed waste under Annex VIII of the Basel Convention? Y <input type="checkbox"/> N <input type="checkbox"/>													
If "yes" then provide all applicable waste numbers													
Is this a listed waste under Environmental Protection Hazardous Waste Management Regulations? Y <input type="checkbox"/> N <input type="checkbox"/>													
If "yes" then provide all applicable waste numbers													
2. COMMON NAME OF WASTE													
3. SITE ID/LOCATION OF WASTE GENERATION (if different than facility address above)													
4. PROCESS GENERATING WASTE													
5. PROJECTED ANNUAL VOLUME			6. WASTE RECEIVING FREQUENCY			WEEKLY <input type="checkbox"/>		MONTHLY <input type="checkbox"/>		ONE-TIME SHIPMENT <input type="checkbox"/>		OTHER (SPECIFY)	
7. WASTE VOLUME			CUBIC METERS <input type="checkbox"/>		GALLONS <input type="checkbox"/>		TONNES <input type="checkbox"/>		OTHER (SPECIFY)				
8. WASTE CONTAINERS			BARRELS (42 GAL.) <input type="checkbox"/>		DRUM (55 GAL.) <input type="checkbox"/>		CUTTINGS BOX <input type="checkbox"/>		OTHER (SPECIFY)				
9. SPECIAL HANDLING REQUIREMENTS													
PART II													
1. PHYSICAL CHARACTERISTICS (Fill where applicable)													
PHYSICAL STATE (CHECK ONE)		<input type="checkbox"/> SOLID		<input type="checkbox"/> LIQUID		<input type="checkbox"/> SEMI-SOLID		<input type="checkbox"/> GAS		OTHER (SPECIFY)			
COLOR				BOILING POINT (°C)									
ODOR & STRENGTH				pH									
FLASH POINT (°C)				VISCOSITY				<input type="checkbox"/> Solid <input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low					
BTUs				TOTAL CYNANIDES (ppm)									
PCBs (ppm)				TOTAL SULFIDES (ppm)									
2. HAZARDOUS AND CHEMICAL PROPERTIES (CHECK BOX)													
NONE		<input type="checkbox"/>		OXIDIZER		<input type="checkbox"/>							
WATER REACTIVE		<input type="checkbox"/>		IGNITABLE		<input type="checkbox"/>							
SHOCK REACTIVE		<input type="checkbox"/>		MEDICAL/INFECT. WST		<input type="checkbox"/>							
AIR REACTIVE		<input type="checkbox"/>		DIOXINS		<input type="checkbox"/>							
EXPLOSIVE		<input type="checkbox"/>		PESTICIDE/HERBICIDE		<input type="checkbox"/>							
PYROPHORIC		<input type="checkbox"/>		POLYMERIZABLE		<input type="checkbox"/>							
REACTIVE CYANIDES		<input type="checkbox"/>		RADIOACTIVE		<input type="checkbox"/>							
REACTIVE SULFIDES		<input type="checkbox"/>		EXEMPT RAD		<input type="checkbox"/>							
PHENOLS		<input type="checkbox"/>		ASBESTOS		<input type="checkbox"/>							
ORGANIC PEROXIDE		<input type="checkbox"/>		THERMALLY UNSTABLE		<input type="checkbox"/>							
3. CHEMICAL / MATERIAL COMPOSITION (LIST ALL HAZARDOUS AND NON-HAZARDOUS CONSTITUENTS)													
CAS #	CONSTITUENTS			RANGE (%) - MUST BE EQUAL OR GREATER THAN 100%				CONCENTRATION (ppm or mg/L)					
KNOWLEDGE IS FROM (check all that apply)		<input type="checkbox"/>		LAB ANALYSIS		<input type="checkbox"/>		MSDS		<input type="checkbox"/>		PROCESS/GENERATOR KNOWLEDGE	
<b>GENERATOR CERTIFICATION:</b> I HEREBY CERTIFY THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE ABOVE AND ATTACHED DESCRIPTION. TO THE BEST OF MY KNOWLEDGE IT IS COMPLETE AND ACCURATE. NO DELIBERATE OR WILLFUL OMISSION OF COMPOSITION OR PROPERTIES EXISTS AND ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.													
NAME:						TITLE:							
SIGNATURE:						DATE:							

## Waste Profile Instructions

### INSTRUCTIONS FOR COMPLETING WASTE PROFILE SHEET

#### PART I

##### A. GENERAL INFORMATION

WASTE PROFILE NUMBER – A unique number assigned to this waste stream for future reference. The preferred format is Generator's Permit Reference Number + three digit profile number assigned by either the Generator or the EPA for this specific waste stream. Any variation from this format must be approved by the EPA.

Waste Stream	Description	EPA assigned Profile Number
General Trash	General/domestic trash. All uncontaminated solids other than recycleables. Includes non-macerated galley waste, cement sacks, insulation, and dry bulk hoses, etc.	001
Wood	Scrap wood, pallets, crating, etc. (pallets intended for reuse are not to be manifested as waste).	002
Scrap Metal	Uncontaminated scrap metal. Slings and straps.	003
Plastic	Scrap plastic (uncontaminated)	004
Cardboard/Paper	Scrap cardboard, paper, etc.	005
Cooking Oil	Used cooking oil	006
Glass	Glass (crushed), fiberglass, etc.	007
Medical	Medical/biological waste	008
Drill Cuttings/Mud Slops	NAF drill cuttings/mud slops	009
Oily Debris	Used absorbent pads, rags, filters, grease tubes, dope brushes, filters, etc.	010
Chemical Sacks	Empty chemical sacks	011
Casting Protectors	Casing protectors (unwashed)	012
IBC Tote Tanks	Empty IBC totes	013
Metal Drums	Empty metal drums	014
Acids/Caustic	Contaminated acid/caustic chemicals (not to be neutralized offshore)	015
Aerosol Cans	Empty aerosol cans (not punctured)	016
Fire Fighting Foams	Fire Fighting Foam	017
Batteries	All types of batteries	018
Brine	Oil/solids contaminated brine	019
Chemical Contaminated Water	Chemical contaminated water that does not meet effluent discharge limits	020
Completion Fluids	Flowback fluids with hydrocarbon or solids contamination	021
Electronics	Computers, printers, TVs, etc.	022
Fluorescent Bulbs	Fluorescent Bulbs	023
Fuel	Contaminated Diesel, gasoline, kerosene, heli-fuel, etc.	024
Lube Oil	Used motor/engine oil	025
Mercury Equipment	Equipment that contains mercury	026
Oily Water	Oil contaminated water that does not meet effluent discharge limits, sump water, etc.	027
Paint/Paint Consumables	Paint and paint consumables (brushes, rollers, etc.). Solvents.	028

Plastic Buckets, Kegs	Empty chemical contaminated plastic buckets, kegs, etc.	029
Plastic Drums	Empty plastic drums	030
Produced Solids	Hydrocarbon contaminated solids/sand from production or exploration processes	031
Pyrotechnics	Expired flares	032
Radioactive Materials	Solids/liquids or equipment contaminated by any radioactive source (including NORM)	033
Rubber Hoses	Contaminated fuel/mud hoses	034
Sludge	Sludge from tank bottoms - mostly solid	035
Transmission/Hydraulic Oil	Used hydraulic/transmission oil	036

1. GENERATOR NAME – Enter the name of the generator. (Should match official name associated with the EPA records).
2. FACILITY'S NAME & ADDRESS – Enter the name and address of generating facility.
3. TECHNICAL CONTACT – Enter the name of the person to contact for more information about this waste.
4. TITLE – Enter the Technical Contact's official title (e.g. Manager).
5. PHONE – Enter the Technical Contact's telephone number.

#### B. WASTE INFORMATION

1. WASTE CLASSIFICATION – Enter classification of waste as described in the Environmental Protection (Hazardous Waste Management) Regulations or the BASEL Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.
2. COMMON NAME OF WASTE – Enter a name that is generally descriptive of this waste (e.g., drill cuttings, paint wastes, oil-water separator sludge, PCB-contaminated dirt, etc.).
3. PROCESS GENERATING WASTE – List the specific process/operation or source that generates this waste (e.g., paint-booth spray, PCB spill, metal-plating operation, etc.).
4. PROJECTED ANNUAL GENERATIONS – The quantity of waste projected for treatment annually.
5. WASTE RECEIVING FREQUENCY – The frequency at which waste is treated/sent for treatment.
6. WASTE VOLUME – The quantity/volume of waste to be treated.
7. WASTE CONTAINERS – The container(s) in which waste is transported to Waste Treatment Plant.
8. SPECIAL HANDLING REQUIREMENTS – Any special/extra considerations to be taken when handling or transporting the waste.

## PART II

### 1. PHYSICAL CHARACTERISTICS

1. PHYSICAL STATE - If the four boxes do not apply, a description should be entered after "Other".
2. COLOR – Describe the color of the waste (e.g., blue, clear, varies, etc.).
3. BOILING POINT – For liquids, list the boiling point.
4. pH – List the pH reading/value of the waste.
5. FLASH POINT – For liquids, list the flash point, regardless of whether the waste is Ignitable or not.
6. VISCOSITY – List the viscosity of the waste.

7. BTU– This entry may be required if you request that this waste be used as a fuel substitute or if the waste is a contaminated fuel to be incinerated.
8. PCBs - Content can be expressed as either a weight percentage, or dry-weight concentration (mg/kg)
9. TOTAL CYNAIDE – Content can be expressed as either a weight percentage, or dry-weight concentration (mg/kg).
10. TOTAL SULFIDES – Content can be expressed as either a weight percentage, or dry-weight concentration (mg/kg).

## 2. HAZARDOUS & CHEMICAL PROPERTIES

Check the applicable box or boxes. Evidence must be provided to support answer(s).

### 3. CHEMICAL/MATERIAL COMPOSITION

1. CAS # - Chemical Abstract Number.
2. CONSTITUENTS – List all chemical *and material* components and contaminants.
  - *Examples of chemical components and contaminants:*
    - PCB's, methanol, oil, sodium chloride, naphthalene, gasoline, solvents, applicable Underlying Hazardous Constituents (UHCs), etc.
  - *Examples of material components and contaminants: water, dirt, sand, paint sludge, rags, etc.*
3. CONCENTRATION – Use this column for constituents of concern which do not exceed 10,000 ppm (1%). Indicate the concentration level in ppm or mg/L.
4. RANGE – For components comprising greater than or equal to 1% of the total waste stream, estimate the range (in percent) in which the component is present. The total maximum values of the components must be greater than, or equal to 100%, including chemical and material components.

LAB ANALYSIS – Attach a copy, if applicable (see Note below). Analysis must be done by an approved and certified laboratory. Laboratory approval(s) and certification(s) must be submitted with lab analysis along with the internationally recognized methodology use to conduct the analysis.

USER KNOWLEDGE - User knowledge is appropriate when it can be documented (e.g., in-out logs, published information, MSDS, process production information, etc.). There is room provided to explain “what” and “why” user knowledge is used in lieu of analysis.

CERTIFICATION - Include the PRINTED NAME of the person providing the Certification.

SIGNATURE - An authorized representative of the generator must sign and date this certification on the completed Waste Profile Sheet.

DATE – Date signed by Certifier\*.

**\* This Waste Profile Sheet (WPS) may be used for subsequent submissions of the same waste stream, for a period of one year. If a submission date is more than a year past the Certification Date listed, the generator must either re-certify the WPS, or provide a new WPS, with the current date.**

**Waste profiles must be verified by the Waste Treatment Facility to determine treatment compatibility, especially if any operational changes occur that would materially change the waste profile.**



### Waste Manifest Instructions

29	1	EA	697154	6x6 Pallet Box	STC		MI SWACO	MI SWACO	2.1
	2	EA			See Attached Waste Form				
30	1	EA	100693-9	6x6 Pallet Box	STC		MI SWACO	MI SWACO	1.6
	1	EA			See Attached Waste Form				
31	1	EA	805884-9	Trash Skip	STC		Tiger Tanks	Tiger Tanks	2.8
	1	EA			See Attached Waste Form				

On shipping manifest

ESSO EXPLORATION PRODUCTION GUYANA LTD.  
WASTE MANIFEST FORM

<b>Generator Information</b>		<b>Transporter Information:</b>	
Generator:	Esso Exploration & Production Guyana Ltd.	Transporter:	Paradise Islnd
Address:	99 New Market St., Georgetown GY	Contact:	John Jacob
Contact:	Jimmy J. Street	Position:	Captain
Position:	Waste Management Lead	Phone:	xxx-xxx-xxx
Phone:	+592-623-1104	Email:	xxx.xxxxx@xxxx.com
Email:	jimmy.j.street@exxonmobil.com		
EPA Region:	Region 4		
Regist. #:	TBD		
<b>Originator Information</b>		<b>Receiving Facility Information</b>	
Originator:	Noble Tom Madden	Facility:	Tiger Rentals Guyana
Manifest #:	120-LIZ_2W2-SMT	Regist. #:	20140506-TTUL
Well:	LIZ_2W2	Location:	LOT A, East Bank Public Rd. Houston GY
Date:	21-Jul-20	Contact:	Shane Singh
Contact:	Company Man	Position:	General Manager
Phone:	xxx-xxx-xxx	Phone:	+592-501-0620
Email:	xxxxxx.xxxx@exxonmobil.com	Email:	ssingh@tigerrentalsguyana.com

CCU #	Waste Stream	Comment	Verified Quantity	Unit	GY Classification	GY aracteristic	Physical aracteristic	Chemical aracteristic
M-260-50	Lube Oil	Engine Maint.	7.2	m3	Exempt			
4LDR-44	Cooking oil	2bbl	0.12	m3	Exempt			
4LDR-44	Batteries	1bbl	0.08	MT	Hazardous	Corrosive	Solid	Inorganic
4LDR-44	Pyrotechnics	1bbl	0.1	MT	Hazardous	Explosive	Solid	Inorganic

CCU #	Waste Stream	Comment	Verified Quantity	Unit	GY Classification	GY aracteristic	Physical aracteristic	Chemical aracteristic
M-260-50	Lube Oil	Engine Maint.	7.2	m3	Exempt			
4LDR-44	Cooking oil	2bbl	0.12	m3	Exempt			
4LDR-44	Batteries	1bbl	0.08	MT	Hazardous	Corrosive	Solid	Inorganic
4LDR-44	Pyrotechnics	1bbl	0.1	MT	Hazardous	Explosive	Solid	Inorganic
DNVBS001	Wood		1.5	MT	Non-hazardous			
DNVBS002	General Trash		1.8	MT	Non-hazardous			
PB 319	IBC Tote Tanks/Empty	2 empty	0.145	MT	Non-hazardous			
PB 320	Metal drums	4 empty	0.08	MT	Non-hazardous			
PB 320	Chemical sacks		0.235	MT				
25256	Drill Cuttings/Mud Slops		3.2	m3				
TB209	Oily Debris		1.2	MT				
696789	IBC Tote Tanks/Empty	Do not dispose drilling tool	0.145	MT				

This information will be filled out when the waste is received and measured at the waste facility. You will receive a scanned copies once finalized on a monthly basis for your own record keeping

Add a comment to indicate quantity of waste. Use piece count only (i.e. 2 drums, 5

If CCU contains multiple waste streams, use separate line items it capture this

Always use comment to indicate if the CCU also contains an item that is NOT to be disposed of

Refer to "Waste Streams" tab for description of each waste stream. If the waste being sent in does not conform to any of the streams in the dropdown - email/call J.Street (contact details for Generator)

Sign the Form

ORIGINATOR: \_\_\_\_\_  
 GENERATOR: \_\_\_\_\_  
 TRANSPORTER: \_\_\_\_\_  
 RECEIVING FACILITY: \_\_\_\_\_

Print Sign Date

**Permitted Effluents Discharge**

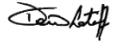
Permitted Effluent Discharges Offshore					
Name	Physical State	Discharge Frequency	Process Comments	Location	Annual Amounts (m3)
Water-Base Mud	Liquid	Intermittent	Drilling fluids used to cool and lubricate the drill bit, clean the hole bottom and carry cuttings to the surface.	Liza Development Drilling Discharges	65,000 - 70,000
Water-Base and NAF Mud Drill Cuttings	Solid	Intermittent	Drill cuttings are solids removed from the borehole. NAF Mud drill cutting are separated from the mud and discharged.	Liza Development Drilling Discharges	15,000 - 20,000
Seawater Discharged	Liquid	Continuous	Seawater used to discharge drill cuttings to sea.	Liza Production and Development Drilling Discharges	3,500,000 - 4,000,000
Freshwater Discharged	Liquid	Continuous	A portion of the treated seawater is treated through a reverse osmosis system to make fresh water.	Liza Production and Development Drilling Discharges	45,000 - 50,000
Waste Water from Drains / Discharges Off Oil-Water Separators	Liquid	Intermittent	Drain fluids (e.g., rainwater) from non-hydrocarbon areas of the vessel which are collected and routed overboard. No visible oil sheen test prior to discharge.	Liza Production and Development Drilling Discharges	15,000 - 20,000
Cement Mix Water / Drilled Cement	Liquid	Intermittent	Cement slurry returns only occur during the cementing of the first casing string for each development well. Excess cement is discharged to the sea.	Liza Development Drilling Discharges	240 - 270
Sub Sea Blowout Preventer (BOP) Fluid	Liquid	Intermittent	Exhaust Fluids from the BOP discharged to sea	Liza Development Drilling Discharges	650 - 750

Permitted Effluent Discharges Offshore					
Name	Physical State	Discharge Frequency	Process Comments	Location	Annual Amounts (m3)
Sanitary Waste Water (Black and Grey water)	Liquid	Intermittent	Black and Grey water is sanitary (sewage) water from the Vessels	Liza Production and Development Drilling Discharges	320,000 - 350,000
Surface Cleaning Spacer, Displacement Interface/Pills & Gravel Pack Fluids	Liquid	Intermittent		Liza Development Drilling Discharges	4,000 - 5,000
Brines	Liquid	Continuous	- Brine effluent generated from the seawater treatment processes to produce low sulfate and potable water. - Completion brine fluids are used as a well-control fluids during well operations.	Liza Production and Development Drilling Discharges	1,100,000 - 1,500,000
Produced Water	Liquid	Continuous	Oil in Water content limit apply	Liza Production and Development Drilling Discharges	240,000 - 280,000
Ballast Water	Liquid	Intermittent	Ballast water is sea water used by the vessels to maintain position. No visible oil sheen test performed prior to discharge.	Liza Production and Development Drilling Discharges	70,000 - 80,000
Cooling Water	Liquid	Continuous	No visible oil sheen test performed prior to discharge.	Liza Production and Development Drilling Discharges	5,000,000 - 6,000,000
Food Waste Discharged Overboard	Solid	Intermittent	Macerated to <25 mm diameter prior to discharge.	Liza Production and Development Drilling Discharges	100 - 200

## **APPENDIX E TRG'S WASTE MANAGEMENT / WASTE ACCEPTANCE CRITERIA**



**Document Verifications:**

Authorized by	
<b>Name:</b> Denis Latiff	<b>Position:</b> General Manager
<b>Date:</b>	<b>Signature :</b> 

Responsible Persons	
<b>Name:</b> Shane Singh	<b>Position:</b> General Manager
<b>Date:</b>	<b>Signature</b>
<b>Name:</b> Aidan Latiff	<b>Position:</b> Operations Manager
<b>Date:</b>	<b>Signature</b>
<b>Name:</b> Sharmin Joseph	<b>Position:</b> HSE Coordinator
<b>Date:</b>	<b>Signature</b>
<b>Name:</b> Jeremiah Hercules	<b>Position:</b> Technical Services Coordinator
<b>Date:</b>	<b>Signature</b>
<b>Name:</b>	<b>Position:</b>
<b>Date:</b>	<b>Signature</b>
<b>Name:</b>	<b>Position:</b>
<b>Date:</b>	<b>Signature</b>

Revision History	Revision #	Revision Date	Review Date	Next Review Date
	1.0	26 <sup>th</sup> February, 2021		



## 1.0 PURPOSE

The purpose of this procedure is to ensure all incoming waste can be accepted, stored, treated, and disposed at the Tiger Rentals Guyana Inc. Facility.

## 2.0 SCOPE

This procedure applies to management of all waste management activities required by TRG at main and external sites.

## 3.0 RESPONSIBILITIES

The General Manager has the overall responsibility and authority to ensure that there is an established process for control.

The Operations Manager, Technical Services Coordinator, HSE Coordinator/ Representative are directly responsible for ensuring that waste is properly segregated, appropriately stored and treated according to correct treatment technologies.

## 4.0 ACRONYMS

SDS- Safety Data sheet  
WGI - Waste Generator Information Form  
CCU –Cargo Carrying Unit  
WMF - Waste Manifest Form  
TRG – Tiger Rentals Guyana  
TT- Tiger Tanks  
WVF - Waste verification Form  
EPA - Environmental Protection Agency  
WAP – Waste Analysis Plan  
SWP – Safe Work Procedure

## 5.0 HAZARDOUS WASTE STREAMS

According to the **Basel Convention**, **Hazardous waste** is defined as:

Wastes that belong to any category contained in Annex I, unless they do not possess any of the characteristics contained in Annex III; and Wastes that are not covered under paragraph (a) but are defined as, or are considered to be, hazardous wastes by the domestic legislation of the Party of export, import or transit.

According to the **Environmental Protection (Hazardous Waste) Regulations 2000**, **Hazardous Waste** is defined as:



Waste or combination of wastes which, because of its quantity, concentration or physical, chemical, or infectious characteristics, may pose a substantial hazard to human health and belong to any category contained in Schedule I unless they do not contain any of characteristics contained in Schedule II and includes waste that is:

- hazardous industrial waste
- acute hazardous waste chemical
- hazardous waste chemical
- severely toxic waste
- flammable waste
- corrosive waste
- reactive waste
- radioactive waste
- clinical waste; or
- leachate toxic waste, or polychlorinated biphenyl waste,

and includes a mixture of acute hazardous waste chemical, hazardous waste chemical, pathological waste, radioactive waste or severely toxic wastes and any other waste or hazardous material.

An **existing** waste stream is defined as a waste stream, through process of generation, maintaining parameters and concentrations of hazardous components. A **new** waste stream is defined as a waste stream that was never received at TRG facility. A **modified** waste stream is defined as a waste stream that will have different levels of the same hazardous components.

**Table 1:** Grouped waste Categories, as per the Basel Convention & Environmental Protection (Hazardous Waste) Regulation’s definition of Hazardous and Non-Hazardous Wastes, which are accepted, stored, treated, and disposed at TRG waste Treatment facility. Furthermore, the table details disposal option for each waste group.

Waste Type	Waste Classification	Disposal Option
General and domestic waste Trash, non- recyclable	Non-Hazardous	Landfill
General and domestic waste Trash, recyclable (wood, glass, paper, cardboard, aluminum cans)	Non-Hazardous	Recycle, Reuse, Landfill
Scrap Metal	Hazardous	Recycle
Incinerator Ash and residue	Non-Hazardous	Landfill
Lube oil/ motor oil	Hazardous waste	Recycle
Contaminated hydrocarbons	Hazardous waste	Thermal Destruction (VIR)/ Waste Stabilization (Pugmill)
Oily water	Hazardous waste	Thermal Destruction/ Filtration (VIR)



<b>Drilling Slops</b>	Hazardous waste	Thermal Destruction (VIR)/ Waste Stabilization (Pugmill)
<b>Vessel Clean out liquid</b>	Hazardous waste	Thermal Destruction (VIR)/ Waste Stabilization (Pugmill)
<b>Treatment Chemicals</b>	Hazardous waste	Thermal Destruction (VIR)
<b>Paint waste (liquid)</b>	Hazardous waste	Thermal Destruction (Incinerator)
<b>Drum/ container rinse</b>	Hazardous waste	Thermal Destruction (VIR)
<b>Acid and caustic solution</b>	Hazardous waste	Thermal Destruction (VIR)
<b>Tank Sludge</b>	Hazardous waste	Thermal Destruction (VIR)/ Waste Stabilization (Pugmill)
<b>Oily Trash</b>	Hazardous waste	Thermal Destruction/ Waste destruction (Incineration)
<b>Oily Filters</b>	Hazardous waste	Thermal destruction (Incineration)
<b>Empty Drums/containers</b>	Hazardous waste	Triple rinse and crushed
<b>Medical/Biological Waste</b>	Hazardous waste	Thermal/ Waste Destruction (Incineration)
<b>Wash Water</b>	Hazardous Waste	Filtration (Oil-Water Separator)
<b>Batteries</b>	Hazardous waste	Recycle
<b>Fluorescent Tubes</b>	Hazardous waste	Bulb Crusher

All incoming waste must be accompanied by a Form A/A1 and waste profile sheet generated by the client (waste generator). All waste is characterized via inspection as per Waste Analysis Plan. Non-Hazardous Waste streams are verified visually and supported by gas testing (CO<sub>2</sub>, H<sub>2</sub>S, VOCs).

For hazardous waste, classification is done pre-receipt via SDS review and once confirmed, the waste will then be delivered to the facility. Upon receipt, waste will be verified and characterized in accordance with the WAP.

**Table 2:** Waste components, both hazardous and non-hazardous, accepted, stored, treated, and disposed at TRG waste treatment facility.

<b>Waste Type</b>	<b>Characteristic</b>
Domestic/ food waste	Non-Hazardous
Barite	Hazardous
Silica Cement	Non-Hazardous
Cement Sacks	Non-Hazardous
Fibre Glass Grating	Non-Hazardous
Scrap Wood	Non-Hazardous



**QHSE Management System**

Operating Procedure

Procedure: Waste Management

Issue Date: February, 2021

Document #: QOP 8.1/5

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Scrap Metal	Hazardous
Cardboard	Non-Hazardous
Plastic	Non-Hazardous
Glass	Non-Hazardous
Paper	Non-Hazardous
Cement	Non-Hazardous
Hoses	Non-Hazardous
Insulation	Non-Hazardous
Rope	Non-Hazardous
Wire Rope Slings	Non-Hazardous
Nylon Rope Slings	Non-Hazardous
Sump Liquid	Hazardous
Drilling Mud (Solid)	Hazardous
Drilling Mud (Liquid)	Hazardous
Oily Water	Hazardous
Oil Based Mud	Hazardous
Cement Slops	Hazardous
Cooking Oil	Non-Hazardous
Waste Oil	Hazardous
Crude Oil	Hazardous
Hydraulic Oil	Hazardous
Heli-Fuel	Hazardous
Acid Blend	Hazardous
Chemical Sacks	Hazardous
Casing Protectors	Hazardous
Paint (Solid)	Hazardous
Paint (Liquid)	Hazardous
Filters	Hazardous



Oily Rags	Hazardous
Metal Drums	Non-Hazardous
Plastic Drums	Non-Hazardous
Aerosol Cans	Hazardous
Batteries	Hazardous
Medical Waste	Hazardous
Bulbs	Hazardous
Electronic Waste	Hazardous

## 6.0 PROCEDURES

### 6.1. Pre- Waste Receiving

1. Client (waste generator) contacts a TRG representative.
2. TRG representative notifies the Operations Manager/Environmental representative. The team reviews the WGI (non-contractual waste receipts) or contract document and proposed destructed methods identified in the Proposals/ Quotations generated from Handling Customer Enquires- OP8.1/1.
3. The Environmental and Operations Department makes the necessary arrangements to receive the waste or dispatch to a third-party disposer.
4. If no SDS is provided, the client must state process by which waste was generated and any other relevant information. Unknown waste types, new generators or high-risk waste types will require pre-sampling. Post analytical testing will be conducted by the client based on parameters identified by TRG. Client can also request TRG to conduct pre-analytical, however, this will be done before the waste is delivered to TRG.
5. The Environmental Technician records the information on the Waste Log. Records a brief description of client and project for data base.
6. The Environmental Representative fills out section #2, waste disposal, of the form based on recommendations.



TRG requires all clients to submit a waste generator information sheet prior to sending waste to our facility. TRG would review and advise client on whether TRG can accept and treat the waste. TRG would not accept waste without a completed Waste Generator Information Form. **See appendix 1 for TRG pre-receipt documentation.**

## 6.2. Waste Transportation

1. The generator of hazardous waste is responsible for ensuring that waste is secured and appropriately packaged during transport. If waste is transported by TRG, representative ensures the following:
  - labels on storage mediums are visible.
  - Storage mediums are adequate i.e., can withstand corrosiveness, volume, lining or seals adequate, etc.
  - SDS/ sufficient information is obtained from the generator regarding characteristics of wastes particularly in terms of being corrosive, reactive, ignitable, or toxic is provided on the label.
  - Waste manifest document (must be signed by the generator).
2. TRG must **not** accept any hazardous waste unless a completed and detailed waste manifest document is provided. **See attached appendix 9 – TRG journey management procedure.**
3. The transporter must ensure:
  - journey management
  - the waste/ materials are transported to designated point.
  - materials are stored in closed containers at all times.
  - emergency response measures are established prior to transportation of waste.

## 6.3. Waste Receipt

### TRG's Facility:

1. If waste is directed to TRG's site, client's manifest must be provided to show custody transfer from generator to transporter.
2. Environmental Representative receiving the waste signs the Client Manifest or Waste manifest document and verifies quantity and waste type and completes the Waste Verification Form.



3. The Environmental Representative completes the Waste Verification Form within 24 hours of receipt. For waste received after normal working hours or weekends, the Environmental Representative ensures the verification is completed within the next business day. The waste receipt section which shows custody transfer from transporter to TRG.
4. Waste with discrepancies must be identified and segregated. Environmental Representative forwards the completed Waste Verification Form to the client.
5. Environmental Representative completes chain of custody form and submits to the laboratory for analytical profiling if required.
6. Environmental Representative completes Waste Log with pertinent information such as location of waste, type of containment unit and serial numbers will be recorded.
7. Waste labels are then inserted based on waste log and waste is then transported to relevant storage area.

### **3<sup>rd</sup> party disposal (special disposal)**

The Environmental Technician ensures the third-party disposer is notified of waste receipts (waste type, client, quantity). The third-party disposer is responsible for verifying waste receipts at the disposal location. The waste documents (waste manifest, cargo manifest, disposal/ destruction certificates) are forwarded to the Environmental Technician.

### **6.4 Waste Verification**

1. For **hazardous** waste streams, TRG Environmental Representative gathers the necessary WGI and SDS and contacts client representative to accompany TRG technician in measuring and verifying incoming waste against manifest or WGI.
2. For **liquid hazardous** waste, TRG Environmental Representative provides dipping stick to measure incoming waste. Client representative verifies the readings and sends approval via email.
3. For **solid hazardous** waste, TRG Environmental Representative weighs incoming waste with calibrated scale onsite and this is verified by client representative. Confirmation of values are sent to TRG via email.



4. For **nonhazardous solid** waste, TRG Environmental Representative weighs incoming waste and verifies against WGI and manifest. For weights beyond TRG measuring capacity, weights from approved incoming manifest and WGI form are utilized.

Waste with discrepancies must be identified and segregated. Environmental Representative forwards the completed Waste Verification Form and send to the client within 24hrs of waste collection.

### **6.5 Waste Characterization/ Screening**

With the use of documentation, clients identify and provide further information on the waste slated for treatment and disposal at TRG. Clients are responsible for identifying the waste generator, the generation process, hazardous characteristics of waste (with the use of Safety Data Sheets), quantity, etc. Reference TRG Waste Generator Information form, Waste Information Data Sheet, and Waste Verification form. Upon receipt, waste is inspected visually and weighed before being accepted into the facility. In the event that TRG has reason to believe waste being sent does not correspond with the information provided by the client, samples are taken and tested for hazardous properties by certified laboratories.

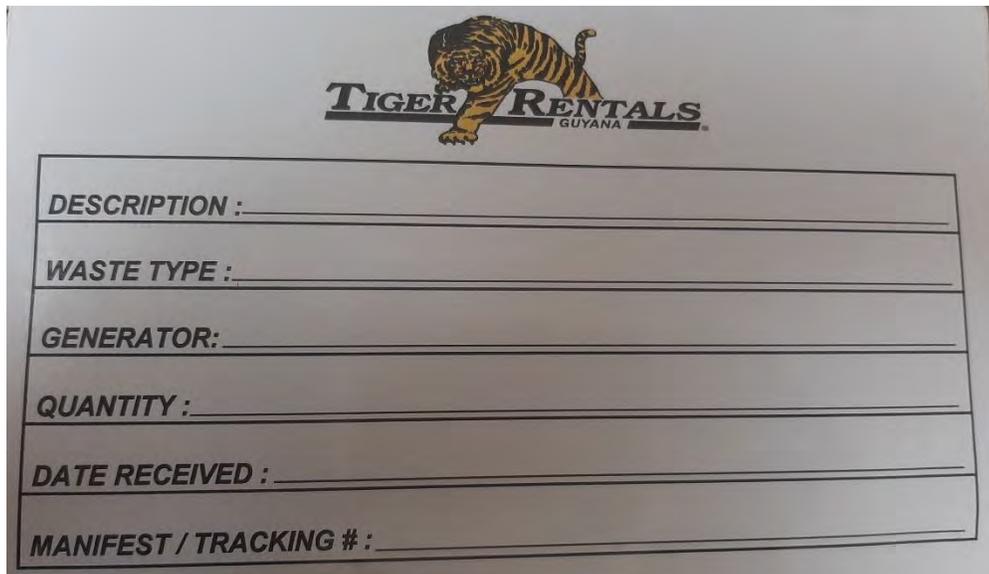
### **6.6 Labelling Wastes (Waste Identification)**

Wastes are labelled upon receipt and verification to allow for identification and placement in designated storage/staging area. Labels possess the following information:

- 1 Source of waste (generator, generation process)
- 2 Physical description (solid, liquid)
- 3 Chemical characteristic/properties (acidic, flammable, corrosive, etc.)
- 4 Hazardous waste characterization code in accordance with the Basel Convention, and
- 5 Hazard symbols in accordance with the Globally Harmonized System for Classifying Hazardous Chemicals.

 <b>QHSE Management System</b>	Operating Procedure	
	Procedure: Waste Management	
Issue Date: February, 2021	Document #: QOP 8.1/5	Page <b>10</b> of <b>104</b>

### 6.7 Figure 1: Waste Storage Container Label



### 6.8 Waste Storage

If waste is pending verification, the Environmental Representative allocates a designated area, and clearly identifies the storage mediums/ waste as “**WASTE PENDING VERIFICATION**”. All relevant personnel are notified.

On completion of the receipt and verification process, the Environmental Representative will identify storage/ staging locations for the waste by considering the following:

- waste type
- waste treatment option
- waste verification/ waste manifest to reference hazardous properties
- accessibility (newer products least accessible)
- compatibility/ reactivity with other chemicals

Waste is appropriately labelled with the following:

- waste type
- hazardous properties
- date of receipt
- client
- waste volume
- expiration date (where applicable)



**NB:** TOXIC CHEMICALS (used products) or HAZARDOUS WASTE must be labelled as such.

The Environmental Representative ensures the waste is appropriately staged, for example, filled storage mediums must **not** be stacked. The storage location of the waste on the facility will be recorded on Waste Log with all the relevant descriptions including container serial number and waste type.

Flammable and combustible liquids shall be stored in glass, metal, or plastic containers. If more than 10 gallons of flammable and combustible liquids, it shall be stored in an approved well-ventilated area on site designated for storage of flammable material/waste.

Lab waste or highly reactive materials like oxidizing agents, reducing agent from acids, and combustibles **must** be segregated. These must be stored in trays large enough to hold the contents of the bottles, away from heat and light. Materials that react vigorously with water **must** be stored away from possible contact with water.

Bulk waste must be stored appropriately in storage mediums, such as IBCs, frac tanks, cuttings boxes. To avoid spillage, storage mediums must **not** be filled to capacity or stacked when filled. Storage units must be constructed of or lined with material that is compatible with the waste to be placed within and has sufficient strength and thickness to prevent failure due to pressure gradients, including static head and external hydrological forces, physical contact with the wastes to which they are exposed, climatic conditions, and daily operations, including stress from nearby vehicular traffic. Storage mediums containing hazardous liquids must be stored within appropriate bunds capable to contain **110%** of the capacity of the largest tank within its boundary.

## 6.9 Waste Handling

The Operations Manager and Environmental Representative must ensure all workers/employees are fitted with the appropriate personal protective equipment (PPE) and safety equipment as recommended by the safety data sheet (SDS).

TRG PPE and Safety Equipment include:

- Coveralls
- Steel Toed Safety Shoes
- High Visibility Vests
- Rubber boots
- Full & half face Respirators and Cartridges



- Hard Hat
- Safety Glasses and Goggles
- Workmen's Gloves/ Fire Retardant Gloves
- Rubber/Latex gloves
- Harnesses and Self Retracting Lanyards
- Spill kits
- First Aid Kits

## 6.10 Waste Processing

### Waste Processing Documentation

#### D. Log

1. Waste for destruction will be selected based on BTU Value. Waste with high BTU Values will be blended with waste with lower BTU Values to optimize the thermal destruction process.
2. The waste volumes can be selected from multiple generators.
3. The Primary Client will be documented under Client along with the Project #.
4. Once waste types, volumes to be blended and the generator(s) are identified, the information is entered on the D. Log under Client 1 or Client 2. If more than two (2) Clients waste are being blended, a sub heading under Client will be created to identify the additional Clients (Client 3, Client 4, etc.)
5. The Total Quantity of waste is documented under Feedstock Quantity. In addition, the process to be used for disposal will be documented under Disposal Type.
6. The operator conducting the blending exercise will sign off on the D. Log as confirmation of completing the process.
7. An **End-of-Life Certificate** is issued to the client with the relevant supporting documents.

**See appendix 1 for copy of TRG D Log.**



### **S. Log**

1. The S. Log is used to document the movement of waste from multiple clients to either the landfill disposal location or to the recyclers.
2. The S. Log document allows for the listing of multiple clients on a single log.
3. Clients will be listed in the left column, with the project # in the second column.
4. The third column will contain the following information:
  - i. the quantity of waste being moved (MT, M<sup>3</sup> etc.)
  - ii. the waste type (glass, plastic, general garbage)
  - iii. treatment type (Recycle, Landfill)
  - iv. and the Service Provider (Haags Bosch, CCI etc.)
5. Finally, the date received, and the date closed (date delivered to the recycler or landfill.)
6. Any further comments on the waste type etc.

### **6.11 Waste Rejection**

TRG is incapable of treating Radioactive wastes, and waste containing Halogenated/Chlorinated Organics as well as polychlorinated biphenyl (PCBs). If the generator of the waste identifies any of the above in the A & A1 forms the waste will not be received. If waste was received without any indication of the above-mentioned constituents from the generator and it is revealed in the screening process, the generator will be notified, and waste returned immediately. TRG has the capacity to treat any other waste stream at various concentrations of hazardous composition.



Figure 2: TRG Waste Receipt Procedure

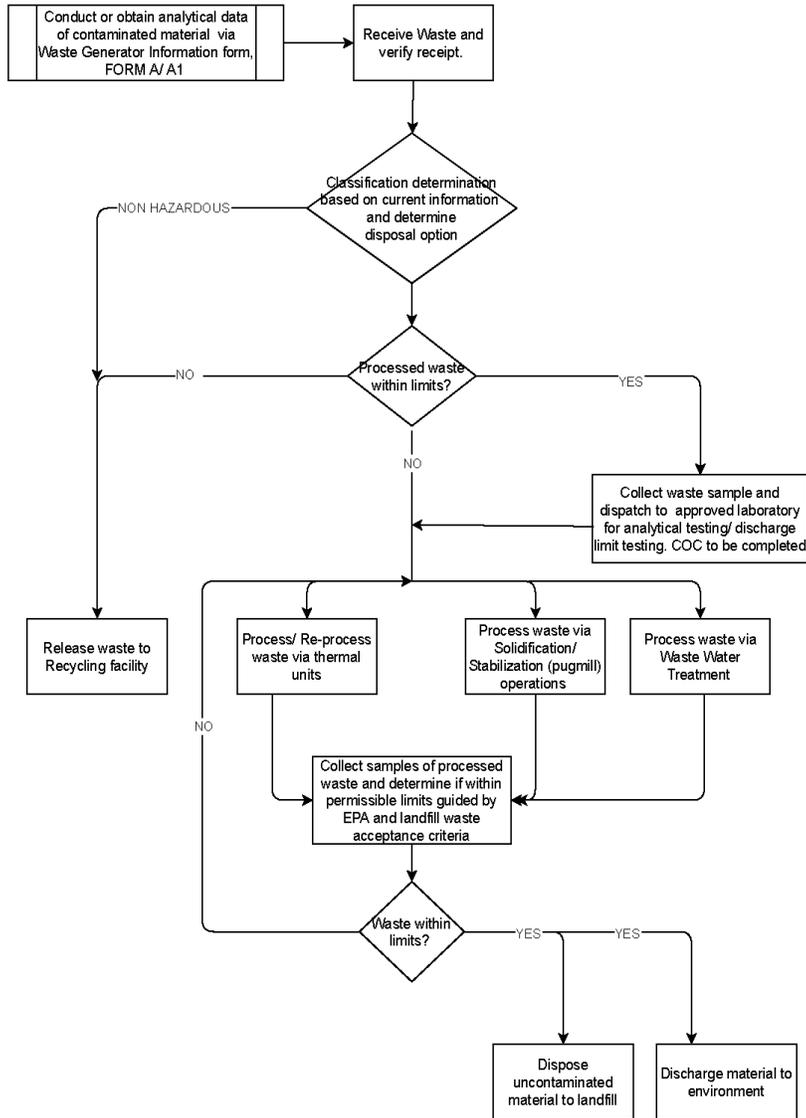
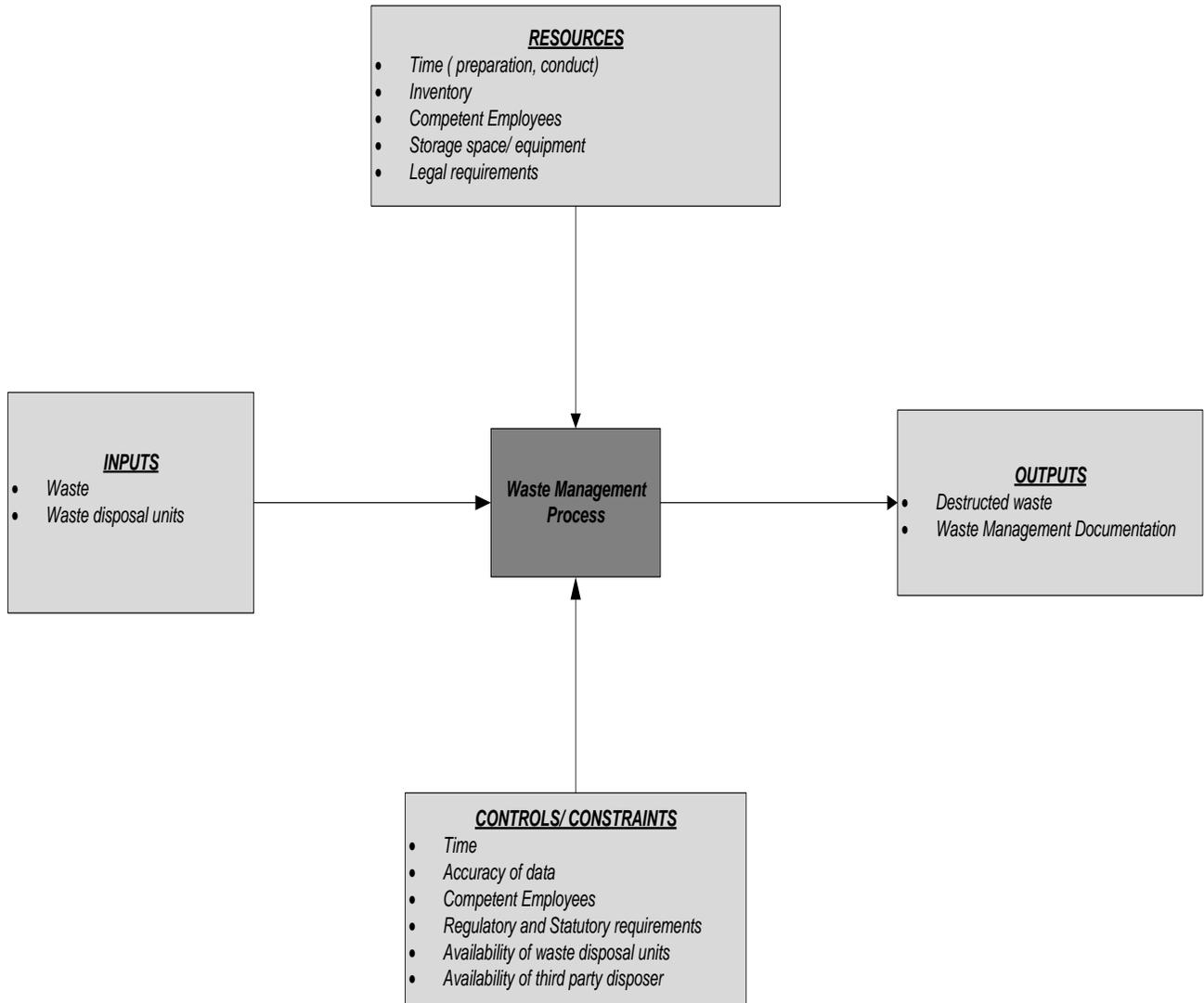




Figure 3: TRG Process Diagram





**Table 3: Process Risk Assessment**

<b>RISK ID</b>	<b>Risk description</b>	<b>Probability/ Likelihood</b>	<b>Severity /Impact</b>	<b>Risk Rank</b>	<b>Mitigation</b>	<b>Contingency</b>	<b>Residual Risk Rank</b>
WM P001	Lack of notification from client of waste receipt	MED	HIGH	HIGH	<ol style="list-style-type: none"> <li>1. Operations department to query prior to transfer of waste/storage units.</li> <li>2. Include WGI in proposal.</li> <li>3. TRG Supervisors to verify prior to leaving client's site.</li> </ol>	<ol style="list-style-type: none"> <li>1. Training</li> <li>2. Audits</li> </ol>	MED
WM P002	Waste documentation not submitted by client (SDS, WGI)	MED	HIGH	HIGH	<ol style="list-style-type: none"> <li>1. Environmental dpt. to notify transporters of documentation requirements prior to transit.</li> <li>2. Waste documentation requirements to be stated in proposals.</li> </ol>	<ol style="list-style-type: none"> <li>1. Training</li> <li>2. Audits</li> </ol>	MED
WM P003	Waste destruction units not capable of destructing waste type	LOW	HIGH	HIGH	<ol style="list-style-type: none"> <li>1. Review destruction requirements prior to making agreement with client.</li> <li>2. Use third party disposer</li> </ol>	<ol style="list-style-type: none"> <li>1. Audits</li> <li>2. Training</li> <li>3. Environmental to develop listing of various waste types and possible destruction methods</li> </ol>	LOW
WM P004	Lack of traceability of waste	MED	MED	MED	<ol style="list-style-type: none"> <li>1. Environmental dpt. to ensure waste storage mediums are properly labeled.</li> <li>2. Environmental dpt. to update and maintain the Waste Location Log</li> <li>3. Ensure Internal Waste Movement Forms are completed</li> </ol>	<ol style="list-style-type: none"> <li>1. Training</li> <li>2. Audits</li> </ol>	LOW



WM P005	Processed/ Un-processed waste not adequately stored	MED	HIGH	HIGH	<ol style="list-style-type: none"> <li>1. Environmental Representative to review storage requirements from SDS.</li> <li>2. Seek alternative storage mediums such as frac tanks, IBC, cuttings boxes.</li> <li>3. Determine appropriate reuse of processed where possible</li> </ol>	<ol style="list-style-type: none"> <li>1. Audits/ Inspections</li> <li>2. Maintenance</li> </ol>	MED
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## 7.0 WASTE ANALYSIS PLAN

### Waste Acceptance Procedures

All waste accepted by TRG must be approved through the pre-acceptance process. As described below, the pre-acceptance process requires completion of the A & A1 forms and waste profile forms by the generator or their authorized agent, and review and approval of the waste by TRG. Once this is reviewed and the waste is within categories that can be accepted by TRG, the client is informed of approval to send waste to TRG facility. The TRG shore base facility is the point of custody transfer.

### 7.1 Acceptance & Analysis

#### Acceptance & Analysis

When a shipment of waste arrives at TRG facility, a Waste Technician is responsible for either receiving or rejecting the waste upon completing the following procedure:

- Review the manifest or shipping paper for accuracy and completeness.
- Unload containers to the TRG waste receiving area.
- Check container labels for completeness and consistency with the A & A1 forms and waste profile.
- Check the condition of each container and verify that it meets TRG acceptance criteria.
- Verify that each container type is consistent with the information on the A & A1/profile, manifest and waste stored within.
- For new, waste streams that cannot be identified by the SDS due to physical and chemical changes from the process they were exposed to, TRG would require lab testing to be conducted to classify the incoming waste. Waste testing includes
  - In house testing with rapid test kits that would allow for profiling of waste streams.
  - Lab testing with local and regional accredited labs to re-evaluate ongoing incoming waste



- Visual verification of physical properties by technicians based on SDS submitted. (color, liquid/solid/powder)
- Gas testing/head space analysis (includes VOC's, CO<sub>2</sub>, LEL, H<sub>2</sub>S, Benzene)
- pH testing
- Once the waste is within criteria to be processed by TRG, waste will then be transferred into storage for treatment.

### **Hazardous and Non-Hazardous Waste Classification**

The waste stream is categorized by the generator based on the SDS and process generating the waste. The generator will complete the relevant hazardous waste forms (A & A1) and provide SDS for all applicable waste streams. TRG will verify this information when waste is received via a screening process using a rapid test kit that will identify if the following hazardous parameters are present.

#### **Kit analytical capabilities:**

1. Thermal Oxidizers,
2. nitrates, chlorates, perchlorates, picrates,
3. Flammable Liquids – flashpoint < 140F
4. Halogenated Hydrocarbons, Chlorinated Solvents, Chlorinated Pesticides,
5. Acids and Bases,
6. Water Reactive Substances,
7. nitrides, carbides, hydrides, phosphides,
8. Oxidizers – peroxides, hypochlorites, nitrites, persulfates, pool shock chemicals,
9. Flammable Solids
10. Spontaneously Combustible substances,
11. Explosives,
12. Radioactive Materials,
13. Reactive Cyanides

The testing kit can also be used in the screening of unknown waste types. The rapid test kit will be utilized to establish baselines to determine waste treatment streams and ensure consistency is maintained for established waste streams.



**Analytical Testing.**

TRG conducts quantitative tests on various waste groups to establish.

- 1) The waste meets the treatability criteria of the waste processing equipment
- 2) On the processed material as confirmation that the waste has achieved the closure criteria

**7.2 Table 4: Post Treatment Tests and Testing Parameters**

<b>Tests Conducted</b>	<b>Rationale</b>	<b>Parameters</b>
TCLP Metals	Determines the concentration of leachable metals in the waste stream (arsenic, barium, cadmium, chromium, lead, mercury, silver, and selenium)	<ul style="list-style-type: none"> <li>✓ TCLP Extractable Arsenic (mg/L) 5.0 mg/L3</li> <li>✓ TCLP Extractable Barium (mg/L) 100 mg/L3</li> <li>✓ TCLP Extractable Cadmium (mg/L) 1.0 mg/L3</li> <li>✓ TCLP Extractable Chromium (mg/L) 5.0 mg/L3</li> <li>✓ TCLP Extractable Lead (mg/L) 5.0 mg/L3</li> <li>✓ TCLP Extractable Mercury (mg/L) 0.2 mg/L3</li> <li>✓ TCLP Extractable Selenium (mg/L) 1.0 mg/L3</li> <li>✓ TCLP Extractable Silver (mg/L) 5.0 mg/L3</li> <li>✓ TCLP Extractable Zinc (mg/L) 10</li> </ul>
Faecal Coliform	To determine the quantity of fecal matter present in the waste stream	✓ <400 CFU/100ml
TSS	To determine the level of treatment (sedimentation & filtration) to meet the discharge criteria.	✓ <100, g/L
BOD	Is used to capture the oxygen consumption for biological degradation of organic matter.	✓ < 50 mg/L
pH	To determine the level of acidity/alkalinity of the waste and the associated corrosivity.	✓ 5.0-9.0
TPH	Determine the level of Petroleum Hydrocarbons in the waste.	✓ < 40 mg/L
Oil & Grease	Is used to determine oil and grease concentrations	✓ < 40 mg/L
Volatile Organics	Determines if the waste is potentially listed (e.g., contains a volatile organic compound potentially used as a solvent) and if the concentration of any volatile organic compound exceeds the limits	Tested for presence.
Flash Point	Indicates the fire-producing potential of the waste and determines whether the waste is RCRA-ignitable	>93°C



Retort Analysis	Used for determining oil, water, and solids content in the mud, comprising a sample chamber assembly of known volume filled with mud	Tested for presence.
Chlorinated Organics	Test Chlorinated organic carriers are chlorinated organo benzenes, toluenes and their isomers. These chemical compounds pose potential health risks to human health	Tested for presence.
Specific Gravity/Density	As a verification of the physical property of the waste as referenced on the SDS.	N/A

**All treated waste destined for discharge or disposal must have a analytical test result showing that the material is within levels. See appendix 1 attached for copy of testing results previously acquired.**

**Ongoing Waste Evaluation Process**

**Testing and Waste Profiling is done where:**

- new waste streams are received from an existing generator
- waste is received from a new generator
- If concentrations of hazardous components change, based on qualitative/quantitative screening
- If existing generator indicates a change in the waste generation process

**Frequency**

- Baseline sampling and analytical for all waste streams
- Biannually verification for the first year and annually thereafter.
- All waste post treatment prior to final disposal
- Waste profile is required annually for all hazardous and nonhazardous waste streams. Analytical profiling is only required annually by client. If there is any suspicion by TRG that waste stream has changed or if the process by which the waste is generated changes a new waste profile is required.
- TRG will conduct at least one random test per year per client waste stream. This is to verify information on the waste profile.

**Re-Sampling**

All waste streams that do not meet the discharge/disposal standards outlined are re-introduced into TRG as waste and re-treated and tested. This is tracked via the **sampling log**.



**Documentation for new or modified waste.**

Please reference the A & A1 forms, Waste Verification Form, & Waste Manifest Form. (Appendix 1 attached)

**Treatment Confirmation following pre-screening/analytical tests**

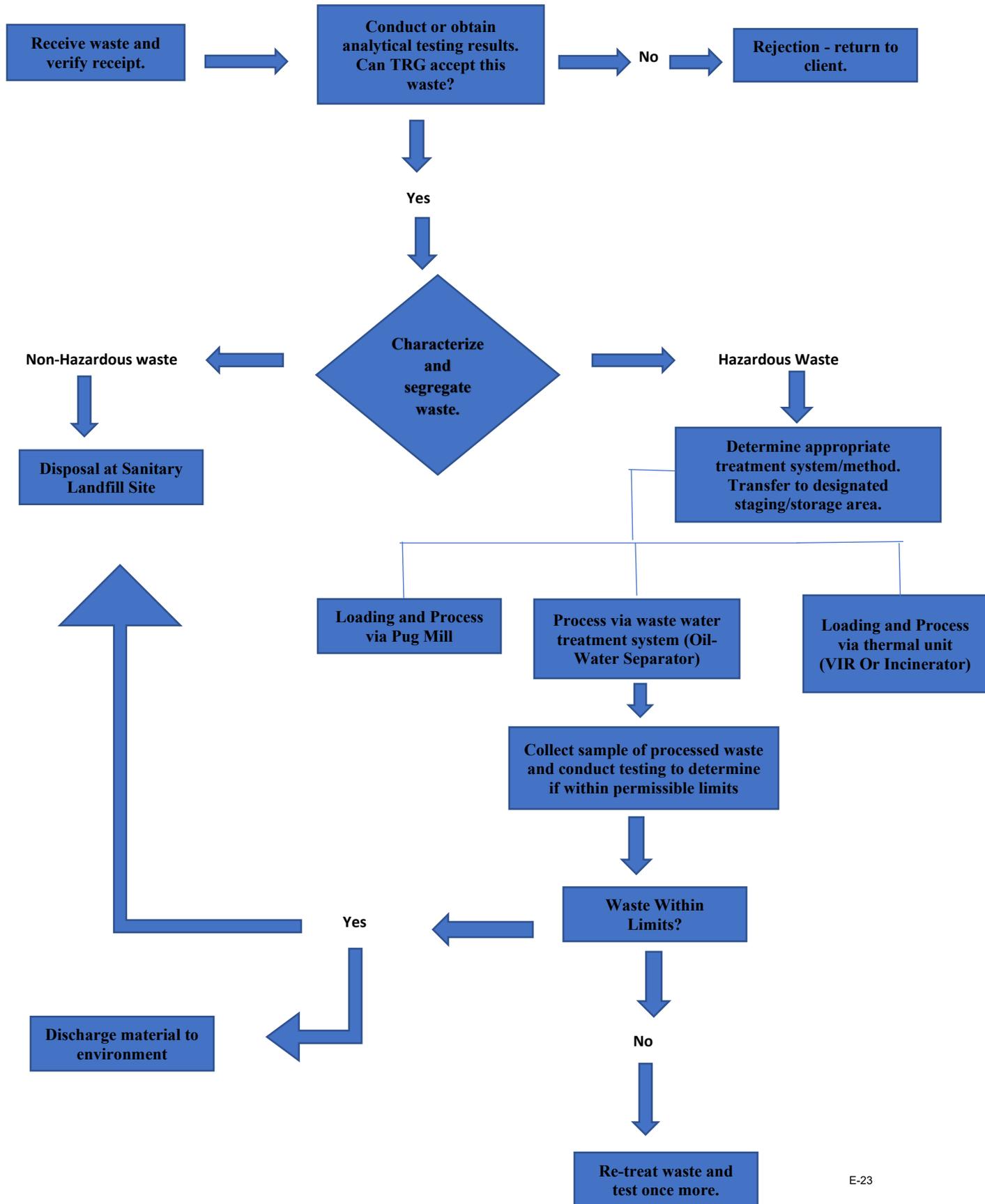
Final confirmation for new or modified waste stream is based on the SDS, Waste Profile Sheet and lab analytical provided by the client. Only waste streams not accepted are radioactive waste and chlorinated organics.

**Discrepancies/ inconsistencies** between the new / modified waste samples and the Generator submitted information are relayed to the customer via a **Non-Conformance Report**. All incoming waste accepted for treatment is verified and labeled with TRG internal waste labels for storage and treatment.

If waste was misclassified then it is put into temporary storage, the client is contacted to verify and then the waste manifest is adjusted. For waste streams that cannot be treated by TRG or is unknown, waste is returned to client for analytical data and then TRG will review and confirm acceptance. Waste will only be accepted once a waste profile is completed by client in advance.

Please note, TRG has commenced process to develop the following documents as per requirement for a treatment storage disposal facility (TSDF):

1. Waste Analysis Process/Procedure
2. Waste Stream Modification Process/Procedure.





## 8.0 WASTE TREATMENT TECHNOLOGIES

**8.1 Table 5:** Treatment System Profile

Treatment Process	Treatment Technology
<p style="text-align: center;">Waste Remediation</p> <p>Electricity is applied to the infrared heating elements inside the element housings. These elements heat up to 1600 degrees F (approx. 871 degrees C). As the waste temperature rises, hydrocarbons and water volatilize and create high pressure. This pressure forces the steam and volatilized hydrocarbons into the low-pressure, perforated element housings where they travel along the 1400-to-1600-degree elements where the vapours are destroyed prior to exhaust. Heat is transferred from the elements to the soil/sludge by conduction and the soil/sludge is heated to temperatures between 350- and 1600-degrees F. Typically the processing time is 72 hours or less, depending on the characteristics of the soil/sludge and the types and concentrations of the contaminants. After the waste goes thru the thermal system the result is a landfillable dry solid, subject to analytical testing before disposal (with grave/sand consistency in ton bag units). This waste is then stored in a designated area and composite samples are taken and sent to authorized labs for testing before discharge. Waste is stored in cuttings boxes before prior to treatment and stored in ton bags for final disposal. Maintenance activities carried out prior to every burn to ensure system performs at optimal capacity and no incidents/accidents/emergencies occur.</p>	<p style="text-align: center;">Vertical Infrared System</p> <p>Utilizes infrared heating elements to heat contaminated soil/sludge.</p> <p>Diesel/Electric Powered</p> <p>Oxidizer/rapid quench system</p> <p>Wet scrubber/stack</p> <p>Elements heat up to 871 degrees Celsius</p> <p>Capacity, 100bbl of soil/sludge</p> <p>100bbl per 4-day cycle; 25bbl per day</p> <p>End product, landfillable dry solid subject to analytical testing before disposal</p> <p>By-product, stack emissions and oily water (treated in oil-water separator)</p> <p><b>See attached appendix 2 for VIR System Operation and Safe Work Procedure.</b></p>



**8.2 Table 6: Treatment System Profile**

Treatment Process	Treatment Technology
<p style="text-align: center;">Waste Destruction</p> <p>The solid waste incinerator is powered by two diesel-fired burners positioned to ensure efficient coverage of the hearth. The products of combustion from the primary chamber will exhaust into the secondary chamber located directly above the primary chamber for treatment. Within the secondary chamber additional heat and air are added to promote combustion in the gaseous phase. These gases will reside within the chamber at a minimum temperature of 900°C, thus ensuring complete combustion of the volatile and solid particulate. Treated gases will exit the secondary chamber and will enter the exhaust chimney and then be redirected into the rapid quench and then to the wet gas scrubber before being released into the atmosphere. The whole system is controlled and policed by a central PLC based / relay logic control System. Wastes are stored in ton bags and CCUs prior to treatment, and in ton bags for final disposal.</p>	<p style="text-align: center;">Solid Waste Incinerator</p> <p>Incorporates a primary chamber and a high-capacity thermal oxidizing secondary chamber.</p> <p>Diesel fired. Operates at temperatures up to 1,400 degrees Celsius.</p> <p>Integrated oxidizer chamber</p> <p>Rapid quench/wet scrubber/stack</p> <p>1 metric ton per day</p> <p>End product, landfillable dry solid subject to analytical testing before disposal</p> <p>By product, stack emissions</p> <p><b>See attached appendix 2 for Solid Waste Incinerator Operation and Safe Work Procedure.</b></p>

**8.3 Table 7: Treatment System Profile**

Treatment Process	Treatment Technology
<p style="text-align: center;">Solidification/Stabilization</p> <p>Waste Encapsulation occurs when additives are mixed with waste to minimize the rate of migration or leaching from the waste and to reduce the toxicity of the waste. Waste Solidification - a process employing additives by which the physical nature of the waste is altered during the process causing it to lose its mobility. The pugmill employs a paddle system to mix waste with other material to make it environmentally safe. Waste is mixed</p>	<p style="text-align: center;">Pug Mill</p> <p>Hopper fed, dual counter rotating roto paddle shafts, discharge into ton sacs.</p> <p>Solidification/stabilization 10 metric tons of waste per day.</p> <p>End product, treated landfillable solid subject to analytical testing before disposal.</p> <p>By-product, none</p>



with cements or other drying agents to encapsulate or stabilize to ensure that the material reaches safe limits for landfill disposal. Waste is stored in cuttings boxes prior to treatment and in ton bags after solidified before final disposal.

**See attached appendix 2 for Pug Mill Operation and Safe Work Procedure.**

**8.4 Table 8:** Treatment system profile

Treatment Process	Treatment Technology
<p style="text-align: center;">Water Treatment</p> <p>After the wastewater has passed through the oil/water separator, the free oil is removed and taken for thermal treatment. The filtered water is then passed through a micron filter to remove large solid particles after which it goes into a holding tank. From the holding tank, water is then transferred to the charcoal filter to remove any organics. This water then goes through another micron mesh filter to a storage tank for testing. Once water reaches local allowable limits, the treated water is then discharged. Waste is stored in IBC totes, Cuttings Boxes, CCUs and TRG on site sump prior to treatment.</p>	<p style="text-align: center;">Oil-Water Separator</p> <p>Highland Oil-Water Separator is designed to treat up to 700 Barrels of oily wastewater per day.</p> <p>Two (2) gravity fed units.</p> <p>Activated charcoal filtration system.</p> <p>1x 100bbl/day &amp; 1x 700bbl/day.</p> <p>End product filtered water meeting GNBS discharge criteria.</p> <p>By-product, skimmed oil (blended in VIR or solidified in Pugmill)</p> <p><b>See attached appendix 2 for Oil-water Separator Operation and Safe Work Procedure.</b></p>

**8.5 Table 9:** Treatment System Profile

Treatment Process	Treatment Technology
<p style="text-align: center;">Depressurization and Encapsulation</p> <p>Crushed bulbs are placed into a metal drum and encapsulated using solidification additives. Waste is stored in CCUs prior to disposal. Aerosol cans are punctured, and the</p>	<p style="text-align: center;">Drum Crusher/Bulb Eater</p> <p>Electrically driven hydraulic drum press.</p> <p>Crushes 8 contaminated drums per hour.</p>

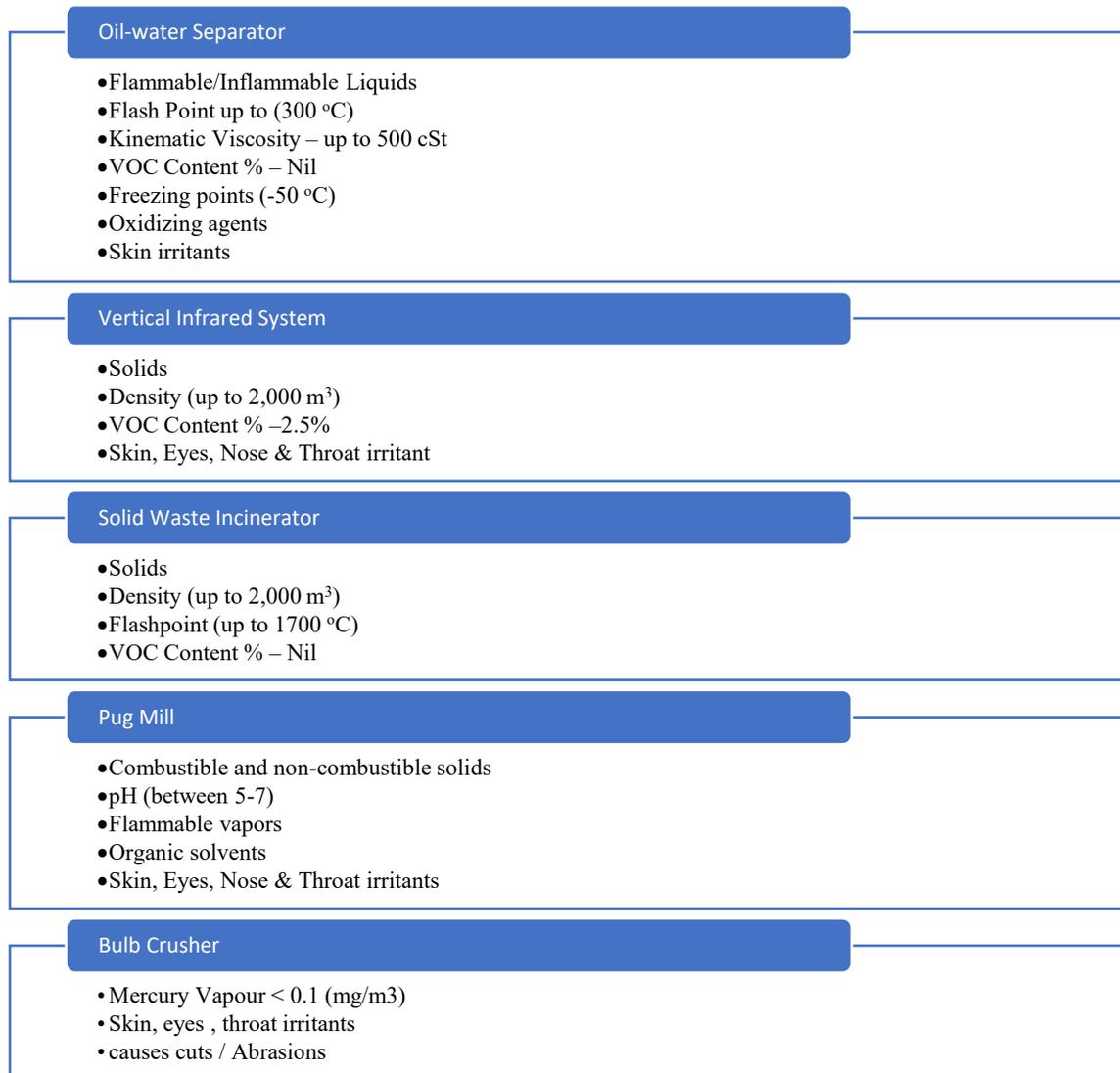


liquid and aerosol contents are expelled through the lower chamber. Empty aerosol cans are sent to scrap metal recyclers. The liquid contents are then processed through thermal processes at TRG facility.

Also crushes bulbs and lamps.

**See attached appendix 2 for Bulb Crusher, Drum Eater and Aerosol Unit Operation and Safe Work Procedures.**

### 8.8 Figure 4: Waste Treatment Technologies – Hazardous Waste Property Acceptance





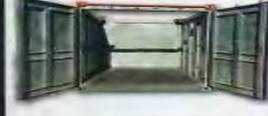
**Table 10: Annual Capacity per Treatment System**

Treatment System	Annual Capacity
Solid Waste Incinerator	300 MT
VIR System	1100 MT
Pugmill System	4500 MT
Above Ground Oil-Water Separator/Filtration System	24000 Barrels

### 9.0 STORAGE CONTAINERS

Cargo Carrying and storage units (CCUs) used for the transport and storage of waste include Boat skips, Hazardous waste skips, Cutting Boxes, 25-barrel tanks, toolboxes etc. All units used are properly maintained and inspected by certified staff, both upon arrival on site and before leaving site.

**Figures 5, 6 & 7 – CCU Profiles**

			
<b>L x W x H</b> 1520 x 1520 x 1580	<b>L x W x H</b> 1690 x 1960 x 2770	<b>L x W x H</b> 1780 x 1962 x 3370	<b>L x W x H</b> 1820 x 2450 x 1625
<b>TARE</b> 1315 KG / 2900 LBS	<b>TARE</b> 1700 KG / 3748 LBS	<b>TARE</b> 2600 KG / 5732 LBS	<b>TARE</b> 1700 KG / 3750 LBS
<b>PAYLOAD</b> 1860 KG / 4100 LBS	<b>PAYLOAD</b> 4000 KG / 8818 LBS	<b>PAYLOAD</b> 4700 KG / 10361 LBS	<b>PAYLOAD</b> 4000 KG / 8820 LBS
<b>8' X 5' PALLET CONTAINER</b>	<b>7' X 8' CONTAINER</b>	<b>8' X 10' CLOSED TOP CONTAINER</b>	<b>8' X 10' INSULATED CONTAINER</b>
			
<b>L x W x H</b> 1600 x 2450 x 2600	<b>L x W x H</b> 2710 x 2160 x 2140	<b>L x W x H</b> 2991 x 2438 x 2591	<b>L x W x H</b> 2991 x 2431
<b>TARE</b> 2100 KG / 4630 LBS	<b>TARE</b> 2200 KG / 4850 LBS	<b>TARE</b> 2400 KG / 5290 LBS	<b>TARE</b> 2010 KG / 4431 LBS
<b>PAYLOAD</b> 8000 KG / 17640 LBS	<b>PAYLOAD</b> 6000 KG / 13227 LBS	<b>PAYLOAD</b> 7600 KG / 16760 LBS	<b>PAYLOAD</b> 7950 KG / 17615 LBS
<b>8' X 10' OPEN TOP CONTAINER</b>	<b>8' X 20' CLOSED TOP CONTAINER</b>	<b>8' X 20' CLOSED TOP HC CONTAINER</b>	<b>8' X 20' REMOVABLE TOP CONTAINER</b>
			
<b>L x W x H</b> 2991 x 2438 x 2591	<b>L x W x H</b> 6058 x 2438 x 2591	<b>L x W x H</b> 6058 x 2438 x 2896	<b>L x W x H</b> 6058 x 2438 x 2896
<b>TARE</b> 2200 KG / 4850 LBS	<b>TARE</b> 3900 KG / 8598 LBS	<b>TARE</b> 4500 KG / 9921 LBS	<b>TARE</b> 6000 KG / 13228 LBS
<b>PAYLOAD</b> 7800 KG / 17196 LBS	<b>PAYLOAD</b> 14100 KG / 31085 LBS	<b>PAYLOAD</b> 15500 KG / 34171 LBS	<b>PAYLOAD</b> 14000 KG / 30864 LBS
<b>8' X 20' OPEN TOP CONTAINER</b>	<b>8' X 20' OPEN TOP CONTAINER W/TARP</b>	<b>8' X 10' ELECTRIC REEFER</b>	<b>8' X 20' ELECTRIC REEFER</b>
			
<b>L x W x H</b> 6058 x 2438 x 2591	<b>L x W x H</b> 6058 x 2438 x 2591	<b>L x W x H</b> 2991 x 2438 x 2591	<b>L x W x H</b> 6058 x 2438 x 2591
<b>TARE</b> 4400 KG / 9700 LBS	<b>TARE</b> 4350 KG / 9590 LBS	<b>TARE</b> 3080 KG / 6790 LBS	<b>TARE</b> 5270 KG / 11618 LBS
<b>PAYLOAD</b> 15600 KG / 34393 LBS	<b>PAYLOAD</b> 15650 KG / 34502 LBS	<b>PAYLOAD</b> 6920 KG / 15256 LBS	<b>PAYLOAD</b> 14730 KG / 32474 LBS



# Operating Procedure

## QHSE Management System

Procedure: Waste Management

Issue Date: February, 2021

Document #: QOP 8.1/5

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<b>6.5' X 16' TUBINGLESS BASKET</b>  <table border="1"> <tr><td><b>L x W x H</b></td><td>4890 x 2110 x 965</td></tr> <tr><td><b>TARE</b></td><td>2131 KG / 4700 LBS</td></tr> <tr><td><b>PAYLOAD</b></td><td>6939 KG / 15300 LBS</td></tr> </table>	<b>L x W x H</b>	4890 x 2110 x 965	<b>TARE</b>	2131 KG / 4700 LBS	<b>PAYLOAD</b>	6939 KG / 15300 LBS	<b>8' X 10' BASKET HH W/ FRONT DOOR</b>  <table border="1"> <tr><td><b>L x W x H</b></td><td>2991 x 2438 x 1280</td></tr> <tr><td><b>TARE</b></td><td>1650 KG / 3638 LBS</td></tr> <tr><td><b>PAYLOAD</b></td><td>8000 KG / 17636 LBS</td></tr> </table>	<b>L x W x H</b>	2991 x 2438 x 1280	<b>TARE</b>	1650 KG / 3638 LBS	<b>PAYLOAD</b>	8000 KG / 17636 LBS	<b>8' X 20' HH BASKET W/SIDE DOOR</b>  <table border="1"> <tr><td><b>L x W x H</b></td><td>6058 x 2438 x 1432</td></tr> <tr><td><b>TARE</b></td><td>3050 KG / 6724 LBS</td></tr> <tr><td><b>PAYLOAD</b></td><td>10000 KG / 22046 LBS</td></tr> </table>	<b>L x W x H</b>	6058 x 2438 x 1432	<b>TARE</b>	3050 KG / 6724 LBS	<b>PAYLOAD</b>	10000 KG / 22046 LBS	<b>8' X 20' HH BASKET W/REMOV. DOOR</b>  <table border="1"> <tr><td><b>L x W x H</b></td><td>6058 x 2438 x 1432</td></tr> <tr><td><b>TARE</b></td><td>3500 KG / 7716 LBS</td></tr> <tr><td><b>PAYLOAD</b></td><td>10000 KG / 22046 LBS</td></tr> </table>	<b>L x W x H</b>	6058 x 2438 x 1432	<b>TARE</b>	3500 KG / 7716 LBS	<b>PAYLOAD</b>	10000 KG / 22046 LBS
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<b>27.4 M (90') BASKET</b>  <table border="1"> <tr><td><b>L x W x H</b></td><td>27430 x 1200 x 1200</td></tr> <tr><td><b>TARE</b></td><td>8800 KG / 19400 LBS</td></tr> <tr><td><b>PAYLOAD</b></td><td>12000 KG / 26456 LBS</td></tr> </table>	<b>L x W x H</b>	27430 x 1200 x 1200	<b>TARE</b>	8800 KG / 19400 LBS	<b>PAYLOAD</b>	12000 KG / 26456 LBS	<b>DRUM RACK/BOTTLE RACK</b>  <table border="1"> <tr><td><b>L x W x H</b></td><td>1428 x 1158 x 2171</td></tr> <tr><td><b>TARE</b></td><td>700 KG / 1543 LBS</td></tr> <tr><td><b>PAYLOAD</b></td><td>1970 KG / 4343 LBS</td></tr> </table>	<b>L x W x H</b>	1428 x 1158 x 2171	<b>TARE</b>	700 KG / 1543 LBS	<b>PAYLOAD</b>	1970 KG / 4343 LBS	<b>DRUM RACK (6' X 6')</b>  <table border="1"> <tr><td><b>L x W x H</b></td><td>1829 x 1829 x 1493</td></tr> <tr><td><b>TARE</b></td><td>1050 KG / 2314 LBS</td></tr> <tr><td><b>PAYLOAD</b></td><td>950 KG / 2094 LBS</td></tr> </table>	<b>L x W x H</b>	1829 x 1829 x 1493	<b>TARE</b>	1050 KG / 2314 LBS	<b>PAYLOAD</b>	950 KG / 2094 LBS	<b>MULTI-UNIT CARRIER (4 UNITS)</b>  <table border="1"> <tr><td><b>L x W x H</b></td><td>3150 x 2845 x 2184</td></tr> <tr><td><b>TARE</b></td><td>2041 KG / 4500 LBS</td></tr> <tr><td><b>PAYLOAD</b></td><td>13835 KG / 30500 LBS</td></tr> </table>	<b>L x W x H</b>	3150 x 2845 x 2184	<b>TARE</b>	2041 KG / 4500 LBS	<b>PAYLOAD</b>	13835 KG / 30500 LBS
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<p><b>1.5 M WASTE SKIP/TOOL BOX</b></p>  <table border="1"> <tr> <td><b>L x W x H</b></td> <td>1500 x 1500 x 1275</td> </tr> <tr> <td><b>TARE</b></td> <td>965 KG / 2127 LBS</td> </tr> <tr> <td><b>PAYLOAD</b></td> <td>3035 KG / 6691 LBS</td> </tr> </table>	<b>L x W x H</b>	1500 x 1500 x 1275	<b>TARE</b>	965 KG / 2127 LBS	<b>PAYLOAD</b>	3035 KG / 6691 LBS	<p><b>2 M WASTE SKIP/TOOL BOX</b></p>  <table border="1"> <tr> <td><b>L x W x H</b></td> <td>2000 x 1500 x 1275</td> </tr> <tr> <td><b>TARE</b></td> <td>1150 KG / 2535 LBS</td> </tr> <tr> <td><b>PAYLOAD</b></td> <td>3050 KG / 6724 LBS</td> </tr> </table>	<b>L x W x H</b>	2000 x 1500 x 1275	<b>TARE</b>	1150 KG / 2535 LBS	<b>PAYLOAD</b>	3050 KG / 6724 LBS	<p><b>CLOSED TOP WASTE SKIP</b></p>  <table border="1"> <tr> <td><b>L x W x H</b></td> <td>2800 x 1820 x 1790</td> </tr> <tr> <td><b>TARE</b></td> <td>2040 KG / 4497 LBS</td> </tr> <tr> <td><b>PAYLOAD</b></td> <td>5460 KG / 12037 LBS</td> </tr> </table>	<b>L x W x H</b>	2800 x 1820 x 1790	<b>TARE</b>	2040 KG / 4497 LBS	<b>PAYLOAD</b>	5460 KG / 12037 LBS	<p><b>BOAT RUBBISH SKIP</b></p>  <table border="1"> <tr> <td><b>L x W x H</b></td> <td>3776 x 1839 x 1554</td> </tr> <tr> <td><b>TARE</b></td> <td>1600 KG / 3527 LBS</td> </tr> <tr> <td><b>PAYLOAD</b></td> <td>5900 KG / 13007 LBS</td> </tr> </table>	<b>L x W x H</b>	3776 x 1839 x 1554	<b>TARE</b>	1600 KG / 3527 LBS	<b>PAYLOAD</b>	5900 KG / 13007 LBS
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## 10.0 TRG WASTE SAMPLING AND ANALYTICAL PROCEDURE – PRE AND POST TREATMENT

10.1 Waste monitoring is a typical requirement outlined by regulators in the Terms of Reference of permits granted. The waste monitoring is conducted to ensure firstly there are no adverse impacts on the environment and secondly that the facility and its operations are operating within the compliance requirements of the permit and the legislation. Where no regulatory body or legislation is applicable, compliance will conform to industry best practice and / or international guidance pertaining to wastewater discharge quality standards.

This procedure applies to all operations generating or receiving waste for processing and disposal. The scope will include identification of the personnel responsible for the sampling, QA/QC guidelines, typical analytical parameters, sampling preparation, sampling techniques, shipping samples and documentation.

TRG has developed field sampling procedures for the following:

1. **Wastewater/Processed Water Pipeline**
2. **Wastewater/Processed Water Tank**
3. **Wastewater/Processed Water IBC**
4. **Solids/Sludge Vertical Infrared Unit**
5. **Solids/Sludge Incinerator**

In general, water samples with multiple or unknown chemical types should be stored in containers made from borosilicate glass, high density polyethylene plastic or polytetrafluoroethylene (PTFE or Teflon) as these materials minimize leaching, dissolution, and sorption (ASTM, 2000a; APHA, 1995). Samples for organic contaminant analysis should be stored in brown borosilicate glass containers with PTFE lid liners. If volatile compounds will be analyzed, containers should have a septum to minimize escape of volatile gases during storage and analysis. Extra containers should be provided for these analyses in the event that re-analysis of the sample is required. If samples are contaminated with photoreactive compounds such as PAHs, exposure to light should be minimized by using brown glass containers or clear containers wrapped tightly with an opaque material (e.g., clean aluminum foil). Plastic or acid-rinsed glass containers are recommended when the chemicals of concern are heavy metals. Fill containers completely if the sample will not be frozen prior to analysis. Any material that is in contact with a field sample has the potential to contaminate the sample or adsorb components from the sample. The use of appropriate materials, along with appropriate cleaning procedures, can minimize or mitigate interferences from sample containers. All utensils (e.g., spoons, scoops, spatulas) which come in direct contact with sediment samples during handling and processing should be made of non-contaminating materials (e.g., glass, high-quality stainless steel and/or Teflon®). If a sample is to be refrigerated, the container should be filled to the brim to reduce oxygen exposure. This is particularly critical for volatile compounds. If a sample is to be frozen, the container should be filled to approximately 90% of its



volume (i.e., 10% headspace) to allow for expansion of the sample during freezing. Refer to Figures #3 to #6. All sample containers should be properly labelled with a marker prior to sampling. Containers should be labelled on their sides in addition to or instead of labelling the lids. Each label should include, at a minimum, the study title, station location and/or sample identification, date and time of collection, sample type, and name of collector. Blind sample labelling (i.e., a sample code) should be used, along with a sample log that identifies information about each sample to minimize potential analytical bias. Additional information such as required analyses and any preservative used might also be included on the label although this information is typically recorded on the chain-of-custody form. Labelled containers should be stabilized in an upright position in the transport or storage container. Extra containers should be carried on each sampling trip.

### Sample Collection

Before each sampling event, all instruments and equipment must be inspected prior to use i.e., clean, good working condition before used for sample collection. Ensure appropriate Personal Protective Equipment is worn (safety goggles, gloves, face shields etc.). Gloves should be clean, new, and disposable. These should be changed upon arrival at a new sampling point. Stick labels on sampling bottles and record on label information.

#### 10.1.1 Sample Collection - Pipeline

Carefully open bleed point on sample line and allow water to flow for 5 - 10 seconds.

Ensure that the flow and material to be collected is constant/consistent before sample is actually collected. b)

Collect amount of representative sample in the pre-labelled sample bottles provided by following the instructions for each bottle type:

- i. **Polyethylene Plastic Bottles** – Rinse bottle 2-3 times with a small amount of the effluent (one tenth of the bottle volume) and discard in an environmentally responsible manner. Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler.
- ii. **Borosilicate Glass Bottles - One Liter** – These are for organic tests and are not to be rinsed to allow for additional organic material to collect in the bottle. Simply fill the bottle to 90% full or to shoulder of bottle (maybe marked by lab) and store on ice in cooler.
- iii. **Borosilicate Glass/HDPE Plastic Bottles - 250 mls Sterilized** - This is for microbiological testing and care must be taken not to touch the mouth or cap of bottle with anything besides the actual liquid sample. Do not rinse bottle before sampling. Fill bottle to shoulder level of bottle. Stopper tightly and store on ice in cooler.



### 10.1.2 Sample Collection – Tank

- A) Prior to opening a tank for internal inspection, the tank sampling team shall:
- i. Review safety procedures and emergency contingency plans with the Health and Safety Officer.
  - ii. Ensure that the tank is properly grounded.
  - iii. Remove all sources of ignition from the immediate area.
- B) Prior to commencing sampling, the tank headspace should be cleared of any toxic or explosive vapor concentration. After opening top hatch of tank, ensure all headspace gases are cleared and/or environmental sampler should wear a respirator. No work shall start if the lower explosive limit 1 (LEL) readings exceed 25% (refer to Section #24 References #11). At 10% LEL, work can continue but with extreme caution.
- C) Collect air quality measurements for each potential sample location using an explosimeter/oxygen meter for a lower explosive limit (LEL/O<sub>2</sub>) reading and an applicable gas monitor for organic vapor concentration. Both readings should be taken from the tank headspace, above the sampling port, and in the breathing zone.
- D) Determine the depth of any and all liquid, solid, and liquid/solid interface, and depth of sludge using a weighted tape measure, probe line, sludge judge, or equivalent.
- E) Collect liquid samples from one (1) foot below the surface, using a subsurface grab sampler sampling rod).
- F) Samples should always be collected through an opened hatch at the top of the tank.
- G) Valves near the bottom should not be used, because of their questionable or unknown integrity.
- H) Collect amount of representative sample in the pre-labelled sample bottles provided by following the instructions for each bottle type:
- i. Polyethylene Plastic Bottles – Rinse bottle 2-3 times with a small amount of the effluent (one tenth of the bottle volume) and discard in an environmentally responsible manner. Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler.
  - ii. Borosilicate Glass Bottles - One Liter – These are for organic tests and are not to be rinsed to allow for additional organic material to collect in the bottle. Simply fill the



bottle to 90% full or to shoulder of bottle (maybe marked by lab) and store on ice in cooler.

- iii. Borosilicate Glass or HPE Plastic Bottles - 250 mls Sterilized - This is for microbiological testing and care must be taken not to touch the mouth or cap of bottle with anything besides the actual liquid sample. Do not rinse bottle before sampling. Fill bottle to shoulder level of bottle. Stopper tightly and store on ice in cooler.

**Subsurface grab samplers** are designed to collect samples of liquids at various depths. The sampler is usually constructed of aluminum or stainless-steel piping with an attached clamp that attaches to a 1-liter polyethylene plastic sample container. When using a subsurface grab sampler:

- ✓ Screw the sampling bottle onto the sampling head.
- ✓ Lower the sampler to the desired depth.
- ✓ Ensure sample bottles are filled with water sample, as indicated in steps 'g' to 'j'.
- ✓ Lift sampler and remove filled sample bottle. Secure bottle cover and place in sampling cooler.

### 10.1.3 Sample Collection – Intermediate Bulk Container (IBC)

- A) Prior to opening an IBC for internal inspection, the IBC sampling team shall:
  - i. Review safety procedures and emergency contingency plans with the Health and Safety Officer.
  - ii. Remove all sources of ignition from the immediate area.
- B) Prior to commencing sampling, the IBC headspace should be cleared of any toxic or explosive vapor concentration. After opening the top fill aperture located on the surface of the IBC, ensure all headspace gases are cleared and/or environmental sampler should wear a respirator. No work shall start if the lower explosive limit 2 (LEL) readings exceed 25%. At 10% LEL, work can continue but with extreme caution.
- C) Collect air quality measurements for each potential sample location using an explosimeter/oxygen meter for a lower explosive limit (LEL/O<sub>2</sub>) reading and an applicable gas monitor for organic vapor concentration. Both readings should be taken from the tank headspace, above the sampling port, and in the breathing zone.
- D) Determine the depth of any and all liquid, solid, and liquid/solid interface, and depth of sludge using a weighted tape measure, probe line, sludge judge, or equivalent.
- E) Collect liquid samples from one (1) foot below the surface, using a subsurface grab sampler (sampling rod).



- F) Samples should always be collected through an opened lid at the top of the IBC.
- G) Collect amount of representative sample in the pre-labelled sample bottles provided by following the instructions for each bottle type.
- i. Polyethylene Plastic Bottles – Rinse bottle 2-3 times with a small amount of the effluent (one tenth of the bottle volume) and discard in an environmentally responsible manner. Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler.
  - ii. Borosilicate Glass Bottles - One Liter – These are for organic tests and are not to be rinsed to allow for additional organic material to collect in the bottle. Simply fill the bottle to 90% full or to shoulder of bottle (maybe marked by lab) and store on ice in cooler.
  - iii. Borosilicate Glass or HDPE Plastic Bottle - 250 mLs Sterilized - This is for microbiological testing and care must be taken not to touch the mouth or cap of bottle with anything besides the actual liquid sample. Do not rinse bottle before sampling. Fill bottle to shoulder level of bottle. Stopper tightly and store on ice in cooler.

When using a subsurface grab sampler:

- ✓ Screw the sampling bottle onto the sampling head.
- ✓ Lower the sampler to the desired depth.
- ✓ Ensure sample bottles are filled with water sample, as indicated in steps above.
- ✓ Lift sampler and remove filled sample bottle.
- ✓ Secure bottle cover and place in sampling cooler.

#### 10.1.4 Sample Collection – Vertical Infrared System & Incinerator

In **VIR system**, 100-bbls waste is processed per batch. Each batch usually generates 4-6 1-ton bags of solid material. A grab sample will be collected from each bag and a composite made. 3-batches or 300- bbls are processed before a sample is sent for analysis. This final sample is a composite of the composite made for each batch. This is done for homogenous waste. If a different waste type is processed, then a composite for that batch burn (100-bbls) will be sent.

For **incinerator** operations, homogenous waste types are comingled and loaded. A composite sample will be collected from no more than 3-bags per homogenous waste type and sent to the lab for analysis.

For generating a composite sample, from sample collection of each bag:

- A) Dip the scoop (trowel) into the solid waste material and withdraw the scoop and level off the material so there is none above the sides of the scoop.



- B) Transfer the sample into a wide stainless-steel tray.
- C) Decontaminate/clean scoop.
- D) Repeat steps above, for each bag.
- E) After all grab samples are collected from each bag, and placed into the stainless-steel tray, thoroughly mix the waste.
- F) Then add the composite mixed sample into two types of sampling bottles:
  - ✓ a wide mouth 1-Liter HDPE plastic sample container and label “MET”.
  - ✓ a wide mouth 1-Liter Borosilicate Glass Bottle and label “ORG”. Fill the sample right up to the top.
- G) Seal the container with an appropriate lid that will prevent leakage or minimize ingress of:
  - i. air.
  - ii. Each sample bottle must be assigned a unique label.
  - iii. The information to be entered on the label includes:
    - ✓ Date, time, and location of sample collection.
    - ✓ Waste Collection Method: Composite
    - ✓ Client Sample Identification Name.
    - ✓ Client’s Name.
  - iv. Composite samples are to be placed into a cooler, on ice, at < 6°C for transport to the laboratory. Sample should not be frozen.
  - v. Solid waste samples must be delivered to the laboratory to allow for analyses or tests to be conducted within the prescribed holding and testing times. Holding times will vary depending on the analyses to be performed.

## 10.2 Allocation of Sample Bottles

The following sampling bottles are to be collected per wastewater sample/sample location:

- ✓ One (1) Borosilicate Glass Bottles - One Liter – Label as “TPH”; PRESERVE by adding 5 ml of 50% Sulphuric Acid (H<sub>2</sub>SO<sub>4</sub>). Stopper Tightly
- ✓ Two (2) Polyethylene Plastic Bottles – 500 milliliters. Label One “TSS/pH” and Label One “BOD” – **Do not** preserve these bottles.
- ✓ One (1) Borosilicate Glass or HDPE Plastic bottle - 250 ml Sterilized – Label as “MICROB”.



### 10.3 Safety Practices

#### Liquid Samples –

1. Sampling a storage tank requires a great deal of manual dexterity, often requiring climbing to the top of the tank upon a narrow vertical or spiral stairway or ladder while wearing protective clothing and carrying sampling equipment.
2. Currently, US OSHA requires that workers on a walking or working surface with an unprotected edge that is 6 feet or more above a lower level shall wear a fall protection approved by OSHA including guardrails, safety net systems, and personal fall arrest systems (i.e., safety harnesses).
3. Before climbing onto the vessel, a structural survey should be performed. This will ensure appropriate consideration of safety and accessibility prior to initiation of any field activities.
4. As in all opening of containers, extreme caution should be taken to avoid ignition or combustion of volatile contents. All tools used must be constructed of a non-sparking material and electronic instruments must be intrinsically safe.
5. All sample locations should be surveyed for air quality prior to sampling. At no time should sampling continue with a lower explosive limit (LEL) reading greater than 25%.

#### Solid Samples –

1. As in all opening of containers, extreme caution should be taken to avoid ignition or combustion of volatile contents. All tools used must be constructed of a non-sparking material and electronic instruments must be intrinsically safe.
2. All sample locations should be surveyed for air quality prior to sampling. At no time should sampling continue with a lower explosive limit (LEL) reading >25%.

### 10.4 Sample Labelling

Place the sample bottle in designated container. Each sample bottle must be assigned a unique label. The information to be entered on the label includes:

1. Date and time of taken sample.
2. Client Sample Identification Name
3. Sample Type: Grab
4. Client's Name
5. Preservation

### 10.5 Temperature Analysis Procedure

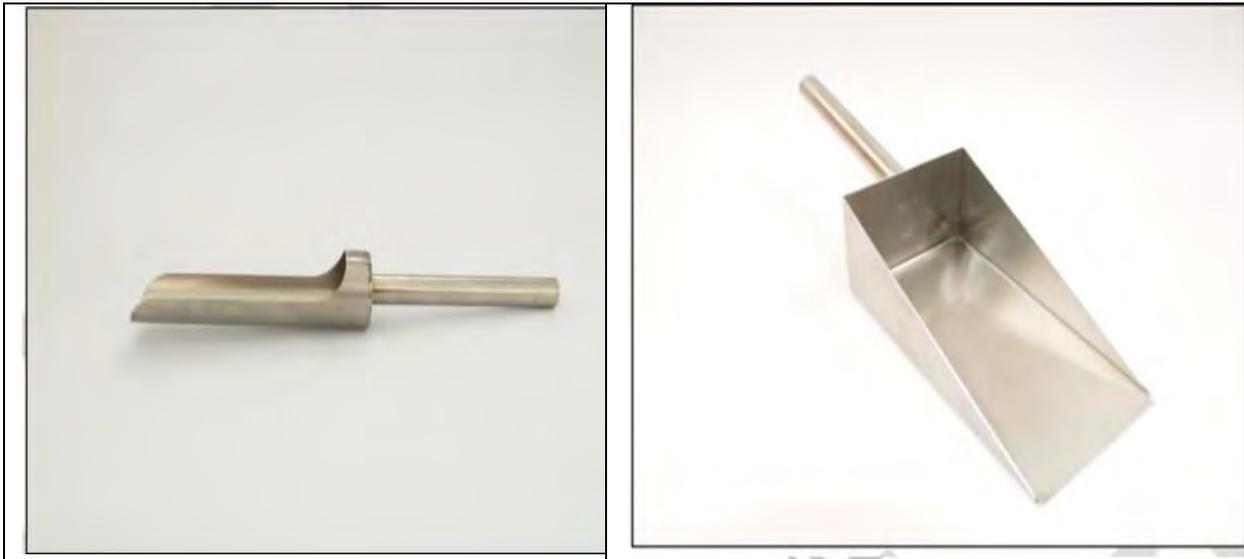
Temperature Analysis Procedure: Using the Plastic bottle labelled “TSS/pH” - Place the thermometer or meter probe in the sample container at least 4 inches or halfway below the surface.



If using a thermometer, allow enough time for it to reach a stable temperature (at least 1 minute). If using a meter, allow the temperature reading to stabilize at a constant temperature reading. Make a note of the temperature reading as this will be transferred to the COC form in the post sampling phase.

**The methods described shall be performed in conformance with the 23rd Edition, 2017, of “Standard Methods for the Examination of Water and Wastewater (SMEWW)”, United States Environmental Protection Agency (USEPA) Reference Methods and the Standard Operating Procedures for Ecotox Environmental Services, the laboratory engaged to provide the waste analytical support services.**

**Figures 8 & 9 : Trowels used for solid sample taking.**





**10.6 Table 11: Sample Containers Preservation and Allocation**

Sample Matrix	Sample Container	Initial Rinse with Sample	Sample Container Fill Level	Preservation	Label I.D.
Wastewater	1 x 1 Liter Borosilicate Glass	NO	Shoulder Level	5 ml of 50% Sulphuric Acid (H <sub>2</sub> SO <sub>4</sub> )	TPH
	1 x 500 milliliter Polyethylene Plastic Bottle	YES	Right-up	None. Store at ≤ 6°C.	TSS
	1 x 500 milliliter Polyethylene Plastic Bottle	YES	Right-up	None. Store at ≤ 6°C.	BOD
	1 x 250 mL Borosilicate glass or Polyethylene plastic bottle	NO	Shoulder Level	None. Store at ≤ 6°C.	MICROB
Solid Waste	1 x 1-L Borosilicate Glass Bottle	Not Applicable	Right-up	None. Store at ≤ 6°C.	ORG
	1 x 1-L Polyethylene Plastic Bottle	Not Applicable	Right-up	None. Store at ≤ 6°C.	MET



### 10.7 Chain of Custody

Samples must be sent with a completed chain-of-custody/analytical request form (temperature reading should include on this form or Field Log Form), signed by the Client Represented and Field Technician/Sampler. The following information must be completed on the chain-of-custody form:

- ✓ Client's Name.
- ✓ Project Name.
- ✓ Project Number.
- ✓ Sampled By (Person who performed the sampling procedure)
- ✓ Client Sample Identification (List of all samples taken) with corresponding date, time, and temperature of the sample.
- ✓ Sample Temperature
- ✓ Requested Analyses (Contract Lab)
- ✓ Matrix (water)
- ✓ Number of containers
- ✓ Plant Condition
- ✓ Weather Conditions
- ✓ Any other comments to be noted at time of sampling.
- ✓ Important information regarding the sample e.g., appearance
- ✓ Relinquished By (Signature by OPS)
- ✓ Received By (Signature by Contract Lab Representative).

### 10.8 Shipping Samples

The shipping or delivery to the laboratory must consider the holding time for any specific parameter to be tested. There must be enough time allowed for the for the samples to be taken, prepared, shipped and received by the laboratory before the holding time expires. Samples must be packed upright in a cooler surrounded by ice or ice packs. The samples that are most likely to deteriorate must be closest to the ice packs. Glass sample bottles must be wrapped in bubble wrap or some other protective wrapping to prevent breakage. Labels must be checked to ensure they are legible before wrapping.

### 10.9 Sample collection and storage containers



**Plastic Microbiology Bottles**



**Glass Microbiology Bottles**



**Nalgene Plastic Bottles**



**Borosilicate Glass Bottles**

## 11.0 WASTE RECYCLING

EPA and SMU Authorized dealer accepts recyclable waste (Scrap Metal, ULABs). This waste is then packaged and shipped for sale/recycling in accordance with the Basel Convention for the Transboundary Movement of Hazardous Wastes and their disposal.



## 12.0 TREATMENT PROCESS WASTE GENERATION

**12.1 Table 12:** Waste Categories, as per the Basel Convention & Environmental Protection (Hazardous Waste) Regulations definitions of Hazardous and Non-Hazardous Wastes, which are generated via TRG treatment processes.

Waste Type	Method of Generation	Waste Classification	Disposal method
Ash/Incineration Debris	Solid Waste Incinerator	Non-Hazardous	Landfill
Stabilized Solid Waste	Pugmill – Solidification/ Stabilization	Non-Hazardous	Landfill
Filtered Water	Water Treatment – Filtration	Non-Hazardous	Discharge
Skimmed Oil	Water Treatment - Filtration	Hazardous	VIR Processing

**12.2 Table 13:** Waste product from treatment systems and respective testing parameters prior to disposal.

Treatment System	Waste Type	Testing components	Respective Parameters/Standard
Oil-Water Separator	Filtered Water	<ul style="list-style-type: none"> <li>pH</li> <li>Total Petroleum Hydrocarbon</li> <li>Faecal Coliform</li> <li>Biochemical Oxygen Demand</li> <li>Total Suspended Solids</li> </ul>	<ul style="list-style-type: none"> <li>Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment</li> </ul>
Pugmill	Stabilized Solid Waste	<ul style="list-style-type: none"> <li>Total Oil &amp; Grease</li> <li>Toxicity Characteristic Leaching Procedure</li> </ul>	<ul style="list-style-type: none"> <li>TCLP United States Environmental Protection Agency Resource Recovery and Conservation Act, RCRA-8 Metals Maximum Permissible Limits (Maximum Concentration of Contaminants)</li> <li>Louisiana Administrative Code (LAC), Title 43, part XIX, Office of Conservation – General Operations Subpart 1. State-wide Order No. 29-B; Section 313, E, Burial or Trenching of Treated Pit Solid Phase Contents – Pit Closure Techniques and Onsite Disposal of Exploration and Production Waste Standard (November 2019).</li> </ul>



<p><b>Solid Waste Incinerator</b></p>	<p><b>Ash/Incineration Debris</b></p>	<ul style="list-style-type: none"> <li>• Total Oil &amp; Grease</li> <li>• Toxicity Characteristic Leaching Procedure</li> </ul>	<ul style="list-style-type: none"> <li>• TCLP United States Environmental Protection Agency Resource Recovery and Conservation Act, RCRA-8 Metals Maximum Permissible Limits (Maximum Concentration of Contaminants)</li> <li>• Louisiana Administrative Code (LAC), Title 43, part XIX, Office of Conservation – General Operations Subpart 1. State-wide Order No. 29-B; Section 313, E, Burial or Trenching of Treated Pit Solid Phase Contents – Pit Closure Techniques and Onsite Disposal of Exploration and Production Waste Standard (November 2019).</li> </ul>
<p><b>VIR System</b></p>	<p><b>Dry Solids</b></p>	<ul style="list-style-type: none"> <li>• Total Oil &amp; Grease</li> <li>• Toxicity Characteristic Leaching Procedure</li> </ul>	<ul style="list-style-type: none"> <li>• TCLP United States Environmental Protection Agency Resource Recovery and Conservation Act, RCRA-8 Metals Maximum Permissible Limits (Maximum Concentration of Contaminants)</li> <li>• Louisiana Administrative Code (LAC), Title 43, part XIX, Office of Conservation – General Operations Subpart 1. State-wide Order No. 29-B; Section 313, E, Burial or Trenching of Treated Pit Solid Phase Contents – Pit Closure Techniques and Onsite Disposal of Exploration and Production Waste Standard (November 2019).</li> </ul>

### 13.0 SAFETY EQUIPMENT AND MACHINERY

#### List of Equipment and Machinery utilized in TRG Waste Management Operations

1. Air Compressor
2. 3- & 16-ton Forklifts
3. 250 & 450 kva Generators
4. Electrical and Engine Driven Vacuums
5. 2 Pugmills
6. 3 Diaphragm Pumps
7. Centrifugal Pumps
8. Electrical Drum Crusher
9. Oxidizer
10. Scrubbers



**List of Safety Equipment utilized in TRG Waste Management Operations**

1. Fire Extinguishers
2. Sand Buckets
3. Ladders
4. Gas Monitors
5. Personal Monitors
6. Rescue Rope
7. Self Contained Breathing Apparatus

**Safety Documents**

TRG has implemented the use of **Job Safety Analysis forms (JSAs)**. These forms are filled before every task and serve to:

1. List activities associated with the task to be conducted when operating a treatment system or any activity in support of treatment system operation;
2. identify hazards associated with the operation of treatment system or performance of supporting tasks, and;
3. Provide recommendations on methods of elimination for each hazard identified.

Furthermore, a daily checklist has been developed for each treatment system. Checklists are filled before the use/operation of any treatment system or associated machinery to ensure optimal functionality and reduction of risk.



**QHSE Management System**

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Operating Procedure

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# APPENDIX





Waste Disposal/End of life certificate

<b>WASTE DISPOSAL CERTIFICATE</b>	
<b>GENERATOR INFORMATION</b>	
Generator: _____	
Address: _____	
Contact Information: Office _____ Mobile _____ email _____	
Contact Person: _____ Position _____	
<b>WASTE INFORMATION</b>	
Waste Description: <input type="checkbox"/> Hazardous <input type="checkbox"/> Non Hazardous	
(Provide a brief description)	
Process Generating Waste: _____	
Physical State <input type="checkbox"/> Solid <input type="checkbox"/> Liquid <input type="checkbox"/> Sludge <input type="checkbox"/> Other _____	
Waste Volume <input type="checkbox"/> _____ Barrels (42 Gal.) <input type="checkbox"/> _____ Drum (55 Gal.) <input type="checkbox"/> _____ Gallons	
<input type="checkbox"/> _____ Cubic Meters <input type="checkbox"/> _____ Pounds <input type="checkbox"/> Other _____	
Date Waste Received: _____	
<b>DISPOSAL INFORMATION</b>	
Disposal Option <input type="checkbox"/> Recycling <input type="checkbox"/> Thermal Desorption <input type="checkbox"/> Bioremediation	
<input type="checkbox"/> Incineration <input type="checkbox"/> Landfill <input type="checkbox"/> Special Disposal	
Disposal Facility <input type="checkbox"/> Tiger Tanks <input type="checkbox"/> Oil Mop <input type="checkbox"/> Enviro Care <input type="checkbox"/> SWMCOL	
Other _____	
Date Waste Processed: _____	
This Disposal Certificate confirms the waste listed above was processed in strict accordance with the regulatory requirements as outlined by the Environmental Management Authority. Where no regulations exists, internationally accepted procedures were employed	
Completed By: _____ Signature _____ Date _____	
Authorized By: _____ Signature _____ Date _____	
<div style="display: flex; justify-content: space-between;"> <div> <p>Phone 868-651-1544, Fax 868-648-9763 Lot 22B LABIDCO Industrial Estate, La Brea, Trinidad, W.I.</p> </div> <div> <p>Issue Date: 19<sup>th</sup> October, 2011 EF-020.00</p> </div> </div>	





Waste Verification Form



Waste Verification Form

WVF # \_\_\_\_\_ A2250

**WASTE VERIFICATION FORM**

126 Quamina and Carmichael Streets,  
Georgetown Guyana  
Tel: +592-501 0620

**GENERATOR INFORMATION**

Generator: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Contact Information: Office \_\_\_\_\_ Mobile \_\_\_\_\_ Email \_\_\_\_\_  
 Contact Person \_\_\_\_\_ Position \_\_\_\_\_

Storage Unit	Waste Information/ Variances	Quantity
	Waste Description: _____ Variances: _____ Comments: _____	Gallons: _____ Barrels: _____ Cubic meters: _____ Pounds: _____
	Waste Description: _____ Variances: _____ Comments: _____	Gallons: _____ Barrels: _____ Cubic meters: _____ Pounds: _____
	Waste Description: _____ Variances: _____ Comments: _____	Gallons: _____ Barrels: _____ Cubic meters: _____ Pounds: _____
	Waste Description: _____ Variances: _____ Comments: _____	Gallons: _____ Barrels: _____ Cubic meters: _____ Pounds: _____

WMF: \_\_\_\_\_  
 WGI: \_\_\_\_\_

This is to verify that description and volume of the received waste is  /  is not consistent with the volumes and type dispatched from the Generator's Facility

Verification by (TIGS Personnel) \_\_\_\_\_ Customer Representative \_\_\_\_\_

Date: \_\_\_\_\_ Date: \_\_\_\_\_

Issue Date: 10<sup>th</sup> April, 2015  
Rev 1.0

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EF-016.00



Internal Waste Movement Form



INTERNAL WASTE MOVEMENT FORM

DATE OF WASTE REMOVAL (DD/MM/YYYY): \_\_\_\_\_

DATE OF WASTE TRANSFER (DD/MM/YYYY): \_\_\_\_\_

GENERATOR INFORMATION

WASTE GENERATOR NAME: \_\_\_\_\_

WASTE DESCRIPTION:  HAZARDOUS  NON -HAZARDOUS

PHYSICAL STATE:  SOLID  LIQUID  SLUDGE OTHER \_\_\_\_\_

COLOR: \_\_\_\_\_ ODOR: \_\_\_\_\_

MANIFEST REFERENCES

WMF: \_\_\_\_\_

WGI: \_\_\_\_\_

WASTE TRANSFER INFORMATION			
REMOVED		TRANSFERRED	
SERIAL #/ LOCATION	QUANTITY	SERIAL #/ LOCATION	QUANTITY

JOB SUPERVISOR : \_\_\_\_\_

DATE: \_\_\_\_\_

TRANSPORTER : \_\_\_\_\_

DATE: \_\_\_\_\_

ENVIRONMENTAL REP : \_\_\_\_\_

DATE: \_\_\_\_\_

DIVISION SUPERVISOR \_\_\_\_\_

DATE: \_\_\_\_\_





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**Chain of Custody**

CLIENT SAMPLE IDENTIFICATION		SAMPLING DATE/TIME		REQUESTED ANALYSIS						MATRIX (W.S.O)	# OF CONT.	COMMENTS	ECOTOX ID
1.													
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													



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### Waste Manifest Form



125 Quamina and Carmichael Streets  
Tel: +592-501 0620  
E-mail: sales@tigertankstrinidad.com/jobs.guyana@tigertankstrinidad.com  
Website: www.tigertankstrinidad.com

Form # A 1650

#### WASTE MANIFEST FORM

PLEASE PRINT IN BLOCK LETTERS UNLESS INSTRUCTED OTHERWISE

1. GENERATOR+S NAME:	A. GENERATOR+S ADDRESS:
2. TRANSPORTER NAME:	B. GENERATOR+S PHONE NO.:
3. DESIGNATED DISPOSAL FACILITY NAME:	C. TRANSPORTER ADDRESS:
	D. TRANSPORTER PHONE NO.:
	E. DESIGNATED FACILITY ADDRESS:
	F. DESIGNATED FACILITY PHONE NO.:
	G. DESIGNATED FACILITY CONTACT PERSON:

4. GENERAL DESCRIPTION OF WASTE	DISPOSAL METHOD	UOM (bbl, lbs, etc)	QTY

5. WASTE PROPERTIES:

PHYSICAL STATE    Solid    Semi-solid    Powder    Liquid    Other: \_\_\_\_\_

COLOR    Describe \_\_\_\_\_

ODOR    Describe \_\_\_\_\_

FLASH POINT, °C    \_\_\_\_\_

USED OILS PRESENT?    YES    NO

MSDS SUPPLIED?    YES    NO

OTHER INFORMATION: \_\_\_\_\_

6. WORK TIME:

A. TIME LEAVE TTTU BASE: \_\_\_\_\_    E. TIME LEAVE JOB LOCATION: \_\_\_\_\_

B. TIME ON JOB LOCATION: \_\_\_\_\_    F. TIME ARRIVE AT DISPOSAL SITE: \_\_\_\_\_

C. TIME START VACUUMING: \_\_\_\_\_    G. TIME LEAVE DISPOSAL SITE: \_\_\_\_\_

D. TIME STOP VACUUMING: \_\_\_\_\_    H. TIME RETURNED TO TTTU BASE: \_\_\_\_\_

ADDITIONAL COMMENTS / STANDBY:    YES    NO

7. GENERATOR DECLARATION: I HEREBY DECLARE THAT THE CONTENTS OF THIS CONSIGNMENT ARE FULLY AND ACCURATELY DESCRIBED ABOVE. I HAVE DONE AS MUCH AS IS REASONABLY PRACTICABLE TO MINIMIZE MY WASTE GENERATION AND, AS LISTED IN MY WASTE MANAGEMENT PROGRAM, I AM UTILIZING THE BEST WASTE MANAGEMENT METHOD THAT IS AVAILABLE AND AFFORDABLE TO MY COMPANY.

GENERATOR REPRESENTATIVE NAME (PRINT)    GENERATOR REPRESENTATIVE (SIGNATURE)    DATE (DD/MM/YY)

8. TRANSPORTER ACKNOWLEDGEMENT OF RECEIPT OF WASTE:

TRANSPORTER REPRESENTATIVE NAME (PRINT)    TRANSPORTER REPRESENTATIVE (SIGNATURE)    DATE (DD/MM/YY)

9. DESIGNATED DISPOSAL FACILITY OPERATOR ACKNOWLEDGEMENT OF RECEIPT OF WASTE AT SITE:

FACILITY REPRESENTATIVE NAME (PRINT)    FACILITY REPRESENTATIVE (SIGNATURE)    DATE (DD/MM/YY)



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Sampling Report/ Testing Results

**ECOTOX** Environmental Services Ltd.

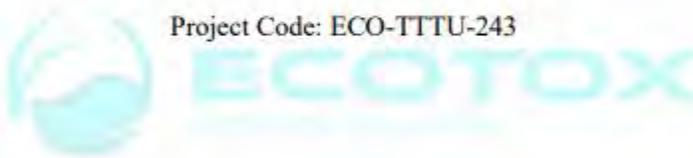
Incinerator 4 Treated Waste (16<sup>th</sup> November 2020)

Quality Analysis Report

Date of Report: 28<sup>th</sup> December 2020

Client: Tiger Tanks Trinidad Unlimited

Project Code: ECO-TTTU-243



Test Conducted By:



213 Caroni Savannah Road, Charlieville, Chaguanas, Trinidad, W.I.  
Tel.: (868) 672-6620 Fax: (868) 665-8620 E-mail: admin@ecotoxes.com, www.ecotoxes.com

*Nafeesa J. Ali*

*Mikael Dookie*

Nafeesa Ali

Mikael Dookie

Laboratory Manager

Operations Manager/Chemist



**Date of Report:** 28<sup>th</sup> December 2020  
**Client:** Tiger Tanks Trinidad Unlimited  
**Client Address:** La Bideo Estate, La Brea, Trinidad, W.I.  
**Project Code:** ECO-TTTU-243  
**Report No.:** 243

### 1.0 Introduction

ECOTOX Environmental Services Limited (ECOTOX) was contracted by Tiger Tanks Trinidad Unlimited (TTTU) to conduct analysis of one Incinerator 4 Treated Waste sample for TCLP<sup>1</sup> Extracted Heavy Metals, Total Oil and Grease and Total Petroleum Hydrocarbons. Samples were logged into the ECOTOX sample tracking system and assigned sample identification numbers (Table #1). The samples were appropriately stored until the tests were initiated.

**Table #1: Client I.D. and Sample Details**

Client Sample ID	ECOTOX Sample ID	Sample Collection Date / Time
Incinerator 4 Treated Waste	2002003	16 <sup>th</sup> November 2020 / 3:00 p.m.

The samples were collected from the Tiger Tanks Guyana Rentals Inc. Waste Processing Facility, Guyana, by a representative on the 16<sup>th</sup> November 2020. Samples were collected and preserved according to recommended procedures as stipulated in the United States Environmental Protection Agency Methods for the requested parameters. The samples were appropriately stored in a cooler, on ice at  $4 \pm 2^{\circ}\text{C}$ , for transportation to the laboratory. The samples were received by ECOTOX on the 7<sup>th</sup> December 2020. On receipt by the laboratory, samples were logged into the ECOTOX sample tracking system and assigned sample identification numbers. The samples were appropriately stored (refrigerator  $4 \pm 2^{\circ}\text{C}$ ) until the tests were initiated.

<sup>1</sup> Toxicity Characteristic Leaching Procedure - a sample extraction method for chemical analysis employed as an analytical method to simulate leaching through a landfill.



**2.0 Results**

Tests were done in accordance with those stipulated in the Standard Methods for the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) and the United States Environmental Protection Agency Standard Methods for the requested parameters. Standard test procedures were followed for all analyses conducted with several quality control measures implemented for each parameter investigated. The results for the requested analyses are listed below in Table #2. Replicate analyses, blanks, spikes and standard reference materials were included during tests to assess the accuracy and precision of the analytical results obtained. Refer to Appendix A for method description and quality control and assurance measures. Refer to Appendix B, for Chain of Custody/Sample Receipt information.

**Table #2: Waste Characterization Results**

Parameter	Maximum Permissible Limit (mg/Kg)	2002003 Incinerator 4 Treated Waste 16 <sup>th</sup> November 2020
Total Petroleum Hydrocarbons (mg/Kg)	Not Listed <sup>2</sup>	714.0
Total Oil & Grease (mg/Kg)	< 3% or < 30,000 ppm <sup>2</sup>	1,408.1
TCLP Extractable Arsenic (mg/L)	5.0 mg/L <sup>3</sup>	< 0.005
TCLP Extractable Barium (mg/L)	100 mg/L <sup>3</sup>	1.762
TCLP Extractable Cadmium (mg/L)	1.0 mg/L <sup>3</sup>	< 0.005
TCLP Extractable Chromium (mg/L)	5.0 mg/L <sup>3</sup>	0.008
TCLP Extractable Lead (mg/L)	5.0 mg/L <sup>3</sup>	< 0.005
TCLP Extractable Mercury (mg/L)	0.2 mg/L <sup>3</sup>	< 0.005
TCLP Extractable Selenium (mg/L)	1.0 mg/L <sup>3</sup>	< 0.005
TCLP Extractable Silver (mg/L)	5.0 mg/L <sup>3</sup>	0.035
TCLP Extractable Zinc (mg/L)	Not Listed <sup>3</sup>	7.938

<sup>2</sup> Louisiana Administrative Code (LAC), Title 43, part XIX, Office of Conservation – General Operations Subpart 1. Statewide Order No. 29-B; Section 313, E, Burial or Trenching of Treated Pit Solid Phase Contents – Pit Closure Techniques and Onsite Disposal of Exploration and Production Waste Standard (November 2019).

<sup>3</sup> TCLP United States Environmental Protection Agency Resource Recovery and Conservation Act, RCRA-8 Metals Maximum Permissible Limits (Maximum Concentration of Contaminants).



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Journey Management Form

**TIGER RENTALS**  
*PROVIDING UNMATCHED SERVICE OUTSIDE THE TANK*

**JOURNEY MANAGEMENT FORM**  
 TIGER RENTALS 10000 Highway 100, Unit 101, West Jordan, UT 84088

104-237  
 LAMBER Industrial Equip  
 La Jolla, Trinidad, West India

Date: \_\_\_\_\_

Driver	License #	Passenger	Supervisor	Police Escort Required	Yes/No
Name:				Contacted	Yes/No
Location		Approved Route Taken		Est. Time	Act. Time
Departure					Fuel
Destination					

State Yes, No or explain where necessary

\*Route been pre-determined with the supervisor?  Yes  No

\*Do you have adequate communication with local authorities and your supervisor?  Yes  No

\*Do you have all valid documents/ certificates in your possession for this journey?

License  Yes  No Insurance  Yes  No Truck/ Trailer Certificates  Yes  No

Inspection Stickers  Yes  No Transport Board Approval  Yes  No

\*Are you well rested and alert for the journey?  Yes  No If NO- did you notify your supervisor?  Yes  No  
 (Driver must NOT be sent if they are fatigued, they must be sent home to rest and be replaced by another driver)

**Emergency Supplies**

Spill Response Kit  Yes  No First Aid Kit  Yes  No Fire Extinguisher  Yes  No

MSDS  Yes  No Cargo Manifest  Yes  No

IF NONE/ Any Missing, inform the supervisor \*Has the issue been rectified?  Yes  No

\*Has the Vehicle Checklist been completed and the vehicle found to be roadworthy?  
 IF NONE/ Any Missing, inform the supervisor \*Has the issue been rectified?  Yes  No

\*Has the Driver taken Drugs (prescribed/ other)?  Yes  No \*Is the driver taking any medication?  Yes  No

If Yes to any of the above, please explain: \_\_\_\_\_

**Possible Hazards to be encountered for this journey**

\*Weather conditions: Storm  Yes  No Flooding  Yes  No Landslides  Yes  No

OTHER \_\_\_\_\_

\*Poor Road Conditions (State Area) \_\_\_\_\_ \*Driving at night?  Yes  No

\*Poor/Reckless driving habits from other drivers  Yes  No

OTHER \_\_\_\_\_

\*Were these Hazards reported to, and reviewed with your supervisor?  Yes  No

**LIFE SAVING RULES**

No consumption of alcohol or drugs while working or driving

Always wear your seat belt

Do not use your phone or exceed speed limits while driving

Follow prescribed Journey Management Plan as outlined

**EMERGENCY CONTACT NUMBERS**

Police: 911 Ambulance: 913 Fire: 912

Anthony: 387-1030 Denis: 384-9368

Completed by (Block Letters) \_\_\_\_\_ Reviewed by (Block Letters) \_\_\_\_\_

Completed by (Signature) \_\_\_\_\_ Reviewed by (Signature) \_\_\_\_\_

Date \_\_\_\_\_ Date \_\_\_\_\_

45.035 Rev 01 August 20



VIR Inspection Checklist



VIR Inspection Checklist		
Inspection	Comments	Corrective Actions
Ensure electrical connections within the VIR control are intact		
Ensure electrical connections within the lids are intact		
Inspect pipelines for any leaks		
Inspect lid gaskets for leaks		
Inspect for buildup of material in stainless steel hoses		
Inspect housing of VIR unit		
Inspect housing of element		
General		
Inspect incinerator for wear on housing		
Inspect refractory within the oxidizer		
Inspect burner for malfunction		
Observe ID fan for abnormal sounds		
Ensure quench pump is functional		
Inspect sump to determine quantity		
Inspect diesel piping to oxidizer		

Notes:

- 1) Test and identify status of heating elements before startup and/ or during routine maintenance. (go to page 2).
- 2) Identify newly installed heating elements before startup
- 3) Use Key below to identify status of heating element
- 4) Normal ohm reading @ 98.2 -104 ohms; Faulty ohm range - fluctuating readings or 0 ohms

STATUS	IDENTIFICATION
NEW	✓
EXISTING & FUNCTIONAL	#
FAULTY	X
THERMOCOUPLE HEATING ELEMENT	T

Inspected By: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed By: \_\_\_\_\_ Date: \_\_\_\_\_

Received By: \_\_\_\_\_ Date: \_\_\_\_\_

Operational Hours: \_\_\_\_\_

Shift: \_\_\_\_\_



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**Daily Forklift Checklist**



**DAILY FORKLIFT CHECKLIST**

Inspection	X ✓	Comments	Corrective Action
1 Check and record oil level			
2 Check and record breaks fluid			
3 Check and record hydraulic fluid			
4 Check and record power steering fluid			
5 Check coolant			
6 Check battery Water			
7 Check diesel			
8 Inspect condition of forklift			
9 Inspect windshield			
10 Inspect tire condition			
11 Check mirrors			
12 Inspect body of forklift			
13 Check reverse alarm			
14 Check head lights			
15 Check park lights			
16 Check right indicator lights			
17 Check left indicator light			
18 Check reverse lights			
19 Check revolving light			
20 Check breaks lights			
21 Check Up /Down mass			
22 Check Left / Right mass			
23 Check Forward / Backward mass			
24 Check mass hydraulic Ram			
25 Check mass chain			
26 Check horn			
27 Ensure battery is secured			
28 Check seat belts			
<input type="checkbox"/> BIG FORKLIFT <input type="checkbox"/> SMALL FORKLIFT			✓ - Conforming X- Non-conforming
Operational Hours & Mileage:			

EQUIPMENT INSPECTED BY

SUPERVISOR ON DUTY

PRINT NAME:

PRINT NAME:

PRINT NAME:

SIGNATURE:

SIGNATURE:

SIGNATURE:

DATE/ TIME:

DATE/ TIME:

DATE/ TIME:



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**Example of Job Safety Analysis Form (Incinerator Operation)**



**JOB SAFETY & ENVIRONMENTAL HAZARD ANALYSIS FORM**

JOB SITE LOCATION: \_\_\_\_\_

DATE: \_\_\_\_\_

TIME: \_\_\_\_\_

JOB TYPE: Incinerator Use

SAFE WORK PERMIT required? (Y/N) (circle)

(Permit required for hot work, confined space entry, excavation/trenching, hazardous materials, and elevated work)

SITE CONDITIONS: (check all applicable)

Fair weather

Rainy weather

Traffic on site

Noise exposure

Pits/ponds present

Buildings/structures

**HAZARD IDENTIFICATION, DISCUSSION AND RECOMMENDATIONS:**

ACTIVITIES	HAZARDS IDENTIFIED	RECOMMENDATIONS
Conduct toolbox talk	Unknown/ Unauthorized persons in area	Ensure that Supervisors address all safety concerns. Discuss JSAs and SOPs
Secure waste using forklift and Loading Incinerator	Mechanical Failure; collisions; spill of content due to improper maneuver and lifts; exposure to waste; Repetitive movements; Pinch points	Conduct pre-job inspections of Forklift. Have qualified banksman to guide forklift. Ensure path is cleared to avoid collisions. Wear appropriate PPE for the waste being loaded.
Light Burners	Mechanical and Electrical Failure; Fire/ smoke exposure	Conduct pre-job inspections of Incinerator. Ensure door to burner is properly sealed.
Monitor Unit	Fire; Mechanical, Electrical failure; Mechanical Failure due to spikes in temperature; Heat exposure/ burns	Monitor temperature and make necessary adjustments as required Wear appropriate PPE (thermal apron, gloves)
Emptying Incinerator (opening and closing of incinerator door)	Exposure to dust and heat.	Do not empty incinerator until temperature has cooled. Wear appropriate PPE (thermal apron, gloves, dust mask, face shield)



**HSE Equipment Maintenance Log**

Serial No.	Location	Quantity	Expiry Date	Frequency of Inspection	Method of testing	Name of inspector	Deficiency found during test	Corrective action	Status
DRWN 2789	PPE Stores container	1	16-Nov-21	1YEAR	Hydro Test	Survival Systems Ltd.	None		Good
BRWN 0812	PPE Stores container	1	16-Nov-21	1YEAR	Hydro Test	Survival Systems Ltd.	None		Good
BRWN 2849	PPE Stores container	1	16-Nov-21	1YEAR	Hydro Test	Survival Systems Ltd.	None		Good
<b>LANYARD</b>									
Serial No.	Location	Quantity	Expiry Date	Frequency of Inspection	Method of testing	Name of inspector	Deficiency found during test	Corrective action	Status
022420-011	PPE Stores container	1	April, 2021	6 MONTHS	Visual	JAGUAR	None		Good
110519-039	PPE Stores container	1	April, 2021	6 MONTHS	Visual	JAGUAR	None		Good
17-3318647	PPE Stores container	1	January, 2021	6 MONTHS	Visual	JAGUAR	None		Good
551439-141	Tank Cleaning Container	1	October, 2020	6 MONTHS				Needs external certification	
170487	PPE Stores container	1	April, 2021	6 MONTHS	Visual	JAGUAR	None		Good
10032833	PPE Stores container	1	April, 2021	6 MONTHS	Visual	JAGUAR	None		Good
019212316	PPE Stores container	1	April, 2021	6 MONTHS	Visual	JAGUAR	None		Good
551439-155	Issued to Pug mill crew	1	April, 2021	6 MONTHS	Visual	JAGUAR	None		Good
<b>RESCUE ROPE</b>									
Serial No.	Location	Quantity	Expiry Date	Frequency of Inspection	Method of testing	Name of inspector	Deficiency found during test	Corrective action	Status
TTU-SR-03	Tank Cleaning Container	1	28-Oct-19	1YEAR	Pull Test	Trinidad Inspection Services Ltd	None		Good
<b>GAS MONITOR</b>									
Serial No.	Location	Quantity	Expiry Date	Frequency of Inspection	Method of testing	Name of inspector	Deficiency found during test	Corrective action	Status
MA 218-000268	Trinidad	1	3-Apr-21	3 MONTHS	Calibration	Analytical Testing Services Limited	None		Good
GAS PRO - 462398J04-00	Trinidad	1	7-Jul-20	3 MONTHS	Calibration	Trinidad Inspection Services Ltd		sent for external certification	
<b>PERSONAL MONITOR</b>									
Serial No.	Location	Quantity	Expiry Date	Frequency of Inspection	Method of testing	Name of inspector	Deficiency found during test	Corrective action	Status
893044975RN	Guyana	1	9-Mar-21	3 MONTHS	Calibration				
893051497RN	Trinidad	1	5-Jan-21	3 MONTHS	Calibration	Analytical Testing Services Limited	None	sent for external certification	
893044973RN	Guyana	1	9-Mar-21	3 MONTHS	Calibration				
893051498RN	Trinidad	1	3-Jan-21	3 MONTHS	Calibration	Analytical Testing Services Limited	None	sent for external certification	
<b>FIRE EXTINGUISHER</b>									
Serial No.	Location	Quantity	Expiry Date	Frequency of Inspection	Method of testing	Name of inspector	Deficiency found during test	Corrective action	Status

Copies of all records, checklist daily toolbox meetings, manifests, internal site permits etc. are available at the site for review as required.



## **Appendix 2: Operation and Safe Work Procedure – Vertical Infrared System (VIR)**

### **Purpose**

This procedure was developed to ensure the safe and efficient operation of the Vertical Infra-Red Unit (V-IR) and includes:

- To define the procedures for operation of the V-IR
- To ensure that Environmental and Health & Safety considerations are included as part of the operating procedures
- To clearly define the responsibilities of personnel responsible for the operation of the V-IR Unit

### **Scope**

- Start-up Procedure
- Standard Operational procedure
- Operational Parameters
- Standard and Emergency shutdown Procedures

### **Responsibilities/Authorities**

The General Manager has the responsibility and authority for ensuring resources are available for implementation of this procedure.

The Operations Manager has the responsibility for ensuring implementation of this procedure for Virtual Infra-Red (VIR) Operations.

Thermal Equipment Technician is responsible for receiving and treating waste which will be processed via Thermal Remediation, ensure that accurate paperwork and documentation is received with waste.

The Thermal Equipment Technician operates the V-IR Desorption Unit in accordance with all health and safety compliance requirements and documents the remediation of waste daily.

The Technical Service Coordinator is responsible for identification of waste to be treated & coordinate with the operations person on the execution of task.



The Compliance Coordinator is responsible for ensuring samples are taken and analyzed and ensure all quality control checks/ assurance are achieved before discharge.

### **Procedure**

#### Personal Protective Equipment Needed:

- Fire Retardant Coveralls
- Steel Toed Safety Shoes
- Rubber boots
- Full face respirator
- Hard Hat
- Safety Glasses
- Workmen's gloves- heat resistant/ temperature resistant
- Rubber gloves
- Harnesses no one uses a harness
- Spill kit
- Ear Protection

#### Equipment Required:

- VIR Box
- VIR lids
- PLC System
- Oxidizer
- Burners
- ID Fans
- Centrifugal pumps
- Cooler / Quench
- Scrubber
- Stack
- Forklift
- Fire Extinguishers
- Fire Pump
- Compressor
- Generator

The following outlines the procedure for the operation, and maintenance of V-IR Thermal Unit and identifies possible hazards and preventative control measures that should be implemented to keep these hazards at a minimum.



## **Pre start-up**

### Generator and Air Compressor

#### **4.1. Step 1**

Before removing the V-IR's lid, ensure the internal temperature of the box is between 70-100° F. This can be verified by the thermocouple present on two ends of the V-IR box. The temperature can be seen on the panel of the temperature reader.

Binders on the box are then released and removed accordingly. Lids are then removed from the V-IR box while ensuring the pillars (legs) of the lids are placed on a clean/level surface in such a way as not to put any pressure on the heating element housings.

#### **4.2 Step 2**

##### **V-IR Loading**

1. Prior to loading the V-IR with sludge, check to make sure that there is no damage to the inside of the V-IR.
2. Check to make sure that the element housings (pipes) are in their individual positions, straight and secured.
3. Fill the V-IR with sludge using either the excavator or vacuum pump to within 8 to 10 inches from the top. Be sure to load the unit evenly. (Nb. The door has been permanently sealed off.)
4. Clean off the top edges of the unit where the lid closes against the lid gasket.
5. Insert the lid being careful to fit each of the lid's legs into its respective groove.
6. Manually using chain & binder ensure the lid seals firmly against the lid gasket.

#### **4.3. Step 3**

##### **Startup**

Check to confirm that the V-IR's Power Control Panel door(s) is properly closed and locked. Turn the main power disconnect switch (photo 2) "on" position - this will energize the V-IR's Power Control Panel.

Turn the V-IR's Power Control Panel's control selector switch to "setup" and verify that the WATLOW EZ-Zone Temperature & set safety Selector switch to automatic. Controller is showing both the current element temperature and the set-point temperature (see photo 3).

Using the control wheel, set the set point temperature on the WATLOW Limit-LV to 850 ° F



Use the up and down arrows on the WATLOW EZ-Zone Temperature Controller to adjust the set-point temperature to 800 ° F.

Turn the control selector switch to “on” (this energizes the heating elements and begins the sludge treatment cycle).

As the sludge begins to heat, it will produce steam. Once steam pressure builds within the V-IR, startup the off-gas treatment equipment.

Once every hour, increase the set-point temperature by 100 ° F on both controllers (starting with the WATLOW Limit-LV) until it reaches 1350 ° F.

Note: When changing the set-point temperature of the WTLOW EZ-Zone controller, remember to first turn the V-IR’s Power Control Panel’s control selector switch to the set position.

#### **4.4. Step 4**

##### **Monitoring During Treatment**

During a treatment cycle, it is necessary to periodically monitor the following:

1. Confirm – scrubber water level and ph Output of the V-IR power control panel
2. Liquid level in the scrubber
3. Keep vacuum pressure between ¼” & ½” water column
4. Testing sludge temperatures
5. Steam leakage
6. Check Heating elements (once per batch)

##### **Output of the V-IR power control panel**

If possible, the output temperature of the WATLOW EZ-Zone Temperature Controller should be observed at least once every ½ hour during operation. The need for hourly observation is simply to ensure that the controller has not tripped the high limit controller and shut down power to the heating elements.

##### **Liquid Level in the scrubber**

This level can be monitored via the clear plastic sight glass located on the scrubber. This value should intermediate between 16 – 20 inches of liquid from the bottom of the scrubber tank to the top of the side glass. Like the output of the temperature controllers, the water level should be monitored every thirty minutes.

Old System) ID is usually operated at 50- 55%. Oxidizer temperature is usually kept between 1400 to 1550 °F.



### Sludge temperatures

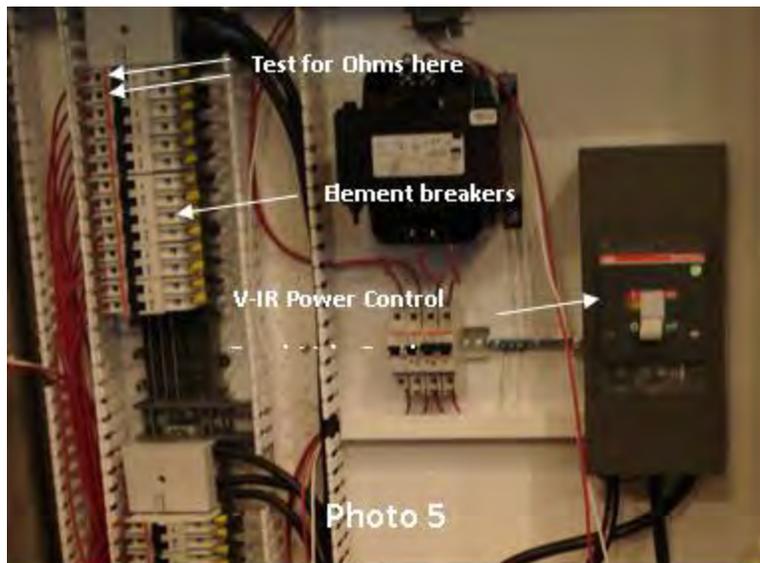
Sludge temperature is periodically check using the thermocouples which are inserted into the VIR box before the burn commence. The temperature is recorded on the control panel to determine the progress of treatment.

### Checking for steam leaks

Visually inspect the V-IR unit for steam leaks. Typically, if there is a vapor leak, it is caused by too much positive pressure within unit. To stop the leak, increase the draft.

### Checking Heating Elements after burn is completed.

1. Turn the main power disconnect switch (photo 2) to the “off” position.
2. Open the panel door
3. Turn the V-IR’s Power Control Panel Main Breaker (photo 5) to the “off” position.
4. Switch all the element breakers to the “off” position.
5. Use a Multi-meter to check the Ohm’s reading on the element side (left) of each breaker. The Ohm readings should be around 90 to 110 Ohms each.
6. Once you have taken the readings, turn the breakers back to the “on” position, turn the V-IR’s Power Control Panel Main Breaker to the “on” position, close the panel door and turn the V-IR back on.





#### **4.5. Step 5**

##### **Shutdown**

When sludge temperatures indicate that a batch is completed (typically, soil/sludge temperatures between 350° and 600° F), the V-IR Power Control Panel's control selector switch can be switched to the "off" position. This is done manually by inserting a probe at the bottom of the box, once the probe comes out dry the process is completed. During the cool down process, the internal temperatures of the processed materials are monitored & once the temperature is less than 250° F & power is disconnected.

Switch each V-IR's main 200 amp disconnect panel to the "off" position.  
Disconnect the electrical feed lines that connect the V-IR's Power Control Panel to the V-IR lids.  
Disconnect the flexible exhaust hoses that connect the V-IR's lids to the off-gas treatment equipment.

Remove thermocouple probes from the sludge. CAUTION: These thermocouple probes will be hot from exposure to the sludge.

The unit is ready to be open using a forklift. The lids are hoisted off the V-IR box and materials "knock off" and lids are placed on a level surface.  
Processed material is cool for approximately 8 to 12 hours.

#### **4.6. Step 6**

##### **Unloading the V-IR**

CAUTION: If combustible material inside the V-IR is heated and then exposed to oxygen, it may combust. Keep fire suppression equipment or a water supply nearby in case it is needed to cool the sludge or extinguish any combustible material.

##### **Lid Removal**

Use CAUTION when opening the lid clamps, be sure to wear gloves to protect hands from hot air and/or steam inside the V-IR and also to wear proper breathing apparatus should there be remnant hazardous gases. Remove the lid.

CAUTION: Any equipment that is exposed to the treated solids or to the inside of the V-IR will get hot. This includes but is not limited to heavy equipment buckets, lifting harnesses or chains and hand shovels

CAUTION: The treated solids that are emptied from the V-IR are hot. Do not touch the solids or place anything on them until they have had adequate time to cool.



**CAUTION:** Take care to empty the V-IR slowly. This will help reduce the amount of dust that is created by the flow of treated solids.

### **Sludge Sampling**

It is recommended that a sludge sample (for each batch) be pulled prior to treatment. This sample should be retained until post-treatment sampling results have been reviewed. If post-treatment results indicate that treatment levels have not been met, the pre-treatment sample may be sent to the laboratory to verify pre-treatment contamination levels.

Post-treatment sampling should be performed once the V-IR has been emptied. If sampling is done immediately after treatment, samples may have to be allowed to cool prior to placing into sample containers.

What follows is a listing of some safety CAUTIONS. This list is not intended to be comprehensive of all such issues but simply examples.

#### **4.7 Refilling Box / Loading Procedure**

1. *Ensure the level in the box is below 2" ball valve which estimated 40bbls have completed processing.*
2. *Lower temperature of the box to 500F before re-filling the box*
3. *Connect pipework from source (waste storage medium) to 2" ball valve on VIR Box*
4. *Once pipework is secured, open ball valve and slowly feed material into the VIR Box- approximately 5 bbl/ min. Monitor pipework for any leaks.*
5. *Monitor box for any variations or signs of over pressure, i.e. lids raising, fluctuations in temperature*
6. *When box has been filled to desired level, close ball valve and disconnect pipework. Ensure all leaks are contained*

*Resume increasing temperatures as outlined in step 3 of the procedure.*

### **5.0. SAFETY PRECAUTIONS**

THE V-IR SHOULD BE OPERATED ONLY IN FULL COMPLIANCE WITH ALL APPLICABLE PROVISIONS OF 19 CFR PART 1910, AND ANALOGOUS OR RELEVANT AND OR APPLICABLE STATE LAWS.

#### **Inclement weather operation**

The V-IR units are designed to operate under most weather conditions; however, they should not be energized during any weather conditions that could cause damage to the V-IR because of falling or blowing debris. In addition, they should not be energized during rain events that might cause flooding.

#### **Lockout/Tagout**



Follow all applicable lockout/tagout procedures of 29 CFR 1910. 147 and analogous state laws.

**V-IR Power Control Panel Access**

Do not unlock or open the V-IR’s Power Control Panel door without following the lockout/tagout procedure for maintenance/repairs.

**Operating Temperature**

Do not operate the Chromalox 1604 Temperature Controller output setpoint over 1550 F.

Lifting hazards

Wear hard hats

Use load-certified lifting harnesses

**High temperatures**

Do not climb inside a V-IR after sludge treatment unless it is empty and has had at least 24 hours to cool. The V-IR’s interior and exterior can store heat from treatment – use CAUTION when working around the unit. After treatment, sludge temperatures are high, use CAUTION when working around treated sludge.

**Emissions**

Do not touch the V-IR’s flexible exhaust hoses or the exhaust steam/air. The exhaust steam/air is very hot. Avoid breathing of emissions from any exhaust stack.

**6.0. MAINTENANCE**

There are a few components of the V-IR that require routine maintenance. These components include:

V-IR’s Power Control Panel

Lid seal gaskets

Exhaust Manifold

V-IR’s Exterior

**1. Weekly**

Each week, after following proper lockout/tagout procedures of 29 CFR 1910. 147, ensure that all electrical connections within the V-IR’s Power Control Panel are tight.

**2. Bi-weekly**

Follow proper lock-out/tag-out procedures and check that all electrical connections are tight inside the V-IR’s Power Control Panel

**3. Monthly**



### **Lid seal gaskets**

If the V-IR is being used continuously, it is recommended that the lid seal gaskets be replaced. The need to replace these gaskets will be indicated by their ability to seal the lid and contain steam during operation. If the gaskets are not damaged, monthly replacement may not be necessary.

### **Exhaust Manifold**

Remove the 4” flexible stainless steel exhaust hose from the V-IR’s exhaust manifold and inspect the inside for solids. Clean it out if necessary so that the exhaust can flow out without obstructions.

### **V-IR’s exterior**

Each month, when the V-IR is not in use, the V-IR’s exterior should be washed with soap and water.

## **7.0. INSPECTIONS**

After each batch, the following should be visually inspected for any defects:

- Lid Clamps
- Lid Gaskets
- Heating element housings
- Electrical feed lines

In addition, the interior and exterior of the V-IR should be visually inspected for any unusual wear and tear or metal fatigue. The interior and exterior of the V-IR Power Control Panel should also be visually inspected for any possible component failures. Prior to inspection of the interior of the Power Control Panel, be sure to follow proper lock-out / tag-out procedures.

### **Repairs**

The three main components that may need replacement are:

1. Heating Elements
2. Thermocouple Probes
3. Thermowells

### **Replacing Heating Elements**

Follow proper lock-out/tag-out procedures.

Disconnect the heating element wires from their connections (approximately 12” from where the wires enter the heater itself).

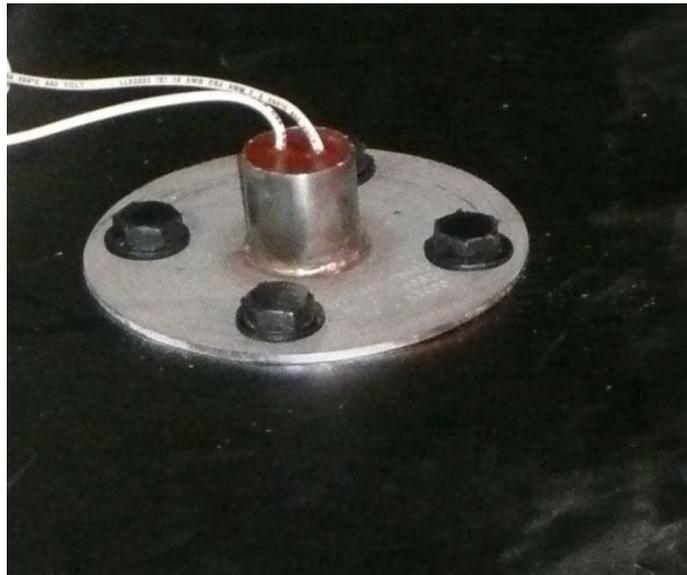


Remove the 4 bolts (photo 7) that hold the heater in place.

If there is a thermocouple probe attached to the heater, disconnect its leads at their connection.

Pull out the heating element.

Slide in a new heating element.



### **Replacing the Thermocouple Probes**

Follow proper lock-out/tag-out procedures.

Identify the thermocouple probe that is non-functional. Since the thermocouple is located within the heating element, disconnect the heating element terminals and thermocouple terminals. Remove the heating element and replace with a new “probe-containing” element. Reconnect terminals.



## 8.0. TROUBLESHOOTING

Most repairs to the V-IR can be performed on-site. Only a licensed electrician should perform any electrical repairs and/or electrical troubleshooting.

**Problem:** Heating element temperatures are falling even though the power control panel is on.

**Cause:** The high limit controller has tripped

**Fix:** Reduce the setpoint temperature or raise the high limit setting

**Problem:** High limit controller keeps tripping

**Cause:** Faulty thermocouple connections or probes

**Fix:** Check thermocouple probes and connections

Check heating element Ohm's

**Problem:** Steam is coming out of the V-IR

**Cause:** Vacuum pressure is too low

**Fix:** Increase the vacuum by adjusting the off-gas treatment equipment ID fan speed

**Problem:** Breakers tripping inside the V-IR Power Control Panel

**Cause:** Breakers are too hot because of elevated temperatures inside the V-IR Power Control Panel or heating elements are failing.

**Fix:** Shelter the V-IR Power Control Panel from the sun, check heating elements for failures.

## 9.0. EMERGENCY SPILL RESPONSE

### A. Emergency Spill Response (Loading Material)

#### **Purpose**

To provide a plan for the addressing of spills this can occur during the loading of waste materials.

If a spill should occur during loading of waste material, the TTTU personnel should assess the situation and initiate basic spill containment procedures if appropriate based on the size of the spill and the measure of the spilt material. Anyone from Management should be immediately contacted. They will ensure that any other emergency personnel is contacted based on the situation.

#### **Procedure**

1. Treat a spill as an emergency.
2. If possible, shut off the source of the spill by righting containers, plugging holes and shutting valves.



3. Immediately report any spill to:
  - a. the shift Team Leader
  - b. Managementand give the following information:
  - Location
  - Type and size of spill
  - Any spill response procedures initiated
  - Point of Contact
4. Isolate the area; prohibit vehicles and personnel from entering.
5. Contain the spill using sandbags, dirt, dry sweep, rags, etc.
6. Prevent the spill from entering drains or any water source.
7. Clean up the spill and dispose of contaminated materials in an appropriate manner according to environmental regulations

#### **b. Emergency Spill Response (Waste Treatment Facility)**

##### **Purpose**

To provide a plan for the addressing of spills on the company's facility.

##### **Preparation and planning for spills**

1. Ensure MSDS for all chemicals, waste materials for disposal or any other substance which may be spilt due to handling or use are kept both on-site and on file. A copy of the MSDS should be reviewed prior to handling or use of the material. Materials can be in the solid, semi solid or liquid form.
2. Ensure that workers that handle or use these materials receive spill response training.
3. Ensure spill absorbent material is in stock.
4. Ensure that all safe work procedures for handling or using materials are adhered to.
5. Ensure that all mitigation measures are taken to prevent and contain a spill prior to using the materials.
6. Ensure there is adequate water supply, eye wash devices and first aid material should anyone come into contact with the spilt material.
7. Dispose of spilt materials and soiled clothing in a bag which should be included in the spill response kit. Ensure that this bag is labeled to include the date of the spill and the material that was spilt.
8. Evacuation procedures as listed below in **Spill Response Procedures**, as well as emergency numbers should be posted on the notice board and on all trucks that are involved in the transportation of waste.



### **Spill response Procedures**

In the event of a spill:

1. All workers performing clean-up actions must wear the appropriate personal protective equipment depending on the material. The MSDS sheet can be used as a guide.
2. If handling liquids or semi solids, create a barrier to any drainage system by placing blocks / absorbent material to confine the material.
3. Use appropriate absorbent pads or other absorbent material to absorb spill material.
4. Place the contaminated spill absorbent in the designated container. Ensure that no leaks are present.
5. Clean area to remove remnants of spilt material.
6. Wash all clothing in contact with material; if necessary, dispose of them.
7. Dispose of contaminated spill absorbent appropriately.

### **9.0. PROCESS RISK SUMMARY**

1. Job Risk Assessment (JSA) – Operations of the Virtual Infra- Red Unit.
2. Job Risk Assessment (JSA) – Manual Handling of the Materials



### Appendix 3: Operation and Safe Work Procedure – Incinerator

#### Purpose

This procedure was developed to ensure the safe and efficient operation of the Incinerator Operations

- To define the procedures for the Incinerator Operations.
- To ensure that Environmental and Health & Safety considerations are included as part of the operating procedures
- To clearly define the responsibilities of personnel responsible for the operation of the Incinerator.

#### Scope

1. Defining responsibilities of Technician
  2. Standard operational procedure
- Maintenance / Troubleshooting

#### Responsibilities/Authorities

The General Manager has the responsibility and authority for ensuring resources are available for implementation of this procedure.

The Operations Manager has the responsibility for ensuring implementation of this procedure for Incinerator Operations.

The Plant Technician will be responsible for the following:

- Complete all required checklist , permits and inspection of equipment this includes oxidizer, burners on incinerator, fuel level, scrubber, the incinerator quench.
- A Toolbox meeting should be done before work commence.
- Complete all the documentation associated with the destruction process (D Log, Waste Location Log, Waste Manifest)
- Compliance with all Health, Safety and Environmental requirements of the facility.
- The Environmental Technician / Compliance Personnel will be responsible for the sampling of the processed material (Ash) & Analysis.



### **PPE Requirements**

- Steel Toed Safety Shoes
- High temperature – Fire retardant gloves.
- Hard Hat
- Safety Glasses
- Fire Retardant coveralls
- Spill kit

### **Equipment Requirement**

- Incinerator
- Scrubber Tank

### **Operating Procedure**

#### **Incinerator Operation**

#### **Generator Start-up**

1. Technician must inspect the plant to make sure that it is in a safe state to start. Check for any lockouts, tag outs or other isolations that are still engaged. HSE placing isolation is to remove if task is completed and safe to do so.
2. Technician must ensure Power Circuit breaker is in the OFF position.
3. Technician must Put Control panel in “MANUAL” and “start” using labelled buttons.
4. After generator starts, the display should show generated voltage levels - should be approximately 480VAC Phase-Phase and 277 Phase-Ground. This must be verified by the Technician.
5. Power System up by Turning breaker to the ON position

#### **Air Compressor Start-up**

1. Ensure all pre-check are done such as oil levels, coolant levels, Fuel levels, all air lines are inspected and intact.
2. Using the on start switch on the compressor, power on the compressor.

#### **Incinerator Operation**

1. The Technician must verify the off-gas fans are not running to send gases to each other. (applicable for operation of VIR and Incinerator). Other verifications may include ensuring



there is sufficient water supply for to cool gases in the ECC /Scrubber and no AIR FLOW restrictions.

2. Waste must be weighed and identified before loading into incinerator, maximum Incinerator capacity is 150kg per hour (Based on the type of material being processed.)
3. Switch on incinerator cooling pump, scrubber pump and ID fan. This can be done using the using the HDMI on the PLC control panel. Incinerator cooler temperature on the PLC should be set at 500 °F and ID fan speed set 30% to 40% max. The cooler temperature is monitored on the incinerator control panel. This is done every 30 minutes during operation. The burner temperature is automated in the sense that it will cut off when the temperature in the primary chamber exceeds 900 0F.
4. Switch on power to incinerator and start secondary burner (this is done by powering on switch located on the incinerator control panel, warm up secondary chamber to at least 600 °F.
5. Switch on primary burner 1 & 2 (these switches are located on the incinerator control panel) then pre-set temperature on the primary burners is 900 °F  
When this temperature is achieved in the primary chamber the burners will automatically cut off and the fire and temperatures will self - sustain until the temperature drops below 900 °F.
6. Continuously loading Incinerator - This must be done when the flames in the incinerator are at minimum, this is achieved by looking through the inspection glass. The incinerator Secondary hatch can then be safely opened by manually unscrewing the butterfly lock. Waste to be processed is then added manually in small quantities until the chamber is fill within capacity. Secondary hatch is closed manually by operator using the butterfly lock.
7. All necessary personal protective equipment must be worn.
8. Cool down incinerator - when the incineration process is completed, switch off burners and allow temperatures to drop to at least 250 °F.
9. Before opening and emptying the incinerator. The temperature must be kept below 250°F. All necessary personal protective equipment to be worn.
10. The incinerator cooling pump can be switched off during cooling down once the temperature stays below 500 °F.



11. The incinerator door is opened manually by removing wing latch. The plant technician (geared in all required Personal Protective equipment) uses a 12-foot stainless steel hoe and manually removed the processed material from the chamber into a metal tray which is placed directly below the opening of the incinerator chamber.

### **Process Risk Summary**

3. Job Risk Assessment (JSA) – Incinerator Operations
4. Job Risk Assessment (JSA) – Manual Handling of the Materials

### **Records**

1. Inspection Equipment Checklist
2. D- log
3. Job Safety Sheets
4. Analytical Results for Waste Materials
5. Temperature logs
6. Waste Location Logs



## **Appendix : 4 Operation and Safe Work Procedure – Pug Mill**

### **Purpose**

This procedure was developed to ensure the safe and efficient operation of the Pug – Milling Operations

1. To define the procedures for the Pug-milling Operations.
2. To ensure that Environmental and Health & Safety considerations are included as part of the operating procedures
3. To clearly define the responsibilities of personnel responsible for the operation of the Pug-Milling.
4. Maintenance / Troubleshooting.

### **Scope**

1. Defining responsibilities of Technician
2. Standard operational procedure

### **Responsibilities / Authorities**

The General Manager has the responsibility and authority for ensuring resources are available for implementation of this procedure.

The Operations Manager has the responsibility for ensuring implementation of this procedure for Pug-Milling Operations.

The Operator will be responsible for the following:

- Complete all required checklist, permits and inspection of equipment this includes excavator, forklift, pugmill, hopper, tools, electrical panels, mega bags.
- A Toolbox meeting should be done before work commence.
- Complete all the documentation associated with the destruction process (D Log, Waste Location Log, Waste Manifest)
- Compliance with all Health, Safety and Environmental requirements of the facility.
- Use appropriate tools to open the units that is storing the waste. Use all necessary Personal Protective Gears. Vent cargo unit for minimum 20 minutes after which a gas test is performed, once the test readings are good the pug-milling process can begin.



- NB. gas testing should be continuously done through the process, a mega bag will be securely placed beneath the pugmill to receive the process material.
- The Technical Service Coordinator is to advise on the proportion of cement that is to be added to have a uniform mixture.
- The Compliance Coordinator is responsible for all quality assurance / quality control checks.

## Procedure

### Operating Procedure

1. Selected cargo unit with waste that is to be process - the unit should be pre-selected by authorized personnel and numbers given to the pugmill team.
2. Prior to starting up the Pugmill inspection checklist is used to ensure all the necessary operational and safety requirements are in place.
3. Filling the hopper - the hopper is to be placed on the ground and will be filled using an excavator. The excavator will move the waste from the CCU to the hopper. All personnel should be a safe distance away from the excavator while the excavator is filling the hopper. The excavator puts one bucket (10 barrels) of waste in the hopper, cement is added accordingly to the waste (based on density) to have a uniform mixture.
4. Manual Mixing of cement and waste - after the excavator has placed waste and cement in the hopper. It is mixed manually using shovel to obtain a consistent mixture. All tools used should be inspected and in good condition. All necessary personal Protective equipment should be worn. The process is repeated until hopper is filled.
5. Placing hopper on pugmill - The forklift is used to place the hopper on the pugmill. The operator must ensure the grooves on the hopper and placed properly on the pugmill platform. During this process, a banksman will assist the forklift operator by giving him directions to safely place the hopper on the pugmill. At this time, no personnel should be on the pugmill platform.
6. Start Pugmill process - harness and all other necessary Personal equipment should be worn before proceeding to the pugmill platform. When operator has reached at the top of the pugmill platform 100% harness tie off should be immediately done. Personnel will then switch on the extractor fans after which the pugmill is switched on. Personnel will then begin to manually pull the material from the hopper using a hoe down into the pugmill in a uniformed and consistent manner. All moving parts (scroll & motor are all guarded.
7. There will be someone monitoring the mega bag that is collecting the pugmill waste when



the mega bag is filled the person feeding the pugmill will stop . The forklift will then carefully remove the filled mega bag, with the aid of a banks man and place it in the designated storage area, a new mega bag will put in place and the process continues.

8. Housekeeping - Housekeeping should be performed after the pugmill process is completed. The excavator, pugmill and all other equipment must be cleaned thoroughly.

### **PPE Requirements**

- Harness
- Steel Toed Safety Shoes
- Hard Hat
- Safety Glasses
- Workmen’s gloves
- Spill kit
- Respirator

### **Equipment Requirement**

- Pug-Mill
- Forklift
- Excavator

### **Process Risk Summary**

1. Job Risk Assessment (JSA) – Pug-Milling Operations
2. Job Risk Assessment (JSA) – Manual Handling of the Materials

### **Records**

1. Inspection Equipment Checklist
2. D- log
3. Job Safety Sheets
4. Analytical Results for waste materials



## **Appendix 5: Safe Work and Operating Procedure – Oil-Water Separator**

### **Purpose**

This procedure was developed to ensure the safe and efficient operation of the Oil – Water Separator

- To define the procedures for the Water Treatment.
- To ensure that Environmental and Health & Safety considerations are included as part of the operating procedures
- To clearly define the responsibilities of personnel responsible for the operation of the Water Treatment.

### **Scope**

1. Defining responsibilities of Technician
2. Standard operational procedure
3. Maintenance / Troubleshooting

### **Responsibilities/Authorities**

The General Manager has the responsibility and authority for ensuring resources are available for implementation of this procedure.

The Operations Manager has the responsibility for ensuring implementation of this procedure for Pug-Milling Operations

The Waste Technician will be responsible for the following:

- Complete all required checklist , permits and inspection of equipment this includes Oil water separator, pumps, hoses, sand filter, charcoal filter, Pod filters, discharge tank
- A Toolbox meeting should be done before work commence.
- Complete all the documentation associated with the destruction process (D Log, Waste Location Log, Waste Manifest)
- Compliance with all Health, Safety and Environmental requirements of the facility.

The Technical Service Coordinator is responsible for identification of waste & determine the best method of treatment.

The Compliance Coordinator is responsible for the sampling, analysis and all other quality assurance / quality control checks that are necessary.



### **PPE Requirements**

- Steel Toed Safety Shoes
- Hard Hat
- Safety Glasses
- Chemical Gloves
- Respirator
- Spill kit
- Coveralls / Tyvek

### **Equipment Required:**

- Oil – Water Separator
- Sand Filter
- Pod Filter
- Charcoal Tank
- Frac Tanks
- Diaphragm & Centrifugal Pumps

### **Procedure**

1. Filling the Oil -Water Separator - This is achieved by either pumping or gravity flow. All lines and connection must be secured. Before filling open the inlet and outlet valves on the oil – water separator followed by the valve on the storage tank. If a pump is being use start the inlet pump. Be certain to ensure there are no leaks.
2. Pumping from the Oil – Water Separator - When the effluent clarewell chamber is filled, and liquid begins to flow out of the outlet line/valve. Start the outlet pump & check to ensure there are no leaks.
3. Pumping to the Sand Trap Filter: As the outlet pump sends into the sand trap filter, NOTE if the sand trap filter is empty the relieve valve on the sand trap filter must be open to relieve any build-up of air pressure while filling.



4. The sand trap filter maximum pressure should not exceed 50 psi. This pressure can be monitored on the gauge at the top of the sand trap filter. Ensure there are no leaks.
5. Pods - The pressure from the sand trap filter will take the liquid through the two filter pods, which will trap any larger particles in the filtered water.
6. Pumping from POD to Charcoal tank - After flow is achieved through the Pods start the inlet charcoal pump. The valve at the top of the charcoal tank should be slightly open to avoid air pressure build up while pumping/filling the tank. Ensure there are no leaks.
7. Pumping from charcoal tank - allow the charcoal tank to fill at least halfway, then start the outlet charcoal pump. This will take the liquid to the final storage tank for testing. Ensure there are no leaks.

### **Preventative Spill Measures**

1. The entire Water Treatment system (From Oil-Water Separator into Frac Tanks) is in a bunded area.
2. Ensure Pre – Inspection equipment checklist is completed before the job commence.
3. Inspect all hoses for any sign of wear, tear, or other damages to ensure the integrity of the hose used during transfer.
4. Ensure all hoses & connections are secured tightly using the respective clamps.
5. Spill response equipment (kits) are present and easily accessible in the event of an emergency.

### **Process Risk Summary**

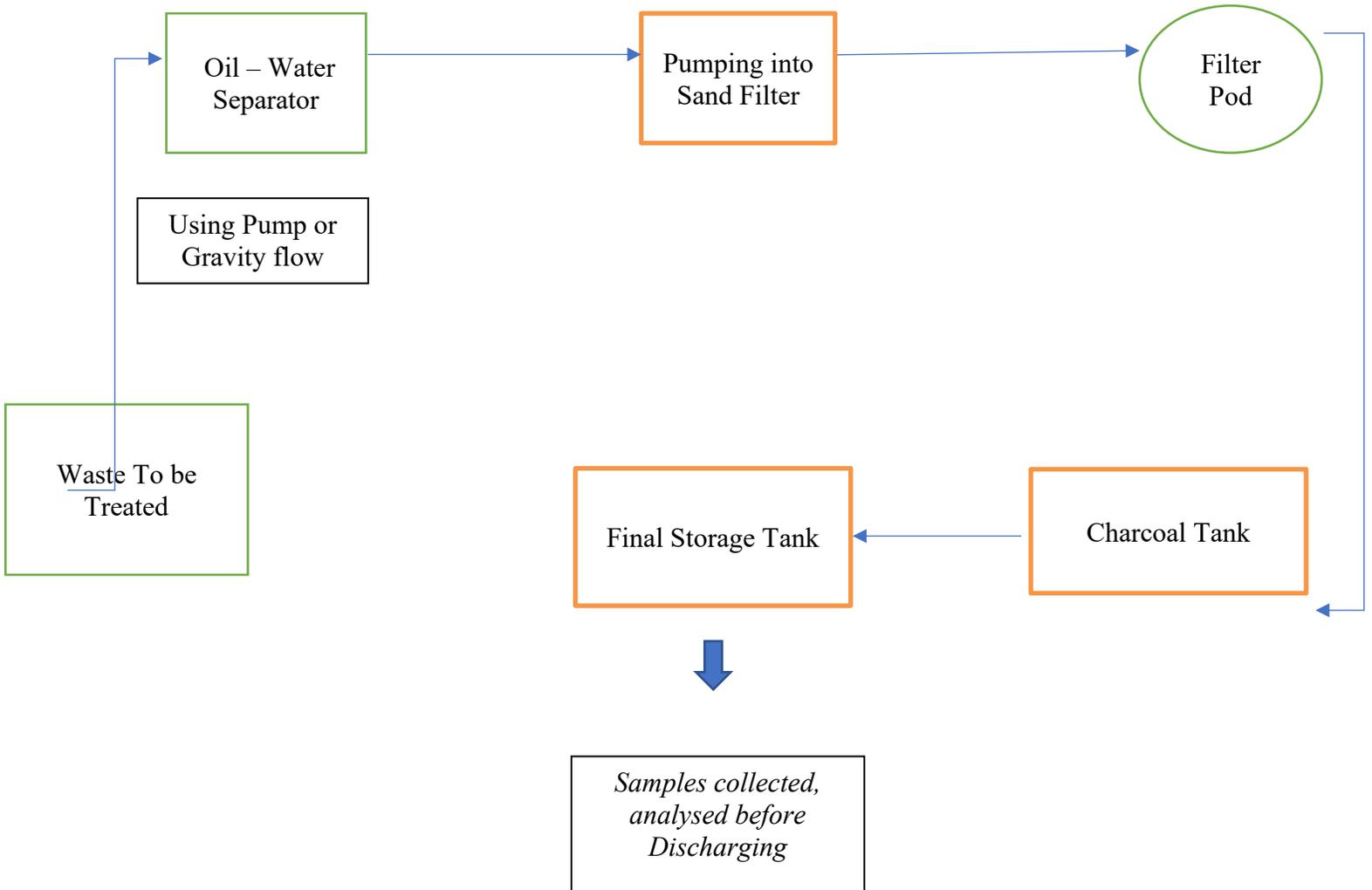
1. Job Risk Assessment (JSA) – Operation of the Water Treatment System.
2. Job Risk Assessment (JSA) – Manual Handling of the Materials

### **Records**

1. Inspection Equipment Checklist
2. D- log
3. Job Safety Sheets
4. Analytical Results for Treated waste.
5. Waste Logs



### Flow Diagram showing the stages in the Water Treatment Plant





## **Appendix 6: Operations and Safe Work Procedure – Drum Crusher**

### **Purpose**

This procedure was developed to ensure the safe and efficient operation of the Drum Crusher System.

1. To define the procedures for operation of the Drum Crusher
2. To ensure that Environmental and Health & Safety considerations are included as part of the operating procedures
3. To clearly define the responsibilities of personnel responsible for the operation of the Drum Crusher.

### **Scope**

- Defining responsibilities of Technician
- Standard operational procedure
- Maintenance / Troubleshooting.

### **Responsibilities/Authorities**

The General Manager has the responsibility and authority for ensuring resources are available for implementation of this procedure.

The Operations Manager has the responsibility for ensuring implementation of this procedure for Drum Crusher operations.

The Operator will be responsible for the following:

- Pre-inspection of the Drum Crusher using checklist.
- Ensure the drums are decontaminated before crushing.
- Complete all the documentation associated with the destruction process (D Log, Waste Location Log, Waste Manifest)
- Compliance with all Health, Safety and Environmental requirements of the facility.



## **Procedure**

### **Operating Procedure**

1. Open door & manually insert drum into chamber. Ensure door is sealed & closed properly by securing the door latch.
2. Press start button to commence the cycle of crushing. Estimated completion time for this cycle is 10 seconds.
3. Manually remove door latch & open door to remove crushed drum & repeat cycle with new drum.

### **Personal Protective Equipment Requirements**

- Fire Retardant Coveralls
- Steel Toed Safety Shoes
- Hard Hat
- Safety Glasses
- Workmen's gloves
- Spill kit

### **Equipment Required**

- Drum Crusher

### **Process Risk Summary**

1. Job Risk Assessment (JSA) – Drum Crusher Operations
2. Job Risk Assessment (JSA) – Manual Handling of the Materials

### **Records**

1. Inspection Checklist
2. D- log
3. Waste Manifest



## **Appendix 7: Operations and Safe Work Procedure – Bulb Eater**

### **Purpose**

This procedure was developed to ensure the safe and efficient operation of the Fluorescent Tube (Bulb Eater) Disposal System and includes:

3. Assembly procedure
4. Standard operational procedure
5. To ensure that Environmental and Health & Safety considerations are included as part of the operating procedures
6. To clearly define the responsibilities of personnel responsible for the operation of the Bulb Eater Unit
7. Maintenance
8. Troubleshooting

### **Scope**

- To define the Procedures for Operation of the Bulb Eater
- Defining responsibilities of Technician

### **Responsibilities/Authorities**

The General Manager has the responsibility and authority for ensuring resources are available for implementation of this procedure.

The Operations Manager has the responsibility for ensuring implementation of this procedure for Bulb Eater operations.

The Operator will be responsible for the following:

- Assembly and Pre-inspection of the Bulb Disposal Equipment
- Inventory (quantity and type) of Waste (Tubes) processed.
- Ensure appropriate hazardous waste labeling of drums used for crushed tubes
- Ensure first stage bag filters and HEPA Filters are changed as per the manufacturer's specifications



- Complete all the documentation associated with the destruction process (D Log, Waste Location Log, Waste Manifest)
- Compliance with all Health, Safety and Environmental requirements of the facility.

#### **4. Procedures**

The following outlines the procedure for the assembly, operation, and maintenance of the Bulb Disposal Unit and also identifies possible hazards and preventative control measures that should be implemented to keep these hazards at a minimum.

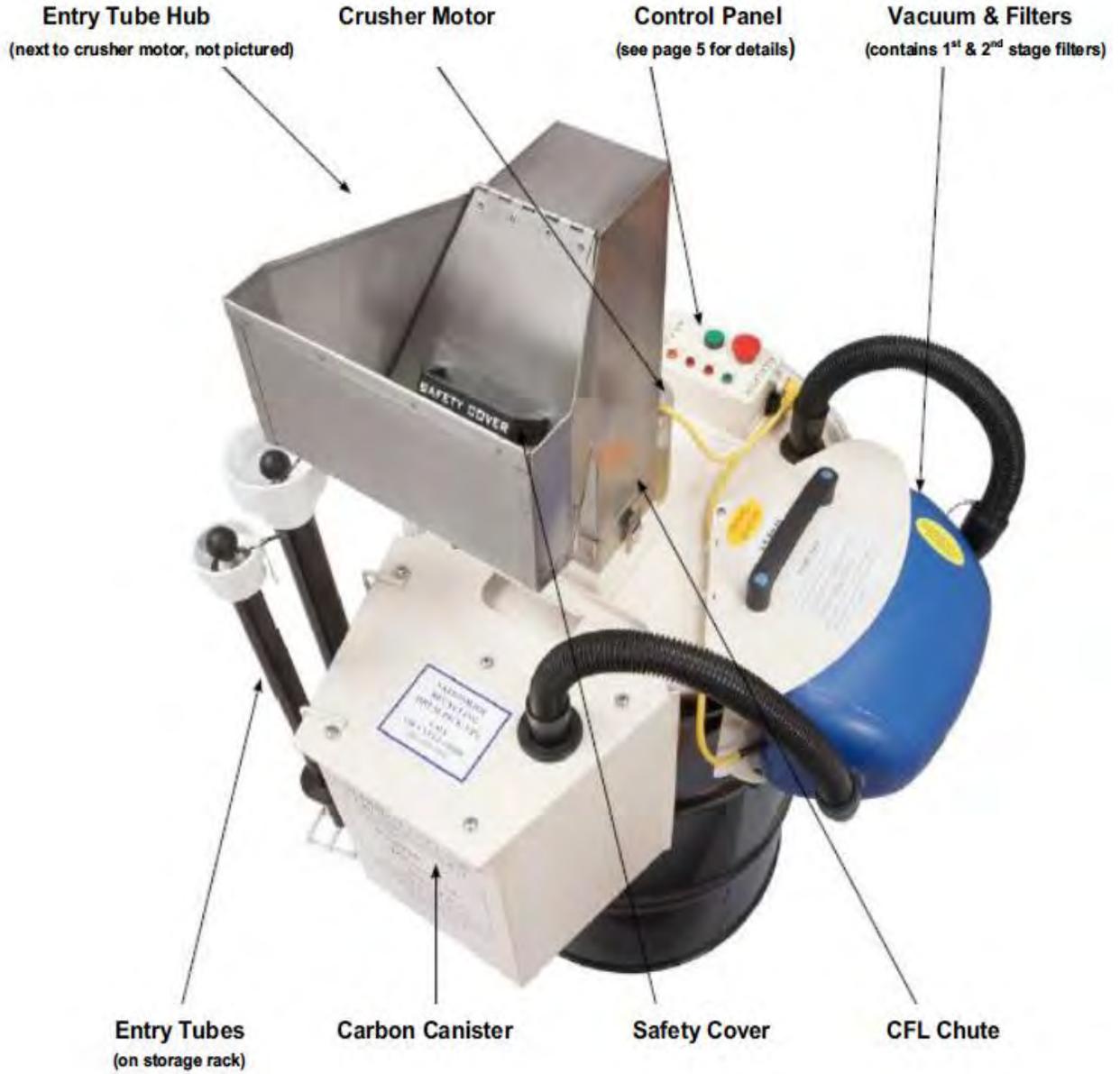
##### **4.1. Step 1**

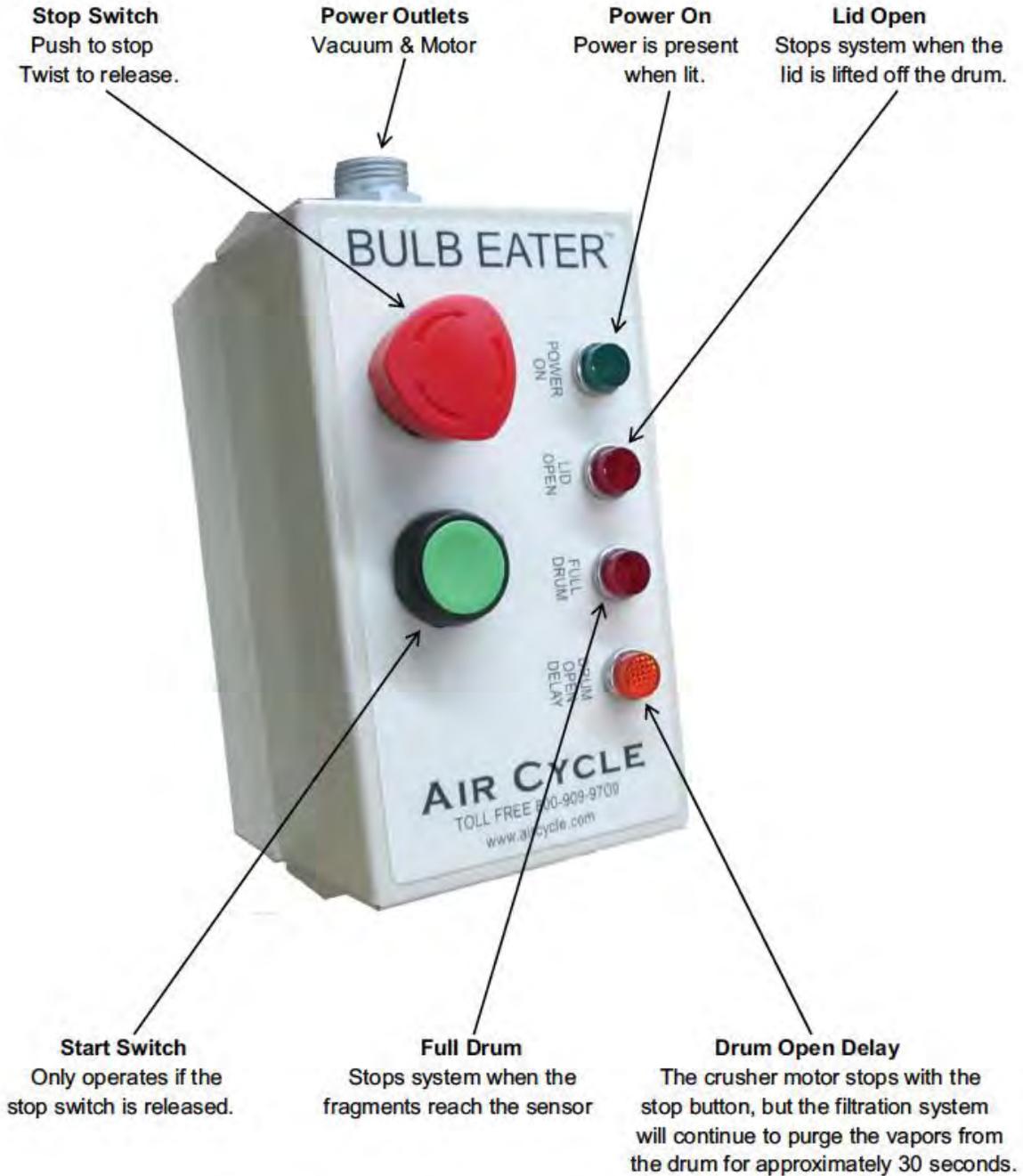
###### **Assembly**

1. Mount the Bulb Eater® onto the drum, tightening the bolt ring with a 15/16” wrench or socket.
2. Unscrew the cap on the entry tube hub and screw the entry tube into the lid.
3. Connect the vacuum hose to the drum lid by inserting the nozzle end into the black rubber grommet on the drum lid and screwing the other end into the hole on the right side of the blue filter case.
4. Remove the carbon bag from the beige carbon canister and slowly pour the activated carbon granules into the carbon canister.
5. Attach the lid and entry tube rack to the carbon canister– Use rubber grommets between the entry tube rack and lid and align all screws before tightening.
6. Hang the canister on the drum edge on the small standoffs provided as hooks.
7. Plug in the hose from the blue vacuum into the black rubber grommet on top of the carbon canister to complete the filtration system. Make sure the nozzle is pushed in deep for a good seal.
8. Finally, connect the power cord to the control panel on your Bulb Eater® and plug it into an outlet.

###### **Operating Procedure**

1. Release the stop switch and press green START button. Confirm suction at top of entry tube and air flow
  - a. out of carbon canister before crushing lamps.
2. Insert lamp into entry tube and then let go. Do not force the lamp down the entry tube.
3. After crushing, press STOP button to stop the crusher motor and begin purge cycle (approximately 30 seconds).
4. Once the purge cycle is complete, seal the top of the entry tube with the rubber plug. When the machine is not in use, make sure that all openings are sealed.
5. Before removing lid: Let the machine sit OFF for at least 15 minutes after the purge cycle is done to allow dust to settle before opening the lid.







### **PPE Requirements**

- Fire Retardant Coveralls
- Steel Toed Safety Shoes
- Rubber boots
- Full face respirator
- Hard Hat
- Safety Glasses
- Workmen’s gloves
- Rubber gloves
- Spill kit
- Spanners & Wrenches

### **Equipment Requirements**

- Fire Extinguisher
- Bulb Eater

## **5. MAINTENANCE**

### **Filter Changing Procedures**

- 1st Stage Bag Filter must be changed a minimum of twice per full drum of crushed lamps
- 2nd Stage HEPA Filter must be changed at least once every 10 drums of crushed lamps
- 3rd Stage Carbon Filter:

Spent filters must NEVER be left exposed. Spent filters must either remain in the blue vacuum case attached to the unit, be sealed in a full drum of crushed lamps, or bagged in a zip-top bag to avoid mercury release. **DO NOT DISPOSE OF FILTERS IN THE TRASH.**

- Confirm that the Bulb Eater is clearly “off” and not operating.
- The operator must wear safety glasses and gloves when changing any of the three Bulb Eater filters



**Replacing the 1st Stage filter:**

1. Locate the right-hand door on the blue filter case of the Bulb Eater®.
2. Remove black nozzle from blue door and immediately cap the end of the black nozzle to prevent dust from falling to the floor.
3. Press the yellow label marked PUSH on the far most right edge of the curved blue vacuum case to open the filter case door.
4. Carefully remove the door from the blue filter case.
5. Immediately place a circular white label from your Bulb Eater® filter kit over the center hole on the front of the 1st Stage filter. This prevents mercury-laden dust from escaping during the change-out process.
6. With the 1st Stage filter safely covered with the white label, grab each side of the brown cardboard front of the filter with both hands.
7. Carefully pull the 1st Stage filter slowly out of the blue vacuum case and place it on top of the full drum of crushed lamps (within the drum) or store in a zip-top bag if drum is not yet full. Avoid compression of the filter to minimize the release of mercury-laden dust.
8. Insert a new filter into the filter case, making sure the cardboard “front” is securely in place and the bag portion of the filter is unfolded and beside the cartridge, not rolled up in front of the cartridge.
9. Replace the blue door and verify that it is latched.

**Replacing the 2nd Stage HEPA filter:**

1. Follow steps 1 through 7 above to remove the 1st Stage Filter
2. Locate the 2nd Stage filter in the middle of the blue case.
3. Rotate the filter a quarter turn counterclockwise.
4. Once the HEPA cartridge is free, carefully remove it from the blue filter case and place it in the full drum along with the crushed lamps and 1st Stage filters for disposal.
5. Replace both filters and replace the blue door, verifying that the door is secure.

**Replacing the 3rd Stage Carbon Canister filter:**

1. Unplug the hose from the tip of the carbon canister at the grommated opening.
2. Remove the used canister from the standoffs on the lid of the machine and place duct tape over the open grommated hole to prevent carbon spillage. It is recommended that the canister be placed into a DOT approved appropriately sized container and sealed. (A 55-gallon DOT metal drum may be the most convenient and cost effective). The used carbon canister should be placed into the shipping container immediately upon removal from the Bulb Eater®. Once the canister is removed, a determination should be made of the waste type in accordance with applicable local, state, and federal regulations. Also, be sure to manage, store, and label the container accordingly.
3. Remove the carbon bag from the new beige carbon canister and slowly pour the activated carbon granules into the carbon canister.
4. Hang the new carbon canister on the standoffs on the lid of the machine.



5. Plug in the hose from the blue vacuum into the black grommet on top of the new carbon canister to complete the filtration system. Make sure the nozzle is pushed in tightly for a good seal.

## **6. Process Risk Summary**

5. Job Risk Assessment (JSA) – Bulb Eater Operations
6. Job Risk Assessment (JSA) – Manual Handling of the Materials

## **6.0 REFERENCES**

- Training Records
- Equipment Operation Manual

## **7.0 INSPECTIONS**

Inspections as per the Checklist are to be conducted prior to each start up.

## **8.0 TROUBLESHOOTING**

Bulb Eater runs with low suction or is overheating.

Low suction and overheating can be an indication that your 1st stage bag filter or 2nd stage HEPA filters need to be changed. In ideal conditions, crushing clean bulbs, 1st stage bag filters should be changed a minimum of twice per full drum of crushed lamps and the 2nd stage HEPA filters, every 10 drums. However, dirty bulbs and various environmental conditions can cause filters to fill more quickly.

- Replace the 1st stage bag filter (instructions can be found in the Maintenance & Troubleshooting section)
- If the problem persists, replace the 2nd stage HEPA filter.

## **Control Panel Lights**

- “Power” light does not illuminate when machine is plugged in and is operating.
- If your Bulb Eater functions normally when plugged in but the power light does not illuminate, you likely have a faulty light. The Bulb Eater will function properly with a faulty power light; you can continue using The Bulb Eater with no changes.
- “Lid Open” light is on when the Bulb Eater properly secured to drum. The lid open sensor



is a safety shut off to prevent the operation of the machine if it is not installed on a drum.

If the light is lit when the lid is installed properly:

- **If your machine has a white sensor block** (found on the underside of the Bulb Eater lid) – Follow the instructions found on page 11 of the operations manual
- **If your machine has a black sensor block** – Remove the setscrew retaining the sensor and with a small screwdriver set, slide the sensor out so it is flush with the end of the block. Then reinstall the setscrew to lightly hold the sensor in place.

### 9.0 Records

- D - Log
- S – Logs
- Waste Manifest



## **Appendix 8: Operation and Safe Work Procedure – Aerosol Unit**

### **Purpose**

This Procedure was developed to ensure the safe and efficient operation of the Aerosol Unit.

1. To define the Procedures for operation of the Aerosol Unit.
2. To ensure that Environmental and Health & Safety considerations are included as part of the operating procedures
3. To clearly define the responsibilities of personnel responsible for the operation of the Aerosol Unit.
4. Maintenance / Troubleshooting.

### **Scope**

- Defining responsibilities of Technician
- Standard operational procedure

### **Responsibilities/Authorities**

The General Manager has the responsibility and authority for ensuring resources are available for implementation of this procedure.

The Operations Manager has the responsibility for ensuring implementation of this procedure for Aerosol Unit Operations

The Operator will be responsible for the following:

- Pre-inspection using checklist & operation of the Unit.
- Complete all the documentation associated with the destruction process (D Log, Waste Location Log, Waste Manifest)
- Compliance with all Health, Safety and Environmental requirements of the facility.

### **Operating Procedure**

1. Remove cover from the vapor catcher & manually insert can into chamber. Placed cover on unit and ensure it closed properly.



2. Pull lever to puncture the can, approximately after 10 seconds remove both cover and can.  
NB. Whatever liquid is present in the can will fall into the drum and if any upward vapor is present it will be caught in the filter present on the unit.
  
3. Repeat steps 1 -2 for new Can.

**PPE Requirements: -**

- Fire Retardant Coveralls
- Half -Face Mask
- Steel Toed Safety Shoes
- Hard Hat
- Safety Glasses
- Workmen’s gloves
- Spill kit

**Equipment Requirement: -**

- Aerosol Unit

**Process Risk Summary**

1. Job Risk Assessment (JSA) – Aerosol Unit Operations
2. Job Risk Assessment (JSA) – Manual Handling of the Materials

**Records**

1. Inspection Checklist
2. D- log
3. Waste Manifest



## **Appendix 9: Journey Management Procedure**

### **1.0 PURPOSE**

The purpose of the procedure is to describe the requirements for managing driving risks associated with the activities of Tiger Tanks Trinidad (TTT) and *Tiger Rentals Guyana (TRG)* and external providers of Transporting services.

### **2.0 SCOPE**

The procedure applies to all driving activities managed or subcontracted by Tiger Tanks/ Tiger Rentals and associated work activities carried out by Tiger Tanks Trinidad and Tiger Rentals Guyana or subcontracted employees.

The procedure applies to the driving of all motor vehicles:

- Vehicles owned, leased or rented by TTT/TRG
- Vehicles leased or rented by TTT/TRG for an employee's use as part of a salary package arrangement.

The procedure does not apply to the operation of heavy earth moving equipment. (Bulldozers, front-end loaders etc.)

### **3.0 RESPONSIBILITIES/AUTHORITY**

The General Manager has the overall responsibility to provide the necessary support and resources required for implementing this procedure.

The HSE Representative has the responsibility to implement and review the Journey Management Program and continuously improve the system.

The Operations Manager has the responsibility to ensure the Journey Management system is being adhered to by Tiger Tanks and subcontracted employees.

The Supervisor has the responsibility to plan the safe Journey in collaboration with driver and to maintain records of the plan. He/she also has the responsibility to ensure vehicles are in good working order.

Drivers/Employees/Subcontractors has the responsibility to adhere to the Journey Management Procedure, record the approve routes and inform Supervisor/Management of any changes or nonconformities on the Journey that may pose additional risk.

### **4.0 REFERENCES**

- Trinidad and Tobago Occupational Safety and Health Act Chapter 88:08



- Trinidad and Tobago Motor Vehicles and road Traffic Act Chapter 48:50
- Guyana Motor Vehicle Act

## 5.0 DEFINITIONS

None

## 6.0 PROCEDURE

*For Guyana's operations, the HSE Representatives are responsible for ensuring the transportation contractors adhere to the requirements of this procedure.*

### 6.1 REQUIREMENTS

#### 6.1.1 Element 1: The Right Vehicle

The Supervisor or Driver has conducts/verifies the following:

1. Regular inspection and maintenance of vehicle
2. Assurance that maintenance is conducted by a competent person
3. Knowledge and understanding of the legislation, standards, HSE rules and regulations and applicable procedures
4. Valid inspection from Licence Authority
5. Vehicle meets job requirements. This includes requirements at client's sites. Vehicles are to be inspected for every trip
6. Selected vehicle is suitable for driving in required route and meets client's requirements
7. Job risk assessment identifying hazards and the risks associated with the potential working environment and ensure that vehicles are fit for the intended purpose

The Driver ensures that all motor vehicles are equipped with the following safety mechanisms:

- i Airbags (at least driver side) for vehicles travelling at speeds > 40 km/hr.
- ii Head restraints for all seating positions
- iii Driver and passenger door /side mirrors.
- iv Spare wheel and Tire
- v Strapping to secure any loads carried in the tray  
Audible reverse alarm which can be clearly heard by pedestrians in proximity to vehicle

Any further equipment requirements shall be based on a risk assessment of the existing driving conditions.

The Supervisor arranges inspections for the vehicles at regular intervals per legal and regulatory requirements.



If a vehicle is not roadworthy, the Supervisor removes the vehicle from service, notifies the Transportation division and Operations Manager.

The Supervisor makes the necessary arrangement to conduct maintenance from a competent resource (internal or external).

**6.2.3 Element 2: The Right Journey**

Transportation of products/ materials begin conducted internally, do not require completion of a Journey Management form. The Supervisor and Driver determines the best route for journey and conducted as outlined below:

**7.0 Journey Planning**

**Responsibility/Authorities**

The Driver and Supervisor makes a pre-determined assessment on probable routes for the haulage of waste specifically to reduce the risk associated with spills and other incidents.

The Operations Manager hosts a planning meeting to discuss the route and job requirements.

The Supervisor/ Driver makes maps available to select a suitable route from the collection and discharge locations.

Points to consider	Action Required
Location of the job	Operations Manager obtains confirmation from client on the job location
How trucks can safely reach job location	Supervisor/ Driver determines the following: <ul style="list-style-type: none"> <li>o Clearances from overpasses of loads</li> <li>o Traffic and alternative routes</li> <li>o Probable checkpoints</li> <li>o Width and length of vehicles</li> </ul>
Are there any hazards to be considered?	Drivers makes preliminary assessment on the hazards for routes
Are mitigation measures in place?	Drivers makes preliminary assessment on the control required to prevent hazards
Are drivers competent?	Drivers have the necessary entry requirements for site and have suitable experience
Have procedures, client's requirements emergency response procedures been communicated?	Operations Manager / Supervisor communicate requirements to team.



Are vehicles available?	Operations Manager/ Supervisor determines upcoming jobs and availability of vehicles from fleet
Do drivers conform to fatigue management program?	Ensure drives do not operate vehicles for more than 16 hours
Are there changes to traffic / alternative routes for scheduled journey time?	Operations Manager / Supervisor / Driver reviews news updates etc
Does cargo require police escort?	Operations Manager / Supervisor submits letter requesting service
Are there any legal requirements to consider?	Operations Manager/ Supervisor to obtain any legal requirement for journey

**Element 3: The Right Driver**

The Operations Manager/ Supervisor verifies the following:

1. Drivers must be trained, licensed and competent to operate vehicle selected

Vehicle type	Classification of Licence
Motor Cycle	Class 1
Wheel Tractor	Class 2
Light Motor Vehicle	Class 3

2. Drivers are medically and *mentally* fit to operate class of vehicle
3. Drivers can meet client’s site requirements
4. Drivers have a valid Defensive Driving certificate *for class of vehicle, cargo and location*
5. Drivers have skills to complete the Journey Management Form
6. Drivers are competent to assess risks during journey and can implement necessary controls
7. Drivers have knowledge on accident/ incident reporting and emergency response protocols
8. Drivers are not under influence of drugs , alcohol or other substances which can impair decision making

*The Operations Manager verifies this with support of the TTT’s GPS tracking system.*

Persons who drive a company vehicle home after work related activities or functions are on their own time and are subject to all driving laws including driving under the influence.



**Element 4: Legal and Other Requirements**

Supervisors/Drivers requests the following information from the relevant departments or news updates

1. any legal requirements
2. special client's requirements
3. road / traffic alerts
4. speed limits
5. any requirements for transportation of hazardous/ dangerous cargo

The driver must ensure adherence to Trinidad and Tobago's Motor Vehicles Act (48:50) and Guyana Motor Vehicle and Road Traffic (51:02) Act requirements while driving company vehicles.

TTT/TRG mandates all personnel in company vehicles must wear seat belts while in driver and passenger seats. Speeds limits are to be adhered to. **EMPLOYEES WILL BE HELD LIABLE FOR ANY NON-COMPLIANCES.**

**Element 5: Number of Passengers**

The Driver ensures the number of passengers does not exceed the Manufacturers' design specifications or legal requirements.

It must be noted that in addition to being non-compliant with the legal requirements, overcrowding also invalidates the insurance coverage of the vehicle. Passengers in company vehicles are limited to company employees only.

The driver will be held liable personnel/ vehicle damages for any unauthorized occupant of a company vehicle.

**Element 6: Load Design**

1. The Drivers ensure loads are secured with the appropriate strapping devices for the loads and do not exceed manufacturers design specifications or design limits for the selected vehicle.
2. Loads should only be carried on fit for purpose vehicles and should not exceed the rate carrying capacity.
  - a. Loads should be secured at all times.



- b. All dangerous cargo should be carried in accordance with legal and regulatory requirements, displaying appropriate warning signage. Where there are no legal or regulatory requirements, the process should default to an established standard or best practice.
- c. Loads should not be carried in the passenger compartment.
- d. Fixed securing devices (stanchions) should be in good condition and of adequate strength for the load.
- e. Sufficient straps, chains, should be applied to prevent movement of loads during transportation.
- f. During long distance journeys, drivers should check load periodically
- g. The driver must load, transport and offload cargo in accordance with HSESWP 053.

**Element 7: Communications**

Drivers are not to operate any mobile communication equipment while driving.

Drivers are not to operate mobile communication equipment while driving.

In case of emergencies, drivers may use mobile communication equipment if the vehicle is off the roadway or is lawfully parked on the roadway. When using the mobile device in such a manner, do not cause an obstruction, interfere with the line of vision of another motorist or impeded traffic.

**Element 8: Vehicle Tracking**

The Operations Manager/ Supervisor ensures a GPS Tracking System is installed and monitored in all company vehicles or company leased vehicles to facilitate locating and monitoring of vehicles during a journey.

The equipment should have the capability to provide the following;

- Speed Tracking
- Vehicle Tracking
- Real-time data processing and alerts

**Element 9: Emergency Response Capabilities**

The Operations Manager/ Supervisor ensures immediate availability of the following for all hazardous waste/dangerous cargo haulage vehicles:

- a) stock of first response equipment
- b) SDS consistent with the waste type being hauled to provide immediate emergency response efforts including spill and first aid response



- c) Emergency numbers
- d) Certified fire extinguisher

### 8.0 PROCESS DIAGRAM

### 9.0 PROCESS PERFORMANCE METRIC(S)

- Reference QHSE Performance Tracker

### 10. PROCESS RISK SUMMARY

<b>RISK ID</b>	<b>Risk description</b>	<b>Probability</b>	<b>Severity /Impact</b>	<b>Risk Rank</b>	<b>Mitigation</b>	<b>Contingency</b>	<b>Residual Risk Rank</b>
JM001	Changes in traffic rules	HIGH	HIGH	HIGH	3. Operations Manager to not route and notify transportation of any rules 4.	1. General work staff to note during daily meeting where applicable	MED
JM002	Vehicles inadequate for journey	MED	MED	MED	3. Operations Manager to ensure equipment is inspected and adequate for job during selection process	1. Audits	LOW

**If waste is transported by the generator, the generator will be responsible for any liability associated with the transportation of the waste. TRG will accept responsibility for the waste at the point of custody transfer at our shore base facility.**



**QHSE Management System**

Operating Procedure

Procedure: Waste Management

Issue Date: February, 2021

*Document #:* QOP 8.1/5

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## **11. RECORDS**

Journey Management Form (HSEF036/1-1)  
Vehicle Checklist

## **APPENDIX F TRG'S WASTE SAMPLING PLAN**



**QHSE Management Procedure**

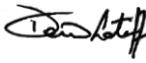
**Operating Procedure**

Procedure: Waste Sampling and Analytical Process

Document #: QHSEOP8.1/6

Page 1 of 34

**Document Verifications:**

<b>Authorized by</b>	
<b>Name: Denis Latiff</b>	<b>Position: General Manager</b>
<b>Date: 4<sup>th</sup> January, 2021</b>	<b>Signature:</b> 
<b>Responsible Persons</b>	
<b>Name: Shane Singh</b>	<b>Position: General Manager</b>
<b>Date: 4<sup>th</sup> January, 2021</b>	<b>Signature:</b>
<b>Name: Elizabeth Thomson</b>	<b>Position: Environmental Coordinator( TT)</b>
<b>Date: 4<sup>th</sup> January, 2021</b>	<b>Signature:</b>
<b>Name:</b>	<b>Position: Environmental Coordinator( GUY)</b>
<b>Date: 4<sup>th</sup> January, 2021</b>	<b>Signature</b>
<b>Name:</b>	<b>Position:</b>
<b>Date:</b>	<b>Signature</b>

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## Issue Record

Revision #	Revision Date	Review Date	Next Review Date	Comments
0.0	30 <sup>th</sup> July, 2019	4 <sup>th</sup> January, 2021	4 <sup>th</sup> January, 2022	No change
1.0	30 <sup>th</sup> April, 2021	30 <sup>th</sup> April, 2021	4 <sup>th</sup> January, 2022	Pugmilling Sample Plan

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## 1.0 PURPOSE

Waste monitoring is a typical requirement outlined by regulators in the Terms of Reference of permits granted. The waste monitoring is conducted to ensure firstly there are no adverse impacts on the environment and secondly that the facility and its operations are operating within the compliance requirements of the permit and the legislation. Where no regulatory body or legislation is applicable, compliance will conform to industry best practice and / or international guidance pertaining to wastewater discharge quality standards.

## 2.0 SCOPE

This procedure applies to all operations generating or receiving waste for processing and disposal. The scope will include identification of the personnel responsible for the sampling, QA/QC guidelines, typical analytical parameters, sampling preparation, sampling techniques, shipping samples and documentation.

Methods for field sampling listed in this document are applicable to standard operating procedures listed in Tables #2, #3, #4, #5, #6 and #7, below for water and solid waste samples. Field sampling procedures discussed are listed for the following:

- Wastewater/Processed Water Pipeline
- Wastewater/Processed Water Tank
- Wastewater/Processed Water IBC
- Solids/Sludge Vertical Infrared Unit
- Solids/Sludge Incinerator

## 3.0 RESPONSIBILITY

The execution of this procedure is the responsibility of the assigned Environmental Coordinator/ Technician. The Operations Coordinator in conjunction with the Country Manager and HSEQ Coordinator will review the process to ensure all QA/QC Steps are adhered to.

## 4.0 REFERENCE

- Reference: Standard Methods for the Examination of Water and Wastewater Method No. 1060. 23<sup>rd</sup> Edition, 2017. Approved by Standards Methods Committee, American Public Health Association, American Water Works Association, Water Environment Federation.
- Waste Management Process (Trinidad, QOP8.1/5; Guyana, 2.3/1-1)



## 5.0 SAMPLING PROCEDURE

### A. QUALITY ASSURANCE /QUALITY CONTROL

#### Analytical Method Requirements/Quality Control Requirements

The methods described shall be performed in conformance with the 23rd Edition, 2017, of “Standard Methods for the Examination of Water and Wastewater (SMEWW)”, United States Environmental Protection Agency (USEPA) Reference Methods and the Standard Operating Procedures for Ecotox Environmental Services, the laboratory engaged to provide the waste analytical support services.

The QC practices are an integral part of each method, are summarized below:

- Training and Competency - Evaluation of analyst performance for each method.
- Determine competence by analyses of samples containing known concentrations.
- Calibrate instruments and ensure that instrument measurements do not drift.
- Asses the precision of analytical procedures by analysing at least 10% of sample in duplicate.
- Analyse a minimum of one duplicate with each set of samples.
- Determine bias of an analytical procedure in each sample batch by analysis of blanks, known additions with a frequency of at least 5% of samples, and an externally provided standard.
- % regression of standard curve must be  $\geq 90\%$ .
- % recovery of test name standard must be within the acceptable range of 90.0 to 110.0 %
- Percent Relative Standard Deviation must be  $\leq 10\%$ .
- Duplicate/Triplicate analyses,
- Method Blank, Laboratory Fortified Blank.
- Standard Reference Material
- Routine and Random Duplicates/Triplicates.
- Determine Method Detection Limit for sample analyte.
- Instrument Operational Range – Upper and Lower Limits
- Calibration & Verification Procedures and Standards
- Equipment Usage and Preventative Maintenance Procedures
- Quality Risk Assessments & Associated Procedures
- Risk Assessments (incorporating Preventative Actions), Corrective Actions, Implementation of Control Measures and Improvement Procedures.
- QHSE Internal Audits
- Management Reviews



## **B. SAMPLING PROCEDURE**

### **3.PROCESS**

#### **5.1. Sampling Containers**

In general, water samples with multiple or unknown chemical types should be stored in containers made from borosilicate glass, high density polyethylene plastic or polytetrafluoroethylene (PTFE or Teflon) as these materials minimize leaching, dissolution, and sorption (ASTM, 2000a; APHA, 1995). Samples for organic contaminant analysis should be stored in brown borosilicate glass containers with PTFE lid liners. If volatile compounds will be analyzed, containers should have a septum to minimize escape of volatile gases during storage and analysis. Extra containers should be provided for these analyses in the event that re-analysis of the sample is required. If samples are contaminated with photoreactive compounds such as PAHs, exposure to light should be minimized by using brown glass containers or clear containers wrapped tightly with an opaque material (e.g., clean aluminium foil). Plastic or acid-rinsed glass containers are recommended when the chemicals of concern are heavy metals. Fill containers completely if the sample will not be frozen prior to analysis.

Any material that is in contact with a field sample has the potential to contaminate the sample or adsorb components from the sample. The use of appropriate materials, along with appropriate cleaning procedures, can minimize or mitigate interferences from sample containers. All utensils (e.g., spoons, scoops, spatulas) which come in direct contact with sediment samples during handling and processing should be made of non-contaminating materials (e.g., glass, high-quality stainless steel and/or Teflon®).

If a sample is to be refrigerated, the container should be filled to the brim to reduce oxygen exposure. This is particularly critical for volatile compounds. If a sample is to be frozen, the container should be filled to approximately 90% of its volume (i.e., 10% headspace) to allow for expansion of the sample during freezing. Refer to Figures #3 to #6. All sample containers should be properly labelled with a marker prior to sampling. Containers should be labelled on their sides in addition to or instead of labelling the lids. Each label should include, at a minimum, the study title, station location and/or sample identification, date and time of collection, sample type, and name of collector. Blind sample labelling (i.e., a sample code) should be used, along with a sample log that identifies information about each sample to minimize potential analytical

bias. Additional information such as required analyses and any preservative used might also be included on the label although this information is typically recorded on the chain-of-custody form. Labelled containers should be stabilized in an upright position in the transport or storage container. Extra containers should be carried on each sampling trip



Figure 3- Nalgene Plastic Bottles



Figure 4- Borosilicate Glass Bottles



Figure 5- Glass Microbiology Bottles



Figure 6- Plastic Microbiology Bottles

## 5.2. Collection of Wastewater Samples

Before each sampling event, all instruments and equipment must be inspected prior to use i.e. clean, good working condition before used for sample collection.

1. Ensure appropriate Personal Protective Equipment is worn (safety goggles, gloves, face-shields etc.). Gloves should be clean, new and disposable. These should be changed upon arrival at a new sampling point.
2. Stick labels on sampling bottles and record on label information as listed in #9 below.

## 5.3 SAMPLING PROCESS: Sample Source - PIPELINE

- a) Carefully open bleed point on sample line and allow water to flow for 5 - 10 seconds.

Ensure that the flow and material to be collected is constant/consistent before sample is actually collected.

- b) Collect amount of representative sample in the pre-labelled sample bottles provided by following the instructions for each bottle type:
  - i. Polyethylene Plastic Bottles – Rinse bottle 2-3 times with a small amount of the effluent (one tenth of the bottle volume) and discard in an environmentally responsible manner. Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler.
  - ii. Borosilicate Glass Bottles - One Liter – These are for organic tests and are not to be rinsed to allow for additional organic material to collect in the bottle. Simply fill the bottle to 90% full or to shoulder of bottle (maybe marked by lab) and store on ice in cooler.
  - iii. Borosilicate Glass/HDPE Plastic Bottles - 250 mls Sterilized - This is for microbiological testing and care must be taken not to touch the mouth or cap of bottle with anything besides the actual liquid sample. Do not rinse bottle before sampling. Fill bottle to shoulder level of bottle. Stopper tightly and store on ice in cooler.

## **5.4. SAMPLING PROCESS: Sample Source - TANK**

a) Prior to opening a tank for internal inspection, the tank sampling team shall:

- i. Review safety procedures and emergency contingency plans with the Health and Safety Officer.
- ii. Ensure that the tank is properly grounded.
- iii. Remove all sources of ignition from the immediate area.

b) Prior to commencing sampling, the tank headspace should be cleared of any toxic or explosive vapor concentration. After opening top hatch of tank, ensure all headspace gases are cleared and/or environmental sampler should wear a respirator. No work shall start if the lower explosive limit<sup>1</sup> (LEL) readings exceed 25% (refer to Section #24 References #11). At 10% LEL, work can continue but with extreme caution.

- i. Collect air quality measurements for each potential sample location using an explosimeter/oxygen meter for a lower explosive limit (LEL/O<sub>2</sub>) reading and an applicable gas monitor for organic vapor concentration. Both readings should be taken from the tank headspace, above the sampling port, and in the breathing zone.

c) Determine the depth of any and all liquid, solid, and liquid/solid interface, and depth of sludge using a weighted tape measure, probe line, sludge judge, or equivalent.

d) Collect liquid samples from one (1) foot below the surface, using a subsurface grab sampler (sampling rod).

e) Samples should always be collected through an opened hatch at the top of the tank.

Valves near the bottom should not be used, because of their questionable or unknown integrity.

f) Subsurface Grab Sampler

- i. Subsurface grab samplers are designed to collect samples of liquids at various depths. The sampler is usually constructed of aluminium or stainless-steel piping with an attached clamp that attaches to a 1-liter polyethylene plastic sample container.

---

<sup>1</sup> The minimum concentration of a particular combustible gas or vapor necessary to support its combustion in air

- ii. Screw the sampling bottle onto the sampling head.
  - iii. Lower the sampler to the desired depth.
  - iv. Ensure sample bottles are filled with water sample, as indicated in steps 'g' to 'j'.
  - v. Lift sampler and remove filled sample bottle. Secure bottle cover and place in sampling cooler.
- g) Collect amount of representative sample in the pre-labelled sample bottles provided by following the instructions for each bottle type:
- i. Polyethylene Plastic Bottles – Rinse bottle 2-3 times with a small amount of the effluent (one tenth of the bottle volume) and discard in an environmentally responsible manner. Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler.
  - ii. Borosilicate Glass Bottles - One Liter – These are for organic tests and are not to be rinsed to allow for additional organic material to collect in the bottle. Simply fill the bottle to 90% full or to shoulder of bottle (maybe marked by lab) and store on ice in cooler.
  - iii. Borosilicate Glass or HPE Plastic Bottles - 250 mls Sterilized - This is for microbiological testing and care must be taken not to touch the mouth or cap of bottle with anything besides the actual liquid sample. Do not rinse bottle before sampling. Fill bottle to shoulder level of bottle. Stopper tightly and store on ice in cooler.
- k) Safety Practices:
- i. Sampling a storage tank requires a great deal of manual dexterity, often requiring climbing to the top of the tank upon a narrow vertical or spiral stairway or ladder while wearing protective clothing and carrying sampling equipment.
  - ii. Currently, US OSHA requires that workers on a walking or working surface with an unprotected edge that is 6 feet or more above a lower level shall wear a fall protection approved by OSHA including guardrails, safety net systems, and personal fall arrest systems (i.e. safety harnesses).
  - iii. Before climbing onto the vessel, a structural survey should be performed. This will ensure appropriate consideration of safety and accessibility prior to initiation of any field activities.
  - iv. As in all opening of containers, extreme caution should be taken to avoid ignition or combustion of volatile contents. All tools used must be constructed of a non-sparking material and electronic instruments must be intrinsically safe.
  - v. All sample locations should be surveyed for air quality prior to sampling. At no time should sampling continue with a lower explosive limit (LEL) reading greater than 25%.

## **5.5 SAMPLING PROCESS: Sample Source – INTERMEDIATE BULK CONTAINER (IBC)**

- a) Prior to opening an IBC for internal inspection, the IBC sampling team shall:
- i. Review safety procedures and emergency contingency plans with the Health and Safety Officer.
  - ii. Remove all sources of ignition from the immediate area.
- b) Prior to commencing sampling, the IBC headspace should be cleared of any toxic or explosive vapor concentration. After opening the top fill aperture located on the surface of the IBC, ensure all headspace gases are cleared and/or environmental sampler should wear a respirator. No work shall start if the lower explosive limit<sup>2</sup> (LEL) readings exceed 25%. At 10% LEL, work can continue but with extreme caution. Collect air quality measurements for each potential sample location using an explosimeter/oxygen meter for a lower explosive limit (LEL/O<sub>2</sub>) reading and an applicable gas monitor for organic vapor concentration. Both readings should be taken from the tank headspace, above the sampling port, and in the breathing zone.
- c) Determine the depth of any and all liquid, solid, and liquid/solid interface, and depth of sludge using a weighted tape measure, probe line, sludge judge, or equivalent.
- d) Collect liquid samples from one (1) foot below the surface, using a subsurface grab sampler (sampling rod).
- e) Samples should always be collected through an opened lid at the top of the IBC.
- f) Subsurface Grab Sampler:

Subsurface grab samplers are designed to collect samples of liquids at various depths. The sampler is usually constructed of aluminium or stainless-steel piping with an attached clamp that attaches to a 1-liter polyethylene plastic sample container.

- i. Screw the sampling bottle onto the sampling head.
- ii. Lower the sampler to the desired depth.
- iii. Ensure sample bottles are filled with water sample, as indicated in steps 'g' to 'j'
- iv. Lift sampler and remove filled sample bottle.
- v. Secure bottle cover and place in sampling cooler.

---

<sup>2</sup> The minimum concentration of a particular combustible gas or vapor necessary to support its combustion in air

g) Collect amount of representative sample in the pre-labelled sample bottles provided by following the instructions for each bottle type.

- i. Polyethylene Plastic Bottles – Rinse bottle 2-3 times with a small amount of the effluent (one tenth of the bottle volume) and discard in an environmentally responsible manner. Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler.
- ii. Borosilicate Glass Bottles - One Liter – These are for organic tests and are not to be rinsed to allow for additional organic material to collect in the bottle. Simply fill the bottle to 90% full or to shoulder of bottle (maybe marked by lab) and store on ice in cooler.
- iii. Borosilicate Glass or HDPE Plastic Bottle - 250 mLs Sterilized - This is for microbiological testing and care must be taken not to touch the mouth or cap of bottle with anything besides the actual liquid sample. Do not rinse bottle before sampling. Fill bottle to shoulder level of bottle. Stopper tightly and store on ice in cooler.

7. Safety Practices:

- i. As in all opening of containers, extreme caution should be taken to avoid ignition or combustion of volatile contents. All tools used must be constructed of a non-sparking material and electronic instruments must be intrinsically safe.
- ii. All sample locations should be surveyed for air quality prior to sampling. At no time should sampling continue with a lower explosive limit (LEL) reading >25%.

8. Allocation of Sample Bottles:

The following sampling bottles are to be collected per wastewater sample/sample location:

One (1) Borosilicate Glass Bottles - One Liter – Label as “TPH”; PRESERVE by adding

- 5 ml of 50% Sulphuric Acid (H<sub>2</sub>SO<sub>4</sub>). Stopper Tightly

Two (2) Polyethylene Plastic Bottles – 500 millilitres

- Label One “TSS/pH” and Label One “BOD” – Do not preserve these bottles

One (1) Borosilicate Glass or HDPE Plastic bottle - 250 mLs Sterilized – Label as

- “MICROB”.
9. Place the sample bottle in designated container. Each sample bottle must be assigned a unique label. The information to be entered on the label includes:
- Date and time of taken sample.
  - Client Sample Identification Name.
  - Sample Type: Grab
  - Client’s Name
  - Preservation

10. Temperature Analysis Procedure:

Using the Plastic bottle labelled “TSS/pH” - Place the thermometer or meter probe in the sample container at least 4 inches or halfway below the surface. If using a thermometer, allow enough time for it to reach a stable temperature (at least 1 minute). If using a meter, allow the temperature reading to stabilize at a constant temperature reading. Make a note of the temperature reading as this will be transferred to the COC form in the post-sampling phase.

Cleaning of Thermometer:

- a) Gently scrub the Probe/Bulb with dilute soap solution (to remove dirt and any oily residue).
  - b) Thoroughly rinse with potable water and wipe the Probe/Bulb dry with clean paper towel.
11. Ensure all sample bottles are tightly capped.
12. Place all filled sample bottles back into coolers provided and fill cooler with ice, before returning to Contracted Lab.
13. Ensure Chain of Custody is completed (refer to Section 41.5).

## **5.6 COLLECTION OF SOLID WASTE SAMPLES – VIR & Incinerator Processing**

1. SAMPLING PROCESS: Sample Source – VIR Processing

100-bbls waste is processed per batch. Each batch usually generates 4-6 1-ton bags of solid material. A grab sample will be collected from each bag and a composite made. 3-batches or 300- bbls are processed before a sample is sent for analysis. This final sample is a composite of the composite made for each batch. This is done for homogenous waste. If a different waste type is processed then a composite for that batch burn (100-bbls) will be sent.

2. *SAMPLING PROCESS: Sample Source – Incinerator Processing*

For Incinerator operations homogenous waste types are comingled and loaded. A composite sample will be collected from no more than 3-bags per homogenous waste type and sent to the lab for analysis.

3. *SAMPLING PROCESS: Sample Source – Pugmilling Processing*

For Pugmilling operations, a composite sample will be collected from no more than 18 bags of Processed homogenous material & sent to the lab for analysis.

4. Procedure for grab sample collection from each bag and compositing, for sample type listed in #1 and #2 above, is detailed below:

- i. For generating a composite sample, from sample collection of each bag:
  - a. Dip the scoop (trowel) (Refer to Figures #7 and #8) into the solid waste material - treated (each bag), and withdraw the scoop and level off the material so there is none above the sides of the scoop.
  - b. Transfer the sample into a wide stainless-steel tray.
  - c. Decontaminate/clean scoop.
  - d. Repeat steps 4(i)(a), 3(i)(b) and 3(i)(c) above, for each bag,
  - e. After all grab samples are collected from each bag, and placed into the stainless-steel tray, thoroughly mix the waste.
  - f. Then add the composite mixed sample into two types of sampling bottles:
    - a wide mouth 1-Liter HDPE plastic sample container and label “MET”.
    - a wide mouth 1-Liter Borosilicate Glass Bottle and label “ORG”.Fill the sample right up to the top.
  - g. Seal the container with an appropriate lid that will prevent leakage or minimise ingress of:
    - h. air.
    - ii. Each sample bottle must be assigned a unique label.
    - iii. The information to be entered on the label includes:

- Date, time and location of sample collection.
  - Waste Collection Method: Composite
  - Client Sample Identification Name.
  - Client's Name.
- iv. Composite samples are to be placed into a cooler, on ice, at  $< 6^{\circ}\text{C}$  for transport to the laboratory. Sample should not be frozen.
- v. Solid waste samples must be delivered to the laboratory to allow for analyses or tests to be conducted within the prescribed holding and testing times. Holding times will vary depending on the analyses to be performed.



**Trowel-A**

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**Trowel-B**

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## **5.7 SAMPLE CONTAINERS, PRESERVATION & ALLOCATION**

<b>Sample Matrix</b>	<b>Sample Container</b>	<b>Initial Rinse with Sample</b>	<b>Sample Container Fill Level</b>	<b>Preservation</b>	<b>Label I.D.</b>
Wastewater	1 x 1 Liter Borosilicate Glass	NO	Shoulder Level	5 ml of 50% Sulphuric Acid (H <sub>2</sub> SO <sub>4</sub> )	TPH
	1 x 500 milliliter Polyethylene Plastic Bottle	YES	Right-up	None. Store at ≤ 6°C.	TSS
	1 x 500 milliliter Polyethylene Plastic Bottle	YES	Right-up	None. Store at ≤ 6°C.	BOD
	1 x 250 mL Borosilicate glass or Polyethylene plastic bottle	NO	Shoulder Level	None. Store at ≤ 6°C.	MICROB
Solid Waste	1 x 1-L Borosilicate Glass Bottle	Not Applicable	Right-up	None. Store at ≤ 6°C.	ORG
	1 x 1-L Polyethylene Plastic Bottle	Not Applicable	Right-up	None. Store at ≤ 6°C.	MET

## 5.8 ANALYTICAL METHODS

Table # 1: Analytical Methodology Listing – Sampling – Water & Solid Waste Matrix

Item	Test Method and Description
<p>Test Method Reference</p>	<p>WATER-As outlined in SMEWW<sup>15</sup> Method # No. 1060-A, B, C.</p> <p>SOLID- As outlined in the following:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment, EPA530-D-02-002, August 2002.</li> <li><input type="checkbox"/> US EPA SW 846 Compendium of Hazardous Waste Testing Methods, Test Methods for Evaluating Solid Waste.</li> <li><input type="checkbox"/> US EPA Hazardous Waste Incineration Measurement Guidance Manual, Volume III of the Hazardous Waste Incineration Guidance, Section 3.3 “Sampling”, EPA/625/6-89/021, June 1989.</li> <li><input type="checkbox"/> US EPA Hazardous Waste Incineration Measurement Guidance Manual, Volume III of the Hazardous Waste Incineration Guidance, Section 3.3.1.2 “Viscous Liquids, Slurries, Sludges, and Solid Waste Samples”, EPA/625/6-89/021, June 1989, as follows: <ul style="list-style-type: none"> <li><input checked="" type="radio"/> Incinerator Ash, Moist or Dry Solids - Trowel (Scoop) Method</li> </ul> </li> </ul>
<p>Test Description</p>	<p>GRAB SAMPLES</p> <p>Grab samples are single samples collected at a specific spot at a site over a short period of time (typically seconds or minutes). Thus, they represent a “snapshot” in both space and time of a sampling area.</p> <p><i>In-Situ</i></p> <p>Sampling in the same place the phenomenon is occurring without isolating it from other systems or altering the original conditions of the test. Parameters to analyze from this sampling method are Temperature, pH.</p>

Sample Collection & Preservation	<p>Sample can be collected in polyethylene (plastic) bottles and/or borosilicate (glass) bottles. Volume for minimum sample collection 1000 mLs. Sample collection as a grab and/or analyzed <i>In-situ</i>.</p> <p><b>Polyethylene Plastic Bottles</b> – Rinse bottle 2-3 times with a small amount of the effluent (one tenth of the bottle volume) and discard. Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler.</p> <p>Cool, <math>\pm 6^{\circ}\text{C}</math>, in dark.</p> <p><b>Borosilicate (Glass) Bottles</b> – Rinse bottle 2-3 times with a small amount of the effluent (one tenth of the bottle volume) and discard. Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler.</p> <p>Cool, <math>\pm 6^{\circ}\text{C}</math>, in dark. For Oil &amp; Grease and TPH – do not rinse bottles.</p>
Maximum Holding Time, Storage & Transportation, QAQC	<p>Outlined in Tables #6 to #13 for the specified parameters.</p>

<sup>15</sup> SMEWW – Standard Methods for the Examination of Water and Wastewater, 23<sup>rd</sup> Edition, 2017.

**Table # 2: Methodology Listing – Temperature – Matrix Water**

Item	Test Method and Description
Test Method Reference	As outlined in SMEWW <sup>16</sup> Method # No. 2550 Temperature & ECOTOX SOP Method W-009.
Test Description	Temperature is measured using a standard liquid-in-glass or electronic thermometer with an analog or digital readout. The device is able to distinguish temperature changes of 0.1°C or less, and equilibrate rapidly (have a minimal thermal capacity).

Sample Collection & Preservation	<p>Analysis of sample for temperature <i>In-Situ</i>. Temperature Analysis Procedure:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Thermometers are calibrated for total immersion or partial immersion. One calibrated for total immersion must be completely immersed to the depth of the etched circle around the stem just below the scale level</li> <li><input type="checkbox"/> Place the thermometer or meter probe in the water effluent sample at least 4 inches below the surface or halfway.</li> <li><input type="checkbox"/> If using a thermometer, allow enough time for it to reach a stable temperature (at least 1 minute). If using a meter, allow the temperature reading to stabilize at a constant temperature reading.</li> <li><input type="checkbox"/> Read the temperature with the thermometer bulb beneath the water surface.</li> <li><input type="checkbox"/> Record the temperature on the chain-of-custody form.</li> </ul>
Maximum Storage Recommended	Analyze Immediately; 0.25 Hours.
Storage & Transportation	Not Applicable
Quality Assurance/Control	<ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure Thermometer/Meter has been calibrated and inspected for good working condition.</li> <li><input type="checkbox"/> Thermometer/Probe must be clean (via Laboratory Cleaning Procedures) before use.</li> <li><input type="checkbox"/> Thermometer is calibrated before use.</li> </ul>

<sup>16</sup> SMEWW – Standard Methods for the Examination of Water and Wastewater, 23<sup>rd</sup> Edition (2017).

**Table # 3: Methodology Listing – pH – Matrix Water**

Item	Test Method and Description
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Test Method Reference	As outlined in SMEWW <sup>17</sup> Method # No. 4500-H <sup>+</sup> pH Value B Electrometric Method & ECOTOX SOP Method W-014.
Test Description	The basic principle of electrometric pH measurement is determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.
Sample Collection & Preservation	<p>Analysis of sample for pH <i>In-Situ</i>. pH Analysis Procedure:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> pH Meters are calibrated. Regression Percent Range must be 95 – 100%. <input type="checkbox"/> Place the pH meter probe in the water effluent sample at least 4 inches below the surface or halfway.</li> <li><input type="checkbox"/> Allow enough time for meter reading to stabilize at a constant pH reading. (Meter can sound a ‘beep’ when reading is stable).</li> <li><input type="checkbox"/> Record the pH on the chain-of-custody form.</li> </ul>
Maximum Storage Recommended	Analyze Immediately; 0.25 Hours.
Storage & Transportation	Not Applicable
Quality Assurance/Control	<ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure pH Meter has been calibrated and inspected for good working condition. <input type="checkbox"/> pH probe must be clean (via Laboratory Cleaning Procedures) before use.</li> <li><input type="checkbox"/> pH Meter is calibrated before use; Regression Percent Range must be 95 – 100%.</li> </ul>

<sup>17</sup> SMEWW – Standard Methods for the Examination of Water and Wastewater, 23<sup>rd</sup> Edition (2017).

**Table # 4: Methodology Listing – Total Suspended Solids – Matrix Water**

Item	Test Method and Description
Test Method Reference	As outlined in SMEWW <sup>18</sup> Method # 2540 A, D

<p>Test Description</p>	<p>Solids refer to matter suspended in water or wastewater. Solids may affect water or effluent quality adversely in a number of ways. “Total solids” is the term applied to the material residue left in the vessel after evaporation of a sample and its subsequent drying in an oven at a defined temperature. A well-mixed sample is filtered through a weighed standard glass-fiber filter (47 mm) and the residue retained on the filter is dried to a constant weight at 103 to 105°C. The increase in weight of the filter represents the</p>
<p>Sample Collection &amp; Preservation</p>	<p>Use resistant-glass or plastic bottles, provided that the material in suspension does not adhere to container walls. Begin analysis as soon as possible because of the impracticality of preserving the sample. Refrigerate sample at 4°C up to the time of analysis to minimize microbiological decomposition of solids. Preferably do not hold samples more than 24 hours. In no case hold sample more than 7 days. Bring samples to room temperature before analysis.</p> <p>Sample can be collected in polyethylene (plastic) bottles and/or borosilicate (glass) bottles. Volume for minimum sample collection 1000 mLs. Sample collection as a grab.</p> <p><b>Polyethylene Plastic Bottles</b> – Rinse bottle 2-3 times with a small amount of the effluent (one tenth of the bottle volume) and discard. Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler.</p>
<p>Maximum Storage Recommended</p>	<p>7 Days</p>
<p>Storage &amp; Transportation</p>	<p>After collection, sample handling should be minimized. Field Technicians should use extreme care to ensure that samples are not contaminated during storage. Environmental and wastewater samples are typically stored in coolers. To reduce the risk of cross contamination, sample containers should be placed inside of sealed, plastic bags before being placed in the cooler(s). If ice is required for preservation of the samples, the ice should be contained in a plastic bag or some equivalent container to prevent the potential for cross contamination of the samples by water produced from melting ice. If ice is emptied into cooler(s) (not contained) the cooler(s) should be checked regularly and water should be drained as needed. Custody of samples will be maintained. Samples will be transported to the analytical laboratory by field technician. All samples must therefore be transported to the laboratory in this manner. At the laboratory samples must be stored at <math>\leq 6^{\circ}\text{C}</math>, in dark (refrigerator).</p>

<sup>18</sup> Standard Methods for the Examination of Water and Wastewater, 23<sup>rd</sup> Edition (2017).

Item	Test Method and Description
Quality Assurance/Control	<ul style="list-style-type: none"> <li><input type="checkbox"/> Duplicate/Triplicate analyses,</li> <li><input type="checkbox"/> Method Blank, Laboratory Fortified Blank. <input type="checkbox"/> Routine and Random Duplicates/Triplicates.</li> <li><input type="checkbox"/> Determine Method Detection Limit for sample analyte.</li> <li><input type="checkbox"/> Instrument Operational Range – Upper and Lower Limits <input type="checkbox"/> Calibration &amp; Verification Procedures and Standards.</li> <li><input type="checkbox"/> Equipment Maintenance and Preventative Maintenance Procedures.</li> </ul>

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**Table # 5: Methodology Listing – Biological Oxygen Demand (5-Day) – Matrix Water**

Item	Test Method and Description
Test Method Reference	As outlined in SMEWW <sup>19</sup> Method # 5210 A, B, 5-Day BOD Test Method. (Approved by Standard Methods Committee, 2016). Quantification of the relative oxygen requirements after 5 Days of incubating diluted samples at $20 \pm 1^\circ\text{C}$ .
Test Description	The method consists of filling with diluted and seeded sample, to overflowing, an airtight bottle of specified size and incubating it at the specified temperature for 5 days. Dissolved oxygen is measured initially and after incubation, and the BOD is computed from the difference between initial and final DO. Because the initial DO is determined shortly after the dilution is made, all oxygen uptake occurring after this measurement is included in the BOD measurement.

<p>Sample Collection &amp; Preservation, Maximum Holding Time</p>	<p>Collect samples in polyethylene, fluoropolymer, or glass containers. Samples for BOD analysis may degrade significantly during storage between collection and analysis, resulting in low BOD values. Collect samples in polyethylene, fluoropolymer, or glass containers. Volume for minimum sample collection 500 mLs. Sample collection as a grab.</p> <p>If analysis is begun within 2 hours of collection, cold storage is unnecessary. If analysis is not started within 2 hours of sample collection, keep sample at or below 4°C from the time of collection. Begin analysis within 6 hours of collection.</p> <p><b>Maximum Storage – 24 Hours<sup>20</sup> – 48<sup>21</sup> Hours</b></p>
<p>Storage &amp; Transportation</p>	<p>After collection, sample handling should be minimized. Field Technicians should use extreme care to ensure that samples are not contaminated during storage. Environmental and wastewater samples are typically stored in coolers. To reduce the risk of cross contamination, sample containers should be placed inside of sealed, plastic bags before being placed in the cooler(s). If ice is required for preservation of the samples, the ice should be contained in a plastic bag or some equivalent container to prevent the potential for cross contamination of the samples by water produced from melting ice. If ice is emptied into cooler(s) (not contained) the cooler(s) should be checked regularly and water should be drained as needed. Custody of samples will be maintained. Samples will be transported to the analytical laboratory by field technician. All samples must therefore be transported to the laboratory in this manner. At the laboratory samples must be stored at ≤ 6°C, in dark (refrigerator).</p>

<sup>19</sup> SMEWW – Standard Methods for the Examination of Water and Wastewater, 23<sup>rd</sup> Edition, 2017.

<sup>20</sup> US EPA, A Guide To The Sampling And Analysis Of Waters, Wastewaters, Soils And Wastes, © Environment Protection Authority, 7th edition, March 2000, [http://www.monitor2manage.com.au/userdata/downloads/p\\_/Victorian%20EPA%20A%20guide%20to%20the%20sampling%20and%20analysis%20of%20waters.pdf](http://www.monitor2manage.com.au/userdata/downloads/p_/Victorian%20EPA%20A%20guide%20to%20the%20sampling%20and%20analysis%20of%20waters.pdf).

<sup>21</sup> US EPA, Method for Chemical Analysis and of Water and Waste, EPA 600/4-79-020, <https://www.wbdg.org/ffc/epa/criteria/epa-600-4-79-020>

Quality Assurance/Control	<ul style="list-style-type: none"> <li><input type="checkbox"/> Multiple dilution analyses, standard reference material, seed controls.</li> <li><input type="checkbox"/> Method Blank, Laboratory Fortified Blank, Laboratory Fortified Matrix. <input type="checkbox"/> Routine and Random Duplicates/Triplicates.</li> <li><input type="checkbox"/> Determine Method Detection Limit for sample analyte.</li> <li><input type="checkbox"/> Instrument Operational Range – Upper and Lower Limits <input type="checkbox"/> Calibration &amp; Verification Procedures and Standards.</li> <li><input type="checkbox"/> Equipment Maintenance and Preventative Maintenance Procedures. <input type="checkbox"/> Occupational Health &amp; Safety Management Policies and Procedures.</li> </ul>
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**Table # 6 : Methodology Listing – Faecal Coliform – Matrix Water**

<b>Item</b>	<b>Test Method and Description</b>
Test Method Reference	As outlined in SMEWW <sup>22</sup> Method # 9221 A, B, E, J – Multiple-Tube Fermentation Technique for Members of the Coliform Group.

<p>Test Description</p>	<p>The coliform group consists of several genera of bacteria belonging to the family Enterobacteriaceae. The historical definition of this group has been based on the method used for detection, lactose fermentation, rather than on the tenets of systematic bacteriology. Accordingly, when the fermentation technique is used, this group is defined as all facultative anaerobic, gram-negative, non-spore-forming, rod-shaped bacteria that ferment lactose with gas and acid formation within 48 h at 35°C. When multiple tubes are used in the fermentation technique, coliform density can be estimated by using a most probable number (MPN) table. This number, based on certain probability formulas, is an estimate of the mean density of coliforms in the sample.</p> <p>Results of coliform testing, together with other information obtained from engineering or sanitary surveys, provide the best assessment of water treatment effectiveness and the sanitary quality of source water. The precision of the fermentation test in estimating coliform density depends on the number of tubes used. The most satisfactory information will be obtained when the largest sample inoculum examined shows acid and/or gas in some or all of the tubes and the smallest sample inoculum shows no acid and/or gas in any or a majority of the tubes. Bacterial density can be estimated by the formula given or from the table using the number of positive tubes in the multiple dilutions. The MPN tables are based on the assumption of a Poisson distribution (random dispersion).</p>
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<p>Sample Collection &amp; Preservation</p>	<p><b>Collect samples as directed in SMEWW Sections 9060A and B:</b></p> <p>Maintain consistent sampling procedures. When the sample is collected, leave ample air space in the bottle (at least 2.5 cm) to facilitate mixing by shaking, before examination. Reject sample bottles that are overfilled and request resampling or, alternatively, add overfilled samples to a larger sterile sample bottle in the laboratory to assure adequate mixing. Keep sampling bottle closed until it is to be filled. Remove cap or stopper, if used, as a unit. Do not place cap down on any surface. Avoid external contamination during sample collection and do not contaminate inner surface of stopper or cap and bottle neck. Fill container without rinsing, replace stopper or cap immediately, and secure hood, if used, around neck of bottle.</p> <p>Use sample containers specified in SMEWW Section 9030B.19:</p> <p>Sample can be collected in clean/sterile polyethylene (plastic) bottles and/or borosilicate (glass) bottles. Volume for minimum sample collection 1000 mLs. Sample collection as a grab and/or composite.</p> <p><b>Sterilized Borosilicate Glass Bottles</b> – Fill bottle to top with headspace (at least 2.5 cm). Stopper tightly and store on ice in cooler. Cool, <math>\pm 6^{\circ}\text{C}</math>, in dark.</p> <p>Start microbiological analysis of water samples as soon as possible after collection to avoid unpredictable changes in the microbial population. Do not analyze samples submitted to the laboratory with chlorine residual or with leakage. In such cases, request resampling. For most accurate results, ice samples during transport to the laboratory if they cannot be processed within 1 hour after collection. Maintain samples in the dark and keep cool with ice or blue ice at <math>\leq 6^{\circ}\text{C}</math> but not frozen. Samples arriving quickly at the laboratory may not have reached this temperature. Verify and record sample temperature upon receipt either through the use of a control water sample bottle or thermometer.</p>
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<sup>22</sup> Standard Methods for the Examination of Water and Wastewater, 23<sup>rd</sup> Edition (2017).

Item	Test Method and Description
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<p>Maximum Holding Time</p>	<p>Hold source water, stream pollution, recreational water, and wastewater samples at <math>\leq 6^{\circ}\text{C}</math> during a maximum transport time of 6 hours. Do not freeze. Record sample receipt time and temperature in sample receipt files. Refrigerate these samples upon receipt in the laboratory and process within 2 hours. When transport conditions necessitate delays in delivery of samples longer than 6 hours, consider using either field laboratory facilities located at the site of collection or delayed incubation procedures.</p> <p>Holding Times - 8 Hours<sup>23</sup> to 24 Hours<sup>24</sup>; @ 0 to <math>6^{\circ}\text{C}</math> (Refrigeration Temperature).</p>
<p>Storage &amp; Transportation</p>	<p>After collection, sample handling should be minimized. Field Technicians should use extreme care to ensure that samples are not contaminated during storage. Environmental and wastewater samples are typically stored in coolers. To reduce the risk of cross contamination, sample containers should be placed inside of sealed, plastic bags before being placed in the cooler(s). If ice is required for preservation of the samples, the ice should be contained in a plastic bag or some equivalent container to prevent the potential for cross contamination of the samples by water produced from melting ice. If ice is emptied into cooler(s) (not contained) the cooler(s) should be checked regularly and water should be drained as needed. Custody of samples will be maintained. Samples will be transported to the analytical laboratory by field technician. All samples must therefore be transported to the laboratory in this manner. At the laboratory samples must be stored at <math>\pm 6^{\circ}\text{C}</math>, in dark (refrigerator).</p>

Quality Assurance/Control	<input type="checkbox"/> 5-Tube, 8-Tube, 10-Tube Duplicate analyses, <input type="checkbox"/> Method Blank,  <input type="checkbox"/> Positive Controls, Negative Controls,  <input type="checkbox"/> Routine and Random Duplicates/Triplicates.  <input type="checkbox"/> Determine Method Detection Limit for sample analyte.  <input type="checkbox"/> Instrument Operational Range – Upper and Lower Limits <input type="checkbox"/> Calibration & Verification Procedures and Standards.  <input type="checkbox"/> Equipment Maintenance and Preventative Maintenance Procedures.
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<sup>23</sup> Table FS1000-4, 40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times, Revision Date: March 1, 2014.

<sup>24</sup> EPA Guidelines: Water and wastewater sampling. [www.epa.sa.gov.au/files/8494\\_guide\\_wws.pdf](http://www.epa.sa.gov.au/files/8494_guide_wws.pdf).

**Table # 7: Methodology Listing – Total Petroleum Hydrocarbons – Matrix Water**

<b>Item</b>	<b>Test Method and Description</b>
Test Method Reference	As outlined in US EPA <sup>25</sup> Method 1664, Revision B n-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry (Feb 2010).
Test Description	A 1-L sample is acidified to pH < 2 and serially extracted three times with n-hexane (85% minimum purity, 99.0% min. saturated C6 isomers, residue less than 1 mg/L) in a separatory funnel. The extract is dried over sodium sulphate. The solvent is distilled from the extract and the HEM is desiccated and weighed. Quality is assured through calibration and testing of the extraction, distillation, and gravimetric systems.

Sample Collection & Preservation	Collect 1 Liter samples in borosilicate wide-mouth glass bottles, with PTFE-lined screw cap. Fill sample to shoulder level of bottle. All samples must be acidified and/or verified in the lab to pH < 2 immediately prior to analysis. If analysis is to be delayed for more than four hours, adjust the sample in the field to pH<2 with HCl or H2SO4 solution at the time of collection and refrigerate to 0-6 °C.
Maximum Holding Time	Preserved – 28 Days
Storage & Transportation	After collection, sample handling should be minimized. Field Technicians should use extreme care to ensure that samples are not contaminated during storage. Environmental and wastewater samples are typically stored in coolers. To reduce the risk of cross contamination, sample containers should be placed inside of sealed, plastic bags before being placed in the cooler(s). If ice is required for preservation of the samples, the ice should be contained in a plastic bag or some equivalent container to prevent the potential for cross contamination of the samples by water produced from melting ice. If ice is emptied into cooler(s) (not contained) the cooler(s) should be checked regularly and water should be drained as needed. Custody of samples will be maintained. Samples will be transported to the analytical laboratory by field technician. All samples must therefore be transported to the laboratory in this manner. At the laboratory samples must be stored at ≤ 6°C, in dark (refrigerator).
Quality Assurance/Control	<ul style="list-style-type: none"> <li><input type="checkbox"/> Duplicate analyses, spike and recovery technique, and standard reference material.</li> <li><input type="checkbox"/> Method Blank, Laboratory Fortified Blank. <input type="checkbox"/> Routine and Random Duplicates/Triplicates.</li> <li><input type="checkbox"/> Determine Method Detection Limit for sample analyte.</li> <li><input type="checkbox"/> Instrument Operational Range – Upper and Lower Limits <input type="checkbox"/> Calibration &amp; Verification Procedures and Standards.</li> <li><input type="checkbox"/> Equipment Maintenance and Preventative Maintenance Procedures.</li> </ul>

<sup>25</sup> US EPA – United States Environmental Protection Agency.

**Table # 8: Methodology Listing – Total Petroleum Hydrocarbons/Total Oil & Grease Matrix Solid**

<b>Parameter</b>	<b>Test Method and Description</b>
<p>Test Method Reference and Description</p>	<p>As outlined in <b>US EPA Method 9071B</b>, n-Hexane Extractable Material (HEM) for Sludge, Sediment, and Solid Samples. Method 9071 may be used to quantify low concentrations of oil and grease in soil, sediments, sludges, and other solid materials amenable to chemical drying and solvent extraction with n-hexane. “Oil and grease” is a conventional pollutant under 40 CFR 401.16 and generally refers to substances, including biological lipids and mineral hydrocarbons that have similar physical characteristics and common solubility in an organic extracting solvent. As such, oil and grease is an operationally defined parameter, and the results will depend entirely on the extracting solvent and method of extraction. Method 9071 employs n-hexane as the extraction solvent with Soxhlet extraction and the results of this method are appropriately termed “n-hexane extractable material (HEM).”</p> <p>As outlined in <b>US EPA 3540C – Soxhlet Extraction Method</b>. Method 3540 is a procedure for extracting non-volatile and semi volatile organic compounds from solids such as soils, sludges, and wastes. The Soxhlet extraction process ensures intimate contact of the sample matrix with the extraction solvent. The solid sample is mixed with anhydrous sodium sulfate, placed in an extraction thimble or between two plugs of glass wool, and extracted using an appropriate solvent in a Soxhlet extractor. The extract is then dried, concentrated (if necessary), and, as necessary, exchanged into a solvent compatible with the clean-up or determinative step being employed.</p> <p>As outlined in <b>5520F – Hydrocarbons (TPH)</b>. Silica gel has the ability to adsorb polar materials. If a solution of hydrocarbons and fatty materials in a nonpolar solvent is mixed with silica gel, the fatty acids are removed selectively from solution. The materials not eliminated by silica gel adsorption are designated hydrocarbons by this test.</p>
<p><b>Holding Time</b></p>	<p>14 days until extraction; 40 days after extraction.</p>

<b>Quality/Assurance Control Measures</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Duplicate/Triplicate analyses,</li> <li><input type="checkbox"/> Method Blank, Laboratory Fortified Blank. <input type="checkbox"/> Routine and Random Duplicates/Triplicates.</li> <li><input type="checkbox"/> Determine Method Detection Limit for sample analyte.</li> <li><input type="checkbox"/> Instrument Operational Range – Upper and Lower Limits <input type="checkbox"/> Calibration &amp; Verification Procedures and Standards.</li> <li><input type="checkbox"/> Equipment Maintenance and Preventative Maintenance Procedures.</li> </ul>
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**Table # 9: Methodology Listing – TCLP<sup>26</sup> Extractable Metals – Matrix Solid**

Item	Test Method and Description
Test Method Reference	As outlined in SMEWW <sup>19</sup> Method # 5210 A, B, 5-Day BOD Test Method. (Approved by Standard Methods Committee, 2016). Quantification of the relative oxygen requirements after 5 Days of incubating diluted samples at 20 ± 1°C.
Test Description	The method consists of filling with diluted and seeded sample, to overflowing, an airtight bottle of specified size and incubating it at the specified temperature for 5 days. Dissolved oxygen is measured initially and after incubation, and the BOD is computed from the difference between initial and final DO. Because the initial DO is determined shortly after the dilution is made, all oxygen uptake occurring after this measurement is included in the BOD measurement.
Sample Collection & Preservation, Maximum Holding Time	<p>Collect samples in polyethylene, fluoropolymer, or glass containers. Samples for BOD analysis may degrade significantly during storage between collection and analysis, resulting in low BOD values. Collect samples in polyethylene, fluoropolymer, or glass containers. Volume for minimum sample collection 500 mLs. Sample collection as a grab.</p> <p>If analysis is begun within 2 hours of collection, cold storage is unnecessary. If analysis is not started within 2 hours of sample collection, keep sample at or below 4°C from the time of collection. Begin analysis within 6 hours of collection.</p>

Storage & Transportation	After collection, sample handling should be minimized. Field Technicians should use extreme care to ensure that samples are not contaminated during storage. Environmental and wastewater samples are typically stored in coolers. To reduce the risk of cross contamination, sample containers should be placed inside of sealed, plastic bags before being placed in the cooler(s). If ice is required for preservation of the samples, the ice should be contained in a plastic bag or some equivalent container to prevent the potential for cross contamination of the samples by water produced from melting ice. If ice is emptied into cooler(s) (not contained) the cooler(s) should be checked regularly and water should be drained as needed. Custody of samples will be maintained. Samples will be transported to the analytical laboratory by field technician. All samples must therefore be transported to the laboratory in this manner. At the laboratory samples must be stored at $\leq 6^{\circ}\text{C}$ , in dark (refrigerator).
--------------------------	---

<sup>26</sup> Toxicity characteristic leaching procedure.

<sup>27</sup> SMEWW – Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 2017, 23<sup>rd</sup> Editorial Revision.

## **5.9 – SAMPLE HANDLING AND TRANSPORTATION METHODS**

Sample collection and preservation shall be performed in conformance with Part 1060 of the 23<sup>rd</sup> Edition (2017) of “Standard Methods for the Examination of Water and Wastewater” and the following guidelines.

Analysis in the field is required for some parameters because of possible sample deterioration during transport to a laboratory, leading to potential erroneous results. Among the parameters requiring field testing are pH and Temperature. These tests may be performed as stand-alone tests or in conjunction with additional sampling requirements. Personnel who will be performing any field testing must have been trained and demonstrated proficiency in the Standard Operating Procedure for that test.

To obtain reproducible results laboratories must use standardized procedures for the preparation of samples. It is important to ensure that no bias is introduced in the analytical results. For example, certain gasworks contaminants can be driven off or modified during drying or handling procedures. Volatile organics may evaporate, PAHs are photosensitive, aerobic biodegradation of phenols may be accelerated, sulphide and cyanide may volatilise as the acid gases, metal complex cyanides can photodissociate to release free cyanide and oxidation may occur, for example, of sulphur to sulphate or to decompose cyanides.

## 5.10 Field Testing

Field testing is performed using the same analytical methods as a fixed laboratory. Data generated for compliance must meet the same rigorous quality control standards as a fixed laboratory. In addition, the environmental and site conditions must be recorded to ensure that future data comparability is based on the same test conditions. Temperature, pH, DO and Turbidity samples should be collected on site and logged in. Any result that appears unusual should be rerun at the site to assure that the first reading was correct. These environmental conditions are more constant in a fixed laboratory but they are extremely variable in the field.

## 5.11 CHAIN of CUSTODY (CoC)

Chain of Custody: Samples must be sent with a completed chain-of-custody/analytical request form (temperature reading should include on this form or Field Log Form), signed by the Client Represented and Field Technician/Sampler. The following information must be completed on the chain-of-custody form:

- Client's Name.
- Project Name.
- Project Number.
- Sampled By (Person who performed the sampling procedure).
- Client Sample Identification (List of all samples taken) with corresponding date, time and temperature of the sample
- Sample Temperature
- Requested Analyses (Contract Lab)
- Matrix (water)
- Number of containers
- Plant Condition
- Weather Conditions
- Any other comments to be noted at time of sampling
- Important information regarding the sample e.g. appearance
- Relinquished By (Signature by OPS)

- Received By (Signature by Contract Lab Representative).

## **5.12 SHIPPING SAMPLES**

The shipping or delivery to the laboratory must take into account the holding time for any specific parameter to be tested. There must be enough time allowed for the for the samples to be taken, prepared, shipped and received by the laboratory before the holding time expires.

Samples must be packed upright in a cooler surrounded by ice or ice packs. The samples that are most likely to deteriorate must be closest to the ice packs. Glass sample bottles must be wrapped in bubble wrap or some other protective wrapping to prevent breakage. Labels must be checked to ensure they are legible before wrapping.

## **6.0 Records**

- TRG – Risk Assesment Procedure
- TRG – JSA Procedure
- Chain of Custody Forms

## **APPENDIX G WASTE FACILITY ASSESSMENT QUESTIONNAIRE**

## WASTE FACILITY ASSESSMENT QUESTIONNAIRE

<b>Name of Facility:</b>	
<b>City/State/Country:</b>	
<b>EMID:</b>	
<b>Auditor:</b>	
<b>Audit Date:</b>	

**Notes to Recipient:**

- i. Please keep answers as brief as possible
- ii. If any questions are not applicable to your facility, please enter **N/A - not applicable**.

Questionnaire completed	Name	
on behalf of facility by:	Position	
	Date	

**SAFETY CONSIDERATIONS FOR THE SITE VISIT:** Please identify any potential safety hazards that should be considered for the site visit and identify all PPE requirements for the site visit.

**WASTE TYPE**       **Hazardous**       **Non-Hazardous**

**FACILITY TYPE**

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Battery Recycler          | <input type="checkbox"/> Incineration      | <input type="checkbox"/> Storage/Transporter  |
| <input type="checkbox"/> Catalyst Regeneration     | <input type="checkbox"/> Landfill/Landfarm | <input type="checkbox"/> Thermal Treatment    |
| <input type="checkbox"/> Cement Kiln               | <input type="checkbox"/> Oil Recycler      | <input type="checkbox"/> Wastewater Treatment |
| <input type="checkbox"/> Commercial Injection Well | <input type="checkbox"/> Soil Treatment    | <input type="checkbox"/> Other:               |
| <input type="checkbox"/> Drum Reconditioning       | <input type="checkbox"/> Solidification    |   |

# EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

## Contents

- A. General Information**
- B. Waste Receipt / Analysis**
- C. Wastewater / Runoff Control**
- D. Specific Unit Operations - Complete as applicable**
  - D1 - Tank/Impoundment Storage**
  - D2 - Container/Bulk Storage/Handling**
  - D3 - Waste Handling or Processing (Transfer / Treatment / Recycling)**
  - D4 - Thermal Treatment**
  - D5 - Landfill**
- E. Regulatory Compliance**
- F. Soil / Groundwater / Water Supply Protection**
- G. Management Systems**
- H. Safety**
- I. Location**
- J. Community Relations**
- K. Security**
- L. Financial/Insurance**

EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

**A. GENERAL INFORMATION**

1. Name of Facility:	
2. EMID:	
3. Address:	
4. Lat/Long/GPS Coordinates:	
5. Phone:	
6. Fax:	
7. Facility Contact Names:	
8. Facility Contact Title:	
9. Facility Contact Email:	
10. Facility Website:	
11. Parent Company:	
12. Owner of land:	
13. Term of lease ( <i>expiry date</i> ):	
14. Number of employees:	

Site History:

15. List previous operators at the site, date site use began, dates site changed owners/operators, types of facilities at site prior to current use. Also provide the history of any reported releases, explosions, fires, spills, remediation, etc.

16. List any significant plant/equipment changes/improvements in facilities during last 5 years, as well as any changes planned for the next 5 years.

17. On-site Activities: (*tick all that apply*)

- | <u>Treatment</u>                                      | <u>Recovery / Recycle</u>                          | <u>Disposal / Other</u>                           |
|---|--|---|
| <input type="checkbox"/> Acid/Base Neutralization     | <input type="checkbox"/> Cement kiln               | <input type="checkbox"/> Incineration             |
| <input type="checkbox"/> Biological treatment         | <input type="checkbox"/> Composting                | <input type="checkbox"/> Landfill - hazardous     |
| <input type="checkbox"/> Catalytic decomposition      | <input type="checkbox"/> Distillation              | <input type="checkbox"/> Landfill - non hazardous |
| <input type="checkbox"/> Chemical fixation            | <input type="checkbox"/> Drum reconditioning       | <input type="checkbox"/> Landfill - municipal     |
| <input type="checkbox"/> Chemical treatment           | <input type="checkbox"/> Fuel blending             | <input type="checkbox"/> Wastewater Treatment     |
| <input type="checkbox"/> Filtration                   | <input type="checkbox"/> Recovery - oils           | <input type="checkbox"/> Storage / Transfer       |
| <input type="checkbox"/> Flocculation / Precipitation | <input type="checkbox"/> Recovery – metals/e-waste | <input type="checkbox"/> Bulking / Transfer       |
| <input type="checkbox"/> Oxidation / Reduction        | <input type="checkbox"/> Recovery - solvents       | <input type="checkbox"/> Injection Disposal       |
| <input type="checkbox"/> Soil Washing                 | <input type="checkbox"/> Recovery – acids          | <input type="checkbox"/> Impoundments             |
| <input type="checkbox"/> Thermal Treatment            | <input type="checkbox"/> Regeneration - Thermal    | <input type="checkbox"/> Radioactive Waste        |
| <input type="checkbox"/> Land Treatment               | <input type="checkbox"/> Regeneration - Catalyst   |   |

Other - Please specify:

EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

18. List the types of waste that can be accepted at the facility (*and attach copy of permit list*). Also list wastes that are specifically prohibited.

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Acid / Caustics     | <input type="checkbox"/> Construction Debris        | <input type="checkbox"/> NORM/TENORM           |
| <input type="checkbox"/> Activated Carbon    | <input type="checkbox"/> Contaminated Solids/Debris | <input type="checkbox"/> PCBs                  |
| <input type="checkbox"/> Amines              | <input type="checkbox"/> Crude Oil                  | <input type="checkbox"/> Pigging Waste         |
| <input type="checkbox"/> Asbestos            | <input type="checkbox"/> Drilling Fluids/Mud        | <input type="checkbox"/> Radioactive Waste     |
| <input type="checkbox"/> Batteries           | <input type="checkbox"/> Filter Media/Cartridges    | <input type="checkbox"/> Soil                  |
| <input type="checkbox"/> Biological Sludge   | <input type="checkbox"/> Glycol                     | <input type="checkbox"/> Tank/Other Bottoms    |
| <input type="checkbox"/> Catalyst            | <input type="checkbox"/> Lab Packs/Used Chems       | <input type="checkbox"/> Used Oil/Oily Sludges |
| <input type="checkbox"/> Combustible Liquids | <input type="checkbox"/> Lamps/E-Waste              | <input type="checkbox"/> Wastewaters           |
| <input type="checkbox"/> Containers          | <input type="checkbox"/> Mercury                    | <input type="checkbox"/> Others:               |

19. Provide the following information regarding waste quantities received and processed/treated:

Provide estimate of current annual waste throughput:	<div style="border: 1px solid black; width: 100%; height: 15px;"></div>
Provide maximum annual waste processing/disposal capacity:	<div style="border: 1px solid black; width: 100%; height: 15px;"></div>
Provide permitted annual waste processing/disposal capacity:	<div style="border: 1px solid black; width: 100%; height: 15px;"></div>
Provide potential future expansion capacity:	<div style="border: 1px solid black; width: 100%; height: 15px;"></div>

20. Method of receipt of all wastes (*tick all that apply*)

- |  |                                       |   |
|--|---------------------------------------|---|
| <input type="checkbox"/> Tanker / Tank Container | <input type="checkbox"/> Vacuum Truck | <input type="checkbox"/> Barge  |
| <input type="checkbox"/> Goods Vehicle / Trailer | <input type="checkbox"/> Rail         | <input type="checkbox"/> Other ( <i>please specify</i> )                |
| <input type="checkbox"/> Tipper Truck            | <input type="checkbox"/> Ship         | <div style="border: 1px solid black; width: 100%; height: 15px;"></div> |

21. Does the Company provide waste transportation services? Yes  No

*If yes, provide transport permit number, number of trucks, geography of operation, & percentage of waste shipments transported by company vs. subcontractors. If no, state how waste is transported to the site.*

**B. WASTE RECEIPT/ANALYSIS**

Incoming Waste Pre-qualification Assessment and Analysis:

22. Is the generator required to complete a waste profile form? Yes  No   
 (*Describe the waste prequalification procedures, including sampling requirements*)

EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

23. What parties review and approve the waste streams prior to shipment to the facility?  
(Include onsite, corporate, and Regulatory Agency, as appropriate)

\_\_\_\_\_

Acceptance of Waste onsite

24. Which of the following activities must be completed as part of the on-arrival waste acceptance and receiving procedures: (Tick all that apply)

- Check of delivery documentation
- Collect/analyze samples from load
- On-site laboratory analyses
- Check compatibility with waste already in intended storage / reaction vessel
- Compare load analysis results with pre-qualification analysis results
- Other (please specify)
- Waste passes across a weigh scale
- Visual inspection of waste contents
- Off-site laboratory analyses

\_\_\_\_\_

25. What percentage of incoming waste deliveries are checked and/or analyzed at receipt?

- Tank Containers
- Bulk Containers
- Packages (e.g. drums)


26. Briefly describe how the facility tracks the incoming and transferred waste streams on-site throughout the facility from arrival through to final treatment/disposal/transfer. (Include the names of any paperwork forms or computer programs used)

\_\_\_\_\_

27. Briefly describe how rejected or non-conforming wastes are handled

\_\_\_\_\_

28. Briefly describe how operating records are managed and retained (Include duration of records storage, paper or electronic retainage, etc.)

\_\_\_\_\_

Transfer and Residual Waste Generation and Management:

29. Does the facility transfer wastes or produce any residual wastes that require further treatment, recycling, or disposal at another facility? Yes  No

If yes, how are those facilities selected?  
(Tick all that apply)

What aspects are considered during selection?  
(Tick all that apply)

- Checks that facility has appropriate permits
- Questionnaire sent to facility prior to use
- On-site visit to inspect facility prior to use
- S, H, & E Performance
- Management Systems
- Facility design and operations

**EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE**

- |   |  |
|---|--|
| <input type="checkbox"/> Checks / interviews with Regulatory Agency     | <input type="checkbox"/> Emissions to air / water / land |
| <input type="checkbox"/> Checks that the hauler has appropriate permits | <input type="checkbox"/> Regulatory Compliance history   |
| <input type="checkbox"/> Use of a scoring process to compare facilities | <input type="checkbox"/> Facility location               |
| <input type="checkbox"/> Other (please specify)                         | <input type="checkbox"/> Community Relations             |

30. List all incoming/residual wastes shipped off-site for transfer, treatment, disposal, or recycling:

Waste	Haz/Non-haz	Destination Facility (include City, State)

Comments:

31. Does the facility use a screening process to select third party waste haulers:

Delivering waste to the facility? Yes  No

Removing / transferring waste from the facility? Yes  No

*If yes, briefly describe the procedure and parameters used.*

**C. WASTEWATER/RUNOFF CONTROL**

Wastewater

32. Does the facility produce any wastewater, which is then discharged? Yes  No

*If yes, describe the source of the wastewater and how it is handled prior to discharge. Also describe if the discharge is covered under a permit?*

33. Briefly describe any sampling (frequency and analysis) of wastewater water prior to discharge.

34. Have any violations / warnings been received for not meeting discharge criteria? Yes  No

*If yes briefly describe ,and state what action was taken to prevent recurrence*

35. Is there any onsite treatment or pretreatment of the wastewater? Yes  No

*If yes, which of the following treatment processes are used? (tick all that apply)*

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Physical Separation | <input type="checkbox"/> Chemical Neutralization | <input type="checkbox"/> Biological Treatment |
|--|--|---|

EXXONMOBIL USE ONLY

EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Electrochemical separation | <input type="checkbox"/> Membrane Filter        | <input type="checkbox"/> UV / Peroxide oxidation |
| <input type="checkbox"/> Activated carbon Filter    | <input type="checkbox"/> Sand Filter            | <input type="checkbox"/> Dissolved Air Flotation |
| <input type="checkbox"/> Air Pollution Controls     | <input type="checkbox"/> Other (please specify) |  |

Rainwater Runoff

36. Is rainwater falling on active and non-active areas of the site collected? Yes  No   
*If yes, please briefly describe the collection, treatment, and discharge system.*

**D1. TANK/IMPOUNDMENT STORAGE**

- NOT APPLICABLE – NO TANK/IMPOUNDMENT STORAGE AT THIS FACILITY

37. Do all tanks carry visible signs displaying the hazards of the materials they contain? Yes  No

38. Describe the number of AST tanks, types of wastes/products in storage, and the types of secondary containment, overspill, and leak prevention and detection measures employed.

39. Briefly explain how any tank vapors are controlled and abated.

40. Are there any underground structures in use? Yes  No

*If yes, describe the structures (tanks, sumps, pipelines, etc.), types of wastes/ Products in storage/conveyance, construction, types of secondary containment/spill prevention Measures and how they are monitored for leak detection (frequency and method).*

41. Are any liquids (wastes/stormwater) stored in open surface impoundments? Yes  No

*If yes, please describe these impoundments, including type of liquids stored, Impoundment size & volume, liner system, and leak detection systems.*

**D2. CONTAINER/BULK SOLID STORAGE/HANDLING**

NOT APPLICABLE – NO CONTAINER/BULK SOLIDS STORAGE/HANDLING AT THIS FACILITY

42. Briefly describe the design and operation of all container storage areas (*tick all that apply and provide further description of containment, spill prevention, runoff and air pollution controls employed*)

Inside warehouse	<input type="checkbox"/>
Under fixed roof	<input type="checkbox"/>
Under tarpaulin	<input type="checkbox"/>
Is an automatic fire alarm installed?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are automatic fire suppression facilities installed?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are any air pollution controls installed?	Yes <input type="checkbox"/> No <input type="checkbox"/>

43. Are all containers:

	In good condition?	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Kept securely closed?	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Marked to identify contents?	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Segregated by waste type?	Yes <input type="checkbox"/> No <input type="checkbox"/>

44. Are bulk waste solids received and stored at the facility? Yes  No   
*If yes, briefly describe the design and operation of all bulk waste storage areas, and include a description of any water and air pollution controls as well as spill and leak prevention aspects.*

45. Are storage areas inspected for leaks or spills? Yes  No   
*If yes, describe by whom, method and frequency.*

46. Is there any restriction on the length of time that waste is allowed to be stored? Yes  No   
*Also describe the average waste storage time and oldest waste in storage.*

47. Briefly describe how the age of the inventory is managed.  
*Also describe the quantity of waste currently in storage vs. total storage/processing capacity.*

**D3. WASTE HANDLING OR PROCESSING**

NOT APPLICABLE – NO WASTE HANDLING OR PROCESSING AT THIS FACILITY

48. Please briefly describe unit design and operation for any waste handling and processing (including transfer / consolidation / treatment / recycling) conducted at the facility (*or attach flow plan and*

EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

supplement with description). Include a description of any containment, spill/leak prevention measures and water and air pollution controls.

49. Please list each product generated / regenerated from waste processing and its destined use (e.g. heavy oils for fuel)

Recovered product	Destined use	Analyzed for quality?		Made to a Specification?	
		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Comments:

**D4. THERMAL TREATMENT**

NOT APPLICABLE – NO THERMAL TREATMENT AT THIS FACILITY

50. What type of furnace is used?

- Rotary Kiln   
  Fluid Bed   
  Multiple Hearth   
  Single Hearth

51. Is a gas incinerator (afterburner) fitted?      Yes  No

52. Please list the emission abatement equipment used (tick all that apply)

- Filter baghouse                       Electrostatic precipitator                       Cyclone  
 Wet Scrubber (state liquor):  
 Dry Scrubber (state adsorbent):  
 Other (please specify)

53. Please briefly describe the thermal treatment facilities showing how all major equipment and processes are controlled. Attach flow plan and supplement with a description. Include how furnace feed is controlled, how operating temperatures are maintained/controlled, and what conditions result in an automatic shutdown.

54. Describe the type and frequency of air emissions monitoring:

	Measurement Frequency
SOx	
NOx	
CO	

	Measurement Frequency
Particulates	
PCB	
PAH / PNA	

EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

HCl	
VOC	

Heavy metals	
Dioxins	

Also describe any stack testing (frequency, analyses, results, etc.)

55. Describe how thermal treatment solid and liquid residual wastes are managed.

**D5. LANDFILL**

NOT APPLICABLE – NO LANDFILL DISPOSAL AT THIS FACILITY

56. Please describe the landfill operations, including size of current landfill disposal cells, historic disposal cells, and current disposal rate. Estimate the remaining operating life of the facility.

57. Is waste pretreated at the site prior to placement in the landfill? Yes  No   
*If yes, briefly describe process*

58. Please describe construction of cells currently in use: (*provide cross section if available*). Also describe the construction of historic/closed cells.

59. Describe how leachate is managed and treated:

60. Briefly describe how landfill gas is monitored and/or handled.

61. Briefly describe what measures are in place to prevent odors, wind dispersal of waste, litter and dust?

**E. REGULATORY COMPLIANCE**

62. List all Regulatory Agency Permits held by the facility:

Permit Reference Number	Expiry date (if applicable)	Enforcing Agency	Frequency of site inspections by Agency

Comments:

63. During the last 5 years have there been any incidents or releases of pollutants to the environment that were required to be reported to a Regulatory Agency? Yes  No   
*(Include releases both inside and outside of containment)*

*If yes, please briefly describe the incidents and state what measures the facility has taken to prevent recurrences?*

64. During the last 5 years have there been any regulatory deficiencies, notices of violations, regulatory orders, fines or penalties issued by the Regulatory Agency? Yes  No

*If yes, briefly describe the areas of non-compliance and state what measures the facility has taken to prevent recurrences? Describe frequency of regulatory inspections and provide inspection dates.*

65. List any current outstanding, unresolved, or incomplete actions, relating to compliance with permit conditions or remediation requirements, including due dates for completion.

66. List any regulatory issues associated with any remediation or corrective actions.

67. Has the facility or its management been the focus of any criminal investigations for violating any regulations/laws, including environmental laws/regulations? Yes  No

*If yes, please briefly describe the circumstances and state what measures the facility has taken to prevent recurrences?*

68. Are there any proposed or pending new government regulations that could affect site operations? Yes  No

*If yes, please briefly describe the new regulations and how they will effect site operations?*

**F. SOIL/GROUNDWATER/WATER SUPPLY PROTECTION**

69. Describe the source of water supply for the facility, and other residential, industrial, agricultural users within 10km. Indicate if the source is groundwater or surface water, and provide the proximity of the water source to the facility, including whether it is upgradient or downgradient to the facility.

70. Briefly describe the geological cross-section beneath the site – include the description of all aquifers underlying the site, depth to the water table and depth to water supply aquifers. Also include the direction of groundwater flow.

71. Briefly describe the groundwater monitoring program in place at the facility (*number of wells, frequency of sampling, parameters analyzed*)

72. Has contamination been detected in either groundwater or soil? Yes  No   
*If Yes, briefly describe contaminants and extent of contamination*

73. Has a corrective action program for either groundwater or soil at the facility been initiated or proposed? (*include assessments*) Yes  No   
*If yes, briefly describe:*

**G. MANAGEMENT SYSTEMS**

74. Management Experience Summary – Provide information for all key management staff and health/safety/ environmental staff:

Name	Title	Number of Years of On-site Experience	Total Number of Years in Waste Business

75. What is the percentage of employee turnover in the last five years? Provide the reason(s) for recent employee turnover, especially those related to management/environmental staff turnover.

76. Does the facility employ off-site environmental resources to support its operations (3<sup>rd</sup> party consultants, corporate resources, etc.)? Yes  No

**EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE**

*If yes, provide name of entity and support/services provided.*

--

77. Does the facility have management systems accredited to the following Standards? (Provide data or indicate "None")

Standard	Certificate Number	Accreditation Body	Expiry Date
ISO 9001			
ISO 14001			
EMAS			
Other (please specify)			

--

78. Do the management procedures include informing ExxonMobil of any changes that could affect handling of ExxonMobil waste at the facility? Yes  No

*Briefly describe any such changes that are underway, or planned with regard to equipment, processing, capacity or type of wastes handled.*

--

79. Briefly describe the types of any daily, weekly, or monthly inspections conducted at the facility. Indicate what types of operations are subject to inspections and if the inspections are documented.

--

80. Are site reviews/audits conducted periodically addressing the following areas?

	Frequency	By Whom (indicate off-site/on-site staff)
Safety		
Health / Industrial hygiene		
Environmental Performance		

--

81. Briefly describe how on site personnel training needs are determined and managed. Provide list of typical training topics, how often training is conducted, and approximately how many hours each employee receives annually.

--

EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

**H. SAFETY**

82. During the last 5 years have there been any fires, explosions, etc. at the facility? Yes  No

*If yes, please briefly describe the incidents (include date, cause, and consequences) and state what measures the facility has taken to prevent recurrences?*

83. Briefly describe the facility safety program, including the frequency of safety meetings, safety inspections, safety training (internal/external), safety committee functions, etc.

84. Does the facility operate a permit to work system? Yes  No

*If Yes, which of the following activities are covered?*

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> General (cold) Work    | <input type="checkbox"/> Hot work             | <input type="checkbox"/> Electrical Work   |
| <input type="checkbox"/> Other (please specify) | <input type="checkbox"/> Confined Space Entry | <input type="checkbox"/> Working at height |

85. Have job safety/risk assessments been conducted for all activities at the facility? Yes  No

*If yes, please briefly explain the process used and how PPE is selected. Describe the typical PPE used at the facility.*

86. Do staff undergo routine medical checks? Yes  No

*If yes, describe the frequency and types of tests conducted*

87. Does the facility operate a 'near miss' reporting system? Yes  No

*If Yes, describe the process used to act upon reducing potential hazards*

88. Does the facility have any of the following Emergency control equipment? (tick all that apply)

- |   |  |
|---|--|
| <input type="checkbox"/> Hand held fire extinguishers       | <input type="checkbox"/> Spill / decontamination materials |
| <input type="checkbox"/> Automatic fire detection and alarm | <input type="checkbox"/> Onsite firewater storage          |
| <input type="checkbox"/> Automatic fire suppression systems | <input type="checkbox"/> Onsite firewater hydrants/hoses   |

*Describe briefly the fire protection and detection systems at the facility.*

89. Does the facility have a written contingency or emergency response plan? Yes  No

*If yes, does the plan include: (tick all that apply)*

- |   |   |
|---|---|
| <input type="checkbox"/> Emergency procedures | <input type="checkbox"/> Emergency Coordinator name & contact details |
|---|---|

**EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE**

- |  |   |
|--|---|
| <input type="checkbox"/> Evacuation plan for facility personnel  | <input type="checkbox"/> Arrangements with local Emergency services |
| <input type="checkbox"/> List of Emergency equipment at facility | <input type="checkbox"/> Contact Numbers for Emergency services     |
| <input type="checkbox"/> Location of all Emergency equipment     |   |

90. When was the plan last updated (Month/Year)?

91. Is the facility Emergency response plan coordinated with community plans? Yes  No

92. Are live exercises conducted to test the plan effectiveness? Yes  No

*If yes, how frequently? Provide the date and scenario of the last exercise.*

93. Have the local Emergency services taken part in Emergency preparedness drills at or with the facility? Yes  No

94. Does the facility monitor injury statistics? Yes  No

*If Yes, please complete the relevant table entries for the last 3 years*

	Current Year	Last Year	Previous Year
Number of first aid injuries onsite			
Number of lost time injuries onsite			
Number of fatalities onsite			
Number of employees onsite			
Total Man-hours worked onsite			

*For fatalities, provide brief description of event. For first aid and lost time injuries, describe the type of injuries that have occurred.*

**I. LOCATION**

95. Describe land use immediately bordering facility in all directions (e.g. industrial, agricultural, and residential).

*If industrial, state types of industry and overall size of adjacent industrial area (km<sup>2</sup>).*

96. Provide an estimate of the total population living and working within 1.5 km and 5 km of the facility.

97. Around the facility, please list the following that are found nearby (within 5 km):

Nature of residence (e.g., low density, village, town, city)	Distance from facility	Direction
--	------------------------	-----------

**EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE**

Surface Water (e.g., drainage, river, lake, etc.)	Distance from facility	Direction
Sensitive Receptor (hospitals, schools, nature reserves, etc.)	Distance from facility	Direction
Natural Hazards (floodplain, earthquake zone, wildfire, etc.)	Distance from facility	Direction

98. Briefly describe any buffer zone(s), if any, between the operational portion of the site and the areas described above.

99. Are there any contaminated sites, landfills, or other businesses conducting hazardous/dangerous activities adjacent to or within 1 km of the facility? *If yes, briefly describe:* Yes  No

100. Has the facility been impacted by any contamination or other hazards originating from adjacent properties or from other sites within 1 km of the facility? Yes  No

*If yes, briefly describe the impact on site operations over the last five years:*

**J. COMMUNITY RELATIONS**

101. Does the facility have any community programs or support community events? Yes  No

*If yes, briefly describe:*

102. Has the facility received any complaints from the local community? Yes  No  Number received year to date  Number received last 5 years

103. Briefly describe the source and nature of complaints, and the action taken to resolve the issue with the community.

104. Has there been public opposition to any of the facility permit applications or activities in the past 5 years? Yes  No

*If yes, please briefly describe the nature of opposition, the opposing parties and the action taken to resolve the issue with the community.*

105. Has the facility been the subject of any media coverage (positive or negative) in the past 5 years? Yes  No

EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

\_\_\_\_\_

**K. SECURITY**

106. Is there an artificial or natural barrier around the facility? (e.g. fence) Yes  No

If yes, please describe the height and type of barrier and extent of facility barrier (% of property line):

\_\_\_\_\_

107. Is access to the facility controlled? Yes  No

If yes, which of the following measures are used? (tick all that apply)

	During working hours	Outside working hours
Entrance gates locked	<input type="checkbox"/>	<input type="checkbox"/>
Entrance gates manned	<input type="checkbox"/>	<input type="checkbox"/>
CCTV / Camera surveillance at entrance gates	<input type="checkbox"/>	<input type="checkbox"/>
CCTV / Camera surveillance along boundary	<input type="checkbox"/>	<input type="checkbox"/>
CCTV / Camera surveillance within facility	<input type="checkbox"/>	<input type="checkbox"/>
Security Guards at entrance gates	<input type="checkbox"/>	<input type="checkbox"/>
Security Guard patrols along boundary	<input type="checkbox"/>	<input type="checkbox"/>
Warning signage at each entrance		<input type="checkbox"/>
Warning signage along boundary		<input type="checkbox"/>

Provide additional details regarding the type of surveillance, access controls, and signage:

\_\_\_\_\_

**L. FINANCIALS/INSURANCE**

Financials

108. Provide the following financial information for the facility/or parent company.

	Current Year	Previous Year
Total Assets		
Total Liabilities		
Owners Equity (total assets-total liabilities)		
Debt to Equity Ratio (total liabilities/equity)		
Current Assets		
Current Liabilities		
Current Ratio (current assets/current liabilities)		
Total Sales		

Comments:

\_\_\_\_\_

EXXONMOBIL WASTE FACILITY ASSESSMENT QUESTIONNAIRE

109. Estimate the number of current customers:  
 Estimated number of multi-national company/  
 Fortune 500 list customers:  
 List 5-10 representative multi-national/Fortune 500 company customers:


--

110. Is there any regulatory requirement to maintain any type of financial assurance in the event of site closure? Yes  No

*If yes, please briefly describe what site activities are covered by financial assurance.*

--

111. List any financial assurance coverage applicable to this facility.

Coverage Amount for Closure  
 Coverage Amount for Post Closure  
 Financial instrument (insurance, bond, etc.)


--

112. Is the financial assurance coverage updated annually? Yes  No

*If no, please indicate when the financial assurance coverage was last updated.*

--

113. With respect to other potential financial liabilities, does the facility/parent company:

- Anticipate future remediation/cleanup at this site? Yes  No
- Have responsibility for closure/remediation/clean-up of other sites? Yes  No
- Have any involvement in current or pending legal proceedings? Yes  No

*If yes to any of these questions, please briefly describe the nature of the liabilities and provide a cost estimate for resolving the liabilities.*

--

Insurance

114. Does the site have any insurance covering environmental or pollution damage caused by the site's operations? Yes  No

*If yes, enter following details*

Insurance Company:  
 Policy No:  
 Expiry Date:  
 Amount of Limits


Comments:

--

## **APPENDIX H ESTIMATED WASTE VOLUMES**

This section includes the methodology (planning bases and assumptions) for waste volume estimates expected to be generated during the period 2021–2046. These volumes include total wastes (hazardous and non-hazardous), total hazardous wastes and total non-hazardous wastes.

Esso Exploration and Production Guyana Limited (EEPGL) has excluded from this waste forecasting effort the relatively small volumes of waste likely to be generated from approved projects such as the EEPGL's Fiber Optic Cable Project and EEPGL's Guyana Office Complex Project. Waste volumes generated from EEPGL's leased office at Duke Street are also excluded. Offshore discharged effluent volumes were also excluded from the 2021–2046 forecast, as these are managed off-shore and do not require onshore facilities for waste management.

Additionally, marine vessels tank clean out (VTCO) waste is currently not included in this Study. VTCO waste continues to be transported to and treated in Trinidad as there is currently no treatment capacity in Guyana for that waste stream. However, commencing in the 3Q2021, the Sustainable Environmental Services (SES) operation is expected to commence and the treatment of a small batch of VTCO wastes will be tested. If successful, another trial test is anticipated for a larger batch in late 2021. The SES operations are expected to expand VTCO treatment capabilities and capacity in Guyana in the future. However, given the uncertainty of when VTCO treatment operations will commence in Guyana, no VTCO waste volumes were included in the forecasting.

Residual waste volumes generated from third party waste management facilities (Tiger Rentals Guyana [TRG], and in the future SES) that send those wastes to the Haags Bosch Landfill (HBL) are also excluded from the forecast. TRG generates its own non-hazardous waste from its treatment processes and operations, and has multiple customers in addition to EEPGL. The total residual wastes generated by TRG are not known to EEPGL. However, approximately 75 percent of EEPGL's non-hazardous wastes that are handled by TRG is transported to the HBL based on EEPGL's Annual Environmental Reports.

The classification of wastes as hazardous is defined by the Environmental Protection (Hazardous Waste Management) Regulations 2000 and, based on instructions from the Guyana Environmental Protection Agency (EPA), the Basel Convention classification scheme. Wastes defined in the Basel Convention Annex VIII are considered as hazardous wastes for this Study.

Based on the waste classification defined by the Basel Convention Annex VIII, the following classified hazardous wastes are generated from EEPGL operations:

- A1010 (metal wastes)
- A1160 (lead-acid batteries, whole or crushed)
- A1170 (unsorted batteries)
- A3020 (mineral oils)
- A4020 (clinical)
- A4060 (waste oils/water, hydrocarbons/water mixtures, emulsions)
- A4090 (acidic or basic solutions)
- A4140 (off spec or outdated chemicals)
- A4160 (spent activated carbon)

The estimated waste volumes incorporate the Government of the Guyana (GoG) Approved Projects for 2021–2046 as well as Theoretical Projects introduced to the GoG but not approved. Approved Projects are based on EEPGL's latest planning assumptions. Theoretical Projects are

based on limited planning assumptions primarily due to the variability of drilling well counts. Section 5, Estimated Waste Volumes, outlines the approved and theoretical scopes as the following:

### **Approved Scope**

- Liza Phase 1 (LP1)—17 operating wells and 1 floating, production, storage and offloading (FPSO) vessel (14 wells completed—FPSO in operation);
- Liza Phase 2 (LP2)—30 Development Wells (Dev Wells) and 1 FPSO (4 wells completed and subsea installation underway);
- Payara—41 Dev Wells and 1 FPSO (well drilling to commence later in 2021—no FPSO operations to date); and
- Exploration and Appraisal (E&A) Operations—25 E&A Wells (well drilling underway).

### **Theoretical Scope**

- 8 FPSOs;
- 281 Dev Wells; and
- 111 E&A Wells.

The factors not quantified, but that could potentially impact the estimated waste volumes forecast for 2021–2046 include:

- Efficiency differences among drill ships;
- Waste minimization and source reduction initiatives;
- Treatment technologies to be developed;
- Changes to schedule for drilling of wells;
- Additional waste service provider's treatment facilities coming online;
- Different oil production capacities of FPSOs;
- Equipment turnaround or production interruption on FPSOs;
- Waste destruction efficiency differences for equipment among waste service providers;
- Well completion complexities;
- New discoveries; and
- Pandemics.

EEPGL's 2020 Environmental Report includes waste generation data from the LP1 and LP2 Projects, and included those wastes generated from the offshore assets only, i.e., drill ships, installation, FPSO support, and other marine vessels.

The following technical assumptions were also made to develop the waste volume forecasts and planning bases:

- E&A Well waste does not include well tests;
- E&A and Dev Wells take 2 months to drill;
- Waste generated from Redtail-1 is representative of average waste generated for approved E&A Wells, and the average of Redtail-1 and Tanager-1 waste volumes are representative of average waste generated for theoretical E&A Wells;

- E&A Well counts are based on planning assumptions;
- Average of waste generated from LIZ\_2W6 (water injection well), LIZ\_2P4 (production well), and LIZ\_1G4 (gas injection well) is representative of average waste generated for development wells;
- Stabroek economic modeling is utilized to determine 38 wells per FPSO required for high gas to oil ratio and 45 wells per FPSO for oil to determine the theoretical development well count;
- Development wells that were spud in 2020 but not completed before 2021 were included in the well count;
- Drilling of theoretical development wells started 2 years prior to startup;
- Maximum of 8 rigs per year for theoretical development drilling;
- Data from the 2020 Environmental Report were used to obtain average volumes of waste per FPSO, 5 installation vessels, 4 FPSO supporting vessels, and 1 logistics vessel that are representative of waste per unit for future years;
- 5 installation vessels are required for the year of each FPSO startup;
- 4 FPSO supporting vessels are required per FPSO in operation;
- 3.5 logistic vessels per drill rig and on average 4.5 wells per drill rig (utilized EEPGL's current drilling schedule that only forecasts through 2022);
- All liquid mud plant (LMP) waste is considered hazardous;
- 138.67 tonnes of LMP waste per well (based on historical operational experience); and
- Waste stream volumes generated from treatment processes at waste service provider facilities include other generators' waste (e.g., Schlumberger/MI-Swaco, Halliburton and Baker Hughes) so volumes for oil debris, batteries, and oily water are not included.

The planning bases used to calculate the estimated waste volume forecast are displayed in Tables 1-6 below. Partial wells and vessels represent a well that was only partially completed in that year and a vessel that was only active for a certain amount of time that year.

- Table 1—Estimated Number of Waste Generation by Source (units) for 2021–2046 (Approved Projects Scope)
- Table 2—Estimated Waste Volume Generated per Well Type (tonnes/well) (Approved Projects Scope)
- Table 3—Estimated Annual Waste Volume Generated per Offshore Activity (tonnes/unit) (Approved Projects Scope)
- Table 4—Estimated Number of Waste Generation Source (units) for 2021–2046 (Theoretical Projects Scope)
- Table 5—Estimated Waste Volume Generated per Well Type (tonnes/well) (Theoretical Projects Scope)

- Table 6—Estimated Annual Waste Volume Generated per Offshore Activity (tonnes/unit) (Theoretical Projects Scope)

Note that repetitive waste volumes or estimated waste volumes of zero in later years is due to insufficient data for accurate projections that far into the future.

**Table 1: Estimated Number of Waste Generation by Source (units) for 2021–2046 (Approved Projects Scope)**

Year	E&A Wells	FPSOs	Development Wells	Installation vessels	FPSO Supporting Vessels	Logistics Vessels
2021	20	2	17	5	8	28
2022	5	2	17	0	8	17
2023	0	3	17	5	12	13
2024	0	3	7	0	12	5
2025	0	3	7	0	12	5
2026	0	3	7	0	12	5
2027	0	3	0	0	12	0
2028	0	3	0	0	12	0
2029	0	3	0	0	12	0
2030	0	3	0	0	12	0
2031	0	3	0	0	12	0
2032	0	3	0	0	12	0
2033	0	3	0	0	12	0
2034	0	3	0	0	12	0
2035	0	3	0	0	12	0
2036	0	3	0	0	12	0
2037	0	3	0	0	12	0
2038	0	3	0	0	12	0
2039	0	3	0	0	12	0
2040	0	3	0	0	12	0
2041	0	3	0	0	12	0
2042	0	3	0	0	12	0
2043	0	3	0	0	12	0
2044	0	3	0	0	12	0
2045	0	3	0	0	12	0
2046	0	3	0	0	12	0

**Table 2: Estimated Waste Volume Generated per Well Type (tonnes/well)  
(Approved Projects Scope)**

	Hazardous	Non-Hazardous	Total
E&A Well	15	51	65
Dev Well	28	35	63

**Table 3: Estimated Annual Waste Volume Generated per Offshore Activity  
(tonnes/unit) (Approved Projects Scope)**

	Hazardous	Non-Hazardous	Total
1 FPSO	110	100	210
5 Installation Vessels	842	214	1,056
4 FPSO Supporting Vessels	66	15	21
1 Logistics Vessel	0.00	29	29

**Table 4: Estimated Number of Waste Generation Source (units) for 2021–2046  
(Theoretical Projects Scope)**

Year	E&A Wells	FPSOs	Development Wells	Installation vessels	FPSO Supporting Vessels	Logistics Vessels
2021	20	2	17	5	8	28
2022	24	2	17	0	8	32
2023	18	3	48	5	12	51
2024	16	3	48	0	12	50
2025	12	4	48	5	16	47
2026	7	5	48	5	20	43
2027	7	6	48	5	24	43
2028	7	7	8	5	28	12
2029	0	8	0	5	32	0
2030	0	8	0	0	32	0
2031	0	8	0	0	32	0
2032	0	8	0	0	32	0
2033	0	8	0	0	32	0
2034	0	8	0	0	32	0
2035	0	8	0	0	32	0
2036	0	8	0	0	32	0
2037	0	8	0	0	32	0
2038	0	8	0	0	32	0
2039	0	8	0	0	32	0
2040	0	8	0	0	32	0

Year	E&A Wells	FPSOs	Development Wells	Installation vessels	FPSO Supporting Vessels	Logistics Vessels
2041	0	8	0	0	32	0
2042	0	8	0	0	32	0
2043	0	8	0	0	32	0
2044	0	8	0	0	32	0
2045	0	8	0	0	32	0
2046	0	8	0	0	32	0

**Table 5: Estimated Waste Volume Generated per Well Type (tonnes/well) (Theoretical Projects Scope)**

	Hazardous	Non-Hazardous	Total
E&A Well	31	47	78
Dev Well	28	35	63

**Table 6: Estimated Annual Waste Volume Generated per Offshore Activity (tonnes/unit) (Theoretical Projects Scope)**

	Hazardous	Non-Hazardous	Total
1 FPSO	110	100	210
5 Installation Vessels	842	214	1,056
4 FPSO Supporting Vessels	66	15	81
1 Logistics Vessel	0.00	299	299

## **APPENDIX I SAFETY DATA SHEETS FOR WASTE PROFILES**

## Safety Data Sheet Index

EPA Waste Profile Sheet Number	Waste Stream	Safety Data Sheets	Hyperlink
20140506-009	Drill Cuttings/Mud Slops	Barite	<a href="https://www.aplng.com.au/content/dam/aplng/compliance/msds/BARITE%20SDS.pdf">https://www.aplng.com.au/content/dam/aplng/compliance/msds/BARITE%20SDS.pdf</a>
		Calcium Chloride	
		Ecotrol RD	
		EMI-1926	
		Lime	
		Escaid 110	
		RHETHIK	
		SUREMUL	
20140506-011	Chemical Sacks	VG-PLUS	
		Calcium Chloride	
		Caustic Soda	
		Deepclean	
		Defoam X	
		Duo Vis	
		Duramod	
		Ecotrol RD	
		Escaid 110	
		HRP	
		KI- 3924	
		Lime	
		M-I Gel	
		Microbar	
		Monoethylene Glycol (MEG)	
		Myacide	
		Novamod	
		Nut Plug (All Grades)	
		Pecan Nut Plug (All grades)	
		Polypac (All Grades)	
		Potassium Chloride	
		Rhebuild	
		RheCon (EMI-1926)	
		Rheducer	
		Rheflat	
		Rheguard Mud System	
		Rhemul	
		Rhethin	
		Safe-Break Prime	
		Safe-Break	
Safe-Carb (all Grades)	<a href="https://ofmp-media.azureedge.net/media/miswaco/documents/safe-carbsds_v1.pdf">https://ofmp-media.azureedge.net/media/miswaco/documents/safe-carbsds_v1.pdf</a>		
Safe-Cor C			
Safe-Cor			
Safe-Scav CA			

EPA Waste Profile Sheet Number	Waste Stream	Safety Data Sheets	Hyperlink
		Safe-Scav NA	
		Salt Saturated Mud System	
		SAPP	
		Seal-N-Peel (Ca Br2)	
		Seal-N- Peel (Kcl-Nacl-Nabr)	
		Soda Ash	
		Sodium Bromide Brine	
		Sodium Bromide	
		Sourscav	
		Surewet	
		VG-Plus	
		VG-Supreme	
		Walnut Nutplug (All Grades)	
		Water Based Mud (Generic)	
201440506-012	Casing Protectors	4421 Kendex OCTG	<a href="https://www.protectivesupplies.com/datasheets/87_MSDS.pdf">https://www.protectivesupplies.com/datasheets/87_MSDS.pdf</a>
		Best O Life 72733	
		Jet-Lube API- Modified – Casing	<a href="https://docs.jetlube.com/documents/SDS+-+Central+Repository-/SDS's+REPOSITORY/United+States/English/Jet-Lube/API-Modified_SDS_USA_En.pdf">https://docs.jetlube.com/documents/SDS+-+Central+Repository-/SDS's+REPOSITORY/United+States/English/Jet-Lube/API-Modified_SDS_USA_En.pdf</a>
20140506-015	Acid Solutions	Hydrochloric Acid	<a href="https://ashtachemicals.com/wp-content/uploads/2020/05/Safety-Data-Sheet_Hydrochloric-Acid.pdf">https://ashtachemicals.com/wp-content/uploads/2020/05/Safety-Data-Sheet_Hydrochloric-Acid.pdf</a>
20140506-016	Aerosol Cans	WD 40	<a href="https://files.wd40.com/pdf/WD-40+Aerosol+CAN+GHS+SDS+(Button+Top)+(11-21-19).pdf">https://files.wd40.com/pdf/WD-40+Aerosol+CAN+GHS+SDS+(Button+Top)+(11-21-19).pdf</a>
20140506-017	AFFF	Ansulite 1	<a href="https://www.safetyemporium.com/content/sds/sds_Ansulite_AF_C1B.pdf">https://www.safetyemporium.com/content/sds/sds_Ansulite_AF_C1B.pdf</a>
20140506-018	Batteries	BBI - Lead Acid Batteries	
		Sonardyne 641-0127 Compatt 6 Battery Pack Lithium	<a href="https://www.swe.com/media/files/files/7eaf7b8f/SDS_LiSOCl2_Saft_eng_Oct_2015_Rev11.pdf">https://www.swe.com/media/files/files/7eaf7b8f/SDS_LiSOCl2_Saft_eng_Oct_2015_Rev11.pdf</a>
20140506-020	Chemical Contaminated Water	ACP22005A	
		AFMR19017A	
		ASPH17544SP	
		MISC17477A	
		PC-191T	
20140506-021	Completion Fluids/ Contaminated Brine	Oceanic HW443 R	
		Crude Oil Sweet	
		Deepclean	
20140506-023	Fluorescent Bulbs	Fluorescent Bulbs	<a href="https://lightbulbdepot.com/common/images/msds/SDS_1621.pdf">https://lightbulbdepot.com/common/images/msds/SDS_1621.pdf</a>
20140506-024	Fuel	Jet Fuel	<a href="https://www.swe.com/media/files/files/7eaf7b8f/SDS_LiSOCl2_Saft_eng_Oct_2015_Rev11.pdf">https://www.swe.com/media/files/files/7eaf7b8f/SDS_LiSOCl2_Saft_eng_Oct_2015_Rev11.pdf</a>

EPA Waste Profile Sheet Number	Waste Stream	Safety Data Sheets	Hyperlink
		MGO	<a href="http://algoma.msdsworld.com/msds/English/34260.pdf">http://algoma.msdsworld.com/msds/English/34260.pdf</a>
20140506-025	Lube Oil	Shell Gadinia 30	
20140506-027	Oily Water	Shell Gadinia 30	
		NGL No 2 Diesel Fuel Low Sulfur All Grades	<a href="http://www.nglenergypartners.com/wp-content/uploads/NGL_NO2_DIESEL_FUEL_LOW_SULFUR_ALL_GRADES_GHS_MS_DS_1_3_2012.pdf">http://www.nglenergypartners.com/wp-content/uploads/NGL_NO2_DIESEL_FUEL_LOW_SULFUR_ALL_GRADES_GHS_MS_DS_1_3_2012.pdf</a>
20140506-028	Paint/Paint Consumables	Primer Paint	
		Tuf Coat Paint	
20145060-036	Hydraulic Oil/Glycol	Shell Tellus S2	<a href="https://www.makino.com/makino-us/media/general/Shell-Tellus-S2-M-22-32-46-68.pdf?ext=.pdf">https://www.makino.com/makino-us/media/general/Shell-Tellus-S2-M-22-32-46-68.pdf?ext=.pdf</a>
		Ethylene Glycol	
		Monoethylene Glycol	
20145060-038	Waste Mineral Oil	Mineral Oil	
20145060-039	Refrigerant	Freon R134A	
20145060-040	Caustic	Lime	
		Sodium Hypochlorite	<a href="https://www.unil.ch/cig/files/live/sites/cig/files/FAQ/Safety/PDF/M_SDS/Sodium%20hypochlorite-msds.pdf">https://www.unil.ch/cig/files/live/sites/cig/files/FAQ/Safety/PDF/M_SDS/Sodium%20hypochlorite-msds.pdf</a>

**Safety Data Sheets:** Barite, Calcium Chloride, Ecotrol RD, EMI-1926, Lime;  
Escaid 110; RHETHIK; SUREMUL; and VG-PLUS

**Waste Stream:** Drill Cuttings/Mud Slops

**EPA Waste Profile Sheet Number:** 20140506-009

## Safety Data Sheet BARITE (ALL GRADES)

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name	BARITE (ALL GRADES)
Product code	MI11207
REACH Registration Name	Exempt Annex V ENTRY 7.
Denmark Pr. no.	1154758

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended use	Weighting agent.
-----------------	------------------

Uses advised against	Consumer use
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#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424  
MISDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

Health hazards	Not classified
----------------	----------------

Environmental hazards	Not classified
-----------------------	----------------

Physical Hazards	Not classified
------------------	----------------

#### 2.2 Label Elements

**Signal word**

None

**Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements - EU (§28, 1272/2008)**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Classification according to EU Directives 67/548/EEC or 1999/45/EC**

**Indication of danger**

Not classified

**Contains**

Crystalline silica (impurity)

*For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.*

**2.3 Other data**

Not classified as PBT/vPvB by current EU criteria

**Australian statement of hazardous/dangerous nature**

Classified as Non-Hazardous according to the criteria of NOHSC.  
 NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

**3. Composition/information on ingredients**

**3.1 Substances**

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
Crystalline silica (impurity)	238-878-4	14808-60-7	1-5	Xn; R48/20	STOT Rep. 2 - H373	Exempt

**3.2 Mixtures**

Not Applicable

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

## 4. First aid measures

### 4.1 First Aid

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye contact</b>	Remove contact lenses. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2 Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### Main symptoms

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically.

## 5. Fire-fighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use extinguishing media appropriate for surrounding material.

#### Extinguishing media which shall not be used for safety reasons

None known.

### 5.2 Special hazards arising from the substance or mixture

#### Unusual fire and explosion hazards

None known.

#### Hazardous combustion products

Thermal decomposition can lead to release of irritating gases and vapours.

### 5.3 Advice for firefighters

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental release measures**

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Do not breathe dust.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and materials for containment and cleaning up

#### **Methods for Containment**

Prevent further leakage or spillage if safe to do so.

#### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water. Avoid generating or breathing dust. Product is slippery if wet.

### 6.4 Reference to other sections

See section 13 for more information.

## **7. Handling and storage**

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Material becomes slippery when wet. Use caution if wet.

#### **Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

#### **Technical measures/precautions**

Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

#### **Storage**

Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid wet and humid conditions.

**Storage class** Chemical storage.  
**Packaging material** Use specially constructed containers only

**7.3 Specific end uses**

See also Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure limits** No biological limit allocated

Component	EU OEL - Third List	Austria	Australia	Denmark
Crystalline silica (impurity)	Not determined	Not determined	0.1 mg/m <sup>3</sup> TWA	0.1mg/m <sup>3</sup>

Component	Finland	France	Germany	Hungary
Crystalline silica (impurity)	Not determined	0.1 mg/m <sup>3</sup>	Not determined	Not determined

Component	New Zealand	Italy	Netherlands	Norway
Crystalline silica (impurity)	0.2 mg/m <sup>3</sup> TWA Known or presumed human carcinogen	Not determined	0.075 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup> TWA total dust 0.1 mg/m <sup>3</sup> TWA respirable dust 0.9 mg/m <sup>3</sup> STEL total dust 0.3 mg/m <sup>3</sup> STEL respirable dust Carcinogen

Component	Poland	Portugal	Romania	Russia
Crystalline silica (impurity)	2 mg/m <sup>3</sup> TWA >50% free crystalline silica total inhalable dust 0.3 mg/m <sup>3</sup> TWA >50% free crystalline silica respirable dust 4.0 mg/m <sup>3</sup> TWA 2% to 50% free crystalline silica total inhalable dust 1.0 mg/m <sup>3</sup> TWA 2% to 50% free crystalline silica respirable dust	0.025 mg/m <sup>3</sup> TWA respirable fraction	Not determined	1 mg/m <sup>3</sup> MAC 3 mg/m <sup>3</sup> STEL 1 mg/m <sup>3</sup> TWA aerosol Fibrogenic substance

Component	Spain	Switzerland	Turkey	UK
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> VLA-ED respirable fraction	0.15 mg/m <sup>3</sup> MAK respirable	Not determined	0.3 mg/m <sup>3</sup> STEL calculated respirable 0.1 mg/m <sup>3</sup> TWA respirable

## **8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### **Engineering measures to reduce exposure**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### **Personal protective equipment**

#### **Eye protection**

It is good practice to wear goggles when handling any chemical. Tightly fitting safety goggles.

#### **Hand protection**

Use protective gloves made of:., Frequent change is advisable, Neoprene, PVC, Nitrile.

#### **Respiratory protection**

Respirator must be worn if exposed to dust, Suitable mask with particle filter P3 (European Norm 143).

#### **Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### **Hygiene measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## **9. Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder
<b>Odour</b>	Odourless
<b>Colour</b>	tan - Gray
<b>Odor threshold</b>	Not applicable

<b><u>Property</u></b>	<b><u>Values</u></b>	<b><u>Remarks</u></b>
pH	No information available	

<b>pH @ dilution</b>		
<b>Melting/freezing point</b>	1580 °C	
<b>Boiling point/range</b>	No information available	
<b>Flash Point</b>	No information available	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not Applicable	
<b>Flammability Limits in Air</b>		
<b>Upper flammability Limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	1920 - 2400 kg/m <sup>3</sup>	
<b>Relative density</b>	4.10 - 4.25	@ 20°C.
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Viscosity, dynamic</b>	No information available	
<b>Log Pow</b>	Not determined	
<b>Explosive properties</b>	Not Applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density VALUE</b>	No information available

**10. Stability and reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid dust formation. Avoid wet and humid conditions.

**10.5 Incompatible materials**

No materials to be especially mentioned.

**10.6 Hazardous decomposition products**

See also section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Product information</b>	This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.  Respirable quartz <0.3% . Report number: N0600517.
<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	May cause slight irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.

**Target organ effects** Lungs.

**Aspiration hazard** No hazard from product as supplied.

**12. Ecological information**

**12.1 Toxicity**

Listed on PLONOR list of OSPAR

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	No information available	No information available	No information available

**12.2 Persistence and degradability**

The product is not biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility in soil**

**Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
<b>EWC waste disposal No.</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 01 05 07

**14. Transport information**

The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

**14.1 UN number**

Not regulated

**14.2 Proper shipping name**

Not regulated

**14.3. Hazard class(es)**

<b>ADR/RID/ADN Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>ADR/RID/ADN Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

**15. Regulatory information**

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

**Germany, Water Endangering Classes (VwVwS)**      Water endangering class = nwg

**New Zealand hazard classification**      Not classified.

**HSNO approval no.**      Not required.

**Group number**      Not required.

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

**International inventories**

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada, Domestic Substance List (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies

Korea (KECL) Complies  
Inventory - New Zealand - Inventory of Chemicals (NZIoC) Complies

Contact REACH@miswaco.slb.com for REACH information.

### **15.2 Chemical Safety Report**

No information available

## **16. Other information**

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	17/Nov/2014
<b>Revision date</b>	19/Mar/2015
<b>Version</b>	10
<b>The following sections have been revised</b>	2,, 3,, 16, Updated according to GHS/CLP.

### **Text of R phrases mentioned in Section 3**

R48/20 - Harmful: danger of serious damage to health by prolonged exposure through inhalation

### **Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.  
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

### **Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.



## Safety Data Sheet Calcium chloride (all grades)

### 1. Identification

#### 1.1 Product identifier

**Product name** Calcium chloride (all grades)  
**Product code** 12556

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid additive. SDS covers all grades.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
M-I L.L.C.

P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Mike McDowell

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Acute oral toxicity	Category 4
Serious eye damage/eye irritation	Category 2

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label elements



**Signal word**

WARNING

**Hazard statements**

H302 - Harmful if swallowed

H319 - Causes serious eye irritation

**Precautionary statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P270 - Do not eat, drink or smoke when using this product

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection

P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P330 - Rinse mouth

P337 + P313 - If eye irritation persists: Get medical advice/attention

P501 - Dispose of contents/ container to an approved waste disposal plant

**Unknown acute toxicity**

0% of the mixture consists of ingredient(s) of unknown toxicity.

### 3. Composition/information on Ingredients

**3.1 Substances**

**3.2 Mixtures**

Component	CAS-No	Weight % - range
Calcium chloride	10043-52-4	60 - 100

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret

### 4. First aid measures

**4.1 First-Aid Measures**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

**Skin contact**

Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

**Eye contact** Remove contact lenses. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**  
Use extinguishing media appropriate for surrounding material.

**Extinguishing media which shall not be used for safety reasons**  
None known.

**5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
None known.

**Hazardous combustion products**  
Calcium oxide, Metal fumes.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**  
As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**  
Containers close to fire should be removed immediately or cooled with water.

**6. Accidental release measures**

**6.1 Personal precautions, protective equipment and emergency procedures**

Evacuate non-essential personnel. Use personal protective equipment. Avoid dust formation. Do not breathe dust.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**  
Avoid release to the environment.

**6.3 Methods and materials for containment and cleaning up**

**Methods for containment**  
Prevent further leakage or spillage if safe to do so.

**Methods for cleaning up**  
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**  
Avoid contact with skin and eyes. Avoid dust formation.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture  
Avoid contact with: Strong oxidizing agents Strong acids.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure limits**                              NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.

Component	ACGIH TLV	OSHA PEL
Calcium chloride	Not Determined	Not Determined

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering measures to reduce exposure**  
Ensure adequate ventilation.

**Personal protective equipment**

**Eye protection**                              Tightly fitting safety goggles.  
**Hand protection**                              Repeated or prolonged contact:, Use protective gloves made of:, Nitrile, Neoprene gloves, Rubber gloves.

**Respiratory protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.

If exposed to airborne mist/aerosol of this product, use at least a NIOSH-approved N95 half-mask disposable or re-usable particulate respirator. In work environments containing oil mist/aerosol, use at least a NIOSH-approved P95 half-mask disposable or re-usable particulate respirator.

This product contains nitrogen compounds which may, in some circumstances, form ammonia or amine compounds. If exposed to ammonia or amine compounds from this product use a NIOSH/MSHA-approved respirator with an Ammonia/Methylamine cartridge. Wear suitable protective clothing, Provide eyewash station.

**Skin and body protection**

**Hygiene measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Color</b>	Off-white
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	7 - 10	5% sol
<b>Melting/freezing point</b>	772 °C	
<b>Boiling point/range</b>	> 1600 °C	
<b>Flash point</b>	No information available	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not Applicable	
<b>Flammability Limits in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Log Pow</b>	No information available	
<b>Explosive properties</b>	Not Applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerization**

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Avoid contact with water and moist air - product is hygroscopic.

### 10.5 Incompatible materials

Metals. Strong oxidizing agents. Strong acids.

### 10.6 Hazardous decomposition products

Calcium oxide. Metal fumes.

## 11. Toxicological information

### 11.1 Information on toxicological effects

#### **Acute toxicity**

##### **Inhalation**

Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

##### **Eye contact**

Causes serious eye irritation.

##### **Skin contact**

Prolonged contact may cause redness and irritation.

##### **Ingestion**

Ingestion may cause stomach discomfort.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium chloride	= 1000 mg/kg ( Rat )	= 2630 mg/kg ( Rat )	No data available

Component	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Calcium chloride	No data available	No data available	No data available	No data available

##### **Sensitization**

This product does not contain any components suspected to be sensitizing.

##### **Mutagenic effects**

This substance has no evidence of mutagenic properties.

##### **Carcinogenicity**

This substance has no evidence of carcinogenic properties.

<b>Reproductive toxicity</b>	None known.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Eye contact.
<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.
<b>Neurological effects</b>	None known.
<b>Target organ effects</b>	Cardiovascular system.
<b>Aspiration hazard</b>	No hazard from product as supplied.

## 12. Ecological information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium chloride 10043-52-4 ( 60 - 100 )	10650 mg/L LC50 (Lepomis macrochirus) = 96 h	No information available	52 mg/L EC50 (Daphnia magna) = 48 h

### 12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

### 12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

### 12.4 Mobility in soil

Soluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

### 13. Disposal considerations

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

### 14. Transport information

**14.1 UN Number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG)</b>	Not regulated
<b>UN No. (ICAO)</b>	Not regulated

**14.2 Proper shipping name**

Not regulated for transportation by DOT, TDG, IMDG and ICAO/IATA.

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
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**14.6 Special precautions**

Not Applicable

### 15. Regulatory information

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>European Union (EINECS and ELINCS)</b>	Complies

Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**  
Immediate (acute) health hazard.

Component	SARA 302 / TPQs	SARA 313	CERCLA RQ
Calcium chloride	N/A	N/A	N/A

**State Comments**

Proposition 65: This product is not known to contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer and/or reproductive toxicity at levels that are expected to pose a significant risk under anticipated use conditions.

**Canadian Classification**

**16. Other information**

<b>Supersedes date</b>	26/Jul/2013
<b>Revision date</b>	03/Feb/2015
<b>Version</b>	3
<b>The following sections have been revised</b>	All sections. Updated according to GHS/CLP.
<b>HMIS classification</b>	
Health	2
Flammability	0
Physical hazard	0
PPE	E

N/A - Not Applicable, N/D - Not Determined.

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID10792  
Version 9  
Revision date 29/Mar/2017  
Supersedes date 05/May/2016



## Safety Data Sheet ECOTROL\* RD

### 1. Identification

#### 1.1 Product identifier

**Product name** ECOTROL\* RD  
**Product code** PID10792

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid additive.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** sdsmi@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Bethicia Prasek

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000 0800-777-2323 (WGRA)

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

**Health hazards** Not classified  
**Environmental hazards** Not classified

**Physical Hazards**

Combustible dust	Category 1
------------------	------------

**2.2 Label elements**

**Signal word**

WARNING

**Hazard statements**

H232 - May form combustible dust concentrations in air

**Precautionary statements**

P240 - Ground/bond container and receiving equipment  
P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment  
P243 - Take precautionary measures against static discharge

**Hazards not otherwise classified**

None known

**Unknown acute toxicity**

Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Polymer	Proprietary	60 - 100
Synthetic amorphous silica	112926-00-8	1 - 5

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret  
Proprietary component(s) in section 3 of this SDS does not/do not trigger application of trade secret exemption under Hazardous Materials Information Review Act (HMIRA). The proprietary component in this product contributes to combustible dust classification.

**4. First aid measures**

**4.1 First-Aid Measures**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

**Skin contact**

Wash off immediately with soap and plenty of water while removing all contaminated

clothes and shoes. Get medical attention immediately if symptoms occur.

**Eye contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

#### **4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-fighting measures**

### **5.1 Extinguishing media**

**Suitable extinguishing media**  
Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**  
None known.

### **5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
Suspended dust may present a dust explosion hazard.

**Hazardous combustion products**  
Carbon oxides (COx).

### **5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**  
As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**  
Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental release measures**

### **6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment identified in Section 8. Keep unnecessary personnel away. Avoid contact with the skin and the eyes. Prevent further leakage or spillage if safe to do so. Avoid dust formation. Suspended dust may present a dust explosion

hazard. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water. Take precautionary measures against static discharges. Use non-sparking tools and equipment. Avoid dust formation.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Fine dust dispersed in air may ignite. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Take precautionary measures against static discharges.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking. Keep away from open flames, hot surfaces and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure limits**                              **Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m<sup>3</sup> (Inhalable); 3 mg/m<sup>3</sup> (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m<sup>3</sup> (Total); 5 mg/m<sup>3</sup> (Respirable).**

Chemical Name	ACGIH TLV	OSHA PEL
Polymer	Not determined	Not determined
Synthetic amorphous silica	10 mg/m <sup>3</sup>	20 mppcf; (80)/(%SiO <sub>2</sub> ) mg/m <sup>3</sup>

Synthetic amorphous silica  
OSHA - Final PELs - Table Z-3 Mineral Dusts  
20 mppcf TWA; (80)/(% SiO<sub>2</sub>) mg/m<sup>3</sup> TWA

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering measures to reduce exposure**

Ensure adequate ventilation.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Wear chemical resistant gloves such as nitrile or neoprene.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution		No information available
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Not applicable	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	0 mmHg	
Vapor density	Not applicable	
Specific gravity	1.03	
Bulk density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	

**Dynamic viscosity** No information available  
**log Pow** Not determined

**Explosive properties** Suspended dust may present a dust explosion hazard  
**Oxidizing properties** None known.

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** None  
**Density** No information available

**10. Stability and reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**  
 Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Heat, flames and sparks.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

Carbon oxides (COx).

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. Harmful: danger of serious damage to health by prolonged exposure through inhalation.

**Eye contact** Dust may cause mechanical irritation.

**Skin contact** Repeated exposure may cause skin dryness or cracking.

**Ingestion** Irritant; may cause pain or discomfort to mouth, throat and stomach.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
---------------	-----------	-------------	-----------------

Polymer	No data available	No data available	No data available
Synthetic amorphous silica	No data available	No data available	> 2.2 mg/L ( Rat ) 1 h

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Polymer	No data available	No data available	No data available	No data available
Synthetic amorphous silica	No data available	No data available	No data available	No data available

<b>Sensitization</b>	Not classified.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	No evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Inhalation. Skin contact. Eye contact.
<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological information

### 12.1 Toxicity

#### Toxicity to algae

No product level data available. See component information below.

#### Toxicity to fish

No product level data available. See component information below.

#### Toxicity to daphnia and other aquatic invertebrates

No product level data available. See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polymer	No information available	No information available	No information available
Synthetic amorphous silica	= 5000 mg/L LC50 Brachydanio rerio 96 h	= 440 mg/L EC50 Pseudokirchneriella subcapitata 72 h	= 7600 mg/L EC50 Ceriodaphnia dubia 48 h

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No data available.

**12.4 Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known. Check for additional information in sect. 7.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

Not regulated	
<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG)</b>	Not regulated
<b>UN No. (ICAO)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

**15. Regulatory information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
European Union (EINECS and ELINCS)	Does not Comply
Philippines (PICCS)	Does not Comply
Japan (ENCS)	Does not Comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**IMPORTS, Canada**

No import volume restrictions.

**SARA 311/312 Hazard Categories**

Fire Hazard (Combustible Dust)

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Polymer	N/A	N/A	N/A
Synthetic amorphous silica	N/A	N/A	N/A

**State Comments**

Proposition 65: This product is not known to contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer and/or reproductive toxicity at levels that are expected to pose a significant risk under anticipated use conditions.

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other information**

<b>Supersedes date</b>	05/May/2016
<b>Revision date</b>	29/Mar/2017
<b>Version</b>	9
<b>This SDS has been revised in the</b>	1, 2, 9, 14, 15, 16. Updated according to WHMIS 2015.

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**following section(s)**

**HMIS classification**

Health	1
Flammability	1
Physical hazard	0
PPE	E

N/A - Not Applicable, N/D - Not Determined.

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

**The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.**

SDS no. PID20342  
Version 2  
Revision date 08/Aug/2018  
Supersedes date None



## Safety Data Sheet EMI-1926

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name EMI-1926

Product code PID20342

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Wetting agent.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I L.L.C.

P.O.Box 42842

Houston, TX 77242

www.miswaco.slb.com

Telephone: 1 281-561-1511

##### M-I SWACO, A Schlumberger Company

200 - 125, 9th Avenue SE

Calgary, Alberta T2G 0P6, Canada

Telephone: 1-780-962-8221

E-mail address sdsmi@slb.com

##### Prepared by

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Acute toxicity - Oral

Category 5

Skin corrosion/irritation	Category 3
Serious eye damage/eye irritation	Category 1

**Environmental hazards**

**Physical Hazards**

**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

H303 - May be harmful if swallowed  
H316 - Causes mild skin irritation  
H318 - Causes serious eye damage

**Precautionary Statements**

P280 - Wear eye protection/ face protection  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P310 - Immediately call a POISON CENTER or doctor/physician

P310 - Immediately call a POISON CENTER or doctor/physician  
P332 + P313 - If skin irritation occurs: Get medical advice/attention  
P312 - Call a POISON CENTER or doctor/physician if you feel unwell

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Polyethylene glycol oleyl ether	9004-98-2	80 - 100

**3.2 Mixtures**

Not applicable

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret

**4. First Aid Measures**

**4.1 First aid measures**

---

<b>Inhalation</b>	Move to fresh air. If breathing has stopped, begin artificial respiration. If breathing is difficult, (trained personnel should) give oxygen. Obtain medical attention.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.
<b>Eye Contact</b>	Immediately flush eyes with water for at least 15 minutes. Get medical attention. If easy to do, remove contact lenses. Continue to rinse for at least 15 minutes. Immediate medical attention is required.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-Fighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

None known, Do not use a solid water stream as it may scatter and spread fire.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Heating of containers may cause pressure rise, with risk of bursting.

**Hazardous combustion products**

Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke), Nitrogen oxides (NO<sub>x</sub>).

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Do not get in eyes, on skin, or on clothing. Use personal protective equipment. See also section 8. Solutions extremely slippery when spilled.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### **Handling**

Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Keep away from open flames, hot surfaces and sources of ignition.

#### **Hygiene measures**

Handle in accordance with good industrial hygiene and safety practice. Wash hands and face before breaks and immediately after handling the product. Do not eat, drink or smoke during work.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid frost. Avoid contact with: Acids. Oxidizing agents.

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

#### **Exposure limits**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Polyethylene glycol oleyl ether	Not determined	Not determined	Not determined	Not determined	Not determined

#### **IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Polyethylene glycol oleyl ether 9004-98-2	Not determined

## 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Use protective gloves made of: Nitrile Neoprene Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Cloudy
<b>Color</b>	Off-white
<b>Odor</b>	Characteristic
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH		
pH @ dilution	5.0 - 7.0	3% aqueous solution
Melting / freezing point		
Boiling point/range	No information available	
Flash point	> 100 °C / > 212 °F	PMCC

<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	0.92 (approximately)	@ 60 °C
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Dispersible	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	
<b>Explosive properties</b>	No information available	
<b>Oxidizing properties</b>	No information available	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No data available.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid frost. Avoid heat, flames and other sources of ignition.

**10.5 Incompatible materials**

Acids. Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

Inhalation of vapors in high concentration may cause irritation of respiratory system.

<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	May cause irritation. Prolonged skin contact may defat the skin and produce dermatitis.
<b>Ingestion</b>	MAY BE HARMFUL IF SWALLOWED. Ingestion causes irritation of upper respiratory system and gastrointestinal disturbance.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyethylene glycol oleyl ether	= 2700 mg/kg ( Rat )	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Polyethylene glycol oleyl ether	No data available	No data available	No data available	No data available

<b>Sensitization</b>	Not classified.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Ingestion. Eye contact.
<b>Routes of entry</b>	Inhalation. Skin absorption.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not classified.

## 12. Ecological Information

**12.1 Toxicity**

**Toxicity to algae**  
See component information below.

**Toxicity to fish**  
See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polyethylene glycol oleyl ether	No information available	No information available	No information available

**12.2 Persistence and degradability**

Not readily biodegradable. Inherently biodegradable.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Do not re-use empty containers. Empty containers should be taken for local recycling, recovery or waste disposal. Do not burn, or use a cutting torch on, the empty drum.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT/ANTT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@sib.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Polyethylene glycol oleyl ether	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**16. Other Information**

Revision date 08/Aug/2018

Version 2

This SDS has been revised in the following section(s) 3, 16

HMIS classification

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Health	3
Flammability	1
Physical hazard	0
PPE	X

N/A - Not Applicable, N/D - Not Determined.

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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# Safety Data Sheet

## LIME

### 1. Identification

#### 1.1 Product identifier

Product name LIME  
Product code PID904

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.

P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Bethicia Prasek

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard statements**

- H315 - Causes skin irritation
- H318 - Causes serious eye damage
- H335 - May cause respiratory irritation

**Precautionary statements**

- P280 - Wear eye protection/ face protection
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P310 - Immediately call a POISON CENTER or doctor/ physician

**Supplementary precautionary statements**

- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P321 - Specific treatment (see supplemental first aid instructions on this label)
- P332 + P313 - If skin irritation occurs: Get medical advice/ attention
- P362 - Take off contaminated clothing and wash before reuse
- P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P310 - Immediately call a POISON CENTER or doctor/physician
- P261 - Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray
- P271 - Use only outdoors or in a well-ventilated area
- P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
- P312 - Call a POISON CENTER or doctor/physician if you feel unwell
- P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
- P501 - Dispose of contents/ container to an approved waste disposal plant

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Component	CAS-No	Weight % - range
Calcium hydroxide	1305-62-0	100

**3.2 Mixtures**

Not Applicable

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret

**4. First aid measures**

**4.1 First-Aid Measures**

<b>Inhalation</b>	Move to fresh air. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Get medical attention immediately if symptoms occur.
<b>Ingestion</b>	Do not induce vomiting. If conscious, give 2 glasses of water. Get immediate medical attention.
<b>Skin contact</b>	Take off contaminated clothing and shoes immediately. Rinse immediately with plenty of water for at least 30 minutes. Get immediate medical attention.
<b>Eye contact</b>	Rinse immediately with plenty of water, also under the eyelids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**Main symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

<b>Notes to physician</b>	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Do not give chemical antidotes. Asphyxia from glottal edema may occur. Marked decrease in blood pressure may occur with moist rales, frothy sputum, and high pulse pressure
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**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which shall not be used for safety reasons**

None known.

**5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Calcium oxide.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**6. Accidental release measures**

**6.1 Personal precautions, protective equipment and emergency procedures**

Wear suitable protective equipment. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Prevent further leakage or spillage if safe to do so.

**6.2 Environmental precautions**

Prevent product from entering drains.

**Environmental exposure controls**

No information available.

**6.3 Methods and materials for containment and cleaning up**

**Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

**Methods for cleaning up**

Avoid dust formation. Sweep up and shovel into suitable containers for disposal.

**6.4 Reference to other sections**

No information available.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Do not get in eyes, on skin or on clothing. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Keep away from direct sunlight. Protect from moisture.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

Component Information

Component	ACGIH TLV	OSHA PEL
Calcium hydroxide 1305-62-0 ( 100 )	5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup> (resp); 15 mg/m <sup>3</sup> (total)

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering measures to reduce exposure**

Ensure adequate ventilation, especially in confined areas.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Neoprene, Nitrile.
<b>Respiratory protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.  If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear suitable protective clothing and gloves.
<b>Hygiene measures</b>	Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid powder
<b>Appearance</b>	Opaque
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	12.4	
Melting/freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.08 - 2.34	
Bulk density	No information available	
Water solubility	Slightly soluble in water.	
Solubility in other solvents	Partly miscible	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Log Pow	No information available	

**Explosive properties** No information available  
**Oxidizing properties** No information available

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** No information available  
**Density** No information available

**10. Stability and reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid extreme temperatures.

**10.5 Incompatible materials**

Acids.

**10.6 Hazardous decomposition products**

Calcium oxide.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Irritating to respiratory system.  
**Eye contact** Causes burns. Corrosive to the eyes and may cause severe damage including blindness.  
**Skin contact** Causes skin irritation.  
**Ingestion** Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium hydroxide	= 7340 mg/kg ( Rat )	No data available	No data available

Component	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Calcium hydroxide	No data available	No data available	No data available	No data available

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	No evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Eye contact.
<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.
<b>Aspiration hazard</b>	Not Applicable.

## 12. Ecological information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium hydroxide	= 160 mg/L LC50 Gambusia affinis 96 h	No information available	No information available

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No product level data available.

### 12.4 Mobility in soil

No information available.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1 UN Number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG)</b>	Not regulated
<b>UN No. (ICAO)</b>	Not regulated

**14.2 Proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**15. Regulatory information**

**International inventories**

**USA (TSCA)** Complies

Canada (DSL)	Complies
European Union (EINECS and ELINCS)	Complies
Philippines (PICCS)	Does not Comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Does not Comply

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Immediate (acute) health hazard.

Component	SARA 302 / TPQs	SARA 313	CERCLA RQ
Calcium hydroxide	N/A	N/A	N/A

**State Comments**

Proposition 65: This product is not known to contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer and/or reproductive toxicity at levels that are expected to pose a significant risk under anticipated use conditions.

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other information**

<b>Supersedes date</b>	17/Jun/2015
<b>Revision date</b>	25/Sep/2015
<b>Version</b>	9
<b>The following sections have been revised:</b>	1, 14, 15, 16.

**HMIS classification**

Health	3
Flammability	0
Physical hazard	0

N/A - Not Applicable, N/D - Not Determined.

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.



Product Name: ESCAID™ 110 FLUID  
Revision Date: 29 Mar 2018  
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## SAFETY DATA SHEET

### SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

#### PRODUCT

**Product Name:** ESCAID™ 110 FLUID  
**Product Description:** Dearomatized Hydrocarbons  
**Intended Use:** Drilling muds, oil-based

#### COMPANY IDENTIFICATION

**Supplier:** EXXONMOBIL CHEMICAL COMPANY  
SDS – LOC. 106  
22777 Springwoods Village Parkway  
Spring, TX 77389-1425 USA

**24 Hour Health Emergency** (800) 726-2015  
**Transportation Emergency Phone** (800) 424-9300 or (703) 527-3887 CHEMTREC  
**Product Technical Information** (832) 624-8500  
**Supplier General Contact** (832) 624-8500

### SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

#### CLASSIFICATION:

Flammable liquid: Category 4.  
Aspiration toxicant: Category 1.

#### LABEL:

##### Pictogram:



**Signal Word:** Danger

#### Hazard Statements:

H227: Combustible liquid. H304: May be fatal if swallowed and enters airways.

#### Precautionary Statements:

P210: Keep away from flames and hot surfaces. -- No smoking. P280: Wear protective gloves and eye / face protection. P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P331: Do NOT induce vomiting. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up. P501: Dispose of contents and container in accordance with local regulations.

Product Name: ESCAID™ 110 FLUID  
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**Contains:** DISTILLATES (PETROLEUM), HYDROTREATED LIGHT

**Other hazard information:**

**HAZARD NOT OTHERWISE CLASSIFIED (HNOC):** None as defined under 29 CFR 1910.1200.

**PHYSICAL / CHEMICAL HAZARDS**

Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited. Combustible.

**HEALTH HAZARDS**

May be irritating to the eyes, nose, throat, and lungs. Repeated exposure may cause skin dryness or cracking.

**ENVIRONMENTAL HAZARDS**

No significant hazards.

<b>NFPA Hazard ID:</b>	Health: 1	Flammability: 2	Reactivity: 0
<b>HMIS Hazard ID:</b>	Health: 1*	Flammability: 2	Reactivity: 0

**NOTE:** This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

<b>SECTION 3</b>	<b>COMPOSITION / INFORMATION ON INGREDIENTS</b>
------------------	---

This material is defined as a complex substance.

**Hazardous Substance(s) or Complex Substance(s) required for disclosure**

Name	CAS#	Concentration*	GHS Hazard Codes
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT	64742-47-8	100 %	H227, H304

\* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume. Concentration values may vary.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

<b>SECTION 4</b>	<b>FIRST AID MEASURES</b>
------------------	---------------------------

**INHALATION**

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

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## SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.

## EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

## INGESTION

Seek immediate medical attention. Do not induce vomiting.

## NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

## SECTION 5 FIRE FIGHTING MEASURES

### EXTINGUISHING MEDIA

**Appropriate Extinguishing Media:** Use water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish flames.

**Inappropriate Extinguishing Media:** Straight Streams of Water

### FIRE FIGHTING

**Fire Fighting Instructions:** Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

**Unusual Fire Hazards:** Combustible. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

**Hazardous Combustion Products:** Incomplete combustion products, Oxides of carbon, Smoke, Fume

### FLAMMABILITY PROPERTIES

**Flash Point [Method]:** 83°C (181°F) [ASTM D-93]

**Flammable Limits (Approximate volume % in air):** LEL: 0.6 UEL: 5.0

**Autoignition Temperature:** 228°C (442°F) [ASTM E659]

## SECTION 6 ACCIDENTAL RELEASE MEASURES

### NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

### PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the

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Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H<sub>2</sub>S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

## SPILL MANAGEMENT

**Land Spill:** Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

**Water Spill:** Stop leak if you can do it without risk. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

## ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

## SECTION 7

## HANDLING AND STORAGE

### HANDLING

Avoid contact with skin. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

**Loading/Unloading Temperature:** [Ambient]

**Transport Temperature:** [Ambient]

**Transport Pressure:** [Ambient]

**Static Accumulator:** This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

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## STORAGE

The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

**Storage Temperature:** [Ambient]  
**Storage Pressure:** [Ambient]

**Suitable Containers/Packing:** Drums; Tank Cars; Tank Trucks; Barges

**Suitable Materials and Coatings (Chemical Compatibility):** Carbon Steel; Stainless Steel; Teflon; Polyethylene; Polypropylene

**Unsuitable Materials and Coatings:** Butyl Rubber; Polystyrene; Ethylene-propylene-diene monomer (EPDM); Natural Rubber

## SECTION 8

## EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT		TWA	400 mg/m3	100 ppm	N/A	OSHA Z1
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT	Vapor.	RCP - TWA	1200 mg/m3	165 ppm	Total Hydrocarbons	ExxonMobil

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

No biological limits allocated.

### ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Adequate ventilation should be provided so that exposure limits are not exceeded. Use explosion-proof ventilation equipment.

### PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

**Respiratory Protection:** If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

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#### Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

**Hand Protection:** Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

If prolonged or repeated contact is likely, chemical resistant gloves are recommended. If contact with forearms is likely, wear gauntlet style gloves.

**Eye Protection:** If contact is likely, safety glasses with side shields are recommended.

**Skin and Body Protection:** Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

If prolonged or repeated contact is likely, chemical, and oil resistant clothing is recommended.

**Specific Hygiene Measures:** Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

## ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

<b>SECTION 9</b>	<b>PHYSICAL AND CHEMICAL PROPERTIES</b>
------------------	---

**Note:** Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

## GENERAL INFORMATION

**Physical State:** Liquid  
**Form:** Clear  
**Color:** Colorless  
**Odor:** Slight  
**Odor Threshold:** N/D

## IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

**Relative Density (at 15.6 °C):** 0.8 [With respect to water] [Calculated]  
**Density (at 15.6 °C):** 800 kg/m<sup>3</sup> (6.68 lbs/gal, 0.8 kg/dm<sup>3</sup>) [ASTM D4052]  
**Flammability (Solid, Gas):** N/A  
**Flash Point [Method]:** 83°C (181°F) [ASTM D-93]  
**Flammable Limits (Approximate volume % in air):** LEL: 0.6 UEL: 5.0  
**Autoignition Temperature:** 228°C (442°F) [ASTM E659]  
**Boiling Point / Range:** 207°C (405°F) - 237°C (459°F) [ASTM D86]  
**Decomposition Temperature:** N/D

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**Vapor Density (Air = 1):** 5.9 at 101 kPa [In-house method]  
**Vapor Pressure:** 0.01 kPa (0.08 mm Hg) at 20 °C [Calculated]  
**Evaporation Rate (n-butyl acetate = 1):** 0.01 [In-house method]  
**pH:** N/A  
**Log Pow (n-Octanol/Water Partition Coefficient):** > 4 [Estimated]  
**Solubility in Water:** Negligible  
**Viscosity:** 1.7 cSt (1.7 mm<sup>2</sup>/sec) at 40 °C | 2.5 cSt (2.5 mm<sup>2</sup>/sec) at 20°C [Calculated]  
**Oxidizing Properties:** See Hazards Identification Section.

#### OTHER INFORMATION

**Freezing Point:** N/D  
**Melting Point:** N/A  
**Pour Point:** -39°C (-38°F) [ASTM D5950]  
**Molecular Weight:** 172 G/MOLE [Calculated]  
**Hygroscopic:** No  
**Coefficient of Thermal Expansion:** 0.00074 per Deg C [Calculated]

<b>SECTION 10</b>	<b>STABILITY AND REACTIVITY</b>
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**REACTIVITY:** See sub-sections below.

**STABILITY:** Material is stable under normal conditions.

**CONDITIONS TO AVOID:** Avoid heat, sparks, open flames and other ignition sources.

**MATERIALS TO AVOID:** Strong oxidizers

**HAZARDOUS DECOMPOSITION PRODUCTS:** Material does not decompose at ambient temperatures.

**POSSIBILITY OF HAZARDOUS REACTIONS:** Hazardous polymerization will not occur.

<b>SECTION 11</b>	<b>TOXICOLOGICAL INFORMATION</b>
-------------------	----------------------------------

#### INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
<b>Inhalation</b>	
Acute Toxicity: (Rat) 4 hour(s) LC50 > 5000 mg/m <sup>3</sup> (Vapor)	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures.
<b>Ingestion</b>	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
<b>Skin</b>	
Acute Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 402
Skin Corrosion/Irritation: Data available.	May dry the skin leading to discomfort and dermatitis. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
<b>Eye</b>	
Serious Eye Damage/Irritation: Data	May cause mild, short-lasting discomfort to eyes. Based on test

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available.	data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
<b>Sensitization</b>	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
<b>Aspiration:</b> Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
<b>Germ Cell Mutagenicity:</b> Data available.	Not expected to be a germ cell mutagen. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 473 474 476 478 479
<b>Carcinogenicity:</b> Data available.	Not expected to cause cancer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 453
<b>Reproductive Toxicity:</b> Data available.	Not expected to be a reproductive toxicant. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 413 414 415
<b>Lactation:</b> No end point data for material.	Not expected to cause harm to breast-fed children.
<b>Specific Target Organ Toxicity (STOT)</b>	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: Data available.	Not expected to cause organ damage from prolonged or repeated exposure. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 408 413

## OTHER INFORMATION

### For the product itself:

Vapor/aerosol concentrations above recommended exposure levels are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness and other central nervous system effects including death.

Prolonged and/or repeated skin contact with low viscosity materials may defat the skin resulting in possible irritation and dermatitis.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC

3 = IARC 1

5 = IARC 2B

2 = NTP SUS

4 = IARC 2A

6 = OSHA CARC

## SECTION 12

## ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

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**ECOTOXICITY**

Material -- Not expected to be harmful to aquatic organisms.  
 Material -- Not expected to demonstrate chronic toxicity to aquatic organisms.

**PERSISTENCE AND DEGRADABILITY**

**Biodegradation:**

Material -- Expected to be readily biodegradable.

**Hydrolysis:**

Material -- Transformation due to hydrolysis not expected to be significant.

**Photolysis:**

Material -- Transformation due to photolysis not expected to be significant.

**Atmospheric Oxidation:**

Material -- Expected to degrade rapidly in air

**OTHER ECOLOGICAL INFORMATION**

VOC (EPA Method 24): 6.676 lbs/gal

**ECOLOGICAL DATA**

**Ecotoxicity**

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	48 day(s)	Daphnia magna	EL0 1000 mg/l
Aquatic - Acute Toxicity	96 hour(s)	Oncorhynchus mykiss	LL0 1000 mg/l
Aquatic - Acute Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	EL0 1000 mg/l

**Persistence, Degradability and Bioaccumulation Potential**

Media	Test Type	Duration	Test Results
Water	Ready Biodegradability	28 day(s)	Percent Degraded 69

**SECTION 13 DISPOSAL CONSIDERATIONS**

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

**DISPOSAL RECOMMENDATIONS**

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

**REGULATORY DISPOSAL INFORMATION**

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used

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product may be regulated.

**Empty Container Warning** Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. **DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.**

<b>SECTION 14</b>	<b>TRANSPORT INFORMATION</b>
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**LAND (DOT):** Not Regulated for Land Transport

Footnote: Testing (ASTM D4206) has shown product does not sustain combustion.

**LAND (TDG):** Not Regulated for Land Transport

**SEA (IMDG):** Not Regulated for Sea Transport according to IMDG-Code

**Marine Pollutant:** No

**AIR (IATA):** Not Regulated for Air Transport

<b>SECTION 15</b>	<b>REGULATORY INFORMATION</b>
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**OSHA HAZARD COMMUNICATION STANDARD:** This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

**Listed or exempt from listing/notification on the following chemical inventories:** AICS, DSL, ENCS, IECSC, KECI, PICCS, TCSI, TSCA

**SARA 302:** No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

**CERCLA:** This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). CERCLA petroleum exclusion applies for this product. Contact local authorities to determine if other reporting requirements apply.

**CWA / OPA:** This product is classified as an oil under Section 311 of the Clean Water Act (40 CFR 110) and the Oil Pollution Act of 1990. Discharge or spills which produce a visible sheen on either surface water, or in waterways/sewers which lead to surface water, must be reported to the National Response Center at 800-424-8802.

**SARA (311/312) REPORTABLE GHS HAZARD CLASSES:** Aspiration Hazard, Flammable (gases, aerosols, liquids, or solids)

**SARA (313) TOXIC RELEASE INVENTORY:** This material contains no chemicals subject to the supplier notification

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requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT	64742-47-8	4, 17, 18

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

<b>SECTION 16</b>	<b>OTHER INFORMATION</b>
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N/D = Not determined, N/A = Not applicable

**KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):**

H227: Combustible liquid; Flammable Liquid, Cat 4

H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1

**THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:**

Section 01: Company Mailing Address information was deleted.

Section 01: Company Mailing Address information was modified.

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Internal Use Only

MHC: 1A, 0, 0, 0, 1, 0

DGN: 4400260HUS (1019199)

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## Safety Data Sheet RHETHIK\*

### 1. Identification

#### 1.1 Product identifier

**Product name** RHETHIK\*

**Product code** PID11728

This product may not be distributed or used in Canada.

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid additive.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
M-I L.L.C.

P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**E-mail address** sdsmi@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Acute oral toxicity	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Sub-Category 1B
Specific target organ toxicity (repeated exposure)	Category 2

##### Environmental hazards

Chronic aquatic toxicity	Category 2
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**Physical Hazards**

Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard statements**

- H302 - Harmful if swallowed
- H315 - Causes skin irritation
- H317 - May cause an allergic skin reaction
- H318 - Causes serious eye damage
- H373 - May cause damage to organs through prolonged or repeated exposure
- H411 - Toxic to aquatic life with long lasting effects

**Precautionary statements**

- P260 - Do not breathe dust/fume/gas/mist/vapors/spray
- P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P310 - Immediately call a POISON CENTER or doctor/ physician
  
- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P272 - Contaminated work clothing should not be allowed out of the workplace
- P273 - Avoid release to the environment
- P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P309 + P311 - IF exposed or if you feel unwell: Call a POISON CENTER or doctor/ physician
- P314 - Get medical advice/attention if you feel unwell
- P330 - Rinse mouth
- P333 + P313 - If skin irritation or rash occurs: Get medical advice/ attention
- P362 - Take off contaminated clothing and wash before reuse
- P391 - Collect spillage
- P501 - Dispose of contents/container in accordance with local regulations.

**Unknown acute toxicity**

19.5% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not Applicable

**3.2 Mixtures**

Component	CAS-No	Weight % - range
Diethylene glycol	111-46-6	60 - 100
Ethoxylated amine	Proprietary	10 - 30

Diethylenetriamine	111-40-0	0.1 - 1
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**Comments**

The product contains other ingredients which do not contribute to the overall classification. The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret

**4. First aid measures**

**4.1 First-Aid Measures**

<b>Inhalation</b>	Move to fresh air. If breathing has stopped, begin artificial respiration. If breathing is difficult, (trained personnel should) give oxygen. Obtain medical attention.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye contact</b>	Remove contact lenses. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Main symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**  
Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which shall not be used for safety reasons**  
None known, Do not use a solid water stream as it may scatter and spread fire.

**5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
Heating of containers may cause pressure rise, with risk of bursting.

**Hazardous combustion products**  
When heated strongly or burned, oxides of carbon and harmful organic chemical fumes are released, Nitrogen oxides (NO<sub>x</sub>), Ammonia.

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental release measures**

### **6.1 Personal precautions, protective equipment and emergency procedures**

Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Use personal protective equipment. Keep away from sources of ignition - No smoking. Evacuate non-essential personnel. If spilled, take caution, as material can cause surfaces to become very slippery.

### **6.2 Environmental precautions**

As local regulations may vary; all waste must be disposed/recycled/reclaimed in accordance with federal, state, and local environmental control regulations.

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and materials for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Do not handle until all safety precautions have been read and understood. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Wear personal protective equipment. Avoid spills and splashing during use. Keep away from heat, sparks and open flame. No smoking.

### **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid frost. Avoid contact with: Acids Aldehydes Ketones Copper alloys

## **8. Exposure controls/personal protection**

### **8.1 Control parameters**

#### **Exposure limits**

Component	ACGIH TLV	OSHA PEL
Diethylene glycol	Not Determined	Not Determined
Ethoxylated amine	Not Determined	Not Determined
Diethylenetriamine	1 ppm	1 ppm

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering measures to reduce exposure

Ensure adequate ventilation.

### Personal protective equipment

#### Eye protection

Tightly fitting safety goggles.

#### Hand protection

Use protective gloves made of., Neoprene gloves, Be aware that liquid may penetrate the gloves. Frequent change is advisable.

#### Respiratory protection

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

#### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

#### Hygiene measures

Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Transparent
Color	Light yellow
Odor	Amine
Odor threshold	Not applicable

Property	Values	Remarks
pH		
pH @ dilution	> 9	10 g/L
Melting/freezing point		
Boiling point/range	> 204 °C / >399 °F	
Flash point	> 95 °C / > 203 °F	PMCC
Evaporation rate (BuAc =1)	No information available -	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		Not applicable
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.9 - 1.1	
Bulk density	No information available	
Water solubility	Slightly soluble in water.	

<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	200 - 600
<b>Dynamic viscosity</b>	No information available
<b>Log Pow</b>	No information available

<b>Explosive properties</b>	Not Applicable
<b>Oxidizing properties</b>	None known.

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**10. Stability and reactivity**

**10.1 Reactivity**

No data available.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid frost. Avoid heat, flames and other sources of ignition.

**10.5 Incompatible materials**

Acids. Ketones. Aldehydes. Copper alloys. Brass. Halogenated compounds.

**10.6 Hazardous decomposition products**

See also section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** May cause irritation of respiratory tract. Harmful: danger of serious damage to health by prolonged exposure through inhalation.

**Eye contact** Causes serious eye damage.

**Skin contact** Causes skin irritation. May cause an allergic skin reaction.

**Ingestion** Harmful if swallowed. Ingestion causes irritation of upper respiratory system and gastrointestinal disturbance. May cause adverse cardiac effects, blood disturbances, and metabolic acidosis.

**Toxicology data for the components**

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Diethylene glycol	= 12565 mg/kg ( Rat )	= 11890 mg/kg ( Rabbit )	No data available
Ethoxylated amine	= 750 mg/kg ( Rat )	No data available	No data available
Diethylenetriamine	= 1080 mg/kg ( Rat )	= 672 mg/kg ( Rabbit )	= 70 mg/L ( Rat ) 4 h

Component	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Diethylene glycol	No data available	No data available	No data available	No data available
Ethoxylated amine	No data available	No data available	No data available	No data available
Diethylenetriamine	No data available	No data available	No data available	No data available

<b>Sensitization</b>	May cause allergic skin reaction.
<b>Mutagenic effects</b>	This substance has no evidence of mutagenic properties.
<b>Carcinogenicity</b>	This substance has no evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	None known.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Ingestion. Eye contact.
<b>Routes of entry</b>	Ingestion. Inhalation.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Category 2.
<b>Target organ effects</b>	Kidney. Respiratory system.
<b>Aspiration hazard</b>	Not classified.

## 12. Ecological information

### 12.1 Toxicity

#### Toxicity to algae

See component information below.

#### Toxicity to fish

See component information below.

#### Toxicity to daphnia and other aquatic invertebrates

See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Diethylene glycol	= 75200 mg/L LC50 Pimephales promelas 96 h	No information available	= 84000 mg/L EC50 Daphnia magna 48 h
Ethoxylated amine	No information available	No information available	No information available
Diethylenetriamine	= 1014 mg/L LC50 Poecilia reticulata 96 h = 248 mg/L LC50 Poecilia reticulata 96 h = 430 mg/L LC50 Leuciscus idus 96 h	= 592 mg/L EC50 Desmodesmus subspicatus 96 h = 345.6 mg/L EC50 Pseudokirchneriella subcapitata 96 h = 1164 mg/L EC50 Pseudokirchneriella subcapitata 72 h	= 16 mg/L EC50 Daphnia magna 48 h = 37 mg/L EC50 Daphnia magna 24 h

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

Bioaccumulation is unlikely.

**12.4 Mobility in soil**

Slightly soluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1 UN Number**

Not regulated

<b>UN No. (DOT)</b>	UN3082
<b>UN No. (TDG)</b>	UN3082
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	UN3082
<b>UN No. (IMDG)</b>	UN3082
<b>UN No. (ICAO)</b>	UN3082

**14.2 Proper shipping name**

ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (contains Alkyl amines, ethoxylated),

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	9
<b>TDG Hazard class</b>	9
<b>ADR/RID/ADN/ADG Hazard class</b>	9
<b>IMDG Hazard class</b>	9
<b>ICAO Hazard class/division</b>	9

**14.4 Packing group**

<b>DOT Packing group</b>	PG III
<b>TDG Packing group</b>	PG III
<b>ADR/RID/ADN/ADG Packing group</b>	PG III
<b>IMDG Packing group</b>	PG III
<b>ICAO Packing group</b>	PG III

**14.5 Environmental hazard**

Marine pollutant Yes, (Alkyl amines, ethoxylated)

**14.6 Special precautions**

Not Applicable

**15. Regulatory information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies.
European Union (EINECS and ELINCS)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not Comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Immediate (acute) health hazard. Delayed (chronic) health hazard.

Component	SARA 302 / TPQs	SARA 313	CERCLA RQ
Diethylene glycol	N/A	N/A	N/A
Ethoxylated amine	N/A	N/A	N/A
Diethylenetriamine	N/A	N/A	N/A

**State Comments**

Proposition 65: This product is not known to contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer and/or reproductive toxicity at levels that are expected to pose a significant risk under anticipated use conditions.

This product may not be distributed or used in Canada.

**16. Other information**

**Supersedes date** 12/Dec/2014

**Revision date** 02/Nov/2016

**Version** 6

**The following sections have been revised:** All sections. Updated according to GHS/CLP.

**HMIS classification**

Health 2\*

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Flammability	1
Physical hazard	1
PPE	H

N/A - Not Applicable, N/D - Not Determined.

**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SDS no. PID11774  
Version 11  
Revision date 09/Mar/2018  
Supersedes date 31/Jan/2017



## Safety Data Sheet SUREMUL\*

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name SUREMUL\*  
Product code PID11774

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Emulsifier.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

E-mail address SDS@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Serious eye damage/eye irritation	Category 2
Skin sensitization	Category 1 Sub-Category 1B

**Environmental hazards** Not classified

**Physical Hazards**

Flammable Liquids	Category 4
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**2.2 Label elements**



**Signal word**

WARNING

**Hazard Statements**

- H317 - May cause an allergic skin reaction
- H319 - Causes serious eye irritation
- H227 - Combustible liquid

**Precautionary statements**

- P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P280 - Wear protective gloves and eye/face protection
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

- P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
- P272 - Contaminated work clothing should not be allowed out of the workplace
- P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
- P337 + P313 - If eye irritation persists: Get medical advice/attention
- P363 - Wash contaminated clothing before reuse
- P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish
- P403 + P235 - Store in a well-ventilated place. Keep cool

**Hazards not otherwise classified**

None known

**Unknown acute toxicity**

Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	68990-47-6	60 - 100



## **5.2. Special hazards arising from the substance or mixture**

### **Unusual fire and explosion hazards**

Combustible liquid. Heating of containers may cause pressure rise, with risk of bursting. Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.).

## **5.3 Advice for firefighters**

### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Do not breathe vapors or spray mist. Avoid contact with the skin and the eyes. Use personal protective equipment. See also section 8. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Solutions extremely slippery when spilled. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). Take precautionary measures against static discharges. Use non-sparking tools and equipment.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product. Take precautionary measures against static discharges. Keep away from heat, sparks and open flame. No smoking.

#### **Hygiene measures**

Do not eat, drink or smoke during work. Wash thoroughly after handling.

### **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Avoid contact with: Combustible

materials

**Packaging materials**

Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits**

Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m<sup>3</sup> and ST. EXP = 10mg/m<sup>3</sup>.  
**No biological limit allocated**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	Not determined	Not determined	Not determined	Not determined	Not determined
2-[2-(2-butoxyethoxy)ethoxy]ethanol	Not determined	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, alkanes C14-C17	Not determined	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, alkanes C10-C14	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine 68990-47-6	-
2-[2-(2-butoxyethoxy)ethoxy]ethanol 143-22-6	-
Hydrocarbons, alkanes C14-C17	-
Hydrocarbons, alkanes C10-C14	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Impervious gloves made of: Nitrile Neoprene PVC Break through time >480 minutes Glove thickness >=0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	Viscous
<b>Color</b>	Amber
<b>Odor</b>	Hydrocarbon-like
<b>Odor threshold</b>	Not applicable

Property	Values	Remarks
pH		
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	> 150 °C / > 302 °F	
Flash point	> 65 °C / > 150 °F	Closed cup
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.88 - 0.95	
Bulk density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	> 20.5 cSt	@ 40 °C
Dynamic viscosity	500-1500 cP	@ 25 °C
log Pow	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

**10.1 Reactivity**

No data available.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid contact with heat, sparks, open flame, and static discharge. Do not freeze.

**10.5 Incompatible materials**

Combustible materials. Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological Information

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact** Causes serious eye irritation.

**Skin contact** May cause an allergic skin reaction.

**Ingestion** Ingestion may cause stomach discomfort.

**LD50 Oral** > 2000 mg/kg (rat) Calculated (Product)

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	> 2020 mg/kg (Rat) Literature data	> 2000 mg/kg (Rat) OECD 402 - Duration: 24h - Literature data	No data available
2-[2-(2-butoxyethoxy)ethoxy]ethanol	= 5300 mg/kg (Rat) Literature data	> 2000 mg/kg (Rabbit)	No data available
Hydrocarbons, alkanes C14-C17	> 5250 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.8 mg/L (Rat) 4 h
Hydrocarbons, alkanes C10-C14	> 3990 mg/kg (Rat)	= 3980 mg/kg (Rabbit)	> 5.6 mg/L (Rat) 4 h

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
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Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	No data available	No data available	No data available	No data available
2-[2-(2-butoxyethoxy)ethoxy]ethanol	No data available	No data available	No data available	No data available
Hydrocarbons, alkanes C14-C17	No data available	No data available	No data available	No data available
Hydrocarbons, alkanes C10-C14	No data available	No data available	No data available	No data available

<b>Sensitization</b>	May cause sensitization by skin contact.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Eye contact. Inhalation.
<b>Routes of entry</b>	Skin contact.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not classified.

## 12. Ecological Information

### 12.1 Toxicity

#### Toxicity to algae

This product is not considered toxic to algae.

#### Toxicity to fish

This product is not considered toxic to fish.

#### Toxicity to daphnia and other aquatic invertebrates

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	OECD 203 Fish LC50 > 100 mg/l - Duration h: 96 Literature data	OECD 201 Algae EC50 > 100 mg/l - Duration h: 72 Literature data	OECD 202 Daphnia magna NOEC = 100 mg/l - Duration h: 48 Literature data
2-[2-(2-butoxyethoxy)ethoxy]ethanol	2200 - 4600 mg/L LC50 Leuciscus idus 96 h = 2400 mg/L LC50 Pimephales promelas 96 h	> 500 mg/L EC50 Desmodesmus subspicatus 72 h	> 500 mg/L EC50 Daphnia magna 48 h
Hydrocarbons, alkanes C14-C17	No information available	No information available	No information available
Hydrocarbons, alkanes C10-C14	No information available	No information available	= 0.02856 mg/L EC50 Daphnia magna 48 h

### 12.2 Persistence and degradability

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Do not re-use empty containers. Empty containers should be taken for local recycling, recovery or waste disposal. Dispose of in accordance with local regulations. Do not burn, or use a cutting torch on, the empty drum. Empty containers may contain flammable or explosive vapors.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	NA1993
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated

**14.2. UN proper shipping name**

Combustible liquid, n.o.s., (contains Hydrocarbons blend),

Not regulated for US ground transport in non-bulk containers (<119 gallons).

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Combustible liquid
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT/ANTT Packing group</b>	PG III
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated

**IMDG/ANTAQ Packing group**  
**ICAO/ANAC Packing group**

Not regulated  
Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

**USA (TSCA)**  
**Canada (DSL)**

Complies  
Volume restriction. This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL.

**Philippines (PICCS)**  
**Japan (ENCS)**  
**China (IECSC)**  
**Australia (AICS)**  
**Korean (KECL)**  
**New Zealand (NZIoC)**

Complies  
Does not comply  
Complies  
Complies  
Complies  
Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**IMPORTS, Canada**

This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL. Possible import volume restrictions apply. For details contact the Corporate info in SECTION 1.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	N/A	N/A	N/A
2-[2-(2-butoxyethoxy)ethoxy]ethanol	N/A	N/A	N/A
Hydrocarbons, alkanes C14-C17	N/A	N/A	N/A
Hydrocarbons, alkanes C10-C14	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other Information**

<b>Supersedes date</b>	31/Jan/2017
<b>Revision date</b>	09/Mar/2018
<b>Version</b>	11
<b>This SDS has been revised in the following section(s)</b>	3. Composition/information on Ingredients
<b>HMIS classification</b>	
Health	2
Flammability	2
Physical hazard	0
PPE	X

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**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID1709  
Version 12  
Revision date 29/Mar/2017  
Supersedes date 24/Oct/2016



## Safety Data Sheet VG-PLUS\*

### 1. Identification

#### 1.1 Product identifier

Product name VG-PLUS\*  
Product code PID1709

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive. Viscosifier.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

E-mail address sdsmi@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Bethicia Prasek

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000 0800-777-2323 (WGRA)

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 2

**Environmental hazards** Not classified

**Physical Hazards**

Combustible dust	Category 1
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**2.2 Label elements**



**Signal word**

DANGER

**Hazard statements**

- H350i - May cause cancer by inhalation
- H373 - May cause damage to organs through prolonged or repeated exposure if inhaled
- H232 - May form combustible dust concentrations in air

**Precautionary statements**

- P201 - Obtain special instructions before use
- P260 - Do not breathe dust/fume/gas/mist/vapors/spray
- P281 - Use personal protective equipment as required
- P308 + P313 - IF exposed or concerned: Get medical advice/attention
- P314 - Get medical advice/ attention if you feel unwell
  
- P202 - Do not handle until all safety precautions have been read and understood
- P240 - Ground/bond container and receiving equipment
- P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment
- P243 - Take precautionary measures against static discharge
- P501 - Dispose of contents/ container to an approved waste disposal plant

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Organophilic clay	Proprietary	60 - 100
Crystalline silica (impurity)	14808-60-7	1 - 5

**Comments**

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret

Proprietary component(s) in section 3 of this SDS does not/do not trigger application of trade secret exemption under Hazardous Materials Information Review Act (HMIRA). The proprietary component in this product contributes to combustible dust classification.

Crystalline silica is the most widely occurring of all minerals. The most common form of silica is sand. The International Agency for Research on Cancer (IARC) has designated crystalline silica in the form of quartz or cristobalite a Group 1 (carcinogenic to humans). This designation was based on an increased risk of lung cancer among crystalline silica exposed workers. IARC did note that carcinogenicity of crystalline silica in humans was not detected in all industrial circumstances studied. Further, carcinogenicity of crystalline silica may be dependent on inherent characteristics of the crystalline silica or external factors affecting its biological activity or distribution of polymorphs. (IARC Vol. 68, 1997, p. 41). The National Toxicology Program (NTP) classifies crystalline silica as "reasonably anticipated to cause cancer in humans" (6th Annual Report on Carcinogens, 1991). Long term inhalation of crystalline silica can also result in the lung disease, silicosis. Symptoms of this disease include coughing and shortness of breath. (NJ HSFS, January 1996) Percentages (concentrations) represented as a range are due to batch-to-batch variability.

**4. First aid measures**

**4.1 First-Aid Measures**

<b>Inhalation</b>	Move to fresh air. If breathing is difficult, (trained personnel should) give oxygen. Get medical attention immediately if symptoms occur.
<b>Ingestion</b>	Do not induce vomiting without medical advice. Call a physician or Poison Control Center. Drink 1 or 2 glasses of water. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if irritation persists.
<b>Eye contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**Main symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

<b>Notes to physician</b>	Treat symptomatically
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**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**  
None known.

### **5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Dusts or fumes may form explosive mixtures in air. Suspended dust may present a dust explosion hazard.

**Hazardous combustion products**

Silicon oxide, Nitrogen oxides (NOx), Carbon oxides (COx).

### **5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

## **6. Accidental release measures**

### **6.1 Personal precautions, protective equipment and emergency procedures**

Wear suitable protective equipment. Evacuate personnel to safe areas. Avoid dust formation. Suspended dust may present a dust explosion hazard. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

### **6.2 Environmental precautions**

As local regulations may vary; all waste must be disposed/recycled/reclaimed in accordance with federal, state, and local environmental control regulations.

Large spills released to the environment may disturb the natural chemical balance of soil/fresh water. Do not allow material to contaminate ground water system.

**Environmental exposure controls**

Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Shovel into suitable container for disposal. Avoid dust formation. Powdered material may form explosive dust-air mixtures. Take precautionary measures against static discharges. Use non-sparking tools and equipment.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and storage**

### **7.1 Precautions for safe handling**

**Handling**

Do not handle until all safety precautions have been read and understood. Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Wear personal protective equipment. Avoid dust formation. Fine dust dispersed in air may ignite. Take precautionary measures against static discharges.

### **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Use spark-proof tools and explosion-proof equipment.

**Storage precautions** Protect from moisture Store in original container. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

## 8. Exposure controls/personal protection

### 8.1 Control parameters

Component Information

Chemical Name	ACGIH TLV	OSHA PEL
Organophilic clay	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	total dust respirable fraction

Crystalline silica (impurity)

OSHA - Final PELs - Table Z-3 Mineral Dusts

(30)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, total dust; (250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

### 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering measures to reduce exposure

Ensure adequate ventilation, especially in confined areas.

#### Personal protective equipment

**Eye protection**

Tightly fitting safety goggles.

**Hand protection**

Neoprene Nitrile

**Respiratory Protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene measures**

Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Opaque
<b>Color</b>	Off-white
<b>Odor</b>	Slight odor of fatty acid
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution		No information available
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5 - 1.7	
Bulk density	No information available	
Water solubility	Negligible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
Explosive properties	Suspended dust may present a dust explosion hazard	
Oxidizing properties	No information available	
<b>9.2 Other information</b>		
Pour point	No information available	
Molecular weight	No information available	
VOC content(%)	No information available	
Density	No information available	

## 10. Stability and reactivity

### 10.1 Reactivity

Dust may form explosive mixture in air.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerization**

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Avoid contact with heat, sparks, open flame, and static discharge. Avoid dust formation.

### 10.5 Incompatible materials

Strong oxidizing agents.

### 10.6 Hazardous decomposition products

Silicon oxide. Carbon oxides (COx). Nitrogen oxides (NOx).

## 11. Toxicological information

### 11.1 Information on toxicological effects

**Acute toxicity**

**Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system. Harmful: danger of serious damage to health by prolonged exposure through inhalation. May cause cancer by inhalation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

**Eye contact**

Dust contact with the eyes can lead to mechanical irritation.

**Skin contact**

Repeated exposure may cause skin dryness or cracking.

**Ingestion**

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Organophilic clay	No data available	No data available	No data available
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Organophilic clay	No data available	No data available	No data available	No data available
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

**Sensitization**

Not classified.

**Mutagenic effects**

No evidence of mutagenic properties.

**Carcinogenicity**

Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

**Reproductive toxicity**

No evidence of toxicity to reproduction.

**Developmental toxicity**

Not known to cause birth defects or have a deleterious effect on a developing fetus.

**Routes of exposure**

Skin contact. Inhalation. Eye contact.

**Routes of entry**

Inhalation.

**Specific target organ toxicity - Single exposure**

Not classified

**Specific target organ toxicity - Repeated exposure**

Category 2.

**Target organ effects**                      Respiratory system. Lungs.  
**Aspiration hazard**                      Not applicable.

**12. Ecological information**

**12.1 Toxicity**

**Toxicity to algae**  
See component information below.

**Toxicity to fish**  
See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Organophilic clay	No information available	No information available	No information available
Crystalline silica (impurity)	No information available	No information available	No information available

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Disposal Method**                      Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging**              Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG)</b>	Not regulated
<b>UN No. (ICAO)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

**15. Regulatory information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>European Union (EINECS and ELINCS)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Does not Comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**IMPORTS, Canada**

No import volume restrictions.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Delayed (chronic) health hazard. Fire Hazard (Combustible Dust)

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Organophilic clay	N/A	N/A	N/A
Crystalline silica (impurity)	N/A	N/A	N/A

**State Comments**

Proposition 65: This product contains chemical(s) considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 to cause cancer and/or reproductive toxicity. See table under U.S. Federal and State Regulations for the specific chemicals.

**Crystalline silica (impurity)**

Carcinogen

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other information**

<b>Supersedes date</b>	24/Oct/2016
<b>Revision date</b>	29/Mar/2017
<b>Version</b>	12
<b>This SDS has been revised in the following section(s)</b>	1, 2, 3, 9, 15, 16. Updated according to WHMIS 2015.
<b>HMIS classification</b>	
Health	1*
Flammability	1
Physical hazard	0
PPE	E

N/A - Not Applicable, N/D - Not Determined.

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**Safety Data Sheets** Calcium Chloride; Caustic Soda; Deep clean; Defoam X; Duo Vis; Duramod; Ecotrol; Escaid 110; HRP; KI- 3924; Lime; M-I Gel; Microbar; Monoethylene Glycol (MEG); Myacide; Novamod; Nut Plug (All Grades); Pecan Nut Plug (All grades); Polypac (All Grades); Potassium Chloride; Rhebuild; RheCon (EMI-1926); Rheduce; Rheflat; Rheguard Mud System; Rhemul ; Rhethin; Safe-Break Prime; Safe-Break; Safe-Carb (all Grades); Safe-Cor C; Safe-Cor; Safe-Scav CA; Safe-Scav NA; Salt Saturated Mud System; SAPP; Seal-N-Peel (Ca Br<sub>2</sub>); Seal-N- Peel (KCl-NaCl-Nabr); Soda Ash; Sodium Bromide Brine; Sodium Bromide; Sourscav; Surewet; VG-Plus; VG-Supreme; Walnut Nutplug (All Grades); Water Based Mud (Generic)

**Waste Stream:** Chemical Sacks

**EPA Waste Profile Sheet Number:** 20140506-011



## Safety Data Sheet CALCIUM CHLORIDE (All Grades)

### 1. Identification

#### 1.1 Product identifier

**Product name** CALCIUM CHLORIDE (All Grades)  
**Product code** PID204  
**Molecular weight** 111

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Weighting agent.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Serious eye damage/eye irritation	Category 2
-----------------------------------	------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements



**Signal word**  
WARNING

### **Hazard Statements**

H319 - Causes serious eye irritation

### **Precautionary Statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves, protective clothing, eye protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P337 + P313 - If eye irritation persists: Get medical advice/attention

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Unknown acute toxicity**

Not applicable.

## 3. Composition/information on Ingredients

### 3.1 Substances

Chemical Name	CAS No	Weight-%
Calcium chloride	10043-52-4	60-100

### 3.2 Mixtures

Not applicable

### Comments

The exact percentage (concentration) of composition has been withheld as a trade secret.

## 4. First Aid Measures

### 4.1 First aid measures

#### Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

#### Ingestion

Rinse mouth. Drink 1 or 2 glasses of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

#### Skin contact

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

#### Eye Contact

Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if

present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Chlorine, May release hydrogen gas (explosive) on contact with metals.

### **5.3 Advice for firefighters**

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture. Avoid contact with: Metals. Strong oxidizing agents. Strong acids.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits**

**NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.**

**Component Information**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Calcium chloride	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Calcium chloride 10043-52-4	Not determined

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard

present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation. See section 7 for more information.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Use protective gloves made of: Neoprene Nitrile Rubber Break through time >480 minutes Glove thickness 0.5 mm Frequent change is advisable
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Color</b>	Off-white
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

Property	Values	Remarks
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	7 - 10	5% sol
<b>Melting point</b>	772 °C / 1421.6 °F	
<b>Boiling point</b>	> 1600 °C / >2912 °F	
<b>Flash point</b>	No information available	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Partition Coefficient (n-octanol/water)</b>	No information available	

**Explosive properties** Not applicable  
**Oxidizing properties** None known.

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** 111  
**VOC content(%)** None  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid contact with water and moist air - product is hygroscopic.

**10.5 Incompatible materials**

Metals. Strong oxidizing agents. Strong acids.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.  
**Eye contact** Causes serious eye irritation.  
**Skin contact** Prolonged contact may cause redness and irritation.  
**Ingestion** Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium chloride	1000 mg/kg (rat)	5005 mg/kg (Rabbit)	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Calcium chloride	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Eye contact. Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium chloride	= 10650 mg/L LC50 Lepomis macrochirus 96 h	No information available	2,400 mg/L EC50 (Daphnia magna) = 48 h

### 12.2 Persistence and degradability

See component information below.

### 12.3 Bioaccumulative potential

See component information below.

**12.4 Mobility**

See component information below.

See component information below.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)

This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Calcium chloride	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**16. Other Information**

Revision date 27/Oct/2020

Version 1

Health 2  
Flammability 0  
Physical hazard 0  
PPE E

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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## Safety Data Sheet Caustic Soda M2

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** Caustic Soda M2  
**Product code** M002

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Used as a fracturing additive in oilfield applications.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

**Schlumberger Technology Corporation**  
110 Schlumberger Drive  
Sugar Land, Texas 77478, USA  
Telephone: 1-281-285-7873

**Schlumberger Canada, Ltd.**  
200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-613-992-4624

**E-mail address** SDS@slb.com

##### Prepared by

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 595 3518/+1 866 928 0789, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000 /0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1A
Serious eye damage/eye irritation	Category 1

**Environmental hazards** Not classified

**Physical Hazards**

Substances/mixtures corrosive to metal	Category 1
--	------------

**2.2 Label elements****Signal word**

DANGER

**Hazard Statements**

H314 - Causes severe skin burns and eye damage

H290 - May be corrosive to metals

**Precautionary Statements**

P234 - Keep only in original container

P260 - Do not breathe dust/fume/gas/mist/vapors/spray

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting

P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower

P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or doctor/physician

P363 - Wash contaminated clothing before reuse

P390 - Absorb spillage to prevent material damage

P406 - Store in corrosion resistant container with a resistant inner liner

P403 + P233 - Store in a well-ventilated place. Keep container tightly closed

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Hazards not otherwise classified**

None known

**Unknown acute toxicity**

Not applicable.

**3. Composition/information on Ingredients****3.1 Substances**

Chemical Name	CAS No	Weight-%
Sodium hydroxide	1310-73-2	100

**3.2 Mixtures**

Not applicable

**Comments**  
No Comments

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	Keep at rest. Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. Seek medical attention at once.
<b>Ingestion</b>	Do NOT induce vomiting. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person. Immediate medical attention is required.
<b>Skin contact</b>	Get immediate medical attention. Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.
<b>Eye Contact</b>	Get immediate medical attention. Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye.

### 4.2. Most important symptoms and effects, both acute and delayed

<b>General advice</b>	Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
<b>Symptoms</b>	
<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

<b>Notes to physician</b>	Treat symptomatically
---------------------------	-----------------------

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

**Suitable extinguishing media**  
Use extinguishing media appropriate for surrounding material.

**Extinguishing media which must not be used for safety reasons**  
Water.

## **5.2. Special hazards arising from the substance or mixture**

### **Unusual fire and explosion hazards**

Reaction with water may generate much heat which will increase the concentration of fumes in the air. Contact with metals may evolve flammable hydrogen gas.

### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapors, Sodium oxides.

## **5.3 Advice for firefighters**

### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Do not get on skin or clothing. Wash thoroughly after handling. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

#### **Methods for cleaning up**

Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid handling causing generation of dust. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Never add water directly to this product - may cause vigorous reaction/boiling. Always dilute by carefully pouring the product into the water.

#### **Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing. Do not eat, drink or smoke when using this product.

### **7.2 Conditions for safe storage, including any incompatibilities**

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture Water Metals Acids
<b>Packaging materials</b>	Use specially constructed containers only.

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Sodium hydroxide	2 mg/m <sup>3</sup> C	2 mg/m <sup>3</sup> TWA	Not determined	Not determined	Not determined

### IDLH (Immediately Dangerous to Life or Health)

This product contains substance(s) classified as Immediately Dangerous to Life or Health (IDLH) by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Sodium hydroxide 1310-73-2	10 mg/m <sup>3</sup> IDLH

### 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering Controls

Ensure adequate ventilation. Local exhaust ventilation.

#### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles. Face-shield.
<b>Hand protection</b>	Impervious gloves made of: Rubber gloves PVC Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear appropriate personal protective clothing to prevent skin contact, Eye wash and

emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Flakes
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	13	10 g/L
<b>Melting / freezing point</b>	318 °C / 604 °F	
<b>Boiling point/range</b>	1390 °C / 2534 °F	
<b>Flash point</b>	No information available	
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	0.13 kPa	@ 739 °C
<b>Vapor density</b>	>1 (air = 1)	
<b>Specific gravity</b>	2.1	@ 20 °C
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

**10.1 Reactivity**

Reacts violently with water. Corrosive to Metals.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerization**

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Protect from moisture. Avoid dust formation. Water.

### 10.5 Incompatible materials

Acids. Metals. Water.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

#### **Acute toxicity**

##### **Inhalation**

Vapors may irritate throat and respiratory system.

##### **Eye contact**

Causes serious eye damage.

##### **Skin contact**

Causes severe skin burns.

##### **Ingestion**

Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	No data available	1350 mg/kg ( Rabbit )	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Sodium hydroxide	No data available	No data available	No data available	No data available

##### **Sensitization**

Not classified.

##### **Mutagenic effects**

This product does not contain any known or suspected mutagens.

##### **Carcinogenicity**

This product does not contain any known or suspected carcinogens.

##### **Reproductive toxicity**

This product does not contain any known or suspected reproductive hazards.

##### **Developmental toxicity**

Not known to cause birth defects or have a deleterious effect on a developing fetus.

##### **Routes of exposure**

Skin contact. Inhalation. Eye contact.

##### **Routes of entry**

Inhalation. Skin contact. Eye contact.

<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

#### Toxicity to algae

This product is not considered toxic to algae.

#### Toxicity to fish

This product is not considered toxic to fish.

#### Toxicity to daphnia and other aquatic invertebrates

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium hydroxide	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available

### 12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

### 12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

### 12.4 Mobility

Soluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information****14.1. UN number**

UN No. (DOT)	UN1823
UN No. (MT/ANTT)	UN1823
UN No. (TDG)	UN1823
UN/ID No. (ADR/RID/ADN/ADG)	UN1823
UN No. (IMDG/ANTAQ)	UN1823
UN No. (ICAO/ANAC)	UN1823
UN No. (DPC)	UN1823

**14.2. UN proper shipping name**

SODIUM HYDROXIDE, SOLID,

Product (RQ): 1000 lbs. (Sodium hydroxide)

(add RQ if shipped in containers &gt;RQ for DOT only)

**14.3 Hazard class(es)**

DOT Hazard class	8
ANTT Hazard class	8
TDG Hazard class	8
ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8
DPC Hazard class	8

**14.4 Packing group**

DOT/ANTT Packing group	II
ANTT Packing group	II
TDG Packing group	II
ADR/RID/ADN/ADG Packing group	II
IMDG/ANTAQ Packing group	II
ICAO/ANAC Packing group	II
DPC Packing group	II

**14.5 Environmental hazard**

Marine pollutant No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### IMPORTS, Canada

No import volume restrictions.

### U.S. Federal and State Regulations

#### SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Sodium hydroxide	N/A	N/A	1000 lb final RQ 454 kg final RQ

### California Proposition 65

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

### Canadian Classification

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

## 16. Other Information

<b>Supersedes date</b>	17/Feb/2017
<b>Revision date</b>	18/Apr/2018
<b>Version</b>	5
<b>This SDS has been revised in the following section(s)</b>	All sections. Prepared in accordance with OSHA HAZCOM 2012. Prepared in accordance with WHMIS 2015
<b>HMIS classification</b>	

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Health	3
Flammability	0
Physical hazard	1
PPE	X

N/A - Not Applicable, N/D - Not Determined.

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. PID16970  
Version 7  
Revision date 05/Nov/2018  
Supersedes date 01/Sep/2015



## Safety Data Sheet DEEPCLEAN\*

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name DEEPCLEAN\*  
Product code PID16970

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Completion fluid additive.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

##### Schlumberger Canada, Ltd.

200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-613-992-4624

E-mail address SDS@slb.com

##### Prepared by

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Aspiration toxicity	Category 1
Acute toxicity - Oral	Category 4

Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1

**Environmental hazards** Not classified

**Physical Hazards**

Flammable Liquids	Category 4
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**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

- H302 - Harmful if swallowed
- H304 - May be fatal if swallowed and enters airways
- H315 - Causes skin irritation
- H317 - May cause an allergic skin reaction
- H318 - Causes serious eye damage
- H332 - Harmful if inhaled
- H227 - Combustible liquid

**Precautionary Statements**

- P280 - Wear protective gloves and eye/face protection
- P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P310 - Immediately call a POISON CENTER or doctor/physician
- P331 - Do NOT induce vomiting
  
- P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
- P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P271 - Use only outdoors or in a well-ventilated area
- P272 - Contaminated work clothing should not be allowed out of the workplace
- P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
- P330 - Rinse mouth
- P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
- P362 - Take off contaminated clothing and wash before reuse
- P403 + P235 - Store in a well-ventilated place. Keep cool
- P233 - Keep container tightly closed
- P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish
- P220 - Keep/Store away from combustible materials

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

### 3. Composition/information on Ingredients

#### 3.1 Substances

Not applicable

#### 3.2 Mixtures

Chemical Name	CAS No	Weight-%
D-Glucopyranose, oligomeric, C8-10 glycosides	68515-73-1	30 - 60
2-butoxyethanol	111-76-2	15 - 40
Citrus Extract	68647-72-3	15 - 40
Distillates, petroleum, hydrotreated light	64742-47-8	15 - 40

#### Comments

The exact percentage (concentration) of composition has been withheld as a trade secret

### 4. First Aid Measures

#### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Do not induce vomiting without medical advice. If vomiting occurs spontaneously, minimize the risk of aspiration by properly positioning the affected person. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

#### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### Symptoms

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

#### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

Combustible liquid. Heating of containers may cause pressure rise, with risk of bursting.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapors.

### 5.3 Advice for firefighters

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Ensure adequate ventilation. Do not get on skin or clothing. Wash thoroughly after handling. Keep away from heat, sparks, and flame. Do not breathe vapors or spray mist. Solutions extremely slippery when spilled.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). Take precautionary measures against static discharges. Use non-sparking tools and equipment.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Take precautionary measures against static discharges. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. All equipment used when handling the product must be grounded.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Use spark-proof tools and explosion-proof equipment.

**Storage precautions** Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking. Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with: Heat, flames and sparks. Strong oxidizing agents. Strong acids. Strong alkalis. Strong reducing agents.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits** OEL for "Normal and branched chain alkanes, > C7: 1200 mg/m<sup>3</sup>  
No biological limit allocated

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined	Not determined	Not determined
2-butoxyethanol	20 ppm	50 ppm TWA 240 mg/m <sup>3</sup> TWA	20 ppm TWA	39 ppm TWA LT; 190 mg/m <sup>3</sup> TWA LT	26 ppm TWA VLE-PPT; 120 mg/m <sup>3</sup> TWA VLE-PPT
Citrus Extract	Not determined	Not determined	Not determined	Not determined	Not determined
Distillates, petroleum, hydrotreated light	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
D-Glucopyranose, oligomeric, C8-10 glycosides 68515-73-1	-
2-butoxyethanol 111-76-2	700 ppm IDLH
Citrus Extract 68647-72-3	-
Distillates, petroleum, hydrotreated light 64742-47-8	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard

present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Use protective gloves made of: Nitrile Neoprene Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached.If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	Transparent
<b>Color</b>	Colorless - Light amber
<b>Odor</b>	Slight Citrus
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution		
Melting / freezing point	-49.5 °C / -57.2 °F	
Boiling point/range	150 °C / 302 °F	
Flash point	61 °C / 143 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.915 - 0.935	
Bulk density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Combustible liquid.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Heat, flames and sparks.

**10.5 Incompatible materials**

Strong oxidizing agents. Strong acids. Strong reducing agents. Strong alkalies.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Vapors inhaled in high concentration have a narcotic effect on the central nervous system. May cause irritation of respiratory tract. Harmful: danger of serious damage to health by prolonged exposure through inhalation.
<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	Causes skin irritation. May cause an allergic skin reaction. May be absorbed through the skin in harmful amounts.
<b>Ingestion</b>	Harmful if swallowed. May be fatal if swallowed and enters airways.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
D-Glucopyranose, oligomeric, C8-10 glycosides	No data available	No data available	No data available
2-butoxyethanol	= 470 mg/kg ( Rat )	= 99 mg/kg ( Rabbit )	= 450 ppm ( Rat ) 4 h
Citrus Extract	No data available	No data available	No data available
Distillates, petroleum, hydrotreated light	> 5000 mg/kg ( Rat )	> 2000 mg/kg ( Rabbit )	> 5.2 mg/L ( Rat ) 4 h

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
D-Glucopyranose, oligomeric, C8-10 glycosides	No data available	No data available	No data available	No data available
2-butoxyethanol	No data available	A3 Confirmed Animal Carcinogen with Unknown Relevance to Humans	No data available	No data available
Citrus Extract	No data available	No data available	No data available	No data available
Distillates, petroleum, hydrotreated light	No data available	No data available	No data available	No data available

<b>Sensitization</b>	May cause sensitization by skin contact.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Ingestion. Eye contact.
<b>Routes of entry</b>	Skin absorption. Inhalation. Ingestion.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	May be fatal if swallowed and enters airways.

## 12. Ecological Information

### 12.1 Toxicity

#### Toxicity to algae

This product is not considered toxic to algae.

#### Toxicity to fish

This product is not considered toxic to fish.

#### Toxicity to daphnia and other aquatic invertebrates

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
D-Glucopyranose, oligomeric, C8-10 glycosides	No information available	No information available	No information available
2-butoxyethanol	= 2950 mg/L LC50 Lepomis macrochirus 96 h = 1490 mg/L LC50 Lepomis macrochirus 96 h	No information available	1698 - 1940 mg/L EC50 Daphnia magna 24 h > 1000 mg/L EC50 Daphnia magna 48 h
Citrus Extract	No information available	No information available	No information available
Distillates, petroleum, hydrotreated light	= 45 mg/L LC50 Pimephales promelas 96 h = 2.2 mg/L LC50 Lepomis macrochirus 96 h = 2.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	= 4720 mg/L LC50 Den-dronereides heteropoda 96 h

### 12.2 Persistence and degradability

Product is biodegradable.

**12.3 Bioaccumulative potential**

The product contains potentially bioaccumulating substances.

**12.4 Mobility**

Dispersible in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Do not re-use empty containers. Empty containers should be taken for local recycling, recovery or waste disposal. Dispose of in accordance with local regulations. Do not burn, or use a cutting torch on, the empty drum. Empty containers may contain flammable or explosive vapors.

**14. Transport information**

**14.1. UN number**

UN No. (DOT)	NA1993
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not Regulated
UN No. (IMDG/ANTAQ)	Not Regulated
UN No. (ICAO/ANAC)	Not Regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

Combustible liquid, n.o.s., Combustible liquid, n.o.s., (contains citric distillate, 2-butoxyethanol),

**14.3 Hazard class(es)**

DOT Hazard class	Combustible liquid
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not Regulated
ICAO/ANAC Hazard class/division	Not Regulated
DPC Hazard class	Not regulated

**14.4 Packing group**

DOT Packing group	PG III
ANTT Packing group	Not regulated

<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	II
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not Regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant No

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**IMPORTS, Canada**

No import volume restrictions.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
D-Glucopyranose, oligomeric, C8-10 glycosides	N/A	N/A	N/A
2-butoxyethanol	N/A	N/A	N/A
Citrus Extract	N/A	N/A	N/A
Distillates, petroleum, hydrotreated light	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other Information**

**Supersedes date** 01/Sep/2015

**Revision date** 05/Nov/2018

**Version** 7

**This SDS has been revised in the following section(s)** 3, 15, 16

**HMIS classification**

Health	2
Flammability	2
Physical hazard	0
PPE	B

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SDS no. PID452  
Version 12  
Revision date 26/Jun/2020  
Supersedes date 03/Apr/2017



## Safety Data Sheet DEFOAM-X\*

### 1. Identification

#### 1.1 Product identifier

**Product name** DEFOAM-X\*  
**Product code** PID452

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Defoamer.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### **GHS - Classification**

**Health hazards** Not classified  
**Environmental hazards** Not classified

**Physical Hazards** Not classified

## **2.2 Label elements**

### **Signal word**

None

### **Hazard Statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### **Precautionary Statements**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

### **Hazards not otherwise classified**

None known

### **Unknown acute toxicity**

Not applicable.

## **3. Composition/information on Ingredients**

### **3.1 Substances**

Not applicable

### **3.2 Mixtures**

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

### **Comments**

No Comments.

## **4. First Aid Measures**

### **4.1 First aid measures**

#### **Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

#### **Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

#### **Skin contact**

Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

#### **Eye Contact**

Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

### **4.2. Most important symptoms and effects, both acute and delayed**

#### **General advice**

The severity of the symptoms described will vary dependant of the concentration and the

length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Ingestion** Ingestion may cause stomach discomfort.

**Skin contact** Prolonged contact may cause redness and irritation.

**Eye contact** May cause slight irritation. May cause redness, itching, and pain.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-Fighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**  
Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**  
None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
None known.

**Hazardous combustion products**  
Silicon oxide, Production of explosive gases, strong alkalis and heat.

**5.3 Advice for firefighters**

**Special protective equipment and precautions for fire-fighters**  
As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**  
Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**  
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

### **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place.

**Packaging materials** Use specially constructed containers only.

## **8. Exposure Controls/Personal Protection**

### **8.1 Control parameters**

**Exposure limits** Contains no substances with occupational exposure limit values

#### **IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

### **8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

<b>Eye protection</b>	Safety glasses with side-shields.
<b>Hand protection</b>	Impervious gloves made of: Nitrile Neoprene
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	Viscous
<b>Color</b>	White
<b>Odor</b>	Mild
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution	5 - 8	@ 1%
Melting point	-28.9 °C / -20 °F	
Boiling point	No information available	
Flash point	> 202.8 °C / > 400 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.91 - 1.0	
Bulk density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

**Hazardous polymerization**

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

None known.

### 10.5 Incompatible materials

Alkali metals. Strong reducing agents.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

**Acute toxicity**

**Inhalation** Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact** May cause slight irritation. May cause pain, redness, discomfort.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**LD50 Oral** > 2000 mg/kg (rat) Calculated (MIXTURE)

### **Delayed and immediate effects and**

**chronic effects from short and long term exposure**

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Eye contact. Skin contact.
<b>Routes of entry</b>	Skin contact. Eye contact.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No product level data available.

### 12.4 Mobility

Dispersible in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

## 15. Regulatory Information

### International inventories

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### IMPORTS, Canada

No import volume restrictions.

### U.S. Federal and State Regulations

#### SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

### California Proposition 65

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

### Canadian Classification

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

### Brazilian Regulations

#### Brazil Regulation

This SDS was prepared in accordance with Brazil law NBR 14725.

#### **Federal Police**

Not determined

#### **Army**

Not determined

#### **ANVISA**

Not determined

## 16. Other Information

**Supersedes date** 03/Apr/2017

**Revision date** 26/Jun/2020

**Version** 12

**This SDS has been revised in the following section(s)** 1, 4, 7, 8, 9, 11, 14, 15, 16 No changes with regard to classification have been made.

**HMIS classification**

Health	1
Flammability	1
Physical hazard	0
PPE	B

N/A - Not Applicable, N/D - Not Determined.

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SDS no. PID510  
Version 15  
Revision date 12/Oct/2020  
Supersedes date 16/Nov/2018



## Safety Data Sheet DUO-VIS\*

### 1. Identification

#### 1.1 Product identifier

Product name DUO-VIS\*  
Product code PID510

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

E-mail address SDS@slb.com

##### Prepared by

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Skin sensitization	Category 1
--------------------	------------

Environmental hazards Not classified

**Physical Hazards**

Combustible dust

**2.2 Label elements**



**Signal word**  
WARNING

**Hazard Statements**

H317 - May cause an allergic skin reaction  
May form combustible dust concentrations in air

**Precautionary Statements**

P261 - Avoid breathing dust/fume/gas/mist/vapors/spray  
P272 - Contaminated work clothing should not be allowed out of the workplace  
P280 - Wear protective gloves, protective clothing, eye protection  
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water  
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention  
P362 + P364 - Take off contaminated clothing and wash it before reuse  
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

P240 - Ground/bond container and receiving equipment  
P241 - Use explosion-proof electrical, ventilating, lighting, equipment  
P243 - Take precautionary measures against static discharge

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Xanthan Gum	11138-66-2	60-100
Glyoxal	107-22-2	0.1-<1

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if symptoms occur.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

Combustible material. Dust may form explosive mixture in air. Heating of containers may cause pressure rise, with risk of bursting.

#### **Hazardous combustion products**

Carbon oxides (COx).

### **5.3 Advice for firefighters**

#### **Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Material becomes slippery when wet. Use caution if wet.

### **6.2 Environmental precautions**

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

#### **Environmental exposure controls**

Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

#### **Methods for cleaning up**

Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Persons susceptible to allergic reactions should not handle this product.

#### **Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### **7.2 Conditions for safe storage, including any incompatibilities**

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Protect from moisture. Avoid contact with: Strong oxidizing agents.
<b>Packaging materials</b>	Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits**

**Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m<sup>3</sup> (Inhalable); 3 mg/m<sup>3</sup> (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m<sup>3</sup> (Total); 5 mg/m<sup>3</sup> (Respirable).**

**Component Information**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Xanthan Gum	Not determined	Not determined	Not determined	Not determined	Not determined
Glyoxal	0.1 mg/m <sup>3</sup>	Not determined	0.1 mg/m <sup>3</sup> TWA	Not determined	0.1 mg/m <sup>3</sup> TWA VLE-PPT (inhalable fraction and vapor)

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Xanthan Gum 11138-66-2	-
Glyoxal 107-22-2	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation.

**Personal protective equipment**

**Eye protection**

Tightly fitting safety goggles.

**Hand protection**

Use protective gloves made of: Butyl Neoprene Nitrile Frequent change is advisable

**Respiratory Protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.

<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Color</b>	Cream - Tan
<b>Odor</b>	Mild
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	7	@ 1% sol.
<b>Melting point</b>	No information available	
<b>Boiling point</b>	No information available	
<b>Flash point</b>	No information available	
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.5	20 °C
<b>Bulk density</b>	50 lb/ft <sup>3</sup> (800 kg/m <sup>3</sup> )	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	> 200 °C / > 392 °F	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Partition Coefficient (n-octanol/water)</b>	No information available	

<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard
<b>Oxidizing properties</b>	None known.

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Combustible material. Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Take precautionary measures against static charges. Avoid dust formation. Heat, flames and sparks. Protect from moisture.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	May cause an allergic skin reaction.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Xanthan Gum	No data available	No data available	No data available
Glyoxal	200 mg/kg (rat)	12700 mg/kg (Rabbit)	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Xanthan Gum	No data available	No data available	No data available	No data available
Glyoxal	No data available	A4 Not Classifiable as a Human Carcinogen	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

<b>Sensitization</b>	May cause sensitization by skin contact.
<b>Mutagenic effects</b>	Conclusive but not sufficient for classification. Contains an known or suspected mutagen.

<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Inhalation. Skin contact.
<b>Routes of entry</b>	Inhalation. Skin contact.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Xanthan Gum	No information available	No information available	No information available
Glyoxal	460 - 680 mg/L LC50 Leuciscus idus 96 h = 215 mg/L LC50 Pimephales promelas 96 h	<= 348.59 mg/L EC50 Pseudokirchneriella subcapitata 96 h > 500 mg/L EC50 Desmodesmus subspicatus 96 h > 500 mg/L EC50 Desmodesmus subspicatus 72 h	= 404 mg/L EC50 Daphnia magna 48 h

### 12.2 Persistence and degradability

The product contains substances which are not expected to be biodegradable.

### 12.3 Bioaccumulative potential

Does not bioaccumulate.

### 12.4 Mobility

Soluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

**14.4 Packing group**

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
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**14.6 Special precautions**

Not applicable

## 15. Regulatory Information

### International inventories

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### U.S. Federal and State Regulations

#### SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Xanthan Gum	N/A	N/A	N/A
Glyoxal	N/A	N/A	N/A

### California Proposition 65

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

#### Brazil Regulation

This SDS was prepared in accordance with Brazil law NBR 14725.

#### **Federal Police**

Not determined

#### **Army**

Not determined

#### **ANVISA**

Not determined

## 16. Other Information

**Supersedes date** 16/Nov/2018

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**Revision date** 12/Oct/2020

**Version** 15

**This SDS has been revised in the following section(s)** All sections. No changes with regard to classification have been made.

**HMIS classification**

Health	2
Flammability	1
Physical hazard	0
PPE	E

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## Safety Data Sheet DURAMOD\*

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** DURAMOD\*  
**Product code** PID19433  
**Country Limitations** This product may not be distributed or used in Canada.

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Viscosifier.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 2

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
WARNING

**Hazard Statements**

H350 - May cause cancer  
H373 - May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements**

P201 - Obtain special instructions before use  
P260 - Do not breathe dust/fume/gas/mist/vapors/spray  
P281 - Use personal protective equipment as required  
P308 + P313 - IF exposed or concerned: Get medical advice/attention  
P314 - Get medical advice/attention if you feel unwell  
P501 - Dispose of contents/container to industrial incineration plant

P202 - Do not handle until all safety precautions have been read and understood  
P314 - Get medical advice/attention if you feel unwell  
P501 - Dispose of contents/ container to an approved waste disposal plant

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Crystalline silica (impurity)	14808-60-7	<3

**3.2 Mixtures**

Not applicable

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret.

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth

to an unconscious person. Get medical attention if symptoms occur.

**Skin contact** Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

**Eye Contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

**Suitable extinguishing media**  
Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**  
None known.

### **5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
None known.

### **5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**  
As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**  
Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA respirable fraction	0.05 mg/m <sup>3</sup> TWA	Not determined	0.1 mg/m <sup>3</sup> TWA VLE-PPT (respirable fraction)

Crystalline silica (impurity)

OSHA - Final PELs - Table Z-3 Mineral Dusts

(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**IDLH (Immediately Dangerous to Life or Health)**

This product contains substance(s) classified as Immediately Dangerous to Life or Health (IDLH) by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Crystalline silica (impurity) 14808-60-7	50 mg/m <sup>3</sup> IDLH (respirable dust)

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation.

**Personal protective equipment**

<b>Eye protection</b>	It is good practice to wear goggles when handling any chemical. Tightly fitting safety goggles.
<b>Hand protection</b>	Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene gloves
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached.If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing and gloves, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Granules
<b>Color</b>	Light gray - Tan
<b>Odor</b>	Earthy
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.2 - 2.4	
Bulk density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	

**Decomposition temperature** No information available  
**Kinematic viscosity** No information available  
**Dynamic viscosity** No information available  
**log Pow** No information available

**Explosive properties** No information available  
**Oxidizing properties** No information available

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** No information available  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid dust formation. Protect from moisture.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

**Eye contact** Dust may cause mechanical irritation.

**Skin contact** Repeated exposure may cause skin dryness or cracking.

**Ingestion** Irritant; may cause pain or discomfort to mouth, throat and stomach.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
---------------	-----------	-------------	-----------------

Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available
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Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	Contains a known or suspected carcinogen.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Inhalation. Skin contact. Eye contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Lungs.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

#### Toxicity to algae

This product is not considered toxic to algae.

#### Toxicity to fish

This product is not considered toxic to fish.

#### Toxicity to daphnia and other aquatic invertebrates

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

### 12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL.
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Crystalline silica (impurity)	N/A	N/A	N/A

**California Proposition 65**

**WARNING**



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Crystalline silica (impurity) 14808-60-7	Carcinogen

**Canadian Classification**

This product may not be distributed or used in Canada.

**16. Other Information**

**Supersedes date** 14/Sep/2014

**Revision date** 12/Mar/2019

**Version** 2

**This SDS has been revised in the following section(s)** All sections. Product Code change No changes with regard to classification have been made.

**HMIS classification**

Health	1*
Flammability	0
Physical hazard	0
PPE	X

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**Disclaimer**

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SDS no. PID10792  
Version 10  
Revision date 12/Oct/2020  
Supersedes date 10/Jul/2020



## Safety Data Sheet ECOTROL\* RD

### 1. Identification

#### 1.1 Product identifier

**Product name** ECOTROL\* RD  
**Product code** PID10792

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Filtration-control.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**

**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**GHS - Classification**

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards**

Combustible dust

**2.2 Label elements**

**Signal word**

WARNING

**Hazard Statements**

May form combustible dust concentrations in air

**Precautionary Statements**

P240 - Ground or bond container and receiving equipment  
P241 - Use explosion-proof electrical, ventilating, lighting, equipment  
P243 - Take precautionary measures against static discharge

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Polymer	Proprietary	60-100
Silica gel, pptd., cryst.-free	112926-00-8	1 - 5

**Comments**

Proprietary component(s) in section 3 of this SDS does not/do not trigger application of trade secret exemption under Hazardous Materials Information Review Act (HMIRA). The proprietary component in this product contributes to combustible dust classification.

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact** Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

**Eye Contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-Fighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**  
Use extinguishing agent suitable for type of surrounding fire.

**Extinguishing media which must not be used for safety reasons**  
None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
Dust may form explosive mixture in air.

**Hazardous combustion products**  
Fire or high temperatures create: Carbon oxides (COx), Hydrocarbon.

**5.3 Advice for firefighters**

**Special protective equipment and precautions for fire-fighters**  
As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**  
Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking. Avoid heat, flames and other sources of ignition. Protect from moisture. Avoid contact with: Strong oxidizing agents.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits** Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m<sup>3</sup> (Inhalable); 3 mg/m<sup>3</sup> (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m<sup>3</sup> (Total); 5 mg/m<sup>3</sup> (Respirable).

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Polymer	Not determined	Not determined	Not determined	Not determined	Not determined
Silica gel, pptd., cryst.-free	Not determined	20 mppcf	10 mg/m <sup>3</sup> TWA	Not determined	Not determined

Silica gel, pptd., cryst.-free  
OSHA - Final PELs - Table Z-3 Mineral Dusts  
20 mppcf TWA; (80)/(% SiO<sub>2</sub>) mg/m<sup>3</sup> TWA

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Polymer	-
Silica gel, pptd., cryst.-free 112926-00-8	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

- Eye protection** Tightly fitting safety goggles.
- Hand protection** Wear chemical resistant gloves such as nitrile or neoprene. Frequent change is advisable
- Respiratory Protection** All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
- Hygiene Measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution	No information available	
Melting point	No information available	

<b>Boiling point</b>	No information available	
<b>Flash point</b>	No information available	
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.03	20 °C
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	400 °C / 752 °F	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Partition Coefficient (n-octanol/water)</b>	No information available	
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard	
<b>Oxidizing properties</b>	No information available	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition. Avoid dust formation. Protect from moisture.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

<b>Acute toxicity</b>	
<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.

### Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polymer	No data available	No data available	No data available
Silica gel, pptd., cryst.-free	7900 mg/kg (rat)	2002 mg/kg (Rabbit)	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Polymer	No data available	No data available	No data available	No data available
Silica gel, pptd., cryst.-free	No data available	No data available	No data available	No data available

### Delayed and immediate effects and chronic effects from short and long term exposure

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polymer	No information available	No information available	No information available
Silica gel, pptd., cryst.-free	= 5000 mg/L LC50 Brachydanio rerio 96 h	= 440 mg/L EC50 Pseudokirchneriella subcapitata 72 h	= 7600 mg/L EC50 Ceriodaphnia dubia 48 h

### 12.2 Persistence and degradability

Not readily biodegradable.

### 12.3 Bioaccumulative potential

Does not bioaccumulate.

### 12.4 Mobility

Insoluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

## 14. Transport information

### 14.1. UN number

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
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**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Does not comply
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that

it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Polymer	N/A	N/A	N/A
Silica gel, pptd., cryst.-free	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**Brazil Regulation** This SDS was prepared in accordance with Brazil law NBR 14725.

**Federal Police** Not determined

**Army** Not determined

**ANVISA** Not determined

**16. Other Information**

**Supersedes date** 10/Jul/2020

**Revision date** 12/Oct/2020

**Version** 10

**This SDS has been revised in the following section(s)** 15. Regulatory Information Section 16: Other information No changes with regard to classification have been made.

**HMIS classification**

Health	1
Flammability	1
Physical hazard	0
PPE	E

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**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on

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## SAFETY DATA SHEET

### ESCAID 110

#### 1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

PRODUCT NAME                      ESCAID 110

APPLICATION                        Base Fluid

SUPPLIER                            M-I SWACO.  
Holburn House,  
475-485, Union Street,  
Aberdeen. AB11 6DB  
Scotland  
T -44 (0)1224-336336  
F -44 (0)1224-336351

EMERGENCY TELEPHONE        (24 Hour) Europe +44 (0) 208 762 8322, Asia Pacific +65 633 44 177, China +86 10 5100 3039, Middle East and Africa +961 3 487 287.

#### 2 HAZARDS IDENTIFICATION

Harmful: may cause lung damage if swallowed.

Repeated exposure may cause skin dryness or cracking.

CLASSIFICATION                    Xn;R65. R66.

#### 3 COMPOSITION/INFORMATION ON INGREDIENTS

Name	EC No.	CAS-No.	Content	Classification
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT; KEROSENE - UNSPECIFIED	265-149-8	64742-47-8	60-100%	Xn;R65.

The Full Text for all R-Phrases are Displayed in Section 16

#### COMPOSITION COMMENTS

The data shown is in accordance with the latest EC Directives.

#### 4 FIRST-AID MEASURES

##### INHALATION

Move the exposed person to fresh air at once. If respiratory problems, artificial respiration/oxygen. Get medical attention if any discomfort continues.

##### INGESTION

Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs. Rinse mouth thoroughly with water and give large amounts of milk or water to people not unconscious. Get medical attention.

##### SKIN CONTACT

Remove contaminated clothing immediately and wash skin with soap and water. Get medical attention promptly if symptoms occur after washing.

##### EYE CONTACT

Promptly wash eyes with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

#### 5 FIRE-FIGHTING MEASURES

##### EXTINGUISHING MEDIA

Water spray, foam, dry powder or carbon dioxide.

##### SPECIAL FIRE FIGHTING PROCEDURES

Do not use water jet as an extinguisher, as this will spread the fire. Containers close to fire should be removed immediately or cooled with water.

##### SPECIFIC HAZARDS

Fire or high temperatures create: Oxides of: Carbon.

##### PROTECTIVE MEASURES IN FIRE

Self contained breathing apparatus and full protective clothing must be worn in case of fire.

## 6 ACCIDENTAL RELEASE MEASURES

### PERSONAL PRECAUTIONS

Wear protective clothing as described in Section 8 of this safety data sheet.

### ENVIRONMENTAL PRECAUTIONS

Do not allow to enter drains, sewers or watercourses.

### SPILL CLEAN UP METHODS

Stop leak if possible without risk. Dike far ahead of larger spills for later disposal. Absorb spillage with suitable absorbent material. Shovel into dry containers. Cover and move the containers. Flush the area with water. In case of spills, beware of slippery floors and surfaces.

## 7 HANDLING AND STORAGE

### USAGE PRECAUTIONS

Do not use contact lenses. Avoid inhalation of vapours/spray and contact with skin and eyes.

### STORAGE PRECAUTIONS

Store in tightly closed original container in a dry, cool and well-ventilated place.

## 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

### INGREDIENT COMMENTS

Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m<sup>3</sup> and ST. EXP = 10mg/m<sup>3</sup>.

### PROTECTIVE EQUIPMENT



### ENGINEERING MEASURES

Provide adequate general and local exhaust ventilation.

### RESPIRATORY EQUIPMENT

Respiratory protection must be used if air contamination exceeds acceptable level. Wear mask supplied with: Gas cartridge suitable for organic substances.

### HAND PROTECTION

Chemical resistant gloves required for prolonged or repeated contact. Use protective gloves made of: Nitrile.

### EYE PROTECTION

Wear splash-proof eye goggles to prevent any possibility of eye contact.

### OTHER PROTECTION

Wear appropriate clothing to prevent repeated or prolonged skin contact. Provide eyewash station.

## 9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE	Clear liquid		
COLOUR	Colourless		
ODOUR	Mild Petroleum. / Solvent.		
SOLUBILITY	Insoluble in water		
MOL. WEIGHT	172	BOILING POINT (°C)	192°C (378°F) - 245°C (473°F)
RELATIVE DENSITY	0.804 s.g	BULK DENSITY	803 kg/m <sup>3</sup>
VAPOUR DENSITY (air=1)	>1 at 101 kPa	VAPOUR PRESSURE	0.3 kPa @ 20°C
EVAPORATION RATE	<0.01 BuAc=1	VISCOSITY	1.64 cSt @ 40°C
FLASH POINT (°C)	>70°C (158°F) CC (Closed cup).	AUTO IGNITION TEMPERATURE (°C)	>200°C (392°F)
FLAMMABILITY LIMIT - LOWER(%)	0.6	FLAMMABILITY LIMIT - UPPER(%)	7.0
POUR POINT (°C)	<-20°C (-4°F)		

## 10 STABILITY AND REACTIVITY

### STABILITY

Stable under normal temperature conditions.

**ESCAID 110**

**CONDITIONS TO AVOID**

Avoid heat, flames and other sources of ignition.

**MATERIALS TO AVOID**

Avoid: Strong oxidising substances.

**HAZARDOUS DECOMPOSITION PRODUCTS**

Fire or high temperatures create: Oxides of: Carbon.

**11 TOXICOLOGICAL INFORMATION**

**INHALATION**

May cause irritation to the respiratory system.

**INGESTION**

Harmful: may cause lung damage if swallowed. Low viscosity product. If after ingestion occurs, harmful or fatal if aspirated into the lungs.

**SKIN CONTACT**

Product has a defatting effect on skin. Prolonged or repeated contact may lead to irritation and dermatitis.

**EYE CONTACT**

Spray and vapour in the eyes may cause irritation and smarting.

**12 ECOLOGICAL INFORMATION**

**ECOTOXICITY**

Contact M-I Swaco's QHSE Department for ecological information.

**13 DISPOSAL CONSIDERATIONS**

**DISPOSAL METHODS**

Recover and reclaim or recycle, if practical. Dispose of waste and residues in accordance with local authority requirements.

**14 TRANSPORT INFORMATION**

**GENERAL**

The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).

**15 REGULATORY INFORMATION**

**LABELLING**



Harmful

**RISK PHRASES**

- R65 Harmful: may cause lung damage if swallowed.
- R66 Repeated exposure may cause skin dryness or cracking.

**SAFETY PHRASES**

- S23 Do not breathe vapour/spray.
- S24 Avoid contact with skin.
- S62 If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

**UK REGULATORY REFERENCES**

Chemicals (Hazard Information & Packaging) Regulations.

**ENVIRONMENTAL LISTING**

OGP Group III non-aqueous fluid

**EU DIRECTIVES**

Dangerous Substance Directive 67/548/EEC. Dangerous Preparations Directive 1999/45/EC.

**GUIDANCE NOTES**

Workplace Exposure Limits EH40.

**16 OTHER INFORMATION**

## INFORMATION SOURCES

Material Safety Data Sheet, Misc. manufacturers. Product information provided by the commercial vendor(s). European Chemicals Bureau - ESIS (European Chemical Substances Information System).

## REVISION COMMENTS

General revision. Compiled or revised by Bill Cameron

## ISSUED BY

Dr. Kirsty Walker

REVISION DATE 07-06-07

REV. NO./REPL. SDS GENERATED 2

SDS NO. 11230

## RISK PHRASES IN FULL

R65 Harmful: may cause lung damage if swallowed.

## DISCLAIMER

MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We cannot make any assertions as to its reliability or completeness; therefore, user may rely only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guarantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.



# Safety Data Sheet

## HRP\*

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name HRP\*  
Product code PID2272

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**Schlumberger Canada, Ltd.**  
200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-613-992-4624

**E-mail address** sdsmi@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard Statements**

H315 - Causes skin irritation

H318 - Causes serious eye damage

**Precautionary Statements**

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or doctor/physician

P302 + P352 - IF ON SKIN: Wash with plenty of soap and water

P332 + P313 - If skin irritation occurs: Get medical advice/attention

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Supplementary precautionary statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P362 - Take off contaminated clothing and wash before reuse

**Hazards not otherwise classified**

None known

**Unknown acute toxicity**

Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Fatty acid, C18 unsatd. dimers, polymer with diethanolamine and diethylenetriamine	515861-19-5	45 - 70
2-[2-(2-butoxyethoxy)ethoxy]ethanol	143-22-6	45 - 70
4-methyl-1,3-dioxolan-2-one	108-32-7	5 - 10

**Comments**

Fatty acid, C18 unsatd. dimers, polymer with diethanolamine and diethylenetriamine can also use the CAS # 68410-22-0. The exact percentage (concentration) of composition has been withheld as a trade secret

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Seek medical attention.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.

### 5.3 Advice for firefighters

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

#### **Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with:  
Strong oxidizing agents.

**Packaging materials**                      Use specially constructed containers only.

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

#### **Exposure limits**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Fatty acid, C18 unsatd. dimers, polymer with	Not determined	Not determined	Not determined	Not determined	Not determined

diethanolamine and diethylenetriamine					
2-[2-(2-butoxyethoxy)ethoxy]ethanol	Not determined				
4-methyl-1,3-dioxolan-2-one	Not determined				

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Fatty acid, C18 unsatd. dimers, polymer with diethanolamine and diethylenetriamine 515861-19-5	-
2-[2-(2-butoxyethoxy)ethoxy]ethanol 143-22-6	-
4-methyl-1,3-dioxolan-2-one 108-32-7	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required. Apply technical measures to comply with the occupational exposure limits. Keep airborne concentrations below exposure limits.

**Personal protective equipment**

**Eye protection**

Tightly fitting safety goggles.

**Hand protection**

Impervious gloves made of: Neoprene Nitrile PVC  
Break through time >480 minutes  
Glove thickness >=0.4 mm

**Respiratory Protection**

Be aware that liquid may penetrate the gloves. Frequent change is advisable.  
All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Transparent
<b>Color</b>	Straw
<b>Odor</b>	Slight
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	No information available	
<b>pH @ dilution</b>	8-9	(20 g/l IPA)
<b>Melting / freezing point</b>	No information available	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	> 93 °C / 200 °F	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.01 sg	
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	2000 mPa s	@ 20 °C
<b>log Pow</b>	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	

### 9.2 Other information

<b>Pour point</b>	4°C / 40°F
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

### Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerization**

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Avoid contact with heat, sparks, open flame, and static discharge. Do not freeze. Keep away from direct sunlight.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact** Causes serious eye damage.

**Skin contact** Causes skin irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fatty acid, C18 unsatd. dimers, polymer with diethanolamine and diethylenetriamine	No data available	No data available	No data available
2-[2-(2-butoxyethoxy)ethoxy]ethanol	= 5300 mg/kg (Rat) Literature data	> 2000 mg/kg (Rabbit)	No data available
4-methyl-1,3-dioxolan-2-one	= 29000 mg/kg ( Rat )	> 3000 mg/kg ( Rabbit )	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Fatty acid, C18 unsatd. dimers, polymer with diethanolamine and diethylenetriamine	No data available	No data available	No data available	No data available
2-[2-(2-butoxyethoxy)ethoxy]ethanol	No data available	No data available	No data available	No data available
4-methyl-1,3-dioxolan-2-one	No data available	No data available	No data available	No data available

**Sensitization** Not classified.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.

**Routes of exposure** Eyes. Skin contact.

**Routes of entry** No route of entry noted.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not classified.

## 12. Ecological Information

### 12.1 Toxicity

#### Toxicity to algae

See component information below.

#### Toxicity to fish

See component information below.

#### Toxicity to daphnia and other aquatic invertebrates

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Fatty acid, C18 unsatd. dimers, polymer with diethanolamine and diethylenetriamine	No information available	No information available	No information available
2-[2-(2-butoxyethoxy)ethoxy]ethanol	2200 - 4600 mg/L LC50 Leuciscus idus 96h = 2400 mg/L LC50 Pimephales promelas 96h	> 500 mg/L EC50 Desmodesmus subspicatus 72h	> 500 mg/L EC50 Daphnia magna 48h
4-methyl-1,3-dioxolan-2-one	= 5300 mg/L LC50 Leuciscus idus 96 h > 1000 mg/L LC50 Cyprinus carpio 96 h	> 500 mg/L EC50 Desmodesmus subspicatus 72 h	> 500 mg/L EC50 Daphnia magna 48 h

### 12.2 Persistence and degradability

Not readily biodegradable.

### 12.3 Bioaccumulative potential

Does not bioaccumulate.

### 12.4 Mobility

Insoluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

#### Disposal Method

Disposal should be made in accordance with federal, state and local regulations.

#### Contaminated packaging

Empty containers should be taken for local recycling, recovery or waste disposal.

## 14. Transport information

**14.1. UN number**

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

**14.4 Packing group**

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that

it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**IMPORTS, Canada**

No import volume restrictions.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Fatty acid, C18 unsatd. dimers, polymer with diethanolamine and diethylenetriamine	N/A	N/A	N/A
2-[2-(2-butoxyethoxy)ethoxy]ethanol	N/A	N/A	N/A
4-methyl-1,3-dioxolan-2-one	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**Brazilian Regulations**

**Brazil Regulation**

This SDS was prepared in accordance with Brazil law NBR 14725.

**Federal Police**

Not determined

**Army**

Not determined

**ANVISA**

Not determined

**16. Other Information**

**Supersedes date** 31/Jan/2017

**Revision date** 19/Dec/2018

**Version** 15

**This SDS has been revised in the following section(s)** 9, 16

**HMIS classification**

Health 3  
Flammability 1  
Physical hazard 0  
PPE X

N/A - Not Applicable, N/D - Not Determined.

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**Disclaimer**

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## Safety Data Sheet KI-3924

### 1. Identification

#### 1.1 Product identifier

**Product name** KI-3924  
**Product code** PID15613

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Corrosion inhibitor.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

**Schlumberger Production Technologies**  
P.O. Box 42842  
Houston, TX 77242  
Telephone: 1 281-561-1511  
www.slb.com

##### **Schlumberger Canada, Ltd.**

200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-613-992-4624

**E-mail address** SDS@slb.com

##### Prepared by

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1

**Environmental hazards**

Acute aquatic toxicity	Category 1
Chronic aquatic toxicity	Category 1

**Physical Hazards**

Not classified

**2.2 Label elements****Signal word**

DANGER

**Hazard Statements**

H315 - Causes skin irritation  
 H317 - May cause an allergic skin reaction  
 H318 - Causes serious eye damage  
 H410 - Very toxic to aquatic life with long lasting effects

**Precautionary Statements**

P280 - Wear protective gloves and eye/face protection  
 P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
 P310 - Immediately call a POISON CENTER or physician  
 P302 + P352 - IF ON SKIN: Wash with plenty of soap and water  
 P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention  
 P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Supplementary precautionary statements**

P261 - Avoid breathing dust/fume/gas/mist/vapors/spray  
 P264 - Wash face, hands and any exposed skin thoroughly after handling  
 P272 - Contaminated work clothing should not be allowed out of the workplace  
 P273 - Avoid release to the environment  
 P362 + P364 - Take off contaminated clothing and wash it before reuse  
 P391 - Collect spillage

**Hazards not otherwise classified**

None known

**Unknown acute toxicity**

Not applicable.

**3. Composition/information on Ingredients****3.1 Substances**

Chemical Name	CAS No	Weight-%
Amines, N-coco alkyltrimethylenedi-, acetates	61791-64-8	60-100

**3.2 Mixtures**

Not applicable

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Immediately flush eyes with water for 15 minutes while holding eyelids open. Seek medical attention.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Skin contact</b>	Causes skin irritation. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons.
<b>Eye contact</b>	Causes severe irritation and or burns. May cause irreversible damage to eyes.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

**Suitable extinguishing media**

Use water spray, fog, Carbon dioxide (CO<sub>2</sub>), foam or dry chemical.

**Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

**Unusual fire and explosion hazards**

Contact with metals may evolve flammable hydrogen gas.

### 5.3 Advice for firefighters

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up****Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

## 7. Handling and Storage

**7.1 Precautions for safe handling****Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Do not breathe dust. Avoid dust formation. Persons susceptible to allergic reactions should not handle this product.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Store in original container. Avoid contact with: Heat. Strong oxidizing agents. Strong acids.

**Packaging materials**                      Use specially constructed containers only.

## 8. Exposure Controls/Personal Protection

**8.1 Control parameters**

**Exposure limits**                              Contains no substances with occupational exposure limit values

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Amines, N-coco alkyltrimethylenedi-, acetates	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Amines, N-coco alkyltrimethylenedi-, acetates 61791-64-8	Not determined

## 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation, especially in confined areas.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles. Safety glasses with side-shields.
<b>Hand protection</b>	Impervious gloves made of: Nitrile Break through time >480 minutes Glove thickness 0.26 mm Frequent change is advisable
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Wax like
<b>Color</b>	Yellow
<b>Odor</b>	No information available
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	5 - 8	
<b>pH @ dilution</b>		
<b>Melting point</b>	No information available	
<b>Boiling point</b>	No information available	

<b>Flash point</b>	186 °C / 366.8 °F	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Slightly soluble in water.	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Partition Coefficient (n-octanol/water)</b>	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	

#### **9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	0.91 - 0.93 g/ml @ 20°C

#### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## **10. Stability and Reactivity**

### **10.1 Reactivity**

No specific reactivity hazards associated with this product.

### **10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

### **10.3 Possibility of Hazardous Reactions**

#### **Hazardous polymerization**

Not known.

### **10.4 Conditions to avoid**

Heat.

### **10.5 Incompatible materials**

Strong oxidizing agents. Strong acids.

### **10.6 Hazardous decomposition products**

See Section 5.2.

## **11. Toxicological Information**

### **11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Causes serious eye damage. May cause irreversible damage to eyes.
<b>Skin contact</b>	Causes skin irritation. May cause an allergic skin reaction.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Amines, N-coco alkyltrimethylenedi-, acetates	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Amines, N-coco alkyltrimethylenedi-, acetates	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

<b>Sensitization</b>	May cause allergic skin reaction.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Eye contact. Skin contact.
<b>Routes of entry</b>	Eye contact. Skin contact.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

**12. Ecological Information****12.1 Toxicity****Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Amines, N-coco alkyltrimethylenedi-, acetates	0.84 mg/l LC 50 (Juv. Turbot, Scopthalmus max) 96 hrs Vendor data	0.023 mg/l EC50 (Skeletonema costatum) 72 hrs Vendor data	0.032 mg/l LC50 (Arcartia tonsa) 48 hrs Vendor data

### 12.2 Persistence and degradability

See component information below.

### 12.3 Bioaccumulative potential

See component information below.

### 12.4 Mobility

See component information below.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

## 14. Transport information

### 14.1. UN number

UN No. (DOT)	UN3077
UN No. (MT/ANTT)	UN3077
UN No. (TDG)	UN3077
UN/ID No. (ADR/RID/ADN/ADG)	UN3077
UN No. (IMDG/ANTAQ)	UN3077
UN No. (ICAO/ANAC)	UN3077
UN No. (DPC)	UN3077

### 14.2. UN proper shipping name

ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Amines, N-coco alkyltrimethylenedi-, acetates)

### 14.3 Hazard class(es)

DOT Hazard class	9
ANTT Hazard class	9
TDG Hazard class	9
ADR/RID/ADN/ADG Hazard class	9
IMDG/ANTAQ Hazard class	9

ICAO/ANAC Hazard class/division 9  
DPC Hazard class 9

**14.4 Packing group**

DOT Packing group III  
 ANTT Packing group III  
 TDG Packing group III  
 ADR/RID/ADN/ADG Packing group III  
 IMDG/ANTAQ Packing group III  
 ICAO/ANAC Packing group III  
 DPC Packing group III

**14.5 Environmental hazard**

Yes

Marine pollutant

Yes, (Amines, N-coco alkyltrimethylenedi-, acetates)

**14.6 Special precautions**

Not applicable

## 15. Regulatory Information

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations****SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Amines, N-coco alkyltrimethylenedi-, acetates	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

-

## 16. Other Information

**Supersedes date** 03/Jan/2017

**Revision date** 15/Jan/2020

**Version** 5

**This SDS has been revised in the following section(s)** All sections. There have been changes with regard to classification.

**HMIS classification**

Health	3
Flammability	1
Physical hazard	0
PPE	X

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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# Safety Data Sheet

## LIME

### 1. Identification

#### 1.1 Product identifier

**Product name** LIME  
**Product code** PID904  
**Synonyms** CALCIUM HYDROXIDE, HYDRATKALK

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid additive. pH modifier.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity - Single exposure	Category 3

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard Statements**

- H315 - Causes skin irritation
- H318 - Causes serious eye damage
- H335 - May cause respiratory irritation

**Precautionary Statements**

- P280 - Wear protective gloves, protective clothing, eye protection
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
- P332 + P313 - If skin irritation occurs: Get medical advice/attention
- P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Supplementary precautionary statements**

- P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P271 - Use only outdoors or in a well-ventilated area
- P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
- P312 - Call a POISON CENTER or doctor/physician if you feel unwell
- P362 + P364 - Take off contaminated clothing and wash it before reuse
- P403 + P233 - Store in a well-ventilated place. Keep container tightly closed

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Calcium hydroxide	1305-62-0	60-100

**3.2 Mixtures**

Not applicable

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Seek medical attention.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

Water.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Calcium oxide.

**5.3 Advice for firefighters**

**Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

**Methods for cleaning up**

Avoid dust formation. Sweep up and shovel into suitable containers for disposal.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture. Avoid contact with:.. Acids.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Calcium hydroxide	5 mg/m <sup>3</sup>	15 mg/m <sup>3</sup> TWA 5 mg/m <sup>3</sup> TWA	5 mg/m <sup>3</sup> TWA	Not determined	5 mg/m <sup>3</sup> TWA VLE-PPT

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Calcium hydroxide 1305-62-0	Not determined

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation, especially in confined areas. Provide appropriate exhaust ventilation at places where dust is formed.

**Personal protective equipment**

- Eye protection**                      Wear chemical splash goggles and face shield.
- Hand protection**                    Wear protective nitrile rubber gloves  
Frequent change is advisable
- Respiratory Protection**            All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
- Skin and body protection**        Wear suitable protective clothing and gloves, Eye wash and emergency shower must be available at the work place.
- Hygiene Measures**                    Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder
<b>Color</b>	White - Off-white
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	12.4	
<b>pH @ dilution</b>	No information available	
<b>Melting point</b>	> 450 °C / > 842 °F	
<b>Boiling point</b>	No information available	
<b>Flash point</b>	No information available	
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	2.24	20 °C
<b>Bulk density</b>	400 Kg/m <sup>3</sup>	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Partition Coefficient (n-octanol/water)</b>	No information available	
<b>Explosive properties</b>	No information available	
<b>Oxidizing properties</b>	No information available	
<b>9.2 Other information</b>		
<b>Pour point</b>	No information available	
<b>Molecular weight</b>	No information available	
<b>VOC content(%)</b>	No information available	
<b>Density</b>	No information available	

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

**Hazardous polymerization**

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

**10.5 Incompatible materials**

Acids. Water.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** May cause respiratory irritation. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

**Eye contact** Causes serious eye damage.

**Skin contact** Causes skin irritation.

**Ingestion** Ingestion may cause stomach discomfort. May cause additional affects as listed under "Inhalation".

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium hydroxide	7340 mg/kg (rat)	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Calcium hydroxide	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

**Sensitization** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.

**Routes of Exposure** Eye contact. Skin contact. Inhalation.

**Routes of entry** Inhalation.

**Specific target organ toxicity - Single exposure** Category 3  
**Specific target organ toxicity - Repeated exposure** Not classified.  
**Target organ effects** Respiratory system.  
**Aspiration hazard** Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**  
This product is not considered toxic to algae.

**Toxicity to fish**  
This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium hydroxide	= 160 mg/L LC50 Gambusia affinis 96 h	No information available	No information available

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
 This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

**14.4 Packing group**

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies

Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Calcium hydroxide	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Brazilian Regulations**

<b>Brazil Regulation</b>	This SDS was prepared in accordance with Brazil law NBR 14725.
<b>Federal Police</b>	Not determined
<b>Army</b>	Not determined
<b>ANVISA</b>	Not determined
<b>MTE (NR 15)</b>	No information available

**16. Other Information**

<b>Supersedes date</b>	07/Oct/2020
<b>Revision date</b>	13/Oct/2020
<b>Version</b>	12
<b>This SDS has been revised in the following section(s)</b>	1, 8, 14, 16 No changes with regard to classification have been made.
<b>HMIS classification</b>	
Health	3
Flammability	0
Physical hazard	0
PPE	E

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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# Safety Data Sheet

## M-I GEL\*

### 1. Identification

#### 1.1 Product identifier

Product name M-I GEL\*  
Product code PID971

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

E-mail address SDS@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard Statements**

H350 - May cause cancer  
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

**Precautionary Statements**

P201 - Obtain special instructions before use  
P202 - Do not handle until all safety precautions have been read and understood  
P260 - Do not breathe dust, fume, gas, mist, vapors, spray  
P280 - Wear protective gloves, protective clothing, eye protection  
P308 + P313 - IF exposed or concerned: Get medical advice/attention  
P314 - Get medical attention if you feel unwell  
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Crystalline silica (impurity)	14808-60-7	<10

**3.2 Mixtures**

Not applicable

**Comments**

The product contains other ingredients which do not contribute to the overall classification. Percentages (concentrations) represented as a range are due to batch-to-batch variability. The exact percentage (concentration) of composition has been withheld as a trade secret.

**4. First Aid Measures**

#### **4.1 First aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

#### **5.1 Extinguishing media**

##### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

##### **Extinguishing media which must not be used for safety reasons**

Do not use water jet.

#### **5.2. Special hazards arising from the substance or mixture**

##### **Unusual fire and explosion hazards**

None known.

##### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapors.

#### **5.3 Advice for firefighters**

##### **Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

**Environmental exposure controls**

Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place.

**Packaging materials**                      Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits -	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits -

			TWAs (CMPs)		TWAs (LMPE-PPTs)
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA respirable fraction	0.05 mg/m <sup>3</sup> TWA	Not determined	0.025 mg/m <sup>3</sup> TWA VLE-PPT (respirable fraction)

**Crystalline silica (impurity)**

OSHA - Final PELs - Table Z-3 Mineral Dusts  
(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Crystalline silica (impurity) 14808-60-7	50 mg/m <sup>3</sup> IDLH (respirable dust)

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Local exhaust ventilation.

**Personal protective equipment**

**Eye protection**

Tightly fitting safety goggles.

**Hand protection**

Use protective gloves made of: Neoprene Nitrile Frequent change is advisable

**Respiratory Protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

**Physical state** Solid

<b>Appearance</b>	Powder
<b>Color</b>	Cream - Gray
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	9-10	
pH @ dilution	No information available	
Melting point	No information available	
Boiling point	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.3 - 2.6	@ 20 °C
Bulk density	48 – 52 lb/ft <sup>3</sup> (769 – 833 kg/m <sup>3</sup> )	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	
<b><u>9.2 Other information</u></b>		
Pour point	No information available	
Molecular weight	No information available	
VOC content(%)	None	
Density	No information available	

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

None known.

**10.5 Incompatible materials**

No materials to be especially mentioned.

**10.6 Hazardous decomposition products**

See Section 5.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

**Eye contact**

Dust may cause mechanical irritation.

**Skin contact**

Prolonged contact may cause redness and irritation.

**Ingestion**

Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

**Delayed and immediate effects and chronic effects from short and long term exposure**

**Sensitization**

This product does not contain any components suspected to be sensitizing.

**Mutagenic effects**

This product does not contain any known or suspected mutagens.

**Carcinogenicity**

May cause cancer. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Respiratory system. Lungs.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

### 12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

### 12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

### 12.4 Mobility

Insoluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

### 13. Disposal Considerations

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

### 14. Transport information

**14.1. UN number**

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

**14.4 Packing group**

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Crystalline silica (impurity)	N/A	N/A	N/A

**California Proposition 65**

**WARNING**



This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Crystalline silica (impurity) 14808-60-7	Carcinogen

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**Brazil Regulation**

This SDS was prepared in accordance with Brazil law NBR 14725.

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<b>Federal Police</b>	Not determined
<b>Army</b>	Not determined
<b>ANVISA</b>	Not determined

### 16. Other Information

<b>Supersedes date</b>	30/Mar/2020
<b>Revision date</b>	12/Oct/2020
<b>Version</b>	8

**This SDS has been revised in the following section(s)** All sections. There have been changes with regard to classification.

**HMIS classification**

Health	1*
Flammability	0
Physical hazard	0
PPE	E

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

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SDS no. PID20269-GBL011  
Version 2  
Revision date 03/Jul/2019  
Supersedes date 10/Nov/2016



## Safety Data Sheet MICROBAR\* (GBL011)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** MICROBAR\*  
(GBL011)

**Product code** PID20269-GBL011

**Synonyms** Micronized barite

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Weighting agent.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**GHS - Classification**

**Health hazards**

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 2

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard Statements**

H350i - May cause cancer by inhalation

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

**Precautionary Statements**

P201 - Obtain special instructions before use

P202 - Do not handle until all safety precautions have been read and understood

P260 - Do not breathe dust/fume/gas/mist/vapors/spray

P281 - Use personal protective equipment as required

P308 + P313 - IF exposed or concerned: Get medical advice/attention

P314 - Get medical advice/attention if you feel unwell

P501 - Dispose of contents/container to industrial incineration plant

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Crystalline silica (impurity)	14808-60-7	1-5

**3.2 Mixtures**

Not applicable

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I. The exact percentage (concentration) of composition has been withheld as a trade secret.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.

### 5.3 Advice for firefighters

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

#### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water. Avoid generating or breathing dust. Material becomes slippery when wet. Use caution if wet.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Material becomes slippery when wet. Use caution if wet.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid wet and humid conditions. Store in original container.

**Packaging materials**                      Use specially constructed containers only.

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA respirable fraction	0.05 mg/m <sup>3</sup> TWA	Not determined	0.025 mg/m <sup>3</sup> TWA VLE-PPT (respirable fraction)

Crystalline silica (impurity)

OSHA - Final PELs - Table Z-3 Mineral Dusts

(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**IDLH (Immediately Dangerous to Life or Health)**

This product contains substance(s) classified as Immediately Dangerous to Life or Health (IDLH) by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Crystalline silica (impurity) 14808-60-7	50 mg/m <sup>3</sup> IDLH (respirable dust)

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Use protective gloves made of: Neoprene PVC Nitrile Frequent change is advisable
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder
<b>Color</b>	Tan - Gray
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	No information available	
<b>pH @ dilution</b>		
<b>Melting / freezing point</b>	1580 °C / 2876 °F	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	No information available	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	

<b>Flammability (solid, gas)</b>	Not applicable
<b>Flammability Limit in Air</b>	
<b>Upper flammability limit</b>	No information available
<b>Lower flammability limit</b>	No information available
<b>Vapor pressure</b>	No information available
<b>Vapor density</b>	No information available
<b>Specific gravity</b>	No information available
<b>Bulk density</b>	1920 - 2400 kg/m <sup>3</sup>
<b>Water solubility</b>	Insoluble in water
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	No information available
<b>Explosive properties</b>	Not applicable
<b>Oxidizing properties</b>	None known.

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid dust formation. Avoid wet and humid conditions.

**10.5 Incompatible materials**

No materials to be especially mentioned.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological Information

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other

diseases, including silicosis and lung cancer.

- Eye contact** Dust may cause mechanical irritation.
- Skin contact** Prolonged contact may cause redness and irritation.
- Ingestion** Ingestion may cause stomach discomfort.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

- Sensitization** Not classified.
- Mutagenic effects** This product does not contain any known or suspected mutagens.
- Carcinogenicity** Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
- Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.
- Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.
- Routes of Exposure** Inhalation.
- Routes of entry** Inhalation.
- Specific target organ toxicity - Single exposure** Not classified
- Specific target organ toxicity - Repeated exposure** Category 2.
- Target organ effects** Lungs. Respiratory system.
- Aspiration hazard** Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**  
This product is not considered toxic to algae.

**Toxicity to fish**  
This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

**12.2 Persistence and degradability**

Product is not biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

UN No. (DOT) Not regulated  
UN No. (MT/ANTT) Not regulated  
UN No. (TDG) Not regulated  
UN/ID No. (ADR/RID/ADN/ADG) Not regulated  
UN No. (IMDG/ANTAQ) Not regulated  
UN No. (ICAO/ANAC) Not regulated  
UN No. (DPC) Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class Not regulated  
ANTT Hazard class Not regulated  
TDG Hazard class Not regulated  
ADR/RID/ADN/ADG Hazard class Not regulated  
IMDG/ANTAQ Hazard class Not regulated

**ICAO/ANAC Hazard class/division** Not regulated  
**DPC Hazard class** Not regulated

**14.4 Packing group**  
**DOT Packing group** Not regulated  
**ANTT Packing group** Not regulated  
**TDG Packing group** Not regulated  
**ADR/RID/ADN/ADG Packing group** Not regulated  
**IMDG/ANTAQ Packing group** Not regulated  
**ICAO/ANAC Packing group** Not regulated  
**DPC Packing group** Not regulated

**14.5 Environmental hazard**  
No

**14.6 Special precautions**  
Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**  
Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Crystalline silica (impurity)	N/A	N/A	N/A

**California Proposition 65**

**WARNING**



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Crystalline silica (impurity) 14808-60-7	Carcinogen

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other Information**

**Supersedes date** 10/Nov/2016

**Revision date** 03/Jul/2019

**Version** 2

**This SDS has been revised in the following section(s)** 8, 15,

**HMIS classification**

Health	1*
Flammability	0
Physical hazard	0
PPE	X

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## Safety Data Sheet MONOETHYLENE GLYCOL (MEG)

### 1. Identification of the substance/mixture and of the company/undertaking

#### 1.1 Product identifier

**Product name** MONOETHYLENE GLYCOL (MEG)  
**Product code** PID1081  
**Synonyms** MONOETHYLENE GLYCOL 100%,  
MEG 100%  
**Molecular weight** 62.06 g/mol

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Commercial chemical

**Uses advised against** None known

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS Classification

##### Health hazards

Acute toxicity - Oral	Category 4
Specific target organ toxicity - Repeated exposure	Category 2

**Environmental hazards** Not classified



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Physical Hazards Not classified

## 2.2 Label elements



### Signal word

WARNING

### Hazard Statements

H302 - Harmful if swallowed

H373 - May cause damage to organs through prolonged or repeated exposure

### Precautionary statements

P260 - Do not breathe dust/fume/gas/mist/vapours/spray

P264 - Wash face, hands and any exposed skin thoroughly after handling

P270 - Do not eat, drink or smoke when using this product

P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

P330 - Rinse mouth

P314 - Get medical advice/attention if you feel unwell

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

### Contains

Ethylene Glycol

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

## 3. Composition/information on Ingredients

### 3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Ethylene Glycol	203-473-3	107-21-1	60-100

### 3.2 Mixtures

Not applicable

## 4. First Aid Measures



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### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically.

## 5. Firefighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Extinguishing media - small fires, Dry powder,  
, Extinguishing media - large fires, Water spray, fog or regular foam.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.



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**Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (COx).

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

## 7. Handling and Storage

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**



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<b>Technical measures/precautions</b>	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time. Avoid contact with: Oxidizing agents
<b>Storage class</b>	Chemical storage.
<b>Packaging materials</b>	Use specially constructed containers only

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

#### Component Information

Chemical Name	Arabic	Australia	Egypt
Ethylene Glycol	Not determined	40ppmSTELvapour 104mg/m <sup>3</sup> STELvapour 10mg/m <sup>3</sup> TWAparticulate 20ppmTWA vapour 52mg/m <sup>3</sup> TWAvapour	39.4 ppm Ceiling 100 mg/m <sup>3</sup> Ceiling
Chemical Name	India	Indonesian	Japan
Ethylene Glycol	Not determined	100 mg/m <sup>3</sup> STEL	Not determined
Chemical Name	Kazakhstan	Kuwait	New Zealand
Ethylene Glycol	5 mg/m <sup>3</sup> MAC	125 mg/m <sup>3</sup> TWA 50.0 ppm TWA 100 mg/m <sup>3</sup> STEL	50 ppm Ceiling mist and vapour 127 mg/m <sup>3</sup> Ceiling mist and vapour
Chemical Name	Malaysia	Philippines	Russia
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m <sup>3</sup> Ceiling aerosol	Not determined	10 mg/m <sup>3</sup> STEL 5 mg/m <sup>3</sup> TWA
Chemical Name	Thailand	Vietnam	Turkey
Ethylene Glycol	Not determined	10 mg/m <sup>3</sup> TWA 60 mg/m <sup>3</sup> TWA 20 mg/m <sup>3</sup> STEL 125 mg/m <sup>3</sup> STEL	40 ppm STEL 104 mg/m <sup>3</sup> STEL Skin 20 ppm TWA 52 mg/m <sup>3</sup> TWA

### 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering Controls

Ensure adequate ventilation

#### Personal protective equipment

##### Eye protection

Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

##### Hand protection

Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee



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	training Use protective gloves made of: Nitrile Neoprene Butyl rubber Break through time >480 minutes Glove thickness 0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory protection</b>	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
<b>Skin and body protection</b>	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use



### 8.2.3 Environmental exposure controls

<b>Environmental exposure</b>	Use appropriate containment to avoid environmental contamination See section 6 for more information
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## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Clear
<b>Odour</b>	Mild
<b>Colour</b>	Colourless
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	No information available	
<b>pH @ dilution</b>	6 - 7.5	@ 10%
<b>Melting / freezing point</b>	< -12 °C / 10.4 °F	
<b>Boiling point/range</b>	196 - 199 °C / 384.8 - 390.2 °F	
<b>Flash point</b>	111 °C / 231.8 °F	Closed cup
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	28 %	
<b>Lower flammability limit</b>	3.2 %	
<b>Vapour pressure</b>	0.007 kPa	@ 20 °C
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	No information available	



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<b>Bulk density</b>	No information available	
<b>Relative density</b>	No information available	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	410 °C / 770 °F	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	21 mPas	@ 20 °C
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	-1.36	

<b>Explosive properties</b>	Not applicable
<b>Oxidising properties</b>	None known

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	62.06 g/mol
<b>VOC content(%)</b>	None
<b>Density</b>	1.11 ± 0.03 g/ml @ 25°C

### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time.

### 10.5 Incompatible materials

Oxidizing agents.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects



## MONOETHYLENE GLYCOL (MEG)

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### Acute toxicity

<b>Inhalation</b>	Vapors may irritate throat and respiratory system. May cause additional affects as listed under "Ingestion".
<b>Eye contact</b>	Contact with eyes may cause irritation.
<b>Skin contact</b>	May be absorbed through the skin in harmful amounts. Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Harmful if swallowed. May cause damage to organs through prolonged or repeated exposure.
<b>Unknown acute toxicity</b>	Not applicable.

### Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene Glycol	= 7712 mg/kg (Rat) ECHA Data	> 3500 mg/kg (Mouse) ECHA Data	> 2.5 mg/l (Rat) 6 hour ECHA Data

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of Exposure</b>	Skin contact. Ingestion. Inhalation.
<b>Routes of entry</b>	Skin contact. Skin absorption. Ingestion.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Kidney.
<b>Aspiration hazard</b>	Not applicable.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

## 12. Ecological Information



## MONOETHYLENE GLYCOL (MEG)

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### 12.1 Toxicity

Listed on PLONOR list of OSPAR

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

#### **Toxicity to algae**

See component information below.

#### **Toxicity to fish**

See component information below.

#### **Toxicity to daphnia and other aquatic invertebrates**

See component information below.

#### **Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylene Glycol	40000 - 60000 mg/L LC50 (Pimephales promelas) = 96 h  40761 mg/L LC50 (Oncorhynchus mykiss) = 96 h  27540 mg/L LC50 (Lepomis macrochirus) = 96 h  14 - 18 mL/L LC50 (Oncorhynchus mykiss) = 96 h  16000 mg/L LC50 (Poecilia reticulata) = 96 h  41000 mg/L LC50 (Oncorhynchus mykiss) = 96 h	6500 - 13000 mg/L EC50 (Pseudokirchneriella subcapitata) = 96 h	46300 mg/L EC50 (Daphnia magna) = 48 h

### 12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Ethylene Glycol	Readily biodegradable

### 12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Ethylene Glycol	log Pow -1.36(Calculated) Not likely to bioaccumulate

#### **log Pow**

-1.36



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**12.4 Mobility**

**Mobility**

Soluble in water.

Chemical Name	Mobility
Ethylene Glycol	Completely soluble

**Mobility in soil**

No information available.

Chemical Name	Mobility in soil
Ethylene Glycol	Not expected to adsorb on soil

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues/unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods



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### 14.3. Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated

IMDG Hazard class Not regulated

ICAO Hazard class/division Not regulated

### 14.4 Packing group

ADR/RID/ADN/ADG Packing Group Not regulated

IMDG Packing group Not regulated

ICAO Packing group Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code.

Proper Shipping Name: Ethylene glycol. Ship Type:- 3. Pollution Category:- Y.

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:

The Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

#### **Australian Standard for the Uniform Scheduling of Drugs and Poisons**

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene Glycol

Schedule 6

Schedule 5

### International inventories

USA, Toxic Substances Control Act inventory (TSCA) Complies

Canada (DSL) Complies

Philippines (PICCS) Complies

Inventory - Japan - Existing and Complies

New Chemicals list

China (IECSC) Complies



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Australia (AICS) Complies  
Korea (KECL) Complies  
Inventory - New Zealand - Inventory of Chemicals (NZIoC) Complies

## 16. Other Information

**Prepared by** Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam

**Supersedes Date:** 17/Dec/2014

**Revision date** 19/Mar/2018

**Version** 10

**This SDS has been revised in the following section(s)** All sections No changes with regard to classification have been made.

### Key literature references and sources for data

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

### Training Advice

Follow general hygiene considerations recognised as common good workplace practices

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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# Safety Data Sheet

## Myacide® GA 25

Revision date : 2018/08/31

Version: 8.0

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(30174147/SDS\_CPA\_US/EN)

### 1. Identification

#### Product identifier used on the label

## Myacide® GA 25

#### Recommended use of the chemical and restriction on use

Recommended use\*: Approved only for uses listed on the FIFRA label.

\* The "Recommended use" identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

#### Details of the supplier of the safety data sheet

##### Company:

BASF CORPORATION  
100 Park Avenue  
Florham Park, NJ 07932, USA

Telephone: +1 973 245-6000

#### Emergency telephone number

CHEMTREC: 1-800-424-9300  
BASF HOTLINE: 1-800-832-HELP (4357)

#### Other means of identification

Substance number: 145849  
EPA Registration number: 33753-26  
Molecular formula: CHO(CH<sub>2</sub>)<sub>3</sub>CHO  
Chemical family: dialdehydes, aqueous solution  
Synonyms: GLUTARALDEHYDE

### 2. Hazards Identification

#### According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

#### Classification of the product

Acute Tox.	4 (oral)	Acute toxicity
Acute Tox.	4 (Inhalation - mist)	Acute toxicity
Skin Corr./Irrit.	1B	Skin corrosion/irritation
Eye Dam./Irrit.	1	Serious eye damage/eye irritation
Resp. Sens.	1	Respiratory sensitization

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Skin Sens.	1A	Skin sensitization
STOT SE	3 (irritating to respiratory system)	Specific target organ toxicity — single exposure
Aquatic Chronic	2	Hazardous to the aquatic environment - chronic
Aquatic Acute	1	Hazardous to the aquatic environment - acute

### Label elements

Pictogram:



Signal Word:

Danger

Hazard Statement:

H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317	May cause an allergic skin reaction.
H335	May cause respiratory irritation.
H314	Causes severe skin burns and eye damage.
H302 + H332	Harmful if swallowed or if inhaled
H411	Toxic to aquatic life with long lasting effects.
H400	Very toxic to aquatic life.

Precautionary Statements (Prevention):

P280	Wear protective gloves/protective clothing/eye protection/face protection.
P271	Use only outdoors or in a well-ventilated area.
P260	Do not breathe dust/mist/vapours.
P273	Avoid release to the environment.
P284	In case of inadequate ventilation wear respiratory protection.
P272	Contaminated work clothing should not be allowed out of the workplace.
P270	Do not eat, drink or smoke when using this product.
P264	Wash with plenty of water and soap thoroughly after handling.

Precautionary Statements (Response):

P310	Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304 + P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P301 + P330 + P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P362 + P364	Take off contaminated clothing and wash it before reuse.
P391	Collect spillage.

Precautionary Statements (Storage):

P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.

Precautionary Statements (Disposal):

P501	Dispose of contents/container in accordance with local regulations.
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### Hazards not otherwise classified

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No specific dangers known, if the regulations/notes for storage and handling are considered.

Labeling of special preparations (GHS):

Corrosive to the respiratory tract.

### 3. Composition / Information on Ingredients

**According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200**

<u>CAS Number</u>	<u>Weight %</u>	<u>Chemical name</u>
111-30-8	>= 20.0 - < 50.0%	glutaral
67-56-1	>= 0.0 - < 0.3%	Methanol

### 4. First-Aid Measures

#### Description of first aid measures

**General advice:**

Immediately remove contaminated clothing. If the patient is likely to become unconscious, place and transport in stable sideways position (recovery position). First aid personnel should pay attention to their own safety.

**If inhaled:**

Keep patient calm, remove to fresh air, seek medical attention.

**If on skin:**

Remove contaminated clothing. Rinse skin immediately with plenty of water for 15 - 20 minutes. Seek medical attention. Consult a skin specialist.

**If in eyes:**

Immediately wash affected eyes for at least 15 minutes under running water with eyelids held open, consult an eye specialist.

**If swallowed:**

Immediately rinse mouth and then drink plenty of water, do not induce vomiting, seek medical attention.

#### Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further symptoms and / or effects are not known so far  
Hazards: No applicable information available.

#### Indication of any immediate medical attention and special treatment needed

Note to physician

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote, administer corticosteroid dose aerosol to prevent pulmonary edema.

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### 5. Fire-Fighting Measures

#### Extinguishing media

Suitable extinguishing media:  
water spray, dry powder, foam

#### Special hazards arising from the substance or mixture

Hazards during fire-fighting:

harmful vapours

Evolution of fumes/fog. The substances/groups of substances mentioned can be released in case of fire.

#### Advice for fire-fighters

Protective equipment for fire-fighting:

Wear a self-contained breathing apparatus in confined areas or when exposed to combustion products.

#### Further information:

Contaminated extinguishing water must be disposed of in accordance with official regulations.

#### Impact Sensitivity:

Impact Weight:

10 kg

Height of Fall:

0.4 m

Method:

Explosive properties

Remarks:

Substance/product is not impact sensitive at room temperature.

### 6. Accidental release measures

#### Further accidental release measures:

Pack in tightly closed containers for disposal.

#### Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

#### Environmental precautions

Do not discharge into drains/surface waters/groundwater.

#### Methods and material for containment and cleaning up

For small amounts: Pick up with absorbent material (e.g. sand, sawdust, general-purpose binder).

Dispose of absorbed material in accordance with regulations.

For large amounts: Pump off product.

Spills should be contained, solidified, and placed in suitable containers for disposal.

### 7. Handling and Storage

#### Precautions for safe handling

No special measures necessary provided product is used correctly.

Protection against fire and explosion:

No special precautions necessary.

#### Conditions for safe storage, including any incompatibilities

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Segregate from foods and animal feeds.

Further information on storage conditions: Keep container tightly closed and in a cool place.  
Store protected against freezing.

### 8. Exposure Controls/Personal Protection

**Users of a pesticidal product should refer to the product label for personal protective equipment requirements.**

#### Components with occupational exposure limits

Methanol	OSHA PEL	PEL 200 ppm 260 mg/m <sup>3</sup> ; TWA value 200 ppm 260 mg/m <sup>3</sup> ; SKIN_FINAL ; The substance can be absorbed through the skin. STEL value 250 ppm 325 mg/m <sup>3</sup> ;
	ACGIH TLV	TWA value 200 ppm ; STEL value 250 ppm ; Skin Designation ; The substance can be absorbed through the skin.
glutaral	OSHA PEL	CLV 0.2 ppm 0.8 mg/m <sup>3</sup> ;
	ACGIH TLV	CLV 0.05 ppm ;

#### **Advice on system design:**

Provide local exhaust ventilation to control vapours/mists.

#### Personal protective equipment

#### **RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:**

##### **Respiratory protection:**

Wear respiratory protection if ventilation is inadequate. Respiratory protection in case of vapour/aerosol release. Wear a NIOSH-certified (or equivalent) organic vapour/particulate respirator.

##### **Hand protection:**

Wear chemical resistant protective gloves.

##### **Eye protection:**

Tightly fitting safety goggles (chemical goggles) and face shield.

##### **Body protection:**

Body protection must be chosen based on level of activity and exposure., Protective coverall and/or impermeable apron and boots as necessary.

##### **General safety and hygiene measures:**

Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is required additionally to the stated personal protection equipment. Keep away from food, drink and animal feeding stuffs. Avoid contact with skin and eyes. Remove contaminated clothing. Handle in accordance with good industrial hygiene and safety practice.

### 9. Physical and Chemical Properties

Form: liquid  
Odour: characteristic

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Odour threshold:	No applicable information available.
Colour:	yellow
pH value:	5.9 ( 0.5 %(m), 23 °C)
Freezing point:	approx. -5 °C ( 1 ATM)
Boiling point:	> 100 °C ( 1 ATM)
Sublimation point:	No applicable information available.
Flash point:	not applicable
Flammability:	No applicable information available.
Lower explosion limit:	No applicable information available.
Upper explosion limit:	No applicable information available.
Autoignition:	> 275 °C (DIN 51794)
Vapour pressure:	approx. 17.5 mmHg ( 20 °C) The product has not been tested. The statement has been derived from the properties of the individual components.
Density:	1.06 g/cm <sup>3</sup> ( 20 °C)
Relative density:	1.06 ( 20 °C)
Vapour density:	No applicable information available.
Partitioning coefficient n-octanol/water (log Pow):	No applicable information available.
Thermal decomposition:	No decomposition if correctly stored and handled.
Viscosity, dynamic:	No applicable information available.
Viscosity, kinematic:	No applicable information available.
Solubility in water:	soluble
Solubility (quantitative):	No applicable information available.
Solubility (qualitative):	No applicable information available.
Molar mass:	100 g/mol
Evaporation rate:	Value can be approximated from Henry's Law Constant or vapor pressure.
Other Information:	If necessary, information on other physical and chemical parameters is indicated in this section.

## 10. Stability and Reactivity

### Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:

No corrosive effect on metal.

Formation of flammable gases:	Remarks:	Forms no flammable gases in the presence of water.
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### Chemical stability

The product is stable if stored and handled as prescribed/indicated.

### Possibility of hazardous reactions

The product is chemically stable.

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### Conditions to avoid

No conditions to avoid anticipated.

### Incompatible materials

acids, bases, amines

### Hazardous decomposition products

Decomposition products:

Hazardous decomposition products:  
carbon monoxide, carbon dioxide

Thermal decomposition:

No decomposition if correctly stored and handled.

---

## 11. Toxicological information

### Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

### Acute Toxicity/Effects

#### Acute toxicity

Assessment of acute toxicity: Of moderate toxicity after single ingestion. Of moderate toxicity after short-term inhalation. Of low toxicity after short-term skin contact.

#### Oral

Type of value: ATE

Value: 301 mg/kg

Tested as a preparation.

#### *Information on: glutaral*

Type of value: LD50

Species: rat (female)

Value: approx. 77 mg/kg (similar to OECD guideline 401)

#### *Information on: Methanol*

Type of value: LD50

Species: rat

Value: > 1187 - 2769 mg/kg (BASF-Test)

-----

#### Inhalation

Type of value: ATE

Value: 1.09 mg/l

Determined for mist

#### Dermal

Type of value: ATE

Value: 3,790 mg/kg

#### Assessment other acute effects

Assessment of STOT single:

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Causes temporary irritation of the respiratory tract.

### Irritation / corrosion

Assessment of irritating effects: Corrosive! Damages skin and eyes.

### Skin

*Information on: glutaral*

*Species: rabbit*

*Result: Corrosive.*

*Method: similar to OECD guideline 404*

-----

### Eye

*Information on: glutaral*

*Species: rabbit*

*Result: Risk of serious damage to eyes.*

*Method: Draize test*

-----

### Sensitization

Assessment of sensitization: The substance may cause sensitization of the respiratory tract.

Sensitization after skin contact possible.

*Information on: glutaral*

*Open epicutaneous test (OET)*

*Species: guinea pig*

*Result: sensitizing*

*Species: human*

*Result: sensitizing*

-----

### Aspiration Hazard

No aspiration hazard expected.

## **Chronic Toxicity/Effects**

### Repeated dose toxicity

*Information on: glutaral*

*Assessment of repeated dose toxicity: After repeated exposure the prominent effect is local irritation. The substance may cause damage to the upper respiratory tract after repeated inhalation, as shown in animal studies.*

-----

### Genetic toxicity

*Information on: glutaral*

*Assessment of mutagenicity: The substance was mutagenic in various test systems with bacterias and cell cultures; however, these results could not be confirmed in tests with mammals.*

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### Carcinogenicity

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Assessment of carcinogenicity: None of the components in this product at concentrations greater than 0.1% are listed by IARC; NTP, OSHA or ACGIH as a carcinogen.

### Reproductive toxicity

*Information on: glutaral*

*Assessment of reproduction toxicity: The results of animal studies gave no indication of a fertility impairing effect.*

-----

### Teratogenicity

*Information on: glutaral*

*Assessment of teratogenicity: No indications of a developmental toxic / teratogenic effect were seen in animal studies.*

-----

### Other Information

The product has not been tested. The statement has been derived from the properties of the individual components.

## Symptoms of Exposure

The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further symptoms and / or effects are not known so far

### Medical conditions aggravated by overexposure

Contact may aggravate pulmonary disorders.

---

## 12. Ecological Information

### Toxicity

#### Aquatic toxicity

Assessment of aquatic toxicity:

Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.

The ecological data given are those of the active ingredient.

#### Toxicity to fish

LC50 (96 h) 0.8 mg/l, *Salmo gairdneri*, syn. *O. mykiss* (Fish test acute, static)

The details of the toxic effect relate to the nominal concentration.

LC50 (96 h) 6.2 mg/l, *Cyprinodon variegatus* (Fish test acute, static)

The details of the toxic effect relate to the nominal concentration.

#### Aquatic invertebrates

EC50 (48 h) 2.1 mg/l, *Daphnia magna* (Daphnia test acute, static)

The details of the toxic effect relate to the nominal concentration.

EC50 (96 h) 0.78 mg/l, *Crassostrea virginica* (OPP 72-3 (EPA-Guideline), Flow through.)

The statement of the toxic effect relates to the analytically determined concentration.

#### Aquatic plants

EC50 (72 h) 0.6 mg/l (growth rate), *Desmodemus subspicatus* (OECD Guideline 201, static)

The statement of the toxic effect relates to the analytically determined concentration.

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No observed effect concentration (72 h) 0.025 mg/l (growth rate), *Desmodesmus subspicatus* (OECD Guideline 201, static)

The statement of the toxic effect relates to the analytically determined concentration.

EC50 (72 h) 0.92 mg/l (growth rate), *Skeletonema costatum* (ISO/DIS 10253, static)

The details of the toxic effect relate to the nominal concentration.

### Chronic toxicity to fish

No observed effect concentration (97 d) 1.6 mg/l, *Oncorhynchus mykiss* (Flow through.)

The details of the toxic effect relate to the nominal concentration.

### Chronic toxicity to aquatic invertebrates

No observed effect concentration (21 d) 5.0 mg/l, *Daphnia magna* (OECD Guideline 211, semistatic)

### Assessment of terrestrial toxicity

Toxic effects have been observed in studies with terrestrial plants. Toxic effects have been observed in studies with soil living organisms.

### Soil living organisms

Toxicity to soil dwelling organisms:

LC50 (14 d) 170 mg/kg, *Eisenia foetida* (OECD Guideline 207, artificial soil)

The details of the toxic effect relate to the nominal concentration.

EC10 (28 d) 10.45 mg/kg, soil dwelling microorganisms (OECD 217, natural soil)

The details of the toxic effect relate to the nominal concentration.

### Toxicity to terrestrial plants

EC20 (19 d) 441 mg/kg, *Vicia sativa* (OECD Guideline 208)

### Other terrestrial non-mammals

LD50 (14 d) 206 mg/kg, *Anas platyrhynchos* (other)

## **Microorganisms/Effect on activated sludge**

### Toxicity to microorganisms

OECD Guideline 209 aerobic

activated sludge, domestic/EC20 (30 min): approx. 15 mg/l

The details of the toxic effect relate to the nominal concentration.

## **Persistence and degradability**

### Assessment biodegradation and elimination (H2O)

Readily biodegradable (according to OECD criteria).

### Elimination information

90 - 100 % DOC reduction (28 d) (OECD 301 A (new version)) (aerobic, activated sludge, domestic)

### Assessment biodegradation and elimination (H2O)

*Information on: glutaral*

*Readily biodegradable (according to OECD criteria).*

### Elimination information

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*Information on: glutaral*

*90 - 100 % DOC reduction (28 d) (OECD 301 A (new version)) (aerobic, activated sludge, domestic)*

### Assessment of stability in water

In contact with water the substance will hydrolyse slowly.

### Information on Stability in Water (Hydrolysis)

$t_{1/2} > 1$  a (50 °C), (Directive 92/69/EEC, C.7, pH 7)

In contact with water the substance will hydrolyse slowly.

### Assessment of stability in water

*Information on: glutaral*

*In contact with water the substance will hydrolyse slowly.*

## **Bioaccumulative potential**

### Assessment bioaccumulation potential

No significant accumulation in organisms is expected as a result of the distribution coefficient of n-octanol/water (log Pow).

### Bioaccumulation potential

Because of the n-octanol/water distribution coefficient (log Pow) accumulation in organisms is not to be expected.

### Assessment bioaccumulation potential

*Information on: glutaral*

*No significant accumulation in organisms is expected as a result of the distribution coefficient of n-octanol/water (log Pow).*

## **Mobility in soil**

### Assessment transport between environmental compartments

The substance will not evaporate into the atmosphere from the water surface.  
Adsorption to solid soil phase is possible.

*Information on: glutaral*

*The substance will not evaporate into the atmosphere from the water surface.  
Adsorption to solid soil phase is possible.*

## **Additional information**

Other ecotoxicological advice:

Data refer to a diluted aqueous solution of the substance.

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## **13. Disposal considerations**

**Waste disposal of substance:**

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Dispose of in accordance with national, state and local regulations. It is the waste generator's responsibility to determine if a particular waste is hazardous under RCRA.

### Container disposal:

Dispose of in a licensed facility. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

### RCRA:

This product meets the D002 (characteristic corrosivity) criteria.

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## 14. Transport Information

### Land transport

USDOT

Hazard class: 8  
Packing group: II  
ID number: UN 3265  
Hazard label: 8, EHSM  
Proper shipping name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (contains GLUTARALDEHYDE)

### Sea transport

IMDG

Hazard class: 8  
Packing group: II  
ID number: UN 3265  
Hazard label: 8, EHSM  
Marine pollutant: YES  
Proper shipping name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (contains GLUTARALDEHYDE)

### Air transport

IATA/ICAO

Hazard class: 8  
Packing group: II  
ID number: UN 3265  
Hazard label: 8  
Proper shipping name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (contains GLUTARALDEHYDE)

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## 15. Regulatory Information

### Federal Regulations

#### Registration status:

Biocide TSCA, US released / exempt

**EPCRA 311/312 (Hazard categories):** Refer to SDS section 2 for GHS hazard classes applicable for this product.

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### State regulations

<u>State RTK</u>	<u>CAS Number</u>	<u>Chemical name</u>
NJ	111-30-8	glutaral
PA	111-30-8	glutaral

### **Safe Drinking Water & Toxic Enforcement Act, CA Prop. 65:**

**WARNING:** This product can expose you to chemicals including METHANOL, which is known to the State of California to cause birth defects or other reproductive harm. For more information, go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

### **NFPA Hazard codes:**

Health: 3      Fire: 1      Reactivity: 0      Special:

### **HMIS III rating**

Health: 3      Flammability: 1      Physical hazard: 0

### **Labeling requirements under FIFRA**

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label.

DANGER:

CORROSIVE.

CAUSES IRREVERSIBLE EYE DAMAGE.

CAUSES SKIN IRRITATION.

HARMFUL IF INHALED.

HARMFUL IF SWALLOWED.

HARMFUL IF ABSORBED THROUGH SKIN.

MAY CAUSE ALLERGIC SKIN REACTION.

CAUSES ASTHMATIC SIGNS AND SYMPTOMS IN HYPER-REACTIVE INDIVIDUALS.

Do not get in eyes, on skin, or on clothing.

Avoid inhalation of vapour.

Not to be used as an aerosol.

Do not swallow.

Wear protective eyewear (goggles or face shield).

Wear chemical resistant protective gloves.

Wear protective clothing.

Wash with plenty of water and soap thoroughly after handling.

Remove contaminated clothing immediately and clean before re-use or dispose it if necessary.

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## 16. Other Information

### **SDS Prepared by:**

BASF NA Product Regulations

SDS Prepared on: 2018/08/31

We support worldwide Responsible Care® initiatives. We value the health and safety of our employees, customers, suppliers and neighbors, and the protection of the environment. Our commitment to Responsible Care is integral to conducting our business and operating our facilities in a safe and environmentally responsible fashion, supporting our customers and suppliers in ensuring the safe and environmentally sound handling of our products, and minimizing the impact of our

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operations on society and the environment during production, storage, transport, use and disposal of our products.

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HEREIN ARE PRESENTED IN GOOD FAITH AND BELIEVED TO BE ACCURATE , IT IS  
PROVIDED FOR YOUR GUIDANCE ONLY. BECAUSE MANY FACTORS MAY AFFECT  
PROCESSING OR APPLICATION/USE, WE RECOMMEND THAT YOU MAKE TESTS TO  
DETERMINE THE SUITABILITY OF A PRODUCT FOR YOUR PARTICULAR PURPOSE PRIOR  
TO USE. NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING  
WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE  
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END OF DATA SHEET

SDS no. PID10626  
Version 7  
Revision date 10/May/2017  
Supersedes date 11/Sep/2014



## Safety Data Sheet NOVAMOD\*

### 1. Identification

#### 1.1 Product identifier

**Product name** NOVAMOD\*  
**Product code** PID10626

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid additive.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** sdsmi@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000 0800-777-2323 (WGRA)

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

**Health hazards** Not classified  
**Environmental hazards** Not classified

**Physical Hazards**

Flammable Liquids	Category 4
-------------------	------------

**2.2 Label elements**

**Signal word**

WARNING

**Hazard statements**

H227 - Combustible liquid

**Precautionary statements**

P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish

P403 + P235 - Store in a well-ventilated place. Keep cool

P303 + P361 + P353 - IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/shower.

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Hazards not otherwise classified**

None known

**Unknown acute toxicity**

76% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
n-Dodecane	112-40-3	5 - 10
Alkenes, C>8	68411-00-7	5 - 10
Tetradecane	629-59-4	5 - 10
n-Undecane	1120-21-4	5 - 10
n-Tridecane	629-50-5	5 - 10

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

**4. First aid measures**

**4.1 First-Aid Measures**

**Inhalation**

Move to fresh air. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Get medical attention immediately if symptoms occur.

**Ingestion**

Do NOT induce vomiting. Call a physician or Poison Control Centre immediately. Rinse mouth. Never give anything by mouth to an unconscious person. Obtain medical attention.

**Skin contact**

Wash skin thoroughly with soap and water. Remove contaminated clothing and shoes. Get medical attention if irritation persists.

**Eye contact** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye.

#### **4.2 Most important symptoms and effects, both acute and delayed**

##### **Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-fighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

### **5.2 Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

Combustible liquid. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapors may form explosive mixtures with air. Porous combustible materials wetted with product may spontaneously ignite if exposed to air.

#### **Hazardous combustion products**

Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

## **6. Accidental release measures**

### **6.1 Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Evacuate personnel to safe areas. Use personal protective equipment. If spilled, take caution, as material can cause surfaces to become very slippery.

### **6.2 Environmental precautions**

Do not allow spilled material to enter sewers, storm drains or surface waters. Large spills released to the environment may disturb the natural chemical balance of soil/fresh water.

#### **Environmental exposure controls**

The product should not be allowed to enter drains, water courses or the soil. Avoid release to the environment.

### **6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike to collect large liquid spills.

**Methods for cleaning up**

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). Take precautionary measures against static discharges. Use non-sparking tools and equipment.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Keep away from heat, sparks and open flame. No smoking. Avoid breathing vapors or mists. Avoid contact with skin, eyes and clothing. Take precautionary measures against static discharges. Avoid static electricity build up with connection to earth. Prevent splashing and leaking of product.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Keep away from open flames, hot surfaces and sources of ignition. Keep container/package tightly closed and in a well-ventilated place. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

Chemical Name	ACGIH TLV	OSHA PEL
n-Dodecane	Not determined	Not determined
Alkenes, C>8	Not determined	Not determined
Tetradecane	Not determined	Not determined
n-Undecane	Not determined	Not determined
n-Tridecane	Not determined	Not determined

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Apply technical measures to comply with the occupational exposure limits. Keep airborne concentrations below exposure limits.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Wear chemical resistant gloves such as nitrile or neoprene. Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear appropriate personal protective clothing to prevent skin contact.
<b>Hygiene measures</b>	Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Transparent
<b>Color</b>	Amber
<b>Odor</b>	Hydrocarbon-like
<b>Odor threshold</b>	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution		
Melting / freezing point	< 0 °C / 32 °F	
Boiling point/range	> 150 °C / 302 °F	
Flash point	> 76 °C / 170 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	>1 @ Air = 1	
Specific gravity	0.80 - 0.90	
Bulk density	No information available	
Water solubility	Negligible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
<b>Explosive properties</b>	No information available	
<b>Oxidizing properties</b>	No information available	

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

### Comments

The data listed above are typical physical and chemical properties that do not constitute product specification. Please refer to Technical Data Sheet for specifications.

## 10. Stability and reactivity

### 10.1 Reactivity

Combustible liquid.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### Hazardous polymerization

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Avoid contact with heat, sparks, open flame, and static discharge. Do not freeze.

### 10.5 Incompatible materials

Strong oxidizing agents.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

##### Inhalation

May cause irritation of respiratory tract. Vapors inhaled in high concentration have a narcotic effect on the central nervous system. Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing.

##### Eye contact

May cause irritation.

##### Skin contact

Prolonged skin contact may defat the skin and produce dermatitis.

##### Ingestion

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

#### Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
n-Dodecane	No data available	No data available	> 142 ppm ( Rat ) 8 h > 5.6 mg/L ( Rat ) 4 h
Alkenes, C>8	No data available	No data available	No data available
Tetradecane	> 5000 mg/kg ( Rat )	> 5000 mg/kg ( Rat )	> 5.8 mg/L ( Rat ) 4 h > 5.6 mg/L ( Rat ) 4 h
n-Undecane	No data available	No data available	> 2.82 mg/L ( Rat ) 8 h > 442 ppm ( Rat ) 8 h > 5.6 mg/L ( Rat ) 4 h
n-Tridecane	> 5000 mg/kg ( Rat )	> 5000 mg/kg ( Rabbit )	> 41 ppm ( Rat ) 8 h > 5.6 mg/L ( Rat ) 4 h

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
n-Dodecane	No data available	No data available	No data available	No data available
Alkenes, C>8	No data available	No data available	No data available	No data available
Tetradecane	No data available	No data available	No data available	No data available
n-Undecane	No data available	No data available	No data available	No data available

n-Tridecane	No data available	No data available	No data available	No data available
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<b>Sensitization</b>	Not classified.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	No evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Inhalation. Skin contact. Eye contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not classified.

## 12. Ecological information

### 12.1 Toxicity

#### Toxicity to algae

See component information below.

#### Toxicity to fish

See component information below.

#### Toxicity to daphnia and other aquatic invertebrates

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
n-Dodecane	No information available	No information available	= 0.02856 mg/L EC50 Daphnia magna 48 h
Alkenes, C>8	No information available	No information available	No information available
Tetradecane	No information available	= 0.026 mg/L EC50 Chlorella vulgaris 24 h	= 0.02856 mg/L EC50 Daphnia magna 48 h
n-Undecane	No information available	No information available	= 0.02856 mg/L EC50 Daphnia magna 48 h
n-Tridecane	No information available	No information available	= 0.02856 mg/L EC50 Daphnia magna 48 h

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No product level data available.

### 12.4 Mobility in soil

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** If recycling is not practicable, dispose of in compliance with local regulations.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	NA1993
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG)</b>	Not regulated
<b>UN No. (ICAO)</b>	Not regulated

**14.2. UN proper shipping name**

Combustible liquid, n.o.s., (contains petroleum distillates),  
Not regulated for U.S. ground transport in non-bulk containers (<119 gallons).

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Combustible
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	PG III
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

## 15. Regulatory information

### International inventories

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL.
<b>European Union (EINECS and ELINCS)</b>	Complies
<b>Philippines (PICCS)</b>	Does not Comply
<b>Japan (ENCS)</b>	Does not Comply
<b>China (IECSC)</b>	Does not Comply
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Does not Comply
<b>New Zealand (NZIoC)</b>	Does not Comply

### IMPORTS, Canada

Possible import volume restrictions apply. For details contact the Corporate info in SECTION 1. This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL.

### U.S. Federal and State Regulations

#### SARA 311/312 Hazard Categories

Fire hazard. Immediate (acute) health hazard.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
n-Dodecane	N/A	N/A	N/A
Alkenes, C>8	N/A	N/A	N/A
Tetradecane	N/A	N/A	N/A
n-Undecane	N/A	N/A	N/A
n-Tridecane	N/A	N/A	N/A

### State Comments

Proposition 65: This product is not known to contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer and/or reproductive toxicity at levels that are expected to pose a significant risk under anticipated use conditions.

### Canadian Classification

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

## 16. Other information

<b>Supersedes date</b>	11/Sep/2014
<b>Revision date</b>	10/May/2017
<b>Version</b>	7
<b>This SDS has been revised in the following section(s)</b>	All sections. Globally Harmonized System (GHS)

### HMIS classification

Health	1
Flammability	2

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Physical hazard	0
PPE	J

N/A - Not Applicable, N/D - Not Determined.

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**Disclaimer**

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## Safety Data Sheet NUT PLUG\* (All Grades)

### 1. Identification

#### 1.1 Product identifier

**Product name** NUT PLUG\* (All Grades)  
**Product code** PID1146  
**Synonyms** NUT PLUG\* FINE, NUT PLUG\* MEDIUM, NUT PLUG\* COARSE

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Lost circulation material.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000 0800-777-2323 (WGRA)

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**GHS - Classification**

##### Health hazards

Carcinogenicity	Category 1A
-----------------	-------------

**Environmental hazards** Not classified

**Physical Hazards**

Combustible dust

**2.2 Label elements**



**Signal word**

DANGER

**Hazard statements**

H350 - May cause cancer  
H232 - May form combustible dust concentrations in air

**Precautionary statements**

P201 - Obtain special instructions before use  
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking  
P233 - Keep container tightly closed  
P240 - Ground/bond container and receiving equipment  
P280 - Wear protective gloves/protective clothing/eye protection/face protection  
P309 + P311 - IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician  
P370 + P378 - In case of fire: Use dry sodium carbonate to extinguish  
P403 + P235 - Store in a well-ventilated place. Keep cool

P202 - Do not handle until all safety precautions have been read and understood  
P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment  
P242 - Use only non-sparking tools  
P243 - Take precautionary measures against static discharge  
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray  
P272 - Contaminated work clothing should not be allowed out of the workplace  
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.  
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention  
P363 - Wash contaminated clothing before reuse  
P501 - Dispose of contents/ container to an approved waste disposal plant

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Cellulose	9004-34-6	60 - 100
Crystalline silica (impurity)	14808-60-7	<1

**3.2 Mixtures**

Not applicable

**Comments**

Percentages (concentrations) represented as a range are due to batch-to-batch variability.

**4. First aid measures**

**4.1 First aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2. Special hazards arising from the substance or mixture Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Suspended dust may present a dust explosion hazard.

**Hazardous combustion products**

Carbon oxides (COx).

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental release measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment identified in Section 8. Evacuate and ventilate the area. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Prevent further leakage or spillage if safe to do so.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil. As local regulations may vary; all waste must be disposed/recycled/reclaimed in accordance with federal, state, and local environmental control regulations.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Shovel into suitable container for disposal. Take precautionary measures against static discharges. Avoid dust formation. Powdered material may form explosive dust-air mixtures.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Use personal protective equipment as required. Avoid contact with skin, eyes and clothing. Avoid dust formation in confined areas. Fine dust dispersed in air may ignite. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Keep airborne concentrations below exposure limits. Use spark-proof tools and explosion-proof equipment. Ensure adequate ventilation.

**Storage precautions** Keep container/package tightly closed and in a well-ventilated place.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure limits** No biological limit allocated

Component	ACGIH TLV	OSHA PEL
Cellulose	10 mg/m <sup>3</sup>	15 mg/m <sup>3</sup> TWA

9004-34-6 ( 60 - 100 )		5 mg/m <sup>3</sup> TWA
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA
14808-60-7 ( <1 )		respirable fraction

Crystalline silica (impurity)  
OSHA - Final PELs - Table Z-3 Mineral Dusts  
(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

## 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Apply technical measures to comply with the occupational exposure limits. Keep airborne concentrations below exposure limits.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Transparent
<b>Color</b>	Tan - Brown
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH		
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	193 °C / 380 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	

<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.1 - 1.4 sg	@ 20 °C
<b>Bulk density</b>	577–641 kg/m <sup>3</sup> / 36–40 lb/ft <sup>3</sup>	
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	Not applicable
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard	
<b>Oxidizing properties</b>	None known.	
<b>9.2 Other information</b>		
<b>Pour point</b>	No information available	
<b>Molecular weight</b>	No information available	
<b>VOC content(%)</b>	None	
<b>Density</b>	No information available	

**Comments**

The data listed above are typical physical and chemical properties that do not constitute product specification. Please refer to Technical Data Sheet for specifications.

## 10. Stability and reactivity

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Keep away from open flames, hot surfaces and sources of ignition.

**10.5 Incompatible materials**

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological information

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system. Harmful: danger of serious damage to health by prolonged exposure through inhalation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other

diseases, including silicosis and lung cancer.

**Eye contact** Dust contact with the eyes can lead to mechanical irritation.

**Skin contact** Contact with dust can cause mechanical irritation or drying of the skin.

**Ingestion** Irritant; may cause pain or discomfort to mouth, throat and stomach.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cellulose	> 5 g/kg ( Rat )	> 2 g/kg ( Rabbit )	> 5800 mg/m <sup>3</sup> ( Rat ) 4 h
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Cellulose	No data available	No data available	No data available	Known Human Carcinogen
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

**Sensitization** Not classified.

**Mutagenic effects** This substance has no evidence of mutagenic properties.

**Carcinogenicity** Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

**Reproductive toxicity** No evidence of toxicity to reproduction.

**Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.

**Routes of exposure** Inhalation. Skin contact. Eye contact.

**Routes of entry** Inhalation.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Target organ effects** Respiratory system.

**Aspiration hazard** Not applicable.

## 12. Ecological information

### 12.1 Toxicity

#### Toxicity to algae

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Cellulose	No information available	No information available	No information available
Crystalline silica (impurity)	No information available	No information available	No information available

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility in soil**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

Not regulated  
**UN No. (DOT)** Not regulated  
**UN No. (TDG)** Not regulated  
**UN/ID No. (ADR/RID/ADN/ADG)** Not regulated  
**UN No. (IMDG)** Not regulated  
**UN No. (ICAO)** Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

**DOT Hazard class** Not regulated  
**TDG Hazard class** Not regulated

**ADR/RID/ADN/ADG Hazard class** Not regulated  
**IMDG Hazard class** Not regulated  
**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**DOT Packing group** Not regulated  
**TDG Packing group** Not regulated  
**ADR/RID/ADN/ADG Packing group** Not regulated  
**IMDG Packing group** Not regulated  
**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

**15. Regulatory information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
European Union (EINECS and ELINCS)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Delayed (chronic) health hazard. Fire Hazard (Combustible Dust)

**SARA 302/304, 313, CERCLA RQ, California Proposition 65**

Note: If no components are listed below, this product is not subject to the referenced SARA and CERCLA regulations and is not known to contain a Proposition 65 listed chemical at a level that is expected to pose a significant risk under anticipated use conditions.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Cellulose	N/A	N/A	N/A
Crystalline silica (impurity)	N/A	N/A	N/A

**State Comments**

Proposition 65: This product contains chemical(s) considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 to cause cancer and/or reproductive toxicity. See table under U.S. Federal and State Regulations for the specific chemicals.

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other information**

**Supersedes date** 15/Oct/2015

**Revision date** 18/May/2017

**Version** 10

**This SDS has been revised in the following section(s)** 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING 2. Hazards Identification 3. Composition/information on Ingredients 6. Accidental release measures 7. Handling and storage 8. EXPOSURE CONTROLS / PERSONAL PROTECTION 11. Toxicological information 16. Updated according to WHMIS 2015.

**HMIS classification**

Health	1*
Flammability	1
Physical hazard	0
PPE	E

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**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.



## Safety Data Sheet PECAN NUT PLUG\* (All Grades)

### 1. Identification

#### 1.1 Product identifier

**Product name** PECAN NUT PLUG\* (All Grades)  
**Product code** 143880  
**Synonyms** PECAN NUT PLUG\* FINE, PECAN NUT PLUG\* MEDIUM, PECAN NUT PLUG\* COARSE

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Lost circulation material.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 2

**Environmental hazards** Not classified

**Physical Hazards**

Combustible dust

**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

H350i - May cause cancer by inhalation

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

May form combustible dust concentrations in air

**Precautionary Statements**

P201 - Obtain special instructions before use

P202 - Do not handle until all safety precautions have been read and understood

P260 - Do not breathe dust, fume, gas, mist, vapors, spray

P280 - Wear protective gloves, protective clothing, eye protection

P308 + P313 - IF exposed or concerned: Get medical advice/attention

P240 - Ground/bond container and receiving equipment

P241 - Use explosion-proof electrical, ventilating, lighting, equipment

P243 - Take precautionary measures against static discharge

**Hazards not otherwise classified**

None known

**Unknown acute toxicity**

Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Cellulose	Proprietary	60-100
Crystalline silica (impurity)	14808-60-7	0.5-1.5

**3.2 Mixtures**

Not applicable

**Comments**

Proprietary component(s) in section 3 of this SDS does not/do not trigger application of trade secret exemption under Hazardous Materials Information Review Act (HMIRA). The proprietary component in this product contributes to combustible dust classification.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if symptoms occur.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

Combustible material. Dust may form explosive mixture in air.

#### **Hazardous combustion products**

Silicon oxide, Carbon oxides (CO<sub>x</sub>).

**5.3 Advice for firefighters**

**Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Protect from moisture. Avoid contact with: Oxidizing agents.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina -	Brazil - Occupational	Mexico -
---------------	-----------	----------	-------------	-----------------------	----------

			Occupational Exposure Limits - TWAs (CMPs)	Exposure Limits - TWAs (LTs)	Occupational Exposure Limits - TWAs (LMPE-PPTs)
Cellulose	10 mg/m <sup>3</sup>	15 mg/m <sup>3</sup> TWA 5 mg/m <sup>3</sup> TWA	10 mg/m <sup>3</sup> TWA	Not determined	10 mg/m <sup>3</sup> TWA VLE-PPT
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA respirable fraction	0.05 mg/m <sup>3</sup> TWA	Not determined	0.025 mg/m <sup>3</sup> TWA VLE-PPT (respirable fraction)

**Crystalline silica (impurity)**

OSHA - Final PELs - Table Z-3 Mineral Dusts  
(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Cellulose	Not determined
Crystalline silica (impurity) 14808-60-7	50 mg/m <sup>3</sup> IDLH (respirable dust)

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

- Eye protection** Tightly fitting safety goggles.
- Hand protection** Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
- Respiratory Protection** All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
- Hygiene Measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Keep away from open flames, hot surfaces and sources of ignition. Avoid dust formation. Take precautionary measures against static charges. Protect from moisture.

**10.5 Incompatible materials**

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Product information**

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

**Inhalation**

May cause cancer by inhalation. May cause damage to organs through prolonged or repeated exposure. Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact**

Dust may cause mechanical irritation.

**Skin contact**

Prolonged contact may cause redness and irritation.

**Ingestion**

Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cellulose	5005 mg/kg (rat)	2002 mg/kg (Rabbit)	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Cellulose	No data available	No data available	No data available	Known Human Carcinogen
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

**Delayed and immediate effects and**

**chronic effects from short and long term exposure**

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Skin contact. Inhalation. Eye contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Lungs.
<b>Aspiration hazard</b>	Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Cellulose	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant No

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

U.S. Federal and State Regulations

SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Cellulose	N/A	N/A	N/A
Crystalline silica (impurity)	N/A	N/A	N/A

California Proposition 65

**WARNING**



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Crystalline silica (impurity) 14808-60-7	Carcinogen

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other Information**

**Supersedes date** 19/May/2017

**Revision date** 17/Aug/2020

**Version** 4

**This SDS has been revised in the following section(s)** Product Code change All sections. No changes with regard to classification have been made.

**HMIS classification**

Health	3*
Flammability	1
Physical hazard	0
PPE	X

N/A - Not Applicable, N/D - Not Determined.

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SDS no. 141381  
Version 3  
Revision date 27/Nov/2018  
Supersedes date 18/Oct/2018



## Safety Data Sheet POLYPAC\* (All Grades)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** POLYPAC\* (All Grades)  
**Product code** 141381  
**Synonyms** POLYPAC\* ELV, R, UL & POLYPAC\* SUPREME R, UL

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Fluid loss reducer. Viscosifier.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### **Supplier**

**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

##### **M-I SWACO, A Schlumberger Company**

200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

##### **Schlumberger Serviços de Petróleo LTDA**

Rua Internacional 500Cavaleiro – Macaé, RJ. CEP: 27.930-075  
Telephone: +55 22 3311-7051

**E-mail address** SDS@slb.com

##### **Prepared by**

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**GHS - Classification**

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards**

Combustible dust

**2.2 Label elements**

**Signal word**

WARNING

**Hazard Statements**

H232 - May form combustible dust concentrations in air

**Precautionary Statements**

P240 - Ground/bond container and receiving equipment

P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment

P243 - Take precautionary measures against static discharge

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Polyanionic cellulose	Proprietary	60-100

**3.2 Mixtures**

Not applicable

**Comments**

Proprietary component(s) in section 3 of this SDS does not/do not trigger application of trade secret exemption under Hazardous Materials Information Review Act (HMIRA). The proprietary component in this product contributes to combustible dust classification.

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact** Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

**Eye Contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-Fighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**  
Use extinguishing agent suitable for type of surrounding fire.

**Extinguishing media which must not be used for safety reasons**  
None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
Suspended dust may present a dust explosion hazard.

**Hazardous combustion products**  
Carbon oxides (COx), Sodium oxides.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**  
As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**  
Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

**Environmental exposure controls**

Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Keep away from heat and sources of ignition.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture. Strong oxidizing agents.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits** Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m<sup>3</sup> (Inhalable); 3 mg/m<sup>3</sup> (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m<sup>3</sup> (Total); 5 mg/m<sup>3</sup> (Respirable).

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Polyanionic cellulose	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Polyanionic cellulose	Not determined

## 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene gloves Frequent change is advisable
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Granules Powder
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	6.5 - 8	@ 1% solution
<b>Melting / freezing point</b>	No information available	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	No information available	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		

<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.5 - 1.6	@ 25 °C
<b>Bulk density</b>	400 - 800 kg/m <sup>3</sup>	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	> 230°C / 446°F	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	Not determined	
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges. Avoid dust formation. Protect from moisture.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact** Dust may cause mechanical irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyanionic cellulose	= 27000 mg/kg ( Rat )	> 2 g/kg ( Rabbit )	> 5800 mg/m <sup>3</sup> ( Rat ) 4 h

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Polyanionic cellulose	No data available	No data available	No data available	No data available

**Sensitization** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.

**Routes of exposure** Inhalation.

**Routes of entry** No route of entry noted.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**  
This product is not considered toxic to algae.

**Toxicity to fish**  
This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates

Polyanionic cellulose	No information available	No information available	No information available
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**12.2 Persistence and degradability**

Product is biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

**14.4 Packing group**

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Polyanionic cellulose	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**Brazilian Regulations**

**Brazil Regulation** This SDS was prepared in accordance with Brazil law NBR 14725.

<b>Federal Police</b>	Not determined
<b>Army</b>	Not determined
<b>ANVISA</b>	Not Listed
<b>MTE (NR 15)</b>	No information available

**16. Other Information**

<b>Supersedes date</b>	18/Oct/2018
<b>Revision date</b>	27/Nov/2018
<b>Version</b>	3
<b>This SDS has been revised in the following section(s)</b>	1, 2, 6, 9, 10, 16

**HMIS classification**

Health	1
Flammability	1
Physical hazard	0
PPE	E

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## Safety Data Sheet POTASSIUM CHLORIDE

### 1. Identification

#### 1.1 Product identifier

**Product name** POTASSIUM CHLORIDE  
**Product code** PID10258  
**Synonyms** Potassium Chloride 88-99%

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Completion fluid additive. Drilling fluid additive.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

**Health hazards** Not classified  
**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**

**Signal word**  
None

**Hazard Statements**  
This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements**  
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Potassium Chloride	7447-40-7	60-100

**3.2 Mixtures**

Not applicable

**Comments**  
No Comments.

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact** Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

**Eye Contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

## Symptoms

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

<b>Notes to physician</b>	Treat symptomatically
---------------------------	-----------------------

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Chlorides.

### 5.3 Advice for firefighters

#### **Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with: Strong oxidizing agents. Strong acids. Strong alkalis. Protect from moisture.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits** Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m<sup>3</sup> (Inhalable); 3 mg/m<sup>3</sup> (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m<sup>3</sup> (Total); 5 mg/m<sup>3</sup> (Respirable).

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Potassium Chloride	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Potassium Chloride 7447-40-7	Not determined

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Use protective gloves made of: Neoprene Nitrile PVC Frequent change is advisable
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	~7	@ 1%
Melting point	768-773 °C / 1414-1423 °F	
Boiling point	1406-1413 °C / 2562-2575 °F	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	

**Partition Coefficient (n-octanol/water)** No information available

**Explosive properties** Not applicable  
**Oxidizing properties** None known.

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** None  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### Hazardous polymerization

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

### 10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Strong alkalis.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

#### Acute toxicity

**Inhalation** Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact** Dust may cause mechanical irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Potassium Chloride	2600 mg/kg (rat)	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Potassium Chloride	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Potassium Chloride	750 - 1020 mg/L LC50 Pimephales promelas 96 h = 1060 mg/L LC50 Lepomis macrochirus 96 h	= 2500 mg/L EC50 Desmodesmus subspicatus 72 h	= 83 mg/L EC50 Daphnia magna 48 h = 825 mg/L EC50 Daphnia magna 48 h

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
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**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

<b>Chemical Name</b>	<b>SARA 302 / TPQs</b>	<b>SARA 313</b>	<b>CERCLA RQ</b>
Potassium Chloride	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

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<b>Brazil Regulation</b>	This SDS was prepared in accordance with Brazil law NBR 14725.
<b>Federal Police</b>	Not determined
<b>Army</b>	Not determined
<b>ANVISA</b>	Not determined

### 16. Other Information

<b>Supersedes date</b>	01/Jul/2020
<b>Revision date</b>	12/Oct/2020
<b>Version</b>	3
<b>This SDS has been revised in the following section(s)</b>	1, 3, 5, 8, 14, 15, 16 No changes with regard to classification have been made.
<b>HMIS classification</b>	
Health	1
Flammability	0
Physical hazard	0
PPE	E

#### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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## Safety Data Sheet RHEBUILD\*

### 1. Identification

#### 1.1 Product identifier

**Product name** RHEBUILD\*  
**Product code** PID11780

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Viscosifier.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Serious eye damage/eye irritation	Category 1
Carcinogenicity	Category 2
Specific target organ toxicity - Repeated exposure	Category 2

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

H318 - Causes serious eye damage

H351 - Suspected of causing cancer

H373 - May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements**

P201 - Obtain special instructions before use

P202 - Do not handle until all safety precautions have been read and understood

P260 - Do not breathe dust, fume, gas, mist, vapors, spray

P280 - Wear protective gloves, protective clothing, eye protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or physician

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

P308 + P313 - IF exposed or concerned: Get medical advice/attention

**Hazards not otherwise classified**

None known

**Unknown acute toxicity**

50% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
2-[2-(2-butoxyethoxy)ethoxy]ethanol	143-22-6	30-60
4-methyl-1,3-dioxolan-2-one	108-32-7	1-5
2,2'-Iminodiethanol	111-42-2	< 3
2,2',2''-nitrilotriethanol	102-71-6	0.1-1

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get immediate medical attention.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Immediate medical attention is required.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### Symptoms

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### Extinguishing media which must not be used for safety reasons

Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture

#### Unusual fire and explosion hazards

Heating of containers may cause pressure rise, with risk of bursting.

#### Hazardous combustion products

Carbon monoxide, Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke), Ammonia, Nitrogen oxides (NOx), Fire or high temperatures create:, Hydrogen peroxide.

### **5.3 Advice for firefighters**

#### **Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Dike far ahead of liquid spill for later disposal. Prevent further leakage or spillage if safe to do so.

#### **Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

### **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Store at room temperature.

**Packaging materials** Use specially constructed containers only.

## **8. Exposure Controls/Personal Protection**

### **8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
2-[2-(2-butoxyethoxy)ethoxy]ethanol	Not determined	Not determined	Not determined	Not determined	Not determined
4-methyl-1,3-dioxolan-2-one	Not determined	Not determined	Not determined	Not determined	Not determined
2,2'-Iminodiethanol	1 mg/m <sup>3</sup>	Not determined	2 mg/m <sup>3</sup> TWA	Not determined	2 mg/m <sup>3</sup> TWA VLE-PPT
2,2',2"-nitrilotriethanol	5 mg/m <sup>3</sup>	Not determined	5 mg/m <sup>3</sup> TWA	Not determined	5 mg/m <sup>3</sup> TWA VLE-PPT

### IDLH (Immediately Dangerous to Life or Health)

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
2-[2-(2-butoxyethoxy)ethoxy]ethanol 143-22-6	-
4-methyl-1,3-dioxolan-2-one 108-32-7	-
2,2'-Iminodiethanol 111-42-2	-
2,2',2"-nitrilotriethanol 102-71-6	-

### 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering Controls

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

#### Personal protective equipment

##### Eye protection

Tightly fitting safety goggles.

##### Hand protection

Impervious gloves made of: Nitrile Neoprene

Break through time >480 minutes

Glove thickness >=0.5 mm

Be aware that liquid may penetrate the gloves. Frequent change is advisable.

##### Respiratory Protection

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved

<b>Skin and body protection</b>	respirator with an organic vapor cartridge. Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Color</b>	Amber
<b>Odor</b>	Slight
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	No information available	
Melting point	No information available	
Boiling point	> 232 °C / > 450 °F	
Flash point	> 93 °C / > 200 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.85 - 1.05	
Bulk density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	< 2500 mPa s	@ 25 °C
Partition Coefficient (n-octanol/water)	No information available	
Explosive properties	Not applicable	
Oxidizing properties	None known.	

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

MAY FORM EXPLOSIVE PEROXIDES.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Store at room temperature.

**10.5 Incompatible materials**

No materials to be especially mentioned.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact**

Causes serious eye damage.

**Skin contact**

Prolonged contact may cause redness and irritation. May be absorbed through the skin in harmful amounts.

**Ingestion**

May cause damage to organs through prolonged or repeated exposure.

**LD50 Oral**

> 2000 mg/kg (rat) Calculated (MIXTURE)

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-[2-(2-butoxyethoxy)ethoxy]ethanol	5300 mg/kg (rat)	2002 mg/kg (Rabbit)	No data available
4-methyl-1,3-dioxolan-2-one	29000 mg/kg (rat)	3003 mg/kg (Rabbit)	No data available
2,2'-Iminodiethanol	676.42 mg/kg (rat)	No data available	No data available
2,2',2"-nitrioltriethanol	4190 mg/kg (rat)	20020 mg/kg (Rabbit)	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
2-[2-(2-butoxyethoxy)ethoxy]ethanol	No data available	No data available	No data available	No data available
4-methyl-1,3-dioxolan-2-one	No data available	No data available	No data available	No data available
2,2'-Iminodiethanol	Group 2B; Monograph 101 [2013] 2B Group 2B; Monograph 77 [2000]	A3 Confirmed Aminimal Carcinogen with unknown Relevance to Humans	Present	No data available
2,2',2"-nitrioltriethanol	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	Contains a known or suspected carcinogen.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Inhalation. Eye contact. Skin contact. Ingestion.
<b>Routes of entry</b>	Inhalation. Skin absorption.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Liver. Blood. Kidneys.
<b>Aspiration hazard</b>	Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-[2-(2-butoxyethoxy)ethoxy]ethanol	2200 - 4600 mg/L LC50 Leuciscus idus 96h = 2400 mg/L LC50 Pimephales promelas 96h	> 500 mg/L EC50 Desmodesmus subspicatus 72h	> 500 mg/L EC50 Daphnia magna 48h
4-methyl-1,3-dioxolan-2-one	= 5300 mg/L LC50 Leuciscus idus 96 h > 1000 mg/L LC50 Cyprinus carpio 96 h	> 500 mg/L EC50 Desmodesmus subspicatus 72 h	> 500 mg/L EC50 Daphnia magna 48 h
2,2'-Iminodiethanol	600 - 1000 mg/L LC50 Lepomis macrochirus 96 h 1200 - 1580 mg/L LC50 Pimephales promelas 96 h 4460 - 4980 mg/L LC50 Pimephales promelas 96 h	2.1 - 2.3 mg/L EC50 Pseudokirchneriella subcapitata 96 h = 7.8 mg/L EC50 Desmodesmus subspicatus 72 h	= 55 mg/L EC50 Daphnia magna 48 h
2,2',2"-nitrilotriethanol	450 - 1000 mg/L LC50 Lepomis	= 216 mg/L EC50 Desmodesmus	= 1386 mg/L EC50 Daphnia magna

	macrochirus 96 h > 1000 mg/L LC50 Pimephales promelas 96 h 10600 - 13000 mg/L LC50 Pimephales promelas 96 h	subspicatus 72 h = 169 mg/L EC50 Desmodesmus subspicatus 96 h	24 h
--	--	--	------

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility**

Dispersible in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

**UN No. (DOT)** NA3082  
**UN No. (MT/ANTT)** Not regulated  
**UN No. (TDG)** Not regulated  
**UN/ID No. (ADR/RID/ADN/ADG)** Not regulated  
**UN No. (IMDG/ANTAQ)** Not regulated  
**UN No. (ICAO/ANAC)** Not regulated  
**UN No. (DPC)** Not regulated

**14.2. UN proper shipping name**

Other regulated substances, liquid, n.o.s. contains 2,2'-Iminodiethanol  
Not regulated for transportation by DOT if shipped in containers < RQ amount.

**DOT reportable quantity** Product (RQ): 380 gallons (2,2'-Iminodiethanol)  
(add RQ if shipped in containers >RQ for DOT only)

**14.3 Hazard class(es)**

**DOT Hazard class** 9

**ANTT Hazard class** Not regulated  
**TDG Hazard class** Not regulated  
**ADR/RID/ADN/ADG Hazard class** Not regulated  
**IMDG/ANTAQ Hazard class** Not regulated  
**ICAO/ANAC Hazard class/division** Not regulated  
**DPC Hazard class** Not regulated

**14.4 Packing group**  
**DOT Packing group** PG III  
**ANTT Packing group** Not regulated  
**TDG Packing group** Not regulated  
**ADR/RID/ADN/ADG Packing group** Not regulated  
**IMDG/ANTAQ Packing group** Not regulated  
**ICAO/ANAC Packing group** Not regulated  
**DPC Packing group** Not regulated

**14.5 Environmental hazard**  
 Marine pollutant No

**14.6 Special precautions**  
 Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Does not comply
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Does not comply
<b>Australia (AICS)</b>	Does not comply
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Does not comply

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
2-[2-(2-butoxyethoxy)ethoxy]ethanol	N/A	N/A	N/A

4-methyl-1,3-dioxolan-2-one	N/A	N/A	N/A
2,2'-Iminodiethanol	N/A	1.0 %	100 lb final RQ 45.4 kg final RQ
2,2',2''-nitrioltriethanol	N/A	N/A	N/A

**California Proposition 65**

**WARNING**



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
2,2'-Iminodiethanol 111-42-2	carcinogen

**16. Other Information**

**Supersedes date** 03/May/2017

**Revision date** 14/Aug/2020

**Version** 10

**This SDS has been revised in the following section(s)** All sections. No changes with regard to classification have been made.

**HMIS classification**

Health	3*
Flammability	1
Physical hazard	0
PPE	X

N/A - Not Applicable, N/D - Not Determined.

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SDS no. 142794  
Version 1  
Revision date 15/Jun/2018  
Supersedes date None



## Safety Data Sheet RheCon

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name RheCon  
Product code 142794

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Wetting agent.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

E-mail address sdsmi@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Acute toxicity - Oral	Category 5
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Skin corrosion/irritation	Category 3
Serious eye damage/eye irritation	Category 1

**Environmental hazards**

**Physical Hazards**

**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

H303 - May be harmful if swallowed  
H316 - Causes mild skin irritation  
H318 - Causes serious eye damage

**Precautionary Statements**

P280 - Wear eye protection/ face protection  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P310 - Immediately call a POISON CENTER or doctor/physician

P310 - Immediately call a POISON CENTER or doctor/physician  
P332 + P313 - If skin irritation occurs: Get medical advice/attention  
P312 - Call a POISON CENTER or doctor/physician if you feel unwell

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Polyethylene glycol oleyl ether	9004-98-2	60 - 100

**3.2 Mixtures**

Not applicable

Chemical Name	CAS No	Weight-%
Polyethylene glycol oleyl ether	9004-98-2	60 - 100

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret

**4. First Aid Measures**

#### **4.1 First aid measures**

<b>Inhalation</b>	Move to fresh air. If breathing has stopped, begin artificial respiration. If breathing is difficult, (trained personnel should) give oxygen. Obtain medical attention.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.
<b>Eye Contact</b>	Immediately flush eyes with water for at least 15 minutes. Get medical attention. If easy to do, remove contact lenses. Continue to rinse for at least 15 minutes. Immediate medical attention is required.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

#### **5.1 Extinguishing media**

##### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

##### **Extinguishing media which must not be used for safety reasons**

None known, Do not use a solid water stream as it may scatter and spread fire.

#### **5.2. Special hazards arising from the substance or mixture**

##### **Unusual fire and explosion hazards**

Heating of containers may cause pressure rise, with risk of bursting.

##### **Hazardous combustion products**

Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke), Nitrogen oxides (NO<sub>x</sub>).

#### **5.3 Advice for firefighters**

##### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

##### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Do not get in eyes, on skin, or on clothing. Use personal protective equipment. See also section 8. Solutions extremely slippery when spilled.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### **Handling**

Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Keep away from open flames, hot surfaces and sources of ignition.

#### **Hygiene measures**

Handle in accordance with good industrial hygiene and safety practice. Wash hands and face before breaks and immediately after handling the product. Do not eat, drink or smoke during work.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place Avoid frost. Avoid contact with: Acids Oxidizing agents

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

#### **Exposure limits**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Polyethylene glycol oleyl ether	Not determined	Not determined	Not determined	Not determined	Not determined
Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits -	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits -

			TWAs (CMPs)		TWAs (LMPE-PPTs)
Polyethylene glycol oleyl ether	Not determined				

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Polyethylene glycol oleyl ether 9004-98-2	Not determined

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Polyethylene glycol oleyl ether 9004-98-2	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

**Personal protective equipment**

- Eye protection** Tightly fitting safety goggles.
- Hand protection** Use protective gloves made of: Nitrile Neoprene Be aware that liquid may penetrate the gloves. Frequent change is advisable.
- Respiratory Protection** All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
- Hygiene Measures** Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

- Physical state** Liquid
- Appearance** Cloudy
- Color** Off-white
- Odor** Characteristic

**Odor threshold** Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH		
pH @ dilution	5.0 - 7.0	3% aqueous solution
Melting / freezing point		
Boiling point/range	No information available	
Flash point	> 100 °C / > 212 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.92 (approximately)	@ 60 °C
Bulk density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

**9.2 Other information**

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

**10.1 Reactivity**

No data available.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid frost. Avoid heat, flames and other sources of ignition.

**10.5 Incompatible materials**

Acids. Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

<b>Acute toxicity</b>	
<b>Inhalation</b>	Inhalation of vapors in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	May cause irritation. Prolonged skin contact may defat the skin and produce dermatitis.
<b>Ingestion</b>	MAY BE HARMFUL IF SWALLOWED. Ingestion causes irritation of upper respiratory system and gastrointestinal disturbance.

#### Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyethylene glycol oleyl ether	= 2700 mg/kg ( Rat )	No data available	No data available

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyethylene glycol oleyl ether	= 2700 mg/kg ( Rat )	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Polyethylene glycol oleyl ether	No data available	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Polyethylene glycol oleyl ether	No data available	No data available	No data available	No data available

<b>Sensitization</b>	Not classified.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Ingestion. Eye contact.
<b>Routes of entry</b>	Inhalation. Skin absorption.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not classified.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**  
See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polyethylene glycol oleyl ether	No information available	No information available	No information available

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polyethylene glycol oleyl ether	No information available	No information available	No information available

**12.2 Persistence and degradability**

Not readily biodegradable. Inherently biodegradable.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)

This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging** Do not re-use empty containers. Empty containers should be taken for local recycling, recovery or waste disposal. Do not burn, or use a cutting torch on, the empty drum.

**14. Transport information**

**14.1. UN number**

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

**14.4 Packing group**

DOT/ANTT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Polyethylene glycol oleyl ether	N/A	N/A	N/A

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Polyethylene glycol oleyl ether	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**16. Other Information**

**Revision date** 15/Jun/2018

**Version** 1

**HMIS classification**

Health	3
Flammability	1
Physical hazard	0
PPE	X

N/A - Not Applicable, N/D - Not Determined.

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## Safety Data Sheet RHEDUCE\*

### 1. Identification

#### 1.1 Product identifier

Product name RHEDUCE\*  
Product code PID11779

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Dispersant. Thinner.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

E-mail address SDS@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
WARNING

**Hazard Statements**

H315 - Causes skin irritation  
H319 - Causes serious eye irritation

**Precautionary Statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling  
P280 - Wear protective gloves, protective clothing, eye protection  
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P337 + P313 - If eye irritation persists: Get medical advice/attention  
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Supplementary precautionary statements**

P332 + P313 - If skin irritation occurs: Get medical attention  
P362 + P364 - Take off contaminated clothing and wash it before reuse

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Alkanes, C10-14	93924-07-3	30-60
Oxyalkylated imidazoline	Proprietary	30-60
Polyhydroxystearic acid	Proprietary	10-30
Alkenes, C>8	68411-00-7	1-5

**Comments**

The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention if irritation occurs.

### 4.2. Most important symptoms and effects, both acute and delayed

<b>General advice</b>	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
-----------------------	--

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

<b>Notes to physician</b>	Treat symptomatically
---------------------------	-----------------------

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Carbon oxides (CO<sub>x</sub>).

### 5.3 Advice for firefighters

**Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Avoid contact with: Strong oxidizing agents.

**Packaging materials**                      Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits**                              Contains no substances with occupational exposure limit values

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational	Brazil - Occupational Exposure Limits -	Mexico - Occupational

			Exposure Limits - TWAs (CMPs)	TWAs (LTs)	Exposure Limits - TWAs (LMPE-PPTs)
Alkanes, C10-14	Not determined	Not determined	Not determined	Not determined	Not determined
Oxyalkylated imidazoline	Not determined	Not determined	Not determined	Not determined	Not determined
Polyhydroxystearic acid	Not determined	Not determined	Not determined	Not determined	Not determined
Alkenes, C>8	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Alkanes, C10-14 93924-07-3	-
Oxyalkylated imidazoline	-
Polyhydroxystearic acid	-
Alkenes, C>8 68411-00-7	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

**Eye protection**

Tightly fitting safety goggles.

**Hand protection**

Wear chemical resistant gloves such as nitrile or neoprene. Be aware that liquid may penetrate the gloves. Frequent change is advisable.

**Respiratory Protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Viscous
<b>Color</b>	Amber
<b>Odor</b>	Amine
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	10.6 - 12.6	Conc. sol.
pH @ dilution	No information available	
Melting point	No information available	
Boiling point	No information available	
Flash point	> 93 °C / > 200 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.83 - 0.87	
Bulk density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	> 50 cSt	@ 40 °C
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

### 9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

#### Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Keep away from open flames, hot surfaces and sources of ignition.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact** Causes serious eye irritation.

**Skin contact** Causes skin irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Alkanes, C10-14	3993.99 mg/kg (rat)	3980 mg/kg (Rabbit)	No data available
Oxyalkylated imidazoline	No data available	No data available	No data available
Polyhydroxystearic acid	No data available	No data available	No data available
Alkenes, C>8	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Alkanes, C10-14	No data available	No data available	No data available	No data available
Oxyalkylated imidazoline	No data available	No data available	No data available	No data available
Polyhydroxystearic acid	No data available	No data available	No data available	No data available
Alkenes, C>8	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

**Sensitization** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Skin contact. Eye contact.
<b>Routes of entry</b>	None known.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Alkanes, C10-14	No information available	No information available	= 0.02856 mg/L EC50 Daphnia magna 48 h
Oxyalkylated imidazoline	No information available	No information available	No information available
Polyhydroxystearic acid	No information available	No information available	No information available
Alkenes, C>8	No information available	No information available	No information available

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No product level data available.

### 12.4 Mobility

Insoluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Does not comply
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Does not comply
<b>Australia (AICS)</b>	Does not comply
<b>Korean (KECL)</b>	Does not comply
<b>New Zealand (NZIoC)</b>	Does not comply

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Alkanes, C10-14	N/A	N/A	N/A
Oxyalkylated imidazoline	N/A	N/A	N/A
Polyhydroxystearic acid	N/A	N/A	N/A
Alkenes, C>8	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**16. Other Information**

<b>Supersedes date</b>	22/Jun/2015
<b>Revision date</b>	09/Jul/2020
<b>Version</b>	8
<b>This SDS has been revised in the following section(s)</b>	All sections. Product Code change There have been changes with regard to classification.
<b>HMIS classification</b>	
Health	1
Flammability	1

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Physical hazard	0
PPE	B

N/A - Not Applicable, N/D - Not Determined.

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SDS no. PID11726  
Version 11  
Revision date 04/Feb/2019  
Supersedes date 06/Mar/2018



## Safety Data Sheet RHEFLAT\*

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name RHEFLAT\*  
Product code PID11726

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

Schlumberger Canada, Ltd.  
200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-613-992-4624

E-mail address SDS@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

Health hazards Not classified  
Environmental hazards Not classified

**Physical Hazards**

Flammable Liquids	Category 4
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**2.2 Label elements**

**Signal word**

WARNING

**Hazard Statements**

H227 - Combustible liquid

**Precautionary Statements**

P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking

P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish

P403 + P235 - Store in a well-ventilated place. Keep cool

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

P240 - Ground/bond container and receiving equipment

P242 - Use only non-sparking tools

P243 - Take precautionary measures against static discharge

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Fatty acids, C18 unsatd., trimers	68937-90-6	60 - 80
Alkanes, C11 - C14	90622-58-5	30 - 60

**Comments**

The product contains other ingredients which do not contribute to the overall classification. The exact percentage (concentration) of composition has been withheld as a trade secret

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation**

Move to fresh air. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Get medical attention immediately if symptoms occur.

**Ingestion**

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting. Rinse mouth. Call a physician or poison control center immediately. Get medical attention. Never give anything by mouth to an unconscious person.

**Skin contact** Wash skin thoroughly with soap and water. Remove contaminated clothing and shoes. Get medical attention if irritation persists.

**Eye Contact** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye.

**4.2. Most important symptoms and effects, both acute and delayed**

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-Fighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Combustible liquid. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Heating of containers may cause pressure rise, with risk of bursting.

**Hazardous combustion products**

Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke).

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Evacuate personnel to safe areas. Use personal protective equipment. If spilled, take caution, as material can cause surfaces to become very slippery.

**6.2 Environmental precautions**

Do not allow spilled material to enter sewers, storm drains or surface waters.

**Environmental exposure controls**

The product should not be allowed to enter drains, water courses or the soil. Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of spill to collect runoff water.

#### **Methods for cleaning up**

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). Use clean non-sparking tools to collect absorbed material. Take precautionary measures against static discharges.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Keep away from heat, sparks and open flame. No smoking. Avoid breathing vapors or mists. Avoid contact with skin, eyes and clothing. Wear personal protective equipment. If spilled, take caution, as material can cause surfaces to become very slippery. Take precautionary measures against static discharges. Prevent splashing and leaking of product.

### **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Keep away from open flames, hot surfaces and sources of ignition. Keep container/package tightly closed and in a well-ventilated place. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

## **8. Exposure Controls/Personal Protection**

### **8.1 Control parameters**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Fatty acids, C18 unsatd., trimers	Not determined	Not determined	Not determined	Not determined	Not determined
Alkanes, C11 - C14	Not determined	Not determined	Not determined	Not determined	Not determined

#### **IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Fatty acids, C18 unsatd., trimers 68937-90-6	-
Alkanes, C11 - C14 90622-58-5	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Keep airborne concentrations below exposure limits. Local exhaust ventilation. Ensure adequate ventilation. Apply technical measures to comply with the occupational exposure limits.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Wear chemical resistant gloves such as nitrile or neoprene.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear appropriate personal protective clothing to prevent skin contact, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	Opaque
<b>Color</b>	Black
<b>Odor</b>	Hydrocarbon-like
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution		
Melting / freezing point	< 0 °C / 32 °F	
Boiling point/range	> 150 °C / 302 °F	
Flash point	76 °C / 170 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	>1 @ Air = 1	
Specific gravity	0.80 - 1.0	
Bulk density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	

<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	> 20.5 mm <sup>2</sup> /s	@ 40 °C
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	

<b>Explosive properties</b>	No information available
<b>Oxidizing properties</b>	No information available

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

**10.1 Reactivity**

No data available.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Not known.

**10.4 Conditions to avoid**

Keep away from sources of ignition - No smoking.

**10.5 Incompatible materials**

Strong oxidizing agents. Acids. Bases.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological Information

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

May cause irritation of respiratory tract. Vapors inhaled in high concentration have a narcotic effect on the central nervous system. Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing.

**Eye contact**

May cause irritation.

**Skin contact**

May cause skin irritation and/or dermatitis. Prolonged skin contact may defat the skin and produce dermatitis.

**Ingestion**

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fatty acids, C18 unsatd., trimers	No data available	No data available	No data available
Alkanes, C11 - C14	> 5000 mg/kg	>3160 mg/kg	> 290 ppm

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Fatty acids, C18 unsatd., trimers	No data available	No data available	No data available	No data available
Alkanes, C11 - C14	No data available	No data available	No data available	No data available

<b>Sensitization</b>	Not classified.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	No evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Inhalation. Skin contact. Eye contact. Ingestion.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Neurological effects</b>	Central Nervous System Depression: signs/symptoms can include headache, dizziness, drowsiness, muscular weakness, incoordination, slowed reaction time, fatigue blurred vision, slurred speech, giddiness, tremors and convulsions.
<b>Target organ effects</b>	Central nervous system.
<b>Aspiration hazard</b>	Not classified.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Fatty acids, C18 unsatd., trimers	No information available	No information available	No information available
Alkanes, C11 - C14	= 2890 mg/L LC50 Pimephales promelas 96 h	No information available	< 100 mg/L EC50 Daphnia magna 48 h

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility**

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Do not burn, or use a cutting torch on, the empty drum. Empty containers may contain flammable or explosive vapors. Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	NA1993
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

Combustible liquid, n.o.s., (Contains alkanes)  
Not regulated for U.S. ground transport in non-bulk containers (<119 gallons).

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Combustible
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	PG III
--------------------------	--------

<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Volume restriction. This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL.
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance.

**IMPORTS, Canada**

Possible import volume restrictions apply. For details contact the Corporate info in SECTION 1. This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

<b>Chemical Name</b>	<b>SARA 302 / TPQs</b>	<b>SARA 313</b>	<b>CERCLA RQ</b>
Fatty acids, C18 unsatd., trimers	N/A	N/A	N/A
Alkanes, C11 - C14	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**Brazilian Regulations**

**Brazil Regulation**

This SDS was prepared in accordance with Brazil law NBR 14725.

**Federal Police**

Not determined

**Army**

Not determined

**ANVISA**

Not determined

**MTE (NR 15)**

No information available

**16. Other Information**

**Supersedes date** 06/Mar/2018

**Revision date** 04/Feb/2019

**Version** 11

**This SDS has been revised in the following section(s)** 3, 16

**HMIS classification**

Health	1
Flammability	2
Physical hazard	0
PPE	X

N/A - Not Applicable, N/D - Not Determined.

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Safety data sheet number PID20198A

Version 1

Revision date 28/Jun/2019

Supercedes Date: None



## Safety Data Sheet

### RHEGUARD\*

(Escaid 110)

## 1. Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifier

Product name	RHEGUARD* (Escaid 110)
Product code	PID20198A
Country Limitations	This SDS is not for use in EU/EEA.

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Oil Based System.
-----------------	-------------------

Uses advised against	Consumer use
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### 1.3 Details of the supplier of the safety data sheet

#### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

## 2. Hazards Identification

### 2.1 Classification of the substance or mixture

#### GHS Classification

Health hazards	Not classified
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Environmental hazards	Not classified
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Physical Hazards	Not classified
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**2.2 Label elements**

**Signal word**

None

**Hazard Statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary statements**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Contains**

Barite

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics\*

Calcium chloride

Crystalline silica (impurity)

Polyamide

**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	EC No	CAS No	Weight-%
Barite	236-664-5	13462-86-7	30-60
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	926-141-6	RM1004246	10-30
Calcium chloride	233-140-8	10043-52-4	1-5
Crystalline silica (impurity)	238-878-4	14808-60-7	<3
Polyamide	Listed	Proprietary	<1

**Comments**

The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply  
 The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

\*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed

in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

<b>General advice</b>	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
<b>Symptoms</b>	
<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

<b>Notes to physician</b>	Treat symptomatically.
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## 5. Firefighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

None known.

## **5.2. Special hazards arising from the substance or mixture**

### **Unusual fire and explosion hazards**

None known.

### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours

## **5.3 Advice for firefighters**

### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure When using do not eat, drink, smoke, sniff Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place

**Storage class** Chemical storage.

**Packaging materials** Use specially constructed containers only

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure Limits**

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics OEL vapour (Total Hydrocarbons/RCP) – TWA 1200 mg/m<sup>3</sup> (165 ppm) Above Occupational Exposure Limit (OEL) is a “in-house” calculated value provided from Suppliers of this component and calculated as per CEFIC/HSPA/UK EH 40 guidelines.

Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

**Component Information**

Chemical Name	Arabic	Australia	Egypt
Barite	Not determined	Not determined	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Calcium chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA	0.1 mg/m <sup>3</sup> TWArespirable dust	Not determined
Polyamide	Not determined	Not determined	Not determined
Chemical Name	India	Indonesian	Japan
Barite	Not determined	Not determined	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Calcium chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.1 mg/m <sup>3</sup> TWA	0.03 mg/m <sup>3</sup> OEL
Polyamide	Not determined	Not determined	Not determined
Chemical Name	Kazakhstan	Kuwait	New Zealand
Barite	6 mg/m <sup>3</sup> MAC	Not determined	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Calcium chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	1 mg/m <sup>3</sup> MAC	0.1 mg/m <sup>3</sup> TWA	0.1 mg/m <sup>3</sup> TWA Confirmed carcinogen
Polyamide	Not determined	Not determined	Not determined
Chemical Name	Malaysia	Philippines	Russia
Barite	Not determined	Not determined	6 mg/m <sup>3</sup> TWA Fibrogenic substance 0242
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Calcium chloride	Not determined	Not determined	2 mg/m <sup>3</sup> MAC (aerosol)

Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA	Not determined	3 mg/m <sup>3</sup> STEL 1 mg/m <sup>3</sup> TWA Fibrogenic substance 1177, 1178
Polyamide	Not determined	Not determined	Not determined
<b>Chemical Name</b>	<b>Thailand</b>	<b>Vietnam</b>	<b>Turkey</b>
Barite	Not determined	Not determined	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
Calcium chloride	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup> TWA	Not determined	Not determined
Polyamide	Not determined	Not determined	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

### Personal protective equipment

#### Eye protection

Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

#### Hand protection

Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC

Be aware that liquid may penetrate the gloves. Frequent change is advisable.

#### Respiratory protection

No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Respirator with combination filter for vapor/particulate Type A/P2 At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

#### Skin and body protection

Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

#### Hygiene Measures

Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use



### 8.2.3 Environmental exposure controls

#### Environmental exposure

Use appropriate containment to avoid environmental contamination See section 6 for more information

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Viscous
<b>Odour</b>	Hydrocarbon like
<b>Colour</b>	Grey - Tan
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	> 80 °C / > 176 °F	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	1.0 - 2.4	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

<b>Explosive properties</b>	No information available
<b>Oxidising properties</b>	No information available

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

None known.

**10.5 Incompatible materials**

No materials to be especially mentioned.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Product information**

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because this product is a liquid, under normal and recommended use, exposure to Respirable Crystalline Silica will not apply.

**Inhalation**

Vapors may irritate throat and respiratory system.

**Eye contact**

May cause slight irritation.

**Skin contact**

Repeated exposure may cause skin dryness or cracking.

**Ingestion**

Ingestion may cause stomach discomfort.

**Unknown acute toxicity**

Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Barite	> 15000 mg/kg ( Rat )	No data available	No data available
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.2 mg/L (Rat) 4 h
Calcium chloride	= 1000 mg/kg ( Rat )	> 5000 mg/kg ( Rabbit )	No data available
Crystalline silica (impurity)	No data available	No data available	No data available
Polyamide	> 2020 mg/kg (Rat)	No data available	No data available

**Sensitisation**

Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of Exposure</b>	Inhalation. Skin contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**  
 See component information below.

**Toxicity to fish**  
 See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
 See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Barite	No information available	No information available	No information available
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	LC50 (Oncorhynchus mykiss (rainbow trout)): 2 - 5 mg/l Exposure time: 96 h Test Type: semi-static test Test substance: WAF Method: OECD Test Guideline 203 Remarks: Information given is based on data obtained from similar substances.	EL50 (Pseudokirchneriella subcapitata (green algae)): > 1 - 3 mg/l Exposure time: 72 h Test Type: static test Test substance: WAF Method: OECD Test Guideline 201 Remarks: Information given is based on data obtained from	EL50 (Water flea (Daphnia magna)): 1,4 mg/l Exposure time: 48 h Test Type: static test Test substance: WAF Method: OECD Test Guideline 202 Remarks: Information given is based on data obtained from similar substances.

		similar substances.	
Calcium chloride	= 10650 mg/L LC50 Lepomis macrochirus 96 h	No information available	2,400 mg/L EC50 (Daphnia magna) = 48 h
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h
Polyamide	No information available	No information available	No information available

### 12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Barite	Inorganic compound
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Inherently biodegradable OECD 301F : 58.6% Duration 28 days
Calcium chloride	Inorganic compound
Crystalline silica (impurity)	Inorganic compound

### 12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Barite	Product/Substance is inorganic
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Does not bioaccumulate
Calcium chloride	Product/Substance is inorganic
Crystalline silica (impurity)	Product/Substance is inorganic

### 12.4 Mobility

#### **Mobility**

Insoluble in water. See component information below.

Chemical Name	Mobility
Barite	Insoluble in water
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Insoluble in water
Calcium chloride	Soluble in water
Crystalline silica (impurity)	Insoluble in water

#### **Mobility in soil**

See component information below.

Chemical Name	Mobility in soil
Barite	Not expected to adsorb on soil
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available
Calcium chloride	After release, disperses through ground water

Crystalline silica (impurity)	Not expected to adsorb on soil
-------------------------------	--------------------------------

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues/unused products**                      Dispose of in accordance with local regulations.

**Contaminated packaging**                      Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Oil-based muds containing mixtures of products listed in Chapters 17 and 18 of the IBC Code and the latest MEPC.2/Circular are permitted to be carried under Annex II of MARPOL and resolution A.673, (16) Offshore Supply Vessel Code. Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

This safety data sheet complies with the requirements of:  
The Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

**International inventories**

**USA, Toxic Substances Control Act inventory (TSCA)** Does not comply

**Canada (DSL)** This product contains chemical(s) which is/are not listed on DSL but is/are listed on the NDSL.

**Philippines (PICCS)** Does not comply

**Inventory - Japan - Existing and** Does not comply

**New Chemicals list**

**China (IECSC)** Does not comply

**Australia (AICS)** Does not comply

**Korea (KECL)** Does not comply

**Inventory - New Zealand - Inventory of Chemicals (NZIoC)** Does not comply

This SDS is not for use in EU/EEA.

## 16. Other Information

**Prepared by** Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

**Revision date** 28/Jun/2019

**Version** 1

**This SDS has been revised in the following section(s)** New

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

\*A mark of M-I L.L.C., a Schlumberger Company

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## Safety Data Sheet RheMul\*

### 1. Identification

#### 1.1 Product identifier

**Product name** RheMul\*  
**Product code** 142776

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Emulsifier.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

##### Schlumberger Canada, Ltd.

200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada

**E-mail address** SDS@slb.com

##### Prepared by

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1

**Environmental hazards** Not classified

**Physical Hazards**

Flammable Liquids	Category 4
-------------------	------------

**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

H317 - May cause an allergic skin reaction  
H318 - Causes serious eye damage  
H227 - Combustible liquid

**Precautionary Statements**

P280 - Wear protective gloves, protective clothing, eye protection  
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water  
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P310 - Immediately call a POISON CENTER or physician  
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable  
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking  
P280 - Wear protective gloves and eye/face protection  
P370 + P378 - In case of fire: Use dry sodium carbonate to extinguish  
P403 + P235 - Store in a well-ventilated place. Keep cool

**Supplementary precautionary statements**

P261 - Avoid breathing dust/fume/gas/mist/vapors/spray  
P272 - Contaminated work clothing should not be allowed out of the workplace  
P362 + P364 - Take off contaminated clothing and wash it before reuse  
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking  
P280 - Wear protective gloves/protective clothing and eye/face protection  
P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish  
P403 + P235 - Store in a well-ventilated place. Keep cool  
P501 - Dispose of contents/container to industrial incineration plant

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Polyamide	Proprietary	45 - 70
Alkanes, C10-24-branched and linear	172343-37-2	30 - 60
2-[2-(2-butoxyethoxy)ethoxy]ethanol	143-22-6	10 - 30

#### Comments

The product contains other ingredients which do not contribute to the overall classification. The exact percentage (concentration) of composition has been withheld as a trade secret.

Alkanes, C10-24-branched and linear can use either CAS#172343-37-2 or 848301-67-7.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek immediate medical attention/advice.
<b>Eye Contact</b>	Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Seek medical attention.

### 4.2. Most important symptoms and effects, both acute and delayed

<b>General advice</b>	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
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#### Symptoms

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

<b>Notes to physician</b>	Treat symptomatically
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## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water spray, dry chemical, carbon dioxide (CO<sub>2</sub>), or foam.

#### Extinguishing media which must not be used for safety reasons

Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture

#### Unusual fire and explosion hazards

Vapors may form explosive mixtures with air. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapors may travel considerable distance to source of ignition and flash back. Heating

of containers may cause pressure rise, with risk of bursting. Combustible material.

**5.3 Advice for firefighters**

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

If spilled, take caution, as material can cause surfaces to become very slippery. Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid breathing vapors or mists. Avoid contact with skin, eyes and clothing. If spilled, take caution, as material can cause surfaces to become very slippery. Persons susceptible to allergic reactions should not handle this product.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits** Contains no substances with occupational exposure limit values

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits -	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits -

			TWAs (CMPs)		TWAs (LMPE-PPTs)
Polyamide	Not determined				
Alkanes, C10-24-branched and linear	Not determined				
2-[2-(2-butoxyethoxy)ethoxy]ethanol	Not determined				

### **IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Polyamide	-
Alkanes, C10-24-branched and linear 172343-37-2	-
2-[2-(2-butoxyethoxy)ethoxy]ethanol 143-22-6	-

### **8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### **Engineering Controls**

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

#### **Personal protective equipment**

##### **Eye protection**

Use eye protection according to EN 166, designed to protect against liquid splashes. Tightly fitting safety goggles. Safety glasses with side-shields.

##### **Hand protection**

Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training

Use protective gloves made of: Nitrile Neoprene

Be aware that liquid may penetrate the gloves. Frequent change is advisable.

##### **Respiratory Protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

##### **Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

##### **Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Color</b>	Amber - Dark amber
<b>Odor</b>	Hydrocarbon odor.
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	5.7 - 6.7	@ 70/5/25: IPA:Product:H20
<b>Melting point</b>	No information available	
<b>Boiling point</b>	> 100 °C / 212 °F	
<b>Flash point</b>	> 82 °C / > 179 °F	ASTM D 93-11
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	> 850 cPs	@ 40 °C
<b>Dynamic viscosity</b>	No information available	
<b>Partition Coefficient (n-octanol/water)</b>	No information available	
<b>Explosive properties</b>	No information available	
<b>Oxidizing properties</b>	No information available	

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

#### Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### Hazardous polymerization

Not known.

### 10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Vapors may irritate throat and respiratory system.

**Eye contact** Causes serious eye damage.

**Skin contact** May cause an allergic skin reaction.

**Ingestion** Ingestion may cause stomach discomfort.

**LD50 Oral** > 2000 mg/kg (rat) (based on components)

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyamide	No data available	No data available	No data available
Alkanes, C10-24-branched and linear	No data available	No data available	No data available
2-[2-(2-butoxyethoxy)ethoxy]ethanol	5300 mg/kg (rat)	2002 mg/kg (Rabbit)	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Polyamide	No data available	No data available	No data available	No data available
Alkanes, C10-24-branched and linear	No data available	No data available	No data available	No data available
2-[2-(2-butoxyethoxy)ethoxy]ethanol	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

**Sensitization** May cause allergic skin reaction.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.

**Routes of Exposure** Skin contact.

**Routes of entry** Skin contact.

**Specific target organ toxicity -** Not classified

**Single exposure**  
**Specific target organ toxicity -**  
**Repeated exposure** Not classified.

**Aspiration hazard** The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**  
See component information below.

**Toxicity to fish**  
See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
See component information below.

#### Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polyamide	No information available	No information available	No information available
Alkanes, C10-24-branched and linear	No information available	No information available	No information available
2-[2-(2-butoxyethoxy)ethoxy]ethanol	2200 - 4600 mg/L LC50 Leuciscus idus 96h = 2400 mg/L LC50 Pimephales promelas 96h	> 500 mg/L EC50 Desmodesmus subspicatus 72h	> 500 mg/L EC50 Daphnia magna 48h

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No product level data available.

### 12.4 Mobility

Insoluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations. Waste

Management: Under RCRA, it is the responsibility of the user to determine at the time of disposal, whether the product meets RCRA criteria for the hazardous waste. This is because product uses, transformations, mixtures, processes, etc., may render the resulting materials hazardous. Empty container retains residues. All labeled precautions must be observed.

**Contaminated packaging**

Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	NA1993
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

Combustible liquid, n.o.s., (Alkanes, C10-24-branched and linear) Not regulated for U.S. ground transport in non-bulk containers (<119 gallons). Not regulated under TDG, IMDG, ICAO/IATA.

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	3
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	III
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant No

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies

<b>Philippines (PICCS)</b>	Does not comply
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Does not comply
<b>Australia (AICS)</b>	Does not comply
<b>Korean (KECL)</b>	Does not comply
<b>New Zealand (NZIoC)</b>	Does not comply

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

<b>Chemical Name</b>	<b>SARA 302 / TPQs</b>	<b>SARA 313</b>	<b>CERCLA RQ</b>
Polyamide	N/A	N/A	N/A
Alkanes, C10-24-branched and linear	N/A	N/A	N/A
2-[2-(2-butoxyethoxy)ethoxy]ethanol	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**Brazilian Regulations**

**Brazil Regulation** This SDS was prepared in accordance with Brazil law NBR 14725.

<b>Federal Police</b>	Not determined
<b>Army</b>	Not determined
<b>ANVISA</b>	Not Listed
<b>MTE (NR 15)</b>	No information available

**16. Other Information**

<b>Supersedes date</b>	26/May/2020
<b>Revision date</b>	30/Jul/2020
<b>Version</b>	4
<b>This SDS has been revised in the following section(s)</b>	2, 3, 5, 9, 14, 16 There have been changes with regard to classification.
<b>HMIS classification</b>	
Health	3

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Flammability	2
Physical hazard	0
PPE	X

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Safety Data Sheet  
RHETHIN\*  
(MIL021)

**1. Identification**

**1.1 Product identifier**

**Product name** RHETHIN\*  
(MIL021)  
**Product code** 143684

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

**Recommended Use** Thinner. Dispersant. Drilling fluid additive.  
**Uses advised against** Consumer use

**1.3 Details of the supplier of the safety data sheet**

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

**1.4 Emergency Telephone Number**

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

**2. Hazards Identification**

**2.1 Classification of the substance or mixture**

**GHS - Classification**

**Health hazards**

Aspiration toxicity	Category 1
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Specific target organ toxicity - Repeated exposure	Category 2
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**Environmental hazards**

Chronic aquatic toxicity	Category 3
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**Physical Hazards**

Flammable Liquids	Category 4
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**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

- H304 - May be fatal if swallowed and enters airways
- H373 - May cause damage to organs through prolonged or repeated exposure
- H412 - Harmful to aquatic life with long lasting effects
- H227 - Combustible liquid

**Precautionary Statements**

- P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
- P260 - Do not breathe dust, fume, gas, mist, vapors, spray
- P273 - Avoid release to the environment
- P280 - Wear protective gloves and eye/face protection
- P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
- P314 - Get medical attention if you feel unwell
- P331 - Do NOT induce vomiting
- P370 + P378 - In case of fire: Use dry sodium carbonate to extinguish
- P403 + P235 - Store in a well-ventilated place. Keep cool
- P405 - Store locked up
- P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** 33% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Alkanes, C10-24-branched and linear	172343-37-2	45 - 70
Distillates (petroleum), straight-run middle	64741-44-2	15 - 40

#### Comments

The product contains other ingredients which do not contribute to the overall classification. The exact percentage (concentration) of composition has been withheld as a trade secret. Alkanes, C10-24-branched and linear can use either CAS#172343-37-2 or 848301-67-7.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. Seek medical attention at once.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Risk of product entering the lungs on vomiting after ingestion. If vomiting occurs spontaneously, minimize the risk of aspiration by properly positioning the affected person. Never give anything by mouth to an unconscious person. Seek medical attention.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### Symptoms

<b>Inhalation</b>	May cause irritation of respiratory tract. Vapors inhaled in high concentration have a narcotic effect on the central nervous system. Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing.
<b>Ingestion</b>	Aspiration may cause pulmonary edema and pneumonitis. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
<b>Skin contact</b>	May cause irritation. Prolonged skin contact may defat the skin and produce dermatitis.
<b>Eye contact</b>	May cause irritation. May cause redness, itching, and pain.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water spray, dry chemical, carbon dioxide (CO<sub>2</sub>), or foam.

#### Extinguishing media which must not be used for safety reasons

Do not use a solid water stream as it may scatter and spread fire.

## **5.2. Special hazards arising from the substance or mixture**

### **Unusual fire and explosion hazards**

Combustible liquid. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

### **Hazardous combustion products**

Carbon oxides (COx), Nitrogen oxides (NOx).

## **5.3 Advice for firefighters**

### **Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid contact with heat, sparks, open flame, and static discharge. Prevent further leakage or spillage if safe to do so. Contaminated surfaces will be extremely slippery. Evacuate and ventilate the area.

### **6.2 Environmental precautions**

Should not be released into the environment. Do not allow spilled material to enter sewers, storm drains or surface waters. As local regulations may vary; all waste must be disposed/recycled/reclaimed in accordance with federal, state, and local environmental control regulations.

### **Environmental exposure controls**

Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so.

#### **Methods for cleaning up**

Dike to collect large spills. Take precautionary measures against static discharges. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Ground and bond containers when transferring material. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid breathing vapors or mists. Avoid contact with skin, eyes and clothing. Keep away from heat, sparks and open flame. No smoking. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapors).

### **7.2 Conditions for safe storage, including any incompatibilities**

#### **Technical measures/precautions**

Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges. Ensure all equipment is electrically grounded before beginning transfer operations.

#### **Storage precautions**

Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents. Strong Lewis acids. Strong mineral acids.

**Packaging materials** Use specially constructed containers only.

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

**Exposure limits** oil mist : 10mg/m<sup>3</sup>, for 15 minutes oil mist : 5mg/m<sup>3</sup>, for 8 hours

### Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Alkanes, C10-24-branched and linear	Not determined	Not determined	Not determined	Not determined	Not determined
Distillates (petroleum), straight-run middle	Not determined	Not determined	Not determined	Not determined	Not determined

### IDLH (Immediately Dangerous to Life or Health)

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Alkanes, C10-24-branched and linear 172343-37-2	-
Distillates (petroleum), straight-run middle 64741-44-2	-

### 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering Controls

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

#### Personal protective equipment

##### Eye protection

Tightly fitting safety goggles.

##### Hand protection

Use protective gloves made of: Viton polyvinyl alcohol or nitrile-butyl rubber gloves  
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

##### Respiratory Protection

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Opaque
<b>Color</b>	Light brown
<b>Odor</b>	Hydrocarbon odor.
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	No information available	
Melting point	No information available	
Boiling point	No information available	
Flash point	82.2 °C / 180 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.83	
Bulk density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	< 20.5 mm <sup>2</sup> /s	@ 40 °C
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	

<b>Explosive properties</b>	May form explosive mixtures with air
<b>Oxidizing properties</b>	No information available

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges.

**10.5 Incompatible materials**

Strong oxidizing agents. Strong Lewis acids. Strong mineral acids.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Product information**

Prolonged and repeated contact with solvents over a long period may lead to permanent health problems.

**Inhalation**

May cause irritation of respiratory tract. Vapors inhaled in high concentration have a narcotic effect on the central nervous system.

**Eye contact**

May cause slight irritation.

**Skin contact**

May cause irritation. Repeated exposure may cause skin dryness or cracking.

**Ingestion**

May be fatal if swallowed and enters airways. Potential for aspiration if swallowed. Aspiration may cause pulmonary edema and pneumonitis. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Alkanes, C10-24-branched and linear	No data available	No data available	No data available
Distillates (petroleum), straight-run middle	5005 mg/kg (rat)	2002 mg/kg (Rabbit)	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Alkanes, C10-24-branched and linear	No data available	No data available	No data available	No data available
Distillates (petroleum), straight-run middle	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

**Sensitization**

This product does not contain any components suspected to be sensitizing.

**Mutagenic effects**

This product does not contain any known or suspected mutagens.

<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Ingestion. Inhalation. Skin contact.
<b>Routes of entry</b>	Ingestion. Inhalation. Skin contact.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Liver. Spleen. Bone marrow.
<b>Aspiration hazard</b>	May be fatal if swallowed and enters airways.

## 12. Ecological Information

### 12.1 Toxicity

#### **Toxicity to algae**

Harmful to aquatic life with long lasting effects.

#### **Toxicity to fish**

Harmful to aquatic life with long lasting effects.

#### **Toxicity to daphnia and other aquatic invertebrates**

Harmful to aquatic life with long lasting effects.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Alkanes, C10-24-branched and linear	No information available	No information available	No information available
Distillates (petroleum), straight-run middle	No information available	No information available	No information available

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No product level data available.

### 12.4 Mobility

Insoluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

### 13. Disposal Considerations

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Do not burn, or use a cutting torch on, the empty drum. Empty containers may contain flammable or explosive vapors. Empty containers should be taken for local recycling, recovery or waste disposal.

### 14. Transport information

**14.1. UN number**

<b>UN No. (DOT)</b>	NA1993
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

Combustible liquid, n.o.s., (contains petroleum distillates), Not regulated for U.S. ground transport in non-bulk containers (<119 gallons). Not regulated under TDG, IMDG, ICAO/IATA.

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Combustible liquid
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	III
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
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**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Does not comply

### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### U.S. Federal and State Regulations

#### SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Alkanes, C10-24-branched and linear	N/A	N/A	N/A
Distillates (petroleum), straight-run middle	N/A	N/A	N/A

### California Proposition 65

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

### Brazilian Regulations

**Brazil Regulation** This SDS was prepared in accordance with Brazil law NBR 14725.

**Federal Police** Not determined

**Army** Not determined

**ANVISA** Not Listed

**MTE (NR 15)** No information available

## 16. Other Information

**Revision date** 20/Mar/2020

**Version** 1

**This SDS has been revised in the following section(s)** New issue.

**HMIS classification**

Health	2*
Flammability	2
Physical hazard	0
PPE	X

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

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SDS no. 142829  
Version 1  
Revision date 27/Aug/2018  
Supersedes date None



## Safety Data Sheet SAFE-BREAK\* Prime

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** SAFE-BREAK\* Prime  
**Product code** 142829

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Demulsifier.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

**Health hazards** Not classified

**Environmental hazards** Not classified  
**Physical Hazards** Not classified

**2.2 Label elements**

**Signal word**  
None

**Hazard Statements**  
This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements**  
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
2-butoxyethanol	111-76-2	3 - 7
Sorbitan monododecanoate, poly(oxy-1,2-ethanediyl) derivs., hexanedioate	74350-59-7	1 - 5

**Comments**  
The exact percentage (concentration) of composition has been withheld as a trade secret

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact** Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

**Eye Contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-Fighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water spray, dry chemical, carbon dioxide (CO<sub>2</sub>), or foam.

**Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Heating of containers may cause pressure rise, with risk of bursting.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
2-butoxyethanol	20 ppm	50 ppm TWA 240 mg/m <sup>3</sup> TWA	20 ppm TWA	39 ppm TWA LT; 190 mg/m <sup>3</sup> TWA LT	26 ppm TWA VLE-PPT; 120 mg/m <sup>3</sup> TWA VLE-PPT
Sorbitan monododecanoate, poly(oxy-1,2-ethanediyl) derivs., hexanedioate	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
2-butoxyethanol 111-76-2	700 ppm IDLH
Sorbitan monododecanoate, poly(oxy-1,2-ethanediyl) derivs., hexanedioate	-

74350-59-7	
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**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**  
Ensure adequate ventilation.

**Personal protective equipment**

<b>Eye protection</b>	Use eye protection according to EN 166, designed to protect against liquid splashes. Tightly fitting safety goggles. Safety glasses with side-shields.
<b>Hand protection</b>	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Use protective gloves made of: Neoprene Nitrile PVC Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Color</b>	Light yellow - Yellow
<b>Odor</b>	Slight
<b>Odor threshold</b>	Not applicable

Property	Values	Remarks
pH	7 - 9	
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	180 °C / 356 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		

<b>Upper flammability limit</b>	No information available
<b>Lower flammability limit</b>	No information available
<b>Vapor pressure</b>	No information available
<b>Vapor density</b>	No information available
<b>Specific gravity</b>	1.01 Kg/l
<b>Bulk density</b>	No information available
<b>Water solubility</b>	Completely soluble
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	Not determined

<b>Explosive properties</b>	Not applicable
<b>Oxidizing properties</b>	None known.

**9.2 Other information**

<b>Pour point</b>	-18°C/-0.4°F ± 1.0°C
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Not known.

**10.4 Conditions to avoid**

None known.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact** May cause slight irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**LD50 Oral** > 2000 mg/kg (rat) (based on components)

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-butoxyethanol	1200 mg/kg (Guinea pigs)	> 2000 mg/kg (Rat)	400 ppm (Rabbit)
Sorbitan monododecanoate, poly(oxy-1,2-ethanediyl) derivs., hexanedioate	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
2-butoxyethanol	No data available	A3 - Confirmed animal carcinogen with unknown relevance to humans	No data available	No data available
Sorbitan monododecanoate, poly(oxy-1,2-ethanediyl) derivs., hexanedioate	No data available	No data available	No data available	No data available

**Sensitization** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.

**Routes of exposure** None known.

**Routes of entry** No route of entry noted.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**  
This product is not considered toxic to algae.

**Toxicity to fish**  
This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-butoxyethanol	= 2950 mg/L LC50 Lepomis macrochirus 96 h = 1490 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 1698 - 1940 mg/L (LC50; Daphnia magna) = 1720 mg/L (EC50; water flea)
Sorbitan monododecanoate, poly(oxy-1,2-ethanediyl) derivs., hexanedioate	No information available	46.88 mg/l EC50 72h Skeletonema Costatum Vendor Data	No information available

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

UN No. (DOT) Not regulated  
UN No. (MT/ANTT) Not regulated  
UN No. (TDG) Not regulated  
UN/ID No. (ADR/RID/ADN/ADG) Not regulated  
UN No. (IMDG/ANTAQ) Not regulated  
UN No. (ICAO/ANAC) Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT/ANTT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	U.S. TSCA - Components are listed or exempt from listing.
<b>Canada (DSL)</b>	Canada DSL - Components are listed or exempt from listing.
<b>Philippines (PICCS)</b>	Does not comply
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Does not comply
<b>Australia (AICS)</b>	Does not comply
<b>Korean (KECL)</b>	Does not comply
<b>New Zealand (NZIoC)</b>	Does not comply

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will

need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
2-butoxyethanol	N/A	N/A	N/A
Sorbitan monododecanoate, poly(oxy-1,2-ethanediyl) derivs., hexanedioate	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Brazilian Regulations**

**Brazil Regulation**

This SDS was prepared in accordance with Brazil law NBR 14725.

**Federal Police**

Not determined

**Army**

Not determined

**ANVISA**

Not determined

**16. Other Information**

**Revision date** 27/Aug/2018

**Version** 1

**This SDS has been revised in the following section(s)** New issue.

**HMIS classification**

Health 1  
Flammability 1  
Physical hazard 0  
PPE B

\*A mark of M-I L.L.C., a Schlumberger Company

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SDS no. PID1354  
Version 12  
Revision date 17/Sep/2018  
Supersedes date 31/Jan/2017



## Safety Data Sheet SAFE-BREAK\* CBF

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name SAFE-BREAK\* CBF  
Product code PID1354

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Completion fluid additive.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

Schlumberger Canada, Ltd.  
200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-613-992-4624

E-mail address sdsmi@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Acute toxicity - Oral	Category 4
Acute toxicity - Dermal	Category 5

Skin corrosion/irritation	Category 3
Serious eye damage/eye irritation	Category 2
Specific target organ toxicity - Single exposure	Category 3 - (H336)

**Environmental hazards**

Chronic aquatic toxicity	Category 3
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**Physical Hazards**

Flammable Liquids	Category 2
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**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

- H302 - Harmful if swallowed
- H313 - May be harmful in contact with skin
- H316 - Causes mild skin irritation
- H319 - Causes serious eye irritation
- H336 - May cause drowsiness or dizziness
- H412 - Harmful to aquatic life with long lasting effects
- H225 - Highly flammable liquid and vapor

**Precautionary Statements**

- P201 - Obtain special instructions before use
- P202 - Do not handle until all safety precautions have been read and understood
- P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
- P280 - Wear protective gloves and eye/face protection
- P281 - Use personal protective equipment as required
- P370 + P378 - In case of fire: Use dry sodium carbonate to extinguish
  
- P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P271 - Use only outdoors or in a well-ventilated area
- P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
- P330 - Rinse mouth
- P312 - Call a POISON CENTER or doctor/physician if you feel unwell
- P332 + P313 - If skin irritation occurs: Get medical advice/attention
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P337 + P313 - If eye irritation persists: Get medical advice/attention
- P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
- P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
- P312 - Call a POISON CENTER or doctor if you feel unwell
- P233 - Keep container tightly closed
- P403 + P235 - Store in a well-ventilated place. Keep cool
- P240 - Ground/bond container and receiving equipment
- P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment
- P242 - Use only non-sparking tools
- P243 - Take precautionary measures against static discharge
- P273 - Avoid release to the environment

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** 1% of the mixture consists of ingredient(s) of unknown toxicity.

1 % of the mixture consists of ingredient(s) of unknown acute oral toxicity

1 % of the mixture consists of ingredient(s) of unknown acute dermal toxicity

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Propan-2-ol	67-63-0	65 - 85
Polyol compound	Proprietary	15 - 40
2-butoxyethanol	111-76-2	1 - 5
Quaternary ammonium salt	Proprietary	1 - 5
Methanol	67-56-1	0.1 - 1
Amine compounds	Proprietary	0.1 - 1

**Comments**

The product contains other ingredients which do not contribute to the overall classification. The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret

**HMIRA Registration Number:** 11090 **Filing Date:** 31/Jan/2017

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** Move to fresh air. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Get medical attention immediately if symptoms occur.

**Ingestion** Do not induce vomiting without medical advice. Call a physician or poison control center immediately. Obtain medical attention.

**Skin contact** Take off contaminated clothing and shoes immediately. Rinse immediately with plenty of water for at least 30 minutes. Get immediate medical attention.

**Eye Contact** Rinse immediately with plenty of water, also under the eyelids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically  
Keep victim under observation

## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

### **5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Highly flammable. Vapors may form explosive mixtures with air. Flash back possible over considerable distance. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Heating of containers may cause pressure rise, with risk of bursting.

**Hazardous combustion products**

Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke), Nitrogen oxides (NO<sub>x</sub>), Ammonia, Chlorine, chlorine oxides, hydrogen chloride.

### **5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Evacuate and ventilate the area. Use personal protective equipment. Avoid contact with heat, sparks, open flame, and static discharge. Contaminated surfaces will be extremely slippery.

### **6.2 Environmental precautions**

Should not be released into the environment. Do not allow spilled material to enter sewers, storm drains or surface waters.

**Environmental exposure controls**

Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Use clean non-sparking tools to collect absorbed material. Take precautionary measures against static discharges.

**6.4 Reference to other sections**

See section 13 for more information. See section 8 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Keep away from heat, sparks and open flame. No smoking. Take precautionary measures against static discharges. Handle in accordance with good industrial hygiene and safety practice. Do not handle until all safety precautions have been read and understood. Avoid breathing vapors or mists. Avoid contact with skin, eyes and clothing. Wear personal protective equipment. Ensure adequate ventilation.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Keep away from open flames, hot surfaces and sources of ignition. Keep airborne concentrations below exposure limits. Ensure adequate ventilation.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking. Keep away from open flames, hot surfaces and sources of ignition. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Store in original container.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Propan-2-ol	200 ppm	400 ppm TWA 980 mg/m <sup>3</sup> TWA	400 ppm TWA	310 ppm TWA LT; 765 mg/m <sup>3</sup> TWA LT	400 ppm TWA VLE-PPT; 980 mg/m <sup>3</sup> TWA VLE-PPT
Polyol compound	Not determined	Not determined	Not determined	Not determined	Not determined
2-butoxyethanol	20 ppm	50 ppm TWA 240 mg/m <sup>3</sup> TWA	20 ppm TWA	39 ppm TWA LT; 190 mg/m <sup>3</sup> TWA LT	26 ppm TWA VLE-PPT; 120 mg/m <sup>3</sup> TWA VLE-PPT
Quaternary ammonium salt	Not determined	Not determined	Not determined	Not determined	Not determined
Methanol	200 ppm	200 ppm TWA 260 mg/m <sup>3</sup> TWA	200 ppm TWA	156 ppm TWA LT; 200 mg/m <sup>3</sup> TWA LT	200 ppm TWA VLE-PPT; 260 mg/m <sup>3</sup> TWA VLE-PPT
Amine compounds	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Propan-2-ol 67-63-0	2000 ppm IDLH (10% LEL)
Polyol compound	-
2-butoxyethanol 111-76-2	700 ppm IDLH

Quaternary ammonium salt	-
Methanol 67-56-1	6000 ppm IDLH
Amine compounds	-

## 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation, especially in confined areas.

### Personal protective equipment

#### Eye protection

Tightly fitting safety goggles.

#### Hand protection

Wear chemical resistant gloves such as nitrile or neoprene. Be aware that liquid may penetrate the gloves. Frequent change is advisable.

#### Respiratory Protection

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

#### Skin and body protection

Wear appropriate personal protective clothing to prevent skin contact, Eye wash and emergency shower must be available at the work place.

#### Hygiene Measures

Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Transparent
Color	Amber
Odor	Alcohol
Odor threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	6.8 - 7.8	
pH @ dilution		No information available
Melting / freezing point	No information available	
Boiling point/range	> 62 °C / 143 °F	
Flash point	17 °C / 62 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	

<b>Vapor pressure</b>	No information available
<b>Vapor density</b>	>1 @ Air = 1
<b>Specific gravity</b>	0.84 - 0.87
<b>Bulk density</b>	No information available
<b>Water solubility</b>	Soluble
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	No information available
<b>Explosive properties</b>	No information available
<b>Oxidizing properties</b>	No information available

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity****10.1 Reactivity**

Highly flammable liquid and vapor.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions****Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid contact with heat, sparks, open flame, and static discharge. Do not freeze.

**10.5 Incompatible materials**

Strong oxidizing agents. Reducing agents. Acids. Bases.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information****11.1 Information on toxicological effects****Acute toxicity****Product information**

Methanol is more toxic to humans and primates than to most experimental animals, due to differences in how it is metabolized. Non-primates do not appear to experience the acidosis or vision effects observed in humans and primates.

**Inhalation**

May cause drowsiness or dizziness. Inhalation of vapors in high concentration may cause irritation of respiratory system. Vapors inhaled in high concentration have a narcotic effect

on the central nervous system. Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing.

<b>Eye contact</b>	Causes serious eye irritation. Inhalation, ingestion, or skin absorption of methanol can cause blindness.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation. May cause skin irritation and/or dermatitis. Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
<b>Ingestion</b>	Harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Propan-2-ol	= 1870 mg/kg ( Rat )	= 4059 mg/kg ( Rabbit )	= 72600 mg/m <sup>3</sup> ( Rat ) 4 h
Polyol compound	= 28,000 mg/kg ( Rat )	> 20,000 mg/kg ( Rabbit )	No data available
2-butoxyethanol	= 470 mg/kg ( Rat )	= 99 mg/kg ( Rabbit )	= 450 ppm ( Rat ) 4 h
Quaternary ammonium salt	= 250 mg/kg ( Rat )	No data available	No data available
Methanol	= 6200 mg/kg ( Rat )	= 15800 mg/kg ( Rabbit )	= 22500 ppm ( Rat ) 8 h = 64000 ppm ( Rat ) 4 h
Amine compounds	= 1500 mg/kg ( Rat )	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Propan-2-ol	No data available	A4	No data available	No data available
Polyol compound	No data available	No data available	No data available	No data available
2-butoxyethanol	No data available	A3 Confirmed Animal Carcinogen with Unknown Relevance to Humans	No data available	No data available
Quaternary ammonium salt	No data available	No data available	No data available	No data available
Methanol	No data available	No data available	No data available	No data available
Amine compounds	No data available	No data available	No data available	No data available

<b>Sensitization</b>	Not classified.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	No evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Contains ingredients that have suspected developmental hazards.
<b>Routes of exposure</b>	Inhalation. Skin contact. Eye contact. Ingestion.
<b>Routes of entry</b>	Inhalation. Skin absorption. Ingestion.
<b>Specific target organ toxicity - Single exposure</b>	Category 3
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Neurological effects</b>	Central nervous system depressant. Central Nervous System Depression: signs/symptoms can include headache, dizziness, drowsiness, muscular weakness, incoordination, slowed reaction time, fatigue blurred vision, slurred speech, giddiness, tremors and convulsions.
<b>Target organ effects</b>	Central nervous system.
<b>Aspiration hazard</b>	Not classified.

## 12. Ecological Information

### 12.1 Toxicity

#### Toxicity to algae

See component information below.

#### Toxicity to fish

See component information below.

#### Toxicity to daphnia and other aquatic invertebrates

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Propan-2-ol	> 1400000 µg/L LC50 Lepomis macrochirus 96 h = 11130 mg/L LC50 Pimephales promelas 96 h = 9640 mg/L LC50 Pimephales promelas 96 h	> 1000 mg/L EC50 Desmodesmus subspicatus 96 h > 1000 mg/L EC50 Desmodesmus subspicatus 72 h	= 13299 mg/L EC50 Daphnia magna 48 h
Polyol compound	> 5000 mg/L LC50 Carassius auratus 24 h	No information available	No information available
2-butoxyethanol	= 2950 mg/L LC50 Lepomis macrochirus 96 h = 1490 mg/L LC50 Lepomis macrochirus 96 h	No information available	1698 - 1940 mg/L EC50 Daphnia magna 24 h > 1000 mg/L EC50 Daphnia magna 48 h
Quaternary ammonium salt	No information available	No information available	No information available
Methanol	18 - 20 mL/L LC50 Oncorhynchus mykiss 96 h 19500 - 20700 mg/L LC50 Oncorhynchus mykiss 96 h 13500 - 17600 mg/L LC50 Lepomis macrochirus 96 h > 100 mg/L LC50 Pimephales promelas 96 h = 28200 mg/L LC50 Pimephales promelas 96 h	EC50= 22000 mg/l - Duration h: 96 - Notes: Literature data.	EC50> 10000 mg/l - Duration h: 48 - Notes: Literature data.
Amine compounds	0.1 - 1 mg/L LC50 Brachydanio rerio 96 h	No information available	No information available

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No product level data available.

### 12.4 Mobility

No information available.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Do not burn, or use a cutting torch on, the empty drum. Empty containers may contain flammable or explosive vapors. Empty containers should be taken for local recycling, recovery or waste disposal.

## 14. Transport information

### 14.1. UN number

<b>UN No. (DOT)</b>	UN1219
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	UN1219
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	UN1219
<b>UN No. (IMDG/ANTAQ)</b>	UN1219
<b>UN No. (ICAO/ANAC)</b>	UN1219
<b>UN No. (DPC)</b>	Not regulated

### 14.2. UN proper shipping name

ISOPROPANOL SOLUTION,

### 14.3 Hazard class(es)

<b>DOT Hazard class</b>	3
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	3
<b>ADR/RID/ADN/ADG Hazard class</b>	3
<b>IMDG/ANTAQ Hazard class</b>	3
<b>ICAO/ANAC Hazard class/division</b>	3
<b>DPC Hazard class</b>	Not regulated

### 14.4 Packing group

<b>DOT Packing group</b>	PG II
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	PG II
<b>ADR/RID/ADN/ADG Packing group</b>	PG II
<b>IMDG/ANTAQ Packing group</b>	PG II
<b>ICAO/ANAC Packing group</b>	PG II
<b>DPC Packing group</b>	Not regulated



### 14.5 Environmental hazard

Yes

### 14.6 Special precautions

Not applicable

## 15. Regulatory Information

### International inventories

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### IMPORTS, Canada

No import volume restrictions.

### U.S. Federal and State Regulations

#### SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Propan-2-ol	N/A	1.0 %	N/A
Polyol compound	N/A	N/A	N/A
2-butoxyethanol	N/A	N/A	N/A
Quaternary ammonium salt	N/A	N/A	N/A
Methanol	N/A	1.0 %	5000 lb final RQ 2270 kg final RQ
Amine compounds	N/A	N/A	N/A

### California Proposition 65

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Methanol 67-56-1	developmental toxicity

### Canadian Classification

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

### Brazilian Regulations

#### Brazil Regulation

This SDS was prepared in accordance with Brazil law NBR 14725.

#### **Federal Police**

Not determined

#### **Army**

Not determined

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<b>ANVISA</b>	Not determined
<b>MTE (NR 15)</b>	No information available

## 16. Other Information

**Supersedes date** 31/Jan/2017

**Revision date** 17/Sep/2018

**Version** 12

**This SDS has been revised in the following section(s)** 3, 15, 16

### HMIS classification

Health	2
Flammability	3
Physical hazard	0
PPE	B

N/A - Not Applicable, N/D - Not Determined.

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SDS no. PID1361  
Version 12  
Revision date 13/Feb/2018  
Supersedes date 09/Feb/2018



## Safety Data Sheet SAFE-CARB\* (All Grades)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** SAFE-CARB\* (All Grades)  
**Product code** PID1361

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Lost circulation material. Weighting agent. Bridging material.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** sdsmi@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**GHS - Classification**

**Health hazards**

Carcinogenicity	Category 1A
-----------------	-------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard Statements**  
H350i - May cause cancer by inhalation

**Precautionary statements**  
P201 - Obtain special instructions before use  
P281 - Use personal protective equipment as required  
P308 + P313 - IF exposed or concerned: Get medical advice/attention

P202 - Do not handle until all safety precautions have been read and understood  
P501 - Dispose of contents/ container to an approved waste disposal plant

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Calcium carbonate	471-34-1	60-100
Crystalline silica (impurity)	14808-60-7	<1

**3.2 Mixtures**

Not applicable

**Comments**

The product contains other ingredients which do not contribute to the overall classification. The exact percentage (concentration) of composition has been withheld as a trade secret

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

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<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-Fighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Fire or high temperatures create:, Carbon oxides (COx), Magnesium oxide.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8. Avoid contact with heat, sparks, open flame, and static discharge. Keep away from sources of ignition - No smoking. Contaminated surfaces will be extremely slippery. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

**6.2 Environmental precautions**

Disposal should be in accordance with applicable regional, national and local laws and regulations.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Shovel into suitable container for disposal. Avoid dust formation. Take precautionary measures against static discharges. Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Use non-sparking tools and equipment.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Take precautionary measures against static discharges. Keep away from open flames, hot surfaces and sources of ignition.

**Hygiene measures**

Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture. Store in original container. Keep away from: Acids Aluminum. Ammonium salts Fluorine. Mercaptans

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits** No biological limit allocated

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Calcium carbonate	Not determined	Not determined	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA respirable fraction	0.05 mg/m <sup>3</sup> TWA	Not determined	0.1 mg/m <sup>3</sup> TWA VLE-PPT (respirable fraction)

Crystalline silica (impurity)  
OSHA - Final PELs - Table Z-3 Mineral Dusts  
(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**IDLH (Immediately Dangerous to Life or Health)**

This product contains substance(s) classified as Immediately Dangerous to Life or Health (IDLH) by the US National Institute for

Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Calcium carbonate 471-34-1	Not determined
Crystalline silica (impurity) 14808-60-7	50 mg/m <sup>3</sup> IDLH (respirable dust)

## 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Keep airborne concentrations below exposure limits. Ensure adequate ventilation. Local exhaust ventilation. enclosure of the process. Apply technical measures to comply with the occupational exposure limits.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution	8.5 - 9.5	@ 100 g/l
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	PMCC

<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	2.6 - 2.8	@ 20 °C
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	825 °C / 1517°F	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No data available.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid dust formation. Protect from moisture.

**10.5 Incompatible materials**

No materials to be especially mentioned.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Product information**

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated

exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

- Inhalation** Inhalation of dust in high concentration may cause irritation of respiratory system. Harmful: danger of serious damage to health by prolonged exposure through inhalation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.
- Eye contact** Dust may cause mechanical irritation.
- Skin contact** Prolonged contact may cause redness and irritation.
- Ingestion** Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium carbonate	= 6450 mg/kg ( Rat )	No data available	No data available
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Calcium carbonate	No data available	No data available	No data available	No data available
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

- Sensitization** Not classified.
- Mutagenic effects** This product does not contain any known or suspected mutagens.
- Carcinogenicity** Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
- Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.
- Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.
- Routes of exposure** Inhalation.
- Routes of entry** Inhalation.
- Specific target organ toxicity - Single exposure** Not classified
- Specific target organ toxicity - Repeated exposure** Not classified.
- Target organ effects** Respiratory system. Lungs.
- Aspiration hazard** Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium carbonate	No information available	No information available	No information available
Crystalline silica (impurity)	No information available	No information available	No information available

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

**UN No. (DOT)** Not regulated  
**UN No. (MT/ANTT)** Not regulated  
**UN No. (TDG)** Not regulated  
**UN/ID No. (ADR/RID/ADN/ADG)** Not regulated  
**UN No. (IMDG/ANTAQ)** Not regulated  
**UN No. (ICAO/ANAC)** Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT/ANTT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

<b>Chemical Name</b>	<b>SARA 302 / TPQs</b>	<b>SARA 313</b>	<b>CERCLA RQ</b>
Calcium carbonate	N/A	N/A	N/A
Crystalline silica (impurity)	N/A	N/A	N/A

**California Proposition 65**

**WARNING**



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Crystalline silica (impurity) 14808-60-7	Carcinogen

**16. Other Information**

<b>Supersedes date</b>	09/Feb/2018
<b>Revision date</b>	13/Feb/2018
<b>Version</b>	12
<b>This SDS has been revised in the following section(s)</b>	6. Accidental release measures
<b>HMIS classification</b>	
Health	1*
Flammability	1
Physical hazard	0
PPE	E

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SDS no. PID1372  
Version 2  
Revision date 22/Jan/2019  
Supersedes date 08/Nov/2018



## Safety Data Sheet SAFE-COR\* C

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name SAFE-COR\* C  
Product code PID1372

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Corrosion inhibitor.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

E-mail address SDS@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements



### Signal word

DANGER

### Hazard Statements

H315 - Causes skin irritation

H318 - Causes serious eye damage

### Precautionary Statements

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or doctor/physician

### Supplementary precautionary statements

P264 - Wash face, hands and any exposed skin thoroughly after handling

P302 + P352 - IF ON SKIN: Wash with plenty of soap and water

P332 + P313 - If skin irritation occurs: Get medical advice/attention

P362 - Take off contaminated clothing and wash before reuse

**Unknown acute toxicity** 60% of the mixture consists of ingredient(s) of unknown toxicity.

## **3. Composition/information on Ingredients**

### 3.1 Substances

Not applicable

### 3.2 Mixtures

Chemical Name	CAS No	Weight-%
Aliphatic heterocyclic amines	68909-77-3	60 - 80

### **Comments**

The product contains other ingredients which do not contribute to the overall classification. The exact percentage (concentration) of composition has been withheld as a trade secret

## **4. First Aid Measures**

### 4.1 First aid measures

---

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Seek medical attention at once.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapors.

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment identified in Section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Evacuate and ventilate the area. Prevent further leakage or spillage if safe to do so.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### Environmental exposure controls

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### Methods for containment

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### Methods for cleaning up

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### Handling

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Aliphatic heterocyclic amines	20 ppm	20 ppm	Not determined	Not determined	Not determined

#### IDLH (Immediately Dangerous to Life or Health)

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Aliphatic heterocyclic amines 68909-77-3	-

## 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation.

### Personal protective equipment

#### Eye protection

Tightly fitting safety goggles. Face-shield.

#### Hand protection

Wear chemical resistant gloves such as nitrile or neoprene. PVC Be aware that liquid may penetrate the gloves. Frequent change is advisable.

#### Respiratory Protection

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

#### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

#### Hygiene Measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

Physical state	No information available
Appearance	No information available
Color	Dark brown
Odor	Ammoniacal
Odor threshold	Not applicable

Property	Values	Remarks
pH	10.42	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	249 °C / 306 °F	@ 760 mm Hg
Flash point	152 °C / 306 °F	
Evaporation rate (BuAc =1)	< 1	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	> 1	
Vapor density	< 1 mm Hg (air = 1)	@ 68 °F / 20 °C

<b>Specific gravity</b>	1.09
<b>Bulk density</b>	No information available
<b>Water solubility</b>	Soluble in water
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	No information available
<b>Explosive properties</b>	No information available
<b>Oxidizing properties</b>	No information available

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Store at room temperature. Do not freeze.

**10.5 Incompatible materials**

Acids. Do not add nitrites or other nitrosating agents to this product. May cause formation of nitrosamine.

**10.6 Hazardous decomposition products**

Thermal decomposition can lead to release of irritating gases and vapors.

## 11. Toxicological Information

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	May cause respiratory irritation.
<b>Eye contact</b>	Corrosive to the eyes and may cause severe damage including blindness.
<b>Skin contact</b>	Causes skin irritation.
<b>Ingestion</b>	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Aliphatic heterocyclic amines	= 1500 mg/kg ( Rat )	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Aliphatic heterocyclic amines	No data available	No data available	No data available	No data available

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	No evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Eye contact.
<b>Routes of entry</b>	None known.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

#### Toxicity to algae

EC50 72h : > 100 mg/l.

#### Toxicity to fish

LC50 96h : > 100 mg/l.

#### Toxicity to daphnia and other aquatic invertebrates

EC50 48h : > 100 mg/l.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Aliphatic heterocyclic amines	No information available	No information available	No information available

### 12.2 Persistence and degradability

Product is biodegradable.

### 12.3 Bioaccumulative potential

No bioaccumulation expected due to high molecular weight.

### 12.4 Mobility

The product is water soluble, and may spread in water systems.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
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**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Does not comply
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Does not comply
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Does not comply
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

<b>Chemical Name</b>	<b>SARA 302 / TPQs</b>	<b>SARA 313</b>	<b>CERCLA RQ</b>
Aliphatic heterocyclic amines	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**Brazilian Regulations**

**Brazil Regulation** This SDS was prepared in accordance with Brazil law NBR 14725.

**Federal Police** Not determined

**Army** Not determined

**ANVISA** Not Listed

**MTE (NR 15)** No information available

**16. Other Information**

**Supersedes date** 08/Nov/2018

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**Revision date** 22/Jan/2019

**Version** 2

**This SDS has been revised in the following section(s)** 16

**HMIS classification**

Health	2
Flammability	1
Physical hazard	0
PPE	X

N/A - Not Applicable, N/D - Not Determined.

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**Disclaimer**

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## Safety Data Sheet SAFE-COR\*

### 1. Identification

#### 1.1 Product identifier

**Product name** SAFE-COR\*  
**Product code** PID1370

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Corrosion inhibitor.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Serious eye damage/eye irritation	Category 2
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##### Environmental hazards

Chronic aquatic toxicity	Category 3
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**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
WARNING

**Hazard Statements**

H319 - Causes serious eye irritation  
H412 - Harmful to aquatic life with long lasting effects

**Precautionary Statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling  
P273 - Avoid release to the environment  
P280 - Wear protective gloves, protective clothing, eye protection  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P337 + P313 - If eye irritation persists: Get medical advice/attention  
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	68909-77-3	30 - 60

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

**Hazardous Material Information Review Act registry number (HMIRA registry #)** 11100

**Filing Date:** 31/Jan/2017

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapors.

### 5.3 Advice for firefighters

**Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid frost. Store at room temperature. Avoid contact with: Acids. Nitrites.

**Packaging materials**                      Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits**                              Contains no substances with occupational exposure limit values No biological limit allocated

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina -	Brazil - Occupational	Mexico -
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			Occupational Exposure Limits - TWAs (CMPs)	Exposure Limits - TWAs (LTs)	Occupational Exposure Limits - TWAs (LMPE-PPTs)
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues 68909-77-3	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Local exhaust ventilation.

**Personal protective equipment**

**Eye protection**

Tightly fitting safety goggles.

**Hand protection**

Impervious gloves made of: Neoprene PVC Nitrile  
Break through time >480 minutes  
Glove thickness 0.4 mm

**Respiratory Protection**

Be aware that liquid may penetrate the gloves. Frequent change is advisable.  
All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing and gloves, including the inside, before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Color</b>	Dark amber
<b>Odor</b>	Slight
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	~ 11.5	
<b>pH @ dilution</b>	No information available	
<b>Melting point</b>	No information available	
<b>Boiling point</b>	> 100 °C / > 212 °F	
<b>Flash point</b>	151.6 °C / 305 °F	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.10	
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	4 cP	@ 25 °C
<b>Partition Coefficient (n-octanol/water)</b>	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	-12°C (<11°F )
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Store at room temperature. Avoid frost.

**10.5 Incompatible materials**

Acids. Do not add nitrites or other nitrosating agents to this product. May cause formation of nitrosamine.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of vapors in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Causes serious eye irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	1500 mg/kg (rat)	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Eye contact.

<b>Routes of entry</b>	None known.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	OECD; Acute LC50; 96 hours Semi-static; Fish > 45 g/l	OECD; Acute ErC50 (growth rate); 72 hours Static; Algae; 45 mg/kg OECD 201 Algae, Growth Inhibitor Test; Chronic NOECr; 72 hours Static; Algae; 3.2 mg/l	OECD; Acute EC50; 48 hours Static, Daphnia; > 100 g/l

### 12.2 Persistence and degradability

Not readily biodegradable.

### 12.3 Bioaccumulative potential

No bioaccumulation expected due to high molecular weight.

### 12.4 Mobility

The product is water soluble, and may spread in water systems.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

## 13. Disposal Considerations

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
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<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Does not comply
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**IMPORTS, Canada**

No import volume restrictions.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

<b>Chemical Name</b>	<b>SARA 302 / TPQs</b>	<b>SARA 313</b>	<b>CERCLA RQ</b>
Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivs. residues	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other Information**

<b>Supersedes date</b>	07/Jul/2017
<b>Revision date</b>	19/Aug/2020
<b>Version</b>	12
<b>This SDS has been revised in the following section(s)</b>	All sections. No changes with regard to classification have been made.
<b>HMIS classification</b>	
Health	2
Flammability	1
Physical hazard	0
PPE	E

N/A - Not Applicable, N/D - Not Determined.

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SDS no. PID1387  
Version 10  
Revision date 13/Aug/2020  
Supersedes date 30/Mar/2017



## Safety Data Sheet SAFE-SCAV\* CA

### 1. Identification

#### 1.1 Product identifier

**Product name** SAFE-SCAV\* CA  
**Product code** PID1387

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Oxygen Scavenger.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

**Health hazards** Not classified

**Environmental hazards** Not classified

##### Physical Hazards

Combustible dust

**2.2 Label elements**

**Signal word**  
WARNING

**Hazard Statements**  
May form combustible dust concentrations in air

**Precautionary Statements**  
P240 - Ground or bond container and receiving equipment  
P241 - Use explosion-proof electrical, ventilating, lighting, equipment  
P243 - Take precautionary measures against static discharge

**Hazards not otherwise classified**  
None known

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Organic salt	Proprietary	60-100

**3.2 Mixtures**

Not applicable

**Comments**  
Proprietary component(s) in section 3 of this SDS does not/do not trigger application of trade secret exemption under Hazardous Materials Information Review Act (HMIRA). The proprietary component in this product contributes to combustible dust classification.

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact** Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

**Eye Contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-Fighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**  
Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**  
Do not use water jet.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
Dust may form explosive mixture in air.

**Hazardous combustion products**  
Carbon oxides (COx).

**5.3 Advice for firefighters**

**Special protective equipment and precautions for fire-fighters**  
As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**  
Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Take precautionary measures against static discharges.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidizing agents. Strong bases. Metals.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Organic salt	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Organic salt	Not determined

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Wear chemical resistant gloves such as nitrile or neoprene.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Crystalline
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	5.5 - 8.0	@ 10%
Melting point	No information available	
Boiling point	No information available	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.65	20 °C
Bulk density	No information available	

<b>Water solubility</b>	Soluble in water
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Dynamic viscosity</b>	No information available
<b>Partition Coefficient (n-octanol/water)</b>	No information available
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard
<b>Oxidizing properties</b>	None known.

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid dust formation. Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges.

**10.5 Incompatible materials**

Metals. Strong bases. Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact** Dust may cause mechanical irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Organic salt	5005 mg/kg (rat)	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Organic salt	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

**Sensitization** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.

**Routes of Exposure** None known.

**Routes of entry** No route of entry noted.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**  
This product is not considered toxic to algae.

**Toxicity to fish**  
This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Organic salt	No information available	No information available	No information available

**12.2 Persistence and degradability**

Not readily biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated

**IMDG/ANTAQ Hazard class** Not regulated  
**ICAO/ANAC Hazard class/division** Not regulated  
**DPC Hazard class** Not regulated

**14.4 Packing group**

**DOT Packing group** Not regulated  
**ANTT Packing group** Not regulated  
**TDG Packing group** Not regulated  
**ADR/RID/ADN/ADG Packing group** Not regulated  
**IMDG/ANTAQ Packing group** Not regulated  
**ICAO/ANAC Packing group** Not regulated  
**DPC Packing group** Not regulated

**14.5 Environmental hazard**

Marine pollutant No

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Organic salt	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

## 16. Other Information

**Supersedes date** 30/Mar/2017

**Revision date** 13/Aug/2020

**Version** 10

**This SDS has been revised in the following section(s)** All sections. Product Code change No changes with regard to classification have been made.

### HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

N/A - Not Applicable, N/D - Not Determined.

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SDS no. PID1392  
Version 11  
Revision date 13/Oct/2020  
Supersedes date 20/Aug/2020



## Safety Data Sheet SAFE-SCAV\* NA

### 1. Identification

#### 1.1 Product identifier

**Product name** SAFE-SCAV\* NA  
**Product code** PID1392

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Oxygen Scavenger.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

##### Prepared by

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Serious eye damage/eye irritation	Category 2
-----------------------------------	------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
WARNING

**Hazard Statements**

H319 - Causes serious eye irritation

**Precautionary Statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves, protective clothing, eye protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P337 + P313 - If eye irritation persists: Get medical advice/attention

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Ammonium hydrogensulfite	10192-30-0	30 - 60
Sulphur Dioxide (Impurity)	7446-09-5	0.1 - 1

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

**Hazardous Material Information Review Act registry number (HMIRA registry #)** 11093

**Filing Date:** 31/Jan/2017

**4. First Aid Measures**

#### **4.1 First aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

#### **5.1 Extinguishing media**

**Suitable extinguishing media**  
Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**  
None known.

#### **5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
None known.

**Hazardous combustion products**  
Heating or fire can release toxic gas, Sulphur oxides, Nitrogen oxides (NO<sub>x</sub>), Oxides of., Ammonia, Amines.

#### **5.3 Advice for firefighters**

**Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

This product slowly releases sulphur dioxide in contact with air. Use only in well-ventilated areas. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with:  
Strong oxidizing agents. Acids. Alkalis. Keep at 5-30°C.

**Packaging materials**                      Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits**                              Exposure limit noted is for decomposition product Sulfur dioxide.

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits -	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits -

			TWAs (CMPs)		TWAs (LMPE-PPTs)
Ammonium hydrogensulfite	Not determined	Not determined	Not determined	Not determined	Not determined
Sulphur Dioxide (Impurity)	Not determined	5 ppm TWA 13 mg/m <sup>3</sup> TWA	2 ppm TWA	4 ppm TWA LT; 10 mg/m <sup>3</sup> TWA LT	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Ammonium hydrogensulfite 10192-30-0	-
Sulphur Dioxide (Impurity) 7446-09-5	100 ppm IDLH

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

- Eye protection** Tightly fitting safety goggles.
- Hand protection** Impervious gloves made of: Neoprene Nitrile PVC  
Break through time >480 minutes  
Glove thickness >=0.4 mm  
Be aware that liquid may penetrate the gloves. Frequent change is advisable.
- Respiratory Protection** All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
- Hygiene Measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Color</b>	Straw - Yellow
<b>Odor</b>	Pungent Sulfur
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	No information available	
<b>pH @ dilution</b>	4.9 - 5.5	1% solution
<b>Melting point</b>	No information available	
<b>Boiling point</b>	105 °C / 221 °F	
<b>Flash point</b>	No information available	
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
<b>Vapor pressure</b>	18 mmHg	@ 20 °C
<b>Vapor density</b>	<1	(Air = 1.0)
<b>Specific gravity</b>	1.27 - 1.39	
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Miscible with water.	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Partition Coefficient (n-octanol/water)</b>	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Reacts violently with oxidizers. Liberates poisonous sulfur dioxide gas on contact with acid.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid heat, flames and other sources of ignition. Keep at temperatures between 5-30°C.

**10.5 Incompatible materials**

Strong oxidizing agents. Acids. Alkalis.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Product information**

This product may release ammonia or amines when heated or during pH adjustment. Ammonia is a severe eye, skin and respiratory irritant. Ammonia has a very strong odor and can be detected at levels as low as 5 ppm. Many amines are also eye, skin and respiratory irritants.

Bisulfites may cause skin sensitization in sulfite sensitive persons. Bisulfites may also cause respiratory sensitization in asthmatics and sulfite sensitive persons.

**Inhalation**

Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact**

Causes serious eye irritation.

**Skin contact**

Prolonged contact may cause redness and irritation.

**Ingestion**

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ammonium hydrogensulfite	No data available	No data available	No data available
Sulphur Dioxide (Impurity)	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Ammonium hydrogensulfite	No data available	No data available	No data available	No data available
Sulphur Dioxide (Impurity)	No data available	A4 Not Classifiable as a Human Carcinogen	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

**Sensitization**

Repeated or prolonged contact may cause allergic reactions in very susceptible persons.

**Mutagenic effects**

This product does not contain any known or suspected mutagens.

<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Eye contact. Inhalation.
<b>Routes of entry</b>	Eye contact. Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

#### **Toxicity to algae**

This product is not considered toxic to algae.

#### **Toxicity to fish**

This product is not considered toxic to fish.

#### **Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

#### **Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ammonium hydrogensulfite	OECD 203 Fish LC50 > 464 mg/l - Duration h: 96 - Notes: By analogy to product with similar composition	Algae EC50 = 43.8 mg/l - Duration h: 72 - Notes: By analogy to product with similar composition.	Daphnia magna EC50 = 89 mg/l - Duration h: 48 - Notes: By analogy to product with similar composition
Sulphur Dioxide (Impurity)	No information available	No information available	No information available

### 12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

### 12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

### 12.4 Mobility

The product is miscible with water. May spread in water systems.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)

This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	NA3082
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

Other regulated substances, liquid, n.o.s. (contains Ammonium hydrogensulfite)  
(add RQ if shipped in containers >RQ for DOT only)

**DOT reportable quantity** Product (RQ): 862 gallons (Ammonium hydrogensulfite)  
(add RQ if shipped in containers >RQ for DOT only)

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	9,
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	PG III
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Ammonium hydrogensulfite	N/A	N/A	5000 lb final RQ 2270 kg final RQ
Sulphur Dioxide (Impurity)	500 lb TPQ	N/A	N/A

**California Proposition 65**

**WARNING**



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
---------------	---------------------------

Sulphur Dioxide (Impurity) 7446-09-5	developmental toxicity
---	------------------------

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

<b>Brazil Regulation</b>	This SDS was prepared in accordance with Brazil law NBR 14725.
<b>Federal Police</b>	Not determined
<b>Army</b>	Not determined
<b>ANVISA</b>	Not determined

**16. Other Information**

<b>Supersedes date</b>	20/Aug/2020
<b>Revision date</b>	13/Oct/2020
<b>Version</b>	11
<b>This SDS has been revised in the following section(s)</b>	15, 16 No changes with regard to classification have been made.
<b>HMIS classification</b>	
Health	2
Flammability	1
Physical hazard	0
PPE	E

N/A - Not Applicable, N/D - Not Determined.

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SDS no. 143799  
Version 2  
Revision date 22/Jun/2020  
Supersedes date 06/Oct/2015



## Safety Data Sheet SALT SATURATED MUD SYSTEM

### 1. Identification

#### 1.1 Product identifier

**Product name** SALT SATURATED MUD SYSTEM  
**Product code** 143799

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Water based system.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### **GHS - Classification**

**Health hazards** Not classified

**Environmental hazards** Not classified  
**Physical Hazards** Not classified

**2.2 Label elements**

**Signal word**  
None

**Hazard Statements**  
This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements**  
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Glyoxal	107-22-2	<0.1

**Comments**  
The product contains other ingredients which do not contribute to the overall classification.

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

The exact percentage (concentration) of composition has been withheld as a trade secret.

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact** Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

**Eye Contact** Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Carbon oxides (COx).

### **5.3 Advice for firefighters**

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment identified in Section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Evacuate and ventilate the area.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking. Avoid contact with: Strong oxidizing agents.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Glyoxal	0.1 mg/m <sup>3</sup>	Not determined	0.1 mg/m <sup>3</sup> TWA	Not determined	0.1 mg/m <sup>3</sup> TWA VLE-PPT (inhalable fraction and vapor)

**IDLH (Immediately Dangerous to Life or Health)**

This product contains substance(s) classified as Immediately Dangerous to Life or Health (IDLH) by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Glyoxal 107-22-2	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation.

**Personal protective equipment**

**Eye protection**

Safety glasses with side-shields.

**Hand protection**

Wear chemical resistant gloves such as nitrile or neoprene.

**Respiratory Protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

**Skin and body protection**

Wear suitable protective clothing, Provide eyewash station.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	Viscous
<b>Color</b>	Light brown
<b>Odor</b>	Hydrocarbon odor.
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	6.0 - 9.0	
<b>pH @ dilution</b>	No information available	
<b>Melting point</b>	No information available	
<b>Boiling point</b>	100 - 121 °C / 212 - 250 °F	
<b>Flash point</b>	> 93.3 °C / > 200 °F	
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.2 - 1.8	@ 20 °C
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Miscible with water.	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Partition Coefficient (n-octanol/water)</b>	No information available	
<b>Explosive properties</b>	No information available	

**Oxidizing properties** No information available

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** No information available  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

None known.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

Carbon oxides (COx).

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact** May cause slight irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glyoxal	200 mg/kg (rat)	12700 mg/kg (Rabbit)	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Glyoxal	No data available	A4 Not Classifiable as a	No data available	No data available

		Human Carcinogen	
--	--	------------------	--

**Delayed and immediate effects and chronic effects from short and long term exposure**

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing >0.1%.
<b>Mutagenic effects</b>	Contains an known or suspected mutagen.
<b>Carcinogenicity</b>	Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Eye contact. Skin contact. Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**  
See component information below.

**Toxicity to fish**  
See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Glyoxal	> 1000 mg/l LC50 Scophthalmus Maximus 96h SLB data	207 mg/l EC50 Skeletonema 72h SLB data	259 mg/L LC50 Acartia 48h SLB Data

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No data available.

**12.4 Mobility**

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

## 15. Regulatory Information

### International inventories

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### IMPORTS, Canada

No import volume restrictions.

### U.S. Federal and State Regulations

#### **SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Glyoxal	N/A	N/A	N/A

### California Proposition 65

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

### Canadian Classification

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

## 16. Other Information

**Supersedes date** 06/Oct/2015

**Revision date** 22/Jun/2020

**Version** 2

**This SDS has been revised in the following section(s)** 1, 2, 3, 6, 7, 9, 11, 12, 15, 16 There have been changes with regard to classification.

**HMIS classification**

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Health	1
Flammability	1
Physical hazard	0
PPE	B

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## Safety Data Sheet SAPP

### 1. Identification of the substance/mixture and of the company/undertaking

#### 1.1 Product identifier

Product name SAPP  
Product code PID1436  
Molecular weight 222.15

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use SAPP dispersant. Thinner.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS Classification

##### Health hazards

Serious eye damage/eye irritation	Category 2
-----------------------------------	------------

Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label elements



**Signal word**

WARNING

**Hazard Statements**

H319 - Causes serious eye irritation

**Precautionary statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P337 + P313 - If eye irritation persists: Get medical advice/attention

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Contains**

Disodium dihydrogen diphosphate

**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

**Australian statement of hazardous/dangerous nature**

Classified as Hazardous according to the criteria of NOHSC.

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

### 3. Composition/information on Ingredients

**3.1 Substances**

Chemical Name	EC No	CAS No	Weight-%
Disodium dihydrogen diphosphate	231-835-0	7758-16-9	60-100

**3.2 Mixtures**

Not applicable

### 4. First Aid Measures

**4.1 First aid measures**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

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<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Firefighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Fire or high temperatures create: Oxides of phosphorus.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

### Special Fire-Fighting Procedures

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Cover powder spill with plastic sheet or tarp to minimise spreading. Prevent further leakage or spillage if safe to do so.

#### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

#### **Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid excessive heat for prolonged periods of time. Protect from moisture. Avoid contact with: Strong alkalis.

**Storage class** Chemical storage.

**Packaging materials** Use specially constructed containers only.

## 8. Exposure Controls/Personal Protection

## 8.1 Control parameters

### Exposure Limits

NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.  
No biological limit allocated

### Component Information

Chemical Name	Arabic	Australia	Egypt
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined
Chemical Name	India	Indonesian	Japan
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined
Chemical Name	Kazakhstan	Kuwait	New Zealand
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined
Chemical Name	Malaysia	Philippines	Russia
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined
Chemical Name	Thailand	Vietnam	Turkey
Disodium dihydrogen diphosphate	Not determined	Not determined	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation

### Personal protective equipment

#### Eye protection

Use eye protection according to EN 166, designed to protect against powders and dusts  
Tightly fitting safety goggles Safety glasses with side-shields

#### Hand protection

Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene PVC Frequent change is advisable

#### Respiratory protection

No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (BS EN 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

#### Skin and body protection

Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

### Hygiene Measures

Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use



## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Crystalline Powder
<b>Odour</b>	Odourless
<b>Colour</b>	White
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	No information available	
<b>pH @ dilution</b>	4.0 - 5.0	@ 10 g/l
<b>Melting / freezing point</b>	No information available	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	No information available	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
<b>Vapour pressure</b>	No information available	
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	1.8 - 1.9 sg	20 °C
<b>Bulk density</b>	1000-1200 kg/m <sup>3</sup>	
<b>Relative density</b>	No information available	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidising properties</b>	None known	

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	222.15
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Protect from moisture. Avoid excessive heat for prolonged periods of time.

**10.5 Incompatible materials**

Strong alkalies.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
<b>Eye contact</b>	Causes serious eye irritation.
<b>Skin contact</b>	Prolonged skin contact may cause skin irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Disodium dihydrogen diphosphate	= 1800 mg/kg (Rat)	No data available	> 0.58 mg/L ( Rat ) 4 h

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of Exposure** Eye contact.

<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Disodium dihydrogen diphosphate	No information available	No information available	No information available

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

**Mobility**

Soluble in water.

**Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues/unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated

**IMDG Packing group** Not regulated

**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@sib.com for info regarding transport in Bulk.

**15. Regulatory Information**

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

This safety data sheet complies with the requirements of:  
The Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

**Australian Standard for the Uniform Scheduling of Drugs and Poisons**

No poisons schedule number allocated

**New Zealand Hazard Classification** Classified

**HSNO approval no.** HSR002503

**Group number** 6.4A

**National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].**

**National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].**

**National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].**

**Safe Work Australia.**

**Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).**

**Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)**

**Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)**

**The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)**

**International inventories**

**USA, Toxic Substances Control Act inventory (TSCA)** Complies

**Canada (DSL)** Complies

**Philippines (PICCS)** Complies

**Inventory - Japan - Existing and** Complies

**New Chemicals list**

**China (IECSC)** Complies

Australia (AICS) Complies  
Korea (KECL) Complies  
Inventory - New Zealand - Inventory of Chemicals (NZIoC) Complies

## 16. Other Information

**Prepared by** Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse  
**Supersedes Date:** 11/Jun/2014  
**Revision date** 06/Jul/2017  
**Version** 2  
**This SDS has been revised in the following section(s)** All sections Product Code change No changes with regard to classification have been made.

### Key literature references and sources for data

www.ChemADVISOR.com  
Supplier  
National Chemical Inventories  
National regulatory information  
National occupational exposure limits

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SDS no. 141507  
Version 1  
Revision date 06/Sep/2018  
Supersedes date None



## Safety Data Sheet SEAL-N-PEEL\* (CaBr2)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name SEAL-N-PEEL\* (CaBr2)  
Product code 141507

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid system.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

Schlumberger Canada, Ltd.  
200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-613-992-4624

E-mail address MISDS@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Serious eye damage/eye irritation	Category 1
Carcinogenicity	Category 1A

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

H318 - Causes serious eye damage

H350 - May cause cancer

**Precautionary Statements**

P201 - Obtain special instructions before use

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P281 - Use personal protective equipment as required

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P308 + P313 - IF exposed or concerned: Get medical advice/attention

P310 - Immediately call a POISON CENTER or doctor/physician

P202 - Do not handle until all safety precautions have been read and understood

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	CAS No	Weight-%
Calcium bromide	7789-41-5	10 - 30
Castor oil, sulfated, sodium salt	68187-76-8	1 - 5

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret

**4. First Aid Measures**

**4.1 First aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Seek medical attention.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapors.

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. If spilled, take caution, as material can cause surfaces to become very slippery.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid excessive heat for prolonged periods of time. Avoid contact with: Strong oxidizing agents. Strong acids.

**Packaging materials**                      Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits**                              Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Calcium bromide	Not determined	Not determined	Not determined	Not determined	Not determined
Castor oil, sulfated, sodium salt	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

This product contains substance(s) classified as Immediately Dangerous to Life or Health (IDLH) by the US National Institute for

Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Calcium bromide 7789-41-5	-
Castor oil, sulfated, sodium salt 68187-76-8	-

## 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Use protective gloves made of: Nitrile Neoprene PVC Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Viscous
<b>Color</b>	Light brown
<b>Odor</b>	Hydrocarbon-like
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	6-9	
<b>pH @ dilution</b>	6-10	@ 10%
<b>Melting / freezing point</b>	No information available	
<b>Boiling point/range</b>	100 °C / 212 °F	
<b>Flash point</b>	> 93 °C / > 200 °F	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	

<b>Flammability (solid, gas)</b>	Not applicable
<b>Flammability Limit in Air</b>	
<b>Upper flammability limit</b>	No information available
<b>Lower flammability limit</b>	No information available
<b>Vapor pressure</b>	No information available
<b>Vapor density</b>	No information available
<b>Specific gravity</b>	No information available
<b>Bulk density</b>	No information available
<b>Water solubility</b>	Miscible with water.
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	15-50 cPs
<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	No information available
<b>Explosive properties</b>	No information available
<b>Oxidizing properties</b>	No information available

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid excessive heat for prolonged periods of time.

**10.5 Incompatible materials**

Strong oxidizing agents. Strong acids.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological Information

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

Inhalation of vapors in high concentration may cause irritation of respiratory system.  
Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury,

and other diseases, including silicosis and lung cancer.

**Eye contact** Causes serious eye damage.  
**Skin contact** Prolonged skin contact may cause skin irritation.  
**Ingestion** Ingestion may cause stomach discomfort.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium bromide	= 4100 mg/kg ( Rat )	No data available	No data available
Castor oil, sulfated, sodium salt	OECD 423 Oral Rat LD50> 2000 mg/kg - Duration: 1h - Lamberti internal data	OECD 402 Skin Rat LD50> 2000 mg/kg - Duration: 24h - By analogy to product with similar composition	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Calcium bromide	No data available	No data available	No data available	No data available
Castor oil, sulfated, sodium salt	No data available	No data available	No data available	No data available

**Sensitization** This product does not contain any components suspected to be sensitizing.  
**Mutagenic effects** This product does not contain any known or suspected mutagens.  
**Carcinogenicity** Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.  
**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.  
**Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.  
**Routes of exposure** Eye contact.  
**Routes of entry** No route of entry noted.  
**Specific target organ toxicity - Single exposure** Not classified  
**Specific target organ toxicity - Repeated exposure** Not classified.  
**Aspiration hazard** Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**  
This product is not considered toxic to algae.

**Toxicity to fish**  
This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other
---------------	------------------	-------------------	-------------------------------

			<b>aquatic invertebrates</b>
Calcium bromide	No information available	No information available	No information available
Castor oil, sulfated, sodium salt	No information available	No information available	No information available

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility**

The product is miscible with water. May spread in water systems.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

**UN No. (DOT)** Not regulated  
**UN No. (MT/ANTT)** Not regulated  
**UN No. (TDG)** Not regulated  
**UN/ID No. (ADR/RID/ADN/ADG)** Not regulated  
**UN No. (IMDG/ANTAQ)** Not regulated  
**UN No. (ICAO/ANAC)** Not regulated  
**UN No. (DPC)** Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

**DOT Hazard class** Not regulated  
**ANTT Hazard class** Not regulated  
**TDG Hazard class** Not regulated  
**ADR/RID/ADN/ADG Hazard class** Not regulated  
**IMDG/ANTAQ Hazard class** Not regulated  
**ICAO/ANAC Hazard class/division** Not regulated  
**DPC Hazard class** Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Calcium bromide	N/A	N/A	N/A
Castor oil, sulfated, sodium salt	N/A	N/A	N/A

**California Proposition 65**

**WARNING**



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Crystalline silica (impurity) 14808-60-7	Carcinogen

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other Information**

**Revision date** 06/Sep/2018

**Version** 1

**This SDS has been revised in the following section(s)** This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made. Updated according to GHS/CLP.

**HMIS classification**

Health	3*
Flammability	1
Physical hazard	0
PPE	X

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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## Safety Data Sheet SEAL-N-PEEL\* (KCl-NaCl-NaBr)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** SEAL-N-PEEL\* (KCl-NaCl-NaBr)  
**Product code** 13246

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid system.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**Schlumberger Serviços de Petróleo LTDA**  
Rua Internacional 500Cavaleiro – Macaé, RJ. CEP: 27.930-075  
Telefone: +55 22 3311-7051

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Carcinogenicity	Category 1A
-----------------	-------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Precautionary Statements

P201 - Obtain special instructions before use  
P281 - Use personal protective equipment as required  
P308 + P313 - IF exposed or concerned: Get medical advice/attention

P201 - Obtain special instructions before use  
P202 - Do not handle until all safety precautions have been read and understood  
P281 - Use personal protective equipment as required  
P308 + P313 - IF exposed or concerned: Get medical advice/attention  
P405 - Store locked up  
P501 - Dispose of contents/ container to an approved waste disposal plant

**Unknown acute toxicity** 1.3% of the mixture consists of ingredient(s) of unknown toxicity.

## **3. Composition/information on Ingredients**

### 3.1 Substances

Not applicable

### 3.2 Mixtures

Chemical Name	CAS No	Weight-%
Crystalline silica (impurity)	14808-60-7	0.1 - 1

### **Comments**

The product contains other ingredients which do not contribute to the overall classification. Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

## **4. First Aid Measures**

### 4.1 First aid measures

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact** Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

**Eye Contact** Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

<b>General advice</b>	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
<b>Symptoms</b>	
<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

<b>Notes to physician</b>	Treat symptomatically
---------------------------	-----------------------

## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Carbon oxides (COx).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment identified in Section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Evacuate and ventilate the area. Prevent further leakage or spillage if safe to do so.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment.

### **6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA respirable fraction	0.05 mg/m <sup>3</sup> TWA	Not determined	0.1 mg/m <sup>3</sup> TWA VLE-PPT (respirable fraction)

Crystalline silica (impurity)  
OSHA - Final PELs - Table Z-3 Mineral Dusts  
(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**IDLH (Immediately Dangerous to Life or Health)**

This product contains substance(s) classified as Immediately Dangerous to Life or Health (IDLH) by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Crystalline silica (impurity) 14808-60-7	50 mg/m <sup>3</sup> IDLH (respirable dust)

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Wear chemical resistant gloves such as nitrile or neoprene.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Provide eyewash station.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	No information available
<b>Appearance</b>	Viscous
<b>Color</b>	Light brown
<b>Odor</b>	Hydrocarbon odor.
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	6.0 - 9.0	
<b>pH @ dilution</b>	No information available	
<b>Melting / freezing point</b>	No information available	
<b>Boiling point/range</b>	100 - 121 °C / 212 - 250 °F	
<b>Flash point</b>	> 93.3 °C / > 200 °F	
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.02 - 1.8	@ 20 °C
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Miscible with water.	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	
<b>Explosive properties</b>	No information available	
<b>Oxidizing properties</b>	No information available	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

None known.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

Carbon oxides (COx).

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact** May cause slight irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources);	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

	Monograph 68 [1997] Group 1; Monograph 68 [1997]			
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<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Eye contact. Skin contact. Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Target organ effects</b>	Respiratory system.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

#### Toxicity to algae

See component information below.

#### Toxicity to fish

See component information below.

#### Toxicity to daphnia and other aquatic invertebrates

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No data available.

### 12.4 Mobility

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

**14.4 Packing group**

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

## 15. Regulatory Information

### International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### IMPORTS, Canada

No import volume restrictions.

### U.S. Federal and State Regulations

#### SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Crystalline silica (impurity)	N/A	N/A	N/A

### California Proposition 65

#### WARNING



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Crystalline silica (impurity) 14808-60-7	Carcinogen

### Canadian Classification

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

### Brazilian Regulations Brazil Regulation

This SDS was prepared in accordance with Brazil law NBR 14725.

<b>Federal Police</b>	Not determined
<b>Army</b>	Not determined
<b>ANVISA</b>	Not Listed
<b>MTE (NR 15)</b>	No information available

## 16. Other Information

<b>Supersedes date</b>	20/May/2015
<b>Revision date</b>	18/Sep/2018
<b>Version</b>	3
<b>This SDS has been revised in the following section(s)</b>	1, 15, 16
<b>HMIS classification</b>	
Health	1*
Flammability	1
Physical hazard	0

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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## Safety Data Sheet SODA ASH

### 1. Identification

#### 1.1 Product identifier

**Product name** SODA ASH  
**Product code** PID1477  
**Synonyms** SODIUM CARBONATE

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** pH modifier.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Serious eye damage/eye irritation	Category 2
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**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
WARNING

**Hazard Statements**

H319 - Causes serious eye irritation

**Precautionary Statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves, protective clothing, eye protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P337 + P313 - If eye irritation persists: Get medical advice/attention

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Sodium carbonate	497-19-8	60-100

**3.2 Mixtures**

Not applicable

**Comments**

No Comments.

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth

to an unconscious person. Seek medical attention if irritation occurs.

**Skin contact**

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

**Eye Contact**

Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice**

The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation**

Please see Section 11. Toxicological Information for further information.

**Ingestion**

Please see Section 11. Toxicological Information for further information.

**Skin contact**

Please see Section 11. Toxicological Information for further information.

**Eye contact**

Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician**

Treat symptomatically

**5. Fire-Fighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Carbon oxides (CO<sub>x</sub>), Sodium oxides.

**5.3 Advice for firefighters**

**Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

**Methods for cleaning up**

Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture. Avoid contact with: Metals. Strong oxidizing agents. Strong acids.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits** Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m<sup>3</sup> (Inhalable); 3 mg/m<sup>3</sup> (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m<sup>3</sup> (Total); 5 mg/m<sup>3</sup> (Respirable).

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Sodium carbonate	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Sodium carbonate 497-19-8	Not determined

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required. Provide appropriate exhaust ventilation at places where dust is formed.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Wear chemical resistant gloves such as nitrile or neoprene. Frequent change is advisable
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	> 12	@ 10 g/l
Melting point	851 °C / 1564 °F	
Boiling point	No information available	
Flash point	Non-flammable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 400°C (752°F)	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	Not determined	
Explosive properties	Not applicable	
Oxidizing properties	None known.	
<b>9.2 Other information</b>		
Pour point	No information available	
Molecular weight	No information available	
VOC content(%)	None	
Density	No information available	

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

Reacts violently with acids.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerization**

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

### 10.5 Incompatible materials

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

- Inhalation** Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
- Eye contact** Causes serious eye irritation.
- Skin contact** Prolonged contact may cause redness and irritation.
- Ingestion** Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium carbonate	4090 mg/kg (rat)	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Sodium carbonate	No data available	No data available	No data available	No data available

**Delayed and immediate effects and chronic effects from short and long term exposure**

- Sensitization** This product does not contain any components suspected to be sensitizing.
- Mutagenic effects** This product does not contain any known or suspected mutagens.
- Carcinogenicity** This product does not contain any known or suspected carcinogens.
- Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.
- Developmental toxicity** Not known to cause birth defects or have a deleterious effect on a developing fetus.
- Routes of Exposure** Eye contact. Inhalation.
- Routes of entry** No route of entry noted.
- Specific target organ toxicity - Single exposure** Not classified
- Specific target organ toxicity - Repeated exposure** Not classified.
- Aspiration hazard** Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium carbonate	310 - 1220 mg/L LC50 Pimephales promelas 96 h = 300 mg/L LC50 Lepomis macrochirus 96 h	= 242 mg/L EC50 Nitzschia 120 h	= 265 mg/L EC50 Daphnia magna 48 h

### 12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

### 12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

### 12.4 Mobility

Soluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

### 12.6 Other adverse effects.

None known.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

**Disposal Method**

Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging**

Empty containers should be taken for local recycling, recovery or waste disposal.

## 14. Transport information

### 14.1. UN number

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

**14.4 Packing group**

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
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**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that

it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Sodium carbonate	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Brazil Regulation** This SDS was prepared in accordance with Brazil law NBR 14725.

**Federal Police** Not determined

**Army** Not determined

**ANVISA** Not determined

**16. Other Information**

**Supersedes date** 03/Jul/2020

**Revision date** 13/Oct/2020

**Version** 3

**This SDS has been revised in the following section(s)** 3, 15, 16 No changes with regard to classification have been made.

**HMIS classification**

Health	1
Flammability	0
Physical hazard	0
PPE	E

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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SDS no. PID1490  
Version 1  
Revision date 12/Jan/2018  
Supersedes date None



## Safety Data Sheet SODIUM BROMIDE BRINE

### 1. Identification

#### 1.1 Product identifier

**Product name** SODIUM BROMIDE BRINE  
**Product code** PID1490

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Completion brine.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

**Health hazards** Not classified  
**Environmental hazards** Not classified

**Physical Hazards** Not classified

## **2.2 Label elements**

### **Signal word**

None

### **Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### **Precautionary statements**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

### **Hazards not otherwise classified**

None known

**Unknown acute toxicity** Not applicable.

## **3. Composition/information on Ingredients**

### **3.1 Substances**

Not applicable

### **3.2 Mixtures**

<b>Chemical Name</b>	<b>CAS No</b>	<b>Weight-%</b>
Sodium bromide	7647-15-6	30 - 60

### **Comments**

The product contains other ingredients which do not contribute to the overall classification.

## **4. First aid measures**

### **4.1 First aid measures**

<b>Inhalation</b>	Keep at rest. Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. Get medical attention if any discomfort continues.
<b>Ingestion</b>	Immediate medical attention is required. Do not induce vomiting without medical advice. Rinse mouth. Never give anything by mouth to an unconscious person. Call a physician or poison control center immediately.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get immediate medical attention.
<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get immediate medical attention.

### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as

soon as possible.

**Symptoms**

**Inhalation**

Please see Section 11. Toxicological Information for further information.

**Ingestion**

Please see Section 11. Toxicological Information for further information.

**Skin contact**

Please see Section 11. Toxicological Information for further information.

**Eye contact**

Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician**

Treat symptomatically

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Extinguishing media - large fires, Water spray, fog or alcohol-resistant foam, Extinguishing media - small fires, Water spray, Carbon dioxide (CO<sub>2</sub>), Dry powder.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Bromine, bromine oxides and hydrogen bromide.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental release measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Keep away from heat, sparks and open flame. No smoking. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking. Store in original container.

**Packaging materials** Use specially constructed containers only.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Sodium bromide	0.1 ppm, 0.2 STEL (Br)	0.1 ppm (Br)	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Sodium bromide 7647-15-6	-

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard

present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Keep airborne concentrations below exposure limits. Ensure adequate ventilation. Local exhaust ventilation. Apply technical measures to comply with the occupational exposure limits.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Impervious gloves made of: Nitrile Rubber Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Clear
<b>Color</b>	Colorless
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Approximately 5.7	
pH @ dilution		
Melting / freezing point		
Boiling point/range	No information available	
Flash point	> 93 °C / > 200 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.008 - 1.500	
Bulk density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	Not determined	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and reactivity**

**10.1 Reactivity**

No data available.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Protect from light. Do not freeze.

**10.5 Incompatible materials**

Oxidizing agents. Acids. Alkali metals. Halogens. Halogenated compounds.

**10.6 Hazardous decomposition products**

See also section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Product information**

<b>Inhalation</b>	May cause respiratory irritation.
<b>Eye contact</b>	May cause irritation.
<b>Skin contact</b>	Components of the product may be absorbed into the body through the skin. Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium bromide	= 3500 mg/kg ( Rat )	> 2000 mg/kg ( Rabbit )	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Sodium bromide	No data available	No data available	No data available	No data available

<b>Sensitization</b>	Not classified.
<b>Mutagenic effects</b>	This substance has no evidence of mutagenic properties.
<b>Carcinogenicity</b>	This substance has no evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	None known.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Eye contact. Skin contact. Inhalation.
<b>Routes of entry</b>	Ingestion.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not classified.

## 12. Ecological information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium bromide	0.054 - 0.081 mg/L LC50 Oncorhynchus mykiss 96 h > 1000 mg/L LC50 Lepomis macrochirus 96 h 15614 - 17428 mg/L LC50 Pimephales promelas 96 h = 16000 mg/L LC50 Poecilia reticulata 96 h > 1000 mg/L LC50 Oncorhynchus mykiss 96 h = 24000 mg/L LC50 Oryzias latipes 96 h 24000 - 96000 mg/L LC50 Oryzias latipes 96 h 16000 - 24000 mg/L LC50 Poecilia reticulata 96 h	5800 - 24000 mg/L EC50 Scenedesmus pannonicus 96 h	5700 - 10800 mg/L EC50 Daphnia magna 48 h 5800 - 48000 mg/L EC50 Daphnia magna 48 h

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No data available.

**12.4 Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

This substance is not considered to be persistent, bioaccumulating or toxic (PBT)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that the containers are empty by the RCRA criteria prior to disposal in a permitted industrial landfill.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT/ANTT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Not applicable Please contact MISDS@slb.com for info regarding transport in Bulk.

**15. Regulatory information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

<b>Chemical Name</b>	<b>SARA 302 / TPQs</b>	<b>SARA 313</b>	<b>CERCLA RQ</b>
Sodium bromide	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Canadian Classification**

This product has been classified in accordance with the hazard criteria of the CPR and the SDS contains all the information required by the CPR.

**16. Other information**

**Revision date** 12/Jan/2018

**Version** 1

**This SDS has been revised in the following section(s)** New

**HMIS classification**

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Health	1*
Flammability	0
Physical hazard	0
PPE	J

N/A - Not Applicable, N/D - Not Determined.

**Disclaimer**

**The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.**

SDS no. PID1494  
Version 1  
Revision date 07/Jan/2019  
Supersedes date None



## Safety Data Sheet SODIUM BROMIDE

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name SODIUM BROMIDE  
Product code PID1494

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Completion fluid additive. Drilling fluid additive.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

E-mail address SDS@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000/0800-777-2323 (WGRA)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

Health hazards Not classified  
Environmental hazards Not classified  
Physical Hazards Not classified

#### 2.2 Label elements

**Signal word**

None

**Hazard Statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Unknown acute toxicity** Not applicable.**3. Composition/information on Ingredients****3.1 Substances**

Chemical Name	CAS No	Weight-%
Sodium bromide	7647-15-6	60-100

**3.2 Mixtures**

Not applicable

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret

**4. First Aid Measures****4.1 First aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

**Suitable extinguishing media**

Use extinguishing agent suitable for type of surrounding fire.

**Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Bromine, bromine oxides and hydrogen bromide.

### 5.3 Advice for firefighters

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture. Avoid contact with: Strong oxidizing agents. Strong acids. Bromine trifluoride.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits**

**NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Sodium bromide	Not determined	Not determined	Not determined	Not determined	Not determined

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Sodium bromide 7647-15-6	Not determined

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

**Eye protection**

Tightly fitting safety goggles.

**Hand protection**

Use protective gloves made of: Butyl PVC Frequent change is advisable

**Respiratory Protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of

<b>Skin and body protection</b>	this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge. Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution		
Melting / freezing point	775 °C / 1427 °F	
Boiling point/range	1390 °C / 2534 °F	
Flash point	No information available	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	@ 806 °C
Vapor pressure	1 mmHg	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	800°C / 1472°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
Explosive properties	Not applicable	
Oxidizing properties	None known.	

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

#### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid dust formation. Protect from moisture.

**10.5 Incompatible materials**

Strong oxidizing agents. Strong acids. Bromine trifluoride.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium bromide	= 3500 mg/kg ( Rat )	> 2000 mg/kg ( Rabbit )	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Sodium bromide	No data available	No data available	No data available	No data available

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Multiple exposure</b>	Not classified.

**Repeated exposure**

**Aspiration hazard** Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium bromide	0.054 - 0.081 mg/L LC50 Oncorhynchus mykiss 96 h > 1000 mg/L LC50 Lepomis macrochirus 96 h 15614 - 17428 mg/L LC50 Pimephales promelas 96 h = 16000 mg/L LC50 Poecilia reticulata 96 h > 1000 mg/L LC50 Oncorhynchus mykiss 96 h = 24000 mg/L LC50 Oryzias latipes 96 h 24000 - 96000 mg/L LC50 Oryzias latipes 96 h 16000 - 24000 mg/L LC50 Poecilia reticulata 96 h	5800 - 24000 mg/L EC50 Scenedesmus pannonicus 96 h	5700 - 10800 mg/L EC50 Daphnia magna 48 h 5800 - 48000 mg/L EC50 Daphnia magna 48 h

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

## 14. Transport information

### 14.1. UN number

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3 Hazard class(es)

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

### 14.4 Packing group

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies

**Korean (KECL)**  
**New Zealand (NZIoC)**

Complies  
Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Sodium bromide	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**16. Other Information**

Revision date 07/Jan/2019

Version 1

This SDS has been revised in the following section(s) 1, 15, 16

**HMIS classification**

Health 1  
Flammability 0  
Physical hazard 0  
PPE E

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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## SAFETY DATA SHEET SOURSCAV®

according to Regulation (EC) No. 2015/830

Revision Date: 10-Dec-2019  
Preparation Date 10-Dec-2019

Revision Number: 30  
Internal ID Code HM003675

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

#### 1.1. Product Identifier

Product Name SOURSCAV®  
Internal ID Code HM003675

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Hydrogen Sulfide Scavenger  
**Sector of uses** SU2 - Mining, (including offshore industries)  
**Product category(ies)** PC20 - Products such as pH-regulators, flocculants, precipitants, neutralization agents, other unspecified  
**Process categories** PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises  
**Uses advised against** Consumer use

#### 1.3. Details of the supplier of the safety data sheet

Halliburton Energy Services  
Halliburton House, Howemoss Place  
Kirkhill Industrial Estate  
Dyce  
Aberdeen, AB21 0GN  
United Kingdom  
+44 1224 776888

[www.halliburton.com](http://www.halliburton.com)

For further information, please contact

**E-mail Address:** [fdunexchem@halliburton.com](mailto:fdunexchem@halliburton.com)

#### 1.4. Emergency telephone number

+44 8 08 189 0979 / 1-760-476-3961  
Global Incident Response Access Code: 334305  
Contract Number: 14012

Emergency telephone - Article 45 - (EC)1272/2008	
<b>Austria</b>	Poison Information Centre (AT): +43-(0)1-406 43 43
<b>Belgium</b>	Poison center (BE): +32 70 245 245
<b>Bulgaria</b>	Bulgarian poison centre: +359 2 915-44-09 or +359 2 915-43-46
<b>Croatia</b>	Centar za kontrolu otrovanja (CKO): (+385 1) 23-48-342 (Poison Control Center (PCC) - Institute for Medical Research and Occupational Health)
<b>Cyprus</b>	1401; +357 22 88 7171
<b>Czech Republic</b>	+420 224 919 293; +420 224 915 402
<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Estonia</b>	16662 (Local Poison Information Centre); (+372) 626 93 90 (International Poison Information Centre)
<b>Europe</b>	112
<b>Finland</b>	Poison Information Centre (FI):+358 9 471 977
<b>France</b>	ORFILA (FR): + 01 45 42 59 59
<b>Germany</b>	Poison Center Berlin (DE): +49 030 30686 790
<b>Greece</b>	+30 210 779 3777
<b>Hungary</b>	+36 (06) 80 201-199
<b>Latvia</b>	(+371) 67042473 (International number for the National Toxicology Centre)
<b>Ireland</b>	National Poisons Information Centre (IE): +353 1 8379964
<b>Italy</b>	Poison Center, Milan (IT): +39 02 6610 1029
<b>Netherlands</b>	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only

**SAFETY DATA SHEET**  
**SOURSCAV®**  
according to Regulation (EC) No. 2015/830

Revision Date: 10-Dec-2019  
Preparation Date 10-Dec-2019

Revision Number: 30  
Internal ID Code HM003675

	available to health professionals)
<b>Norway</b>	Poisons Information (NO):+ 47 22 591300
<b>Poland</b>	Poison Control and Information Centre, Warsaw (PL): +48 22 619 66 54; +48 22 619 08 97
<b>Portugal</b>	CIAV - Centro de Informação Antivenenos (Portuguese Poison Centre): + 351 213 303 271
<b>Romania</b>	+40 21 318 36 06
<b>Spain</b>	Poison Information Service (ES): +34 91 562 04 20
<b>Sweden</b>	Poisons Information Center (SV):+46 8 33 12 31
<b>Switzerland</b>	Poison Center: Tel 145; +41 44 251 51 51
<b>Turkey</b>	Ulusal Zehir Danisma Merkezi (UZEM) :114 Acil Saglik Hizmetleri : 112
<b>United Kingdom</b>	NHS Direct (UK): +44 0845 46 47

## SECTION 2: Hazards identification

### 2.1. Classification of the substance or mixture

**Regulation (EC) No 1272/2008**

Not classified

### 2.2. Label Elements

Not classified

### Hazard Pictograms

**Signal Word:** None

### Hazard Statements:

Not Classified

### Precautionary Statements:

None

### Contains

#### Substances

Contains no hazardous substances in concentrations above cut-off values according to the competent authority

#### CAS Number

NA

### 2.3. Other Hazards

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).

This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

## SECTION 3: Composition/information on ingredients

### 3.1. Substances

Substance

Substances	EINECS	CAS Number	PERCENT (w/w)	EU - CLP Substance Classification	REACH Reg. No
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	NA	60 - 100%	Not classified	No data available

**For the full text of the H-phrases mentioned in this Section, see Section 16**

## SECTION 4: First aid measures

# SAFETY DATA SHEET

## SOURSCAV®

according to Regulation (EC) No. 2015/830

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### 4.1. Description of first aid measures

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Eyes** In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

**Skin** Wash with soap and water. Get medical attention if irritation persists.

**Ingestion** Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

### 4.2. Most important symptoms and effects, both acute and delayed

May be harmful if swallowed.

### 4.3. Indication of any immediate medical attention and special treatment needed

**Notes to Physician** Treat symptomatically

## SECTION 5: Firefighting measures

### 5.1. Extinguishing media

#### **Suitable Extinguishing Media**

Water fog, carbon dioxide, foam, dry chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Special exposure hazards in a fire**

Decomposition in fire may produce harmful gases.

### 5.3. Advice for firefighters

#### **Special protective equipment for firefighters**

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

## SECTION 6: Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid creating and breathing dust. Ensure adequate ventilation.

See Section 8 for additional information

### 6.2. Environmental precautions

None known.

### 6.3. Methods and material for containment and cleaning up

Scoop up and remove.

### 6.4. Reference to other sections

See Section 8 and 13 for additional information.

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

#### **Hygiene Measures**

Handle in accordance with good industrial hygiene and safety practice.

### 7.2. Conditions for safe storage, including any incompatibilities

Store away from acids. Store away from oxidizers. Store in a cool, dry location. Keep container closed when not in use. Store away from direct sunlight. Product has a shelf life of 24 months.

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### 7.3. Specific end use(s)

**Exposure scenario** No information available  
**Other Guidelines** No information available

## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

#### Exposure Limits

Substances	CAS Number	EU	UK	Netherlands	France
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

Substances	CAS Number	Germany	Spain	Portugal	Finland
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

Substances	CAS Number	Austria	Ireland	Switzerland	Norway
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

Substances	CAS Number	Italy	Poland	Hungary	Czech Republic
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

Substances	CAS Number	Denmark	Romania	Croatia	Cyprus
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

**Derived No Effect Level (DNEL)** No information available  
**Worker**

#### General Population

**Predicted No Effect Concentration (PNEC)** No information available.

### 8.2. Exposure controls

**Engineering Controls** A well ventilated area to control dust levels.  
**Personal protective equipment** If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

**Respiratory Protection** Not normally needed. But if significant exposures are possible then the following respirator is recommended:

**Hand Protection** Dust/mist respirator. (N95, P2/P3)  
Normal work gloves.

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<b>Skin Protection</b>	Normal work coveralls.
<b>Eye Protection</b>	Wear safety glasses or goggles to protect against exposure.
<b>Other Precautions</b>	None known.

**Environmental Exposure Controls** No information available

**SECTION 9: Physical and chemical properties**

**9.1. Information on basic physical and chemical properties**

<b>Physical State:</b> Solid	<b>Color</b>	Light yellow-green
<b>Odor:</b> Mild burnt sugar	<b>Odor</b>	No information available

<u>Property</u> <u>Remarks/ - Method</u>	<u>Threshold:</u> <u>Values</u>
<b>pH:</b>	4-5.5
<b>Freezing Point / Range</b>	No data available
<b>Melting Point / Range</b>	No data available
<b>Pour Point / Range</b>	No data available
<b>Boiling Point / Range</b>	No data available
<b>Flash Point</b>	No data available
<b>Flammability (solid, gas)</b>	No data available
<b>Upper flammability limit</b>	No data available
<b>Lower flammability limit</b>	No data available
<b>Evaporation rate</b>	No data available
<b>Vapor Pressure</b>	No data available
<b>Vapor Density</b>	No data available
<b>Specific Gravity</b>	1.73
<b>Water Solubility</b>	Soluble in water
<b>Solubility in other solvents</b>	No data available
<b>Partition coefficient: n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	No data available
<b>Decomposition Temperature</b>	No data available
<b>Viscosity</b>	No data available
<b>Explosive Properties</b>	No information available
<b>Oxidizing Properties</b>	No information available

**9.2. Other information**

**VOC Content (%)** No data available

**SECTION 10: Stability and reactivity**

**10.1. Reactivity**

Not expected to be reactive.

**10.2. Chemical stability**

Stable

**10.3. Possibility of hazardous reactions**

Will Not Occur

**10.4. Conditions to avoid**

None anticipated

**10.5. Incompatible materials**

Strong oxidizers. Strong acids.

**10.6. Hazardous decomposition products**

Carbon monoxide and carbon dioxide. Metal oxides.

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**SECTION 11: Toxicological information**

**11.1. Information on toxicological effects**

**Acute Toxicity**

<b>Inhalation</b>	May cause mild respiratory irritation.
<b>Eye Contact</b>	May cause mechanical irritation to eye.
<b>Skin Contact</b>	None known.
<b>Ingestion</b>	May be harmful if swallowed. May cause abdominal pain, vomiting, nausea, and diarrhea.

**Chronic Effects/Carcinogenicity** No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

**Toxicology data for the components**

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Rat = Rat, Rabbit = Rabbit, dust = dust

**SECTION 12: Ecological information**

**12.1. Toxicity**

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

growth rate = growth rate, similar substance = similar substance, activated sludge = activated sludge, reproduction = reproduction

**12.2. Persistence and degradability**

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

**12.3. Bioaccumulative potential**

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in	NA	No information available



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**14.3.**

**14.4. Packing Group** Not applicable

**14.5. Environmental Hazards:** Not applicable

**14.6. Special Precautions for User** None

**14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** Not applicable

**SECTION 15: Regulatory information**

**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture**

**International Inventories**

**US TSCA Inventory** All components listed on inventory or are exempt.  
**Canadian Domestic Substances List (DSL)** All components listed on inventory or are exempt.

**Legend**

**TSCA** - United States Toxic Substances Control Act Section 8(b) Inventory  
**EINECS/ELINCS** - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances  
**DSL/NDSL** - Canadian Domestic Substances List/Non-Domestic Substances List

**Denmark PR No.:** 2314995

**Germany, Water Endangering Classes (WGK)** WGK 0: Generally not water endangering.

Take note of Directive 92/85/EEC regarding maternity protection or stricter national regulations, where applicable.  
Take note of Directive 94/33/EC on the protection of young people at work or stricter national regulations, where applicable.

Substances	CAS Number	Seveso III	TA LUFT
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Substances	CAS Number	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

**15.2. Chemical safety assessment**

No information available

**SECTION 16: Other information**

**Full text of H-Statements referred to under sections 2 and 3**

None

**Key or legend to abbreviations and acronyms used in the safety data sheet**

bw – body weight  
CAS – Chemical Abstracts Service  
CLP – REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Classification, Labelling and Packaging of substances and mixtures  
EC – European Commission

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EC10 – Effective Concentration 10%  
EC50 – Effective Concentration 50%  
EEC – European Economic Community  
ErC50 – Effective Concentration growth rate 50%  
IBC Code – International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk  
LC50 – Lethal Concentration 50%  
LD50 – Lethal Dose 50%  
LL0 – Lethal Loading 0%  
LL50 – Lethal Loading 50%  
MARPOL – International Convention for the Prevention of Pollution from Ships  
mg/kg – milligram/kilogram  
mg/L – milligram/liter  
NIOSH – National Institute for Occupational Safety and Health  
NOEC – No Observed Effect Concentration  
NTP – National Toxicology Program  
OEL – Occupational Exposure Limit  
PBT – Persistent Bioaccumulative and Toxic  
PC – Chemical Product category  
PEL – Permissible Exposure Limit  
ppm – parts per million  
PROC – Process category  
REACH – REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals  
STEL – Short Term Exposure Limit  
SU – Sector of Use category

**Key literature references and sources for data**

[www.ChemADVISOR.com/](http://www.ChemADVISOR.com/)  
NZ CCID

**Revision Date:** 10-Dec-2019

**Revision Note**

Not applicable

**This safety data sheet complies with the requirements of Regulation (EC) No. 2015/830**

**Disclaimer Statement**

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

**End of Safety Data Sheet**





## Safety Data Sheet SUREWET\*

### 1. Identification

#### 1.1 Product identifier

**Product name** SUREWET\*  
**Product code** PID11775

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Emulsifier. Wetting agent.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**

**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**GHS - Classification**

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Unknown acute toxicity** Not applicable.

## **3. Composition/information on Ingredients**

### 3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

### 3.2 Mixtures

Not applicable

### Comments

No Comments.

## **4. First Aid Measures**

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

### Symptoms

---

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

### **5.3 Advice for firefighters**

**Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Dike far ahead of liquid spill for later disposal. Prevent further leakage or spillage if safe to do so.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

#### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

### **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with:  
Strong oxidizing agents.

**Packaging materials** Use specially constructed containers only.

## **8. Exposure Controls/Personal Protection**

### **8.1 Control parameters**

**Exposure limits** **The product does not contain any hazardous materials with occupational exposure limits established.**

#### **IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

### **8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### **Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles. Safety glasses with side-shields.
<b>Hand protection</b>	Impervious gloves made of: PVC Nitrile Neoprene Break through time >480 minutes Glove thickness >= 0.4 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
<b>Hygiene Measures</b>	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Color</b>	Light yellow
<b>Odor</b>	Slight
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	No information available	
Melting point	No information available	
Boiling point	No information available	
Flash point	184 °C / 363 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.891	@ 20 °C
Bulk density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	4.4 – 15.6°C / 40 – 60°F
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

None known.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of vapors in high concentration may cause irritation of respiratory system.

**Eye contact** May cause slight irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**LD50 Oral** > 5000 mg/kg (rat)

**Delayed and immediate effects and chronic effects from short and long term exposure**

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	None known.
<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

Fish LC50 > 100 mg/l.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

### 12.2 Persistence and degradability

Product is biodegradable.

### 12.3 Bioaccumulative potential

Bioaccumulative potential.

### 12.4 Mobility

Insoluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

## 15. Regulatory Information

### International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### U.S. Federal and State Regulations

#### SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

#### California Proposition 65

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

#### Canadian Classification

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**Brazil Regulation** This SDS was prepared in accordance with Brazil law NBR 14725.

**Federal Police** Not determined

**Army** Not determined

**ANVISA** Not determined

## 16. Other Information

**Supersedes date** 18/Aug/2020

**Revision date** 13/Oct/2020

**Version** 9

**This SDS has been revised in the following section(s)** 15, 16 No changes with regard to classification have been made.

**HMIS classification**

Health	1
Flammability	1
Physical hazard	0
PPE	B

N/A - Not Applicable, N/D - Not Determined.

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SDS no. PID1709  
Version 15  
Revision date 22/Jun/2020  
Supersedes date None



## Safety Data Sheet VG-PLUS\*

### 1. Identification

#### 1.1 Product identifier

Product name VG-PLUS\*  
Product code PID1709

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

E-mail address SDS@slb.com

##### Prepared by

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

**Physical Hazards**

Combustible dust

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard Statements**

H350i - May cause cancer by inhalation  
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled  
H232 - May form combustible dust concentrations in air

**Precautionary Statements**

P201 - Obtain special instructions before use  
P260 - Do not breathe dust, fume, gas, mist, vapors, spray  
P281 - Use personal protective equipment as required  
P308 + P313 - IF exposed or concerned: Get medical advice/attention  
P314 - Get medical attention if you feel unwell

P202 - Do not handle until all safety precautions have been read and understood  
P240 - Ground/bond container and receiving equipment  
P241 - Use explosion-proof electrical, ventilating, lighting, equipment  
P243 - Take precautionary measures against static discharge  
P501 - Dispose of contents and container to an approved waste disposal plant

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Crystalline silica (impurity)	14808-60-7	< 1

**3.2 Mixtures**

Not applicable

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret.

**4. First Aid Measures**

#### **4.1 First aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

## **5. Fire-Fighting Measures**

#### **5.1 Extinguishing media**

##### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

##### **Extinguishing media which must not be used for safety reasons**

Do not use water jet.

#### **5.2. Special hazards arising from the substance or mixture**

##### **Unusual fire and explosion hazards**

Suspended dust may present a dust explosion hazard.

##### **Hazardous combustion products**

Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen chloride gas.

#### **5.3 Advice for firefighters**

##### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Protect from moisture. Avoid contact with: Oxidizing agents.

**Packaging materials**                      Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits**                              **No biological limit allocated**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)

Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA respirable fraction	0.05 mg/m <sup>3</sup> TWA	Not determined	0.025 mg/m <sup>3</sup> TWA VLE-PPT (respirable fraction)
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**Crystalline silica (impurity)**

OSHA - Final PELs - Table Z-3 Mineral Dusts

(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Crystalline silica (impurity) 14808-60-7	50 mg/m <sup>3</sup> IDLH (respirable dust)

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

**Eye protection**

Tightly fitting safety goggles. Safety glasses with side-shields.

**Hand protection**

Repeated or prolonged contact Use protective gloves made of: Neoprene Nitrile Frequent change is advisable

**Respiratory Protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached. If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

**Physical state** Solid  
**Appearance** Powder Dust  
**Color** Off-white  
**Odor** Odorless  
**Odor threshold** Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>		
<b>pH @ dilution</b>	No information available	
<b>Melting point</b>	No information available	
<b>Boiling point</b>	No information available	
<b>Flash point</b>	Not applicable	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	> = 0.05 g/l	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.5 sg	20 °C
<b>Bulk density</b>	528 kg/m <sup>3</sup> (33 lb/ft <sup>3</sup> )	
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	190 °C / 374 °F	
<b>Decomposition temperature</b>	200°C / 392°F	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Partition Coefficient (n-octanol/water)</b>	No information available	

**Explosive properties** Suspended dust may present a dust explosion hazard  
**Oxidizing properties** No information available

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** No information available  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges. Avoid dust formation. Protect from moisture.

**10.5 Incompatible materials**

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of dust in high concentration may cause irritation of respiratory system. Harmful: danger of serious damage to health by prolonged exposure through inhalation. May cause cancer by inhalation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

**Eye contact** Dust contact with the eyes can lead to mechanical irritation.

**Skin contact** Repeated exposure may cause skin dryness or cracking.

**Ingestion** Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

**Delayed and immediate effects and chronic effects from short and long term exposure**

**Sensitization** Not classified.

**Mutagenic effects** No evidence of mutagenic properties.

<b>Carcinogenicity</b>	Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Skin contact. Inhalation. Eye contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Respiratory system. Lungs.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

#### **Toxicity to algae**

This product is not considered toxic to algae.

#### **Toxicity to fish**

This product is not considered toxic to fish.

#### **Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

#### **Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

### 12.2 Persistence and degradability

Not readily biodegradable. See component information below.

### 12.3 Bioaccumulative potential

Does not bioaccumulate. See component information below.

### 12.4 Mobility

Insoluble in water. See component information below.

See component information below.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

UN No. (DOT)	Not regulated
UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

**14.4 Packing group**

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

<b>Chemical Name</b>	<b>SARA 302 / TPQs</b>	<b>SARA 313</b>	<b>CERCLA RQ</b>
Crystalline silica (impurity)	N/A	N/A	N/A

**California Proposition 65**

This product does not contain chemical[s] which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**16. Other Information**

**Revision date** 22/Jun/2020

**Version** 15

**HMIS classification**

Health	1*
Flammability	1
Physical hazard	0
PPE	E

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**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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# Safety Data Sheet VG-SUPREME\*

## 1. Identification

### 1.1 Product identifier

Product name VG-SUPREME\*  
Product code PID10001

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.  
Uses advised against Consumer use

### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

Schlumberger Canada, Ltd.  
200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada

E-mail address SDS@slb.com

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

## 2. Hazards Identification

### 2.1 Classification of the substance or mixture

#### GHS - Classification

#### Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

#### Physical Hazards

Combustible dust

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard Statements**

H350i - May cause cancer by inhalation  
H373 - May cause damage to organs through prolonged or repeated exposure  
May form combustible dust concentrations in air

**Precautionary Statements**

P201 - Obtain special instructions before use  
P202 - Do not handle until all safety precautions have been read and understood  
P280 - Wear protective gloves, protective clothing, eye protection  
P308 + P313 - IF exposed or concerned: Get medical advice/attention  
P314 - Get medical attention if you feel unwell  
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

P260 - Do not breathe dust, fume, gas, mist, vapors, spray  
P240 - Ground/bond container and receiving equipment  
P241 - Use explosion-proof electrical, ventilating, lighting, equipment  
P243 - Take precautionary measures against static discharge

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Organophilic clay	Proprietary	60-100
Crystalline silica (impurity)	14808-60-7	<3

**3.2 Mixtures**

Not applicable

**Comments**

Proprietary component(s) in section 3 of this SDS does not/do not trigger application of trade secret exemption under Hazardous Materials Information Review Act (HMIRA). The proprietary component in this product contributes to combustible dust classification.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water spray, fog or regular foam, Carbon dioxide (CO<sub>2</sub>), Dry powder, Dry sand.

#### **Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

#### **Hazardous combustion products**

Carbon oxides (CO<sub>x</sub>), Hydrogen chloride gas, Nitrogen oxides (NO<sub>x</sub>).

### 5.3 Advice for firefighters

**Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Protect from moisture. Avoid contact with: Strong oxidizing agents.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational	Brazil - Occupational Exposure Limits -	Mexico - Occupational
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			Exposure Limits - TWAs (CMPs)	TWAs (LTs)	Exposure Limits - TWAs (LMPE-PPTs)
Organophilic clay	Not determined	Not determined	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA respirable fraction	0.05 mg/m <sup>3</sup> TWA	Not determined	0.025 mg/m <sup>3</sup> TWA VLE-PPT (respirable fraction)

**Crystalline silica (impurity)**

OSHA - Final PELs - Table Z-3 Mineral Dusts

(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Organophilic clay	Not determined
Crystalline silica (impurity) 14808-60-7	50 mg/m <sup>3</sup> IDLH (respirable dust)

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation.

**Personal protective equipment**

**Eye protection**

Tightly fitting safety goggles.

**Hand protection**

Wear chemical resistant gloves such as nitrile or neoprene. Frequent change is advisable

**Respiratory Protection**

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Color</b>	Off-white
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution	No information available	
Melting point	No information available	
Boiling point	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.7	
Bulk density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	No information available	
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact** Dust may cause mechanical irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**LD50 Oral** > 8000 mg/kg (rat) (based on similar product)

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Organophilic clay	5005 mg/kg (rat)	No data available	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Organophilic clay	No data available	No data available	No data available	No data available
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

**Delayed and immediate effects and chronic effects from short and long term exposure**

**Sensitization** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

<b>Carcinogenicity</b>	Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological Information

### 12.1 Toxicity

#### **Toxicity to algae**

This product is not considered toxic to algae. PRODUCT: > 1000 mg/L (Marine alga; 48 hrs).

#### **Toxicity to fish**

This product is not considered toxic to fish.

#### **Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates. PRODUCT: > 2000 mg/L (Marine invertebrate; 48 hrs).

#### **Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Organophilic clay	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

### 12.2 Persistence and degradability

Product is not biodegradable.

### 12.3 Bioaccumulative potential

Does not bioaccumulate.

### 12.4 Mobility

Insoluble in water.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

U.S. Federal and State Regulations

SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Organophilic clay	N/A	N/A	N/A
Crystalline silica (impurity)	N/A	N/A	N/A

California Proposition 65

**WARNING**



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Crystalline silica (impurity) 14808-60-7	Carcinogen

**16. Other Information**

Supersedes date 12/Jan/2017

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**Revision date** 07/Aug/2020

**Version** 9

**This SDS has been revised in the following section(s)** All sections. No changes with regard to classification have been made.

**HMIS classification**

Health	1*
Flammability	1
Physical hazard	0
PPE	X

\*A mark of M-I L.L.C., a Schlumberger Company

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SDS no. PID2234  
Version 10  
Revision date 13/Oct/2020  
Supersedes date 17/Aug/2020



## Safety Data Sheet WALNUT NUTPLUG\* (All Grades)

### 1. Identification

#### 1.1 Product identifier

**Product name** WALNUT NUTPLUG\* (All Grades)  
**Product code** PID2234  
**Synonyms** WALNUT NUT PLUG\* FINE, WALNUT NUT PLUG\* MEDIUM, WALNUT NUT PLUG\* COARSE

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Lost circulation material.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**M-I SWACO, A Schlumberger Company**  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : +55 11 3197 5891

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 2

**Environmental hazards** Not classified

**Physical Hazards**

Combustible dust

**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

H350i - May cause cancer by inhalation  
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled  
May form combustible dust concentrations in air

**Precautionary Statements**

P201 - Obtain special instructions before use  
P202 - Do not handle until all safety precautions have been read and understood  
P260 - Do not breathe dust, fume, gas, mist, vapors, spray  
P280 - Wear protective gloves, protective clothing, eye protection  
P308 + P313 - IF exposed or concerned: Get medical advice/attention

P240 - Ground/bond container and receiving equipment  
P241 - Use explosion-proof electrical, ventilating, lighting, equipment  
P243 - Take precautionary measures against static discharge

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Cellulose	Proprietary	60-100
Crystalline silica (impurity)	14808-60-7	<1

**3.2 Mixtures**

Not applicable

**Comments**

Proprietary component(s) in section 3 of this SDS does not/do not trigger application of trade secret exemption under Hazardous

Materials Information Review Act (HMIRA). The proprietary component in this product contributes to combustible dust classification.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if symptoms occur.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### Symptoms

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically

## 5. Fire-Fighting Measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### Extinguishing media which must not be used for safety reasons

Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture

#### Unusual fire and explosion hazards

Combustible material. Dust may form explosive mixture in air.

**Hazardous combustion products**

Silicon oxide, Carbon oxides (COx).

**5.3 Advice for firefighters**

**Special protective equipment and precautions for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Protect from moisture. Avoid contact with: Oxidizing agents.

**Packaging materials** Use specially constructed containers only.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Component Information

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Cellulose	10 mg/m <sup>3</sup>	15 mg/m <sup>3</sup> TWA 5 mg/m <sup>3</sup> TWA	10 mg/m <sup>3</sup> TWA	Not determined	10 mg/m <sup>3</sup> TWA VLE-PPT
Crystalline silica (impurity)	0.025 mg/m <sup>3</sup>	50 µg/m <sup>3</sup> TWA respirable fraction	0.05 mg/m <sup>3</sup> TWA	Not determined	0.025 mg/m <sup>3</sup> TWA VLE-PPT (respirable fraction)

Crystalline silica (impurity)  
OSHA - Final PELs - Table Z-3 Mineral Dusts  
(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**IDLH (Immediately Dangerous to Life or Health)**

Immediately Dangerous to Life or Health (IDLH) is established by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Cellulose	Not determined
Crystalline silica (impurity) 14808-60-7	50 mg/m <sup>3</sup> IDLH (respirable dust)

**8.2 Exposure controls**

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

- Eye protection**                      Tightly fitting safety goggles.
- Hand protection**                    Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
- Respiratory Protection**            All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
- Skin and body protection**        Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
- Hygiene Measures**                    Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing

before re-use.

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	No information available
<b>Color</b>	Light brown
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	No information available	
Melting point	No information available	
Boiling point	No information available	
Flash point	193 °C / 380 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.1 - 1.4	@ 20 °C
Bulk density	577-641 kg/m <sup>3</sup> /36-40 lb/ft <sup>3</sup>	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	Not applicable
Dynamic viscosity	No information available	
Partition Coefficient (n-octanol/water)	Not determined	
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard	
<b>Oxidizing properties</b>	None known.	

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

#### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

Combustible material. Dust may form explosive mixture in air.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Keep away from open flames, hot surfaces and sources of ignition. Avoid dust formation. Take precautionary measures against static charges. Protect from moisture.

**10.5 Incompatible materials**

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Product information**

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

**Inhalation**

May cause cancer by inhalation. May cause damage to organs through prolonged or repeated exposure. Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact**

Dust may cause mechanical irritation.

**Skin contact**

Prolonged contact may cause redness and irritation.

**Ingestion**

Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cellulose	5005 mg/kg (rat)	2002 mg/kg (Rabbit)	No data available
Crystalline silica (impurity)	No data available	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Cellulose	No data available	No data available	No data available	Known Human Carcinogen
Crystalline silica (impurity)	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

	occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]			
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**Delayed and immediate effects and chronic effects from short and long term exposure**

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of Exposure</b>	Skin contact. Inhalation. Eye contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Lungs.
<b>Aspiration hazard</b>	Not applicable.

**12. Ecological Information**

**12.1 Toxicity**

**Toxicity to algae**  
This product is not considered toxic to algae.

**Toxicity to fish**  
This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Cellulose	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (MT/ANTT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG/ANTAQ)</b>	Not regulated
<b>UN No. (ICAO/ANAC)</b>	Not regulated
<b>UN No. (DPC)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>ANTT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated
<b>DPC Hazard class</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
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<b>ANTT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated
<b>DPC Packing group</b>	Not regulated

**14.5 Environmental hazard**

Marine pollutant	No
------------------	----

**14.6 Special precautions**

Not applicable

**15. Regulatory Information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Cellulose	N/A	N/A	N/A
Crystalline silica (impurity)	N/A	N/A	N/A

**California Proposition 65**

**WARNING**



This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Chemical Name	California Proposition 65
Crystalline silica (impurity) 14808-60-7	Carcinogen

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**Brazil Regulation** This SDS was prepared in accordance with Brazil law NBR 14725.

**Federal Police** Not determined

**Army** Not determined

**ANVISA** Not determined

**16. Other Information**

**Supersedes date** 17/Aug/2020

**Revision date** 13/Oct/2020

**Version** 10

**This SDS has been revised in the following section(s)** 15, 16 No changes with regard to classification have been made.

**HMIS classification**

Health	3*
Flammability	1
Physical hazard	0
PPE	X

N/A - Not Applicable, N/D - Not Determined.

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

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## Safety Data Sheet WATER BASED MUD (GENERIC)

### 1. Identification

#### 1.1 Product identifier

**Product name** WATER BASED MUD (GENERIC)  
**Product code** 12153

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid system.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
M-I L.L.C.

P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Mike McDowell

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Acute oral toxicity	Category 4
Acute inhalation toxicity - dust/mist	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2
Carcinogenicity	Category 1A

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard statements**

- H302 - Harmful if swallowed
- H315 - Causes skin irritation
- H319 - Causes serious eye irritation
- H332 - Harmful if inhaled
- H350 - May cause cancer

**Precautionary statements**

- P201 - Obtain special instructions before use
- P281 - Use personal protective equipment as required
- P308 + P313 - IF exposed or concerned: Get medical advice/ attention

**Supplementary precautionary statements**

- P202 - Do not handle until all safety precautions have been read and understood
- P261 - Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray
- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P271 - Use only outdoors or in a well-ventilated area
- P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection
- P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P312 - Call a POISON CENTER or doctor/physician if you feel unwell
- P321 - Specific treatment (see supplemental first aid instructions on this label)
- P330 - Rinse mouth
- P332 + P313 - If skin irritation occurs: Get medical advice/ attention
- P337 + P313 - If eye irritation persists: Get medical advice/attention
- P362 - Take off contaminated clothing and wash before reuse
- P501 - Dispose of contents/ container to an approved waste disposal plant

**Unknown acute toxicity** 5.5% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not Applicable

**3.2 Mixtures**

Component	CAS-No	Weight % - range
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Barite	7727-43-7	10 - 30
Bentonite	1302-78-9	5 - 10
Sodium chloride	7647-14-5	5 - 10
Silica, crystalline, quartz	14808-60-7	1 - 5
Sodium hydroxide	1310-73-2	0.1 - 1
Calcium hydroxide	1305-62-0	0.1 - 1

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

**4. First aid measures**

**4.1 First-Aid Measures**

- Inhalation** Move to fresh air. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Get medical attention immediately if symptoms occur.
- Ingestion** Drink 1 or 2 glasses of water. Get medical attention if symptoms occur.
- Skin contact** Wash off with soap and water. Remove contaminated clothing and shoes. Get medical attention if irritation persists.
- Eye contact** Rinse with plenty of water. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**Main symptoms**

- Inhalation** Please see Section 11. Toxicological Information for further information.
- Ingestion** Please see Section 11. Toxicological Information for further information.
- Skin contact** Please see Section 11. Toxicological Information for further information.
- Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

- Notes to physician** Treat symptomatically

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which shall not be used for safety reasons**

None known.

**5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Carbon oxides (COx), Silicon oxide, Sodium oxides.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**6. Accidental release measures**

**6.1 Personal precautions, protective equipment and emergency procedures**

Evacuate personnel to safe areas. Use personal protective equipment. If spilled, take caution, as material can cause surfaces to become very slippery.

**6.2 Environmental precautions**

Do not allow spilled material to enter sewers, storm drains or surface waters.

**Environmental exposure controls**

No information available.

**6.3 Methods and materials for containment and cleaning up**

**Methods for cleaning up**

Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Sweep up and shovel into suitable containers for disposal.

**6.4 Reference to other sections**

No information available.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Avoid breathing vapors or mists. Avoid contact with skin, eyes and clothing. Wear personal protective equipment.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Keep container/package tightly closed and in a well-ventilated place. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

Component Information

Component	ACGIH TLV	OSHA PEL
Barite	10 mg/m <sup>3</sup>	15 mg/m <sup>3</sup> (total); 5 mg/m <sup>3</sup> (resp)
Bentonite	Not Determined	Not Determined
Sodium chloride	Not Determined	Not Determined
Silica, crystalline, quartz	0.025 mg/m <sup>3</sup>	see Table Z-3
Sodium hydroxide	2 mg/m <sup>3</sup> (ceiling)	2 mg/m <sup>3</sup>
Calcium hydroxide	5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup> (resp); 15 mg/m <sup>3</sup> (total)

Silica, crystalline, quartz

OSHA - Final PELs - Table Z-3 Mineral Dusts

(30)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, total dust; (250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering measures to reduce exposure

Ensure adequate ventilation, especially in confined areas.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Gloves- Neoprene, Nitrile Unless Specified.
<b>Respiratory protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.

If exposed to airborne mist/aerosol of this product, use at least a NIOSH-approved N95 half-mask disposable or re-usable particulate respirator. In work environments containing oil mist/aerosol, use at least a NIOSH-approved P95 half-mask disposable or re-usable particulate respirator. If exposed to vapors from this product use a NIOSH/MSHA-approved respirator with an Organic Vapor cartridge.

<b>Skin and body protection</b>	Wear suitable protective clothing.
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## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	Opaque
<b>Color</b>	Tan - Gray
<b>Odor</b>	Characteristic
<b>Odor threshold</b>	Not applicable

Property	Values	Remarks
pH		
pH @ dilution		
Melting/freezing point		
Boiling point/range	No information available	
Flash point	> 93.3 °C / > 200 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Water solubility	Soluble	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	

<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Dynamic viscosity</b>	10 - 220 cPs @ 78°F / 25.5°C
<b>Log Pow</b>	No information available
<b>Explosive properties</b>	No information available
<b>Oxidizing properties</b>	No information available
<b>9.2 Other information</b>	
<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

## 10. Stability and reactivity

### 10.1 Not chemically reactive.

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerization**

Hazardous polymerization does not occur.

#### **Hazardous Reactions**

None known.

### 10.4 Conditions to avoid

Avoid extreme temperatures.

### 10.5 Incompatible materials

Oxidizing agents.

### 10.6 Hazardous decomposition products

Carbon oxides (COx). Silicon oxide. Sodium oxides.

## 11. Toxicological information

### 11.1 Information on toxicological effects

#### **Acute toxicity**

##### **Inhalation**

Inhalation of vapors in high concentration may cause irritation of respiratory system. Breathing dried dust or spray mist may irritate respiratory tract.

##### **Eye contact**

Causes eye irritation.

##### **Skin contact**

May cause skin irritation and/or dermatitis. Repeated exposure may cause skin dryness or cracking.

##### **Ingestion**

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Barite	No data available	No data available	No data available
Bentonite	> 5000 mg/kg ( Rat )	No data available	No data available
Sodium chloride	= 3 g/kg ( Rat )	> 10 g/kg ( Rabbit )	> 42 g/m <sup>3</sup> ( Rat ) 1 h
Silica, crystalline, quartz	= 500 mg/kg ( Rat )	No data available	No data available
Sodium hydroxide	No data available	= 1350 mg/kg ( Rabbit )	No data available
Calcium hydroxide	= 7340 mg/kg ( Rat )	No data available	No data available

Component	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Barite	No data available	No data available	No data available	No data available
Bentonite	No data available	No data available	No data available	No data available
Sodium chloride	No data available	No data available	No data available	No data available
Silica, crystalline, quartz	Group 1; Monograph 100C [in preparation] Group 1; Monograph 68 [1997] Monograph 100C [in preparation] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen
Sodium hydroxide	No data available	No data available	No data available	No data available
Calcium hydroxide	No data available	No data available	No data available	No data available

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	Contains a known or suspected carcinogen.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Eyes.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.
<b>Aspiration hazard</b>	Not Applicable.

## 12. Ecological information

### 12.1 Toxicity

#### Toxicity to algae

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Barite 7727-43-7 ( 10 - 30 )	No information available	No information available	No information available
Bentonite 1302-78-9 ( 5 - 10 )	19000 mg/L LC50 (Oncorhynchus mykiss) = 96 h 8.0 - 19.0 g/L LC50 (Salmo gairdneri) = 96 h	No information available	No information available
Sodium chloride 7647-14-5 ( 5 - 10 )	5560 - 6080 mg/L LC50 (Lepomis macrochirus) = 96 h 12946 mg/L LC50 (Lepomis macrochirus) = 96 h 4747 - 7824 mg/L LC50 (Oncorhynchus mykiss) = 96 h 7050 mg/L LC50 (Pimephales promelas) = 96 h 6420 - 6700 mg/L LC50 (Pimephales promelas) = 96 h 6020 - 7070 mg/L LC50 (Pimephales promelas) = 96 h	No information available	340.7 - 469.2 mg/L EC50 (Daphnia magna) = 48 h 1000 mg/L EC50 (Daphnia magna) = 48 h
Silica, crystalline, quartz 14808-60-7 ( 1 - 5 )	No information available	No information available	No information available
Sodium hydroxide 1310-73-2 ( 0.1 - 1 )	45.4 mg/L LC50 (Oncorhynchus mykiss) = 96 h	No information available	No information available
Calcium hydroxide 1305-62-0 ( 0.1 - 1 )	160 mg/L LC50 (Gambusia affinis) = 96 h	No information available	No information available

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging** Do not burn, or use a cutting torch on, the empty drum. Empty containers may contain flammable or explosive vapors. Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1 UN Number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG)</b>	Not regulated
<b>UN No. (ICAO)</b>	Not regulated

**14.2 Proper shipping name**

Not regulated for transportation by DOT, TDG, IMDG and ICAO/IATA.

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**15. Regulatory information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>European Union (EINECS and ELINCS)</b>	Does not Comply
<b>Philippines (PICCS)</b>	Does not Comply
<b>Japan (ENCS)</b>	Does not Comply
<b>China (IECSC)</b>	Does not Comply

Australia (AICS)	Does not Comply
Korean (KECL)	Does not Comply
New Zealand (NZIoC)	Does not Comply

**U.S. Federal and State Regulations**

Component	SARA 302 / TPQs	SARA 313	CERCLA RQ
Barite	N/A	N/A	N/A
Bentonite	N/A	N/A	N/A
Sodium chloride	N/A	N/A	N/A
Silica, crystalline, quartz	N/A	N/A	N/A
Sodium hydroxide	N/A	N/A	1000 lb final RQ 454 kg final RQ
Calcium hydroxide	N/A	N/A	N/A

**State Comments**

Proposition 65: This product contains chemical(s) considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 to cause cancer and/or reproductive toxicity. See table under U.S. Federal and State Regulations for the specific chemicals.

**Silica, crystalline, quartz**  
carcinogen

This product has been classified in accordance with the hazard criteria of the CPR and the SDS contains all the information required by the CPR.

**16. Other information**

**Supersedes date** 16/Mar/2011

**Revision date** 18/Jun/2014

**Version** 1

**HMIS classification**

Health	1*
Flammability	1
Physical hazard	0
PPE	J

N/A - Not Applicable, N/D - Not Determined.

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

**Safety Data Sheets:** 4421 Kendex OCTG; Best O Life 72733; Jet-Lube API- Modified – Casing;

**Waste Stream:** Casing Protectors

**EPA Waste Profile Sheet Number:** 201440506-012

## Material Safety Data Sheet

Prepared according to 29 CFR 1910.1200

### 1. Chemical Product and Company Identification

American Refining Group, Inc.  
77 North Kendall Avenue  
Bradford, PA 16701 USA  
Tel: (814) 368.1200  
www.amref.com



<b>Product Name</b>	Kendex® OCTG
<b>Product Code</b>	4421
<b>CAS Number</b>	Not applicable for mixtures
<b>Synonyms</b>	Piping Dope, Grease
<b>Generic Chemical Name</b>	Petroleum distillate
<b>Product Type</b>	Mixture
<b>Transportation Emergency Phone No.</b>	Chemtrec: 1-800-424-9300 (24 HRS)
<b>ARG Emergency Phone No.</b>	814-368-1297 (24 HRS)
<b>MSDS E-Mail</b>	msds@amref.com

### 2. Hazards Identification

<b>Appearance</b>	Orange grease
<b>Odor</b>	Petroleum Oil
<b>Signal Word</b>	None
	May cause eye irritation
	May cause skin irritation
<b>OSHA Regulatory Status</b>	This material is NOT considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200)
<b>Primary Routes of Exposure</b>	Inhalation, skin adsorption
<b>Precautions</b>	
<b>Inhalation</b>	Avoid breathing dust/fume/gas/mist/vapors/spray. Keep container tightly closed. Use only with adequate ventilation.
<b>Eyes</b>	Avoid contact with eyes. Wash thoroughly after handling.
<b>Skin</b>	Avoid contact with skin and clothing. Wash thoroughly after handling.
<b>Chronic Effects</b>	See Section 11 for complete health hazard information
<b>Environmental Effects</b>	See Section 12 for complete ecological information

### 3. Composition / Information on Ingredients

**This product does not contain hazardous ingredients**

### 4. First Aid Measures

#### 4. First Aid Measures

<b>Eyes</b>	Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
<b>Skin</b>	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
<b>Inhalation</b>	Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
<b>Ingestion</b>	If conscious, rinse out mouth with water. Get medical attention immediately.
<b>Note to Physicians</b>	No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

#### 5. Fire Fighting Measures

##### **Flammable Properties**

This product poses no unusual fire-fighting problems.

##### **Extinguishing Media**

Use dry chemical, CO<sub>2</sub>, water spray (FOG) or foam

##### **Specific Hazards Arising from Chemical**

Elevated temperatures can lead to the formation of irritating fumes and vapors. Decomposition products may include the following materials: Oxides of sulfur, oxides of carbon, oxides of calcium

##### **Protective Equipment and Precautions for Firefighters**

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

#### 6. Accidental Release Measures

##### **Personal Precautions**

No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

##### **Environmental Precautions**

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution.

##### **Methods for Containment**

Stop leak if without risk.

##### **Methods for Cleanup**

Move containers from spill area. Approach release from upwind. Absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

**7. Handling and Storage**

**Handling Procedures**

Eating, drinking, and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Use only with adequate ventilation. Use non-sparking tools.

**Shipping and Storing Procedures**

Maximum storage temperature is 93 °C. Store in accordance with local regulations. Store in a segregated and approved area. Keep in the original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials. Do not store in unlabeled containers. Store and use away from heat, sparks, open flame or any other ignition source. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers that retain product residue may be hazardous. Do not reuse container.

**8. Exposure Controls / Personal Protection**

**Component Exposure Limits:** None

**Engineering Controls**

None normally required. Use additional ventilation if needed to control vapor concentrations particularly if a mist is generated or fumes from hot material are present.

**Eye/Face Protection**

Chemical goggles or face shield.

**Skin Protection**

Use neoprene type gloves and apron

**Respiratory Protection**

None required if area is adequately ventilated. Use appropriate respiratory protection if used in confined areas. If used in an application where a mist may be generated, observe a TWA/PEL of 5 mg/m<sup>3</sup> (OSHA, ACGIH) for a mineral oil mist. Use a respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.

**General Hygiene**

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing.

**9. Physical and Chemical Properties**

<b>Appearance</b>	Orange	<b>Vapor Pressure (mm Hg at 20 °C)</b>	<.0003
<b>Odor</b>	Petroleum oil	<b>Water Soluble</b>	No
<b>Physical State</b>	Grease like	<b>Specific Gravity (g/cc)</b>	.948
<b>Flash Point (°F)</b>	>356	<b>Density (lbs/gal)</b>	7.89
<b>Boiling Point (°F)</b>	700-860	<b>pH</b>	Not available

**10. Chemical Stability & Reactivity Information**

**Stability**

Stable under normal conditions

**Polymerization**

No polymerization

**10. Chemical Stability & Reactivity Information**

<b>Incompatibility</b>	Strong acids and oxidizing materials
<b>Conditions to Avoid</b>	High temperatures
<b>Hazardous Decomposition Products</b>	Oxides of carbon (carbon monoxide, carbon dioxide), oxides of hydrogen (water), oxides of sulfur (sulfur dioxide), and oxides of calcium are all formed from burning.

**11. Toxicological Information**

<b>Acute Exposure</b>	
<b>Respiratory Irritation</b>	Not expected to cause respiratory tract irritation.
<b>Eye Irritation</b>	May cause eye irritation.
<b>Skin Irritation</b>	May cause skin irritation.
<b>Sensitization</b>	Not expected to cause skin or respiratory sensitization.
<b>Chronic Exposure</b>	
<b>Target Organ Effects</b>	No data available to indicate product or components present at greater than 1% are chronic health hazards.
<b>Carcinogenicity</b>	No data available to indicate product or components present at greater than .1% are carcinogens.
<b>Mutagenicity</b>	No data available to indicate product or any components present at greater than .1% are mutagenic or genotoxic.
<b>Reproductive Toxicity</b>	No data available to indicate product or any components present at greater than .1% are a reproductive toxin.
<b>Teratogenicity</b>	No data available to indicate product or any components contained at greater than .1% may cause birth defects.

**12. Ecological Information**

**Component Analysis- Ecotoxicity – Aquatic Life**

<b>Duration/Test/Species</b>	<b>Concentration/Conditions</b>
96 Hr LC50 Pimephales promelas	N/A mg/L

<b>Degradability</b>	Not determined
<b>Bioaccumulation</b>	Not determined
<b>Soil Mobility</b>	Not determined

**13. Disposal Considerations**

**Disposal Instructions**

Not a hazardous waste if disposed of as is, by the definitions of the U.S. EPA. Dispose of properly complying with appropriate laws and regulations.

**14. Transportation Information**

**Emergency Response** 128 *North American Emergency Response Guide Book*  
**Guide No.**

**Not regulated for transport unless shipped hot, at temperatures greater than 212°F but below the flash point and in containers of 450 liters (119 gallons) or more. For these conditions, please see below.**

	UN Number	Shipping Name (technical name)	Hazard Class	Packing Group	Labels/Placard*
<b>U.S. DOT Bulk</b>	3257	Elevated temperature liquid, N.O.S. (65 Petroleum oil)	9	III	 Bulk container must be labeled on two opposing sides

**U.S. DOT Non-Bulk** Not Regulated

\*NOTE: If loading >625F, this classification will change

**15. Regulatory Information**

**SARA Extremely Hazardous Substances (Sections 302 & 304)**

This product does not contain greater than 1% of any “extremely hazardous substances” listed pursuant to Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) Section 302 or Section 304 as identified in 40 CFR Part 355, Appendix A and B.

**SARA Section 313**

This product does not contain greater than 1.0% of the substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

**SARA Section 311 & 312 Classifications**

<b>Acute Hazard</b>	No
<b>Chronic Hazard</b>	No
<b>Fire Hazard</b>	No
<b>Reactivity Hazard</b>	No

**CERCLA**

This product does not contain any “hazardous substances” listed under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) in 40 CFR Part 302, Table 302.4.

**Global Chemical Inventories**

Inventory	Component
	<b>All components</b>
US TSCA	Present
EU	Present

Inventory	Component
Japan	Present
Australia	Present
New Zealand	Not available
Canada	Present
Switzerland	Not available
Korea	Present
Philippines	Not available
China	Present
Taiwan	Not available

**16. Other Information**

**US NFPA Ratings**

Health	Fire	Instability
1	1	0

**HMIS Ratings**

Health	Fire	Physical Hazards
1	1	0

**Preparation/Revision Date**

5/14/2012

**Revision Reason**

MSDS out of date

**Prepared By:**

Jenna Precht, Product Compliance Coordinator

*The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.*

**End of MSDS**

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## SECTION 1. IDENTIFICATION

Product name : 72733

SDS-Identcode : 463G

### Manufacturer or supplier's details

Company name of supplier : Bestolife Corporation

Address : 2777 N. Stemmons Frwy Ste 1800  
Dallas TX 75207,

Telephone : 855-243-9164/972-865-8961

Telefax : 214-631-3047

E-mail address : [www.bestolife.com](http://www.bestolife.com)

### Recommended use of the chemical and restrictions on use

Recommended use : Industrial use  
Thread Compound (Pipe Dope) and Jacking grease for use in  
Offshore industries  
Mining, (without offshore industries)

Restrictions on use : Do not use on oxygen lines or in oxygen enriched atmospheres.

---

## SECTION 2. HAZARDS IDENTIFICATION

### GHS classification in accordance with the Hazardous Products Regulations

Carcinogenicity : Category 2

Reproductive toxicity : Category 1A

Effects on or via lactation

Specific target organ systemic toxicity - repeated exposure : Category 1 (Kidney, Central nervous system, Blood)

### GHS label elements

Hazard pictograms : 

Signal Word : Danger

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**Hazard Statements** : H351 Suspected of causing cancer.  
H360FD May damage fertility. May damage the unborn child.  
H362 May cause harm to breast-fed children.  
H372 Causes damage to organs (Kidney, Central nervous system, Blood) through prolonged or repeated exposure.

**Precautionary Statements** : **Prevention:**  
P201 Obtain special instructions before use.  
P202 Do not handle until all safety precautions have been read and understood.  
P260 Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.  
P263 Avoid contact during pregnancy and while nursing.  
P264 Wash skin thoroughly after handling.  
P270 Do not eat, drink or smoke when using this product.  
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

**Response:**  
P308 + P313 IF exposed or concerned: Get medical advice/ attention.

**Storage:**  
P405 Store locked up.

**Disposal:**  
P501 Dispose of contents/ container to an approved waste disposal plant.

**Other hazards**  
None known.

### SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

#### Hazardous ingredients

Chemical name	CAS-No.	Concentration (% w/w)
Distillates (petroleum), hydrotreated heavy naphthenic	64742-52-5	>= 30 - < 50
Lead	7439-92-1	>= 30 - < 50
Graphite	7782-42-5	>= 10 - < 20
Copper metal powder	7440-50-8	>= 1 - < 5
Talc	14807-96-6	>= 1 - < 5
Quartz	14808-60-7	>= 1 - < 5
12-Hydroxy lithium stearate	7620-77-1	>= 1 - < 5
Distillates (petroleum), hydrotreated light naphthenic	64742-53-6	>= 1 - < 5
Barium bis(di C8-C10, branched, C9 rich, alkyl)naphthalenesulphonate)	25619-56-1	>= 1 - < 5

### SECTION 4. FIRST AID MEASURES

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- General advice : In the case of accident or if you feel unwell, seek medical advice immediately.  
When symptoms persist or in all cases of doubt seek medical advice.
- If inhaled : If inhaled, remove to fresh air.  
Get medical attention.
- In case of skin contact : In case of contact, immediately flush skin with plenty of water.  
Remove contaminated clothing and shoes.  
Get medical attention.  
Wash clothing before reuse.  
Thoroughly clean shoes before reuse.
- In case of eye contact : Flush eyes with water as a precaution.  
Get medical attention if irritation develops and persists.
- If swallowed : If swallowed, DO NOT induce vomiting.  
Get medical attention.  
Rinse mouth thoroughly with water.
- Most important symptoms and effects, both acute and delayed : Suspected of causing cancer.  
May damage fertility. May damage the unborn child.  
May cause harm to breast-fed children.  
Causes damage to organs through prolonged or repeated exposure.
- Protection of first-aiders : First Aid responders should pay attention to self-protection,  
and use the recommended personal protective equipment when the potential for exposure exists.
- Notes to physician : Treat symptomatically and supportively.
- 

## SECTION 5. FIRE-FIGHTING MEASURES

- Suitable extinguishing media : Water spray  
Alcohol-resistant foam  
Carbon dioxide (CO<sub>2</sub>)  
Dry chemical
- Unsuitable extinguishing media : None known.
- Specific hazards during fire fighting : Exposure to combustion products may be a hazard to health.
- Hazardous combustion products : Carbon oxides  
Lead compounds  
Metal oxides  
Silicon oxides  
Sulfur oxides
- Specific extinguishing methods : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
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Use water spray to cool unopened containers.  
Remove undamaged containers from fire area if it is safe to do so.  
Evacuate area.

Special protective equipment for fire-fighters : In the event of fire, wear self-contained breathing apparatus.  
Use personal protective equipment.

---

## SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Use personal protective equipment.  
Follow safe handling advice and personal protective equipment recommendations.

Environmental precautions : Discharge into the environment must be avoided.  
Prevent further leakage or spillage if safe to do so.  
Retain and dispose of contaminated wash water.  
Local authorities should be advised if significant spillages cannot be contained.

Methods and materials for containment and cleaning up : Sweep up or vacuum up spillage and collect in suitable container for disposal.  
Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable.  
Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.

---

## SECTION 7. HANDLING AND STORAGE

Technical measures : See Engineering measures under EXPOSURE CONTROLS/PERSONAL PROTECTION section.

Advice on safe handling : Do not get on skin or clothing.  
Do not swallow.  
Avoid contact with eyes.  
Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment  
Keep container tightly closed.  
Take care to prevent spills, waste and minimize release to the environment.

Conditions for safe storage : Keep in properly labeled containers.  
Store locked up.  
Keep tightly closed.  
Store in accordance with the particular national regulations.

Materials to avoid : Do not store with the following product types:  
Strong oxidizing agents  
Organic peroxides  
Explosives

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Gases

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Ingredients with workplace control parameters

Ingredients	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Distillates (petroleum), hydrotreated heavy naphthenic	64742-52-5	TWA (Mist)	5 mg/m <sup>3</sup>	CA AB OEL
		STEL (Mist)	10 mg/m <sup>3</sup>	CA AB OEL
		TWAEV (Mist)	5 mg/m <sup>3</sup>	CA QC OEL
		STEV (Mist)	10 mg/m <sup>3</sup>	CA QC OEL
		TWA (Mist)	1 mg/m <sup>3</sup>	CA BC OEL
		TWA (Inhalable fraction)	5 mg/m <sup>3</sup>	ACGIH
Lead	7439-92-1	TWA	0.05 mg/m <sup>3</sup>	CA AB OEL
		TWA	0.05 mg/m <sup>3</sup>	CA BC OEL
		TWA	0.05 mg/m <sup>3</sup> (Lead)	CA ON OEL
		TWAEV (Lead)	0.05 mg/m <sup>3</sup> (Lead)	CA QC OEL
		TWA	0.05 mg/m <sup>3</sup> (Lead)	ACGIH
Graphite	7782-42-5	TWA (Respirable)	2 mg/m <sup>3</sup>	CA BC OEL
		TWA (Respirable)	2 mg/m <sup>3</sup>	CA AB OEL
		TWAEV (Respirable fibres)	5 mg/m <sup>3</sup>	CA QC OEL
		TWAEV (Total fibres)	10 mg/m <sup>3</sup>	CA QC OEL
		TWAEV (respirable dust)	2 mg/m <sup>3</sup>	CA QC OEL
		TWA (Respirable fraction)	2 mg/m <sup>3</sup>	ACGIH
Copper metal powder	7440-50-8	TWA (Fumes)	0.2 mg/m <sup>3</sup>	CA AB OEL
		TWA (Dust and mist) (Copper)	1 mg/m <sup>3</sup> (Copper)	CA AB OEL
		TWAEV (dusts and mists) (Copper)	1 mg/m <sup>3</sup> (Copper)	CA QC OEL
		TWAEV (Fumes) (Copper)	0.2 mg/m <sup>3</sup> (Copper)	CA QC OEL
		TWA (Dust and mists) (Copper)	1 mg/m <sup>3</sup> (Copper)	CA BC OEL

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		TWA (Fumes)	0.2 mg/m <sup>3</sup> (Copper)	CA BC OEL
		TWA (Dust and mist)	1 mg/m <sup>3</sup> (Copper)	ACGIH
		TWA (Fumes)	0.2 mg/m <sup>3</sup> (Copper)	ACGIH
Talc	14807-96-6	TWAEV (respirable dust)	3 mg/m <sup>3</sup>	CA QC OEL
		TWA (Respirable particulates)	2 mg/m <sup>3</sup>	CA AB OEL
		TWA (Respirable)	2 mg/m <sup>3</sup>	CA BC OEL
		TWA	2 fibres per cubic centimeter	CA ON OEL
		TWA (Respirable fraction)	2 mg/m <sup>3</sup>	CA ON OEL
		TWA (Respirable fraction)	2 mg/m <sup>3</sup>	ACGIH
Quartz	14808-60-7	TWA (Respirable fraction)	0.1 mg/m <sup>3</sup>	CA ON OEL
		TWA (Respirable particulates)	0.025 mg/m <sup>3</sup>	CA AB OEL
		TWAEV (respirable dust)	0.1 mg/m <sup>3</sup>	CA QC OEL
		TWA (Respirable)	0.025 mg/m <sup>3</sup> (Silica)	CA BC OEL
		TWA (Respirable fraction)	0.025 mg/m <sup>3</sup> (Silica)	ACGIH
12-Hydroxy lithium stearate	7620-77-1	TWA	10 mg/m <sup>3</sup>	CA AB OEL
		TWA	10 mg/m <sup>3</sup>	CA BC OEL
		TWA	10 mg/m <sup>3</sup>	ACGIH
Distillates (petroleum), hydrotreated light naphthenic	64742-53-6	TWA (Mist)	5 mg/m <sup>3</sup>	CA AB OEL
		STEL (Mist)	10 mg/m <sup>3</sup>	CA AB OEL
		TWAEV (Mist)	5 mg/m <sup>3</sup>	CA QC OEL
		STEV (Mist)	10 mg/m <sup>3</sup>	CA QC OEL
		TWA (Mist)	1 mg/m <sup>3</sup>	CA BC OEL
		TWA (Inhalable fraction)	5 mg/m <sup>3</sup>	ACGIH
Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate)	25619-56-1	TWA	0.5 mg/m <sup>3</sup> (Barium)	CA AB OEL
		TWAEV	0.5 mg/m <sup>3</sup> (Barium)	CA QC OEL

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		TWA	0.5 mg/m <sup>3</sup> (Barium)	CA BC OEL
		TWA	0.5 mg/m <sup>3</sup> (Barium)	ACGIH

**These substance(s) are inextricably bound in the product and therefore do not contribute to a dust inhalation hazard.**

Quartz

### Biological occupational exposure limits

Ingredients	CAS-No.	Control parameters	Biological specimen	Sam-pling time	Permissible concentra-tion	Basis
Lead	7439-92-1	Lead (Lead)	In blood	Not criti-cal	30 micrograms per 100 milliliters	ACGIH BEI

**Engineering measures** : Minimize workplace exposure concentrations. Dust formation may be relevant in the processing of this product. In addition to substance-specific OELs, general limitations of concentrations of particulates in the air at workplaces have to be considered in workplace risk assessment. Relevant limits include: OSHA PEL for Particulates Not Otherwise Regulated of 15 mg/m<sup>3</sup> - total dust, 5 mg/m<sup>3</sup> - respirable fraction; and ACGIH TWA for Particles (insoluble or poorly soluble) Not Otherwise Specified of 3 mg/m<sup>3</sup> - respirable particles, 10 mg/m<sup>3</sup> - inhalable particles.

### Personal protective equipment

**Respiratory protection** : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines.

**Filter type** : Combined particulates and organic vapor type

**Hand protection**

**Material** : Chemical-resistant gloves

**Remarks** : Choose gloves to protect hands against chemicals depending on the concentration specific to place of work. Breakthrough time is not determined for the product. Change gloves often! For special applications, we recommend clarifying the resistance to chemicals of the aforementioned protective gloves with the glove manufacturer. Wash hands before breaks and at the end of workday.

**Eye protection** : Wear the following personal protective equipment: Safety glasses

**Skin and body protection** : Select appropriate protective clothing based on chemical

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resistance data and an assessment of the local exposure potential.  
Skin contact must be avoided by using impervious protective clothing (gloves, aprons, boots, etc).

Hygiene measures : Ensure that eye flushing systems and safety showers are located close to the working place.  
When using do not eat, drink or smoke.  
Wash contaminated clothing before re-use.

---

### SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Viscous semi-solid
Color	: black, copper
Odor	: Petroleum
Odor Threshold	: No data available
pH	: Not applicable (not an aqueous solution)
Melting point/freezing point	: No data available
Initial boiling point and boiling range	: No data available
Flash point	: $\geq 162.8$ °C Method: ASTM D 92, Cleveland open cup Distillates (petroleum), hydrotreated heavy naphthenic
Evaporation rate	: Not applicable
Flammability (solid, gas)	: Not classified as a flammability hazard
Upper explosion limit / Upper flammability limit	: No data available
Lower explosion limit / Lower flammability limit	: No data available
Vapor pressure	: Not applicable
Relative vapor density	: Not applicable
Relative density	: 1.9
Solubility(ies) Water solubility	: negligible
Partition coefficient: n-octanol/water	: Not applicable
Autoignition temperature	: No data available

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Decomposition temperature : No data available

Viscosity  
Viscosity, kinematic : Not applicable

Flow time : No data available

Explosive properties : Not explosive

Oxidizing properties : The substance or mixture is not classified as oxidizing.

Molecular weight : No data available

Particle size : No data available

---

## SECTION 10. STABILITY AND REACTIVITY

Reactivity : Not classified as a reactivity hazard.

Chemical stability : Stable under normal conditions.

Possibility of hazardous reactions : Can react with strong oxidizing agents.

Conditions to avoid : None known.

Incompatible materials : Oxidizing agents

Hazardous decomposition products : No hazardous decomposition products are known.

---

## SECTION 11. TOXICOLOGICAL INFORMATION

### Information on likely routes of exposure

Skin contact  
Ingestion  
Eye contact

### Acute toxicity

Not classified based on available information.

### Product:

Acute oral toxicity : Acute toxicity estimate: > 5,000 mg/kg  
Method: Calculation method

Acute inhalation toxicity : Acute toxicity estimate: > 10 mg/l  
Exposure time: 4 h  
Test atmosphere: dust/mist  
Method: Calculation method

### Ingredients:

**Distillates (petroleum), hydrotreated heavy naphthenic:**

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Acute oral toxicity : LD50 (Rat): > 5,000 mg/kg  
Method: OECD Test Guideline 401  
Remarks: Based on data from similar materials

Acute inhalation toxicity : LC50 (Rat): > 5.53 mg/l  
Exposure time: 4 h  
Test atmosphere: dust/mist  
Method: OECD Test Guideline 403  
Assessment: The substance or mixture has no acute inhalation toxicity  
Remarks: Based on data from similar materials

Acute dermal toxicity : LD50 (Rabbit): > 5,000 mg/kg  
Method: OECD Test Guideline 402  
Remarks: Based on data from similar materials

### Lead:

Acute oral toxicity : LD50 (Rat): > 2,000 mg/kg  
Remarks: Based on data from similar materials

Acute dermal toxicity : LD50 (Rat): > 2,000 mg/kg  
Remarks: Based on data from similar materials

### Graphite:

Acute oral toxicity : LD50 (Rat): > 2,000 mg/kg  
Method: OECD Test Guideline 401  
Assessment: The substance or mixture has no acute oral toxicity

Acute inhalation toxicity : LC50 (Rat): > 2 mg/l  
Exposure time: 4 h  
Test atmosphere: dust/mist  
Method: OECD Test Guideline 403  
Assessment: The substance or mixture has no acute inhalation toxicity

### Copper metal powder:

Acute oral toxicity : LD50 (Rat): > 2,500 mg/kg  
Method: OECD Test Guideline 423  
Assessment: The substance or mixture has no acute oral toxicity

Acute inhalation toxicity : LC50 (Rat): > 5.11 mg/l  
Exposure time: 4 h  
Test atmosphere: dust/mist  
Method: OECD Test Guideline 436  
Assessment: The substance or mixture has no acute inhalation toxicity

Acute dermal toxicity : LD50 (Rat): > 2,000 mg/kg  
Method: OECD Test Guideline 402  
Assessment: The substance or mixture has no acute dermal toxicity

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## II

### Talc:

Acute oral toxicity : LD50 (Rat): > 5,000 mg/kg  
Remarks: Based on data from similar materials

### Quartz:

Acute oral toxicity : LD50 (Rat): > 5,000 mg/kg

### 12-Hydroxy lithium stearate:

Acute oral toxicity : LD50 (Rat): > 2,000 mg/kg  
Assessment: The substance or mixture has no acute oral toxicity

### Distillates (petroleum), hydrotreated light naphthenic:

Acute oral toxicity : LD50 (Rat): > 5,000 mg/kg  
Method: OECD Test Guideline 401

Acute inhalation toxicity : LC50 (Rat): > 5.53 mg/l  
Exposure time: 4 h  
Test atmosphere: dust/mist  
Method: OECD Test Guideline 403  
Assessment: The substance or mixture has no acute inhalation toxicity

Acute dermal toxicity : LD50 (Rabbit): > 2,000 mg/kg  
Assessment: The substance or mixture has no acute dermal toxicity

### Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate):

Acute oral toxicity : LD50 (Rat): 1,750 mg/kg  
Remarks: Based on data from similar materials

Acute inhalation toxicity : Acute toxicity estimate: 1.5 mg/l  
Exposure time: 4 h  
Test atmosphere: dust/mist  
Method: Expert judgment  
Remarks: Based on harmonised classification in EU regulation 1272/2008, Annex VI

Acute dermal toxicity : LD50 (Rat): > 10,000 mg/kg  
Remarks: Based on data from similar materials

### Skin corrosion/irritation

Not classified based on available information.

### Ingredients:

#### Distillates (petroleum), hydrotreated heavy naphthenic:

Species: Rabbit  
Result: No skin irritation  
Remarks: Based on data from similar materials

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**Lead:**

Species: Rabbit  
Method: OECD Test Guideline 404  
Result: No skin irritation  
Remarks: Based on data from similar materials

**Graphite:**

Species: Rabbit  
Method: OECD Test Guideline 404  
Result: No skin irritation

**Copper metal powder:**

Species: Rabbit  
Method: OECD Test Guideline 404  
Result: No skin irritation

**Talc:**

Species: Rabbit  
Result: No skin irritation

**12-Hydroxy lithium stearate:**

Species: Rabbit  
Result: No skin irritation  
Remarks: Based on data from similar materials

**Distillates (petroleum), hydrotreated light naphthenic:**

Species: Rabbit  
Result: No skin irritation

**Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate):**

Species: Rabbit  
Result: Skin irritation  
Remarks: Based on data from similar materials

**Serious eye damage/eye irritation**

Not classified based on available information.

**Ingredients:**

**Distillates (petroleum), hydrotreated heavy naphthenic:**

Species: Rabbit  
Result: No eye irritation  
Remarks: Based on data from similar materials

**Lead:**

Species: Rabbit  
Result: No eye irritation  
Method: OECD Test Guideline 405

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Remarks: Based on data from similar materials

**Graphite:**

Species: Rabbit  
Result: No eye irritation

**Copper metal powder:**

Species: Rabbit  
Result: No eye irritation  
Method: OECD Test Guideline 405

**Talc:**

Species: Rabbit  
Result: No eye irritation

**12-Hydroxy lithium stearate:**

Species: Rabbit  
Result: No eye irritation  
Remarks: Based on data from similar materials

**Distillates (petroleum), hydrotreated light naphthenic:**

Species: Rabbit  
Result: No eye irritation

**Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate):**

Species: Rabbit  
Result: No eye irritation  
Remarks: Based on data from similar materials

**Respiratory or skin sensitization**

**Skin sensitization**

Not classified based on available information.

**Respiratory sensitization**

Not classified based on available information.

**Ingredients:**

**Distillates (petroleum), hydrotreated heavy naphthenic:**

Test Type: Buehler Test  
Routes of exposure: Skin contact  
Species: Guinea pig  
Result: negative  
Remarks: Based on data from similar materials

**Lead:**

Test Type: Maximization Test  
Routes of exposure: Skin contact  
Species: Guinea pig

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Method: OECD Test Guideline 406  
Result: negative  
Remarks: Based on data from similar materials

**Graphite:**

Test Type: Local lymph node assay (LLNA)  
Routes of exposure: Skin contact  
Species: Mouse  
Result: negative

**Copper metal powder:**

Test Type: Maximization Test  
Routes of exposure: Skin contact  
Species: Guinea pig  
Method: OECD Test Guideline 406  
Result: negative

**Talc:**

Routes of exposure: Skin contact  
Species: Humans  
Result: negative

**12-Hydroxy lithium stearate:**

Test Type: Local lymph node assay (LLNA)  
Routes of exposure: Skin contact  
Species: Mouse  
Method: OECD Test Guideline 429  
Result: negative

**Distillates (petroleum), hydrotreated light naphthenic:**

Test Type: Buehler Test  
Routes of exposure: Skin contact  
Species: Guinea pig  
Method: OECD Test Guideline 406  
Result: negative

**Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate):**

Test Type: Buehler Test  
Routes of exposure: Skin contact  
Species: Guinea pig  
Result: negative  
Remarks: Based on data from similar materials

**Germ cell mutagenicity**

Not classified based on available information.

**Ingredients:**

**Distillates (petroleum), hydrotreated heavy naphthenic:**

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)

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Method: OECD Test Guideline 471

Result: negative

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)  
Species: Mouse  
Application Route: Intraperitoneal injection  
Method: OECD Test Guideline 474  
Result: negative  
Remarks: Based on data from similar materials

**Lead:**

Genotoxicity in vitro : Test Type: In vitro sister chromatid exchange assay in mammalian cells  
Result: negative  
Remarks: Based on data from similar materials

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)  
Species: Rat  
Application Route: Ingestion  
Result: positive  
Remarks: Based on data from similar materials

**Graphite:**

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)  
Result: negative

**Copper metal powder:**

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)  
Method: OECD Test Guideline 471  
Result: negative

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)  
Species: Mouse  
Application Route: Ingestion  
Method: Directive 67/548/EEC, Annex V, B.12.  
Result: negative  
Remarks: Based on data from similar materials

**Talc:**

Genotoxicity in vitro : Test Type: DNA damage and repair, unscheduled DNA synthesis in mammalian cells (in vitro)  
Result: negative

Genotoxicity in vivo : Test Type: Chromosome aberration test in vitro  
Species: Rat  
Application Route: Ingestion  
Result: negative

**Distillates (petroleum), hydrotreated light naphthenic:**

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Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)  
Method: OECD Test Guideline 476  
Result: negative

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)  
Species: Mouse  
Application Route: Intraperitoneal injection  
Method: OECD Test Guideline 474  
Result: negative

**Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate):**

Genotoxicity in vitro : Test Type: Chromosome aberration test in vitro  
Method: OECD Test Guideline 473  
Result: negative  
Remarks: Based on data from similar materials

**Carcinogenicity**

Suspected of causing cancer.

**Product:**

Carcinogenicity - Assessment : Petroleum distillates have been classified as not carcinogenic based on DMSO extract content < 3% (Regulation (EC) 1272/2008, Annex VI, Part 3, Note L).

**Ingredients:**

**Distillates (petroleum), hydrotreated heavy naphthenic:**

Species: Mouse  
Application Route: Skin contact  
Exposure time: 78 weeks  
Method: OECD Test Guideline 451  
Result: negative

**Lead:**

Species: Rat  
Application Route: Ingestion  
Exposure time: 2 Years  
Result: positive  
Remarks: Based on data from similar materials

Carcinogenicity - Assessment : Limited evidence of carcinogenicity in animal studies

**Talc:**

Species: Mouse  
Application Route: inhalation (dust/mist/fume)  
Exposure time: 2 Years  
Result: negative

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**Quartz:**

Species: Humans  
Application Route: inhalation (dust/mist/fume)  
Result: positive  
Remarks: IARC: (International Agency for Research on Cancer)  
These substance(s) are inextricably bound in the product and therefore do not contribute to a dust inhalation hazard.

Carcinogenicity - Assessment : Positive evidence from human epidemiological studies (inhalation)

**Distillates (petroleum), hydrotreated light naphthenic:**

Species: Mouse  
Application Route: Skin contact  
Exposure time: 78 weeks  
Result: negative

**Reproductive toxicity**

May damage fertility. May damage the unborn child.  
May cause harm to breast-fed children.

**Ingredients:**

**Lead:**

Effects on fertility : Test Type: Two-generation reproduction toxicity study  
Species: Mouse  
Application Route: Ingestion  
Result: positive  
Remarks: Based on data from similar materials

Effects on fetal development : Test Type: Embryo-fetal development  
Species: Rat  
Application Route: Ingestion  
Result: positive  
Remarks: Based on data from similar materials

Reproductive toxicity - Assessment : Positive evidence of adverse effects on sexual function and fertility from human epidemiological studies., Positive evidence of adverse effects on development from human epidemiological studies., Studies indicating a hazard to babies during the lactation period

**Graphite:**

Effects on fertility : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test  
Species: Rat  
Application Route: Ingestion  
Method: OECD Test Guideline 422  
Result: negative

Effects on fetal development : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test  
Species: Rat

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Application Route: Ingestion  
 Method: OECD Test Guideline 422  
 Result: negative

**Copper metal powder:**

Effects on fertility : Test Type: Two-generation reproduction toxicity study  
 Species: Rat  
 Application Route: Ingestion  
 Result: negative  
 Remarks: Based on data from similar materials

Effects on fetal development : Test Type: Embryo-fetal development  
 Species: Rabbit  
 Application Route: Ingestion  
 Result: negative

**Talc:**

Effects on fetal development : Test Type: Embryo-fetal development  
 Species: Rat  
 Application Route: Ingestion  
 Result: negative

**Distillates (petroleum), hydrotreated light naphthenic:**

Effects on fertility : Test Type: Reproduction/Developmental toxicity screening test  
 Species: Rat  
 Application Route: Ingestion  
 Result: negative

Effects on fetal development : Test Type: Embryo-fetal development  
 Species: Rat  
 Application Route: Skin contact  
 Result: negative

**Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate):**

Effects on fertility : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test  
 Species: Rat  
 Application Route: Ingestion  
 Method: OECD Test Guideline 422  
 Result: negative  
 Remarks: Based on data from similar materials

Effects on fetal development : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test  
 Species: Rat  
 Application Route: Ingestion  
 Method: OECD Test Guideline 422  
 Result: negative  
 Remarks: Based on data from similar materials

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## **STOT-single exposure**

Not classified based on available information.

## **STOT-repeated exposure**

Causes damage to organs (Kidney, Central nervous system, Blood) through prolonged or repeated exposure.

## **Ingredients:**

### **Lead:**

Target Organs: Kidney, Central nervous system, Blood

Assessment: Causes damage to organs through prolonged or repeated exposure.

### **Quartz:**

Routes of exposure: inhalation (dust/mist/fume)

Target Organs: Lungs

Assessment: Shown to produce significant health effects in animals at concentrations of 0.02 mg/l/6h/d or less.

### **12-Hydroxy lithium stearate:**

Routes of exposure: Ingestion

Assessment: No significant health effects observed in animals at concentrations of 100 mg/kg bw or less.

## **Repeated dose toxicity**

## **Ingredients:**

### **Distillates (petroleum), hydrotreated heavy naphthenic:**

Species: Rat

NOAEL: > 0.98 mg/l

Application Route: inhalation (dust/mist/fume)

Exposure time: 28 Days

Remarks: Based on data from similar materials

### **Lead:**

Species: Rat

NOAEL: 0.0015 mg/kg

LOAEL: 0.005 mg/kg

Application Route: Ingestion

Exposure time: 6 - 12 Months

Remarks: Based on data from similar materials

### **Graphite:**

Species: Rat

NOAEL: 12 mg/m<sup>3</sup>

Application Route: inhalation (dust/mist/fume)

Exposure time: 28 Days

Method: OECD Test Guideline 412

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## Copper metal powder:

Species: Rat  
NOAEL:  $\geq 2$  mg/m<sup>3</sup>  
Application Route: inhalation (dust/mist/fume)  
Exposure time: 28 Days

## Quartz:

Species: Humans  
LOAEL: 0.053 mg/m<sup>3</sup>  
Application Route: inhalation (dust/mist/fume)  
Remarks: These substance(s) are inextricably bound in the product and therefore do not contribute to a dust inhalation hazard.

## 12-Hydroxy lithium stearate:

Species: Rat  
NOAEL:  $> 88$  mg/kg  
Application Route: Ingestion  
Exposure time: 90 Days

## Distillates (petroleum), hydrotreated light naphthenic:

Species: Rabbit  
NOAEL: 1,000 mg/kg  
Application Route: Skin contact  
Exposure time: 4 Weeks  
Method: OECD Test Guideline 410

## Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate):

Species: Rat  
NOAEL: 55 mg/kg  
LOAEL: 165 mg/kg  
Application Route: Ingestion  
Exposure time: 29 Days  
Method: OECD Test Guideline 422  
Remarks: Based on data from similar materials

## Aspiration toxicity

Not classified based on available information.

---

## SECTION 12. ECOLOGICAL INFORMATION

### Ecotoxicity

#### Ingredients:

#### Distillates (petroleum), hydrotreated heavy naphthenic:

Toxicity to fish : LC50 (Pimephales promelas (fathead minnow)):  $> 100$  mg/l  
Exposure time: 96 h  
Method: OECD Test Guideline 203  
Remarks: Based on data from similar materials

Toxicity to daphnia and other : EC50 (Daphnia magna (Water flea)):  $> 10,000$  mg/l

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aquatic invertebrates		Exposure time: 48 h Remarks: Based on data from similar materials
Toxicity to algae	:	EC50 (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	NOEC (Daphnia magna (Water flea)): 10 mg/l Exposure time: 21 d Remarks: Based on data from similar materials
Toxicity to microorganisms	:	NOEC: > 1.93 mg/l Exposure time: 10 min Remarks: Based on data from similar materials

**Lead:**

Toxicity to fish	:	LC50 (Oncorhynchus mykiss (rainbow trout)): 0.107 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Ceriodaphnia dubia (water flea)): 0.029 mg/l Exposure time: 48 h
Toxicity to algae	:	ErC50 (Pseudokirchneriella subcapitata (green algae)): 0.025 mg/l Exposure time: 72 h  EC10 (Pseudokirchneriella subcapitata (green algae)): 6.1 µg/l Exposure time: 72 h
M-Factor (Acute aquatic toxicity)	:	10
Toxicity to fish (Chronic toxicity)	:	EC10 (Pimephales promelas (fathead minnow)): 20 µg/l Exposure time: 30 d
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	EC10 (Ceriodaphnia dubia (water flea)): 1.7 µg/l Exposure time: 7 d
M-Factor (Chronic aquatic toxicity)	:	10

**Graphite:**

Toxicity to fish	:	LC50 (Danio rerio (zebra fish)): > 100 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): > 100 mg/l Exposure time: 48 h Method: OECD Test Guideline 202

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Toxicity to algae : EC50 (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l  
Exposure time: 72 h  
Method: OECD Test Guideline 201

Toxicity to microorganisms : EC50: > 1,012.5 mg/l  
Exposure time: 3 h  
Method: OECD Test Guideline 209

### **Copper metal powder:**

Toxicity to fish : LC50: > 10 - 100 µg/l  
Exposure time: 96 h

M-Factor (Acute aquatic toxicity) : 10

Toxicity to fish (Chronic toxicity) : NOEC: > 1 - 10 µg/l

M-Factor (Chronic aquatic toxicity) : 10

### **Talc:**

Toxicity to fish : LC50 (Brachydanio rerio (zebrafish)): > 100,000 mg/l  
Exposure time: 24 h

### **Quartz:**

#### **Ecotoxicology Assessment**

Acute aquatic toxicity : No toxicity at the limit of solubility.

Chronic aquatic toxicity : No toxicity at the limit of solubility.

### **12-Hydroxy lithium stearate:**

Toxicity to fish : LL50 (Oncorhynchus mykiss (rainbow trout)): > 100 mg/l  
Exposure time: 96 h  
Method: OECD Test Guideline 203

Toxicity to daphnia and other aquatic invertebrates : EL50 (Daphnia magna (Water flea)): > 100 mg/l  
Exposure time: 48 h  
Method: OECD Test Guideline 202

Toxicity to algae : NOELR (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l  
Exposure time: 72 h  
Method: OECD Test Guideline 201

### **Distillates (petroleum), hydrotreated light naphthenic:**

Toxicity to fish : LL50 (Pimephales promelas (fathead minnow)): > 100 mg/l  
Exposure time: 96 h  
Test substance: Water Accommodated Fraction

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- Toxicity to daphnia and other aquatic invertebrates : EL50 (Daphnia magna (Water flea)): > 10,000 mg/l  
Exposure time: 48 h  
Test substance: Water Accommodated Fraction
- Toxicity to algae : NOELR (Pseudokirchneriella subcapitata (green algae)): >= 100 mg/l  
Exposure time: 72 h  
Test substance: Water Accommodated Fraction
- Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : NOEC (Daphnia magna (Water flea)): 10 mg/l  
Exposure time: 21 d
- Toxicity to microorganisms : NOEC (Photobacterium phosphoreum): > 2.17 mg/l  
Exposure time: 4 d

### **Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate):**

- Toxicity to fish : LL50 (Cyprinus carpio (Carp)): > 100 mg/l  
Exposure time: 96 h  
Test substance: Water Accommodated Fraction  
Method: OECD Test Guideline 203  
Remarks: Based on data from similar materials
- Toxicity to daphnia and other aquatic invertebrates : EL50 (Daphnia magna (Water flea)): > 100 mg/l  
Exposure time: 48 h  
Test substance: Water Accommodated Fraction  
Method: OECD Test Guideline 202  
Remarks: Based on data from similar materials
- Toxicity to algae : EL50 (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l  
Exposure time: 72 h  
Test substance: Water Accommodated Fraction  
Method: OECD Test Guideline 201  
Remarks: Based on data from similar materials
- Toxicity to microorganisms : EC50: > 100 mg/l  
Exposure time: 3 h  
Method: OECD Test Guideline 209  
Remarks: Based on data from similar materials

### **Persistence and degradability**

#### **Ingredients:**

#### **Distillates (petroleum), hydrotreated heavy naphthenic:**

- Biodegradability : Result: Not readily biodegradable.  
Biodegradation: 2 - 4 %  
Exposure time: 28 d  
Method: OECD Test Guideline 301B

#### **12-Hydroxy lithium stearate:**

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**Biodegradability** : Result: Readily biodegradable.  
Biodegradation: 78 %  
Exposure time: 28 d  
Method: OECD Test Guideline 301C

**Distillates (petroleum), hydrotreated light naphthenic:**

**Biodegradability** : Result: Not readily biodegradable.  
Biodegradation: 2 - 8 %  
Exposure time: 28 d  
Method: OECD Test Guideline 301B

**Barium bis(di C8-C10, branched, C9 rich, alkylnaphthalenesulphonate):**

**Biodegradability** : Result: Not readily biodegradable.  
Biodegradation: 14 %  
Exposure time: 28 d  
Method: OECD Test Guideline 301B  
Remarks: Based on data from similar materials

**Bioaccumulative potential**

No data available

**Mobility in soil**

No data available

**Other adverse effects**

No data available

---

### SECTION 13. DISPOSAL CONSIDERATIONS

**Disposal methods**

**Waste from residues** : Dispose of in accordance with local regulations.

**Contaminated packaging** : Empty containers should be taken to an approved waste handling site for recycling or disposal.  
Empty containers retain residue and can be dangerous.  
Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury and/or death.  
If not otherwise specified: Dispose of as unused product.

---

### SECTION 14. TRANSPORT INFORMATION

**International Regulations**

**UNRTDG**

**UN number** : UN 3077  
**Proper shipping name** : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.  
(Lead, Copper metal powder)  
**Class** : 9

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Packing group : III  
Labels : 9

### IATA-DGR

UN/ID No. : UN 3077  
Proper shipping name : Environmentally hazardous substance, solid, n.o.s.  
(Lead, Copper metal powder)  
Class : 9  
Packing group : III  
Labels : Miscellaneous  
Packing instruction (cargo aircraft) : 956  
Packing instruction (passenger aircraft) : 956  
Environmentally hazardous : yes

### IMDG-Code

UN number : UN 3077  
Proper shipping name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID,  
N.O.S.  
(Lead, Copper metal powder)  
Class : 9  
Packing group : III  
Labels : 9  
EmS Code : F-A, S-F  
Marine pollutant : yes

### Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

### Domestic regulation

#### TDG

UN number : UN 3077  
Proper shipping name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID,  
N.O.S.  
(Lead, Copper metal powder)  
Class : 9  
Packing group : III  
Labels : 9  
ERG Code : 171  
Marine pollutant : yes(Lead, Copper metal powder)

---

## SECTION 15. REGULATORY INFORMATION

### The ingredients of this product are reported in the following inventories:

DSL : All components of this product are on the Canadian DSL

TSCA : All chemical substances in this product are either listed on the TSCA Inventory or are in compliance with a TSCA Inventory exemption.

AICS : All ingredients listed or exempt.

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## SECTION 16. OTHER INFORMATION

### Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
ACGIH BEI	:	ACGIH - Biological Exposure Indices (BEI)
CA AB OEL	:	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
CA BC OEL	:	Canada. British Columbia OEL
CA ON OEL	:	Ontario Table of Occupational Exposure Limits made under the Occupational Health and Safety Act.
CA QC OEL	:	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
ACGIH / TWA	:	8-hour, time-weighted average
CA AB OEL / TWA	:	8-hour Occupational exposure limit
CA AB OEL / STEL	:	15-minute occupational exposure limit
CA BC OEL / TWA	:	8-hour time weighted average
CA ON OEL / TWA	:	Time-Weighted Average Limit (TWA)
CA QC OEL / TWA EV	:	Time-weighted average exposure value
CA QC OEL / STEV	:	Short-term exposure value

AICS - Australian Inventory of Chemical Substances; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; CPR - Controlled Products Regulations; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

Sources of key data used to compile the Material Safety : Internal technical data, data from raw material SDSs, OECD eChem Portal search results and European Chemicals Agen-

# SAFETY DATA SHEET



## 72733

Version	Revision Date:	SDS Number:	Date of last issue: 10/31/2017
10.0	11/20/2017	115248-00016	Date of first issue: 05/12/2015

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Data Sheet cy, <http://echa.europa.eu/>

Revision Date : 11/20/2017

Items where changes have been made to the previous version are highlighted in the body of this document by two vertical lines.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and shall not be considered a warranty or quality specification of any type. The information provided relates only to the specific material identified at the top of this SDS and may not be valid when the SDS material is used in combination with any other materials or in any process, unless specified in the text. Material users should review the information and recommendations in the specific context of their intended manner of handling, use, processing and storage, including an assessment of the appropriateness of the SDS material in the user's end product, if applicable.

CA / Z8

# API-MODIFIED

## HIGH-PRESSURE THREAD COMPOUND

### DESCRIPTION

**JET-LUBE® API-MODIFIED** is a high-pressure thread compound that conforms to or exceeds the requirements of API RP 5A3 and former API BUL 5A2. It also contains rust and oxidation inhibitors blended in **JET-LUBE's** unique grease compounded from custom-refined, low-sulfur oil to ensure brushability over a wide temperature range, tenacious adherence to all surfaces, resistance to water washout, and prevention of rust/corrosion.

**API-MODIFIED** will seal and withstand pressures to 10,000 psi and will not harden or dry.

The lubricating characteristics of **API-MODIFIED** reduces friction in the makeup of casing and tubing, preventing galling and wear. Maximum thread engagement is ensured, providing optimum leak resistance.

Inhibitors in **API-MODIFIED** provide maximum protection against rust and corrosion of threaded surfaces. Its conductivity reduces the possibility of electrolytic corrosion by preventing the formation of galvanic cells in the presence of salt water and other corrosive fluids.

**Not recommended for rotary shouldered connections.**

- Meets or exceeds API RP 5A3
- Additives for rust & corrosion protection
- Excellent lubrication qualities to prevent galling & wear
- Sticks to wet or oily threads
- Brushable over a wide temperature range
- Leak prevention to 10,000 psi
- Available in Arctic Grade
- California Proposition 65: Carcinogen & reproductive toxin

### APPLICATIONS

**JET-LUBE API-MODIFIED** is specially formulated for use on casing, tubing, line pipe, flow lines, subsurface production tools, tank batteries, and will lubricate, seal and protect threaded connections of oilfield tubular goods on makeup, in service, and in storage.

### PRODUCT CHARACTERISTICS

Thickener	Soap
Fluid Type	Petroleum
Color/Appearance	Black/Brown
Dropping Point (ASTM D-2265)	>280°F (138°C)
Specific Gravity	1.97
Density (lbs./gal.)	16.4
Flash Point (ASTM D-92)	>430°F (221°C)
NLGI Grade	1
Penetration @77°F	310 - 340
Friction Factor	1.0
Copper Strip Corrosion (ASTM D-4048)	1A
4-Ball (ASTM D-2596)	1000 Weld Point, kgf >130 Load Wear Index

**Shelf Life: Minimum 2 years from manufacture date.**

### PACKAGING

Code No.	Container Size	Shipping Wt.
22123	10 lb.	11 lbs.
22112	25 lb.	27 lbs.
22114	50 lb.	54 lbs.
22119	25 kg.	27 kg.

### LIMITED WARRANTY

Jet-Lube, Inc. makes the Limited Express Warranty that at the date of delivery, this product shall be free from defects in Jet-Lube, Inc. materials and workmanship.

This Limited Express Warranty is expressly in lieu of any other express or implied warranties, including any implied warranty of merchantability or fitness for a particular purpose, and of any other obligation on the part of Jet-Lube, Inc.

The sole remedy for breach of the Limited Express Warranty shall be the refund of the purchase price. All other liability is negated and disclaimed, and Jet-Lube, Inc. shall not be liable for incidental or consequential damages.

## CORPORATE LOCATIONS

Houston, Texas—World Headquarters

Maidenhead, England

Edmonton, Canada



JET-LUBE, INC.  
4849 HOMESTEAD RD.,  
SUITE 232  
HOUSTON, TX 77028

WATS: 800-538-5823  
PHONE: 713-670-5700  
FAX: 713-678-4604  
sales@jetlube.com  
www.jetlube.com

**Safety Data Sheets:** Hydrochloric Acid

**Waste Stream:** Acid Solutions

**EPA Waste Profile Sheet Number:** 20140506-015

# SAFETY DATA SHEET

## Hydrochloric Acid, 31 – 36%

### SECTION 1

### PRODUCT AND COMPANY IDENTIFICATION

**Product Name:** Hydrochloric Acid, 31 – 36.7%

**Identified Uses:** Acid etching, steel pickling, oil and gas, ore and mineral, food processing, pharmaceutical, organic chemical synthesis

**Company Information:**

ASHTA Chemicals Inc.

P.O. Box 858

Ashtabula, Ohio 44005

**Phone:** (440)997-5221

**Fax:** (440)998-0286

**24-hour Emergency Phone:** CHEMTREC: (800)424-9300

### SECTION 2

### HAZARDS IDENTIFICATION

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Corrosive to metals - Category 1 Serious eye damage - Category 1 Skin corrosion - Category 1B

Specific target organ toxicity - single exposure - Category 3

**GHS label elements, including precautionary statements:**

Signal Word: **Danger**

Pictograms(s):



**Hazard Statements**

H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.

**Precautionary Statements**

P234	Keep only in original container.
P261	Avoid breathing dust/fume/mist/vapors/spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water. Shower.

P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container with a resistant inner liner.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/container in accordance with local/state/national regulations.

### SECTION 3 COMPOSITION/INFORMATION ON INGREDIENTS

**Synonyms:**

CHEMICAL NAME: Hydrochloric acid  
TRADE NAME: Hydrochloric acid, 31 –36%  
SYNONYMS: Muriatic acid, Chlorohydric acid, Hydrogen Chloride

C.A.S: 7647-01-0  
EC: 231-595-7  
WHMIS: D2A, E

CHEMICAL FORMULA: HCl (in aqueous solution)  
CHEMICAL FAMILY: Inorganic Acid

### SECTION 4 FIRST AID MEASURES

**Description of first aid measures:**

Consult a physician. Show this safety data sheet to the doctor in attendance.

**If inhaled:**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give humidified air. Give oxygen, but only by a certified physician. Consult a physician.

**In case of skin contact:**

Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact:**

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Remove contact lenses if present and easy to do. Continue rinsing eyes during transport to medical facility.

**If swallowed:**

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Consult a physician.

NOTICE: The data and information in this bulletin are to the best of ASHTA Chemicals' knowledge complete, accurate and correct; however, no representations or warranties, written or oral, express or implied, are made by ASHTA Chemicals Inc., as to such data and information or that the goods mentioned herein are suitable for any particular purpose or merchantable, or that such goods are free from any patent infringement. Purchasers should satisfy themselves of the suitability of any such goods for the purpose intended prior to purchase.

**SECTION 5 FIRE FIGHTING MEASURES**

Flash Point (Method):	Non-combustible.
Extinguishing Media:	Use extinguishing agents compatible with acid and appropriate for the burning material. Use water spray to keep fire-exposed containers cool.
Auto Ignition Temp:	Non-combustible.
Special Fire Fighting Procedures:	Wear self-contained breathing apparatus and full protective clothing. In case of fire and/or explosion do not breathe fumes. Use standard fire fighting procedures and consider the hazards of other involved materials.
Unusual Fire/Explosion Hazards:	Releases flammable hydrogen gas when reacting with metals.

**SECTION 6 ACCIDENTAL RELEASE MEASURES**

**Environmental Precautions:**

Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Avoid discharge into drains, water courses or onto the ground.

**Containment and Cleaning:**

Follow preplanned emergency procedures. Only properly equipped, trained, functional personnel should attempt to contain a leak. All other personnel should be evacuated from the danger area. Using full protective equipment, apply appropriate emergency device or other securement technology to stop the leak if possible.

Small Spill:	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: neutralize the residue with a dilute solution of sodium carbonate.
Large Spill:	Corrosive liquid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to knock down vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that vapor is not present at a concentration level above TLV.

**SECTION 7 HANDLING AND STORAGE**

**Precautions to be taken for handling and storage:**

Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Do not breathe mist or vapor. Observe good industrial hygiene practices. Do not empty into drains. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes. Store in a well-ventilated place. Store away from incompatible materials. Store closed containers in a clean, cool, open or well-ventilated area. Keep out of sun.

**SECTION 8 EXPOSURE CONTROL/PERSONAL PROTECTION**

**Principal Component:** Hydrochloric Acid

**Occupational Exposure Limits:**

**Regulatory Limits:**

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrochloric Acid Mixture	---	---	5 ppm 7.59 mg/m <sup>3</sup>

ACGIH TLV = 5 ppm (7.59 mg/m<sup>3</sup>) TWA

NIOSH IDLH = 50 ppm (as HCl, 2010)

**Exposure Controls:**

Eye Protection:

Tightly fitting safety goggles. Face shield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Respiratory Protection:

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Other Protection:

Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Ventilation Recommended:

Exhaust ventilation is required to meet PEL limits.

Glove Type Recommended:

Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

**SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES**

Information on basic physical and chemical properties:

Appearance	Colorless to light yellow liquid
Odor	Pungent (irritating/strong)
Odor threshold	0.3ppm (can cause olfactory fatigue)
pH	<1 (in aqueous solution)
Melting point/freezing point	-30°C (-22°F)
Initial boiling point	>100°C (>212°F)
Flash point	Not applicable

Auto-ignition temp	Not applicable
Evaporation rate	No data available
Decomposition temperature	No data available
Flammability (solid, gas)	Not combustible
Upper/lower flammability or explosive limits	Not combustible
Water solubility	100%
Molecular weight	36.46
Relative density (specific gravity)	1.16 (32% HCl solution) 1.19 (36.5% HCl solution)
Bulk density	8.75 lbs/gal (32% HCl solution) 9.83 lbs/gal (36.5% HCl solution)
Vapor density (air = 1)	1.267 at 20 °C
Vapor pressure	84 mm Hg @ 20°C
Partition coefficient: n-octanol/water	No data available

## SECTION 10

## STABILITY AND REACTIVITY

Stability:	Hydrochloric acid is stable under normal conditions and pressures.
Conditions to avoid:	Incompatible materials, metals, excess heat, bases.
Incompatibility:	Bases, amines, metals, permanganates (e.g., potassium permanganate), fluorine, metal acetylides, hexalithium disilicide.
Hazardous decomposition products:	Hydrogen chloride, chlorine, hydrogen gas.
Polymerization:	Hazardous polymerization WILL NOT occur.

## SECTION 11

## TOXICOLOGICAL INFORMATION

### Information on likely routes of exposure:

Inhalation:	Vapors and mist will irritate throat and respiratory system and cause coughing.
Skin contact:	Causes skin burns.
Eye contact:	Causes eye burns.
Ingestion:	Harmful if swallowed. Causes digestive tract burns. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

### Symptoms related to the physical, chemical and toxicological characteristics:

Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

### Information on toxicological effects:

Acute toxicity:	Harmful if swallowed.
Skin corrosion/irritation:	Causes severe skin burns and eye damage.
Irritation:	Causes serious eye damage.

Respiratory sensitization:	Not available.
Skin sensitization:	No data available.
Germ cell mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive toxicity:	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure:	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure:	No data available.
Aspiration hazard:	Not available.
Chronic effects:	Prolonged inhalation may be harmful.

**Components Species Test Results:**  
Hydrochloric acid (CAS# 7647-01-0)

Rat - Inhalation LC <sub>50</sub> :	3124 ppm, (1 hour)
Rabbit - Dermal LD <sub>50</sub> :	5010 mg/kg

**SECTION 12 ECOLOGICAL INFORMATION**

Ecotoxicity:	Because of the low pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Aquatic Toxicity:	This material is toxic to fish and aquatic organisms. Most aquatic species do not tolerate pH lower than 5.5 for any extended period.
Fish Toxicity:	Fish LC <sub>50</sub> Mosquito fish: 282 mg/l, 96 hours Fish LC <sub>50</sub> Bluegill: 3.6 mg/l, 48 hours
Persistence and Degradability:	Not biodegradable. Hydrochloric acid will likely be neutralized to chloride by alkalinity present in natural environment.
Bioaccumulative Potential:	No data available.
Mobility in Soil:	Hydrochloric acid will be neutralized by naturally occurring alkalinity. The acid will permeate soil, dissolving some soil material and will then neutralize.
Other Adverse Effects:	No other adverse environmental effects (e.g., ozone depletion, photochemical ozone creation).

**SECTION 13 DISPOSAL CONSIDERATIONS**

Collect and reclaim or dispose in sealed containers at a properly licensed waste disposal site. This material, if not neutralized, must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national or international regulations.

NOTICE: The data and information in this bulletin are to the best of ASHTA Chemicals' knowledge complete, accurate and correct; however, no representations or warranties, written or oral, express or implied, are made by ASHTA Chemicals Inc., as to such data and information or that the goods mentioned herein are suitable for any particular purpose or merchantable, or that such goods are free from any patent infringement. Purchasers should satisfy themselves of the suitability of any such goods for the purpose intended prior to purchase.

**SECTION 14**

**TRANSPORT INFORMATION**

**Shipping:**

Usual Shipping Containers:	Tank cars, bulk tankers.
Usual Shelf Life:	Indefinite (life of containers).
Storage/Transport Temperatures:	Ambient.

**Suitable Storage:**

Materials/Coatings: Teflon, Tygon, Rubber, PVC and Polypropylene Materials.

**D.O.T. Information:**

Labeling:	Corrosive
D.O.T. Identification Number:	UN 1789
D.O.T. Shipping Name:	Hydrochloric Acid
Hazard Class:	8
Packing Group:	II
Hazard Guide:	157
Placard:	UN 1789

**SECTION 15**

**REGULATORY INFORMATION**

**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:

Hydrochloric Acid	CAS#: 7647-01-0
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**SARA 311/312 Hazards**

Acute health hazard, reactive hazard.

**Massachusetts Right to Know Components**

Hydrochloric Acid	CAS#: 7647-01-0
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**Pennsylvania Right to Know Components**

Hydrochloric Acid	CAS#: 7647-01-0
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**New Jersey Right to Know Components**

Hydrochloric Acid	CAS#: 7647-01-0
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**California Prop. 65 Components**

This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other reproductive harm.

**OSHA PSM/RMP Threshold for Accidental Release:**

CAS# 7647-01-0 is regulated under OSHA PSM *only* if anhydrous HCl.

CAS# 7647-01-0 is regulated under EPA RMP *only* if  $\geq 37\%$  HCl.

**Toxic Substances Control Act (TSCA):**

Hydrochloric Acid

CAS#: 7647-01-0

**Comprehensive Environmental Response Compensation Liability Act: (CERCLA)**

Hydrochloric Acid

CAS#: 7647-01-0

**SECTION 16**

**OTHER INFORMATION**

**NFPA Rating:**

Health hazard: 3

Fire Hazard: 0

Reactivity Hazard: 1

This information is drawn from recognized sources believed to be reliable. ASHTA Chemicals, Inc. makes no guarantees or assumes any liability in connection with this information. The user should be aware of changing technology, research, regulations and analytical procedures that may require changes herein. The above data is supplied upon the condition that persons will evaluate this information and then determine its suitability for their use. Only U.S.A. regulations apply to the above.

Version 1.0	For the new GHS SDS Standard	Revision Date: 12/31/2014
Version 1.1	Graphics updated	Revision Date: 3/9/2015
Version 1.2	Title updated	Revision Date: 6/2/2015
Version 1.3	Section 9 changes	Revision Date: 7/30/2015
Version 1.4	Section 1, 15 changes	Revision Date: 4/15/2016
Version 1.5	Changed P501 text (Section 2)	Revision Date: 6/15/2016
Version 1.6	Updated Section 2.0	Revision Date 4/20/2017
Removed Version, Updated Format		Revision Date 5/16/2018
Updated Format		Revision Date: 11/03/2020

**Safety Data Sheets:** WD-40 Aerosol CAN

**Waste Stream:** Aerosol Cans

**EPA Waste Profile Sheet Number:** 20140506-016



# Safety Data Sheet

## 1 - Identification

<p><b>Trade Name:</b> WD-40 Aerosol</p> <p><b>Product Use:</b> Lubricant, Penetrant, Drives Out Moisture, Removes and Protects Surfaces From Corrosion</p> <p><b>Restrictions on Use:</b> None identified</p> <p><b>SDS Date Of Preparation:</b> November 21, 2019</p>	<p><b>Canadian Office:</b>  WD-40 Products [Canada] Ltd.  P.O. Box 220  Toronto, Ontario M9C 4V3  <b>Information Phone #:</b> (416) 622-9881  <b>Emergency Phone # 24 hr:</b> Canutec: (613) 996-6666 -  Designated for use only in the event of chemical emergencies involving a spill, leak, fire exposure or accident involving chemicals</p>
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## 2 – Hazards Identification

### WHMIS 2015/GHS Classification:

Flammable Aerosol Category 1  
Gas Under Pressure: Compressed Gas  
Aspiration Toxicity Category 1  
Specific Target Organ Toxicity Single Exposure Category 3 (nervous system effects)

Note: This product is a consumer product and is labeled in accordance with the Consumer Chemicals and Containers Regulations (CCCR) which take precedence over WHMIS 2015 labeling. The actual container label will not include the label elements below. The labeling below applies to industrial/professional products.

### Label Elements:



### DANGER!

Extremely flammable aerosol.  
Contains gas under pressure; may explode if heated.  
May be fatal if swallowed and enters airways.  
May cause drowsiness or dizziness.

### Prevention

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.  
Do not spray on an open flame or other ignition source.  
Do not pierce or burn, even after use.  
Avoid breathing mist or vapors.  
Use only outdoors or in a well-ventilated area.

### Response

IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting.  
IF INHALED: Remove person to fresh air and keep comfortable for breathing.  
Call a POISON CENTER or doctor if you fell unwell.

### Storage

Store locked up.  
Protect from sunlight. Do not expose to temperatures exceeding 50°C/122°F. Store in a well-ventilated place.

### Disposal

Dispose of contents and container in accordance with local and national regulations.

### 3 - Composition/Information on Ingredients

Ingredient	CAS #	Weight Percent	WHMIS 2015/ GHS Classification
Aliphatic Hydrocarbon	64742-47-8	50-70%	Flammable Liquid Category 3 Aspiration Toxicity Category 1 Specific Target Organ Toxicity Single Exposure Category 3 (nervous system effects)
Petroleum Base Oil	64742-56-9 64742-65-0 64742-53-6 64742-54-7 64742-71-8	30-35%	Not Hazardous
Carbon Dioxide	124-38-9	2-3%	Simple Asphyxiant

### 4 – First Aid Measures

**Ingestion (Swallowed):** Aspiration Hazard. DO NOT induce vomiting. Call physician, poison control center or the WD-40 Safety Hotline at 1-888-324-7596 immediately.

**Eye Contact:** Flush thoroughly with water. Remove contact lenses if present after the first 5 minutes and continue flushing for several more minutes. Get medical attention if irritation persists.

**Skin Contact:** Wash with soap and water. If irritation develops and persists, get medical attention.

**Inhalation (Breathing):** If irritation is experienced, move to fresh air. Get medical attention if irritation or other symptoms develop and persist.

**Signs and Symptoms of Exposure:** Harmful or fatal if swallowed. If swallowed, may be aspirated and cause lung damage. May cause eye irritation. Inhalation of mists or vapors may cause nasal and respiratory tract irritation and central nervous system effects such as headache, dizziness and nausea. Skin contact may cause drying of the skin.

**Indication of Immediate Medical Attention/Special Treatment Needed:** Immediate medical attention is needed for ingestion.

### 5 – Fire Fighting Measures

**Suitable (and unsuitable) Extinguishing Media:** Use water fog, dry chemical, carbon dioxide or foam. Do not use water jet or flooding amounts of water. Burning product will float on the surface and spread fire.

**Specific Hazards Arising from the Chemical:** Contents under pressure. Keep away from ignition sources and open flames. Exposure of containers to extreme heat and flames can cause them to rupture often with violent force. Vapors are heavier than air and may travel along surfaces to remote ignition sources and flash back. Combustion will produce oxides of carbon and hydrocarbons.

**Special Protective Equipment and Precautions for Fire-Fighters:** Firefighters should always wear positive pressure self-contained breathing apparatus and full protective clothing. Cool fire-exposed containers with water. Use shielding to protect against bursting containers.

### 6 – Accidental Release Measures

**Personal Precautions, Protective Equipment and Emergency Procedures:** Wear appropriate protective clothing (see Section 8). Eliminate all sources of ignition and ventilate area.

**Methods and Materials for Containment/Cleanup:** Leaking cans should be placed in a plastic bag or open pail until the pressure has dissipated. Contain and collect liquid with an inert absorbent and place in a container for disposal. Clean spill area thoroughly. Report spills to authorities as required.

### 7 – Handling and Storage

**Precautions for Safe Handling:** Avoid contact with eyes. Avoid prolonged contact with skin. Avoid breathing vapors or aerosols. Use only with adequate ventilation. Keep away from heat, sparks, pilot lights, hot surfaces and open flames. Unplug electrical tools, motors and appliances before spraying or bringing the can near any source of electricity. Electricity can burn a hole in the can and cause contents to burst into flames. To avoid serious burn injury, do not let the can touch battery terminals, electrical connections on motors or appliances

or any other source of electricity. Wash thoroughly with soap and water after handling. Keep containers closed when not in use. Keep out of the reach of children. Do not puncture, crush or incinerate containers, even when empty.

**Conditions for Safe Storage:** Store in a cool, well-ventilated area, away from incompatible materials Do not store above 120°F or in direct sunlight. U.F.C (NFPA 30B) Level 3 Aerosol. Store away from oxidizers.

### 8 – Exposure Controls/Personal Protection

Chemical	Occupational Exposure limits
Aliphatic Hydrocarbon	1200 mg/m <sup>3</sup> TWA (manufacturer recommended)
Petroleum Base Oil	5 mg/m <sup>3</sup> TWA (Inhalable) ACGIH TLV (as mineral oil) 5 mg/m <sup>3</sup> TWA, 10 mg/m <sup>3</sup> STEL Canada- Québec (as oil mist, mineral) 5 mg/m <sup>3</sup> TWA, 10 mg/m <sup>3</sup> STEL Canada- Ontario (as oil mist, mineral) 1 mg/m <sup>3</sup> TWA British Columbia (as Oil mist-mineral, severely refined)
Carbon Dioxide	5000 ppm TWA, 30,000 ppm STEL ACGIH TLV 5000 ppm TWA, 30,000 ppm STEL Canada-Ontario 5000 ppm TWA, 30,000 ppm STEL Canada-Québec 5000 ppm TWA, 15,000 ppm STEL British Columbia

### The Following Controls are Recommended for Normal Consumer Use of this Product

**Appropriate Engineering Controls:** Use in a well-ventilated area.

**Personal Protection:**

**Eye Protection:** Avoid eye contact. Always spray away from your face.

**Skin Protection:** Avoid prolonged skin contact. Chemical resistant gloves recommended for operations where skin contact is likely.

**Respiratory Protection:** None needed for normal use with adequate ventilation.

### For Bulk Processing or Workplace Use the Following Controls are Recommended

**Appropriate Engineering Controls:** Use adequate general and local exhaust ventilation to maintain exposure levels below that occupational exposure limits.

**Personal Protection:**

**Eye Protection:** Safety goggles recommended where eye contact is possible.

**Skin Protection:** Wear chemical resistant gloves.

**Respiratory Protection:** None required if ventilation is adequate. If the occupational exposure limits are exceeded, wear a NIOSH approved respirator. Respirator selection and use should be based on contaminant type, form and concentration. Follow applicable regulations and good Industrial Hygiene practice.

**Work/Hygiene Practices:** Wash with soap and water after handling.

### 9 – Physical and Chemical Properties

Appearance:	Light amber liquid	Flammable Limits: (Solvent Portion)	LEL: 0.6% UEL: 8%
Odor:	Mild petroleum odor	Vapor Pressure:	95-115 PSI @ 70°F
Odor Threshold:	Not established	Vapor Density:	Greater than 1 (air=1)
pH:	Not Applicable	Relative Density:	0.8 – 0.82 @ 60°F
Melting/Freezing Point:	Not established	Solubilities:	Insoluble in water
Boiling Point/Range:	361 - 369°F (183 - 187°C)	Partition Coefficient; n-octanol/water:	Not established
Flash Point:	122°F (49°C) Tag Open Cup (liquid)	Autoignition Temperature:	Not established
Evaporation Rate:	Not established	Decomposition Temperature:	Not established
Flammability (solid, gas):	Flammable Aerosol	Viscosity:	2.79-2.96 cSt @ 100°F
VOC:	65%	Pour Point:	-63°C (-81.4°F ) ASTM D-97

## 10 – Stability and Reactivity

**Reactivity:** Not reactive under normal conditions

**Chemical Stability:** Stable

**Possibility of Hazardous Reactions:** May react with strong oxidizers generating heat.

**Conditions to Avoid:** Avoid heat, sparks, flames and other sources of ignition. Do not puncture or incinerate containers.

**Incompatible Materials:** Strong oxidizing agents.

**Hazardous Decomposition Products:** Carbon monoxide and carbon dioxide.

## 11 – Toxicological Information

**Symptoms of Overexposure:**

**Inhalation:** High concentrations may cause nasal and respiratory irritation and central nervous system effects such as headache, dizziness and nausea. Intentional abuse may be harmful or fatal.

**Skin Contact:** Prolonged and/or repeated contact may produce mild irritation and defatting with possible dermatitis.

**Eye Contact:** Contact may be irritating to eyes. May cause redness and tearing.

**Ingestion:** This product has low oral toxicity. Swallowing may cause gastrointestinal irritation, nausea, vomiting and diarrhea. This product is an aspiration hazard. If swallowed, can enter the lungs and may cause chemical pneumonitis, severe lung damage and death.

**Chronic Effects:** None expected.

**Carcinogen Status:** None of the components are listed as a carcinogen or suspect carcinogen by IARC, NTP, ACGIH or OSHA.

**Reproductive Toxicity:** None of the components is considered a reproductive hazard.

**Numerical Measures of Toxicity:**

Acute Toxicity Estimates: Oral > 5,000 mg/kg; Dermal >2,000 mg/kg based on an assessment of the ingredients. This product is not classified as toxic by established criteria. It is an aspiration hazard.

## 12 – Ecological Information

**Ecotoxicity:** No specific aquatic toxicity data is currently available; however components of this product are not expected to be harmful to aquatic organisms

**Persistence and Degradability:** Components are readily biodegradable.

**Bioaccumulative Potential:** Bioaccumulation is not expected based on an assessment of the ingredients.

**Mobility in Soil:** No data available

**Other Adverse Effects:** None known

## 13 - Disposal Considerations

Aerosol containers should not be punctured, compacted in home trash compactors or incinerated. Empty containers may be disposed of through normal waste management options. Dispose of all waste product, absorbents, and other materials in accordance with applicable Federal, state and local regulations.

## 14 – Transportation Information

DOT Surface Shipping Description: UN1950, Aerosols, 2.1 Ltd. Qty

(Note: Shipping Papers are not required for Limited Quantities unless transported by air or vessel – each package must be marked with the Limited Quantity Mark)

Canadian TDG Classification: Limited Quantity

IMDG Shipping Description: Un1950, Aerosols, 2.1, LTD QTY

ICAO Shipping Description: UN1950, Aerosols, flammable, 2.1

NOTE: WD-40 Company does not test aerosol cans to assure that they meet the pressure and other requirements for transport by air. We do not recommend that our aerosol products be transported by air.

### 15 – Regulatory Information

**National Pollutant Release Inventory (NPRI):** This product contains the following chemicals that are listed on the NPRI Substance List: Aliphatic Hydrocarbon (64742-47-8) 50-70%

**Canadian Environmental Protection Act:** All of the ingredients are listed on the Canadian Domestic Substances List or exempt from notification.

### 16 – Other Information

**HMIS Hazard Rating:**

**Health – 1 (slight hazard), Fire Hazard – 4 (severe hazard), Physical Hazard – 0 (minimal hazard)**

Revision Date: November 21, 2019

Supersedes: November 15, 2016

Prepared by: Industrial Health & Safety Consultants, Inc. Shelton, CT, USA

Reviewed by: I. Kowalski

Regulatory Affairs Dept.

1014100/No.0084104

**Safety Data Sheets:** AFFF Ansulite 1

**Waste Stream:** AFFF

**EPA Waste Profile Sheet Number:** 20140506-017



## Safety Data Sheet

This safety data sheet complies with the requirements of: 2012 OSHA Hazard Communication Standard ( 29CFR 1910.1200)

**Product name** ANSULITE 1% AFFF (AFC1B)

### 1. Identification

#### 1.1. Product Identifier

**Product name** ANSULITE 1% AFFF (AFC1B)

#### 1.2. Other means of identification

**Product code** 443102  
**Synonyms** None  
**Chemical Family** No information available

#### 1.3. Recommended use of the chemical and restrictions on use

**Recommended use** Fire extinguishing agent.  
**Uses advised against** Consumer use.

#### 1.4. Details of the Supplier of the Safety Data Sheet

**Company Name** Tyco Fire Protection Products  
One Stanton Street  
Marinette, WI 54143-2542  
Telephone: 715-735-7411  
**Contact point** Product Stewardship at 1-715-735-7411  
**E-mail address** psra@tycofp.com

#### 1.5. Emergency Telephone Number

**Emergency telephone** CHEMTREC 001-800-424-9300 or 001-703-527-3887

### 2. Hazards Identification

#### Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Serious eye damage/eye irritation - Category 1  
Skin Sensitization - Category 1B

#### 2.2. Label Elements

##### Signal Word

DANGER

##### Hazard Statements

Causes serious eye damage  
May cause an allergic skin reaction





## Precautionary Statements

### Prevention

Wear protective gloves/protective clothing/eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Contaminated work clothing should not be allowed out of the workplace.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.

IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

### Disposal

Dispose of contents/container to an approved waste disposal plant.

### 2.3. Hazards Not Otherwise Classified (HNOC)

Not Applicable.

### 2.4. Other Information

May be harmful if swallowed.

## 3. Composition/information on Ingredients

### 3.1. Mixture

The following component(s) in this product are considered hazardous under applicable OSHA(USA)

Chemical name	CAS No.	weight-%
2-(2-Butoxyethoxy)ethanol	112-34-5	10 - 30
Sodium Decyl Sulfate	142-87-0	1 - 5
Polyfluorinated alkyl betaine	Proprietary	1 - 5
Sodium Octyl Sulfate	142-31-4	1 - 5
Polyfluorinated alkyl polyamide	Proprietary	1 - 5

## 4. First aid measures

### 4.1. Description of first aid measures

<b>General Advice</b>	If symptoms persist, call a physician.
<b>Eye Contact</b>	Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.
<b>Skin contact</b>	Wash skin with soap and water. Get medical attention if irritation develops and persists.
<b>Inhalation</b>	Remove to fresh air. If breathing is difficult, give oxygen. (Get medical attention immediately if symptoms occur.)
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. If swallowed, call a poison control center or physician immediately.

### 4.2. Most Important Symptoms and Effects, Both Acute and Delayed

**Symptoms** No information available.

### 4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

**Note to physicians** Treat symptomatically.



## 5. Fire-fighting measures

### 5.1. Suitable Extinguishing Media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

### 5.2. Unsuitable Extinguishing Media

None.

### 5.3. Specific Hazards Arising from the Chemical

None known.

#### Hazardous Combustion Products

Carbon oxides, Fluorinated oxides, Nitrogen oxides (NOx), Oxides of sulfur

### 5.4. Explosion Data

Sensitivity to Mechanical Impact None.

Sensitivity to Static Discharge None.

### 5.5. Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

## 6. Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

**Personal Precautions** Ensure adequate ventilation, especially in confined areas.

**For emergency responders** Use personal protection recommended in Section 8.

### 6.2. Environmental Precautions

**Environmental Precautions** Prevent further leakage or spillage if safe to do so. Prevent entry into waterways, sewers, basements or confined areas. See Section 12 for additional Ecological Information.

### 6.3. Methods and material for containment and cleaning up

**Methods for Containment** Prevent further leakage or spillage if safe to do so.

**Methods for Cleaning Up** Pick up and transfer to properly labeled containers.

## 7. Handling and Storage

### 7.1. Precautions for Safe Handling

**Advice on safe handling** Avoid contact with skin and eyes. Handle in accordance with good industrial hygiene and safety practice.

### 7.2. Conditions for safe storage, including any incompatibilities



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**Storage Conditions** Keep containers tightly closed in a dry, cool and well-ventilated place.

**Incompatible Materials** Strong oxidizing agents. Strong acids. Strong bases.

**8. Exposure Controls/Personal Protection**

**8.1. Control Parameters**

**Exposure guidelines**

Chemical name	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL
2-(2-Butoxyethoxy)ethanol 112-34-5	TWA: 10 ppm inhalable fraction and vapor	-	-	-

ACGIH (American Conference of Governmental Industrial Hygienists) OSHA (Occupational Safety and Health Administration of the US Department of Labor) NIOSH IDLH Immediately Dangerous to Life or Health

**8.2. Appropriate Engineering Controls**

**Engineering controls** Ensure adequate ventilation, especially in confined areas.

**8.3. Individual protection measures, such as personal protective equipment**

**Eye/Face Protection** Avoid contact with eyes. Tight sealing safety goggles.

**Skin and Body Protection** Wear protective gloves and protective clothing.

**Respiratory Protection** If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

**Ventilation** Use local exhaust or general dilution ventilation to control exposure with applicable limits

**8.4. General hygiene considerations**

Do not eat, drink or smoke when using this product. Handle in accordance with good industrial hygiene and safety practice.

**9. Physical and Chemical Properties**

**9.1. Information on basic physical and chemical properties**

<b>Physical State</b>	Liquid	<b>Color</b>	Light yellow
<b>Odor</b>	Characteristic		
<b>Odor Threshold</b>	No data available		

Property	Values	Remarks • Method
pH	8.5	
Melting point/freezing point	No data available	
Boiling point / boiling range	No data available	
Flash Point	No data available	
Evaporation Rate	No data available	
Flammability (solid, gas)	No data available	
Flammability limit in air		
Upper flammability limit:	No data available	
Lower flammability limit:	No data available	
Vapor Pressure	No data available	



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Vapor Density	No data available
Specific gravity	No data available
Water Solubility	No data available
Solubility in Other Solvents	No data available
Partition coefficient	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Kinematic viscosity	No data available
VOC content (%)	25.4782
Density	1.02

## 10. Stability and Reactivity

### 10.1. Chemical Stability

Stable under recommended storage conditions.

### 10.2. Reactivity

No data available

### 10.3. Possibility of hazardous reactions

None under normal processing.

**Hazardous Polymerization** Hazardous polymerization does not occur.

### 10.4. Conditions to Avoid

Extremes of temperature and direct sunlight.

### 10.5. Incompatible Materials

Strong oxidizing agents. Strong acids. Strong bases.

### 10.6. Hazardous decomposition products

Carbon oxides. Nitrogen oxides (NO<sub>x</sub>). Oxides of sulfur. Fluorinated oxides.

## 11. Toxicological Information

### 11.1. Information on Likely Routes of Exposure

#### Product information

Inhalation	No data available.
Eye Contact	Severely irritating to eyes.
Skin contact	May cause irritation.
Ingestion	May be harmful if swallowed.

#### Component Information

##### Acute Toxicity



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Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
2-(2-Butoxyethoxy)ethanol 112-34-5	= 5660 mg/kg ( Rat )	= 2700 mg/kg ( Rabbit )	-
Sodium Decyl Sulfate 142-87-0	= 1950 mg/kg ( Rat )	-	-
Sodium Octyl Sulfate 142-31-4	= 3200 mg/kg ( Rat )	-	-
Polyfluorinated alkyl polyamide	>2000 mg/kg	>2000 mg/kg	>5.11 mg/l

## 11.2. Information on Toxicological Effects

**Symptoms** No information available.

**11.3. Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Skin Corrosion/Irritation** Irritating to skin.

**Serious eye damage/eye irritation** Severely irritating to eyes.

Component Information					
Polyfluorinated alkyl polyamide					
Method	species	Exposure Route	Effective dose	Exposure time	Results
OECD Test No. 405: Acute Eye Irritation/Corrosion	Rabbit	eye			Class 4 on a 1 to 8 scale according to a modified Kay and Calandra classification system. Mild eye irritation

**Sensitization** May cause sensitization by skin contact.

Component Information			
Polyfluorinated alkyl polyamide			
Method	species	Exposure Route	Results
OECD Test No. 429: Skin Sensitisation: Local Lymph Node Assay	mouse	dermal	sensitizing

Component Information		
Polyfluorinated alkyl polyamide		
Method	species	Results
OECD Test No. 473: In vitro Mammalian Chromosome Aberration Test	in vitro	Non-clastogenic to human lymphocytes in vitro.

**Carcinogenicity** No information available.

**Reproductive Toxicity** No information available.

**STOT - Single Exposure** No information available.

**STOT - Repeated Exposure** No information available.

**Chronic Toxicity** Avoid repeated exposure.

**Aspiration Hazard** No information available.

## 11.4. Numerical Measures of Toxicity - Product information

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	4874 mg/kg
ATEmix (dermal)	10216 mg/kg
ATEmix (inhalation-dust/mist)	321.4 mg/l

## 12. Ecological Information

### 12.1. Ecotoxicity



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Chemical name	Algae/aquatic plants	Fish	Crustacea
2-(2-Butoxyethoxy)ethanol 112-34-5	EC50 (96h) > 100 mg/L Desmodesmus subspicatus	LC50 (96h) static = 1300 mg/L Lepomis macrochirus	EC50 (48h) > 100 mg/L Daphnia magna EC50 (24h) = 2850 mg/L Daphnia magna
1,2-Propanediol 57-55-6	EC50 (96h) = 19000 mg/L Pseudokirchneriella subcapitata	LC50 (96h) static = 51600 mg/L Oncorhynchus mykiss LC50 (96h) static = 51400 mg/L Pimephales promelas LC50 (96h) = 710 mg/L Pimephales promelas LC50 (96h) static 41 - 47 mL/L Oncorhynchus mykiss	EC50 (48h) Static > 1000 mg/L Daphnia magna EC50 (24h) > 10000 mg/L Daphnia magna
t-Butanol 75-65-0	EC50 (72h) > 1000 mg/L Desmodesmus subspicatus	LC50 (96h) flow-through 6130 - 6700 mg/L Pimephales promelas	EC50 (48h) = 933 mg/L Daphnia magna EC50 (48h) Static 4607 - 6577 mg/L Daphnia magna
1-Octanol 111-87-5	EC50 (48h) static = 14 mg/L Desmodesmus subspicatus	LC50 (96h) static = 17.68 mg/L Oncorhynchus mykiss LC50 (96h) flow-through 11.4 - 12.9 mg/L Pimephales promelas	EC50 (24h) 15 - 26 mg/L Daphnia magna
Formaldehyde 50-00-0	-	LC50 (96h) static 100 - 136 mg/L Oncorhynchus mykiss LC50 (96h) flow-through 0.032 - 0.226 mL/L Oncorhynchus mykiss LC50 (96h) flow-through 22.6 - 25.7 mg/L Pimephales promelas LC50 (96h) static 23.2 - 29.7 mg/L Pimephales promelas LC50 (96h) static = 41 mg/L Brachydanio rerio LC50 (96h) static = 1510 µg/L Lepomis macrochirus	LC50 (48h) = 2 mg/L Daphnia magna EC50 (48h) Static 11.3 - 18 mg/L Daphnia magna
4,4'-bis-(sulfostyryl)-biphenyl disodium salt 27344-41-8	EC50 (72h) = 10 mg/L Desmodesmus subspicatus EC50 (96h) 10.0 - 11.0 mg/L Desmodesmus subspicatus	LC50 (96h) static = 76 mg/L Brachydanio rerio	EC50 (48h) = 1000 mg/L Daphnia magna

<b>Concentrate</b>	
Method	Biological Test Method: Acute Lethality Test Using Daphnia ssp. (EPS 1/RM/11)
Species	Daphnia magna
Endpoint type	LC50
Effective dose	564 mg/L
Exposure time	48h

Method	Biological Test Method: Acute Lethality Test Using Daphnia ssp. (EPS 1/RM/11)
Species	Daphnia magna
Endpoint type	EC50
Effective dose	556 mg/L
Exposure time	48h

Method	Biological Test Method: Acute Lethality Test Using Rainbow Trout (EPS 1/RM/9)
Species	Oncorhynchus mykiss (rainbow trout)
Endpoint type	LC50
Effective dose	2,140 mg/L
Exposure time	96h



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1% Solution	
Method	Biological Test Method: Acute Lethality Test Using Daphnia ssp. (EPS 1/RM/11)
Species	Daphnia magna
Endpoint type	LC50
Effective dose	93,350 mg/L
Exposure time	48h
Method	Biological Test Method: Acute Lethality Test Using Rainbow Trout (EPS 1/RM/9)
Species	Oncorhynchus mykiss (rainbow trout)
Endpoint type	LC50
Effective dose	153,000 mg/L
Exposure time	96h
Method	Biological Test Method: Acute Lethality Using Threespine Stickleback (Gasterosteus aculeatus) (EPS 1/RM/10)
Species	Gasterosteus aculeatus
Endpoint type	LC50
Effective dose	74,830 mg/L
Exposure time	96h
Method	Biological Test Method: Acute Lethality Test Using Daphnia ssp. (EPS 1/RM/11)
Species	Daphnia magna
Endpoint type	EC50
Effective dose	60,440 mg/L
Exposure time	48h

Polyfluorinated alkyl polyamide					
Method	Species	Endpoint type	Effective dose	Exposure time	Results
OECD Test No. 203: Fish, Acute Toxicity Test	Oncorhynchus mykiss (rainbow trout)	LC50	>14 mg/l	96h	NOEC: 14 mg/L No toxic effects at saturation.
OECD Test No. 201: Freshwater Alga and Cyanobacteria, Growth Inhibition Test	Algae	ErC50	>15 mg/l	72h	Growth rate >15, Yield 13. NOEC: 4.0 mg/L, LOEC: 8.5 mg/L
OECD Test No. 202: Daphnia sp., Acute Immobilization Test	Daphnia magna	EC50	>20 mg/l	48h	NOEC: 20 mg/L No toxic effects at saturation.

**12.2. Persistence and Degradability**

**Chemical Oxygen Demand (mg/L)**

Concentrate	580,000
1% Solution	6,100



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**Concentrate Biological Oxygen Demand (mg/L)**

Biological Oxygen Demand (5 Day)	180000
%BOD/COD	31.03
Biological Oxygen Demand (10 Day)	380000
%BOD/COD	65.51
Biological Oxygen Demand (15 Day)	440000
%BOD/COD	75.86
Biological Oxygen Demand (20 Day)	450000
%BOD/COD	77.59

**1% Solution Biological Oxygen Demand (mg/L)**

Biological Oxygen Demand (5 Day)	2300
%BOD/COD	37.70
Biological Oxygen Demand (10 Day)	4400
%BOD/COD	72.13
Biological Oxygen Demand (15 Day)	4800
%BOD/COD	78.69
Biological Oxygen Demand (20 Day)	5000
%BOD/COD	81.97

**12.3. Bioaccumulation**

No information available.

**12.4. Other Adverse Effects**

No information available

**13. Disposal Considerations**

**13.1. Waste Treatment Methods**

<b>Disposal of wastes</b>	Disposal should be in accordance with applicable regional, national and local laws and regulations.
<b>Contaminated Packaging</b>	Do not reuse container.

**14. Transport Information**

<b><u>DOT</u></b>	NOT REGULATED
<b><u>TDG</u></b>	NOT REGULATED
<b><u>MEX</u></b>	NOT REGULATED
<b><u>ICAO (air)</u></b>	NOT REGULATED
<b><u>IATA</u></b>	NOT REGULATED
<b><u>IMDG</u></b>	NOT REGULATED

**15. Regulatory Information**



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**15.1. International Inventories**

TSCA	Complies
DSL/NDSL	Does not comply
ENCS	Does not comply
IECSC	Does not comply
KECL	Does not comply
PICCS	Does not comply
AICS	Does not comply

**Legend:**

- TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
- DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
- ENCS - Japan Existing and New Chemical Substances
- IECSC - China Inventory of Existing Chemical Substances
- KECL - Korean Existing and Evaluated Chemical Substances
- PICCS - Philippines Inventory of Chemicals and Chemical Substances
- AICS - Australian Inventory of Chemical Substances

**15.2. US Federal Regulations**

**SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
2-(2-Butoxyethoxy)ethanol - 112-34-5	1.0

**SARA 311/312 Hazard Categories**

Acute Health Hazard	Yes
Chronic health hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

**CWA (Clean Water Act)**

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

**CERCLA**

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

**15.3. US State Regulations**

**California Proposition 65**

This product contains the following Proposition 65 chemicals

Chemical name	California Proposition 65
Formaldehyde - 50-00-0	Carcinogen
Perfluorooctanoic acid - 335-67-1	Developmental Toxicity

**U.S. State Right-to-Know Regulations**



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Chemical name	New Jersey	Massachusetts	Pennsylvania
2-(2-Butoxyethoxy)ethanol 112-34-5	X	-	X
1-Octanol 111-87-5	-	-	X
Formaldehyde 50-00-0	X	X	X

#### 16. Other information, including date of preparation of the last revision

**NFPA** Health Hazards 2 Flammability 0 Instability 0 Physical and chemical properties -  
**HMIS** Health Hazards 2 Flammability 0 Physical Hazards 0 Personal Protection X

Revision date 13-Jan-2019

Revision note SDS sections updated, 12.

#### Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

**Safety Data Sheets:** BBI- Lead Acid Batteries; Sonardyne 641-0127 Compatt 6 Battery Pack Lithium

**Waste Stream:** Batteries

**EPA Waste Profile Sheet Number:** 20140506-018



# Safety Data Sheet

Issue Date 01-Jan-2013

Revision Date: 09-Aug-2013

Version 1

## 1. IDENTIFICATION

### Product Identifier

**Product Name** Lead Acid Batteries

### Other means of identification

**SDS #** BB-001  
**UN/ID No** UN2794  
**Product Code** UN2794

### Recommended use of the chemical and restrictions on use

**Recommended Use** Batteries, wet, filled with acid.

### Details of the supplier of the safety data sheet

#### **Manufacturer Address**

Battery Builders Inc.  
 31 W238 91st St  
 Naperville, IL 60564  
 PO Box 5005  
 Naperville, IL 60567

### Emergency Telephone Number

**Company Phone Number** Phone: 630-851-5800  
 Fax: 630-851-1040  
**Emergency Telephone (24 hr)** INFOTRAC 1-352-323-3500 (International)  
 1-800-535-5053 (North America)

## 2. HAZARDS IDENTIFICATION

### Classification

This product is a battery. The classification below is based on the battery acid contained in the battery, which would only be released during an incident.

Acute toxicity - Oral	Category 4
Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Skin corrosion/irritation	Category 1 Sub-category C
Carcinogenicity	Category 1A
Reproductive toxicity	Category 1A
Specific target organ toxicity (repeated exposure)	Category 2

### Signal Word

Danger

**Hazard Statements**

Harmful if swallowed  
 Harmful if inhaled  
 Causes severe skin burns and eye damage  
 May cause cancer  
 May damage fertility or the unborn child  
 May cause damage to organs through prolonged or repeated exposure



**Appearance** Industrial/commercial lead acid battery

**Physical State** Sulfuric acid: Liquid  
 Lead: Solid

**Odor** Odorless

**Precautionary Statements - Prevention**

Obtain special instructions before use  
 Do not handle until all safety precautions have been read and understood  
 Use personal protective equipment as required  
 Wash face, hands and any exposed skin thoroughly after handling  
 Do not eat, drink or smoke when using this product  
 Use only outdoors or in a well-ventilated area  
 Do not breathe dust/fume/gas/mist/vapors/spray

**Precautionary Statements - Response**

If exposed or concerned: Get medical advice/attention  
 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
 Immediately call a POISON CENTER or doctor/physician  
 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower  
 Wash contaminated clothing before reuse  
 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing  
 Call a poison center or doctor/physician if you feel unwell  
 Rinse mouth  
 Do not induce vomiting

**Precautionary Statements - Storage**

Store locked up

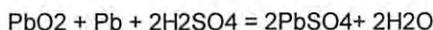
**Precautionary Statements - Disposal**

Dispose of contents/container to an approved waste disposal plant

**Other Hazards**

Very toxic to aquatic life with long lasting effects  
 Very toxic to aquatic life

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

**Formula**

Chemical Name	CAS No	Weight-%
Water	7732-18-5	19.2
Lead	7439-92-1	25.5
Lead Sulfate	7446-14-2	18.2
Lead Oxide	1309-60-0	18
Sulfuric acid	7664-93-9	5.2
Antimony	7440-36-0	<1

## 4. FIRST-AID MEASURES

### First Aid Measures

<b>General Advice</b>	If exposed or concerned: Get medical advice/attention. If the battery is compromised, the most probably routes of entry would include eyes, skin, mouth, and inhalation. Lead compounds: Hazardous exposure can occur only when product is heated above melting point, oxidized or otherwise processed or damaged to create dust, vapor or fume.
<b>Eye Contact</b>	In case of exposure to electrolyte and lead compounds: Flush immediately with large amounts of clean water or saline for at least 15 minutes. Call a physician immediately.
<b>Skin Contact</b>	In case of exposure to electrolyte, flush with large amounts of water for at least 15 minutes. In case of contact with lead compounds: wash immediately with soap and water. Remove contaminated clothing and shoes.
<b>Inhalation</b>	In case of exposure to electrolyte, remove to fresh air. If breathing is difficult, give oxygen. In case of exposure to lead compounds, remove from exposure, gargle, wash nose and lips. Call a physician.
<b>Ingestion</b>	Rinse mouth. In case of exposure to electrolyte, give large quantities of water. Do not induce vomiting. Call a physician. In case of ingestion of lead compounds: consult physician immediately.

### Most important symptoms and effects

<b>Symptoms</b>	Prolonged contact may even cause severe skin irritation or mild burn. Ingestion may cause severe burns to mouth, throat or stomach. Inhalation of sulfuric acid vapors or mists may cause severe respiratory irritation. In severe cases, burns, corneal damage, and blindness may occur.
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### Indication of any immediate medical attention and special treatment needed

<b>Notes to Physician</b>	Treat symptomatically.
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## 5. FIRE-FIGHTING MEASURES

### Suitable Extinguishing Media

Carbon dioxide (CO<sub>2</sub>). Dry chemical.

**Unsuitable Extinguishing Media** Not determined.

### Specific Hazards Arising from the Chemical

Highly flammable hydrogen gas is generated during charging and operation of batteries. To avoid risk of fire or explosion, keep sparks or other sources of ignition away from batteries. Do not allow metallic materials to simultaneously contact negative and positive terminals of cells and batteries.

### Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. If batteries are on charge, shut off power. Water applied to electrolyte generates heat and causes it to spatter. Wear acid-resistant clothing.

## 6. ACCIDENTAL RELEASE MEASURES

### Personal precautions, protective equipment and emergency procedures

- Personal Precautions**                      Wear acid-resistant clothing, boots, gloves, and face shield.
- Environmental Precautions**            Do not allow discharge of unneutralized acid to sewer.

### Methods and material for containment and cleaning up

- Methods for Containment**                Prevent further leakage or spillage if safe to do so.
- Methods for Clean-Up**                    Stop flow of material, contain/absorb small spills with dry sand, earth and vermiculite. Do not use combustible materials. If possible, carefully neutralize spilled electrolyte with soda ash, sodium bicarbonate, lime, etc.

## 7. HANDLING AND STORAGE

### Precautions for safe handling

- Advice on Safe Handling**                Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protection recommended in Section 8. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust/fume/gas/mist/vapors/spray. Use only in well-ventilated areas. Handle carefully and avoid tipping, which may allow electrolyte leakage. Single batteries pose no risk of electric shock, but there may be increased risk of electric shock from strings of connected batteries exceeding three 12-volt units.

### Conditions for safe storage, including any incompatibilities

- Storage Conditions**                      Store locked up. Store batteries under roof in cool, dry, well-ventilated areas that are separated from incompatible materials and from activities that may create flames, spark or heat. Store on smooth, impervious surfaces that are provided with measures for liquid containment in the event of electrolyte spills. Keep away from metallic objects that could bridge the terminals on a battery and create a dangerous short-circuit.
- Incompatible Materials**                 Electrolyte: Contact with combustibles and organic material may cause fire and explosion. Also reacts violently with strong reducing agents, metals, sulfur trioxide gas, strong oxidizers, and water. Lead compounds: Avoid contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen, and reducing agents.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

**Exposure Guidelines**

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Lead 7439-92-1	TWA: 0.05 mg/m <sup>3</sup> TWA: 0.05 mg/m <sup>3</sup> Pb	TWA: 50 µg/m <sup>3</sup> TWA: 50 µg/m <sup>3</sup> Pb	IDLH: 100 mg/m <sup>3</sup> IDLH: 100 mg/m <sup>3</sup> Pb TWA: 0.050 mg/m <sup>3</sup> TWA: 0.050 mg/m <sup>3</sup> Pb
Lead Sulfate 7446-14-2	TWA: 0.05 mg/m <sup>3</sup> Pb	TWA: 50 µg/m <sup>3</sup> Pb	IDLH: 100 mg/m <sup>3</sup> Pb TWA: 0.050 mg/m <sup>3</sup> Pb
Lead Oxide 1309-60-0	TWA: 0.05 mg/m <sup>3</sup> Pb	TWA: 50 µg/m <sup>3</sup> Pb	IDLH: 100 mg/m <sup>3</sup> Pb TWA: 0.050 mg/m <sup>3</sup> Pb
Sulfuric acid 7664-93-9	TWA: 0.2 mg/m <sup>3</sup> thoracic fraction	TWA: 1 mg/m <sup>3</sup> (vacated) TWA: 1 mg/m <sup>3</sup>	IDLH: 15 mg/m <sup>3</sup> TWA: 1 mg/m <sup>3</sup>
Antimony 7440-36-0	TWA: 0.5 mg/m <sup>3</sup> TWA: 0.5 mg/m <sup>3</sup> Sb	TWA: 0.5 mg/m <sup>3</sup> TWA: 0.5 mg/m <sup>3</sup> Sb (vacated) TWA: 0.5 mg/m <sup>3</sup> (vacated) TWA: 0.5 mg/m <sup>3</sup> Sb	IDLH: 50 mg/m <sup>3</sup> IDLH: 50 mg/m <sup>3</sup> Sb TWA: 0.5 mg/m <sup>3</sup> TWA: 0.5 mg/m <sup>3</sup> Sb

**Appropriate engineering controls**

**Engineering Controls** None under normal use conditions. Use engineering controls (work station design and ventilation) to reduce exposure below OSHA PEL when potential exposure to battery contents exists. Eyewash stations. Showers.

**Individual protection measures, such as personal protective equipment**

**Eye/Face Protection** Wear safety glasses when handling sealed batteries as a general precaution. If topping is off of a battery or if potential exposure to battery contents exists, wear splash goggles and/or a full face shield.

**Skin and Body Protection** Wear acid resistant clothing such as apron or splash suit if handling damaged or leaking batteries. Wear chemical and acid resistant gloves when handling electrolyte.

**Respiratory Protection** No protective equipment is needed under normal use conditions. When responding to a spill involving damaged batteries or potential exposure to battery contents, use a NIOSH approved respirator with particulate and acid gas cartridges.

**General Hygiene Considerations** Do not eat, drink or smoke when using this product. Wash contaminated clothing before reuse.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

**Information on basic physical and chemical properties**

<b>Physical State</b>	Sulfuric acid: Liquid Lead: Solid	<b>Odor</b>	Odorless
<b>Appearance</b>	Industrial/commercial lead acid battery	<b>Odor Threshold</b>	Not Applicable
<b>Color</b>	Not determined		
<b>Property</b>	<b>Values</b>	<b>Remarks • Method</b>	
pH	<1		
Melting Point/Freezing Point	Not applicable		
Boiling Point/Boiling Range	113-116 °C / 235-240 °F	(as sulfuric acid)	
Flash Point	Below room temperature	(as hydrogen gas)	
Evaporation Rate	< 1	(butyl acetate = 1)	
Flammability (Solid, Gas)	Not determined		
Upper Flammability Limits	74% (as hydrogen gas)		
Lower Flammability Limit	4% (as hydrogen gas)		
Vapor Pressure	10 mmHg		

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
Vapor Density	>1	(Air=1)
Specific Gravity	1.27-1.33	(1=Water)
Water Solubility	Completely soluble	(as sulfuric acid)
Solubility in other solvents	Not determined	
Partition Coefficient	Not determined	
Autoignition Temperature	Not applicable	
Decomposition Temperature	Not determined	
Kinematic Viscosity	Not determined	
Dynamic Viscosity	Not determined	
Explosive Properties	Not determined	
Oxidizing Properties	Not determined	

## 10. STABILITY AND REACTIVITY

### Reactivity

Not reactive under normal conditions.

### Chemical Stability

Stable under recommended storage conditions.

### Possibility of Hazardous Reactions

None under normal processing.

### Conditions to Avoid

Prolonged overcharge at high current. Ignition sources.

### Incompatible Materials

Electrolyte: Contact with combustibles and organic material may cause fire and explosion. Also reacts violently with strong reducing agents, metals, sulfur trioxide gas, strong oxidizers, and water. Lead compounds: Avoid contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen, and reducing agents.

### Hazardous Decomposition Products

Electrolyte: Sulfur trioxide, carbon monoxide, sulfuric acid mist, sulfur dioxide, hydrogen sulfide. Lead compounds: Temperatures above the melting point are likely to produce toxic metal fume, vapor, or dust; contact with strong acid or base or presence of nascent hydrogen may generate highly toxic arsine gas.

## 11. TOXICOLOGICAL INFORMATION

### Information on likely routes of exposure

#### Product Information

**Eye Contact** Causes severe eye damage.

**Skin Contact** Causes severe skin burns.

**Inhalation** Harmful if inhaled.

**Ingestion** Harmful if swallowed.

### Component Information

<u>Chemical Name</u>	<u>Oral LD50</u>	<u>Dermal LD50</u>	<u>Inhalation LC50</u>
Sulfuric acid 7664-93-9	= 2140 mg/kg ( Rat )	-	= 510 mg/m <sup>3</sup> ( Rat ) 2 h = 347 ppm ( Rat ) 1 h

**Information on physical, chemical and toxicological effects**

**Symptoms** Please see section 4 of this SDS for symptoms.

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Carcinogenicity** IARC has classified "strong inorganic acid mist containing sulfuric acid" as a category 1 carcinogen, substance that is carcinogenic to humans. This classification does not apply to liquid forms of sulfuric acid or sulfuric acid solutions contained within a battery. Inorganic acid mist is not generated under normal use of this product. Misuse of the product, such as overcharging, may result in the generation of sulfuric acid mist.

Chemical Name	ACGIH	IARC	NTP	OSHA
Lead 7439-92-1	A3	Group 2A	Reasonably Anticipated	X
Lead Sulfate 7446-14-2	A3	Group 2A	Reasonably Anticipated	X
Lead Oxide 1309-60-0	A3	Group 2A	Reasonably Anticipated	X
Sulfuric acid 7664-93-9	A2	Group 1	Known	X

**Legend**

*ACGIH (American Conference of Governmental Industrial Hygienists)*

*A2 - Suspected Human Carcinogen*

*A3 - Animal Carcinogen*

*IARC (International Agency for Research on Cancer)*

*Group 1 - Carcinogenic to Humans*

*Group 2A - Probably Carcinogenic to Humans*

*NTP (National Toxicology Program)*

*Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*

*Known - Known Carcinogen*

*OSHA (Occupational Safety and Health Administration of the US Department of Labor)*

*X - Present*

**Reproductive toxicity** May damage fertility or the unborn child.

**STOT - repeated exposure** May cause damage to organs through prolonged or repeated exposure.

**Numerical measures of toxicity**

Not determined

**12. ECOLOGICAL INFORMATION****Ecotoxicity**

Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.

Chemical Name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Lead 7439-92-1		0.44: 96 h Cyprinus carpio mg/L LC50 semi-static 1.17: 96 h Oncorhynchus mykiss mg/L LC50 flow-through 1.32: 96 h Oncorhynchus mykiss mg/L LC50 static		600: 48 h water flea µg/L EC50
Sulfuric acid 7664-93-9		500: 96 h Brachydanio rerio mg/L LC50 static		29: 24 h Daphnia magna mg/L EC50

**Persistence/Degradability**

Not determined

**Bioaccumulation**

Not determined

**Mobility**

Not determined

**Other Adverse Effects**

Not determined

**13. DISPOSAL CONSIDERATIONS**

**Waste Treatment Methods**

**Disposal of Wastes**

Disposal should be in accordance with applicable regional, national and local laws and regulations. Spent batteries: Send to secondary lead smelter for recycling. Place neutralized slurry into sealed containers and handle as applicable with state and federal regulations. Large water-diluted spills, after neutralization and testing, should be managed in accordance with approved local, state and federal requirements. Consult state environmental agency and/or federal EPA.

**Contaminated Packaging**

Disposal should be in accordance with applicable regional, national and local laws and regulations.

**US EPA Waste Number**

Spent lead-acid batteries are not regulated as hazardous waste by the EPA when recycled; however, state and international regulations may vary

Chemical Name	RCRA	RCRA - Basis for Listing	RCRA - D Series Wastes	RCRA - U Series Wastes
Lead 7439-92-1		Included in waste streams: F035, F037, F038, F039, K002, K003, K005, K046, K048, K049, K051, K052, K061, K062, K069, K086, K100, K176	5.0 mg/L regulatory level	
Antimony 7440-36-0		Included in waste streams: F039, K021, K161, K177		

Chemical Name	RCRA - Halogenated Organic Compounds	RCRA - P Series Wastes	RCRA - F Series Wastes	RCRA - K Series Wastes
Antimony 7440-36-0				Toxic waste waste number K021 Waste description: Aqueous spent antimony catalyst waste from fluoromethanes production.

**California Hazardous Waste Status**

Chemical Name	California Hazardous Waste Status
Lead 7439-92-1	Toxic
Lead Sulfate 7446-14-2	Toxic
Lead Oxide 1309-60-0	Toxic
Sulfuric acid 7664-93-9	Toxic Corrosive
Antimony 7440-36-0	Toxic

## 14. TRANSPORT INFORMATION

**Note** Please see current shipping paper for most up to date shipping information, including exemptions and special circumstances.

**DOT**

UN/ID No UN2794  
 Proper Shipping Name Batteries, Wet, Filled with Acid  
 Hazard Class 8  
 Packing Group III

**IATA**

UN/ID No UN2794  
 Proper Shipping Name Batteries, Wet, Filled with Acid  
 Hazard Class 8  
 Packing Group III

**IMDG**

UN/ID No UN2794  
 Proper Shipping Name Batteries, Wet, Filled with Acid  
 Hazard Class 8  
 Packing Group III

## 15. REGULATORY INFORMATION

**International Inventories**

**TSCA** All ingredients are listed or exempt from listing on Chemical Substance Inventory  
**DSL** Listed  
**EINECS** Listed

**Legend:**

*TSCA - United States Toxic Substances Control Act Section 8(b) Inventory*  
*DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List*  
*EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances*  
*ENCS - Japan Existing and New Chemical Substances*  
*IECSC - China Inventory of Existing Chemical Substances*  
*KECL - Korean Existing and Evaluated Chemical Substances*  
*PICCS - Philippines Inventory of Chemicals and Chemical Substances*

**US Federal Regulations****CERCLA**

Chemical Name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Lead 7439-92-1	10 lb		RQ 10 lb final RQ RQ 4.54 kg final RQ
Lead Sulfate 7446-14-2	10 lb		RQ 10 lb final RQ RQ 4.54 kg final RQ
Sulfuric acid 7664-93-9	1000 lb	1000 lb	RQ 1000 lb final RQ RQ 454 kg final RQ
Antimony 7440-36-0	5000 lb 10 lb		RQ 5000 lb final RQ RQ 2270 kg final RQ RQ 10 lb final RQ RQ 4.54 kg final RQ

**SARA 311/312 Hazard Categories**

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

**SARA 313**

Chemical Name	CAS No	Weight-%	SARA 313 - Threshold Values %
Lead - 7439-92-1	7439-92-1	25.5	0.1
Lead Sulfate - 7446-14-2	7446-14-2	18.2	0.1
Lead Oxide - 1309-60-0	1309-60-0	18	0.1
Sulfuric acid - 7664-93-9	7664-93-9	5.2	1.0
Antimony - 7440-36-0	7440-36-0	<1	1.0

**CWA (Clean Water Act)**

Component	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Lead 7439-92-1 ( 25.5 )		X	X	
Lead Sulfate 7446-14-2 ( 18.2 )		X		X
Lead Oxide 1309-60-0 ( 18 )		X		
Sulfuric acid 7664-93-9 ( 5.2 )	1000 lb			X
Antimony 7440-36-0 ( <1 )		X	X	

**US State Regulations****California Proposition 65**

This product contains the following Proposition 65 chemicals.

Chemical Name	California Proposition 65
Lead - 7439-92-1	Carcinogen Developmental Female Reproductive Male Reproductive
Lead Sulfate - 7446-14-2	Carcinogen Developmental
Lead Oxide - 1309-60-0	Carcinogen Developmental
Sulfuric acid - 7664-93-9	Carcinogen

**U.S. State Right-to-Know Regulations**

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Lead 7439-92-1	X	X	X
Lead Sulfate 7446-14-2	X	X	X
Lead Oxide 1309-60-0	X	X	X
Sulfuric acid 7664-93-9	X	X	X
Antimony 7440-36-0	X	X	X





# Safety Data Sheet

## Primary Li-SOCl<sub>2</sub> single cells and multi-cell battery packs

### 1. IDENTIFICATION

#### 1.1 Product

Lithium-thionyl dichloride primary unit LS/LSH cells and multi-cell battery systems composed of these cells

#### 1.2 Supplier

Headquarters Address Phone/Fax	<b>Saft S.A.S.</b> 12 rue Sadi Carnot, 93170 BAGNOLET – France +33 (0)1 49 93 19 18 /+33 (0)1 49 93 19 50
Factory Address Phone/Fax	<b>Saft Poitiers</b> Rue Georges Leclanché, BP 1039, 86060 POITIERS Cedex 9 – France +33 (0)5 49 55 48 48 /+33 (0)5 49 55 48 50
Factory Address Phone/Fax	<b>Saft Ltd.</b> River Drive, Tyne & Wear, SOUTH SHIELDS, NE33 2TR – United Kingdom +1 44 191 456 1451/+1 44 191 456 6383
Factory Address Phone/Fax	<b>Saft America Inc.</b> 313 Crescent Street, VALDESE, NC 28690 – USA +1 828 874 4111/+1 828 874 2431
Factory Address Phone/Fax	<b>Saft Batteries Co., Ltd.</b> Zhuhai Free Trade Zone, Lianfeng Road, ZHUHAI 519030, Guangdong Province – China +86 756 881 9318/+86 756 881 9328
Factory Address Phone/Fax	<b>Tadiran Batteries Ltd.</b> 34 Y. Rabin Avenue – KIRYAT EKRON 76950 - Israel +972 894 44374/+972 894 13066
Factory Address Phone/Fax	<b>Tadiran Batteries GmbH</b> Industriestrasse 22, D-63654 BÜDINGEN – Germany +49 (0)6 042 954 599/+49 (0)6 042 954 190

**1.3 Emergency contact** For chemical emergency ONLY (in case of spill, leak, fire, exposure or accident) call CHEMTREC at:  
International: +1-703-527-3887 for English  
Within the USA: +1-800-424-9300



## 2. HAZARD IDENTIFICATION

The Li-SOCl<sub>2</sub> batteries described in this Battery Information Sheet are sealed units which are not hazardous under normal operating conditions in accordance with manufacturer's recommendations, as stated in the user's manual or other similar documentation. Under normal use, the battery integrity is maintained and the active components it contains are isolated from the outside.

In particular, the battery should not be submitted to any mechanical (opening, puncture, immersion), thermal (burning, heating to temperatures above the normal temperature range of the product) or electrical abuse (short-circuit, recharge, forced discharge), which will lead to the activation of safety valves and/or the rupture of the battery container.

Any accidental release of the inner components of the cell, or their combustion products could be highly hazardous. Battery content exposition to air humidity/liquid water may be followed by severe battery vent/explosion/fire, depending on the hazard causes and circumstances.

### Protection from charging:

Whenever lithium batteries are not the single power source in a circuit, the following measures recommended by Underwriters Laboratories are relevant. The cells should not be connected with an electrical power source that would increase the load through the cells. The electronic circuit shall include one of the following:

- A. Two suitable diodes or the equivalent in series with the cells to prevent any reverse (charging) current. The second diode is used to provide protection in the event that one would fail. Quality control, or equivalent procedures, shall be established by the device manufacturer to check that the diode polarity is correct for each unit.

or

- B. A blocking diode or the equivalent to prevent any reverse (charging) current and a resistor to limit current in case of diode failure. The resistor should be sized to limit the reverse (charging) current to the maximum value according to the data sheet of the cell.

## 3. COMPOSITION, INFORMATION OR INGREDIENTS

Each unit cell consists of a hermetically sealed metallic can containing a number of chemicals and materials of construction of which the following are potentially hazardous upon release to air.

<u>Component</u>	<u>CAS Number</u>	<u>EINECS/ELINCS</u>	<u>Content (wt. %)*</u>
Lithium metal	7439-93-2	231-102-5	2-6
Thionyl dichloride	7719-09-7	231-748-8	18-47
Aluminium chloride	7446-70-0	231-208-1	1-5
Gallium chloride	13450-90-3	236-610-0	0-2
Lithium chloride	7447-41-8	231-212-3	1-2
Carbon	1333-86-4	215-609-9	2-5
PTFE	9002-84-0	N/A	0-1
Stainless steel, Nickel and inert material	N/A	N/A	remainder

\* Quantities may vary with cell model

## 4. FIRST AID MEASURES (not anticipated under normal use)

### 4.1. Electrolyte contact

**EYE CONTACT:** Immediately flush with plenty of water for at least 15 minutes and get medical attention.



**SKIN CONTACT:** Remove contaminated clothing and immediately flush with plenty of water for at least 15 minutes. In severe cases, get medical attention.

**INHALATION:** Contents of an opened cell may cause respiratory tract and mucus membrane irritation. Remove from exposure, rest and keep warm. Immediately inhale Cortisone spray. In severe cases, track medical surveillance for 48 hours.

**INGESTION:** Wash out mouth thoroughly with water and give plenty of water to drink. Get medical attention.

**FURTHER TREATMENT:** All cases of eye contamination, persistent skin irritation and casualties who have swallowed this substance or have breathed its vapours should be seen by a Doctor.

#### 4.2. Lithium metal contact

**EYE CONTACT:** Immediately flush with large quantities of water for at least 15 minutes, with open eyelids, and get medical attention.

**SKIN CONTACT:** Remove particles of lithium from skin as quick as possible. Immediately flush with plenty of water for at least 15 minutes and get medical attention.

**INHALATION/INGESTION:** Contents of an opened cell may cause respiratory tract and mucus membrane irritation. Remove from exposure, rest and keep warm. Immediately inhale Cortisone spray. In severe cases, track medical surveillance for 48 hours.

### 5. FIRE FIGHTING MEASURES (not anticipated under normal use)

#### EXTINGUISHING MEDIA:

- During a fire with lithium batteries, using large amounts of cold water or water-based foam has some cooling effect and is effective to prevent fire expansion as long as the extent of the fire has not progressed to the point that the lithium metal they contain is exposed (as marked by appearance of deep red flames). Do not use warm or hot water.
- Lith-X Class D extinguishers are effective on fires involving only a few lithium batteries.
- Do not use CO<sub>2</sub> or Halon-type extinguishers.
- Do not use sand, dry powder or soda ash, graphite powder or fire blankets.
- Use only class D metal extinguishers on raw lithium metal.

#### SPECIAL FIRE FIGHTING PROCEDURES:

- Fire fighters should wear approved/certified positive pressure self-contained breathing apparatus.
- Full protective clothing is necessary to prevent potential body contact with electrolyte solution.
- During water spraying, caution is advised as burning pieces of lithium may be ejected from the fire.
- It is permissible to use any class of extinguishing medium, specified above, on these batteries or their packing material. Cool exterior of batteries if exposed to fire to prevent rupture.
- If the cells or batteries are not located at the center of the fire, copious amounts of water may be supplied using a diffuser type nozzle so that the cells remain cool during the fire containment and extinction. A sprinkler system should be suitable for this purpose, the critical factor being that the lithium cells do not experience temperatures above the melting point of lithium (180°C).
- Small amounts of water should never be used such as the volumes contained within portable fire extinguishers. Standard dry powder extinguishers are ineffective. It should be kept in mind that a hazard of hydrogen formation exists whenever hot lithium metal comes into contact with water.



## 6. ACCIDENTAL RELEASE MEASURES (not anticipated under normal use)

**INDIVIDUAL PRECAUTIONS:** Evacuate the employees from area until fumes dissipate. In case of electrolyte leakage from a cell or battery, do not inhale vapors or touch liquid with bare hands. In case of skin or eye contact, inhalation or ingestion, follow the measured described in section 4.

**ENVIRONMENTAL PRECAUTION:** Avoid sewage, surface water and underground water contamination. Avoid ground and atmosphere contamination.

**WAYS OF CLEANING:** With protective glasses and gloves, use absorbent material (sand, earth, chalk ( $\text{CaCO}_3$ ) or lime ( $\text{CaO}$ ) powder or Vermiculite) to absorb any exuded material. Seal leaking battery (unless hot) and contaminated absorbent material tight in plastic bag, and dispose of as hazardous waste in accordance with local regulations. Electrolyte traces may be wiped off dryly using household paper. Rinse with water afterwards.

## 7. HANDLING AND STORAGE

**IMPORTANT NOTICE:** Lithium-thionyle chloride batteries are not rechargeable and should not be tentatively charged or recharged. Manufacturer's recommendations should be followed regarding maximum current and operating temperature range. Applying pressure or deforming the battery may lead to disassembly and cause eye, skin and throat irritation.

**STORAGE:** Store in a cool, regulated (preferably below  $21^\circ\text{C}$  and in any case below  $30^\circ\text{C}$ ), dry and ventilated area, away from possible sources of heat, open flames, food and drink. Avoid exposure to direct sunlight for long periods. Temperatures above  $100^\circ\text{C}$  (or higher for High Temperatures cells and batteries such as the LSH20-150 cell- refer to individual data sheets for maximum temperatures) may cause leakage and rupture, and result in shortened battery service life. Keep proper clearance space between batteries and walls. Since short circuit can cause burn hazard, leakage or explosion hazard, keep batteries in original packaging until use and do not mix them.

### HANDLING:

- Do not open the battery system.
- Do not crush or pierce the cells.
- Do not short (+) or (-) terminal with conductors.
- Do not reverse the polarity.
- Do not submit to excessive mechanical stress.
- Do not mix batteries of different types or mix new and old ones together.
- Do not use the unit without its electronic management system.
- Do not expose the unit to water or condensation.
- Do not directly heat, solder or throw into fire. Such unsuitable use can cause leakage or spout vaporized electrolyte fumes and may cause fire or explosion.

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION\* (not anticipated under normal use)

	<b>Respiratory protection</b>	In all fire situations, use self-contained breathing apparatus
	<b>Hand protection</b>	In case of leakage wear protective gloves
	<b>Eye protection</b>	Safety glasses are mandatory during handling
	<b>Other</b>	In the event of leakage or ruptured cells, wear a rubber apron and protective clothes.

I-669

\*AFNOR pictograms



#### Occupational exposure standard:

Compound	8 hour TWA	15 min TWA	SK
Sulfur Dioxide	1 ppm	1 ppm	-
Hydrogen chloride	1 ppm	5 ppm	-

## 9. PHYSICAL AND CHEMICAL PROPERTIES

The lithium-thionyl chloride cell or battery described by this Safety Data Sheet is a sealed unit when offered for sale. It is a manufactured "article" and does not expose the user to hazardous chemicals when used in accordance with manufacturer specifications.

Appearance – Cylindrical shape

Odour – If leaking, gives off a pungent corrosive odour

Flash point – Not applicable

Boiling Point – Not applicable

Vapor Pressure – Not applicable

pH – Not applicable

Solubility (in water) – Not applicable

Flammability – Not applicable

Melting Point – Not applicable

Vapor Density – Not applicable

Specific Gravity – Not applicable

Solubility (other) – Not applicable

## 10. STABILITY AND REACTIVITY

The battery system is stable when handled and stored according to section 7.

**MATERIALS TO AVOID:** Oxidizing agents, bases, water. Avoid electrolyte contact with aluminium or zinc.

**CONDITIONS TO AVOID:** Do not heat above 100°C (or higher (150°C) for High Temperatures cells and batteries such as the LSH20-150 cell- refer to individual data sheets for maximum temperatures) or incinerate. Do not disassemble, crush, pierce, short, charge or recharge. Avoid mechanical or electrical abuse.

**HAZARDOUS DECOMPOSITION PRODUCTS:** Hydrogen (H<sub>2</sub>) as well as lithium oxide (Li<sub>2</sub>O) and lithium hydroxide (LiOH) dust are produced in case of reaction of lithium metal with water (hydrolysis).

Chlorine (Cl<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>) and disulfur dichloride (S<sub>2</sub>Cl<sub>2</sub>) are produced in case of thermal decomposition of thionyl dichloride above 100°C. Hydrochloric acid (HCl) and sulfur dioxide (SO<sub>2</sub>) are produced in case of reaction of thionyl dichloride with water at room temperature.

Hydrochloric acid (HCl) fumes, lithium oxide (Li<sub>2</sub>O), lithium hydroxide (LiOH) and aluminium hydroxide (Al(OH)<sub>3</sub>) dust are produced in case of reaction of lithium tetrachloroaluminate (LiAlCl<sub>4</sub>) with water.

## 11. TOXICOLOGICAL INFORMATION

There is no risk, unless the battery ruptures. In the event of accidental exposure to internal contents, corrosive fumes will cause severe skin, eye and mucous membrane irritation. Medical conditions are generally aggravated by exposure to battery internal contents: eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur. Overexposure may cause symptoms of non-fibrotic lung injury and ingestion can cause tissue damage to throat and gastro-respiratory tract.

## 12. ECOLOGICAL INFORMATION

The batteries do not contain mercury, cadmium or other heavy metals.



Eco-toxicity	None known if used/disposed of correctly.
Mammalian affects	None known if used/disposed of correctly.
Bioaccumulation potential	None known if used/disposed of correctly.
Environmental fate	None known if used/disposed of correctly.

### 13. DISPOSAL CONSIDERATIONS

Batteries do not contain hazardous materials according to EC Directives 91/157/EEC, 93/86/EEC, and 2002/95/EC (RoHS Directive). Battery recycling is either mandatory or recommended: The European Directive 2006/66/EC has been implemented by most EC member states.

Dispose of in accordance with local laws and regulations. Store material for disposal as indicated in Section 7. A disposal service is offered upon request by Tadiran Batteries.

Do not incinerate, or subject cells to temperatures in excess of 100°C (or 150°C for LSH20-150 cells and the battery packs assembled from them). Such abuse can result in loss of seal, electrolyte leakage and/or violent disassembly with risk of material projections.

For additional information a Technical Notice is available upon request.

See the section on "Sustainability & Environment" on <http://www.saftbatteries.com>

### 14. TRANSPORTATION INFORMATION

Note: when manufacturing a new battery pack, one must assure that it has fulfilled the tests according to the UN Model Regulations, Manuel of Tests and Criteria, Part III, subsection 38.3.

#### 14.1 United Nations Class

For the single cell batteries and multi-cell battery packs that are non-restricted to transport (non-assigned to the Miscellaneous Class 9), use lithium batteries inside label.

For the single cell batteries and multi-cell battery packs which are restricted to transport (assigned to Class 9), use Class 9 Miscellaneous Dangerous Goods and UN Identification Number Labels.

In all cases, refer to the product transport certificate issued by the manufacturer.

UN Numbers:	3090	LITHIUM METAL BATTERIES: Shipment of cells and batteries <i>in bulk</i>
	3091	LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT: Cells and batteries <i>contained in equipment or packed with it</i>

Shipping name	LITHIUM METAL BATTERIES
Hazard Classification:	9
	Depending on their lithium metal content, some single cells and small multi-cell battery packs may be non-assigned to Class 9. Refer to Transport Certificate.
Packaging:	Group II

#### 14.2 International agreements

By Air International:	IATA/ICAO: UN 3090 or UN3091
By Sea International:	IMDG: UN 3090 or UN 3091
European road transportation:	ADR
European rail transportation:	RID



## 15. REGULATORY INFORMATION

Regulations specifically applicable to the product:

- ACGIH and OSHA: see exposure limits of the internal components of the battery in section 8.
- IATA/ICAO (air transportation): UN 3090 or UN 3091.
- IMDG (sea transportation) : UN 3090 or UN 3091.
- Transportation within the US-DOT, 49 Code of Federal Regulations
- UK regulatory references: Classified under CHIP.
- Battery Directive (2006/66/EC): see section 13

## 16. OTHER INFORMATION

This information has been compiled from sources considered to be dependable and is, to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, neither exhaustively nor perfect reliability can be granted. Information does not imply implicit or specific warranty of it.

This information relates to the specific products designated and may not be valid for such products used in combination with any other materials or in any process. It is the user's responsibility to satisfy himself as to the suitability and completeness of this information for his particular use.

Saft does not accept liability for any loss or damage that may occur, whether direct, indirect, incidental or consequential, from the use of this SDS. Saft does not offer warranty against patent infringement.

**saft**

12, rue Sadi Carnot  
93170 Bagnolet – France  
Tel.: +33 (0)1 49 93 19 18  
Fax: +33 (0)1 49 93 19 69  
[www.saftbatteries.com](http://www.saftbatteries.com)

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Version 11.0

Data in this document is subject to  
change without notice and  
becomes contractual only after  
written confirmation.

**Safety Data Sheets:** ACP22005A; AFMR19017A; ASPH17544SP; MISC17477A; PC-191T;  
Oceanic HW443 R 2015

**Waste Stream:** Chemical Contaminated Water

**EPA Waste Profile Sheet Number:** 20140506-020

## SAFETY DATA SHEET

ACPC22005A

### Section: 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : ACPC22005A

Other means of identification : Not applicable.

Recommended use : ASPHALTENE/PARAFFIN INHIBITOR

Restrictions on use : Refer to available product literature or ask your local Sales Representative for restrictions on use and dose limits.

Company : Nalco Champion  
11177 S. Stadium Drive  
Sugar Land, Texas 77478  
USA  
TEL: (281) 632-6500

Emergency telephone number : (800) 424-9300 (24 Hours) CHEMTREC

Issuing date : 06/01/2018

### Section: 2. HAZARDS IDENTIFICATION

#### GHS Classification

Flammable liquids : Category 3

Acute toxicity (Dermal) : Category 4

Skin irritation : Category 2

Eye irritation : Category 2A

Carcinogenicity : Category 2

Reproductive toxicity : Category 2

Specific target organ toxicity - single exposure : Category 3 (Respiratory system, Central Nervous System)

Aspiration hazard : Category 1

#### GHS Label element

Hazard pictograms : 

Signal Word : Danger

Hazard Statements : Flammable liquid and vapour.  
May be fatal if swallowed and enters airways.  
Harmful in contact with skin.  
Causes skin irritation.  
Causes serious eye irritation.  
May cause respiratory irritation.  
May cause drowsiness or dizziness.  
Suspected of causing cancer.  
Suspected of damaging fertility or the unborn child.

# SAFETY DATA SHEET

**ACPC22005A**

Precautionary Statements : **Prevention:**  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray. Wear protective gloves/ protective clothing/ eye protection/ face protection.  
**Response:**  
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor/ physician. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.  
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
**Storage:**  
Store in a well-ventilated place.  
**Disposal:**  
Dispose of contents/ container to an approved waste disposal plant.

Other hazards : None known.

## Section: 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

Chemical Name	CAS-No.	Concentration: (%)
Xylene	1330-20-7	60 - 100
Ethylbenzene	100-41-4	10 - 30
Toluene	108-88-3	0.1 - 1

## Section: 4. FIRST AID MEASURES

In case of eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes. Use a mild soap if available. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops and persists.

If swallowed : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Aspiration hazard if swallowed - can enter lungs and cause damage. Get medical attention immediately.

If inhaled : Remove to fresh air. Treat symptomatically. Get medical attention if symptoms occur.

Protection of first-aiders : In event of emergency assess the danger before taking action. Do not put yourself at risk of injury. If in doubt, contact emergency responders. Use personal protective equipment as required.

Notes to physician : Treat symptomatically.

Most important symptoms and effects, both acute and : See Section 11 for more detailed information on health effects and symptoms.

# SAFETY DATA SHEET

**ACPC22005A**

delayed

## Section: 5. FIREFIGHTING MEASURES

- Suitable extinguishing media : Foam  
Carbon dioxide  
Dry powder  
Other extinguishing agent suitable for Class B fires  
For large fires, use water spray or fog, thoroughly drenching the burning material.
- Unsuitable extinguishing media : High volume water jet
- Specific hazards during firefighting : Fire Hazard  
Keep away from heat and sources of ignition.  
Flash back possible over considerable distance.  
Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
- Hazardous combustion products : Carbon oxides
- Special protective equipment for firefighters : Use personal protective equipment.
- Specific extinguishing methods : Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. In the event of fire and/or explosion do not breathe fumes.

## Section: 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions, protective equipment and emergency procedures : Ensure adequate ventilation. Remove all sources of ignition. Ensure clean-up is conducted by trained personnel only. Refer to protective measures listed in sections 7 and 8.
- Environmental precautions : Do not allow contact with soil, surface or ground water.
- Methods and materials for containment and cleaning up : Eliminate all ignition sources if safe to do so. Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Do not flush into surface water or sanitary sewer system.

## Section: 7. HANDLING AND STORAGE

- Advice on safe handling : Avoid contact with skin and eyes. Open drum carefully as content may be under pressure. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours). Keep away from fire, sparks and heated surfaces. Do not breathe dust/fume/gas/mist/vapours/spray. Wash hands thoroughly after handling. Use only with adequate ventilation.
- Conditions for safe storage : Keep away from heat and sources of ignition. Keep in a cool, well-ventilated

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**ACPC22005A**

place. Keep away from oxidizing agents. Keep out of reach of children. Keep container tightly closed. Store in suitable labelled containers.

Suitable material : The following compatibility data is suggested based on similar product data and/or industry experience: Copper, Brass, PTFE, Aluminum, Mild steel, Stainless Steel 304, Stainless Steel 316L, Hastelloy C-276, Perfluoroelastomer, Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

Unsuitable material : The following compatibility data is suggested based on similar product data and/or industry experience: PVC, Polypropylene, Polyethylene, Plexiglass, EPDM, Buna-N, HDPE (high density polyethylene), Natural rubber, Polyurethane, Neoprene, Ethylene propylene, Polytetrafluoroethylene/polypropylene copolymer, Chlorosulfonated polyethylene rubber, Fluoroelastomer

## Section: 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Components with workplace control parameters

Components	CAS-No.	Form of exposure	Permissible concentration	Basis
Xylene	1330-20-7	TWA	100 ppm 435 mg/m <sup>3</sup>	OSHA Z1
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
Ethylbenzene	100-41-4	TWA	20 ppm	ACGIH
		TWA	100 ppm 435 mg/m <sup>3</sup>	NIOSH REL
		STEL	125 ppm 545 mg/m <sup>3</sup>	NIOSH REL
Toluene	108-88-3	TWA	100 ppm 435 mg/m <sup>3</sup>	OSHA Z1
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m <sup>3</sup>	NIOSH REL
		STEL	150 ppm 560 mg/m <sup>3</sup>	NIOSH REL
		TWA	200 ppm	OSHA/Z2
		CEIL	300 ppm	OSHA/Z2
		Peak	500 ppm	OSHA/Z2

Engineering measures : Effective exhaust ventilation system. Maintain air concentrations below occupational exposure standards.

### Personal protective equipment

Eye protection : Safety goggles  
Face-shield

Hand protection : Wear protective gloves.  
Nitrile  
Viton

## SAFETY DATA SHEET

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Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

- Skin protection : Wear suitable protective clothing.
- Respiratory protection : When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
- Hygiene measures : Handle in accordance with good industrial hygiene and safety practice. Remove and wash contaminated clothing before re-use. Wash face, hands and any exposed skin thoroughly after handling.

### Section: 9. PHYSICAL AND CHEMICAL PROPERTIES

- Appearance : Liquid
- Colour : Clear Colorless
- Odour : aromatic, solvent-like
- Flash point : 25 °C, Method: closed cup
- pH : Not applicable.
- Odour Threshold : no data available
- Melting point/freezing point : no data available
- Initial boiling point and boiling range : 135 - 210 °C
- Evaporation rate : 0.7, (BuAc = 1)
- Flammability (solid, gas) : no data available
- Upper explosion limit : no data available
- Lower explosion limit : no data available
- Vapour pressure : 6 - 6.5 mm Hg, (20 °C),
- Relative vapour density : 3.7(Air = 1)
- Relative density : 0.86, (20 °C),
- Density : 7.19 lb/gal
- Water solubility : insoluble
- Solubility in other solvents : no data available
- Partition coefficient: n-octanol/water : log Pow: 3.12 - 3.20
- Auto-ignition temperature : 464 °C
- Thermal decomposition : no data available
- Viscosity, dynamic : no data available
- Viscosity, kinematic : 0.9 mm<sup>2</sup>/s (25 °C), estimated
- Molecular weight : no data available
- VOC : no data available

# SAFETY DATA SHEET

**ACPC22005A**

## Section: 10. STABILITY AND REACTIVITY

- Chemical stability : Stable under normal conditions.
- Possibility of hazardous reactions : No dangerous reaction known under conditions of normal use.
- Conditions to avoid : Heat, flames and sparks.
- Incompatible materials : Strong oxidizing agents
- Hazardous decomposition products : In case of fire, hazardous decomposition products may be produced such as:  
Carbon oxides

## Section: 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : Inhalation, Eye contact, Skin contact

### Potential Health Effects

- Eyes : Causes serious eye irritation.
- Skin : Harmful in contact with skin. Causes skin irritation.
- Ingestion : May be fatal if swallowed and enters airways.
- Inhalation : May cause respiratory tract irritation. May cause nose, throat, and lung irritation. Inhalation may cause central nervous system effects.
- Chronic Exposure : Suspected of damaging fertility or the unborn child. Suspected of causing cancer.

### Experience with human exposure

- Eye contact : Redness, Pain, Irritation
- Skin contact : Redness, Irritation
- Ingestion : Vomiting
- Inhalation : Respiratory irritation, Cough, Dizziness, Drowsiness

### Toxicity

#### Product

- Acute oral toxicity : rat: 4,300 mg/kg  
Test substance: Product
- Acute inhalation toxicity : no data available
- Acute dermal toxicity : Acute toxicity estimate: 1,375 mg/kg
- Skin corrosion/irritation : no data available
- Serious eye damage/eye : no data available

# SAFETY DATA SHEET

**ACPC22005A**

irritation

Respiratory or skin sensitization : no data available

Carcinogenicity

IARC **Group 2B: Possibly carcinogenic to humans**  
Ethylbenzene 100-41-4

OSHA No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

Reproductive effects : no data available

Germ cell mutagenicity : no data available

Teratogenicity : no data available

STOT - single exposure : no data available

STOT - repeated exposure : no data available

Aspiration toxicity : no data available

## Components

Acute inhalation toxicity : Ethylbenzene  
LC50 rat: 17.4 mg/l  
Exposure time: 4 h  
Test atmosphere: vapour  
  
Toluene  
LC50 rat: 28.1 mg/l  
Exposure time: 4 h  
Test atmosphere: vapour

## Section: 12. ECOLOGICAL INFORMATION

### Ecotoxicity

Environmental Effects : This product has no known ecotoxicological effects.

### Product

Toxicity to fish : LC50 Sheepshead Minnow: 174 mg/l  
Exposure time: 96 hrs  
Test substance: Product

NOEC Sheepshead Minnow: 100 mg/l  
Exposure time: 96 hrs  
Test substance: Product

Toxicity to daphnia and other aquatic invertebrates : LC50 Acartia tonsa: 562 mg/l  
Exposure time: 48 hrs  
Test substance: Solvent used in the product

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NOEC *Acartia tonsa*: 250 mg/l  
Exposure time: 48 hrs  
Test substance: Solvent used in the product

Toxicity to algae : EC50 Marine Algae (*Skeletonema costatum*): 710 mg/l  
Exposure time: 72 hrs  
Test substance: Solvent used in the product

NOEC Marine Algae (*Skeletonema costatum*): 100 mg/l  
Exposure time: 72 hrs  
Test substance: Solvent used in the product

## Components

Toxicity to bacteria : Toluene  
84 mg/l  
EC50 *Nitrosomonas* Sp.: 84 mg/l  
Exposure time: 24 h

## Components

Toxicity to fish (Chronic toxicity) : Toluene  
NOEC: 1.39 mg/l  
Exposure time: 40 d  
Species: *Oncorhynchus kisutch* (coho salmon)

## Components

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : Toluene  
NOEC: 0.74 mg/l  
Exposure time: 7 d  
Species: *Ceriodaphnia dubia*

## Persistence and degradability

The organic portion of this preparation is expected to be inherently biodegradable.

## Mobility

The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.

If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air : 10 - 30%  
Water : 10 - 30%  
Soil : 50 - 70%

The portion in water is expected to float on the surface.

## Bioaccumulative potential

Component substances have a low potential to bioconcentrate.

# SAFETY DATA SHEET

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## Other information

no data available

## Section: 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Disposal methods : Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.

Disposal considerations : Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

## Section: 14. TRANSPORT INFORMATION

The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.

The presence of an RQ component (Reportable Quantity for U.S. DOT) in this product causes it to be regulated with an additional description of RQ for road, or as Environmentally hazardous for road and air, ONLY when the net weight in the package exceeds the calculated RQ for the product.

### Land transport (DOT)

Proper shipping name : XYLENES  
Technical name(s) :  
UN/ID No. : UN 1307  
Transport hazard class(es) : 3  
Packing group : III  
Reportable Quantity (per package) : 125 lbs  
RQ Component : Xylene

### Air transport (IATA)

Proper shipping name : XYLENES  
Technical name(s) :  
UN/ID No. : UN 1307  
Transport hazard class(es) : 3  
Packing group : III  
Reportable Quantity (per package) : 125 lbs  
RQ Component : Xylene

### Sea transport (IMDG/IMO)

Proper shipping name : XYLENES  
Technical name(s) :  
UN/ID No. : UN 1307  
Transport hazard class(es) : 3  
Packing group : III

# SAFETY DATA SHEET

ACPC22005A

## Section: 15. REGULATORY INFORMATION

**TSCA list** : No substances are subject to a Significant New Use Rule.  
No substances are subject to TSCA 12(b) export notification requirements.

### EPCRA - Emergency Planning and Community Right-to-Know Act

#### CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Xylene	1330-20-7	100	125

#### SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

**SARA 311/312 Hazards** : Flammable (gases, aerosols, liquids, or solids)  
Acute toxicity (any route of exposure)  
Skin corrosion or irritation  
Serious eye damage or eye irritation  
Carcinogenicity  
Reproductive toxicity  
Specific target organ toxicity (single or repeated exposure)  
Aspiration hazard

**SARA 302** : This material does not contain any components with a section 302 EHS TPQ.

**SARA 313** : The following components are subject to reporting levels established by SARA Title III, Section 313:

Xylene	1330-20-7	60 - 100 %
Ethylbenzene	100-41-4	10 - 30 %

#### California Prop 65

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene 108-88-3

WARNING! This product contains a chemical known to the State of California to cause cancer.

Ethylbenzene 100-41-4

#### INTERNATIONAL CHEMICAL CONTROL LAWS :

##### United States TSCA Inventory

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

##### Australia. Industrial Chemical (Notification and Assessment) Act

# SAFETY DATA SHEET

**ACPC22005A**

All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

## Canadian Domestic Substances List (DSL)

The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

## Japan. ENCS - Existing and New Chemical Substances Inventory

All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Existing and New Chemical Substances list (ENCS).

## Korea. Korean Existing Chemicals Inventory (KECI)

All substances in this product comply with the Chemical Control Act (CCA) and are listed on the Existing Chemicals List (ECL)

## Philippines Inventory of Chemicals and Chemical Substances (PICCS)

All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

## China Inventory of Existing Chemical Substances

All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on or exempt from the Inventory of Existing Chemical Substances China (IECSC).

## New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand

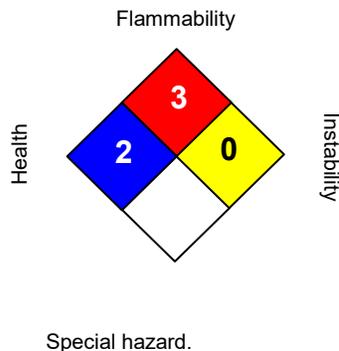
All substances in this product comply with the Hazardous Substances and New Organisms (HSNO) Act 1996, and are listed on or are exempt from the New Zealand Inventory of Chemicals.

## Taiwan Chemical Substance Inventory

On the inventory, or in compliance with the inventory

## Section: 16. OTHER INFORMATION

### NFPA:



### HMIS III:

<b>HEALTH</b>	<b>2*</b>
<b>FLAMMABILITY</b>	<b>3</b>
<b>PHYSICAL HAZARD</b>	<b>0</b>

0 = not significant, 1 = Slight,  
2 = Moderate, 3 = High  
4 = Extreme, \* = Chronic

Revision Date : 06/01/2018  
Version Number : 1.2  
Prepared By : Regulatory Affairs

REVISED INFORMATION: Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

## **SAFETY DATA SHEET**

**ACPC22005A**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. For additional copies of an SDS visit [www.nalco.com](http://www.nalco.com) and request access.

## SAFETY DATA SHEET

AFMR19017A

### Section: 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : AFMR19017A

Other means of identification : Not applicable.

Recommended use : ANTIFOAM

Restrictions on use : Refer to available product literature or ask your local Sales Representative for restrictions on use and dose limits.

Company : Nalco Champion  
11177 S. Stadium Drive  
Sugar Land, Texas 77478  
USA  
TEL: (281) 632-6500

Emergency telephone number : (800) 424-9300 (24 Hours) CHEMTREC

Issuing date : 03/05/2019

### Section: 2. HAZARDS IDENTIFICATION

#### GHS Classification

Flammable liquids : Category 3  
Carcinogenicity : Category 2  
Specific target organ toxicity - single exposure : Category 3 (Central Nervous System)

#### GHS Label element

Hazard pictograms : 

Signal Word : Warning

Hazard Statements : Flammable liquid and vapour.  
May cause drowsiness or dizziness.  
Suspected of causing cancer.

Precautionary Statements : **Prevention:**  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray. Wear protective gloves/ protective clothing/ eye protection/ face protection.  
**Response:**  
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.  
**Storage:**  
Store in a well-ventilated place.

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**Disposal:**

Dispose of contents/ container to an approved waste disposal plant.

**Other hazards** : None known.

## Section: 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

Chemical Name	CAS-No.	Concentration: (%)
Kerosene	8008-20-6	60 - 100
Naphthalene	91-20-3	1 - 5
Ethylbenzene	100-41-4	0.1 - 1

## Section: 4. FIRST AID MEASURES

In case of eye contact : Rinse with plenty of water. Get medical attention if symptoms occur.

In case of skin contact : Wash off with soap and plenty of water. Get medical attention if symptoms occur.

If swallowed : Rinse mouth. Get medical attention if symptoms occur.

If inhaled : Remove to fresh air. Treat symptomatically. Get medical attention if symptoms occur.

Protection of first-aiders : In event of emergency assess the danger before taking action. Do not put yourself at risk of injury. If in doubt, contact emergency responders. Use personal protective equipment as required.

Notes to physician : Treat symptomatically.

Most important symptoms and effects, both acute and delayed : See Section 11 for more detailed information on health effects and symptoms.

## Section: 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Foam  
Carbon dioxide  
Dry powder  
Other extinguishing agent suitable for Class B fires  
For large fires, use water spray or fog, thoroughly drenching the burning material.

Unsuitable extinguishing media : High volume water jet

Specific hazards during firefighting : Fire Hazard  
Keep away from heat and sources of ignition.  
Flash back possible over considerable distance.  
Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

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- Hazardous combustion products : Decomposition products may include the following materials: Carbon oxides metal oxides
- Special protective equipment for firefighters : Use personal protective equipment.
- Specific extinguishing methods : Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. In the event of fire and/or explosion do not breathe fumes.

### Section: 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions, protective equipment and emergency procedures : Ensure adequate ventilation. Remove all sources of ignition. Refer to protective measures listed in sections 7 and 8.
- Environmental precautions : Do not allow contact with soil, surface or ground water.
- Methods and materials for containment and cleaning up : Eliminate all ignition sources if safe to do so. Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Do not flush into surface water or sanitary sewer system.

### Section: 7. HANDLING AND STORAGE

- Advice on safe handling : Open drum carefully as content may be under pressure. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours). Keep away from fire, sparks and heated surfaces. Do not breathe dust/fume/gas/mist/vapours/spray. Wash hands thoroughly after handling. Use only with adequate ventilation.
- Conditions for safe storage : Keep away from heat and sources of ignition. Keep in a cool, well-ventilated place. Keep away from oxidizing agents. Keep out of reach of children. Keep container tightly closed. Store in suitable labelled containers.
- Suitable material : The following compatibility data is suggested based on similar product data and/or industry experience: Mild steel, Stainless Steel 304, Stainless Steel 316L, Hastelloy C-276, PVC, Plexiglass, PTFE, Perfluoroelastomer
- Unsuitable material : The following compatibility data is suggested based on similar product data and/or industry experience: Aluminum, Brass, Copper, Buna-N, Nylon, Natural rubber, Polyethylene, Polypropylene, HDPE (high density polyethylene), Ethylene propylene, EPDM, Neoprene, Polyurethane, Alfax, Hypalon, Fluoroelastomer, Shipping and long term storage compatibility with construction materials can vary; we therefore recommend that compatibility is tested prior to use.

### Section: 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

#### Components with workplace control parameters

Components	CAS-No.	Form of exposure	Permissible	Basis
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# SAFETY DATA SHEET

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			concentration	
Kerosene	8008-20-6	TWA	100 mg/m <sup>3</sup>	NIOSH REL
		TWA	500 ppm 2,000 mg/m <sup>3</sup>	OSHA Z1
		TWA	200 mg/m <sup>3</sup> (as total hydrocarbon vapor)	ACGIH
Naphthalene	91-20-3	TWA	10 ppm	ACGIH
		TWA	10 ppm 50 mg/m <sup>3</sup>	NIOSH REL
		STEL	15 ppm 75 mg/m <sup>3</sup>	NIOSH REL
		TWA	10 ppm 50 mg/m <sup>3</sup>	OSHA Z1
Ethylbenzene	100-41-4	TWA	20 ppm	ACGIH
		TWA	100 ppm 435 mg/m <sup>3</sup>	NIOSH REL
		STEL	125 ppm 545 mg/m <sup>3</sup>	NIOSH REL
		TWA	100 ppm 435 mg/m <sup>3</sup>	OSHA Z1

Engineering measures : Effective exhaust ventilation system. Maintain air concentrations below occupational exposure standards.

## Personal protective equipment

Eye protection : Safety goggles  
Face-shield

Hand protection : Wear the following personal protective equipment:  
Standard glove type.  
Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

Skin protection : Wear suitable protective clothing.

Respiratory protection : When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice. Remove and wash contaminated clothing before re-use. Wash face, hands and any exposed skin thoroughly after handling.

## Section: 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Liquid  
Colour : colourless to yellow  
Odour : characteristic  
Flash point : > 38 °C  
pH : Not applicable.

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Odour Threshold	:	no data available
Melting point/freezing point	:	no data available
Initial boiling point and boiling range	:	no data available
Evaporation rate	:	no data available
Flammability (solid, gas)	:	no data available
Upper explosion limit	:	5 V%, Based on solvent
Lower explosion limit	:	0.7 V%, Based on solvent
Vapour pressure	:	< 100 Pa, Based on solvent
Relative vapour density	:	no data available
Relative density	:	0.805 - 0.840, (25 °C),
Density	:	0.819 g/cm <sup>3</sup>
Water solubility	:	insoluble
Solubility in other solvents	:	no data available
Partition coefficient: n-octanol/water	:	no data available
Auto-ignition temperature	:	no data available
Thermal decomposition	:	no data available
Viscosity, dynamic	:	no data available
Viscosity, kinematic	:	60 - 80 mm <sup>2</sup> /s (40 °C)
Molecular weight	:	no data available
VOC	:	no data available

### Section: 10. STABILITY AND REACTIVITY

Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	No dangerous reaction known under conditions of normal use.
Conditions to avoid	:	Heat, flames and sparks.
Incompatible materials	:	Strong oxidizing agents
Hazardous decomposition products	:	Decomposition products may include the following materials: Carbon oxides metal oxides

### Section: 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : Inhalation, Eye contact, Skin contact

#### Potential Health Effects

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Eyes : Health injuries are not known or expected under normal use.  
Skin : Health injuries are not known or expected under normal use.  
Ingestion : Health injuries are not known or expected under normal use.  
Inhalation : Inhalation may cause central nervous system effects.  
Chronic Exposure : Suspected of causing cancer.

## Experience with human exposure

Eye contact : No symptoms known or expected.  
Skin contact : No symptoms known or expected.  
Ingestion : No symptoms known or expected.  
Inhalation : Dizziness, Drowsiness

## Toxicity

### Product

Acute oral toxicity : Acute toxicity estimate: 4,876 mg/kg  
Acute inhalation toxicity : no data available  
Acute dermal toxicity : no data available  
Skin corrosion/irritation : no data available  
Serious eye damage/eye irritation : no data available  
Respiratory or skin sensitization : no data available  
Carcinogenicity

IARC

### **Group 2B: Possibly carcinogenic to humans**

Naphthalene 91-20-3  
Ethylbenzene 100-41-4

OSHA

No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

NTP

### **Reasonably anticipated to be a human carcinogen**

Naphthalene 91-20-3

Reproductive effects : no data available  
Germ cell mutagenicity : no data available  
Teratogenicity : no data available  
STOT - single exposure : no data available  
STOT - repeated exposure : no data available  
Aspiration toxicity : no data available

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## Components

Acute inhalation toxicity : Ethylbenzene  
LC50 rat: 17.4 mg/l  
Exposure time: 4 h  
Test atmosphere: vapour

## Components

Acute dermal toxicity : Ethylbenzene  
LD50 rabbit: 15,400 mg/kg

## Section: 12. ECOLOGICAL INFORMATION

### Ecotoxicity

Environmental Effects : Harmful to aquatic life with long lasting effects.

### Product

Toxicity to daphnia and other aquatic invertebrates : LC50 Ceriodaphnia dubia: 4,063 mg/l  
Exposure time: 48 hrs  
Test substance: Product

NOEC Ceriodaphnia dubia: 2,500 mg/l  
Exposure time: 48 hrs  
Test substance: Product

### Components

Toxicity to algae : Kerosene  
EC50 : 5 mg/l  
Exposure time: 72 h

### Persistence and degradability

The organic portion of this preparation is expected to be inherently biodegradable.

### Mobility

The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.

If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air : <5%  
Water : 10 - 30%  
Soil : 70 - 90%

The portion in water is expected to float on the surface.

### Bioaccumulative potential

Component substances have a potential to bioaccumulate.

# SAFETY DATA SHEET

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## Other information

no data available

## Section: 13. DISPOSAL CONSIDERATIONS

The information presented only applies to the material as supplied. The classification or waste code may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated at the time of disposal to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Disposal methods : The product should not be allowed to enter drains, water courses or the soil. Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.

Disposal considerations : Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

## Section: 14. TRANSPORT INFORMATION

The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.

The presence of an RQ component (Reportable Quantity for U.S. DOT) in this product causes it to be regulated with an additional description of RQ for road, or as Environmentally hazardous for road and air, ONLY when the net weight in the package exceeds the calculated RQ for the product.

### Land transport (DOT)

Proper shipping name : KEROSENE  
Technical name(s) :  
UN/ID No. : UN 1223  
Transport hazard class(es) : 3  
Packing group : III  
Reportable Quantity (per package) : 4,444 lbs  
RQ Component : Naphthalene

### Air transport (IATA)

Proper shipping name : KEROSENE  
Technical name(s) :  
UN/ID No. : UN 1223  
Transport hazard class(es) : 3  
Packing group : III  
Reportable Quantity (per package) : 4,444 lbs  
RQ Component : Naphthalene

### Sea transport (IMDG/IMO)

Proper shipping name : KEROSENE

# SAFETY DATA SHEET

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Technical name(s) :  
UN/ID No. : UN 1223  
Transport hazard class(es) : 3  
Packing group : III

\*Marine pollutant : Naphthalene

\* Note: This product is regulated as a Marine Pollutant when shipped by Rail or Highway (in bulk quantities), and when shipped by water in all quantities.

## Section: 15. REGULATORY INFORMATION

**TSCA list** : No substances are subject to a Significant New Use Rule.  
No substances are subject to TSCA 12(b) export notification requirements.

### EPCRA - Emergency Planning and Community Right-to-Know Act

#### CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Naphthalene	91-20-3	100	4444

#### SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

**SARA 311/312 Hazards** : Flammable (gases, aerosols, liquids, or solids)  
Carcinogenicity  
Specific target organ toxicity (single or repeated exposure)

**SARA 302** : This material does not contain any components with a section 302 EHS TPQ.

**SARA 313** : The following components are subject to reporting levels established by SARA Title III, Section 313:

Naphthalene	91-20-3	1 - 5 %
Ethylbenzene	100-41-4	0.1 - 1 %

#### California Prop. 65

 **WARNING:** Cancer - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Naphthalene	91-20-3
Ethylbenzene	100-41-4

### INTERNATIONAL CHEMICAL CONTROL LAWS :

#### United States TSCA Inventory

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

#### Australia. Industrial Chemical (Notification and Assessment) Act

All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

# SAFETY DATA SHEET

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## Canadian Domestic Substances List (DSL)

The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

## Japan. ENCS - Existing and New Chemical Substances Inventory

All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Existing and New Chemical Substances list (ENCS).

## Korea. Korean Existing Chemicals Inventory (KECI)

All substances in this product comply with the Chemical Control Act (CCA) and are listed on the Existing Chemicals List (ECL)

## Philippines Inventory of Chemicals and Chemical Substances (PICCS)

All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

## China Inventory of Existing Chemical Substances

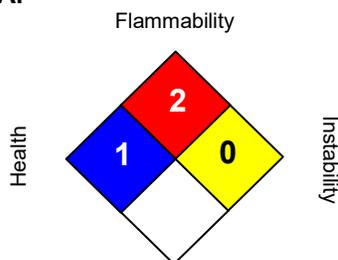
All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on or exempt from the Inventory of Existing Chemical Substances China (IECSC).

## Taiwan Chemical Substance Inventory

On the inventory, or in compliance with the inventory

## Section: 16. OTHER INFORMATION

### NFPA:



### HMIS III:

<b>HEALTH</b>	<b>1*</b>
<b>FLAMMABILITY</b>	<b>2</b>
<b>PHYSICAL HAZARD</b>	<b>0</b>

0 = not significant, 1 =Slight,  
2 = Moderate, 3 = High  
4 = Extreme, \* = Chronic

Revision Date : 03/05/2019  
Version Number : 1.5  
Prepared By : Regulatory Affairs

REVISED INFORMATION: Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. For additional copies of an SDS visit [www.ecolab.com/sds](http://www.ecolab.com/sds) and request access.

## SAFETY DATA SHEET

**ASPH17544SP**

### Section: 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : ASPH17544SP

Other means of identification : Not applicable.

Recommended use : ASPHALTENE INHIBITOR

Restrictions on use : Refer to available product literature or ask your local Sales Representative for restrictions on use and dose limits.

Company : Nalco Champion  
11177 S. Stadium Drive  
Sugar Land, Texas 77478  
USA  
TEL: (281) 632-6500

Emergency telephone number : (800) 424-9300 (24 Hours) CHEMTREC

Issuing date : 11/14/2017

### Section: 2. HAZARDS IDENTIFICATION

#### GHS Classification

Flammable liquids : Category 2

Skin irritation : Category 2

Serious eye damage : Category 1

Skin sensitization : Category 1

Carcinogenicity : Category 2

Reproductive toxicity : Category 2

Specific target organ toxicity : Category 3 (Respiratory system, Central Nervous System)

- single exposure

Specific target organ toxicity : Category 2

- repeated exposure

Aspiration hazard : Category 1

#### GHS Label element

Hazard pictograms :



Signal Word : Danger

Hazard Statements : Highly flammable liquid and vapour.  
May be fatal if swallowed and enters airways.  
Causes skin irritation.  
May cause an allergic skin reaction.  
Causes serious eye damage.  
May cause respiratory irritation.  
May cause drowsiness or dizziness.  
Suspected of causing cancer.

# SAFETY DATA SHEET

**ASPH17544SP**

Suspected of damaging fertility or the unborn child.  
May cause damage to organs through prolonged or repeated exposure.

Precautionary Statements : **Prevention:**  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not breathe dust/fume/gas/mist/vapours/spray. Wear protective gloves/ protective clothing/ eye protection/ face protection.  
**Response:**  
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor/ physician. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.  
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.

**Storage:**  
Store in a well-ventilated place.

**Disposal:**  
Dispose of contents/ container to an approved waste disposal plant.

Other hazards : None known.

## Section: 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No.	Concentration: (%)
Xylene	1330-20-7	30 - 60
Kerosene	8008-20-6	10 - 30
Ethylbenzene	100-41-4	5 - 10
Fatty acid-amine condensate	Proprietary	5 - 10
Fatty acid-amine condensate	Proprietary	5 - 10
Fatty amine	Proprietary	1 - 5
Isopropanol	67-63-0	1 - 5
Toluene	108-88-3	0.1 - 1
Diethylenetriamine	111-40-0	0.1 - 1

## Section: 4. FIRST AID MEASURES

In case of eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes. Use a mild soap if available. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

If swallowed : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Aspiration hazard if swallowed - can enter lungs and cause damage. Get medical attention immediately.

If inhaled : Remove to fresh air. Treat symptomatically. Get medical attention if symptoms occur.

## SAFETY DATA SHEET

**ASPH17544SP**

- Protection of first-aiders : In event of emergency assess the danger before taking action. Do not put yourself at risk of injury. If in doubt, contact emergency responders. Use personal protective equipment as required.
- Notes to physician : Treat symptomatically.
- Most important symptoms and effects, both acute and delayed : See Section 11 for more detailed information on health effects and symptoms.

### Section: 5. FIREFIGHTING MEASURES

- Suitable extinguishing media : Foam  
Carbon dioxide  
Dry powder  
Other extinguishing agent suitable for Class B fires  
For large fires, use water spray or fog, thoroughly drenching the burning material.
- Unsuitable extinguishing media : None known.
- Specific hazards during firefighting : Fire Hazard  
Keep away from heat and sources of ignition.  
Flash back possible over considerable distance.  
Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
- Hazardous combustion products : Decomposition products may include the following materials: Carbon oxides  
nitrogen oxides (NOx)
- Special protective equipment for firefighters : Use personal protective equipment.
- Specific extinguishing methods : Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. In the event of fire and/or explosion do not breathe fumes.

### Section: 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions, protective equipment and emergency procedures : Ensure adequate ventilation. Remove all sources of ignition. Keep people away from and upwind of spill/leak. Avoid inhalation, ingestion and contact with skin and eyes. When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Ensure clean-up is conducted by trained personnel only. Refer to protective measures listed in sections 7 and 8.
- Environmental precautions : Do not allow contact with soil, surface or ground water.
- Methods and materials for containment and cleaning up : Eliminate all ignition sources if safe to do so. Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Flush away traces with water.

# SAFETY DATA SHEET

**ASPH17544SP**

## Section: 7. HANDLING AND STORAGE

- Advice on safe handling : Avoid contact with skin and eyes. Open drum carefully as content may be under pressure. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours). Keep away from fire, sparks and heated surfaces. Do not breathe dust/fume/gas/mist/vapours/spray. Do not get in eyes, on skin, or on clothing. Wash hands thoroughly after handling. Use only with adequate ventilation.
- Conditions for safe storage : Keep away from heat and sources of ignition. Keep in a cool, well-ventilated place. Keep away from oxidizing agents. Keep out of reach of children. Keep container tightly closed. Store in suitable labelled containers.
- Suitable material : Keep in properly labelled containers.
- Unsuitable material : not determined

## Section: 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Components with workplace control parameters

Components	CAS-No.	Form of exposure	Permissible concentration	Basis
Xylene	1330-20-7	TWA	100 ppm 435 mg/m <sup>3</sup>	OSHA Z1
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
Kerosene	8008-20-6	TWA	100 mg/m <sup>3</sup>	NIOSH REL
		TWA	500 ppm 2,000 mg/m <sup>3</sup>	OSHA Z1
		TWA	200 mg/m <sup>3</sup> (as total hydrocarbon vapor)	ACGIH
Ethylbenzene	100-41-4	TWA	20 ppm	ACGIH
		TWA	100 ppm 435 mg/m <sup>3</sup>	NIOSH REL
		STEL	125 ppm 545 mg/m <sup>3</sup>	NIOSH REL
		TWA	100 ppm 435 mg/m <sup>3</sup>	OSHA Z1
Isopropanol	67-63-0	TWA	200 ppm	ACGIH
		STEL	400 ppm	ACGIH
		TWA	400 ppm 980 mg/m <sup>3</sup>	NIOSH REL
		STEL	500 ppm 1,225 mg/m <sup>3</sup>	NIOSH REL
Toluene	108-88-3	TWA	400 ppm 980 mg/m <sup>3</sup>	OSHA Z1
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m <sup>3</sup>	NIOSH REL
		STEL	150 ppm 560 mg/m <sup>3</sup>	NIOSH REL

# SAFETY DATA SHEET

## ASPH17544SP

		TWA	200 ppm	OSHA/Z2
		CEIL	300 ppm	OSHA/Z2
		Peak	500 ppm	OSHA/Z2
Diethylenetriamine	111-40-0	TWA	1 ppm	ACGIH
		TWA	1 ppm 4 mg/m3	NIOSH REL

Engineering measures : Effective exhaust ventilation system. Maintain air concentrations below occupational exposure standards.

### Personal protective equipment

Eye protection : Safety goggles  
Face-shield

Hand protection : Wear the following personal protective equipment:  
Standard glove type.  
Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

Skin protection : Wear suitable protective clothing.

Respiratory protection : When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice. Remove and wash contaminated clothing before re-use. Wash face, hands and any exposed skin thoroughly after handling. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.

### Section: 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : liquid

Colour : clear, amber

Odour : aromatic

Flash point : -3.3 °C, Method: ASTM D7094

pH : Not applicable

Odour Threshold : no data available

Melting point/freezing point : no data available

Initial boiling point and boiling range : 81.8 °C, Method: ASTM D 86

Evaporation rate : no data available

Flammability (solid, gas) : no data available

Upper explosion limit : no data available

Lower explosion limit : no data available

Vapour pressure : 22.8 hPa, (37.8 °C), ASTM D-5191,

Relative vapour density : no data available

# SAFETY DATA SHEET

## ASPH17544SP

Relative density	:	0.9023, (15.56 °C), ASTM D4052
Density	:	0.8982 g/cm <sup>3</sup>
Water solubility	:	partly soluble
Solubility in other solvents	:	no data available
Partition coefficient: n-octanol/water	:	no data available
Auto-ignition temperature	:	no data available
Thermal decomposition	:	no data available
Viscosity, dynamic	:	no data available
Viscosity, kinematic	:	7.24 mm <sup>2</sup> /s (40 °C)
Molecular weight	:	no data available
VOC	:	no data available

### Section: 10. STABILITY AND REACTIVITY

Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	No dangerous reaction known under conditions of normal use.
Conditions to avoid	:	Heat, flames and sparks.
Incompatible materials	:	Strong oxidizing agents
Hazardous decomposition products	:	Decomposition products may include the following materials: Carbon oxides nitrogen oxides (NO <sub>x</sub> )

### Section: 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : Inhalation, Eye contact, Skin contact

#### Potential Health Effects

Eyes	:	Causes serious eye damage.
Skin	:	Causes skin irritation. May cause allergic skin reaction.
Ingestion	:	May be fatal if swallowed and enters airways.
Inhalation	:	May cause respiratory tract irritation. May cause nose, throat, and lung irritation. Inhalation may cause central nervous system effects.
Chronic Exposure	:	Suspected of damaging fertility or the unborn child. May cause damage to organs through prolonged or repeated exposure. Suspected of causing cancer.

#### Experience with human exposure

# SAFETY DATA SHEET

**ASPH17544SP**

Eye contact : Redness, Pain, Corrosion  
Skin contact : Redness, Irritation, Allergic reactions  
Ingestion : Vomiting  
Inhalation : Respiratory irritation, Cough, Dizziness, Drowsiness

## Toxicity

### Product

Acute oral toxicity : Acute toxicity estimate: > 5,000 mg/kg  
Acute inhalation toxicity : Acute toxicity estimate: 199.47 mg/l  
Exposure time: 4 h  
Test atmosphere: vapour  
Acute dermal toxicity : Acute toxicity estimate: 3,019 mg/kg  
Skin corrosion/irritation : no data available  
Serious eye damage/eye irritation : no data available  
Respiratory or skin sensitization : no data available  
Carcinogenicity  
IARC **Group 2B: Possibly carcinogenic to humans**  
Ethylbenzene 100-41-4  
OSHA No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.  
NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.  
Reproductive effects : no data available  
Germ cell mutagenicity : no data available  
Teratogenicity : no data available  
STOT - single exposure : no data available  
STOT - repeated exposure : no data available  
Aspiration toxicity : no data available

## Section: 12. ECOLOGICAL INFORMATION

### Ecotoxicity

Environmental Effects : This product has no known ecotoxicological effects.

### Components

Toxicity to fish : Isopropanol  
LC50 Pimephales promelas (fathead minnow): 9,640 mg/l

# SAFETY DATA SHEET

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Exposure time: 96 h

Toluene

LC50 *Oncorhynchus kisutch* (coho salmon): 5.5 mg/l

Exposure time: 96 h

Diethylenetriamine

LC50 *Poecilia reticulata* (guppy): 430 mg/l

Exposure time: 96 h

## Components

Toxicity to daphnia and other aquatic invertebrates : Kerosene  
EC50 : 9 mg/l  
Exposure time: 48 h

Ethylbenzene

EC50 *Daphnia*: 1.81 mg/l

Exposure time: 48 h

Fatty amine

EC50 : 0.011 mg/l

Exposure time: 48 h

Isopropanol

LC50 *Daphnia magna* (Water flea): > 10,000 mg/l

Toluene

LC50 *Ceriodaphnia dubia* (water flea): 3.78 mg/l

Exposure time: 48 h

Diethylenetriamine

*Daphnia magna* (Water flea): 16 mg/l

Exposure time: 48 h

## Components

Toxicity to algae : Kerosene  
EC50 : 5 mg/l  
Exposure time: 72 h

Toluene

EC50 *Chlorella vulgaris* (Fresh water algae): 134 mg/l

Exposure time: 72 h

Diethylenetriamine

EC50 *Pseudokirchneriella subcapitata* (green algae): 187 mg/l

Exposure time: 72 h

## Components

Toxicity to bacteria : Isopropanol  
1,050 mg/l

Toluene

84 mg/l

# SAFETY DATA SHEET

**ASPH17544SP**

EC50 Nitrosomonas Sp.: 84 mg/l  
Exposure time: 24 h

Diethylenetriamine  
32.7 mg/l

## Components

Toxicity to fish (Chronic toxicity) : Toluene  
NOEC: 1.39 mg/l  
Exposure time: 40 d  
Species: Oncorhynchus kisutch (coho salmon)

## Components

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : Toluene  
NOEC: 0.74 mg/l  
Exposure time: 7 d  
Species: Ceriodaphnia dubia

## Persistence and degradability

no data available

## Mobility

no data available

## Bioaccumulative potential

no data available

## Other information

no data available

## Section: 13. DISPOSAL CONSIDERATIONS

The information presented only applies to the material as supplied. The classification or waste code may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated at the time of disposal to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Disposal methods : Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.

Disposal considerations : Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

## Section: 14. TRANSPORT INFORMATION

The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.

# SAFETY DATA SHEET

**ASPH17544SP**

The presence of an RQ component (Reportable Quantity for U.S. DOT) in this product causes it to be regulated with an additional description of RQ for road, or as Environmentally hazardous for road and air, ONLY when the net weight in the package exceeds the calculated RQ for the product.

## Land transport (DOT)

Proper shipping name : FLAMMABLE LIQUID, N.O.S.  
Technical name(s) : Xylene, Ethylbenzene  
UN/ID No. : UN 1993  
Transport hazard class(es) : 3  
Packing group : II  
Reportable Quantity (per package) : 278 lbs  
RQ Component : Xylene

## Air transport (IATA)

Proper shipping name : FLAMMABLE LIQUID, N.O.S.  
Technical name(s) : Xylene, Ethylbenzene  
UN/ID No. : UN 1993  
Transport hazard class(es) : 3  
Packing group : II  
Reportable Quantity (per package) : 278 lbs  
RQ Component : Xylene

## Sea transport (IMDG/IMO)

Proper shipping name : FLAMMABLE LIQUID, N.O.S.  
Technical name(s) : Xylene, Ethylbenzene  
UN/ID No. : UN 1993  
Transport hazard class(es) : 3  
Packing group : II

## Section: 15. REGULATORY INFORMATION

**TSCA list** : No substances are subject to a Significant New Use Rule.  
No substances are subject to TSCA 12(b) export notification requirements.

## EPCRA - Emergency Planning and Community Right-to-Know Act

### CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Xylene	1330-20-7	100	278

### SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

**SARA 311/312 Hazards** : Fire Hazard  
Acute Health Hazard  
Chronic Health Hazard

# SAFETY DATA SHEET

**ASPH17544SP**

**SARA 302** : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313** : The following components are subject to reporting levels established by SARA Title III, Section 313:

Xylene	1330-20-7	30 - 60 %
Ethylbenzene	100-41-4	5 - 10 %

## California Prop 65

WARNING! This product contains a chemical known to the State of California to cause cancer.

Ethylbenzene 100-41-4

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene 108-88-3

## INTERNATIONAL CHEMICAL CONTROL LAWS :

### United States TSCA Inventory

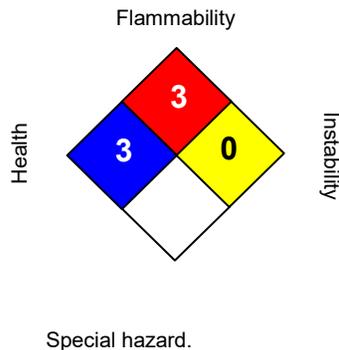
On TSCA Inventory

### Australia. Industrial Chemical (Notification and Assessment) Act

On the inventory, or in compliance with the inventory

## Section: 16. OTHER INFORMATION

### NFPA:



### HMIS III:

<b>HEALTH</b>	<b>3*</b>
<b>FLAMMABILITY</b>	<b>3</b>
<b>PHYSICAL HAZARD</b>	<b>0</b>

0 = not significant, 1 =Slight,  
2 = Moderate, 3 = High  
4 = Extreme, \* = Chronic

Revision Date : 11/14/2017  
Version Number : 1.0  
Prepared By : Regulatory Affairs

REVISED INFORMATION: Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use,

## SAFETY DATA SHEET

**ASPH17544SP**

processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. For additional copies of an SDS visit [www.nalco.com](http://www.nalco.com) and request access.

## SAFETY DATA SHEET

MISC17477A

### Section: 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : MISC17477A  
Other means of identification : Not applicable.  
Recommended use : GAS TREATING CHEMICAL, DEHYDRATION  
Restrictions on use : Refer to available product literature or ask your local Sales Representative for restrictions on use and dose limits.  
Company : Nalco Champion  
11177 S. Stadium Drive  
Sugar Land, Texas 77478  
USA  
TEL: (281) 632-6500  
Emergency telephone : (800) 424-9300 (24 Hours) CHEMTREC  
number  
Issuing date : 06/07/2019

### Section: 2. HAZARDS IDENTIFICATION

#### GHS Classification

Not a hazardous substance or mixture.

#### GHS Label element

Precautionary Statements : **Prevention:**  
Wash hands thoroughly after handling.  
**Response:**  
Get medical advice/ attention if you feel unwell.  
**Storage:**  
Store in accordance with local regulations.

Other hazards : None known.

### Section: 3. COMPOSITION/INFORMATION ON INGREDIENTS

No hazardous ingredients

### Section: 4. FIRST AID MEASURES

In case of eye contact : Rinse with plenty of water. Get medical attention if symptoms occur.  
In case of skin contact : Wash off with soap and plenty of water. Get medical attention if symptoms occur.  
If swallowed : Rinse mouth. Get medical attention if symptoms occur.  
If inhaled : Get medical attention if symptoms occur.  
Protection of first-aiders : In event of emergency assess the danger before taking action. Do not put yourself at risk of injury. If in doubt, contact emergency responders. Use personal protective equipment as required.  
Notes to physician : Treat symptomatically.  
Most important symptoms : See Section 11 for more detailed information on health effects and symptoms.

# SAFETY DATA SHEET

**MISC17477A**

and effects, both acute and delayed

## Section: 5. FIREFIGHTING MEASURES

- Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Unsuitable extinguishing media : None known.
- Specific hazards during firefighting : Not flammable or combustible.
- Hazardous combustion products : Decomposition products may include the following materials: Carbon oxides
- Special protective equipment for firefighters : Use personal protective equipment.
- Specific extinguishing methods : Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

## Section: 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions, protective equipment and emergency procedures : Refer to protective measures listed in sections 7 and 8.
- Environmental precautions : No special environmental precautions required.
- Methods and materials for containment and cleaning up : Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Flush away traces with water.

## Section: 7. HANDLING AND STORAGE

- Advice on safe handling : For personal protection see section 8. Wash hands after handling.
- Conditions for safe storage : Keep out of reach of children. Keep container tightly closed. Store in suitable labelled containers.
- Suitable material : The following compatibility data is suggested based on similar product data and/or industry experience: Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.
- Unsuitable material : not determined

## Section: 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

- Engineering measures : Good general ventilation should be sufficient to control worker exposure to

# SAFETY DATA SHEET

**MISC17477A**

airborne contaminants.

## Personal protective equipment

Eye protection	:	Safety glasses
Hand protection	:	Wear the following personal protective equipment: Impervious gloves, resistant to chemicals. Nitrile rubber butyl-rubber Neoprene gloves Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Skin protection	:	Wear suitable protective clothing.
Respiratory protection	:	No personal respiratory protective equipment normally required.
Hygiene measures	:	Wash hands before breaks and immediately after handling the product.

## Section: 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Liquid
Colour	:	Clear
Odour	:	Slight
Flash point	:	165.0 °C
pH	:	6.5 - 7.5,(50 %), (20 °C)
Odour Threshold	:	no data available
Melting point/freezing point	:	no data available
Initial boiling point and boiling range	:	287.0 °C
Evaporation rate	:	no data available
Flammability (solid, gas)	:	no data available
Upper explosion limit	:	no data available
Lower explosion limit	:	no data available
Vapour pressure	:	1.0 mm Hg, (20.0 °C),
Relative vapour density	:	no data available
Relative density	:	1.12, (20.0 °C),
Density	:	9.3 lb/gal
Water solubility	:	completely soluble
Solubility in other solvents	:	no data available
Partition coefficient: n-octanol/water	:	no data available
Auto-ignition temperature	:	no data available
Thermal decomposition	:	no data available
Viscosity, dynamic	:	48 mPa.s (20 °C)
Viscosity, kinematic	:	no data available

# SAFETY DATA SHEET

**MISC17477A**

Molecular weight : no data available  
VOC : 99.9 %, Calculation method

## Section: 10. STABILITY AND REACTIVITY

Reactivity : No dangerous reaction known under conditions of normal use.  
Chemical stability : Stable under normal conditions.  
Possibility of hazardous reactions : No dangerous reaction known under conditions of normal use.  
Conditions to avoid : None known.  
Incompatible materials : Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors.  
Hazardous decomposition products : In case of fire, hazardous decomposition products may be produced such as: Carbon oxides

## Section: 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : Inhalation, Eye contact, Skin contact

### Potential Health Effects

Eyes : Health injuries are not known or expected under normal use.  
Skin : Health injuries are not known or expected under normal use.  
Ingestion : Health injuries are not known or expected under normal use.  
Inhalation : Health injuries are not known or expected under normal use.  
Chronic Exposure : Health injuries are not known or expected under normal use.

### Experience with human exposure

Eye contact : No symptoms known or expected.  
Skin contact : No symptoms known or expected.  
Ingestion : No symptoms known or expected.  
Inhalation : No symptoms known or expected.

### Toxicity

### Product

# SAFETY DATA SHEET

**MISC17477A**

Acute oral toxicity : no data available  
Acute inhalation toxicity : no data available  
Acute dermal toxicity : no data available  
Skin corrosion/irritation : no data available  
Serious eye damage/eye irritation : no data available  
Respiratory or skin sensitization : no data available  
Carcinogenicity : no data available  
Reproductive effects : no data available  
Germ cell mutagenicity : no data available  
Teratogenicity : no data available  
STOT - single exposure : no data available  
STOT - repeated exposure : no data available  
Aspiration toxicity : no data available

## Section: 12. ECOLOGICAL INFORMATION

### Ecotoxicity

Environmental Effects : This product has no known ecotoxicological effects.

### Persistence and degradability

The organic portion of this preparation is expected to be readily biodegradable.

### Mobility

The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.

If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air : <5%  
Water : 30 - 50%  
Soil : 50 - 70%

The portion in water is expected to float on the surface.

### Bioaccumulative potential

This preparation or material is not expected to bioaccumulate.

### Other information

no data available

# SAFETY DATA SHEET

**MISC17477A**

## Section: 13. DISPOSAL CONSIDERATIONS

The information presented only applies to the material as supplied. The classification or waste code may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated at the time of disposal to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Disposal methods : Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.

Disposal considerations : Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

## Section: 14. TRANSPORT INFORMATION

The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.

### Land transport (DOT)

Proper shipping name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

### Air transport (IATA)

Proper shipping name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

### Sea transport (IMDG/IMO)

Proper shipping name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

## Section: 15. REGULATORY INFORMATION

**TSCA list** : No substances are subject to a Significant New Use Rule.  
No substances are subject to TSCA 12(b) export notification requirements.

### EPCRA - Emergency Planning and Community Right-to-Know Act

#### CERCLA Reportable Quantity

This product does not contain a RQ substance, or this product contains a substance with a RQ, however the calculated RQ exceeds the reasonably attainable upper limit.

#### SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

**SARA 311/312 Hazards** : No SARA Hazards

**SARA 302** : This material does not contain any components with a section 302 EHS TPQ.

# SAFETY DATA SHEET

**MISC17477A**

**SARA 313** : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

## California Prop. 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

## INTERNATIONAL CHEMICAL CONTROL LAWS :

### United States TSCA Inventory

On the inventory, or in compliance with the inventory

### Australia. Industrial Chemical (Notification and Assessment) Act

On the inventory, or in compliance with the inventory

**New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand**  
not determined

### Japan. ENCS - Existing and New Chemical Substances Inventory

On the inventory, or in compliance with the inventory

### Korea. Korean Existing Chemicals Inventory (KECI)

On the inventory, or in compliance with the inventory

### Philippines Inventory of Chemicals and Chemical Substances (PICCS)

On the inventory, or in compliance with the inventory

### China Inventory of Existing Chemical Substances

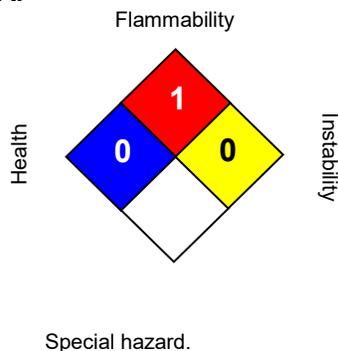
On the inventory, or in compliance with the inventory

### Taiwan Chemical Substance Inventory

not determined

## Section: 16. OTHER INFORMATION

### NFPA:



### HMIS III:

<b>HEALTH</b>	<b>0</b>
<b>FLAMMABILITY</b>	<b>1</b>
<b>PHYSICAL HAZARD</b>	<b>0</b>

0 = not significant, 1 =Slight,  
2 = Moderate, 3 = High  
4 = Extreme, \* = Chronic

Revision Date : 06/07/2019  
Version Number : 1.0

## SAFETY DATA SHEET

**MISC17477A**

Prepared By : Regulatory Affairs

REVISED INFORMATION: Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. For additional copies of an SDS visit [www.ecolab.com/sds](http://www.ecolab.com/sds) and request access.

## SAFETY DATA SHEET

### PERMATREAT™ PC-191T

#### Section: 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : PERMATREAT™ PC-191T

Other means of identification : Not applicable.

Recommended use : REVERSE OSMOSIS ANTISCALANT

Restrictions on use : Refer to available product literature or ask your local Sales Representative for restrictions on use and dose limits.

Company : Nalco Company  
1601 W. Diehl Road  
Naperville, Illinois 60563-1198  
USA  
TEL: (630)305-1000

Emergency telephone number : (800) 424-9300 (24 Hours) CHEMTREC

Issuing date : 03/19/2018

#### Section: 2. HAZARDS IDENTIFICATION

##### GHS Classification

Not a hazardous substance or mixture.

##### GHS Label element

Precautionary Statements : **Prevention:**  
Wash hands thoroughly after handling.  
**Response:**  
Get medical advice/ attention if you feel unwell.  
**Storage:**  
Store in accordance with local regulations.

**Other hazards** : None known.

#### Section: 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

No hazardous ingredients

#### Section: 4. FIRST AID MEASURES

In case of eye contact : Rinse with plenty of water. Get medical attention if symptoms occur.

In case of skin contact : Wash off with soap and plenty of water. Get medical attention if symptoms occur.

If swallowed : Rinse mouth. Get medical attention if symptoms occur.

If inhaled : Get medical attention if symptoms occur.

## SAFETY DATA SHEET

### PERMATREAT™ PC-191T

- Protection of first-aiders : In event of emergency assess the danger before taking action. Do not put yourself at risk of injury. If in doubt, contact emergency responders. Use personal protective equipment as required.
- Notes to physician : Treat symptomatically.
- Most important symptoms and effects, both acute and delayed : See Section 11 for more detailed information on health effects and symptoms.

#### Section: 5. FIREFIGHTING MEASURES

- Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Unsuitable extinguishing media : None known.
- Specific hazards during firefighting : Not flammable or combustible.
- Hazardous combustion products : Carbon oxides nitrogen oxides (NOx) Sulphur oxides Oxides of phosphorus
- Special protective equipment for firefighters : Use personal protective equipment.
- Specific extinguishing methods : Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

#### Section: 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions, protective equipment and emergency procedures : Refer to protective measures listed in sections 7 and 8.
- Environmental precautions : No special environmental precautions required.
- Methods and materials for containment and cleaning up : Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Flush away traces with water.

#### Section: 7. HANDLING AND STORAGE

- Advice on safe handling : For personal protection see section 8. Wash hands after handling.
- Conditions for safe storage : Keep out of reach of children. Keep container tightly closed. Store in suitable labelled containers.

## SAFETY DATA SHEET

### PERMATREAT™ PC-191T

- Suitable material : The following compatibility data is suggested based on similar product data and/or industry experience: HDPE (high density polyethylene), Stainless Steel 304, Polyethylene (rigid), Polypropylene (rigid), CPVC (rigid), 100% phenolic resin liner, Epoxy phenolic resin, coated steel
- Unsuitable material : The following compatibility data is suggested based on similar product data and/or industry experience: Brass, Buna-N, EPDM, Neoprene, Polyurethane, Fluoroelastomer, Chlorosulfonated polyethylene rubber, Shipping and long term storage compatibility with construction materials can vary; we therefore recommend that compatibility is tested prior to use.

### Section: 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

- Engineering measures : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

#### Personal protective equipment

- Eye protection : Safety glasses
- Hand protection : Wear protective gloves.  
Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
- Skin protection : Wear suitable protective clothing.
- Respiratory protection : No personal respiratory protective equipment normally required.
- Hygiene measures : Wash hands before breaks and immediately after handling the product.

### Section: 9. PHYSICAL AND CHEMICAL PROPERTIES

- Appearance : Liquid
- Colour : clear amber - yellow green
- Odour : Ammoniacal
- Flash point : > 93.3 °C
- pH : 10.0 - 11.5,(1 %), (25 °C)
- Odour Threshold : no data available
- Melting point/freezing point : no data available
- Initial boiling point and boiling range : no data available
- Evaporation rate : no data available
- Flammability (solid, gas) : no data available
- Upper explosion limit : no data available
- Lower explosion limit : no data available

## SAFETY DATA SHEET

### PERMATREAT™ PC-191T

Vapour pressure	:	no data available
Relative vapour density	:	no data available
Relative density	:	1.335 - 1.362, (15.6 °C),
Density	:	1.127 g/cm <sup>3</sup> , 11.3 lb/gal
Water solubility	:	completely soluble
Solubility in other solvents	:	no data available
Partition coefficient: n-octanol/water	:	Pow: 3.5, log Pow: 0.544
Auto-ignition temperature	:	no data available
Thermal decomposition	:	no data available
Viscosity, dynamic	:	no data available
Viscosity, kinematic	:	no data available
Molecular weight	:	no data available
VOC	:	0 %, Calculation method

### Section: 10. STABILITY AND REACTIVITY

Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	No dangerous reaction known under conditions of normal use.
Conditions to avoid	:	Freezing temperatures.
Incompatible materials	:	None known.
Hazardous decomposition products	:	In case of fire, hazardous decomposition products may be produced such as: Carbon oxides nitrogen oxides (NO <sub>x</sub> ) Sulphur oxides Oxides of phosphorus

### Section: 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : Inhalation, Eye contact, Skin contact

#### Potential Health Effects

Eyes	:	Health injuries are not known or expected under normal use.
Skin	:	Health injuries are not known or expected under normal use.
Ingestion	:	Health injuries are not known or expected under normal use.
Inhalation	:	Health injuries are not known or expected under normal use.

## SAFETY DATA SHEET

### PERMATREAT™ PC-191T

Chronic Exposure : Health injuries are not known or expected under normal use.

#### Experience with human exposure

Eye contact : No symptoms known or expected.

Skin contact : No symptoms known or expected.

Ingestion : No symptoms known or expected.

Inhalation : No symptoms known or expected.

#### Toxicity

##### Product

Acute oral toxicity : LD50 rat: > 17,800 mg/kg  
Test substance: Similar Product

Acute inhalation toxicity : no data available

Acute dermal toxicity : LD50 rabbit: > 15,800 mg/kg  
Test substance: Similar Product

Skin corrosion/irritation : Species: Rabbit  
Exposure time: 24 hrs  
Result: 0.3  
Method: Draize Test  
Test substance: Similar Product

Serious eye damage/eye irritation : Species: rabbit  
Exposure time: 24 hrs  
Result: 3.7  
Method: Draize Test  
Test substance: Similar Product

Respiratory or skin sensitization : no data available

Carcinogenicity : no data available

Reproductive effects : no data available

Germ cell mutagenicity : no data available

Teratogenicity : no data available

STOT - single exposure : no data available

STOT - repeated exposure : no data available

Aspiration toxicity : no data available

### Section: 12. ECOLOGICAL INFORMATION

#### Ecotoxicity

Environmental Effects : This product has no known ecotoxicological effects.

#### Product

Toxicity to fish : LC50 Oncorhynchus mykiss (rainbow trout): > 330 mg/l

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Exposure time: 96 hrs  
Test substance: Similar Product

LC50 *Cyprinodon variegatus* (sheepshead minnow): 8,132 mg/l

Exposure time: 96 hrs  
Test substance: Similar Product

LC50 *Lepomis macrochirus* (Bluegill sunfish): > 330 mg/l

Exposure time: 96 hrs  
Test substance: Similar Product

LC50 *Ictalurus punctatus* (channel catfish): 1,212 mg/l

Exposure time: 96 hrs  
Test substance: Similar Product

LC50 *Oncorhynchus mykiss* (rainbow trout): 4,530 mg/l

Exposure time: 96 hrs  
Test substance: Product  
Test Type: Static

NOEC *Oncorhynchus mykiss* (rainbow trout): 3,600 mg/l

Exposure time: 96 hrs  
Test substance: Product  
Test Type: Static

LC50 Inland Silverside: > 10,000 mg/l

Exposure time: 96 h  
Test substance: Product

NOEC Inland Silverside: 10,000 mg/l

Exposure time: 96 h  
Test substance: Product

Toxicity to daphnia and other aquatic invertebrates : LC50 Grass Shrimp: 4,575 mg/l  
Exposure time: 96 hrs  
Test substance: Similar Product

LC50 *Daphnia magna* (Water flea): 1,673 mg/l

Exposure time: 48 hrs  
Test substance: Product  
Test Type: Static

EC50 *Daphnia magna* (Water flea): 297 mg/l

Exposure time: 48 hrs  
Test substance: Similar Product

NOEC *Daphnia magna* (Water flea): 1,296 mg/l

Exposure time: 48 hrs  
Test substance: Product  
Test Type: Static

LC50 Mysid Shrimp (*Mysidopsis bahia*): 8,263 mg/l

Exposure time: 96 h  
Test substance: Product

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NOEC Mysid Shrimp (*Mysidopsis bahia*): 6,000 mg/l  
Exposure time: 96 h  
Test substance: Product

Toxicity to algae : LC50 Green Algae (*Pseudokirchneriella subcapitata*,  
previously *Selenastrum capricornutum*): 20 mg/l  
Exposure time: 96 hrs  
Test substance: Similar Product

Toxicity to fish (Chronic toxicity) : LOEC: 47.6 mg/l  
Exposure time: 60 Days  
Species: *Oncorhynchus mykiss* (rainbow trout)  
Test substance: Similar Product

NOEC: 23 mg/l  
Exposure time: 60 Days  
Species: *Oncorhynchus mykiss* (rainbow trout)  
Test substance: Similar Product

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : LOEC: 50 mg/l  
Exposure time: 28 Days  
Species: *Daphnia magna*  
Test substance: Similar Product  
Test Type: 3 Brood

NOEC: 25 mg/l  
Exposure time: 28 Days  
Species: *Daphnia magna*  
Test substance: Similar Product  
Test Type: 3 Brood

Toxicity to terrestrial organisms : LC50 Bobwhite Quail: > 2,510 mg/kg  
Exposure time: 14 Days  
Test substance: Similar Product

LC50 Mallard Duck: > 2,510 mg/kg  
Exposure time: 14 Days  
Test substance: Similar Product

### Persistence and degradability

Total Organic Carbon (TOC) : 65,000 mg/l

### Mobility

The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.

If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

## SAFETY DATA SHEET

### PERMATREAT™ PC-191T

Air : <5%  
Water : 30 - 50%  
Soil : 50 - 70%

The portion in water is expected to be soluble or dispersible.

#### Bioaccumulative potential

no data available

#### Other information

no data available

### Section: 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

Disposal methods : Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.

Disposal considerations : Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

### Section: 14. TRANSPORT INFORMATION

The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.

#### Land transport (DOT)

Proper shipping name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

#### Air transport (IATA)

Proper shipping name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

#### Sea transport (IMDG/IMO)

Proper shipping name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

### Section: 15. REGULATORY INFORMATION

TSCA list : Not relevant

#### EPCRA - Emergency Planning and Community Right-to-Know Act

##### CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

##### SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

## SAFETY DATA SHEET

### PERMATREAT™ PC-191T

**SARA 311/312 Hazards** : No SARA Hazards

**SARA 302** : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313** : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

#### **California Prop 65**

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

#### **INTERNATIONAL CHEMICAL CONTROL LAWS :**

##### **United States TSCA Inventory**

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

##### **Australia. Industrial Chemical (Notification and Assessment) Act**

All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

##### **Canadian Domestic Substances List (DSL)**

The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

##### **Japan. ENCS - Existing and New Chemical Substances Inventory**

All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Existing and New Chemical Substances list (ENCS).

##### **Korea. Korean Existing Chemicals Inventory (KECI)**

All substances in this product comply with the Chemical Control Act (CCA) and are listed on the Existing Chemicals List (ECL)

##### **Philippines Inventory of Chemicals and Chemical Substances (PICCS)**

All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

##### **China Inventory of Existing Chemical Substances**

All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on or exempt from the Inventory of Existing Chemical Substances China (IECSC).

##### **New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand**

All substances in this product comply with the Hazardous Substances and New Organisms (HSNO) Act 1996, and are listed on or are exempt from the New Zealand Inventory of Chemicals.

##### **Taiwan Chemical Substance Inventory**

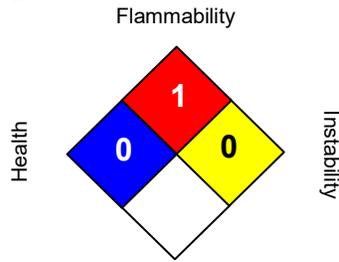
All substances in this product comply with the Taiwan Existing Chemical Substances Inventory (ECSI).

#### **Section: 16. OTHER INFORMATION**

# SAFETY DATA SHEET

## PERMATREAT™ PC-191T

### NFPA:



### HMIS III:

<b>HEALTH</b>	<b>0</b>
<b>FLAMMABILITY</b>	<b>1</b>
<b>PHYSICAL HAZARD</b>	<b>0</b>

0 = not significant, 1 = Slight,  
2 = Moderate, 3 = High  
4 = Extreme, \* = Chronic

Revision Date : 03/19/2018  
Version Number : 1.2  
Prepared By : Regulatory Affairs

REVISED INFORMATION: Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. For additional copies of an SDS visit [www.nalco.com](http://www.nalco.com) and request access.



245 Freight St Waterbury, CT 06702

## SAFETY DATA SHEET

**Product name** OCEANIC HW 443R

**Code** 174832

### Section 1. Identification

**Product name** : OCEANIC HW 443R

#### Relevant identified uses of the substance or mixture and uses advised against

##### Identified uses

Industrial use only.

##### Uses advised against

Not applicable.

##### Reason

**Supplier's details** : MacDermid  
245 Freight St  
Waterbury, CT 06702

**Emergency telephone number (with hours of operation)** : Chemtrec (1-800-424-9300) 24 Hours

### Section 2. Hazards identification

**OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture** : ACUTE TOXICITY (oral) - Category 4  
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A  
CARCINOGENICITY - Category 2  
Percentage of the mixture consisting of ingredient(s) of unknown toxicity: 5%

#### GHS label elements

##### Hazard pictograms



**Signal word** : Warning

**Hazard statements** : Harmful if swallowed.  
Causes serious eye irritation.  
Suspected of causing cancer.

#### Precautionary statements

**Prevention** : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Wear eye or face protection. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

## Section 2. Hazards identification

**Response** : IF exposed or concerned: Get medical attention. IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

**Storage** : Store locked up.

**Disposal** : Dispose of contents and container in accordance with all local, regional, national and international regulations.

**Hazards not otherwise classified** : None known.

## Section 3. Composition/information on ingredients

Hazardous ingredients	%	CAS number
ethylene glycol	35 - 45	107-21-1
arylsulfonamidocarboxylic acid	3 - 7	proprietary
diethanolamine	0.1 - 0.3	111-42-2

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

Occupational exposure limits, if available, are listed in Section 8.

## Section 4. First aid measures

### Description of necessary first aid measures

- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

### Most important symptoms/effects, acute and delayed

#### Potential acute health effects

- Eye contact** : Causes serious eye irritation.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : No known significant effects or critical hazards.
- Ingestion** : Harmful if swallowed. Irritating to mouth, throat and stomach.

#### Over-exposure signs/symptoms

## Section 4. First aid measures

- Eye contact** : Adverse symptoms may include the following:  
pain or irritation  
watering  
redness
- Inhalation** : No specific data.
- Skin contact** : No specific data.
- Ingestion** : No specific data.

### Indication of immediate medical attention and special treatment needed, if necessary

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

## Section 5. Fire-fighting measures

### Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

**Specific hazards arising from the chemical** : In a fire or if heated, a pressure increase will occur and the container may burst.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide

**Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

**Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## Section 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

**Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

### Methods and materials for containment and cleaning up

- Small spill** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

## Section 6. Accidental release measures

- Large spill** : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

## Section 7. Handling and storage

### Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

## Section 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

Ingredient name	Exposure limits
ethylene glycol	<b>OSHA PEL 1989 (United States, 3/1989).</b> CEIL: 50 ppm CEIL: 125 mg/m <sup>3</sup>
diethanolamine	<b>ACGIH TLV (United States, 6/2013).</b> C: 100 mg/m <sup>3</sup> Form: Aerosol <b>OSHA PEL 1989 (United States, 3/1989).</b> TWA: 3 ppm 8 hours. TWA: 15 mg/m <sup>3</sup> 8 hours. <b>NIOSH REL (United States, 10/2013).</b> TWA: 3 ppm 10 hours. TWA: 15 mg/m <sup>3</sup> 10 hours. <b>ACGIH TLV (United States, 6/2013).</b> <b>Absorbed through skin.</b> TWA: 1 mg/m <sup>3</sup> 8 hours. Form: Inhalable fraction and vapor

- Appropriate engineering controls** : If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

## Section 8. Exposure controls/personal protection

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

### Individual protection measures

**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

### Skin protection

**Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

### Appearance

**Physical state** : Liquid.

**Color** : Pink

**Odor** : Amine-like.

**Odor threshold** : Not available.

**pH** : 9.6

**Melting point** : Not available.

**Boiling point** : Not available.

**Flash point** : Not available.

**Evaporation rate** : Not available.

**Flammability (solid, gas)** : Not available.

**Lower and upper explosive (flammable) limits** : Not available.

**Vapor pressure** : Not available.

**Vapor density** : Not available.

**Relative density** : 1.071

**Solubility** : Not available.

**Solubility in water** : Soluble

**Partition coefficient: n-octanol/water** : Not available.

## Section 9. Physical and chemical properties

- Auto-ignition temperature** : Not available.  
**Decomposition temperature** : Not available.  
**Viscosity** : Not available.

## Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
- Conditions to avoid** : No specific data.
- Incompatible materials** : Oxidizers
- Hazardous decomposition products** : Thermal decomposition may yield carbon monoxide and/or carbon dioxide.

## Section 11. Toxicological information

### Information on toxicological effects

#### Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
ethylene glycol	LD50 Oral	Rat	4700 mg/kg	-

#### Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
ethylene glycol	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Eyes - Mild irritant	Rabbit	-	1 hours 100 milligrams	-
	Eyes - Moderate irritant	Rabbit	-	6 hours 1440 milligrams	-
diethanolamine	Skin - Mild irritant	Rabbit	-	555 milligrams	-
	Eyes - Severe irritant	Rabbit	-	24 hours 750 Micrograms	-
	Eyes - Severe irritant	Rabbit	-	5500 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	50 milligrams	-

#### Sensitization

Not available.

#### Mutagenicity

Not available.

#### Carcinogenicity

Not available.

#### Classification

## Section 11. Toxicological information

Product/ingredient name	OSHA	IARC	NTP
diethanolamine	-	2B	-

### Reproductive toxicity

Not available.

### Teratogenicity

Not available.

### Specific target organ toxicity (single exposure)

Not available.

### Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
diethanolamine	Category 2	Not determined	Not determined

### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

- Eye contact** : Causes serious eye irritation.  
**Inhalation** : No known significant effects or critical hazards.  
**Skin contact** : No known significant effects or critical hazards.  
**Ingestion** : Harmful if swallowed. Irritating to mouth, throat and stomach.

### Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:  
 pain or irritation  
 watering  
 redness  
**Inhalation** : No specific data.  
**Skin contact** : No specific data.  
**Ingestion** : No specific data.

### Delayed and immediate effects and also chronic effects from short and long term exposure

#### Short term exposure

- Potential immediate effects** : Not available.  
**Potential delayed effects** : Not available.

#### Long term exposure

- Potential immediate effects** : Not available.  
**Potential delayed effects** : Not available.

### Potential chronic health effects

Not available.

- General** : No known significant effects or critical hazards.  
**Carcinogenicity** : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.  
**Mutagenicity** : No known significant effects or critical hazards.  
**Teratogenicity** : No known significant effects or critical hazards.

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## Section 11. Toxicological information

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : No known significant effects or critical hazards.

### Numerical measures of toxicity

#### Acute toxicity estimates

Route	ATE value
Oral	1250 mg/kg

## Section 12. Ecological information

### Toxicity

Product/ingredient name	Result	Species	Exposure
ethylene glycol	Acute LC50 6900000 µg/l Fresh water	Crustaceans - Ceriodaphnia dubia - Neonate	48 hours
	Acute LC50 41000000 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
diethanolamine	Acute LC50 8050000 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Acute EC50 12 mg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Acute LC50 28800 µg/l Fresh water	Crustaceans - Ceriodaphnia dubia - Neonate	48 hours
	Acute LC50 2150 µg/l Fresh water Acute LC50 100 mg/l Fresh water	Daphnia - Daphnia pulex Fish - Pimephales promelas - Juvenile (Fledgling, Hatchling, Weanling)	48 hours 96 hours

### Persistence and degradability

Not available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
ethylene glycol	-1.36	-	low
diethanolamine	-1.43	-	low

### Mobility in soil

**Soil/water partition coefficient (K<sub>oc</sub>)** : Not available.

**Other adverse effects** : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

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## Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	UN3082	Not regulated.	Not regulated.
UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. CONTAINS ETHYLENE GLYCOL	ORGANIC ADDITIVE	ORGANIC ADDITIVE
Transport hazard class(es)	9 	-	-
Packing group	III	-	-
Environmental hazards	Yes.	No.	No.
Additional information	Reportable quantity 1396 gal Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.	-	

**Special precautions for user :** **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

## Section 15. Regulatory information

**U.S. Federal regulations :** **United States inventory (TSCA 8b):** All components are listed or exempted.

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) :** Listed

**Clean Air Act Section 602 Class I Substances :** Not listed

**Clean Air Act Section 602 Class II Substances :** Not listed

**DEA List I Chemicals (Precursor Chemicals) :** Not listed

**DEA List II Chemicals (Essential Chemicals) :** Not listed

### SARA 302/304

#### Composition/information on ingredients

No products were found.

**SARA 304 RQ :** Not applicable.

### SARA 311/312

**Classification :** Immediate (acute) health hazard  
Delayed (chronic) health hazard

## Section 15. Regulatory information

### Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
ethylene glycol	35 - 45	No.	No.	No.	Yes.	No.
diethanolamine	0.1 - 0.3	No.	No.	No.	Yes.	Yes.

### SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	ethylene glycol	107-21-1	35 - 45
Supplier notification	ethylene glycol	107-21-1	35 - 45

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

### State regulations

- Massachusetts** : The following components are listed: ETHYLENE GLYCOL
- New York** : The following components are listed: Ethylene glycol; Diethanolamine
- New Jersey** : The following components are listed: ETHYLENE GLYCOL; 1,2-ETHANEDIOL; DIETHANOLAMINE; ETHANOL, 2,2'-IMINOBI-
- Pennsylvania** : The following components are listed: 1,2-ETHANEDIOL; ETHANOL, 2,2'-IMINOBI-

### California Prop. 65

**WARNING:** This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
diethanolamine	Yes.	No.	No.	No.

### International regulations

#### Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

#### Montreal Protocol (Annexes A, B, C, E)

Not listed.

#### Stockholm Convention on Persistent Organic Pollutants

Not listed.

#### Rotterdam Convention on Prior Inform Consent (PIC)

Not listed.

#### UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

## Section 16. Other information

### History

- Date of printing** : 7/17/2015.
- Date of issue/Date of revision** : 7/17/2015.

## Section 16. Other information

**Key to abbreviations** : ATE = Acute Toxicity Estimate  
BCF = Bioconcentration Factor  
GHS = Globally Harmonized System of Classification and Labelling of Chemicals  
IATA = International Air Transport Association  
IMDG = International Maritime Dangerous Goods  
LogPow = logarithm of the octanol/water partition coefficient  
UN = United Nations

✔ Indicates information that has changed from previously issued version.

### Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

**Safety Data Sheets:** Crude Oil Sweet; Deepclean

**Waste Stream:** Completion Fluids/Contaminated Brine

**Waste Sheet Profile Number:** 20140506-021

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## SAFETY DATA SHEET

### SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

#### PRODUCT

**Product Name:** CRUDE OIL SWEET  
**Product Description:** Petroleum Crude Oil  
**Product Code:** 949094-00  
**Intended Use:** Crude oil

#### COMPANY IDENTIFICATION

**Supplier:** U.S. Production  
22777 Springwoods Village Parkway  
Spring, TX 77389 USA

**24 Hour Health Emergency  
ExxonMobil Transportation No.** 609-737-4411  
800-424-9300 or 703-527-3887 CHEMTREC

### SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

#### CLASSIFICATION:

Flammable liquid: Category 2.  
Eye irritation: Category 2A. Carcinogen: Category 1B. Specific target organ toxicant (central nervous system):  
Category 3. Specific target organ toxicant (repeated exposure): Category 2. Aspiration toxicant: Category 1.

#### LABEL:

##### Pictogram:



**Signal Word:** Danger

#### Hazard Statements:

H225: Highly flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H319: Causes serious eye irritation. H336: May cause drowsiness or dizziness. H350: May cause cancer. H373: May cause

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damage to organs through prolonged or repeated exposure. Blood, Liver, Spleen, Thymus

### Precautionary Statements:

P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P260: Do not breathe mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection. P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P308 + P313: IF exposed or concerned: Get medical advice/ attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P337 + P313: If eye irritation persists: Get medical advice/attention. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish. P391: Collect spillage. P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up. P501: Dispose of contents and container in accordance with local regulations.

**Contains:** PETROLEUM CRUDE OIL

### Other hazard information:

**HAZARD NOT OTHERWISE CLASSIFIED (HNOC):** None as defined under 29 CFR 1910.1200.

### PHYSICAL / CHEMICAL HAZARDS

Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

### HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. Hydrogen sulfide, a highly toxic gas, may be present. Signs and symptoms of overexposure to hydrogen sulfide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odor does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. Repeated exposure may cause skin dryness or cracking. May be irritating to nose, throat, and lungs. May cause central nervous system depression. Exposure to benzene is associated with cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders (see Section 11).

### ENVIRONMENTAL HAZARDS

Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

<b>NFPA Hazard ID:</b>	Health: 2	Flammability: 3	Reactivity: 0
<b>HMIS Hazard ID:</b>	Health: 2*	Flammability: 3	Reactivity: 0

**NOTE:** This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary

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from person to person.

<b>SECTION 3</b>	<b>COMPOSITION / INFORMATION ON INGREDIENTS</b>
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This material is defined as a complex substance.

**Hazardous Substance(s) or Complex Substance(s) required for disclosure**

Name	CAS#	Concentration*	GHS Hazard Codes
PETROLEUM CRUDE OIL	8002-05-9	100%	H225, H304, H336, H350(1B), H319(2A), H373, H401, H411

**Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure**

Name	CAS#	Concentration*	GHS Hazard Codes
BENZENE	71-43-2	1 - 5%	H225, H303, H304, H340(1B), H350(1A), H315, H319(2A), H372, H401
CYCLOHEXANE	110-82-7	1 - 5%	H225, H304, H336, H315, H400(M factor 1), H410(M factor 1)
N-HEXANE	110-54-3	1 - 5%	H225, H304, H336, H361(F), H315, H373, H401, H411
NAPHTHALENE	91-20-3	1 - 5%	H228(2), H302, H351, H400(M factor 1), H410(M factor 1)
TOLUENE	108-88-3	1 - 5%	H225, H304, H336, H361(D), H315, H373, H401, H412
XYLENES	1330-20-7	1 - 5%	H226, H303, H304, H312, H332, H335, H315, H320(2B), H373, H401, H412

\* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: Hydrogen sulfide (H<sub>2</sub>S) may be present in the material in trace quantities (by weight) and, when present, may accumulate to toxic or flammable concentrations in enclosed spaces such as tanks or tanker/railcar headspaces.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

<b>SECTION 4</b>	<b>FIRST AID MEASURES</b>
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**INHALATION**

Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

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## SKIN CONTACT

Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury. For hot product: Immediately immerse in or flush affected area with large amounts of cold water to dissipate heat. Cover with clean cotton sheeting or gauze and get prompt medical attention.

## EYE CONTACT

Flush thoroughly with water for at least 15 minutes. Get medical assistance.

## INGESTION

Seek immediate medical attention. Do not induce vomiting.

## NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately. This material, or a component, may be associated with cardiac sensitization following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

## SECTION 5 FIRE FIGHTING MEASURES

### EXTINGUISHING MEDIA

**Appropriate Extinguishing Media:** Use water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish flames.

**Inappropriate Extinguishing Media:** Straight Streams of Water

### FIRE FIGHTING

**Fire Fighting Instructions:** Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

**Unusual Fire Hazards:** Highly flammable. Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger. Exposure to fire can generate toxic fumes. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

**Hazardous Combustion Products:** Hydrogen sulfide, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

### FLAMMABILITY PROPERTIES

**Flash Point [Method]:** <21°C (70°F) [ASTM D-92]

**Flammable Limits (Approximate volume % in air):** LEL: N/D UEL: N/D

**Autoignition Temperature:** N/D

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<b>SECTION 6</b>
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<b>ACCIDENTAL RELEASE MEASURES</b>
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### NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

### PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H<sub>2</sub>S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Chemical goggles are recommended if splashes or contact with eyes is possible. Work gloves that are resistant to aromatic hydrocarbons are recommended. If contact with hot product is possible or anticipated, gloves should be heat-resistant and thermally insulated. Note: gloves made of PVA are not water-resistant, and are not suitable for emergency use. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic and, if necessary, heat resistant and thermal insulated material is recommended.

### SPILL MANAGEMENT

**Land Spill:** Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

**Water Spill:** Stop leak if you can do it without risk. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where indicated in local oil spill contingency plans.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

### ENVIRONMENTAL PRECAUTIONS

Use booms as a barrier to protect shorelines. Use containment booms when the ambient temperature is below the flash point of the material. Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

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<b>SECTION 7</b>
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<b>HANDLING AND STORAGE</b>
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## HANDLING

Avoid all personal contact. Crude oils can contain trace levels of natural impurities including heavy metals, such as mercury, nickel or lead, as well as naturally occurring radioactive material. As the impurity content may concentrate during refining/processing, process operations, including equipment, materials and products should be evaluated to identify and manage any potential risks to health, safety or the environment or regulatory concerns.

Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapors may be evolved from heated or agitated material. Use only with adequate ventilation. Do not enter storage areas or confined spaces unless adequately ventilated. Harmful amounts of H<sub>2</sub>S may be present. Material may contain trace amounts of naturally occurring radioactive material (NORM), which will accumulate in process equipment and storage vessels. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

**Static Accumulator:** This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

## STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

## SECTION 8

## EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard		NOTE	Source
BENZENE		OSHA Action level	0.5 ppm	N/A	OSHA Sp.Reg.
BENZENE		STEL	5 ppm	N/A	OSHA Sp.Reg.
BENZENE		TWA	1 ppm	N/A	OSHA Sp.Reg.
BENZENE		STEL	1 ppm	N/A	ExxonMobil
BENZENE		TWA	0.5 ppm	N/A	ExxonMobil

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BENZENE		STEL	2.5 ppm		Skin	ACGIH
BENZENE		TWA	0.5 ppm		Skin	ACGIH
CYCLOHEXANE		TWA	1050 mg/m3	300 ppm	N/A	OSHA Z1
CYCLOHEXANE		TWA	100 ppm		N/A	ACGIH
N-HEXANE		TWA	1800 mg/m3	500 ppm	N/A	OSHA Z1
N-HEXANE		TWA	50 ppm		Skin	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH
PETROLEUM CRUDE OIL		TWA	2000 mg/m3	500 ppm	N/A	OSHA Z1
TOLUENE		Ceiling	300 ppm		N/A	OSHA Z2
TOLUENE		Maximum concentration	500 ppm		N/A	OSHA Z2
TOLUENE		TWA	200 ppm		N/A	OSHA Z2
TOLUENE		TWA	20 ppm		N/A	ACGIH
XYLENES		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
XYLENES		STEL	150 ppm		N/A	ACGIH
XYLENES		TWA	100 ppm		N/A	ACGIH
Hydrogen sulfide		Ceiling	20 ppm		N/A	OSHA Z2
Hydrogen sulfide		Maximum concentration	50 ppm		N/A	OSHA Z2
Hydrogen sulfide		STEL	14 mg/m3	10 ppm	N/A	ExxonMobil
Hydrogen sulfide		TWA	7 mg/m3	5 ppm	N/A	ExxonMobil
Hydrogen sulfide		STEL	5 ppm		N/A	ACGIH
Hydrogen sulfide		TWA	1 ppm		N/A	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

### Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
BENZENE	Creatinine in urine	End of shift	25 ug/g	S-Phenylmercapturic acid	ACGIH BELs (BEIs)
BENZENE	Creatinine in urine	End of shift	500 ug/g	t,t-Muconic acid	ACGIH BELs (BEIs)
N-HEXANE	Urine	End of shift	0.5 mg/l	2,5-Hexanedione, without hydrolysis	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)
TOLUENE	Blood	Prior to last shift of work wk	0.02 mg/l	Toluene	ACGIH BELs (BEIs)
TOLUENE	Creatinine in urine	End of shift	0.3 mg/g	o-Cresol, with hydrolysis	ACGIH BELs (BEIs)

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TOLUENE	Urine	End of shift	0.03 mg/l	Toluene	ACGIH BELs (BEIs)
XYLENES	Creatinine in urine	End of shift	1.5 g/g	Methylhippuric acids	ACGIH BELs (BEIs)

## ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

## PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

**Respiratory Protection:** If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Positive-pressure, air-supplied respirator in areas where H<sub>2</sub>S vapors may accumulate is recommended.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

**Hand Protection:** Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves.

**Eye Protection:** Chemical goggles are recommended.

**Skin and Body Protection:** Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

**Specific Hygiene Measures:** Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

## ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit

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emissions.

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

**Note:** Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

### GENERAL INFORMATION

**Physical State:** Liquid  
**Color:** Black  
**Odor:** Petroleum/Solvent  
**Odor Threshold:** N/D

### IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

**Relative Density (at 15 °C):** 0.661 - 1.013  
**Flammability (Solid, Gas):** N/A  
**Flash Point [Method]:** <21°C (70°F) [ASTM D-92]  
**Flammable Limits (Approximate volume % in air):** LEL: N/D UEL: N/D  
**Autoignition Temperature:** N/D  
**Boiling Point / Range:** > 35°C (95°F)  
**Decomposition Temperature:** N/D  
**Vapor Density (Air = 1):** N/D  
**Vapor Pressure:** 0 kPa (0 mm Hg) at 20 °C - 106.4 kPa (800 mm Hg) at 20 °C  
**Evaporation Rate (n-butyl acetate = 1):** N/D  
**pH:** N/A  
**Log Pow (n-Octanol/Water Partition Coefficient):** N/D  
**Solubility in Water:** Negligible  
**Viscosity:** >0.42 cSt (0.42 mm<sup>2</sup>/sec) at 40 °C  
**Oxidizing Properties:** See Hazards Identification Section.

### OTHER INFORMATION

**Freezing Point:** N/D  
**Melting Point:** N/A  
**Pour Point:** -73°C (-99°F) - 48°C (118°F)

## SECTION 10 STABILITY AND REACTIVITY

**REACTIVITY:** See sub-sections below.

**STABILITY:** Material is stable under normal conditions.

**CONDITIONS TO AVOID:** Avoid heat, sparks, open flames and other ignition sources.

**MATERIALS TO AVOID:** Strong oxidizers

**HAZARDOUS DECOMPOSITION PRODUCTS:** Material does not decompose at ambient temperatures.

**POSSIBILITY OF HAZARDOUS REACTIONS:** Hazardous polymerization will not occur.

## SECTION 11 TOXICOLOGICAL INFORMATION

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## INFORMATION ON TOXICOLOGICAL EFFECTS

<b>Hazard Class</b>	<b>Conclusion / Remarks</b>
<b>Inhalation</b>	
Acute Toxicity: No end point data for material.	Not determined.
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
<b>Ingestion</b>	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
<b>Skin</b>	
Acute Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 402
Skin Corrosion/Irritation: Data available.	May dry the skin leading to discomfort and dermatitis. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
<b>Eye</b>	
Serious Eye Damage/Irritation: Data available.	Irritating and will injure eye tissue. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
<b>Sensitization</b>	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
<b>Aspiration:</b> Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
<b>Germ Cell Mutagenicity:</b> Data available.	Not expected to be a germ cell mutagen. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 474 479
<b>Carcinogenicity:</b> Data available.	Caused cancer in laboratory animals. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
<b>Reproductive Toxicity:</b> Data available.	Not expected to be a reproductive toxicant. Based on test data for structurally similar materials. Test method unavailable.
<b>Lactation:</b> No end point data for material.	Not expected to cause harm to breast-fed children.
<b>Specific Target Organ Toxicity (STOT)</b>	
Single Exposure: Data available.	May cause drowsiness or dizziness. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401 402
Repeated Exposure: Data available.	Concentrated, prolonged or deliberate exposure may cause organ damage. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 411

## TOXICITY FOR SUBSTANCES

<b>NAME</b>	<b>ACUTE TOXICITY</b>
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

## OTHER INFORMATION

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**For the product itself:**

Target Organs Repeated Exposure: Blood, Liver, Spleen, Thymus

Vapor/aerosol concentrations above recommended exposure levels are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness and other central nervous system effects including death.

May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion and blurred vision) and/or damage.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Exposure to this material, or one of its components, in situations where there is the potential for high levels, such as in confined spaces or with abuse, may result in abnormal heart rhythm (arrhythmia). High-level exposure to hydrocarbons (above occupational exposure limits) may initiate arrhythmia in a worker that is undergoing stress or is taking a heart-stimulating substance such as epinephrine, a nasal decongestant, or an asthma or cardiovascular drug.

Crude oil: Contains polycyclic aromatic compounds (PACs). Prolonged and / or repeated exposure by skin or inhalation of certain PACs may cause cancer of the skin, lung, and of other sites of the body. In animal studies, some crudes produced skin tumors in mice, while other crudes produced no tumors. Developmental studies of crude oil in lab animals showed reduced fetal weight and increased fetal resorptions at maternally toxic levels. Repeated dermal exposure to crude oils in rats resulted in toxicity to the blood, liver, thymus, and bone marrow.

**Contains:**

**BENZENE:** Caused cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders in human studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus and cancer in laboratory animal studies.

**HYDROGEN SULFIDE :** Chronic health effects due to repeated exposures to low levels of H<sub>2</sub>S have not been established. High level (700 ppm) acute exposure can result in sudden death. High concentrations will lead to cardiopulmonary arrest due to nervous system toxicity and pulmonary edema. Lower levels (150 ppm) may overwhelm sense of smell, eliminating warning of exposure. Symptoms of overexposure to H<sub>2</sub>S include headache, fatigue, insomnia, irritability, and gastrointestinal problems. Repeated exposures to approximately 25 ppm will irritate mucous membranes and the respiratory system and have been implicated in some eye damage.

**NAPHTHALENE:** Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

**N-HEXANE:** Prolonged and/or repeated exposures to n-Hexane can cause progressive and potentially irreversible damage to the peripheral nervous system (e.g. fingers, feet, arms, legs, etc.). Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system. n-Hexane has been shown to cause testicular damage at high doses in male rats. The relevance of this effect for humans is unknown.

**TOLUENE :** Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects.

**ETHYLBENZENE:** Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
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BENZENE	71-43-2	1, 3, 6
ETHYL BENZENE	100-41-4	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC

2 = NTP SUS

3 = IARC 1

4 = IARC 2A

5 = IARC 2B

6 = OSHA CARC

## SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

### ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

### MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

### PERSISTENCE AND DEGRADABILITY

#### Biodegradation:

Low molecular wt. component -- Expected to be inherently biodegradable

High molecular wt. component -- Expected to biodegrade slowly.

#### Photolysis:

More water soluble component -- Expected to degrade at a moderate rate in water when exposed to sunlight.

#### Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

### BIOACCUMULATION POTENTIAL

Components -- Has the potential to bioaccumulate.

## ECOLOGICAL DATA

### Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	48 hour(s)	Invertebrate	EC50 10 - 100 mg/l: data for similar materials

## SECTION 13 DISPOSAL CONSIDERATIONS

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Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

## DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

## REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY. TCLP (BENZENE)

**Empty Container Warning** Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

## SECTION 14

## TRANSPORT INFORMATION

### LAND (DOT)

**Proper Shipping Name:** PETROLEUM CRUDE OIL

**Hazard Class & Division:** 3

**ID Number:** 1267

**Packing Group:** II

**Marine Pollutant:** No

**ERG Number:** 128

**Label(s):** 3

**Transport Document Name:** UN1267, PETROLEUM CRUDE OIL, 3, PG II

### LAND (TDG)

**Proper Shipping Name:** PETROLEUM CRUDE OIL

**Hazard Class & Division:** 3

**UN Number:** 1267

**Packing Group:** II

**Special Provisions:** 92,106,150

Footnote: Marine Pollutant designation is applicable only if shipped over water.

### SEA (IMDG)

**Proper Shipping Name:** PETROLEUM CRUDE OIL

**Hazard Class & Division:** 3

**EMS Number:** F-E, S-E

**UN Number:** 1267

**Packing Group:** II

**Marine Pollutant:** Yes

**Label(s):** 3

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**Transport Document Name:** UN1267, PETROLEUM CRUDE OIL, 3, PG II, (21°C c.c.), MARINE POLLUTANT

**AIR (IATA)**

**Proper Shipping Name:** PETROLEUM CRUDE OIL

**Hazard Class & Division:** 3

**UN Number:** 1267

**Packing Group:** II

**Label(s) / Mark(s):** 3

**Transport Document Name:** UN1267, PETROLEUM CRUDE OIL, 3, PG II

<b>SECTION 15</b>	<b>REGULATORY INFORMATION</b>
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**OSHA HAZARD COMMUNICATION STANDARD:** This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

**Listed or exempt from listing/notification on the following chemical inventories:** AICS, DSL, ENCS, IECSC, KECI, PICCS, TCSI, TSCA

**SARA 302:** No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

**CERCLA:** This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

**SARA (311/312) REPORTABLE GHS HAZARD CLASSES:** Aspiration Hazard, Carcinogenicity, Flammable (gases, aerosols, liquids, or solids), Serious eye damage or eye irritation, Specific Target Organ toxicity (single or repeated exposure)

**SARA (313) TOXIC RELEASE INVENTORY:**

Chemical Name	CAS Number	Typical Value
BENZENE	71-43-2	1 - 5%
CYCLOHEXANE	110-82-7	1 - 5%
ETHYL BENZENE	100-41-4	0.1 - 1%
N-HEXANE	110-54-3	1 - 5%
NAPHTHALENE	91-20-3	1 - 5%
POLYNUCLEAR AROMATIC HYDROCARBONS		> 0.1%
TOLUENE	108-88-3	1 - 5%
XYLENES	1330-20-7	1 - 5%

The following ingredients are cited on the lists below:

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Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 2, 4, 10, 11, 13, 15, 16, 17, 18, 19
CYCLOHEXANE	110-82-7	1, 4, 13, 16, 17, 18, 19
ETHYL BENZENE	100-41-4	1, 4, 10, 17, 19
N-HEXANE	110-54-3	1, 4, 13, 16, 17, 18, 19
NAPHTHALENE	91-20-3	1, 4, 10, 13, 16, 17, 18, 19
PETROLEUM CRUDE OIL	8002-05-9	4, 13, 16, 17, 18
POLYNUCLEAR AROMATIC HYDROCARBONS		18
TOLUENE	108-88-3	1, 4, 11, 13, 15, 16, 17, 18, 19
XYLENES	1330-20-7	1, 4, 13, 15, 16, 17, 18, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

<b>SECTION 16</b>	<b>OTHER INFORMATION</b>
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**WARNING:** Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights.

N/D = Not determined, N/A = Not applicable

**KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):**

- H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
- H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
- H302: Harmful if swallowed; Acute Tox Oral, Cat 4
- H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
- H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
- H312: Harmful in contact with skin; Acute Tox Dermal, Cat 4
- H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
- H319(2A): Causes serious eye irritation; Serious Eye Damage/Irr, Cat 2A
- H320(2B): Causes eye irritation; Serious Eye Damage/Irr, Cat 2B
- H332: Harmful if inhaled; Acute Tox Inh, Cat 4
- H335: May cause respiratory irritation; Target Organ Single, Resp Irr
- H336: May cause drowsiness or dizziness; Target Organ Single, Narcotic
- H340(1B): May cause genetic defects; Germ Cell Mutagenicity, Cat 1B
- H350(1A): May cause cancer; Carcinogenicity, Cat 1A
- H350(1B): May cause cancer; Carcinogenicity, Cat 1B
- H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
- H361(D): Suspected of damaging the unborn child; Repro Tox, Cat 2 (Develop)
- H361(F): Suspected of damaging fertility; Repro Tox, Cat 2 (Fertility)
- H372: Causes damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 1

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H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2

H400: Very toxic to aquatic life; Acute Env Tox, Cat 1

H401: Toxic to aquatic life; Acute Env Tox, Cat 2

H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1

H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2

H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

**THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:**

Section 08: Biological Exposure Limits (ACG BEL) Table information was modified.

Section 16: Materials Covered information was modified.

**THIS MSDS COVERS THE FOLLOWING MATERIALS:** AASGARD BLEND CRUDE OIL | AASGARD CONDENSATE | AASGARD CRUDE OIL | ABO CRUDE OIL | ABU ATTIFEL CRUDE OIL | ACACIA CRUDE OIL | AKTOBINSK CRUDE OIL | ALBA CONDENSATE | ALBERTA CONDENSATE | ALBIAN PREMIUM SCO CRUDE OIL | ALEXANDRIA RESID CRUDE OIL | ALGERIAN CONDENSATE | ALGERIAN SR RESID ALGIERS CRUDE OIL | ALGERIAN SR RESID SKIKDA CRUDE OIL | ALVHEIM CRUDE OIL | AMENAM BLEND CRUDE OIL | AMNA CRUDE OIL | AMOKURA CRUDE OIL | ANACO WAX DILUENT CRUDE OIL | ANACO WAX EXPORT CRUDE OIL | ANASURIA CRUDE OIL | ANDROMEDE CRUDE OIL | ANGSU CRUDE OIL | ANGUS CRUDE OIL | ANTAN CRUDE OIL | ARABIAN SUPER LIGHT CRUDE OIL | ARDJUNA CRUDE OIL | ARDMORE CRUDE OIL | ARIMBI CRUDE OIL | ASTRAEA CRUDE OIL | AVALON CRUDE OIL | AZERI HEAVY CRUDE OIL | AZERI LIGHT CRUDE OIL | BADIN CRUDE OIL | BAKKEN SWEET C.O. | BALDER BLEND CRUDE OIL | BANFF CRUDE OIL | BANYU URIP CRUDE OIL | BAOBAB CRUDE OIL | BARBADOS CRUDE OIL | BARENTS SEA CRUDE OIL | BASKER CRUDE OIL | BATON ROUGE HLS CRUDE OIL | BATUQUE CRUDE OIL | BAYOU CHOCTAW SWEET CRUDE OIL | BAYU-UNDAN CONDENSATE | BEATRICE CRUDE OIL | BEBATIK CRUDE OIL | BELANAK CRUDE OIL | BELIZE CRUDE OIL | BELRIDGE HEAVY CRUDE OIL | BENCHAMAS CRUDE OIL | BIG HILL SWEET CRUDE OIL | BIJUPIRA-SALEMA CRUDE OIL | BIMA CRUDE OIL | BINTULU CONDENSATE | BINTULU CRUDE OIL | BOLIVIAN BLEND CRUDE OIL | BOLIVIAN RECON CRUDE OIL | BOLOBO BLEND CRUDE OIL | BOMBAY HIGH CRUDE OIL | BONGA CRUDE OIL | BONGKOT CONDENSATE (51) | BONGKOT CONDENSATE (53) | BONNY LIGHT CRUDE OIL | BOSI CRUDE OIL | BOTLECK CONDENSATE | BOZHONG CRUDE OIL | BRAEFOOT CONDENSATE | BRASS RIVER CRUDE OIL | BREGA CRUDE OIL | BRENT BLEND CRUDE OIL | BROOKLAND CRUDE OIL | BRUNEI CONDENSATE | BRYAN MOUND SWEET CRUDE OIL | BUCKLAND CRUDE OIL | BUFFALO CRUDE OIL | BURUN CRUDE OIL | CABINDA CRUDE OIL | CAKERWALA CONDENSATE | CALYPSO CRUDE OIL | CAMISEA CASHIRIARI CRUDE OIL | CANADON SECO CRUDE OIL | CANELA CRUDE OIL | CANO LIMON CRUDE OIL | CAOFEDIAN CRUDE OIL | CAPTAIN CRUDE OIL | CARMOPOLIS CRUDE OIL | CEIBA CRUDE OIL | CERES CRUDE OIL | CHAUNOY CRUDE OIL | CHECHNYA CRUDE OIL | CHELEKEN CRUDE OIL | CHINGUETTI CRUDE OIL | CLAIR CRUDE OIL | CLIFF HEAD CRUDE OIL | CLOCHES CRUDE OIL | CLYDE CRUDE OIL | CONGO COMPOSITE (Coco) CRUDE OIL | CPC BLEND CRUDE OIL | CRAVO CRUDE OIL | CRUDE OIL | CRUDE OIL (<0.002% H2S) | CRUDE OIL SWEET ("Sweet" applied by definition of Society of Petroleum Engineers for oils containing sulfur compounds < 1%) | CURLEW CRUDE OIL | DAI HUNG CRUDE OIL | DALIA CRUDE OIL | DAQING CRUDE OIL | DE RUYTER CRUDE OIL | DEN HELDER CONDENSATE | DIDON CRUDE OIL | DJENO BLEND CRUDE OIL | DOBA | DOMESTIC SWEET CRUDE | DORTYOL CRUDE OIL | DOUGLAS CRUDE OIL | DRAUGEN CRUDE OIL | DUMBARTON CRUDE OIL | DURU CRUDE OIL | DUTCH MIX CRUDE OIL | EA CRUDE OIL | EAST TEXAS SWEET CRUDE OIL | EAST ZEIT CRUDE OIL | EBOK CRUDE OIL | EBOME MARINE CRUDE OIL | EGINA CRUDE OIL | EKOFISK CRUDE OIL | EL SHARARA CRUDE OIL | EL WAFI CRUDE OIL | ELEPHANT CRUDE OIL | ELK HILLS CRUDE OIL | EMPIRE (HLS) CRUDE OIL | ENFIELD CRUDE OIL | ERHA CRUDE OIL | ES SIDER CRUDE OIL | ESCALANTE CRUDE OIL | ESPADARTE CRUDE OIL | ESPOIR CRUDE OIL | ETAME CRUDE OIL | ETTRICK CRUDE OIL | EZZAOUIA CRUDE OIL | F3 CONDENSATE | FEDERATED PIPELINE CRUDE OIL | FHR HYDROCRACKATE CRUDE OIL | FIFE CRUDE OIL | FIFE/ANGUS BLEND CRUDE OIL | FLOTTA MIX CRUDE OIL | FOINAVEN CRUDE OIL |

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FORCADOS CRUDE OIL | FORSETI CRUDE OIL | FORTIES BLEND CRUDE OIL | FULMAR MIX CRUDE OIL | GALEOTA MIX CRUDE OIL | GALVESTON 42 CRUDE OIL | GALVESTON 51 CRUDE OIL | GAMBA CRUDE OIL | GERAGAI CRUDE OIL | GIPPSLAND EXPORT CRUDE OIL | GIPPSLAND NEAT CRUDE OIL | GIRASSOL CRUDE OIL | GJOA CRUDE OIL | GLITNE CRUDE OIL | GOLDENEYE CRUDE OIL | GRAND ISLE PIPELINE MIX CRUDE OIL | GRANE CRUDE OIL | GREGORIO CRUDE OIL | GRYPHON BLEND CRUDE OIL | GUADUAS CRUDE OIL | GUAFITA CRUDE OIL | GULF COAST MIX CRUDE OIL | GULLFAKS A/B CRUDE OIL | GULLFAKS BLEND CRUDE OIL | GULLFAKS C CRUDE OIL | HANNOVER CRUDE OIL | HANZ CRUDE OIL | HANZE CRUDE OIL | HARDING CRUDE OIL | HEBRON-BEN NEVIS BLEND CRUDE OIL | HEIDRUN CRUDE OIL | HIBERNIA BLEND CRUDE OIL | HIDRA CRUDE OIL | HIGH ISLAND CRUDE OIL | HIGH POUR LIBYAN CRUDE OIL | HIGH POUR OFICINA CRUDE OIL | HOUGH CRUDE OIL | HT SHALE NAPHTHA CRUDE OIL | HUSKY SYNTHETIC BLEND CRUDE OIL | IKAN PARI CRUDE OIL | IMA CRUDE OIL | ISIS CRUDE OIL | JACKSON CRUDE OIL | JASMIM CRUDE OIL | JASMINE (KRAB) CRUDE OIL | JASMINE CRUDE OIL | JATIBARANG CRUDE OIL | JOHNSON BAYOU CRUDE OIL | JONES CREEK | JOTUN BLEND CRUDE OIL | JUNO CRUDE OIL | KAJI-SEMOGA CRUDE OIL | KAKAP CRUDE OIL | KALININGRAD CRUDE OIL | KARACHAGANAK CONDENSATE | KASHAGAN CRUDE OIL | KATAPA CRUDE OIL | KAZAKH CRUDE OIL | KENKIYAK CRUDE OIL | KHUFF CONDENSATE | KIAME CRUDE OIL | KIDURONG CRUDE OIL | KISSANJE BLEND CRUDE OIL | KITTIWAKE CRUDE OIL | KNK CRUDE OIL | KOLE BLEND CRUDE OIL | KOME A1/A2 CRUDE OIL | KOME LK CRUDE OIL | KOME YO/M1 CRUDE OIL | KRIBI CRUDE OIL | KRISTIN CRUDE OIL | KUITO CRUDE OIL | KUMKOL CRUDE OIL | KYLE CRUDE OIL | KYLE/CURLEW BLEND CRUDE OIL | KYZILORDA CRUDE OIL | LAN TAY CONDENSATE | LANGSA CRUDE OIL | LEADON CRUDE OIL | LENNOX CRUDE OIL | LIBYAN LSSR CRUDE OIL | LIGHT LOUISIANA SWEET CRUDE OIL | LION CRUDE OIL | LITHUANIAN CRUDE OIL | LIUHUA CRUDE OIL | LIVERPOOL BLEND CRUDE OIL | LIZA CRUDE OIL | LOKELE CRUDE OIL | LOWER VOLGA CRUDE OIL | LUCINA BLEND CRUDE OIL | LUFENG CRUDE OIL | MADURA CRUDE OIL | MAGAWISH CRUDE OIL | MAKAT CRUDE OIL | MALAMPAYA CONDENSATE | MANGARA CRUDE OIL | MANIS CRUDE OIL | MARIA INES CRUDE OIL | MARIMBA CRUDE OIL | MARLIM CRUDE OIL | MASA CRUDE OIL | MASILA CRUDE OIL | MAUI CONDENSATE | MAVACOLA CRUDE OIL | MAYNA CRUDE OIL | MEDANITOS CRUDE OIL | MELLITAH CONDENSATE | MESSLA CRUDE OIL | MIANDOUM CRUDE OIL | MIDLAND SWEET C.O. | MIKKEL CONDENSATE | MIRZAANI CRUDE OIL | MIXED BLEND SWEET | MIXED SWEET BLEND CRUDE OIL | MONDO CRUDE OIL | MONDOULI CRUDE OIL | MONTANA MIX CRUDE OIL | MOUDI CRUDE OIL | MUBAREK CRUDE OIL | MUBARRAS CRUDE OIL | MUDI BLEND CRUDE OIL | MUTINEER-EXETER CRUDE OIL | N'KOSSA BLEND CRUDE OIL | NANG NUAN CRUDE OIL | NANHAI LIGHT CRUDE OIL | NANHAI MEDIUM CRUDE OIL | NEMBA CRUDE OIL | NEW BREGA CONDENSATE | NEWGRADE SYNTHETIC BLEND CRUDE OIL | NFC CONDENSATE | NILE BLEND CRUDE OIL | NJORD CRUDE OIL | NORNE CRUDE OIL | NOVOSERGIEVSKAYA CRUDE OIL | NUEVO CRUDE OIL | NWS CONDENSATE | NYA CRUDE OIL | OB RIVER HEAVY CRUDE OIL | OB RIVER LIGHT CRUDE OIL | OBE CRUDE OIL | OFICINA CRUDE OIL | OFON CRUDE OIL | OKAREM CRUDE OIL | OKONO CRUDE OIL | OKWORI CRUDE OIL | OLOMBENDO C.O. | ONAKO LIGHT CRUDE OIL | ONTARIO SWEET CRUDE OIL | ORIBI CRUDE OIL | ORMEN LANGE CRUDE OIL | ORQUIDEA CRUDE OIL | OSEBERG BLEND CRUDE OIL | OSO CONDENSATE | PAGERUNGAN CRUDE OIL | PALANCA CRUDE OIL | PALANCA BLEND CRUDE OIL | PALAS CRUDE OIL | PALO BLANCO CRUDE OIL | PANYU CRUDE OIL | PARENTIS CRUDE OIL | PATTANI BLEND CRUDE OIL | PEMBINA CRUDE OIL | PENARA BLEND CRUDE OIL | PENG LAI CRUDE OIL | PENNINGTON CRUDE OIL | PERPETUA CRUDE OIL | PETROLE BRUT | PHET CRUDE OIL | PICT CRUDE OIL | PIERCE CRUDE OIL | PINE ISLAND CONDENSATE | PLUTAO CRUDE OIL | PURPE CONDENSATE | Q16 CONDENSATE | QARUN CRUDE OIL | QATAR RETURN CONDENSATE | QINHUANGDAO (QHD) CRUDE OIL | QUA IBOE (NIGERIAN LIGHT) CRUDE OIL | RABI LIGHT CRUDE OIL | RAINBOW CRUDE OIL | RAMBA CRUDE OIL | RANGELAND SOUR CRUDE OIL | RANGELAND SWEET CRUDE OIL | REMBOUE CRUDE OIL | RGN CRUDE OIL | RHEMOURA CRUDE OIL | RINCON CRUDE OIL | RINGHORNE CRUDE OIL | ROLLER CRUDE OIL | RONCADOR CRUDE OIL | ROSA CRUDE OIL | ROSS CRUDE OIL | ROSS/BLAKE CRUDE OIL | ROZEWIE CRUDE OIL | RUBY CRUDE OIL | SABLE CRUDE OIL | SABLE ISLAND

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CONDENSATE | SAHARAN BLEND ARZEW CRUDE OIL | SAHARAN BLEND BEJAIA (S) CRUDE OIL | SAHARAN BLEND BEJAIA (W) CRUDE OIL | SAHARAN BLEND SKIKDA CRUDE OIL | SAIGAK CRUDE OIL | SALADIN CRUDE OIL | SAMGORI CRUDE OIL | SAN JOAQUIN VALLEY LIGHT BLEND CRUDE OIL | SAN MARTIN CRUDE OIL | SAN SEBASTIAN CRUDE OIL | SANTA CRUZ CRUDE OIL | SARATOV CRUDE OIL | SARIR CRUDE OIL | SARKHOON CONDENSATE | SAXI CRUDE OIL | SAXI BLEND CRUDE OIL | SCHIEHALLION CRUDE OIL | SCOTIAN LIGHT BLEND CRUDE OIL | SCURLOCK LAROSE CRUDE OIL | SEDIGI CRUDE OIL | SEMBA CRUDE OIL | SHABWA CRUDE OIL | SHELL SYNTHETIC BLEND CRUDE OIL | SHENGLI CRUDE OIL | SIBERIAN LIGHT CRUDE OIL | SINCOR MEDIUM (10%) SCO CRUDE OIL | SINCOR SWEET SCO CRUDE OIL | SIRI CRUDE OIL | SIRTICA CRUDE OIL | SLEIPNER (West) CRUDE OIL | SLEIPNER CONDENSATE | SOUR LIGHT EDMONTON CRUDE OIL | SOUTH BLEND CRUDE OIL | SOUTH LOUISIANA INTERMEDIATE CRUDE OIL | SOUTH PARS CONDENSATE | SOUTHWEST LINE CRUDE OIL | SOYO CRUDE OIL | STAG CRUDE OIL | STATFJORD A CRUDE OIL | STATFJORD B CRUDE OIL | STATFJORD BLEND CRUDE OIL | STATFJORD C CRUDE OIL | STYBARROW CRUDE OIL | SU TU DEN CRUDE OIL | SUIZHONG CRUDE OIL | SUKOWATI CRUDE OIL | SUN MP 5 CRUDE OIL | SUNCOR (OSA) SCO CRUDE OIL | SUNCOR (OSN) SCO CRUDE OIL | SWEET CRUDE OIL | SYD ARNE CRUDE OIL | SYRIAN LIGHT CRUDE OIL | TAZERKA CRUDE OIL | TCHATAMBA MARINE CRUDE OIL | TENGIZ CRUDE OIL | TERENGGANU CONDENSATE | TERRA NOVA CRUDE OIL | THAMAMA CONDENSATE | THAYYEM CRUDE OIL | THUNDER HORSE CRUDE OIL | TIERRA DEL FUEGO CRUDE OIL | TRINTOPEC CRUDE OIL | TRITON BLEND CRUDE OIL | TROLL BLEND CRUDE OIL | TULIPA CRUDE OIL | TYRIHANS NORTH CRUDE OIL | TYRIHANS SOUTH CRUDE OIL | UDANG CRUDE OIL | UJUNG PANGKAH WEST CRUDE OIL | UKPOKITI CRUDE OIL | URALS BELOKAMENKA CRUDE OIL | URALS VYSOTSK CRUDE OIL | USAN BLEND CRUDE OIL | USINSK CRUDE OIL | UWEINATE CONDENSATE | VALENTINE CRUDE OIL | VARANUS BLEND CRUDE OIL | VARG CRUDE OIL | VENICE CRUDE OIL | VITYAZ (Sakhalin 2) CRUDE OIL | Wafa BLEND (-w- Elephant) CRUDE OIL | WALIO CRUDE OIL | WEEKS ISLAND CRUDE OIL | WENCHANG CRUDE OIL | WESSEX CRUDE OIL | WEST HACKBERRY SWEET CRUDE OIL | WEST SENO CRUDE OIL | WEST TEXAS INTERMEDIATE CRUDE OIL | WESTERN DESERT BLEND CRUDE OIL | WHITE ROSE CRUDE OIL | WHITE SEA CRUDE OIL | WYTCH FARM CRUDE OIL | XIKOMBA CRUDE OIL | YETAGUN CONDENSATE | YOHO CRUDE OIL | YOMBO CRUDE OIL | ZAGORSKAYA CRUDE OIL | ZAIKINSKAYA CRUDE OIL | ZAIRE CRUDE OIL | ZARZAITINE CRUDE OIL | ZINIA CRUDE OIL | ZUEITINA CRUDE OIL | BRRF: Preflashed crude

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Internal Use Only

MHC: 1A, 0, 0, 2, 1, 1

PPEC: DVF

DGN: 2000339VUS (1014034)

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Product Name: CRUDE OIL SWEET  
Revision Date: 29 Oct 2019  
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Safety data sheet number MI13958  
Version 2  
Revision date 11/Mar/2015  
Supercedes date 04/Feb/2014



## Safety Data Sheet DEEPCLEAN†

Quantity restrictions apply! Not to be used in quantities of 1 tonne or more within the EEA.

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name DEEPCLEAN†  
Product code MI13958

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended use Completion fluid additive.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier identification  
M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424  
MISDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

##### Health hazards

Aspiration toxicity	Category 1
Acute oral toxicity	Category 4
Acute inhalation toxicity - dust/mist	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitisation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

## 2.2 Label Elements



### Signal word

DANGER

### Hazard statements

H302 - Harmful if swallowed  
H304 - May be fatal if swallowed and enters airways  
H315 - Causes skin irritation  
H317 - May cause an allergic skin reaction  
H318 - Causes serious eye damage  
H332 - Harmful if inhaled

### Precautionary Statements - EU (§28, 1272/2008)

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection  
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician  
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P310 - Immediately call a POISON CENTER or doctor/ physician  
P331 - Do NOT induce vomiting

### Supplementary precautionary statements

P261 - Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray  
P264 - Wash face, hands and any exposed skin thoroughly after handling  
P270 - Do not eat, drink or smoke when using this product  
P271 - Use only outdoors or in a well-ventilated area  
P272 - Contaminated work clothing should not be allowed out of the workplace  
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.  
P330 - Rinse mouth  
P333 + P313 - If skin irritation or rash occurs: Get medical advice/ attention  
P362 - Take off contaminated clothing and wash before re-use  
P501 - Dispose of contents/container in accordance with local regulations.

### Classification according to EU Directives 67/548/EEC or 1999/45/EC

### Indication of danger

Xn - Harmful  
Xi - Irritant

### R-code(s)

Xn;R20/22, R65, Xi;R38, R41, R43

### Contains

D-Glucopyranose, oligomeric, C8-10 glycosides

2-Butoxyethanol

Citrus Extract

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics

For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

### 2.3 Other data

Not classified as PBT/vPvB by current EU criteria

### Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.  
 HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

## 3. Composition/information on ingredients

### 3.1 Substances

Not Applicable

### 3.2 Mixtures

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
D-Glucopyranose, oligomeric, C8-10 glycosides	500-220-1	68515-73-1	30-60	Xi; R41	Eye Dam. 1(H318)	No data available
2-Butoxyethanol	203-905-0	111-76-2	10-30	Xn; R20/21/22 Xi; R36/38	Acute Tox. 4 (H302) Acute Tox. 4 (H312) Acute Tox. 4 (H332) Skin Irrit. 2 (H315) Eye Irrit. 2 (H319)	No data available
Citrus Extract		68647-72-3	10-30	F; R10 Xn; R65 Xi; R38, R43	Flam Liq.3(H226) Skin Irrit.2(H315) Skin Sens.1(H317) Asp Tox.1(H304)	No data available
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics		64742-47-8	10-30	Xn; R65	Asp. Tox. 1 (H304)	No data available

### Comments

Citrus extract can use either CAS# 8028-48-6 or 68647-72-3.

## 4. First aid measures

### 4.1 First Aid

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<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Do not induce vomiting without medical advice. If vomiting occurs spontaneously, minimize the risk of aspiration by properly positioning the affected person. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye contact</b>	Remove contact lenses. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

#### **4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Fire-fighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which shall not be used for safety reasons**

None known.

### **5.2 Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours.

### **5.3 Advice for firefighters**

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**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and materials for containment and cleaning up

**Methods for Containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustable material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and storage

### 7.1 Precautions for safe handling

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with:  
Heat, flames and sparks Strong oxidising agents Strong acids. Strong alkalies. Strong reducing agents.

**Storage class** Chemical storage.

**Packaging material** Use specially constructed containers only

**7.3 Specific end uses**

See also Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure limits** OEL for "Normal and branched chain alkanes, > C7: 1200 mg/m<sup>3</sup>  
 No biological limit allocated

Component	EU OEL - Third List	Austria	Australia	Denmark
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined	Not determined
2-Butoxyethanol	20 ppm TWA 98 mg/m <sup>3</sup> TWA 50 ppm STEL 246 mg/m <sup>3</sup> STEL Possibility of significant uptake through the skin	Not determined	skin notation 20 ppm TWA; 96.9 mg/m <sup>3</sup> TWA 50 ppm STEL; 242 mg/m <sup>3</sup> STEL	20 ppm TWA 98 mg/m <sup>3</sup> TWA Potential for cutaneous absorption
Citrus Extract	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	Not determined	Not determined	Not determined	Not determined

Component	Finland	France	Germany	Hungary
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined	Not determined
2-Butoxyethanol	Not determined	2 ppm 9.8 mg/m <sup>3</sup>	10 ppm MAK 49 mg/m <sup>3</sup> MAK	Not determined
Citrus Extract	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	Not determined	Not determined	Not determined	Not determined

Component	New Zealand	Italy	Netherlands	Norway
D-Glucopyranose, oligomeric, C8-10 glycosides	Not Determined	Not determined	Not determined	Not determined
2-Butoxyethanol	25 ppm TWA 121 mg/m <sup>3</sup> TWA Possibility of significant uptake through the skin	Not determined	100 mg/m <sup>3</sup>	10 ppm TWA 50 mg/m <sup>3</sup> TWA 20 ppm STEL 75 mg/m <sup>3</sup> STEL Skin
Citrus Extract	Not Determined	Not determined	Not determined	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	Not Determined	Not determined	Not determined	Not determined

Component	Poland	Portugal	Romania	Russia
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D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined	Not determined
2-Butoxyethanol	200 mg/m <sup>3</sup> STEL Skin 98 mg/m <sup>3</sup> TWA	20 ppm TWA	Not determined	5 mg/m <sup>3</sup> MAC
Citrus Extract	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	Not determined	Not determined	Not determined	Not determined

Component	Spain	Switzerland	Turkey	UK
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined	Not determined
2-Butoxyethanol	50 ppm VLA-EC 245 mg/m <sup>3</sup> VLA-EC Skin 20 ppm VLA-ED indicative limit value 98 mg/m <sup>3</sup> VLA-ED indicative limit value	20 ppm STEL 98 mg/m <sup>3</sup> STEL Skin 10 ppm MAK 49 mg/m <sup>3</sup> MAK	50 ppm STEL 246 mg/m <sup>3</sup> STEL Skin 20 ppm TWA 98 mg/m <sup>3</sup> TWA	50 ppm STEL 246 mg/m <sup>3</sup> STEL Skin 25 ppm TWA 123 mg/m <sup>3</sup> TWA
Citrus Extract	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	Not determined	Not determined	Not determined	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering measures to reduce exposure

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### Personal protective equipment

#### Eye protection

It is good practice to wear goggles when handling any chemical. Tightly fitting safety goggles.

#### Hand protection

Use protective gloves made of:., Nitrile, Neoprene, Be aware that liquid may penetrate the gloves. Frequent change is advisable.

#### Respiratory protection

No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Use respirator with organic vapor protection (A, brown).

#### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### Hygiene measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odour	Citrus
Colour	Yellow
Odor threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution		
Melting/freezing point		
Boiling point/range	No information available	
Flash Point	>61 °C	
Evaporation rate		
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability Limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.90 - 0.94 sg	@ 20°C.
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity		
Viscosity, dynamic	No information available	
Log Pow	Not determined	
Explosive properties	Not Applicable	
Oxidizing properties	None known.	

### 9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density VALUE	No information available

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Heat, flames and sparks.

**10.5 Incompatible materials**

No materials to be especially mentioned. Strong oxidising agents. Strong acids. Strong reducing agents. Strong alkalis.

**10.6 Hazardous decomposition products**

See also section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Harmful by inhalation.
<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	Causes skin irritation. May cause an allergic skin reaction. May be absorbed through the skin in harmful amounts.
<b>Ingestion</b>	Harmful if swallowed. May be fatal if swallowed and enters airways.
<b>Acute toxicity</b>	Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
D-Glucopyranose, oligomeric, C8-10 glycosides	No data available	No data available	No data available
2-Butoxyethanol	= 470 mg/kg ( Rat )	= 220 mg/kg ( Rabbit ) = 2270 mg/kg ( Rat )	= 2.21 mg/L ( Rat ) 4 h = 450 ppm ( Rat ) 4 h
Citrus Extract	No data available	No data available	No data available
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	> 5000 mg/kg ( Rat )	> 2000 mg/kg ( Rabbit )	> 5.2 mg/L ( Rat ) 4 h

**Sensitisation** May cause sensitization by skin contact.

<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Skin contact. Inhalation. Ingestion. Eye contact.
<b>Routes of entry</b>	Skin absorption. Inhalation. Ingestion.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.
<b>Aspiration hazard</b>	May be fatal if swallowed and enters airways.

**12. Ecological information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**  
 This product is not considered toxic to algae.

**Toxicity to fish**  
 This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
 This product is not considered toxic to invertebrates.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
D-Glucopyranose, oligomeric, C8-10 glycosides	No information available	No information available	No information available
2-Butoxyethanol	2950 mg/L LC50 (Lepomis macrochirus) = 96 h 1490 mg/L LC50 (Lepomis macrochirus) = 96 h	No information available	1000 mg/L EC50 (Daphnia magna) = 48 h 1698 - 1940 mg/L EC50 (Daphnia magna) = 24 h
Citrus Extract	No information available	No information available	No information available

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, <2% aromatics	2.2 mg/L LC50 (Lepomis macrochirus) = 96 h 45 mg/L LC50 (Pimephales promelas) = 96 h 2.4 mg/L LC50 (Oncorhynchus mykiss) = 96 h	No information available	4720 mg/L LC50 (Den-dronereides heteropoda) = 96 h
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**12.2 Persistence and degradability**

Product is biodegradable.

**12.3 Bioaccumulative potential**

The product contains potentially bioaccumulating substances.

**12.4 Mobility in soil**

**Mobility**

Dispersible in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**EWC waste disposal No.**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04 Waste Code: 7152 Organic waste without halogen.

## 14. Transport information

The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

### 14.1 UN number

Not regulated

### 14.2 Proper shipping name

Not regulated

### 14.3. Hazard class(es)

ADR/RID/ADN Hazard class Not regulated

IMDG Hazard class Not regulated

ICAO Hazard class/division Not regulated

### 14.4 Packing group

ADR/RID/ADN Packing Group Not regulated

IMDG Packing group Not regulated

ICAO Packing group Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not Applicable

### 14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Please contact MISDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

#### Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-Butoxyethanol  
Schedule 6

**New Zealand hazard classification** Corrosive

**HSNO approval no.** HSR002625

**Group number** N.O.S. (Toxic [6.1, 6.7], Corrosive) Group Standard 2006

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada, Domestic Substance List (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Does not Comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

Restricted for use in Europe until REACH assessed. Please contact REACH@miswaco.slb.com if intended for use in Europe.

#### 15.2 Chemical Safety Report

No information available

### 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	04/Feb/2014
<b>Revision date</b>	11/Mar/2015
<b>Version</b>	2
<b>The following sections have been revised</b>	2,, 8,, 11,, 16, There have been changes with regard to classification, Updated according to GHS/CLP.

**Text of R phrases mentioned in Section 3**

R10 - Flammable  
R38 - Irritating to skin  
R41 - Risk of serious damage to eyes  
R43 - May cause sensitization by skin contact  
R65 - Harmful: may cause lung damage if swallowed

R20/22 - Harmful by inhalation and if swallowed  
R36/38 - Irritating to eyes and skin

**Full text of H-Statements referred to under sections 2 and 3**

H302 - Harmful if swallowed  
H304 - May be fatal if swallowed and enters airways  
H315 - Causes skin irritation  
H317 - May cause an allergic skin reaction  
H318 - Causes serious eye damage  
H332 - Harmful if inhaled  
H226 - Flammable liquid and vapor  
H319 - Causes serious eye irritation

†A mark of M-I L.L.C.

**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

**Safety Data Sheets:** Fluorescent Bulbs

**Waste Stream:** Fluorescent Bulbs

**EPA Waste Profile Sheet Number:** 20140506-023



# SAFETY DATA SHEET (SDS)

## for: Fluorescent Bulbs

### Section 1. Identification

1.1. Company:

Damar Worldwide 4 LLC  
Telephone: (800) 238-9080  
805 N Carnation Dr  
Aurora, MO 65605

1.2. Product:

Compact Fluorescent Bulbs

### Section 2. Hazards Identification

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#### NOTE

Grinding, sanding and/or mechanical manipulation of this product may change and alter the hazards and information listed in all of the following sections in ways that can not be predicted.

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2.1. Hazard Classification: Inert, Article

2.2. OSHA Regulatory Status:

This product, when intact, is not known to be hazardous as defined by OSHA's Hazard Communication Standard, 29 CFR 1910.1200. This product is exempt from OSHA's Hazard Communication Standard requirements for an MSDS because it meets the definition of an "article". An article is a manufactured item: (1) which is formed to a specific shape or design during manufacture (2) which has end use function(s) dependent in whole or in part upon its shape or design during end use: and (3) which does not release, or otherwise result in exposure to, a hazardous chemical under normal conditions of use. Any product which meets the definition of an "article" is exempt from the requirements of the Standard.

2.3. Hazardous Ingredients

Ingredient	CAS Number	OSHA PEL mg/m <sup>3</sup>	ACGIH TLV	% By Weight
Glass	(65997-17-3)	15	10	<96.0%
Phosphor Powder (as nuisance dust)		15	10	<2.5%
Yttrium Oxide	(1314-36-9)	1	1	<0.5%
Barium Carbonate	(0513-77-9)	0.5	0.5	<0.1%
Manganese Carbonate	(598-62-9)	5	5	<0.1%
Tin	(7440-31-5)	0.1	0.1	<0.1%
Indium	(7440-74-6)	0.1		<0.07%
Bismuth	(7440-69-9)			<0.005%
Mercury	(7439-97-6)	0.1	0.025	~0.025%

- 2.4. The Phosphor Powder materials are ceramic phosphors. The ceramics are Barium Aluminate and Yttrium Oxide. The PEL and TLV are given where available for the base materials. There is no data for the ceramics as mixtures.
- 2.5. GHS Classification:
- 2.5.1. Acute toxicity oral: unknown; unlikely
  - 2.5.2. Acute toxicity dermal: unknown; unlikely
  - 2.5.3. Aspiration hazard: unknown; unlikely
- 2.6. Signal Word: Not Applicable
- 2.7. Hazard Statement:  
This article is essentially inert under most conditions including those most likely to be present in a fire or other emergency situation.
- 2.8. Pictograms: Not Applicable
- 2.9. Precautionary Statement:  
Call a POISON CENTER if you feel unwell.  
This product is an electrical device that when used in or along with appropriate equipment designed for those products and constructed for use with such products, has no special health or safety concerns.  
Additional information regarding applications or technical specifications for this product may be available at <http://www.damarww.com>.
- 2.10. Description of any hazards not otherwise classified:
- 2.10.1. Primary routes of particulate entry: Ingestion, Eye/Skin Contact.
  - 2.10.2. Skin Exposure:
    - 2.10.2.1. Minor laceration and/or abrasion may occur if product is broken, sharp objects pierce coating and then come into contact with skin. Alteration/damage to the product can result in exposure to additional unforeseen and unpredictable hazards including but not limited to electrical hazards..
    - 2.10.2.2. Refer to Sections 7 and 8 for additional information regarding Handling and Personal Protective Equipment (PPE).
  - 2.10.3. Eye Exposure:  
Injury may occur if eyes are subjected to prolonged direct exposure to bright light.
  - 2.10.4. Respiratory Exposure:  
Inhalable dust and particulates may be generated if product is pulverized. As with any particulate matter, respirable particles may cause mechanical irritation of the respiratory system and/or lung injury.
- 2.11. NFPA Rating: Health 1 Fire 1 Instability/Reactivity 0

### **Section 3. Composition/Information on Ingredients**

- 3.1. Exempt article ingredients not measured

- 3.2. These items are light bulbs in various shapes, configurations, and designs. All contain a small fluorescent tube (either twisted or bent to shape), a plastic housing (containing an electronic circuit to start the lamp), and a threaded base for use in standard incandescent lamp sockets (or a pin base for use in a GU24 socket). Some lamps utilize a glass, or plastic, outer envelope to enclose the fluorescent tube.

#### **Section 4. First Aid Measures**

- 4.1. Eyes: Not Applicable
- 4.2. Skin:
- 4.2.1. Wash with soap and water.
  - 4.2.2. Treat lacerations using standard first aid procedures.
  - 4.2.3. Seek medical attention.
- 4.3. Inhalation: Not Applicable
- 4.4. Call poison center if you feel unwell.
- 4.5. Physicians: Treat according to person's condition and specifics of exposure.

#### **Section 5. Fire Fighting Measures**

- 5.1. Flash point: Not applicable/determined
- 5.2. Lower/Upper Explosive Limit: Not applicable/determined
- 5.3. Extinguishing Media: Water, CO<sub>2</sub>, and sand.
- 5.4. Extinguishing Media to Avoid: None
- 5.5. Protection of Firefighters
- 5.5.1. Hazardous Decomposition Products: Not applicable/determined
  - 5.5.2. Unusual Fire and Explosion Data: Material may be electrically conductive.
  - 5.5.3. Protective Equipment and Precautions for Firefighters: Standard protective equipment and precautions – Self-contained breathing apparatus (SCBA) and full firefighting turnout gear
- 5.6. Unusual Fire Hazards: None known

#### **Section 6. Accidental Release Measures**

- 6.1. Pieces of broken fixture components may form sharp edges and fine particulate matter can be created. Sweep up loose material while wearing eye protection, respiratory protection, and gloves as needed to prevent irritation and/or lacerations. Place gathered material in an impermeable container and label appropriately.
- 6.2. Refer to Sections 5 and 8 for personal protective equipment requirements.
- 6.3. Refer to Sections 13 and 15 for possible additional guidance regarding regulatory requirements.

## **Section 7. Handling & Storage**

- 7.1. Use normal good material and housekeeping practices to avoid breakage.
- 7.2. Always disconnect power before installing, inspecting, removing or replacing bulbs.
- 7.3. After disconnecting power allow sufficient time for bulb to cool before attempting to make contact. Heat resistant gloves may be suggested for additional safety.
- 7.4. Follow NFPA 654 (dusts) and 484 for metal dust for managing dust hazards.

## **Section 8. Exposure Controls/Personal Protection**

- 8.1. Appropriate Engineering Controls:  
Do not use any light bulb in applications where humans and/or animals will be subjected to direct long-term uncomfortable visual exposure to light emissions as this could result in eye injury. If bulb appears damaged, remove power and then repair or replace the product before returning it to service. If any materials are to be processed in such a manner as to create particulates (mechanical breaking as part of end of product life disposal and recycling), use exhaust ventilation and/or wet working methods to minimize release of particulate to workroom air and employee breathing
- 8.2. Personal Protective Equipment
  - 8.2.1. Respiratory:  
None required under normal use conditions. Appropriate local ventilation or an air purifying respirator should be used if the articles are being abraded or reduced in size using mechanical methods.
  - 8.2.2. Skin Protection:
    - 8.2.2.1. If risk of breakage is present impermeable and/or cut resistant gloves should be worn.
    - 8.2.2.2. Operating light bulbs are hot. Use of temperature resistant gloves is recommended.  
\*\*Always allow sufficient time for product to cool prior to touching.\*\*
  - 8.2.3. Eye/Face Protection:  
Wear safety glasses with side shields to avoid chance of product getting into unprotected eye. If service personnel need to work with a lit bulb without light diffusers and/or filters installed, appropriate light filtering eye wear should be used.
- 8.3. General Hygiene Considerations:  
Workers should wash their face and hands prior to eating, drinking, or smoking.
- 8.4. Additional Exposure Information: Not Applicable

## **Section 9. Physical and Chemical Properties**

- 9.1. Physical form: Solid
- 9.2. Color: Opaque/Translucent

9.3.	Odor	Little / none
9.4.	Odor threshold:	Not applicable/determined
9.5.	pH:	Not applicable/determined
9.6.	Sublimes at:	Not applicable/determined
9.7.	Decomposition temperature:	No vapor expected
9.8.	Evaporation rate:	0
9.9.	Relative density (g/cc):	Not applicable/determined
9.10.	Vapor density (air = 1):	No vapor expected
9.11.	Fat solubility (mg/kg, °C):	Not applicable/determined
9.12.	Water solubility (mg/kg °C):	Not applicable/determined
9.13.	Partition coefficient (low Pow):	Not applicable/determined
9.14.	Flammability:	Not applicable/determined
	Flash point (°C):	Not applicable/determined
	Explosivity limits (% v/v):	Not applicable/determined
9.15.	Auto-ignition temperature (°C):	Not applicable/determined
9.16.	Volatility by Weight:	<0.01%
9.17.	Oxidizing properties:	None known
9.18.	Other physical-chemical properties:	None known
9.19.	Viscosity:	Solid

## Section 10. Stability and Reactivity

10.1.	Reactivity:	Normally stable
10.2.	Chemical Stability:	Normally stable
10.3.	Hazardous polymerization Conditions:	Will not occur
10.4.	Conditions to avoid:	
	Rapid temperature change may result in broken envelope.	
10.5.	Materials to Avoid (incompatible):	
	Because of heat generated by bulb during operation flammable materials and objects adversely affected by heating or drying action should be avoided.	

## Section 11. Toxicological Information

11.1.	Acute toxicity oral:	None known
11.2.	Carcinogenicity:	
11.2.1.	Some components may contain carcinogens listed by IARC, but these quantities typically are well below 0.1% of the total.	
11.3.	Acute toxicity inhalation:	None known
11.4.	Skin irritation / corrosion:	None known
11.5.	Serious damage to eyes / eye irritation:	None known
11.6.	Skin and respiratory sensitization:	None known

- |        |   |                           |
|--------|---|---------------------------|
| 11.7.  | Specific target organ toxicity following single or repeated exposure: | None known                |
| 11.8.  | Toxicity following single exposure:                                   |                           |
|        | Oral:   | None known                |
|        | Inhalation:   | None known                |
| 11.9.  | Toxicity repeated exposure:   | None known                |
| 11.10. | Reproductive toxicity:  | Not applicable/determined |
| 11.11. | STOT - single exposure:   | Not applicable/determined |
| 11.12. | STOT - repeated exposure:   | Not applicable/determined |
| 11.13. | Aspiration hazard:  | Not applicable/determined |

## **Section 12. Ecological Information**

- |       |                              |   |
|-------|------------------------------|---|
| 12.1. | Air:                         | Atmospheric contamination should not occur                  |
| 12.2. | Water:                       | Solid; little to no solubility; may sink in water           |
| 12.3. | Soil:                        | Transformation in landfill unlikely                         |
| 12.4. | Degradation:                 | not biodegradable   |
| 12.5. | Toxicity to water organisms: | unlikely/low risk   |
| 12.6. | Toxicity to soil organisms:  | unlikely/low risk   |
| 12.7. | Bioaccumulation:             | Solid; little to no solubility                              |
| 12.8. | Water treatment plants:      | Solid; little to no solubility; unlikely to affect bacteria |

## **Section 13. Disposal Considerations**

- 13.1. Normal precautions should be taken for the collection of glass particles in the event a lamp is broken.
- 13.2. All disposal options should be evaluated with respect to federal, state, and local requirements. Before disposing of waste lamps, check with federal, state, and/or local officials for current guidelines and regulations. Damar encourages recycling of its products through qualified recycling facilities.

## **Section 14. Transport Information**

- 14.1. This material is not classified as a hazardous material or dangerous good by the U.S. Department of Transportation, the International Air Transport Association, or the International Maritime Organization

## **Section 15. Regulatory Information**

- 15.1. The contents of this SDS comply with United Nations (GHS) or Globally Harmonized System of Classification and Labeling of Chemicals.
- 15.2. U.S. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65): This product may contain chemicals or product chemicals when heated known to the state of California to cause cancer, birth defects, or other reproductive harm.

- 15.3. Section 302 Extremely Hazardous Substances (40 CFR 355): None
- 15.4. Section 304 CERCLA Hazardous Substances (40 CFR 302): None
- 15.5. Section 311/312 Hazard Class (40 CFR 370):
  - 15.5.1. Acute: No
  - 15.5.2. Chronic: No
  - 15.5.3. Fire: No
  - 15.5.4. Pressure: No
  - 15.5.5. Reactive: No
- 15.6. Section 311 Toxic Chemicals (40 CFR 372):  
None present in a regulated quantity nor intentionally added
- 15.7. As an article, these mercury-containing lamps, when shipped in the manufacturer's original packaging, may be regulated for air, truck, or ocean shipment. As a waste, these lamps may be regulated in various states and local communities.

**Section 16. Other Information**

- 16.1. Preparer: Damar Worldwide 4 LLC, Technical and Testing Department
- 16.2. Disclaimer:  
The information contained in this Material Safety Data Sheet is supplied in conformity with 29 CFR 1910.1200 of the OSHA Hazard Communication Standard. The information set forth herein is presented in good faith and believed to be correct. No representations are made as to the completeness or accuracy thereof. The purchaser is solely responsible for compliance with all applicable laws and regulations concerning the use of this product. Neither Preparer nor Company assumes any liability or responsibility for its use.

**Safety Data Sheets:** Jet Fuel; Marine Gas Oil (MGO)

**Waste Stream:** Fuel

**EPA Waste Profile Sheet Number:** 20140506-024



# Material Safety Data Sheet

## Jet Fuel



**HMIS III:**

HEALTH	1
FLAMMABILITY	2
PHYSICAL	0

0 = Insignificant, 1 = Slight, 2 = Moderate, 3 = High, 4 = Extreme

### SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

<b>Product name</b>	: Jet Fuel		
<b>Synonyms</b>	: Jet Fuel - A, B, A-1, A-50, High Sulfur, Military, Jet A & B Aviation Turbine Fuel, Jet A-1, Jet A; Avjet For Blending; Jet Q Turbine Fuel, Aviation Fuel; Turbine Fuel; JP-4; JP-5; JP-8, Av-Jet, 888100004452		
<b>MSDS Number</b>	: 888100004452	<b>Version</b>	: 2.12
<b>Product Use Description</b>	: Fuel		
<b>Company</b>	: For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259		
<b>Tesoro Call Center</b>	: (877) 783-7676	<b>Chemtrec (Emergency Contact)</b>	: (800) 424-9300

### SECTION 2. HAZARDS IDENTIFICATION

#### Emergency Overview

<b>Regulatory status</b>	: This material is considered hazardous by the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200).
<b>Signal Word</b>	: WARNING
<b>Hazard Summary</b>	: Harmful or fatal if swallowed. Harmful by inhalation. Irritating to eyes, respiratory system and skin. Affects central nervous system. Flammable.

#### Potential Health Effects

<b>Eyes</b>	: Severe eye irritant. Contact may cause stinging, watering, redness, swelling, and eye damage.
<b>Skin</b>	: Prolonged or repeated skin contact with liquid may cause defatting resulting in drying, redness and possible blistering. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.
<b>Ingestion</b>	: Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.
<b>Inhalation</b>	: Inhalation of fumes or mist may result in respiratory tract irritation and central

nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

**WARNING:** the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

**Chronic Exposure**

: Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

**Target Organs**

: Eyes, Skin, Respiratory system, Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash)

**SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS**

Component	CAS-No.	Weight %
Kerosene (petroleum)	8008-20-6	100%
Naphthalene	91-20-3	0 to 3%
Ethyl Benzene	100-41-4	0 to 1%
Trimethy Benzene	95-63-6	0 to 1%
Ethyl Benzene	100-41-4	0 to 1%
Diethylene Glycol Monomethyl Ether	111-77-3	0 to 0.15%
Alkyl Dithiothiadiazole	N/A	0 to 15%

**SECTION 4. FIRST AID MEASURES**

- Inhalation** : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.
- Skin contact** : Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, seek medical attention.
- Eye contact** : In case of eye contact, remove contact lens and rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical attention immediately.
- Ingestion** : Do NOT induce vomiting. Do not give liquids. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.
- Notes to physician** : Symptoms: Aspiration may cause pulmonary edema and pneumonitis. Treatment: Do not induce vomiting, use gastric lavage only. Remove from further exposure and treat symptomatically.

**SECTION 5. FIRE-FIGHTING MEASURES**

<b>Form</b>	: Liquid
<b>Flash point</b>	: 38 °C (100 °F) minimum
<b>Auto Ignition temperature</b>	: 210 °C (410 °F)
<b>Lower explosive limit</b>	: 0.7 %(V)
<b>Upper explosive limit</b>	: 5.0 %(V)
<b>Suitable extinguishing media</b>	: Carbon dioxide (CO <sub>2</sub> ), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray., Do not use a solid water stream as it may scatter and spread fire., Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.
<b>Specific hazards during fire fighting</b>	: Fire Hazard. Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray. Sealed containers may rupture when heated. Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back.
<b>Special protective equipment for fire-fighters</b>	: Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.
<b>Further information</b>	: Exposure to decomposition products may be a hazard to health. Standard procedure for chemical fires.

**SECTION 6. ACCIDENTAL RELEASE MEASURES**

<b>Personal precautions</b>	: ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN if applicable. Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.
<b>Environmental precautions</b>	: Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.
<b>Methods for cleaning up</b>	: Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

**SECTION 7. HANDLING AND STORAGE**

<b>Handling</b>	: Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.
-----------------	---

- Advice on protection against fire and explosion** : Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initiated fire or explosion during transfer, storage or handling, include but are not limited to these examples:
- (1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
  - (2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha).
  - (3) Storage tank level floats must be effectively bonded.
- For more information on precautions to prevent static-initiated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).
- Dust explosion class** : Not applicable
- Requirements for storage areas and containers** : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".
- Advice on common storage** : Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.
- Other data** : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

**SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION**

**Exposure Guidelines**

List	Components	CAS-No.	Type:	Value
OSHA Z1	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Ethyl Benzene	100-41-4	PEL	100 ppm 435 mg/m3
ACGIH	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Kerosene (petroleum)	8008-20-6	TWA	200 mg/m3
	Ethyl Benzene	100-41-4	TWA	100 ppm 434 mg/m3
			STEL	125 ppm 543 mg/m3

- Protective measures** : Keep out of reach of children.
- Engineering measures** : Use only intrinsically safe electrical equipment approved for use in classified areas. Emergency eye wash capability should be available in the vicinity of any potential splash exposure.

- Eye protection** : Goggles and face shield as needed to prevent eye and face contact.
- Hand protection** : Gloves constructed of nitrile, neoprene, or PVC are recommended.
- Skin and body protection** : Chemical protective clothing such as DuPont TyChem®, Barricade or equivalent, recommended based on degree of exposure. Consult manufacturer specifications for further information.
- Respiratory protection** : NIOSH/MSHA approved positive-pressure self-contained breathing apparatus (SCBA) or Type C positive-pressure supplied air with escape bottle must be used for gas concentrations above occupational exposure limits, for potential of uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere.
- Work / Hygiene practices** : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

- Form** : Liquid
- Appearance** : Light yellow to white
- Odor** : Characteristic Petroleum distillate
- Flash point** : 38 °C (100 °F) minimum
- Auto Ignition temperature** : 210 °C (410 °F)
- Thermal decomposition** : No decomposition if stored and applied as directed.
- Lower explosive limit** : 0.7 %(V)
- Upper explosive limit** : 5.0 %(V)
- pH** : Not applicable
- Specific gravity** : 0.8 (H2O=1)
- Freezing point** : -45°C to -62°C (-50°F to -80°F)
- Boiling Range** : 160 - 300 °C(320 - 572 °F)
- Vapor Pressure** : 6.9 hPa  
at 20 °C (68 °F)
- Relative Vapor Density** : 4.5
- Density** : 0.8 g/cm3
- Water solubility** : Insoluble
- Viscosity, kinematic** : 1.6 mm2/s  
at 40 °C (104 °F)



**Naphthalene**

91-20-3

Acute inhalation toxicity: LC50 rat  
Dose: 5.28 mg/l  
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.  
Result: Skin irritation

Acute oral toxicity: LD50 rat  
Dose: 2,001 mg/kg

Acute dermal toxicity: LD50 rat  
Dose: 2,501 mg/kg

Acute inhalation toxicity: LC50 rat  
Dose: 101 mg/l  
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.  
Result: Mild skin irritation

Eye irritation: Classification: Irritating to eyes.  
Result: Mild eye irritation

Carcinogenicity: N11.00422130

**SECTION 12. ECOLOGICAL INFORMATION**

**Additional ecological information**

: Release of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of this material that could reach any surface waters. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802. Naphthalene (91-20-3) one of the ingredients in this mixture is classified as a Marine Pollutant.

**Component:**

**Naphthalene**

91-20-3

Toxicity to algae:  
EC50  
Species:  
Dose: 33 mg/l  
Exposure time: 24 h

**SECTION 13. DISPOSAL CONSIDERATIONS**

**Disposal**

: Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

**SECTION 14. TRANSPORT INFORMATION**

**CFR**

Proper shipping name : Fuel, aviation, turbine engine  
UN-No. : 1863  
Class : 3  
Packing group : III



The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

California Prop. 65

: **WARNING!** This product contains a chemical known to the State of California to cause cancer.

Naphthalene

91-20-3

## SECTION 16. OTHER INFORMATION

### Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

**Template** : GWU mbH  
**Prepared by** : Birlenbacher Str. 18  
D-57078 Siegen  
  
Germany  
  
Telephone: +49-(0)271-88072-0

**Revision Date** : 01/27/2011

40, 41, 42, 43, 44, 45, 60, 113, 137, 138, 139, 140, 141, 142, 263, 285, 1048, 1117, 1137, 1138, 1546



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# MATERIAL SAFETY DATA SHEET

(SOLAS regulation VI/5-1 format)

<b>SECTION 1</b>	<b>PRODUCT AND COMPANY IDENTIFICATION</b>
------------------	---

**PRODUCT**

**Product Name:** MARINE GAS OIL  
**Alternate Product Name:** MGO - DMA  
**Product Description:** Hydrocarbons and Additives  
**Product Code:** 708441  
**Intended Use:** Fuel  
**MARPOL Annex I Category:** Gas oils, including ship's bunkers  
**See Section 14 for transportation information related to the Bill of Lading, other shipping documents**

**COMPANY IDENTIFICATION**

Country	Company	Emergency Telephone Number
International Sales	ExxonMobil Marine Fuels Ermyn House MP 31 Ermyn Way Leatherhead, KT22 8UX UK	(UK) (+44) (0) 23 8089 1558
Belgium	ExxonMobil Petroleum & Chemical BVBA Polderdijkweg Haven 447 - 2030 Antwerpen, Belgium	+32 (0) 487 545 780
Canada	Imperial Oil 505 Quarry Park Boulevard SE Calgary, AB T2C 5N1 Canada	1-866-232-9563
France	Esso SAF Tour Manhattan La Defense 2 5/6 Place de l'Iris 92400 Courbevoie France	+33 08 1000 3353
Hong Kong	ExxonMobil Hong Kong Limited: 2201, 22/F, Central Plaza 18 Harbour Road, Wanchai, Hong Kong	+1 609 737 4411
Italy	Esso Italiana SRL Viale Castello della Magliana 25 Rome 00148 Italy	+39 0382 24444
Netherlands	Esso Nederland BV Graaf Engelbertlaan 75 4837 DS Breda The Netherlands	+32 (0) 487 545 780
New Zealand	Mobil Oil New Zealand Limited Vero Centre 48 Shortland Street Auckland 1140 New Zealand	National Poison Center +64 3 479 7248 Freephone 0800 764 766
Norway	Esso Norge AS Drammensveien 149 Skøyen N-0213	Emergency: (NO) +47 33 37 73 00 Poison: (NO) +47 22 59 13 00

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	Oslo, Norway	
Singapore	ExxonMobil Asia Pacific Pte Limited 1 HarbourFront Place #06-00 HarbourFront Tower One Singapore 098633	01-609-737-4411
Thailand	Esso (Thailand) Public Company Limited 3195/17-29 Rama 4 Road, Klong Ton, Klong Toey District Bangkok, Thailand 10110	+1-609-737-4411
United Kingdom	Esso Petroleum Company Limited Ermyn House MP 31 Ermyn Way Leatherhead, KT22 8UX UK	+32 (0) 487 545 780
United States	ExxonMobil Oil Corporation 22777 Springwoods Village Parkway Spring, TX 77389 USA	+1 609 737 4411

This (M)SDS is a document with no country specific information included.

## SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to UN GHS Criteria. Classification includes all GHS hazard classes. For hazard categories with two cut-off/concentration limits, classification was based on the higher limit.

### GHS CLASSIFICATION:

Flammable liquid: Category 3.

Acute inhalation toxicant: Category 4.

Skin irritation: Category 2.

Carcinogen: Category 2.

Specific target organ toxicant (repeated exposure): Category 2.

Aspiration toxicant: Category 1.

Acute aquatic toxicant: Category 2.

Chronic aquatic toxicant: Category 2.

### GHS Label Elements:

#### Pictogram:



Signal Word: Danger

### Hazard Statements:

Physical: H226: Flammable liquid and vapour.

Health: H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H332: Harmful if inhaled. H351: Suspected of causing cancer. H373: May cause damage to organs through prolonged or repeated exposure.

Environmental: H411: Toxic to aquatic life with long lasting effects.

### Precautionary Statements:

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Prevention: P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground/bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P260: Do not breathe mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish. P391: Collect spillage.

Storage: P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.

Disposal: P501: Dispose of contents and container in accordance with local regulations.

**Contains:** FUELS, DIESEL

Other hazard information:

**PHYSICAL / CHEMICAL HAZARDS**

Material can accumulate static charges which may cause an ignition. Material can release vapours that readily form flammable mixtures. Vapour accumulation could flash and/or explode if ignited.

**HEALTH HAZARDS**

High-pressure injection under skin may cause serious damage. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. Hydrogen sulphide, a highly toxic gas, may be present. Signs and symptoms of overexposure to hydrogen sulphide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odour does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. May be irritating to the eyes, nose, throat, and lungs.

**ENVIRONMENTAL HAZARDS**

No additional hazards.

**NOTE:** This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

<b>SECTION 3</b>	<b>COMPOSITION / INFORMATION ON INGREDIENTS</b>
------------------	---

This material is defined as a mixture.

**Hazardous Substance(s) or Complex Substance(s) required for disclosure**

Name	CAS#	Concentration*	GHS Hazard Codes
FUELS, DIESEL	68334-30-5	> 99 %	H227, H304, H332, H351,

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			H315, H373, H401, H411
--	--	--	------------------------

**Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure**

Name	CAS#	Concentration*	GHS Hazard Codes
Hydrogen sulphide	7783-06-4	< 0.0002%	H220, H280, H330(2), H400(M factor 1)

\* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

NOTE: Composition may contain up to 0.5% performance additives and / or dyes.

<b>SECTION 4</b>	<b>FIRST AID MEASURES</b>
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**INHALATION**

Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

**SKIN CONTACT**

Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

**EYE CONTACT**

Flush thoroughly with water. If irritation occurs, get medical assistance.

**INGESTION**

Seek immediate medical attention. Do not induce vomiting.

**ACUTE AND DELAYED SYMPTOMS/EFFECTS**

See Toxicological Section

**NOTE TO PHYSICIAN**

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

**PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE**

Contains hydrocarbon solvent/petroleum hydrocarbons; skin contact may aggravate an existing dermatitis.

<b>SECTION 5</b>	<b>FIRE FIGHTING MEASURES</b>
------------------	-------------------------------

**EXTINGUISHING MEDIA**

**Appropriate Extinguishing Media:** Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

**Inappropriate Extinguishing Media:** Straight streams of water

**FIRE FIGHTING**

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**Fire Fighting Instructions:** Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

**Unusual Fire Hazards:** Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

**Hazardous Combustion Products:** Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulphur oxides

#### FLAMMABILITY PROPERTIES

**Flash Point [Method]:**  $\geq 60^{\circ}\text{C}$  (140°F) [Typical]

**Flammable Limits (Approximate volume % in air):** LEL: 1.0 UEL: 6.0

**Autoignition Temperature:**  $>250^{\circ}\text{C}$  (482°F)

### SECTION 6

### ACCIDENTAL RELEASE MEASURES

#### NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

#### PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required, due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H<sub>2</sub>S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

#### SPILL MANAGEMENT

**Land Spill:** Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapour, but may not prevent ignition in enclosed spaces.

**Water Spill:** Stop leak if you can do so without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction

and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

**ENVIRONMENTAL PRECAUTIONS**

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

**SECTION 7 HANDLING AND STORAGE**

**HANDLING**

Avoid all personal contact. Do not siphon by mouth. Harmful amounts of H<sub>2</sub>S may be present. The toxic and olfactory (sense of smell) fatigue properties of hydrogen sulfide require that air monitoring alarms and respiratory protection be used where the concentration might be expected to reach a harmful level, such as in an enclosed space, heated transport vessel, or in a spill or leak situation.

Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put petrol into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapour and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices etc) in or around any fuelling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

**Static Accumulator:** This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

**STORAGE**

The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be earthed and bonded. Fixed storage containers, transfer containers and associated equipment should be earthed and bonded to prevent accumulation of static charge. Keep away from incompatible materials.

**SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION**

**EXPOSURE LIMIT VALUES**

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit/Standard			Note	Source	Year
FUELS, DIESEL	Stable Aerosol.	TWA	5 mg/m <sup>3</sup>		Skin	ExxonMobil	2019
FUELS, DIESEL	Vapour.	TWA	200 mg/m <sup>3</sup>		Skin	ExxonMobil	2019

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FUELS, DIESEL [total hydrocarb, vapour&aerosol]	Inhalable fraction and vapour	TWA	100 mg/m3		Skin	ACGIH	2018
Hydrogen sulphide		STEL	14 mg/m3	10 ppm		ExxonMobil	2019
Hydrogen sulphide		TWA	7 mg/m3	5 ppm		ExxonMobil	2019

### Biological limits

No biological limits allocated.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

### ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

### PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

**Respiratory Protection:** If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Positive-pressure, air-supplied respirator in areas where H<sub>2</sub>S vapours may accumulate is recommended.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

**Hand Protection:** Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves. Nitrile, Viton

**Eye Protection:** If contact with material is likely, chemical goggles are recommended.

**Skin and Body Protection:** Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

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Chemical/oil resistant clothing is recommended.

**Specific Hygiene Measures:** Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

## ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

**Note:** Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

### GENERAL INFORMATION

**Physical State:** Liquid  
**Colour:** Amber  
**Odour:** Petroleum/Solvent  
**Odour Threshold:** N/D

### IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

**Relative Density (at 15 °C):** 0.8 - 0.89  
**Flammability (Solid, Gas):** N/A  
**Flash Point [Method]:**  $\geq 60^{\circ}\text{C}$  (140°F) [Typical]  
**Flammable Limits (Approximate volume % in air):** LEL: 1.0 UEL: 6.0  
**Autoignition Temperature:**  $> 250^{\circ}\text{C}$  (482°F)  
**Boiling Point / Range:**  $> 180^{\circ}\text{C}$  (356°F)  
**Decomposition Temperature:** N/D  
**Vapour Density (Air = 1):**  $> 2$  at 101 kPa  
**Vapour Pressure:**  $< 0.04$  kPa (0.3 mm Hg) at 20 °C  
**Evaporation Rate (n-butyl acetate = 1):** N/D  
**pH:** N/D  
**Log Pow (n-Octanol/Water Partition Coefficient):**  $> 3.5$   
**Solubility in Water:** Negligible  
**Viscosity:** 1.5 cSt (1.5 mm<sup>2</sup>/sec) at 40°C - 6 cSt (6 mm<sup>2</sup>/sec) at 40°C  
**Oxidizing Properties:** See Hazards Identification Section.

### OTHER INFORMATION

**Freezing Point:** N/D  
**Melting Point:** N/A  
**Pour Point:**  $< 0^{\circ}\text{C}$  (32°F)

## SECTION 10 STABILITY AND REACTIVITY

**STABILITY:** Material is stable under normal conditions.

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**CONDITIONS TO AVOID:** Open flames and high energy ignition sources.

**MATERIALS TO AVOID:** Alkalies, Halogens, Strong Acids, Strong Bases, Strong oxidisers

**HAZARDOUS DECOMPOSITION PRODUCTS:** Material does not decompose at ambient temperatures.

**POSSIBILITY OF HAZARDOUS REACTIONS:** Hazardous polymerization will not occur.

<b>SECTION 11</b>	<b>TOXICOLOGICAL INFORMATION</b>
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**ACUTE TOXICITY**

<u>Route of Exposure</u>	<u>Conclusion / Remarks</u>
<b>Inhalation</b>	
Toxicity (Rat): LC50 4100 mg/m3	Moderately toxic. Based on test data for structurally similar materials.
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
<b>Ingestion</b>	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
<b>Skin</b>	
Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials.
<b>Eye</b>	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

**OTHER HEALTH EFFECTS FROM SHORT AND LONG TERM EXPOSURE**

Anticipated health effects from sub-chronic, chronic, respiratory or skin sensitization, mutagenicity, reproductive toxicity, carcinogenicity, target organ toxicity (single exposure or repeated exposure), aspiration toxicity and other effects based on human experience and/or experimental data.

**For the product itself:**

Vapour concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anaesthetic and may have other central nervous system effects. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

Diesel exhaust fumes: Carcinogenic in animal tests. Inhalation exposures to exhaust for 2 years in test animals resulted in lung tumours and lymphoma. Extract of particulate produced skin tumours in test animals. Caused mutations in-vitro. Diesel fuel: Carcinogenic in animal tests. Caused mutations in-vitro. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased fetal resorptions at maternally toxic doses. Dermal exposure to high concentrations resulted in severe skin irritation with weight loss and some mortality. Inhalation exposure to high concentrations resulted in

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respiratory tract irritation, lung changes/infiltration/accumulation, and reduction in lung function.

**Contains:**

**HYDROGEN SULPHIDE:** Chronic health effects due to repeated exposures to low levels of H<sub>2</sub>S have not been established. High level (700 ppm) acute exposure can result in sudden death. High concentrations will lead to cardiopulmonary arrest due to nervous system toxicity and pulmonary edema. Lower levels (150 ppm) may overwhelm sense of smell, eliminating warning of exposure. Symptoms of overexposure to H<sub>2</sub>S include headache, fatigue, insomnia, irritability, and gastrointestinal problems. Repeated exposures to approximately 25 ppm will irritate mucous membranes and the respiratory system and have been implicated in some eye damage.

**IARC Classification:**

The following ingredients are cited on the lists below: None.

1 = IARC 1

--REGULATORY LISTS SEARCHED--

2 = IARC 2A

3 = IARC 2B

**SECTION 12**

**ECOLOGICAL INFORMATION**

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

**ECOTOXICITY**

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

**MOBILITY**

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

High molecular wt. component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

**PERSISTENCE AND DEGRADABILITY**

**Biodegradation:**

Material -- Expected to be inherently biodegradable

**Atmospheric Oxidation:**

More volatile component -- Expected to degrade rapidly in air

**INTERNATIONAL OIL POLLUTION COMPENSATION (IOPC)**

Material is considered a non-persistent oil.

**SECTION 13**

**DISPOSAL CONSIDERATIONS**

**DISPOSAL METHODS**

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Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

**MARPOL** - see International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) which provides technical aspects at controlling pollutions from ships.

## DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

**Empty Container Warning** Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. **DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.**

## SECTION 14 TRANSPORT INFORMATION

### SEA (IMDG)

**Proper Shipping Name:** GAS OIL

**Hazard Class & Division:** 3

**EMS Number:** F-E, S-E

**UN Number:** 1202

**Packing Group:** III

**Marine Pollutant:** Yes

**Label(s):** 3

**Transport Document Name:** UN1202, GAS OIL, 3, PG III, (60°C c.c.), MARINE POLLUTANT

**Note - this material is being carried under the scope of MARPOL Annex I**

## SECTION 15 REGULATORY INFORMATION

### REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Listed or exempt from listing/notification on the following chemical inventories (May contain substance(s) subject to notification to the EPA Active TSCA inventory prior to import to USA): AICS, DSL, ENCS, IECSC, KECI, PICCS, TSCA

## SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

### KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):

H220: Extremely flammable gas; Flammable Gas, Cat 1

H227: Combustible liquid; Flammable Liquid, Cat 4

H280: Contains gas under pressure; may explode if heated; Pressurized Gas

H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1

H315: Causes skin irritation; Skin Corr/Irritation, Cat 2

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H330(2): Fatal if inhaled; Acute Tox Inh, Cat 2

H332: Harmful if inhaled; Acute Tox Inh, Cat 4

H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2

H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2

H400: Very toxic to aquatic life; Acute Env Tox, Cat 1

H401: Toxic to aquatic life; Acute Env Tox, Cat 2

H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2

**THIS MATERIAL SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:**

Section 01: IMO R&S Emergency Numbers information was modified.

Section 08: Exposure Limits Table information was modified.

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The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

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DGN: 7109765I (1016784)

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**Safety Data Sheet:** Shell Gadinia 30

**Waste Stream:** Lube Oil

**EPA Waste Sheet Profile Number:** 20140506-025



**Material Safety Data Sheet****1. MATERIAL AND COMPANY IDENTIFICATION**

**Material Name** : Shell Gadinia 30  
**Uses** : Engine oil.

**Manufacturer/Supplier** : SOPUS Products  
 PO BOX 4427  
 Houston, TX 77210-4427  
 USA

**MSDS Request** : 877-276-7285

**Emergency Telephone Number**

**Spill Information** : 877-242-7400

**Health Information** : 877-504-9351

**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Highly refined mineral oils and additives.

The highly refined mineral oil contains <3% (w/w) DMSO-extract, according to IP346.

**3. HAZARDS IDENTIFICATION**

<b>Emergency Overview</b>	
<b>Appearance and Odour</b>	: Brown. Liquid at room temperature. Slight hydrocarbon.
<b>Health Hazards</b>	: Not classified as dangerous for supply or conveyance.
<b>Safety Hazards</b>	: Not classified as flammable but will burn.
<b>Environmental Hazards</b>	: Not classified as dangerous for the environment.

**Health Hazards** : Not expected to be a health hazard when used under normal conditions.

**Health Hazards****Inhalation**

: Under normal conditions of use, this is not expected to be a primary route of exposure.

**Skin Contact**

: Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.

**Eye Contact**

: May cause slight irritation to eyes.

**Ingestion**

: Low toxicity if swallowed.

**Other Information**

: Used oil may contain harmful impurities.

**Signs and Symptoms**

: Oil acne/folliculitis signs and symptoms may include formation of black pustules and spots on the skin of exposed areas. Ingestion may result in nausea, vomiting and/or diarrhoea.

**Aggravated Medical Conditions**

: Pre-existing medical conditions of the following organ(s) or organ system(s) may be aggravated by exposure to this material: Skin.

**Material Safety Data Sheet**

**Environmental Hazards** : Not classified as dangerous for the environment.  
**Additional Information** : Under normal conditions of use or in a foreseeable emergency, this product does not meet the definition of a hazardous chemical when evaluated according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**4. FIRST AID MEASURES**

**General Information** : Not expected to be a health hazard when used under normal conditions.  
**Inhalation** : No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.  
**Skin Contact** : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available. If persistent irritation occurs, obtain medical attention.  
**Eye Contact** : Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.  
**Ingestion** : In general no treatment is necessary unless large quantities are swallowed, however, get medical advice.  
**Advice to Physician** : Treat symptomatically.

**5. FIRE FIGHTING MEASURES**

Clear fire area of all non-emergency personnel.

**Flash point** : > 200 °C / 392 °F (PMCC / ASTM D93)  
**Upper / lower Flammability or Explosion limits** : Typical 1 - 10 %(V)(based on mineral oil)  
**Auto ignition temperature** : > 320 °C / 608 °F  
**Specific Hazards** : Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Unidentified organic and inorganic compounds.  
**Suitable Extinguishing Media** : Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.  
**Unsuitable Extinguishing Media** : Do not use water in a jet.  
**Protective Equipment for Firefighters** : Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

**6. ACCIDENTAL RELEASE MEASURES**

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal. Observe the relevant local and international regulations.

**Protective measures** : Avoid contact with skin and eyes. Use appropriate containment to avoid environmental contamination. Prevent from spreading

**Material Safety Data Sheet**

- Clean Up Methods** : or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers.
- Clean Up Methods** : Slippery when spilled. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.
- Additional Advice** : Local authorities should be advised if significant spillages cannot be contained.

**7. HANDLING AND STORAGE**

- General Precautions** : Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
- Handling** : Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used.
- Storage** : Keep container tightly closed and in a cool, well-ventilated place. Use properly labelled and closeable containers. Store at ambient temperature.
- Recommended Materials** : For containers or container linings, use mild steel or high density polyethylene.
- Unsuitable Materials** : PVC.
- Additional Information** : Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

**Occupational Exposure Limits**

Material	Source	Type	ppm	mg/m3	Notation
Oil mist, mineral	ACGIH	TWA(Inhalable fraction.)		5 mg/m3	
Oil mist, mineral	OSHA Z1	PEL(Mist.)		5 mg/m3	
Oil mist, mineral	OSHA Z1A	TWA(Mist.)		5 mg/m3	
Oil mist, mineral	OSHA Z1	(Mist.)			Listed.

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- Additional Information** : Shell has adopted as Interim Standards the OSHA Z1A values that were established in 1989 and later rescinded.
- Exposure Controls** : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.
- Personal Protective Equipment** : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.
- Respiratory Protection** : No respiratory protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65°C(149 °F)].
- Hand Protection** : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.
- Eye Protection** : Wear safety glasses or full face shield if splashes are likely to occur.
- Protective Clothing** : Skin protection not ordinarily required beyond standard issue work clothes.
- Monitoring Methods** : Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
- Environmental Exposure Controls** : Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

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Appearance	: Brown. Liquid at room temperature.
Odour	: Slight hydrocarbon.
pH	: Not applicable.
Initial Boiling Point and Boiling Range	: > 280 °C / 536 °F estimated value(s)
Pour point	: Typical -18 °C / 0 °F
Flash point	: > 200 °C / 392 °F (PMCC / ASTM D93)
Upper / lower Flammability or Explosion limits	: Typical 1 - 10 %(V) (based on mineral oil)
Auto-ignition temperature	: > 320 °C / 608 °F
Vapour pressure	: < 0.5 Pa at 20 °C / 68 °F (estimated value(s))
Specific gravity	: Typical 0.897 at 15 °C / 59 °F
Density	: Typical 897 kg/m <sup>3</sup> at 15 °C / 59 °F
Water solubility	: Negligible.
n-octanol/water partition coefficient (log Pow)	: > 6 (based on information on similar products)
Kinematic viscosity	: Typical 104 mm <sup>2</sup> /s at 40 °C / 104 °F
Vapour density (air=1)	: > 1 (estimated value(s))
Evaporation rate (nBuAc=1)	: Data not available

**10. STABILITY AND REACTIVITY**

<b>Stability</b>	: Stable.
<b>Conditions to Avoid</b>	: Extremes of temperature and direct sunlight.
<b>Materials to Avoid</b>	: Strong oxidising agents.
<b>Hazardous Decomposition Products</b>	: Hazardous decomposition products are not expected to form during normal storage.

**11. TOXICOLOGICAL INFORMATION**

<b>Basis for Assessment</b>	: Information given is based on data on the components and the toxicology of similar products.
<b>Acute Oral Toxicity</b>	: Expected to be of low toxicity: LD50 > 5000 mg/kg , Rat
<b>Acute Dermal Toxicity</b>	: Expected to be of low toxicity: LD50 > 5000 mg/kg , Rabbit
<b>Acute Inhalation Toxicity</b>	: Not considered to be an inhalation hazard under normal conditions of use.
<b>Skin Irritation</b>	: Expected to be slightly irritating. Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.
<b>Eye Irritation</b>	: Expected to be slightly irritating.
<b>Respiratory Irritation</b>	: Inhalation of vapours or mists may cause irritation.
<b>Sensitisation</b>	: Not expected to be a skin sensitiser.
<b>Repeated Dose Toxicity</b>	: Not expected to be a hazard.
<b>Mutagenicity</b>	: Not considered a mutagenic hazard.
<b>Carcinogenicity</b>	: Product contains mineral oils of types shown to be non-carcinogenic in animal skin-painting studies. Highly refined mineral oils are not classified as carcinogenic by the International Agency for Research on Cancer (IARC). Other components are not known to be associated with carcinogenic

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effects.

- Reproductive and Developmental Toxicity** : Not expected to be a hazard.
- Additional Information** : Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal. ALL used oil should be handled with caution and skin contact avoided as far as possible. Continuous contact with used engine oils has caused skin cancer in animal tests.

**12. ECOLOGICAL INFORMATION**

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.

- Acute Toxicity** : Poorly soluble mixture. May cause physical fouling of aquatic organisms. Expected to be practically non toxic: LL/EL/IL50 > 100 mg/l (to aquatic organisms) LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract. Mineral oil is not expected to cause any chronic effects to aquatic organisms at concentrations less than 1 mg/l.
- Mobility** : Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
- Persistence/degradability** : Expected to be not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.
- Bioaccumulation** : Contains components with the potential to bioaccumulate.
- Other Adverse Effects** : Product is a mixture of non-volatile components, which are not expected to be released to air in any significant quantities. Not expected to have ozone depletion potential, photochemical ozone creation potential or global warming potential.

**13. DISPOSAL CONSIDERATIONS**

- Material Disposal** : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses.
- Container Disposal** : Dispose in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
- Local Legislation** : Disposal should be in accordance with applicable regional, national, and local laws and regulations.

## Material Safety Data Sheet

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### 14. TRANSPORT INFORMATION

#### US Department of Transportation Classification (49CFR)

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

#### IMDG

This material is not classified as dangerous under IMDG regulations.

#### IATA (Country variations may apply)

This material is either not classified as dangerous under IATA regulations or needs to follow country specific requirements.

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### 15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

#### Federal Regulatory Status

##### Notification Status

EINECS	All components listed or polymer exempt.
TSCA	All components listed.
DSL	All components listed.

Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA.

##### SARA Hazard Categories (311/312)

No SARA 311/312 Hazards.

#### State Regulatory Status

##### California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

## Material Safety Data Sheet

This material does not contain any chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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### 16. OTHER INFORMATION

- NFPA Rating (Health, Fire, Reactivity)** : 0, 1, 0
- MSDS Version Number** : 8.2
- MSDS Effective Date** : 03/07/2012
- MSDS Revisions** : A vertical bar (|) in the left margin indicates an amendment from the previous version.
- MSDS Regulation** : The content and format of this MSDS is in accordance with the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
- MSDS Distribution** : The information in this document should be made available to all who may handle the product.
- Disclaimer** : The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

**Safety Data Sheets:** Shell Gadinia 30; NGL No 2 Diesel Fuel Low Sulfur All Grades

**Waste Stream:** Oily Water

**EPA Waste Profile Sheet Number:** 20140506-027



**Material Safety Data Sheet****1. MATERIAL AND COMPANY IDENTIFICATION**

**Material Name** : Shell Gadinia 30  
**Uses** : Engine oil.

**Manufacturer/Supplier** : SOPUS Products  
 PO BOX 4427  
 Houston, TX 77210-4427  
 USA

**MSDS Request** : 877-276-7285

**Emergency Telephone Number**

**Spill Information** : 877-242-7400  
**Health Information** : 877-504-9351

**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Highly refined mineral oils and additives.

The highly refined mineral oil contains <3% (w/w) DMSO-extract, according to IP346.

**3. HAZARDS IDENTIFICATION**

<b>Emergency Overview</b>	
<b>Appearance and Odour</b>	: Brown. Liquid at room temperature. Slight hydrocarbon.
<b>Health Hazards</b>	: Not classified as dangerous for supply or conveyance.
<b>Safety Hazards</b>	: Not classified as flammable but will burn.
<b>Environmental Hazards</b>	: Not classified as dangerous for the environment.

**Health Hazards** : Not expected to be a health hazard when used under normal conditions.

**Health Hazards****Inhalation**

: Under normal conditions of use, this is not expected to be a primary route of exposure.

**Skin Contact**

: Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.

**Eye Contact**

: May cause slight irritation to eyes.

**Ingestion**

: Low toxicity if swallowed.

**Other Information**

: Used oil may contain harmful impurities.

**Signs and Symptoms**

: Oil acne/folliculitis signs and symptoms may include formation of black pustules and spots on the skin of exposed areas. Ingestion may result in nausea, vomiting and/or diarrhoea.

**Aggravated Medical Conditions**

: Pre-existing medical conditions of the following organ(s) or organ system(s) may be aggravated by exposure to this material: Skin.

**Material Safety Data Sheet**

**Environmental Hazards** : Not classified as dangerous for the environment.  
**Additional Information** : Under normal conditions of use or in a foreseeable emergency, this product does not meet the definition of a hazardous chemical when evaluated according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**4. FIRST AID MEASURES**

**General Information** : Not expected to be a health hazard when used under normal conditions.  
**Inhalation** : No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.  
**Skin Contact** : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available. If persistent irritation occurs, obtain medical attention.  
**Eye Contact** : Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.  
**Ingestion** : In general no treatment is necessary unless large quantities are swallowed, however, get medical advice.  
**Advice to Physician** : Treat symptomatically.

**5. FIRE FIGHTING MEASURES**

Clear fire area of all non-emergency personnel.

**Flash point** : > 200 °C / 392 °F (PMCC / ASTM D93)  
**Upper / lower Flammability or Explosion limits** : Typical 1 - 10 %(V)(based on mineral oil)  
**Auto ignition temperature** : > 320 °C / 608 °F  
**Specific Hazards** : Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Unidentified organic and inorganic compounds.  
**Suitable Extinguishing Media** : Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.  
**Unsuitable Extinguishing Media** : Do not use water in a jet.  
**Protective Equipment for Firefighters** : Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

**6. ACCIDENTAL RELEASE MEASURES**

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal. Observe the relevant local and international regulations.

**Protective measures** : Avoid contact with skin and eyes. Use appropriate containment to avoid environmental contamination. Prevent from spreading

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- or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers.
- Clean Up Methods** : Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.
- Additional Advice** : Local authorities should be advised if significant spillages cannot be contained.

**7. HANDLING AND STORAGE**

- General Precautions** : Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
- Handling** : Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used.
- Storage** : Keep container tightly closed and in a cool, well-ventilated place. Use properly labelled and closeable containers. Store at ambient temperature.
- Recommended Materials** : For containers or container linings, use mild steel or high density polyethylene.
- Unsuitable Materials** : PVC.
- Additional Information** : Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION****Occupational Exposure Limits**

Material	Source	Type	ppm	mg/m3	Notation
Oil mist, mineral	ACGIH	TWA(Inhalable fraction.)		5 mg/m3	
Oil mist, mineral	OSHA Z1	PEL(Mist.)		5 mg/m3	
Oil mist, mineral	OSHA Z1A	TWA(Mist.)		5 mg/m3	
Oil mist, mineral	OSHA Z1	(Mist.)			Listed.

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- Additional Information** : Shell has adopted as Interim Standards the OSHA Z1A values that were established in 1989 and later rescinded.
- Exposure Controls** : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.
- Personal Protective Equipment** : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.
- Respiratory Protection** : No respiratory protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65°C(149 °F)].
- Hand Protection** : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.
- Eye Protection** : Wear safety glasses or full face shield if splashes are likely to occur.
- Protective Clothing** : Skin protection not ordinarily required beyond standard issue work clothes.
- Monitoring Methods** : Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
- Environmental Exposure Controls** : Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

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Appearance	: Brown. Liquid at room temperature.
Odour	: Slight hydrocarbon.
pH	: Not applicable.
Initial Boiling Point and Boiling Range	: > 280 °C / 536 °F estimated value(s)
Pour point	: Typical -18 °C / 0 °F
Flash point	: > 200 °C / 392 °F (PMCC / ASTM D93)
Upper / lower Flammability or Explosion limits	: Typical 1 - 10 %(V) (based on mineral oil)
Auto-ignition temperature	: > 320 °C / 608 °F
Vapour pressure	: < 0.5 Pa at 20 °C / 68 °F (estimated value(s))
Specific gravity	: Typical 0.897 at 15 °C / 59 °F
Density	: Typical 897 kg/m <sup>3</sup> at 15 °C / 59 °F
Water solubility	: Negligible.
n-octanol/water partition coefficient (log Pow)	: > 6 (based on information on similar products)
Kinematic viscosity	: Typical 104 mm <sup>2</sup> /s at 40 °C / 104 °F
Vapour density (air=1)	: > 1 (estimated value(s))
Evaporation rate (nBuAc=1)	: Data not available

**10. STABILITY AND REACTIVITY**

<b>Stability</b>	: Stable.
<b>Conditions to Avoid</b>	: Extremes of temperature and direct sunlight.
<b>Materials to Avoid</b>	: Strong oxidising agents.
<b>Hazardous Decomposition Products</b>	: Hazardous decomposition products are not expected to form during normal storage.

**11. TOXICOLOGICAL INFORMATION**

<b>Basis for Assessment</b>	: Information given is based on data on the components and the toxicology of similar products.
<b>Acute Oral Toxicity</b>	: Expected to be of low toxicity: LD50 > 5000 mg/kg , Rat
<b>Acute Dermal Toxicity</b>	: Expected to be of low toxicity: LD50 > 5000 mg/kg , Rabbit
<b>Acute Inhalation Toxicity</b>	: Not considered to be an inhalation hazard under normal conditions of use.
<b>Skin Irritation</b>	: Expected to be slightly irritating. Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.
<b>Eye Irritation</b>	: Expected to be slightly irritating.
<b>Respiratory Irritation</b>	: Inhalation of vapours or mists may cause irritation.
<b>Sensitisation</b>	: Not expected to be a skin sensitiser.
<b>Repeated Dose Toxicity</b>	: Not expected to be a hazard.
<b>Mutagenicity</b>	: Not considered a mutagenic hazard.
<b>Carcinogenicity</b>	: Product contains mineral oils of types shown to be non-carcinogenic in animal skin-painting studies. Highly refined mineral oils are not classified as carcinogenic by the International Agency for Research on Cancer (IARC). Other components are not known to be associated with carcinogenic

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effects.

- Reproductive and Developmental Toxicity** : Not expected to be a hazard.
- Additional Information** : Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal. ALL used oil should be handled with caution and skin contact avoided as far as possible. Continuous contact with used engine oils has caused skin cancer in animal tests.

**12. ECOLOGICAL INFORMATION**

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.

- Acute Toxicity** : Poorly soluble mixture. May cause physical fouling of aquatic organisms. Expected to be practically non toxic: LL/EL/IL50 > 100 mg/l (to aquatic organisms) LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract. Mineral oil is not expected to cause any chronic effects to aquatic organisms at concentrations less than 1 mg/l.
- Mobility** : Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
- Persistence/degradability** : Expected to be not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.
- Bioaccumulation** : Contains components with the potential to bioaccumulate.
- Other Adverse Effects** : Product is a mixture of non-volatile components, which are not expected to be released to air in any significant quantities. Not expected to have ozone depletion potential, photochemical ozone creation potential or global warming potential.

**13. DISPOSAL CONSIDERATIONS**

- Material Disposal** : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses.
- Container Disposal** : Dispose in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
- Local Legislation** : Disposal should be in accordance with applicable regional, national, and local laws and regulations.

## Material Safety Data Sheet

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### 14. TRANSPORT INFORMATION

#### US Department of Transportation Classification (49CFR)

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

#### IMDG

This material is not classified as dangerous under IMDG regulations.

#### IATA (Country variations may apply)

This material is either not classified as dangerous under IATA regulations or needs to follow country specific requirements.

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### 15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

#### Federal Regulatory Status

##### Notification Status

EINECS	All components listed or polymer exempt.
TSCA	All components listed.
DSL	All components listed.

Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA.

##### SARA Hazard Categories (311/312)

No SARA 311/312 Hazards.

#### State Regulatory Status

##### California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

## Material Safety Data Sheet

This material does not contain any chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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### 16. OTHER INFORMATION

- NFPA Rating (Health, Fire, Reactivity)** : 0, 1, 0
- MSDS Version Number** : 8.2
- MSDS Effective Date** : 03/07/2012
- MSDS Revisions** : A vertical bar (|) in the left margin indicates an amendment from the previous version.
- MSDS Regulation** : The content and format of this MSDS is in accordance with the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
- MSDS Distribution** : The information in this document should be made available to all who may handle the product.
- Disclaimer** : The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.



Crude Logistics

# MATERIAL SAFETY DATA SHEET NO. 2 DIESEL FUEL, LOW SULFUR, ALL GRADES

Prepared according to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH regulations

## SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **NO.2 DIESEL FUEL, LOW SULFUR, ALL GRADES**  
 CHEMICAL FAMILY NAME: Diesel Fuel  
 U.N. NUMBER: NA 1993  
 U.N. DANGEROUS GOODS CLASS: Diesel Fuel, Class 3, Combustible Liquid with flash point greater than 100°F  
 SUPPLIER/MANUFACTURER'S NAME: **NGL Crude Logistics, LLC.**  
 ADDRESS: 2900 North Loop West Suite 1250, Houston, TX 77092 USA  
**EMERGENCY PHONE: TOLL-FREE in USA/Canada** 800-424-9300 Chemtrec  
 BUSINESS PHONE: 713-730-7320 (Product Information)  
 WEB SITE: [www.nglep.com](http://www.nglep.com)  
 DATE OF PREPARATION: January 3, 2012  
 DATE OF LAST REVISION: New

## SECTION 2 - HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW:

**Product Description:** This product is a transparent, clear to yellow or red liquid with a characteristic or kerosene-like odor.  
**Health Hazards:** Harmful if swallowed – may enter lungs if swallowed or vomited. May cause irritation to eyes upon contact. Vapors from heated product may cause respiratory irritation.  
**Flammability Hazards:** Combustible liquid with a flash point of 52°C (125.6°F)  
**Reactivity Hazards:** This product is not reactive.  
**Environmental Hazards:** Release of the product may cause adverse effects to the aquatic environment.  
**Emergency Recommendations:** Emergency responders must have personal protective equipment and fire protection appropriate for the situation to which they are responding.

### US DOT SYMBOLS



### CANADA (WHMIS) SYMBOLS



### EUROPEAN and (GHS) Hazard Symbols



Signal Word: **Warning!**

### EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1

EC# 270-676-1 Annex 1 Index# 649-227-00-2

### GHS Hazard Classification(s):

Carcinogen Category 2  
Aspiration Toxicity Category 2

### Hazard Statement(s):

H304: May be fatal if swallowed and enters the airways  
H320: Causes eye irritation  
H335: May cause respiratory irritation

### Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray  
P264: Wash hands thoroughly after handling  
P280: Wear protective gloves/protective clothing/eye protection/face protection

### EU HAZARD CLASSIFICATION PER DIRECTIVE 1999/45/EC:

[Xn] Harmful

### Risk Phrases:

R20: Harmful if swallowed  
R40: Limited evidence of carcinogenic effects  
R65: Harmful: may cause lung damage if swallowed

### Safety Phrases:

S37/39: Wear suitable gloves and eye/face protection  
S45: In case of an accident or if you feel unwell, seek medical advice immediately  
S62: If swallowed do not induce vomiting

# MATERIAL SAFETY DATA SHEET

## NO. 2 DIESEL FUEL, LOW SULFUR, ALL GRADES

### HEALTH HAZARDS OR RISKS FROM EXPOSURE:

#### ACUTE:

**INHALATION:** Negligible unless heated to produce vapors. Vapors or finely misted materials may irritate the mucous membranes and cause irritation, dizziness, and nausea.

**EYE CONTACT:** May cause eye irritation with tearing, redness or stinging. High vapor concentrations may cause irritation.

**SKIN CONTACT:** Prolonged or repeated contact is not likely to cause significant skin irritation.

**INGESTION:** Harmful if swallowed - may enter lungs if swallowed or vomited.

#### CHRONIC:

Secondary effects of ingestion and subsequent aspiration into the lungs may cause pneumatocele (lung cavity) formation and chronic lung dysfunction.

**TARGET ORGANS:** ACUTE: Eye, Respiratory

CHRONIC: None known

### SECTION 3 - COMPOSITION AND INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Diesel Fuel No.2	68476-34-6	270-676-1	1561	100%	HAZARD CLASSIFICATION: Carc Cat 3, [Xn] Harmful RISK PHRASES: R40
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

**NOTE:** ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the 29 CFR 1200 and the MSDS contains all the information required by the 29 CFR 1200, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

### SECTION 4 - FIRST-AID MEASURES

**EYE CONTACT:** If product enters the eyes, hold eyes open while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

**SKIN CONTACT:** Wash skin thoroughly after handling product. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder clothing before re-use.

**INHALATION:** If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing difficulty continues.

**INGESTION:** If product is swallowed, call physician or poison control center for most current response information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Take a copy of the label and/or MSDS with the victim to the health professional.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** Pre-existing respiratory system or eye problems may be aggravated by prolonged contact.

**RECOMMENDATIONS TO PHYSICIANS:** Treat symptoms and eliminate over exposure.

### SECTION 5 - FIRE-FIGHTING MEASURES

**FLASH POINT:**

125.6°F (52°C) (Pensky-Martens closed cup)

**AUTOIGNITION TEMPERATURE:**

>489°F (>254°C)

**FLAMMABLE LIMITS (in air by volume, %):**

Lower (LEL): 0.6% Upper (UEL): 7.5%

**FIRE EXTINGUISHING MATERIALS:**

Extinguish with foam, carbon dioxide, dry powder or water fog.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:**

Combustible liquid! This material releases vapors when heated above ambient temperatures.

**SPECIAL FIRE-FIGHTING PROCEDURES:**

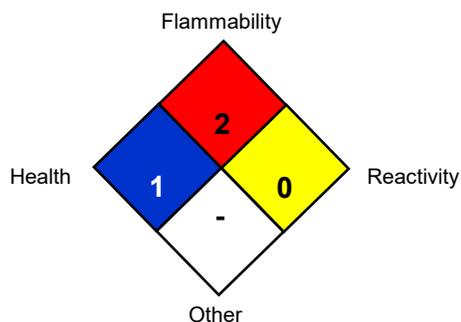
Incipient fire responders should wear eye protection. Structural firefighters must wear self-contained breathing apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done

# MATERIAL SAFETY DATA SHEET

## NO. 2 DIESEL FUEL, LOW SULFUR, ALL GRADES

without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

### NFPA RATING SYSTEM



### HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD (BLUE)			2
FLAMMABILITY HAZARD (RED)			2
PHYSICAL HAZARD (YELLOW)			0
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8
For Routine Industrial Use and Handling Applications			

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe \* = Chronic hazard

## SECTION 6 - ACCIDENTAL RELEASE MEASURES

**SPILL AND LEAK RESPONSE:** Personnel should be trained for spill response operations.

**SPILLS:** Contain spill if safe to do so. Small Liquid Spills: Absorb with sand or other non-combustible absorbent material. Large Spillages: Use water spray to disperse vapors and dilute spill to a nonflammable mixture.

Prevent runoff from entering drains, sewers, or streams. Dike for later disposal. Dispose of in accordance with applicable federal, state, and local procedures (see Section 13, Disposal Considerations).

## SECTION 7 - HANDLING AND STORAGE

**WORK PRACTICES AND HYGIENE PRACTICES:** As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing vapors/mists generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

**STORAGE AND HANDLING PRACTICES:** Do not breathe mist or vapor. Do not get in eyes. Use only with adequate ventilation. Keep away from heat, sparks, and flame. Keep container tightly closed and in a well-ventilated place. Use caution when storing or processing at temperatures above 151°C.

## SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

### EXPOSURE LIMITS/GUIDELINES:

CHEMICAL NAME	CAS#	ACGIH TLV	OSHA TWA
Diesel Fuel No.2	68476-34-6	100 mg/m <sup>3</sup> Skin	Not Listed

Currently, international exposure limits are established for the components of this product. Please check with competent authority in each country for the most recent limits.

**VENTILATION AND ENGINEERING CONTROLS:** Use with adequate ventilation to ensure exposure levels are maintained below the exposure limits provided above. Use local exhaust ventilation to control airborne vapor. Ensure eyewash/safety shower stations are available near areas where this product is used.

*The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.*

# MATERIAL SAFETY DATA SHEET

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**RESPIRATORY PROTECTION:** Maintain airborne contaminant concentrations below exposure limit guidelines listed above. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or by EU member states.

**EYE PROTECTION:** Use safety glasses or chemical goggles as appropriate to prevent eye contact. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

**HAND PROTECTION:** Use chemical resistant gloves to prevent skin contact. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

**BODY PROTECTION:** Use body protection appropriate to prevent contact as appropriate for task (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

### SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

<b>PHYSICAL STATE:</b>	Liquid
<b>APPEARANCE &amp; ODOR:</b>	Transparent, clear to yellow or red color with characteristic or kerosene-like odor.
<b>ODOR THRESHOLD (PPM):</b>	Mild
<b>VAPOR PRESSURE (mmHg):</b>	<2 mm Hg @ 20°C
<b>VAPOR DENSITY (AIR=1):</b>	AP 5
<b>EVAPORATION RATE (nBuAc = 1):</b>	Not Available
<b>BOILING POINT (C°):</b>	>154°C (>309°F)
<b>FREEZING POINT (C°):</b>	Not Available
<b>pH:</b>	Not Applicable
<b>SPECIFIC GRAVITY 20°C: (WATER =1)</b>	0.84
<b>SOLUBILITY IN WATER (%):</b>	Slight
<b>VOC%:</b>	840 g/l VOC (w/v)

### SECTION 10 – STABILITY AND REACTIVITY

**STABILITY:** Product is stable

**DECOMPOSITION PRODUCTS:** None known

**MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:** Strong oxidizing agents, acids

**HAZARDOUS POLYMERIZATION:** Will not occur

**CONDITIONS TO AVOID:** Contact with incompatible materials

### SECTION 11 - TOXICOLOGICAL INFORMATION

**TOXICITY DATA:** The following toxicity data is available for this product:

CAS# 68476-34-6 Oral LD 50 12,000 mg/kg Rat

**SUSPECTED CANCER AGENT:** None of the ingredients of this product are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore are not considered to be, or suspected to be cancer-causing agents by these agencies.

**IRRITANT INFORMATION:** Vapors from this product can be irritating to eyes and respiratory system.

**SENSITIZER INFORMATION:** This product is not considered a sensitizer.

**REPRODUCTIVE TOXICITY INFORMATION:** There is no evidence that this product may cause reproductive effects.

### SECTION 12 - ECOLOGICAL INFORMATION

**ENVIRONMENTAL STABILITY:** This product is biodegradable

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** This material has not been tested for its effects on plants and animals.

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** This material has not been tested for effects on aquatic life.

# MATERIAL SAFETY DATA SHEET

## NO. 2 DIESEL FUEL, LOW SULFUR, ALL GRADES

### SECTION 13 - DISPOSAL CONSIDERATIONS

**WASTE DISPOSAL:** Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

### SECTION 14 - TRANSPORTATION INFORMATION

**THIS PRODUCT IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.**

**PROPER SHIPPING NAME:** Diesel Fuel, Combustible Liquid

**HAZARD CLASS NUMBER and DESCRIPTION:** Class 3, Combustible Liquid with a flash point greater than 100°F

**UN IDENTIFICATION NUMBER:** NA 1993

**PACKING GROUP:** PGIII

**DOT LABEL(S) REQUIRED:** Class 3 Flammable

**NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004):** 128

**MARINE POLLUTANT:** Product or ingredients are not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

**U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:**

This product is classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

**TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:**

This product is classified as Dangerous Goods, per regulations of Transport Canada.

**INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):**

This product is classified as Dangerous Goods, by rules of IATA

**INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:**

This product is classified as Dangerous Goods by the International Maritime Organization.

**EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):**

This product is classified by the United Nations Economic Commission for Europe to be dangerous goods.

### SECTION 15 - REGULATORY INFORMATION

**UNITED STATES REGULATIONS:**

**SARA REPORTING REQUIREMENTS:** This product is subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) as follows:

SARA 313 Reporting Naphthalene CAS# 91-20-3 <2%, Ethylbenzene CAS# 100-41-4 <0.9%

**TSCA:** All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

**SARA 311/312:**

Acute Health: Yes      Chronic Health: No      Fire: Yes      Reactivity: No

**U.S. CERCLA REPORTABLE QUANTITY (RQ):** CERCLA petroleum exemption applies.

**CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):** This product does contain ingredient(s) are on the California Proposition 65 lists.

**WARNING!** This product contains ingredients that are known to the State of California to cause cancer or Reproductive harm.

**CANADIAN REGULATIONS:**

**CANADIAN DSL/NDL INVENTORY STATUS:** All of the components of this product are on the DSL Inventory

**CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:** No component of this product is on the CEPA First Priorities Substance lists.

**CANADIAN WHMIS CLASSIFICATION and SYMBOLS:** This product is categorized as "Not Controlled" as per the Controlled Product regulations

**EUROPEAN ECONOMIC COMMUNITY INFORMATION:**

**EU LABELING AND CLASSIFICATION:**

**Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.**

**AUSTRALIAN INFORMATION FOR PRODUCT:**

**AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS:** All components of this product are listed

# MATERIAL SAFETY DATA SHEET

## NO. 2 DIESEL FUEL, LOW SULFUR, ALL GRADES

on the AICS.

**STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS:** Not applicable.

**JAPANESE INFORMATION FOR PRODUCT:**

**JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS:** The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

**INTERNATIONAL CHEMICAL INVENTORIES:**

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory of Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

### SECTION 16 - OTHER INFORMATION

**PREPARED BY:** Paul Eigbrett

MSDS Authoring PLUS

**Disclaimer:** To the best of NGL Crude Logistics LLC's knowledge, the information contained herein is reliable and accurate as of this date; however, NGL Crude Logistics, LLC assumes no liability for the reliability or accuracy of the information contained herein and no warranties of any type either express or implied are provided. Final determination of suitability of any material is the sole responsibility of the user. The information contained herein relates only to this specific product.

**Safety Data Sheets:** Primer Paint; Tuf Coat Paint

**Waste Stream:** Paint/Paint Consumables

**EPA Waste Profile Sheet Number:** 20140506-028

# Safety Data Sheet

Tuff Coat Primer

## SECTION I - IDENTIFICATION

**TUF-COAT**  
MARINE AND INDUSTRIAL  
COATINGS

Lafayette Paint & Supply, Inc.  
150 Commercial Parkway  
Broussard, LA 70518  
(337) 837-5517  
CHEMTREC (CCN16851) :..... (800) 424-9300

**Product Number** LPS74  
**Product Name** Tuff Coat Primer  
**Chemical Family**  
**CAS Number** Multiple  
**Date Prepared** 6/1/2015  
**Revision Number** 9/14/2015

## SECTION II - HAZARDOUS IDENTIFICATION

### GHS CLASSIFICATION:

#### Classification

Flammable Liquids	Category 3
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2B
Acute Toxicity, Inhalation	Category 4
Specific target organ toxicity, single exposure, R	Category 3
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A, 1B
Reproductive Toxicity	Category 2
Specific target organ toxicity, repeated exposure	Category 2

### DANGER!

#### GHS LABEL:



#### Hazard Statements

H226	Flammable liquid and vapor
H315	Causes skin irritation
H320	Causes eye irritation
H332	Harmful if inhaled
H335	May cause respiratory irritation
H341	Suspected of causing genetic defects
H350	May cause cancer

## Safety Data Sheet

### Tuff Coat Primer

- H361 Suspected of damaging fertility or the unborn child  
H373 Causes damage to organs through prolonged or repeated exposure

#### Precautionary Statements

- P201 Obtain special instructions before use.
- P202 Do not handle until all safety precautions have been read and understood.
- P210 Keep away from heat/sparks/open flames/hot surface - No smoking.
- P233 Keep container tightly closed.
- P240 Ground/bond container and receiving equipment.
- P241 Use explosion-proof electrical/ventilating/light/equipment, etc.
- P242 Use only non-sparking tools.
- P243 Take precautionary measures against static discharge.
- P260 Do not breathe dust/fume/gas/mist/vapours/spray.
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
- P264 Wash hands thoroughly after handling.
- P271 Use only outdoors or in a well-ventilated are.
- P280 Wear protective gloves/protective clothing/eye protection/face protection.
- P281 Use personal protective equipment as required.
- P302+352 IF ON SKIN: Wash with soap and water.
- P303+361+353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- p304+340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P305+351+338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so - continue rinsing.
- P308+313 IF exposed or concerned: get medical advice/attention.
- P312 Call a POISON CENTER or a doctor/physician if you feel unwell.
- P314 Get medical advice/attention if you feel unwell.
- P332+313 If skin irritation occurs: get medical advice/attention.
- P337+313 If eye irritation persists get medical advice/attention.
- P362 Take off contaminated clothing and wash before reuse.
- P370+378 In case of fire: Usedry sand, dry chemical, or alcohol-resistant foam for extinction.
- P403+233 Store in a well ventilated place. Keep container tightly closed.
- P403+235 Store in a well ventilated place. Keep cool.

# Safety Data Sheet

## Tuff Coat Primer

P405 Store locked up.

P501 Dispose of contents/container to an approved waste disposal plant.

### SECTION III - COMPOSITION/INFORMATION ON INGREDIENTS

The precise composition of this product is proprietary information. In the event of a medical emergency, a complete disclosure will be provided to medical personnel.

Component Name	CAS #	Component%	OSHA PEL	ACGIH TLV
Ferric Oxide	1309-37-1	20-25	10 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Dimethylbenzene	1330-20-7	40-45	100 ppm	100 ppm
Stoddard Solvent	8052-41-3	0-5	500 ppm	100 ppm
Light Aromatic Solvent Naphtha	64742-95-6	<1	300 ppm	300 ppm

### SECTION IV - FIRST AID MEASURES

**Contact with eyes:** Flush IMMEDIATELY with copious amounts of running water for at least 15 minutes. Take to physician for definitive medical treatment.

**Skin contact:** Wash exposed areas with water and mild soap. Remove contaminated clothing immediately and launder before reuse. If irritations persist, consult a physician.

**Inhalation:** Remove victim to fresh air and keep at rest in a position comfortable for breathing.

**Ingestion:** If swallowed. Do not induce vomiting. Seek immediate medical attention.

### SECTION V - FIREFIGHTING MEASURES

**Suitable Extinguishing Media:** Water fog, foam, dry chemical, or carbon dioxide extinguisher.

**Special Fire Fighting Procedures** Use self-contained breathing apparatus and full bunker gear in fire areas. Evacuate all unprotected personnel from area. Keep containers cool with water fog to minimize swelling taking care not to spread flames with water used for cooling.

**Unusual Fire Fighting Hazards:** Vapor accumulation will flash and/or explode, if ignited. Containers may burst explosively if overheated in fire. Cool with water spray or fog. Empty containers also present fire explosion hazard due to residual vapors. Keep containers tightly closed. During emergency situations, over-exposure to decomposition products may cause a health hazard with no symptoms immediately apparent. Obtain medical attention.

# Safety Data Sheet

## Tuff Coat Primer

### SECTION VI - ACCIDENTAL RELEASE MEASURES

**Personal Precautions:** Keep all sources of ignition and hot metal surfaces away from spill or release.

**Environmental Precautions:** Contain spill if it can be done with minimal risk. Prevent liquid from entering drains, sewers or waterways. Notify proper authorities if spill is in excess of the reportable quantity.

**Methods for Cleaning Up:** Using only non-sparking tools and explosion proof equipment, collect spill on absorbent material and put into approved container. Call Chemtrec at 1-800-424-9300 (CCN16851) for additional information.

### SECTION VII - HANDLING AND STORAGE

**Handling and Storage:**

- "Empty" containers retain residue and/or vapor and may be dangerous. Do not cut, weld, braze solder, drill, grind or expose such containers to heat, flames, sparks, or other ignition sources.
- Keep containers tightly closed when not in use.
- Store out of direct sunlight and in a cool, well-ventilated area.

### SECTION VIII - PRECAUTIONS TO CONTROL EXPOSURE / PERSONAL PROTECTION

#### EXPOSURE LIMITS:

Component Name	CAS #	OSHA PEL	ACGIH TLV
Ferric Oxide	1309-37-1	10 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Dimethylbenzene	1330-20-7	100 ppm	100 ppm
Stoddard Solvent	8052-41-3	500 ppm	100 ppm
Light Aromatic Solvent Naphtha	64742-95-6	300 ppm	300 ppm

**Engineering Controls:** Adequate local or mechanical to reduce vapor or mist to below the PEL or TLV.

**Monitoring:** Follow accepted work practices for handling a flammable material.

#### Personal Protective Equipment (PPE)

**Eye Protection:** Goggles or approved OSHA device with side shields; do not wear contact lenses when handling this product.

**Skin Protection:** Impervious solvent resistant gloves. Impervious apron and work boots recommend where splashing may occur.

**Respiratory Protection:** Use NIOSH/MSHA TC23C Chemical/Mechanical type filter system to remove a combination of particles, gas & vapors or air supplied respirator if necessary in areas where the chemical exposure is unknown or above the OSHA PEL or ACGIH TLV.

# Safety Data Sheet

## Tuff Coat Primer

### SECTION IX - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	All Colors
Odor	Mild
pH@25°C	N/A
Melting/Freezing Point	N/A
Flashpoint	80°F
Specific Gravity	1.34
Solubility	None
Auto-Ignition Temperature	No Data
Decomposition Temperature	No Data
VOC Content	4.55
Odor Threshold	No Data
Boiling Range	281°F
Evaporation Point	Slower Than Ether
Flammable Limits - Upper	7%
Flammable Limits - Lower	1%
Vapor Pressure	2.31mmHg@68°F
Vapor Density (Air=1)	>1
Viscosity	No Data

### SECTION X - STABILITY AND REACTIVITY

**Stability:** Stable, under normal conditions of storage and handling.

**Conditions to Avoid:** Heat, open flames, ignition sources, electrical or static discharge.

**Hazardous Decomposition/Byproducts:** CO<sub>2</sub> and possibly CO and carbon smoke.

**Hazardous Polymerization:** Will not occur.

**Polymerization Conditions to Avoid:** None.

**Incompatibilities:** None known.

# Safety Data Sheet

## Tuff Coat Primer

### SECTION XI - TOXICOLOGICAL INFORMATION

**Likely Route of Exposure:** Inhalation, eye contact, skin contact, ingestion .

**Inhalation:** Anesthetic. Irritation of respiratory tract or acute nervous system depression. Overexposure may result in headaches and nausea possibly followed by loss of consciousness.

**Eye Contact:** High vapor concentrations are irritating to the eyes.

**Skin Contact:** Liquids can be absorbed through the skin resulting in symptoms similar to the inhalation effects above.

**Ingestion:** Gastrointestinal irritation including vomiting can occur. Aspiration of material into lungs may result in chemical pneumonitis, which can be fatal.

**Toxicity:**

Component Name	LD50	LC50
Ferric Oxide	IPR-Rat 5500 mg/kg; IPR-Mus 5400 mg/kg	
Ferric Oxide	IPR-Rat 5500 mg/kg IPR-Mus 5400 mg/kg	
Dimethylbenzene	Oral - rat - 2,840 mg/kg; Dermal - rabbit - 4,500 mg/kg	Inhalation - rat - 4H/6,350 mg/l
Stoddard Solvent	Not Established	Not Established
Light Aromatic Solvent Naphtha	Not Established	Not Established

Reproductive Effects	Teratogenicity	Mutagenicity	Embryotoxicity	Sensitization to Product	Synergistic Products
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

### SECTION XII - ECOLOGICAL INFORMATION

**Ecotoxicity:** Information not available.

**Mobility:** Information not available.

**Degradability:** Information not available.

**BioAccumulation:** Information not available.

# Safety Data Sheet

## Tuff Coat Primer

### SECTION XIII - WASTE DISPOSAL CONSIDERATIONS

Do not discharge into drains, surface water, or groundwater. Empty containers can retain product residue and vapor. Observe all precautions even when containers are empty. The use and processing of this product, or addition of other constituents, may cause it to be considered a hazardous waste. It is the waste generators responsibility to determine if a particular waste is hazardous under RCRA. Dispose of or incinerate in accordance with all applicable local, state, and federal regulations at a RCRA licensed facility.

### SECTION XIV - TRANSPORT INFORMATION

#### DOT SHIPPING INFORMATION

**Proper Shipping Name:** PAINT  
**Contains:** See Section III - Composition/  
**Hazard Class and Label:** 3 FLAMMABLE LIQUID  
**Identification Number:** UN1263  
**Packaging Group:** II

### SECTION XV - REGULATORY INFORMATION

**TSCA STATUS:**.....

#### SARA TITLE III SECTION 302/304 EXTREMELY HAZARDOUS SUBSTANCE:

No chemicals in this material are subject to the reporting requirements.

#### SARA TITLE III SECTION 311/312 HAZARD CATEGORIZATION:

Acute	Chronic	Fire	Pressure	Reactive
X	X	X	N/A	N/A

#### SARA TITLE III SECTION 313 SUPPLIER INFORMATION:

Component Name	CAS #	% by wt.
Dimethylbenzene	1330-20-7	40-45

#### CERCLA SECTION 102(a) HAZARDOUS SUBSTANCE:

Component Name	CAS #	% by wt.	RQ (lbs.)
Dimethylbenzene	1330-20-7	40-45	100

#### CALIFORNIA PROPOSITION 65:

No chemicals in this material are subject to the reporting requirements.

### SECTION XVI - OTHER INFORMATION

**HMIS Health:** ..... 2  
**HMIS Flammability:** ..... 3  
**HMIS Reactivity:** ..... 0

## Safety Data Sheet

### Tuff Coat Primer

**Additional:**

DISCLAIMER: WARNING! KEEP THIS AND ALL PAINT RELATED PRODUCTS OUT OF THE REACH OF CHILDREN! The information contained in this SDS is based on data from sources considered to be reliable but we do not guarantee the accuracy or completeness thereof. We urge each customer or recipient of this SDS to study it carefully to become aware of and understand the hazards associated with this product. The reader should consider consulting reference works or individuals who are experts in ventilation, toxicology, or fire prevention as necessary or appropriate to use and understand the data in this SDS.

# Safety Data Sheet

Tuff Coat Enamel

## SECTION I - IDENTIFICATION

**TUF-COAT**  
MARINE AND INDUSTRIAL  
COATINGS

Lafayette Paint & Supply, Inc.  
150 Commercial Parkway  
Broussard, LA 70518  
(337) 837-5517  
CHEMTREC (CCN16851) :..... (800) 424-9300

**Product Number** LPS 100 Series  
**Product Name** Tuff Coat Enamel  
**Chemical Family**  
**CAS Number** Multiple  
**Date Prepared** 6/1/2015  
**Revision Number** 9/14/2015

## SECTION II - HAZARDOUS IDENTIFICATION

### GHS CLASSIFICATION:

#### Classification

Flammable Liquids	Category 3
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2B
Acute Toxicity, Inhalation	Category 4
Specific target organ toxicity, single exposure, R	Category 3
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A, 1B
Reproductive Toxicity	Category 2
Specific target organ toxicity, repeated exposure	Category 2

### DANGER!

#### GHS LABEL:



#### Hazard Statements

H226	Flammable liquid and vapor
H315	Causes skin irritation
H320	Causes eye irritation
H332	Harmful if inhaled
H335	May cause respiratory irritation
H341	Suspected of causing genetic defects
H350	May cause cancer

## Safety Data Sheet

### Tuff Coat Enamel

- H361 Suspected of damaging fertility or the unborn child  
H373 Causes damage to organs through prolonged or repeated exposure

#### Precautionary Statements

- P201 Obtain special instructions before use.
- P202 Do not handle until all safety precautions have been read and understood.
- P210 Keep away from heat/sparks/open flames/hot surface - No smoking.
- P233 Keep container tightly closed.
- P240 Ground/bond container and receiving equipment.
- P241 Use explosion-proof electrical/ventilating/light/equipment, etc.
- P242 Use only non-sparking tools.
- P243 Take precautionary measures against static discharge.
- P260 Do not breathe dust/fume/gas/mist/vapours/spray.
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
- P264 Wash hands thoroughly after handling.
- P271 Use only outdoors or in a well-ventilated area.
- P280 Wear protective gloves/protective clothing/eye protection/face protection.
- P281 Use personal protective equipment as required.
- P302+352 IF ON SKIN: Wash with soap and water.
- P303+361+353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- p304+340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P305+351+338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so - continue rinsing.
- P308+313 IF exposed or concerned: get medical advice/attention.
- P312 Call a POISON CENTER or a doctor/physician if you feel unwell.
- P314 Get medical advice/attention if you feel unwell.
- P332+313 If skin irritation occurs: get medical advice/attention.
- P337+313 If eye irritation persists get medical advice/attention.
- P362 Take off contaminated clothing and wash before reuse.
- P370+378 In case of fire: Use dry sand, dry chemical, or alcohol-resistant foam for extinction.
- P403+233 Store in a well ventilated place. Keep container tightly closed.
- P403+235 Store in a well ventilated place. Keep cool.

# Safety Data Sheet

## Tuff Coat Enamel

P405 Store locked up.

P501 Dispose of contents/container to an approved waste disposal plant.

### SECTION III - COMPOSITION/INFORMATION ON INGREDIENTS

The precise composition of this product is proprietary information. In the event of a medical emergency, a complete disclosure will be provided to medical personnel.

Component Name	CAS #	Component%	OSHA PEL	ACGIH TLV
Dimethylbenzene	1330-20-7	5-10	100 ppm	100 ppm
Stoddard Solvent	8052-41-3	15-20	500 ppm	100 ppm

### SECTION IV - FIRST AID MEASURES

**Contact with eyes:** Flush IMMEDIATELY with copious amounts of running water for at least 15 minutes. Take to physician for definitive medical treatment.

**Skin contact:** Wash exposed areas with water and mild soap. Remove contaminated clothing immediately and launder before reuse. If irritations persist, consult a physician.

**Inhalation:** Remove victim to fresh air and keep at rest in a position comfortable for breathing.

**Ingestion:** If swallowed. Do not induce vomiting. Seek immediate medical attention.

### SECTION V - FIREFIGHTING MEASURES

**Suitable Extinguishing Media:** Water fog, foam, dry chemical, or carbon dioxide extinguisher.

**Special Fire Fighting Procedures** Use self-contained breathing apparatus and full bunker gear in fire areas. Evacuate all unprotected personnel from area. Keep containers cool with water fog to minimize swelling taking care not to spread flames with water used for cooling.

**Unusual Fire Fighting Hazards:** Vapor accumulation will flash and/or explode, if ignited. Containers may burst explosively if overheated in fire. Cool with water spray or fog. Empty containers also present fire explosion hazard due to residual vapors. Keep containers tightly closed. During emergency situations, over-exposure to decomposition products may cause a health hazard with no symptoms immediately apparent. Obtain medical attention.

# Safety Data Sheet

## Tuff Coat Enamel

### SECTION VI - ACCIDENTAL RELEASE MEASURES

- Personal Precautions:** Keep all sources of ignition and hot metal surfaces away from spill or release.
- Environmental Precautions:** Contain spill if it can be done with minimal risk. Prevent liquid from entering drains, sewers or waterways. Notify proper authorities if spill is in excess of the reportable quantity.
- Methods for Cleaning Up:** Using only non-sparking tools and explosion proof equipment, collect spill on absorbent material and put into approved container. Call Chemtrec at 1-800-424-9300 (CCN16851) for additional information.

### SECTION VII - HANDLING AND STORAGE

- Handling and Storage:**
- "Empty" containers retain residue and/or vapor and may be dangerous. Do not cut, weld, braze solder, drill, grind or expose such containers to heat, flames, sparks, or other ignition sources.
  - Keep containers tightly closed when not in use.
  - Store out of direct sunlight and in a cool, well-ventilated area.

### SECTION VIII - PRECAUTIONS TO CONTROL EXPOSURE / PERSONAL PROTECTION

#### EXPOSURE LIMITS:

Component Name	CAS #	OSHA PEL	ACGIH TLV
Dimethylbenzene	1330-20-7	100 ppm	100 ppm
Stoddard Solvent	8052-41-3	500 ppm	100 ppm

**Engineering Controls:** Adequate local or mechanical to reduce vapor or mist to below the PEL or TLV.

**Monitoring:** Follow accepted work practices for handling a flammable material.

#### Personal Protective Equipment (PPE)

**Eye Protection:** Goggles or approved OSHA device with side shields; do not wear contact lenses when handling this product.

**Skin Protection:** Impervious solvent resistant gloves. Impervious apron and work boots recommend where splashing may occur.

**Respiratory Protection:** Use NIOSH/MSHA TC23C Chemical/Mechanical type filter system to remove a combination of particles, gas & vapors or air supplied respirator if necessary in areas where the chemical exposure is unknown or above the OSHA PEL or ACGIH TLV.

# Safety Data Sheet

## Tuff Coat Enamel

### SECTION IX - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	All Colors
Odor	Mild
pH@25°C	N/A
Melting/Freezing Point	N/A
Flashpoint	80°F
Specific Gravity	0.88
Solubility	None
Auto-Ignition Temperature	No Data
Decomposition Temperature	No Data
VOC Content	4.67
Odor Threshold	No Data
Boiling Range	149-281°F
Evaporation Point	Slower Than Ether
Flammable Limits - Upper	7%
Flammable Limits - Lower	1%
Vapor Pressure	1.54mmHg@68°F
Vapor Density (Air=1)	>1
Viscosity	No Data

### SECTION X - STABILITY AND REACTIVITY

**Stability:** Stable, under normal conditions of storage and handling.

**Conditions to Avoid:** Heat, open flames, ignition sources, electrical or static discharge.

**Hazardous Decomposition/Byproducts:** CO<sub>2</sub> and possibly CO and carbon smoke.

**Hazardous Polymerization:** Will not occur.

**Polymerization Conditions to Avoid:** None.

**Incompatibilities:** None known.

# Safety Data Sheet

## Tuff Coat Enamel

### SECTION XI - TOXICOLOGICAL INFORMATION

**Likely Route of Exposure:** Inhalation, eye contact, skin contact, ingestion .

**Inhalation:** Anesthetic. Irritation of respiratory tract or acute nervous system depression. Overexposure may result in headaches and nausea possibly followed by loss of consciousness.

**Eye Contact:** High vapor concentrations are irritating to the eyes.

**Skin Contact:** Liquids can be absorbed through the skin resulting in symptoms similar to the inhalation effects above.

**Ingestion:** Gastrointestinal irritation including vomiting can occur. Aspiration of material into lungs may result in chemical pneumonitis, which can be fatal.

**Toxicity:**

Component Name	LD50	LC50
Dimethylbenzene	Oral - rat - 2,840 mg/kg; Dermal - rabbit - 4,500 mg/kg	Inhalation - rat - 4H/6,350 mg/l
Stoddard Solvent	Not Established	Not Established

Reproductive Effects	Teratogenicity	Mutagenicity	Embryotoxicity	Sensitization to Product	Synergistic Products
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

### SECTION XII - ECOLOGICAL INFORMATION

**Ecotoxicity:** Information not available.

**Mobility:** Information not available.

**Degradability:** Information not available.

**BioAccumulation:** Information not available.

### SECTION XIII - WASTE DISPOSAL CONSIDERATIONS

Do not discharge into drains, surface water, or groundwater. Empty containers can retain product residue and vapor. Observe all precautions even when containers are empty. The use and processing of this product, or addition of other constituents, may cause it to be considered a hazardous waste. It is the waste generators responsibility to determine if a particular waste is hazardous under RCRA. Dispose of or incinerate in accordance with all applicable local, state, and federal regulations at a RCRA licensed facility.

# Safety Data Sheet

Tuff Coat Enamel

## SECTION XIV - TRANSPORT INFORMATION

### DOT SHIPPING INFORMATION

**Proper Shipping Name:** PAINT  
**Contains:** See Section III - Composition/  
**Hazard Class and Label:** 3 FLAMMABLE LIQUID  
**Identification Number:** UN1263  
**Packaging Group:** II

## SECTION XV - REGULATORY INFORMATION

**TSCA STATUS:**.....

### SARA TITLE III SECTION 302/304 EXTREMELY HAZARDOUS SUBSTANCE:

No chemicals in this material are subject to the reporting requirements.

### SARA TITLE III SECTION 311/312 HAZARD CATEGORIZATION:

Acute	Chronic	Fire	Pressure	Reactive
X	X	X	N/A	N/A

### SARA TITLE III SECTION 313 SUPPLIER INFORMATION:

Component Name	CAS #	% by wt.
Dimethylbenzene	1330-20-7	5-10

### CERCLA SECTION 102(a) HAZARDOUS SUBSTANCE:

Component Name	CAS #	% by wt.	RQ (lbs.)
Dimethylbenzene	1330-20-7	5-10	100

### CALIFORNIA PROPOSITION 65:

No chemicals in this material are subject to the reporting requirements.

## SECTION XVI - OTHER INFORMATION

**HMIS Health:** ..... 2  
**HMIS Flammability:** ..... 3  
**HMIS Reactivity:** ..... 0

**Additional:** DISCLAIMER: WARNING! KEEP THIS AND ALL PAINT RELATED PRODUCTS OUT OF THE REACH OF CHILDREN! The information contained in this SDS is based on data from sources considered to be reliable but we do not guarantee the accuracy or completeness thereof. We urge each customer or recipient of this SDS to study it carefully to become aware of and understand the hazards associated with this product. The reader should consider consulting reference works or individuals who are experts in ventilation, toxicology, or fire prevention as necessary or appropriate to use and understand the data in this SDS.

**Safety Data Sheet**  
Tuff Coat Enamel

**Safety Data Sheets:** Shell Tellus S2; Ethylene Glycol; Monoethylene Glycol (MEG)

**Waste Stream:** Hydraulic Oil/Glycol

**EPA Waste Sheet Profile Number:** 20145060-036

# Safety Data Sheet

acc. to OSHA HCS

Printing date 07/03/2017

Reviewed on 06/29/2017

## 1 Identification

- **Product identifier**
- **Trade name:** Ethylene Glycol
- **Article number:** 152-55-4
- **CAS Number:**  
107-21-1
- **EC number:**  
203-473-3
- **Index number:**  
603-027-00-1
- **Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**  
OFI Testing Equipment Inc.  
11302 Steeplecrest Dr.  
Houston, TX 77065  
(877) 837-8683
- **Information department:** techservices@ofite.com
- **Emergency telephone number:**  
INFOTRAC USA - CANADA: 1-800-535-5053  
INTERNATIONAL: 1-352-323-3500



## 2 Hazard(s) identification

- **Classification of the substance or mixture**



GHS07

Acute Tox. 4 H302 Harmful if swallowed.

- **Label elements**
- **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).
- **Hazard pictograms**



GHS07

- **Signal word** Warning
- **Hazard statements**  
Harmful if swallowed.
- **Precautionary statements**  
Wash thoroughly after handling.  
Do not eat, drink or smoke when using this product.  
IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.  
Rinse mouth.  
Dispose of contents/container in accordance with local/regional/national/international regulations.
- **Classification system:**
- **NFPA ratings (scale 0 - 4)**



Health = 0  
Fire = 1  
Reactivity = 0

(Contd. on page 2)

US

# Safety Data Sheet

acc. to OSHA HCS

Printing date 07/03/2017

Reviewed on 06/29/2017

Trade name: Ethylene Glycol

(Contd. of page 1)

- **HMIS-ratings (scale 0 - 4)**

HEALTH	2	Health = 2
FIRE	1	Fire = 1
REACTIVITY	0	Reactivity = 0

- **Other hazards**
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.

### 3 Composition/information on ingredients

- **Chemical characterization: Substances**
- **CAS No. Description**  
107-21-1 Ethylene Glycol
- **Identification number(s)**
- **EC number:** 203-473-3
- **Index number:** 603-027-00-1

### 4 First-aid measures

- **Description of first aid measures**
- **General information:**  
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
- **After inhalation:** Supply fresh air; consult doctor in case of complaints.
- **After skin contact:** Generally the product does not irritate the skin.
- **After eye contact:** Rinse opened eye for several minutes under running water.
- **After swallowing:** Immediately call a doctor.
- **Information for doctor:**
- **Most important symptoms and effects, both acute and delayed** No further relevant information available.
- **Indication of any immediate medical attention and special treatment needed**  
No further relevant information available.

### 5 Fire-fighting measures

- **Extinguishing media**
- **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
- **Special hazards arising from the substance or mixture** No further relevant information available.
- **Advice for firefighters**
- **Protective equipment:** No special measures required.

### 6 Accidental release measures

- **Personal precautions, protective equipment and emergency procedures** Not required.
- **Environmental precautions:**  
Dilute with plenty of water.  
Do not allow to enter sewers/ surface or ground water.
- **Methods and material for containment and cleaning up:**  
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).

(Contd. on page 3)

US

# Safety Data Sheet

acc. to OSHA HCS

Printing date 07/03/2017

Reviewed on 06/29/2017

**Trade name:** Ethylene Glycol

(Contd. of page 2)

Dispose contaminated material as waste according to item 13.

· **Reference to other sections**

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

· **Protective Action Criteria for Chemicals**

· **PAC-1:** 30 ppm

· **PAC-2:** 150 ppm

· **PAC-3:** 900 ppm

## 7 Handling and storage

· **Handling:**

· **Precautions for safe handling** No special precautions are necessary if used correctly.

· **Information about protection against explosions and fires:** No special measures required.

· **Conditions for safe storage, including any incompatibilities**

· **Storage:**

· **Requirements to be met by storerooms and receptacles:** No special requirements.

· **Information about storage in one common storage facility:** Not required.

· **Further information about storage conditions:** None.

· **Specific end use(s)** No further relevant information available.

## 8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**

**CAS: 107-21-1 Ethylene Glycol**

TLV Short-term value: NIC-127\* NIC-10\*\* mg/m<sup>3</sup>, NIC-50\* ppm

Long-term value: NIC-63.5\* mg/m<sup>3</sup>, NIC-25\* ppm

Ceiling limit value: (100) mg/m<sup>3</sup>

(H); \*inh. fraction + vapor, P: \*\*inh. fraction, H

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**

· **Personal protective equipment:**

· **General protective and hygienic measures:**

Keep away from foodstuffs, beverages and feed.

Wash hands before breaks and at the end of work.

· **Breathing equipment:** Not required.

· **Protection of hands:**

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.

Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.

Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

· **Material of gloves**

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.

· **Penetration time of glove material**

The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

(Contd. on page 4)

US

# Safety Data Sheet

acc. to OSHA HCS

Printing date 07/03/2017

Reviewed on 06/29/2017

Trade name: Ethylene Glycol

(Contd. of page 3)

- **Eye protection:** Goggles recommended during refilling.
- **Body protection:** Protective work clothing

## 9 Physical and chemical properties

### · Information on basic physical and chemical properties

#### · General Information

#### · Appearance:

<b>Form:</b>	Liquid
<b>Color:</b>	Colorless
<b>Odor:</b>	Sweetish
<b>Odor threshold:</b>	Not determined.

· **pH-value:** Not determined.

#### · Change in condition

<b>Melting point/Melting range:</b>	-12.4 °C (10 °F)
<b>Boiling point/Boiling range:</b>	197 °C (387 °F)

· **Flash point:** 111 °C (232 °F)

· **Flammability (solid, gaseous):** Not applicable.

· **Ignition temperature:** 410 °C (770 °F)

· **Decomposition temperature:** Not determined.

· **Auto igniting:** Not determined.

· **Danger of explosion:** Product does not present an explosion hazard.

#### · Explosion limits:

<b>Lower:</b>	3.2 Vol %
<b>Upper:</b>	53 Vol %

· **Vapor pressure at 20 °C (68 °F):** 0.08 hPa

· **Density at 20 °C (68 °F):** 1.11 g/cm<sup>3</sup> (9.263 lbs/gal)

· **Relative density** Not determined.

· **Vapor density** Not determined.

· **Evaporation rate** Not determined.

#### · Solubility in / Miscibility with

**Water at 20 °C (68 °F):** 1 g/l

· **Partition coefficient (n-octanol/water):** Not determined.

#### · Viscosity:

<b>Dynamic at 20 °C (68 °F):</b>	21 mPas
<b>Kinematic:</b>	Not determined.

· **Other information** No further relevant information available.

## 10 Stability and reactivity

- **Reactivity** No further relevant information available.
- **Chemical stability**
- **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
- **Possibility of hazardous reactions** No dangerous reactions known.

(Contd. on page 5)

US

# Safety Data Sheet

## acc. to OSHA HCS

Printing date 07/03/2017

Reviewed on 06/29/2017

**Trade name:** Ethylene Glycol

(Contd. of page 4)

- **Conditions to avoid** No further relevant information available.
- **Incompatible materials:** No further relevant information available.
- **Hazardous decomposition products:** No dangerous decomposition products known.

### 11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**

Oral	LD50	5840 mg/kg (rat)
Dermal	LD50	9530 mg/kg (rabbit)

- **Primary irritant effect:**
- **on the skin:** No irritant effect.
- **on the eye:** No irritating effect.
- **Sensitization:** No sensitizing effects known.
- **Additional toxicological information:**
- **Carcinogenic categories**
- **IARC (International Agency for Research on Cancer)** Substance is not listed.
- **NTP (National Toxicology Program)** Substance is not listed.
- **OSHA-Ca (Occupational Safety & Health Administration)** Substance is not listed.

### 12 Ecological information

- **Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **Persistence and degradability** No further relevant information available.
- **Behavior in environmental systems:**
- **Bioaccumulative potential** No further relevant information available.
- **Mobility in soil** No further relevant information available.
- **Additional ecological information:**
- **General notes:**
- Water hazard class 1 (Assessment by list): slightly hazardous for water
- Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Other adverse effects** No further relevant information available.

### 13 Disposal considerations

- **Waste treatment methods**
- **Recommendation:**
- Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
- **Uncleaned packagings:**
- **Recommendation:** Disposal must be made according to official regulations.
- **Recommended cleansing agent:** Water, if necessary with cleansing agents.

US

(Contd. on page 6)

# Safety Data Sheet

acc. to OSHA HCS

Printing date 07/03/2017

Reviewed on 06/29/2017

Trade name: Ethylene Glycol

(Contd. of page 5)

## 14 Transport information

· UN-Number	
· DOT, ADN, IMDG, IATA	Not regulated
· UN proper shipping name	
· DOT, ADN, IMDG, IATA	Not regulated
· Transport hazard class(es)	
· DOT, ADN, IMDG, IATA	
· Class	Not regulated
· Packing group	
· DOT, IMDG, IATA	Not regulated
· Environmental hazards:	
· Marine pollutant:	No
· Special precautions for user	Not applicable.
· Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
· Transport/Additional information:	
· DOT	
· Hazardous substance:	5000 lbs, 2270 kg
· UN "Model Regulation":	Not regulated

## 15 Regulatory information

- Safety, health and environmental regulations/legislation specific for the substance or mixture
- Sara
- Section 355 (extremely hazardous substances): Substance is not listed.
- Section 313 (Specific toxic chemical listings): Substance is listed.
- TSCA (Toxic Substances Control Act): Substance is listed.
- Proposition 65
- Chemicals known to cause cancer: Substance is not listed.
- Chemicals known to cause reproductive toxicity for females: Substance is not listed.
- Chemicals known to cause reproductive toxicity for males: Substance is not listed.
- Chemicals known to cause developmental toxicity: Substance is listed.
- Carcinogenic categories
- EPA (Environmental Protection Agency) Substance is not listed.
- TLV (Threshold Limit Value established by ACGIH) A4
- NIOSH-Ca (National Institute for Occupational Safety and Health) Substance is not listed.
- GHS label elements The substance is classified and labeled according to the Globally Harmonized System (GHS).
- Hazard pictograms



GHS07

- Signal word Warning

(Contd. on page 7)

US

# Safety Data Sheet

acc. to OSHA HCS

Printing date 07/03/2017

Reviewed on 06/29/2017

**Trade name: Ethylene Glycol**

(Contd. of page 6)

- **Hazard statements**  
Harmful if swallowed.
- **Precautionary statements**  
Wash thoroughly after handling.  
Do not eat, drink or smoke when using this product.  
IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.  
Rinse mouth.  
Dispose of contents/container in accordance with local/regional/national/international regulations.
- **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

## 16 Other information

*This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.*

- **Department issuing SDS:** Environment protection department.
- **Contact:**
- **Date of preparation / last revision**  
Revision 0.1, 5-01-2015: revised to correct emergency contact and information dept. . STN  
Creation date for SDS 10-02-2014. STN  
Revision 0.2, 07-03-2017: Reviewed SDS. STN  
07/03/2017 / -
- **Abbreviations and acronyms:**  
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)  
IMDG: International Maritime Code for Dangerous Goods  
DOT: US Department of Transportation  
IATA: International Air Transport Association  
ACGIH: American Conference of Governmental Industrial Hygienists  
EINECS: European Inventory of Existing Commercial Chemical Substances  
CAS: Chemical Abstracts Service (division of the American Chemical Society)  
NFPA: National Fire Protection Association (USA)  
HMIS: Hazardous Materials Identification System (USA)  
LC50: Lethal concentration, 50 percent  
LD50: Lethal dose, 50 percent  
PBT: Persistent, Bioaccumulative and Toxic  
vPvB: very Persistent and very Bioaccumulative  
NIOSH: National Institute for Occupational Safety  
OSHA: Occupational Safety & Health  
TLV: Threshold Limit Value  
PEL: Permissible Exposure Limit  
REL: Recommended Exposure Limit  
Acute Tox. 4: Acute toxicity – Category 4

US



## Safety Data Sheet MONOETHYLENE GLYCOL (MEG)

### 1. Identification of the substance/mixture and of the company/undertaking

#### 1.1 Product identifier

**Product name** MONOETHYLENE GLYCOL (MEG)  
**Product code** PID1081  
**Country Limitations** This SDS is not for use in the European Union (EU).  
**Synonyms** MONOETHYLENE GLYCOL 100%,  
MEG 100%  
**Molecular weight** 62.06 g/mol

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Commercial chemical

**Uses advised against** None known.

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
SMI Oilfield Technology & Products FZE  
P.O Box 17120  
Jebel Ali  
Dubai  
UAE  
+97 14 8833100  
+97 14 8837197

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

##### GHS Classification

##### Health hazards

Acute toxicity - Oral	Category 4
Specific target organ toxicity - Repeated exposure	Category 2

**Environmental hazards** Not classified

Physical Hazards Not classified

## 2.2 Label elements



**Signal word**  
WARNING

### Hazard Statements

H302 - Harmful if swallowed

H373 - May cause damage to organs through prolonged or repeated exposure

### Precautionary statements

P260 - Do not breathe dust/fume/gas/mist/vapors/spray

P264 - Wash face, hands and any exposed skin thoroughly after handling

P270 - Do not eat, drink or smoke when using this product

P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

P330 - Rinse mouth

P314 - Get medical advice/attention if you feel unwell

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

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### Contains

Ethylene Glycol

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

## 3. Composition/information on ingredients

### 3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Ethylene Glycol	203-473-3	107-21-1	60-100

### 3.2 Mixtures

Not applicable

## 4. First Aid Measures

### 4.1 First aid measures

#### Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

#### Ingestion

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

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<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Extinguishing media - small fires, Dry powder,  
, Extinguishing media - large fires, Water spray, fog or regular foam.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (COx).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

## **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

## **6.3 Methods and material for containment and cleaning up**

### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

### **Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

## **6.4 Reference to other sections**

See section 13 for more information.

# **7. Handling and Storage**

## **7.1 Precautions for safe handling**

### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

### **Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

## **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid excessive heat for prolonged periods of time. Avoid contact with: Oxidizing agents

**Storage class** Chemical storage.

**Packaging materials** Use specially constructed containers only.

# **8. Exposure controls/personal protection**

## **8.1 Control parameters**

### **Component Information**

<b>Chemical Name</b>	<b>Arabic</b>	<b>Australia</b>	<b>Egypt</b>
Ethylene Glycol	Not determined	40ppmSTELvapour 104mg/m <sup>3</sup> STELvapour 10mg/m <sup>3</sup> TWAparticulate 20ppmTWA vapour 52mg/m <sup>3</sup> TWA vapour	39.4 ppm Ceiling 100 mg/m <sup>3</sup> Ceiling
<b>Chemical Name</b>	<b>India</b>	<b>Indonesian</b>	<b>Japan</b>
Ethylene Glycol	Not determined	100 mg/m <sup>3</sup> STEL	Not determined

Chemical Name	Kazakhstan	Kuwait	New Zealand
Ethylene Glycol	5 mg/m <sup>3</sup> MAC	100 mg/m <sup>3</sup> STEL	50 ppm Ceiling mist and vapour 127 mg/m <sup>3</sup> Ceiling mist and vapour
Chemical Name	Malaysia	Philippines	Russia
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m <sup>3</sup> Ceiling aerosol	Not determined	10 mg/m <sup>3</sup> STEL 5 mg/m <sup>3</sup> TWA
Chemical Name	Thailand	Vietnam	Turkey
Ethylene Glycol	Not determined	10 mg/m <sup>3</sup> TWA 60 mg/m <sup>3</sup> TWA 20 mg/m <sup>3</sup> STEL 125 mg/m <sup>3</sup> STEL	40 ppm STEL 104 mg/m <sup>3</sup> STEL Skin 20 ppm TWA 52 mg/m <sup>3</sup> TWA

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation

### Personal protective equipment

#### Eye protection

Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

#### Hand protection

Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training

Use protective gloves made of: Nitrile Neoprene Butyl rubber

Break through time >480 minutes

Glove thickness 0.4 mm

Be aware that liquid may penetrate the gloves. Frequent change is advisable.

#### Respiratory protection

No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

#### Skin and body protection

Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

#### Hygiene Measures

Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use



### 8.2.3 Environmental exposure controls

#### Environmental exposure

Use appropriate containment to avoid environmental contamination See section 6 for more information

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

#### Physical state

Liquid

Appearance	Clear
Odor	Mild
Color	Colorless
Odor threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	6 - 7.5	@ 10%
Melting / freezing point	< -12 °C / 10.4 °F	
Boiling point/range	196 - 199 °C / 384.8 - 390.2 °F	
Flash point	111 °C / 231.8 °F	Closed cup
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	28 %	
Lower flammability limit	3.2 %	
Vapor pressure	0.007 kPa	@ 20 °C
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	410 °C / 770 °F	
Decomposition temperature	No information available	
Kinematic viscosity	21 mPas	@ 20 °C
Dynamic viscosity	No information available	
log Pow	-1.36	
Explosive properties	Not applicable	
Oxidizing properties	None known.	

## 9.2 Other information

Pour point	No information available
Molecular weight	62.06 g/mol
VOC content(%)	None
Density	1.11 ± 0.03 g/ml @ 25°C

### Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### Hazardous polymerization

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time.

**10.5 Incompatible materials**

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological Information

**11.1 Information on toxicological effects****Acute toxicity**

<b>Inhalation</b>	Vapors may irritate throat and respiratory system. May cause additional affects as listed under "Ingestion".
<b>Eye contact</b>	Contact with eyes may cause irritation.
<b>Skin contact</b>	May be absorbed through the skin in harmful amounts. Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Harmful if swallowed. May cause damage to organs through prolonged or repeated exposure.
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene Glycol	= 7712 mg/kg (Rat) ECHA Data	> 3500 mg/kg (Mouse) ECHA Data	> 2.5 mg/l (Rat) 6 hour ECHA Data

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Skin contact. Ingestion. Inhalation.
<b>Routes of entry</b>	Skin contact. Skin absorption. Ingestion.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Kidney.
<b>Aspiration hazard</b>	Not applicable.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

## 12. Ecological Information

### 12.1 Toxicity

Listed on PLONOR list of OSPAR

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

#### Toxicity to algae

See component information below.

#### Toxicity to fish

See component information below.

#### Toxicity to daphnia and other aquatic invertebrates

See component information below.

#### Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylene Glycol	40000 - 60000 mg/L LC50 (Pimephales promelas) = 96 h  40761 mg/L LC50 (Oncorhynchus mykiss) = 96 h  27540 mg/L LC50 (Lepomis macrochirus) = 96 h  14 - 18 mL/L LC50 (Oncorhynchus mykiss) = 96 h  16000 mg/L LC50 (Poecilia reticulata) = 96 h  41000 mg/L LC50 (Oncorhynchus mykiss) = 96 h	6500 - 13000 mg/L EC50 (Pseudokirchneriella subcapitata) = 96 h	46300 mg/L EC50 (Daphnia magna) = 48 h

### 12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Ethylene Glycol	Readily biodegradable

### 12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Ethylene Glycol	log Pow -1.36(Calculated) Not likely to bioaccumulate

#### log Pow

-1.36

**12.4 Mobility****Mobility**

Soluble in water.

**Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal considerations****13.1 Waste treatment methods**

**Waste from residues / unused products** Dispose of in accordance with local regulations.

**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information****14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG/ANTAQ Hazard class** Not regulated

**ICAO/ANAC Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing group** Not regulated

**IMDG/ANTAQ Packing group** Not regulated

**ICAO/ANAC Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code.

Proper Shipping Name: Ethylene glycol. Ship Type:- 3. Pollution Category:- Y.

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory information****15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture****The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)****Australian Standard for the Uniform Scheduling of Drugs and Poisons**

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene Glycol

Schedule 6

Schedule 5

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

This SDS is not for use in the European Union (EU).

**16. Other Information**

**Prepared by** Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam

**Supersedes Date:** 17-Dec-2014

**Revision date** 19-Mar-2018

**Version** 10

**This SDS has been revised in the following section(s)** All sections No changes with regard to classification have been made.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Follow general hygiene considerations recognized as common good workplace practices

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

**Safety Data Sheet (SDS)**

Effective Date: November 1, 2017

**1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING**

**Material Name** : SHELL TELLUS S2 M 22,32,46,68  
**Recommended Use** : Hydraulic oil.  
**Restricted Use** : Other than those above.  
**Manufacturer/Supplier** : Shell Lubricants Japan K.K.  
 3-2, Daiba 2-chome, Minato-ku, Tokyo, 135-8074, Japan  
**Telephone/Fax** : Refer to end of this document.  
**Emergency Telephone Number** : Refer to end of this document. (Japanese office hours only)  
 Quality Assurance Division  
**SDS Code** : 463030

**2. HAZARDS IDENTIFICATION**

**GHS Classification** : NOT HAZARDOUS  
**GHS Label Elements**  
**Symbol(s)** : No symbol  
**Signal Words** : No signal word  
**Hazard Statement** : Not classified under GHS criteria.  
**GHS Precautionary Statements**  
**Prevention** : No precautionary phrases.  
**Response** : No precautionary phrases.  
**Storage** : No precautionary phrases.  
**Disposal** : No precautionary phrases.  
**Unclassified Hazard Information** : Please see Section 4 - 8 before use for Prevention/Response/Storage/Disposal.  
 Used oil may contain harmful impurities.

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

**Substance or Mixture** : Mixture  
**Chemical Description** : Lubricating oil.  
**Component Information** : Lubricant base oil ≥97%  
 Additives ≤3%  
**Chemical Formula** : Not possible to define.  
**CAS registry number** : Trade secret  
**Additional Information** : The highly refined mineral oil contains <3% DMSO-extract, according to IP346.  
**Pollutant Release and Transfer Register (PRTR) Law** : Not applicable  
**Industrial Safety and Health Law** : Labeling(Delivery of Documents): Mineral oil 90-100%  
**Poisonous and Deleterious** : Not applicable  
**Substance Control Law**  
**Classification of components according to GHS** : [Chemical Identity/Hazard Class (category)/Hazard Statement/Conc.]  
 No hazardous information.  
 The specific chemical identities and percentages of composition have been withheld as trade secrets.

**4. FIRST AID MEASURES**

**General Information** : Not expected to be a health hazard when used under normal conditions.  
**Inhalation** : Remove casualty to fresh air and keep at rest in a position comfortable for breathing.  
 Cover with blanket to keep warm and rest in a quiet surrounding. Seek immediate medical advice and attention.  
**Skin Contact** : Wash skin with large amount of water using soap.  
**Eye Contact** : Rinse cautiously with clean water for several minutes. Remove contact lenses, if present and easy to do, and continue rinsing. After rinsing for a minimum of 15 minutes, seek medical advice and attention.  
**Ingestion** : Without inducing vomiting, call a doctor for treatment. If mouth has been dirtied, clean with water.  
**Most Important Symptoms/Effects, Acute & Delayed** : If swallowed, may irritate mucous membrane of stomach and induce vomiting. Inhalation if mist may cause feeling ill. Skin contact and eye contact may cause irritation.  
**Immediate Medical Attention, Special Treatment** : Treat symptomatically. Call a doctor or poison control center for guidance.

**5. FIRE FIGHTING MEASURES**

Clear fire area of all non-emergency personnel.  
**Suitable Extinguishing Media** : Concentrated strong liquid in mist and powder forms, carbon dioxide and foam. Use powder and carbon dioxide may be used small fires only. Effective to use foam to shutdown the air in a large fires.

<b>Unsuitable Extinguishing Media</b>	: Do not use water in a jet.
<b>Specific Hazards Arising from Chemicals</b>	: Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Unidentified organic and inorganic compounds
<b>Fire fighting instructions</b>	: Water the surrounding equipment to cool them down. Cordon off the affected place and its vicinity to all, except the concerned parties.
<b>Protective Equipment &amp; Precautions for Fighters</b>	: Ensure to wear protective equipment and approach from windward.

## 6. ACCIDENTAL RELEASE MEASURES

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Section 8 of this SDS. See Section 13 for information on disposal. Observe the relevant local and international regulations.

<b>Personal Precautions, Protective Equipment and Emergency Procedures</b>	: Avoid contact with skin and eyes. Prepare suitable equipment and materials.
<b>Environmental Precautions</b>	: Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. In event of entering in the sea, extend oil fences to prevent from spreading, and sop up with absorbent materials. Use chemicals and/or detergents, they must satisfy technical standards as set by the Ministry of Land, Infrastructure and Transport / Ministry of the Environment.
<b>Methods and Material for Containment and Clean Up</b>	: Promptly remove all ignition sources and stop leakages. In a small leakage, absorb and recover by use of soil, sand, sawdust and waste clothes. In a large leakage, cordon off the danger zone, prevent from entering and enclose it with sand bank and stop outflow. Cover liquid surface with foam, and recover liquid into containers.
<b>Additional Advice</b>	: Local authorities should be advised if significant spillages cannot be contained.

## 7. HANDLING AND STORAGE

### HANDLING

<b>Technical Measures</b>	: In handling this material over the allocated volume, ensure approval to meet requires of the laws. Keep away from heat, sparks, open flames, hot objects. No smoking. Take measures against static discharge. Ensure to wear clothing and shoes made of conductive materials. When fixing or processing machine, it carries out after removing dangerous objects completely. NEVER suck up (siphoning) this material by mouth. Wear suitable protect equipment if skin or eye contact may cause. Seal containers hermetically without handling in violent such as falling, dropping, or jolting.
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**Ventilation Precautions** : see Section 8

**Precautions for Safe Handling** : Use under normal temperature. Prevent from mixing water and impurity. Avoid contact with halogens, strong acids, alkali and oxidizing materials.

### STRAGE

**Conditions for Safe Storage** : Keep containers tightly closed and in a cool, well-ventilated place away from direct sunlight. It is recommended to lock up storage area. Use properly labelled and closeable containers. Avoid heat, sparks, open flame and static accumulation.

**Technical Measures** : All electrical appliances shall be explosion-proof types, and they all must be earthed.

**Precautions for Safe Stroage** : Avoid contact and storage in same place with halogens, strong acids, alkali and oxidizing materials.

**Recommended Materials** : Storage in original containers. Do not pressurize empty containers. May cause rupture. Do not weld, heat up, drill or cut containers. May ignite the residue and cause explosion.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

<b>Equipment</b>	: Seal or install ventilations for mist occurs. Install eye shower and body shower near working site.
<b>Standard Concentration Control</b>	: Not specified
<b>OSHA, Permissible Exposure Limits (PEL)</b>	: 5mg/m <sup>3</sup> (Oil mist, mineral)
<b>Occupational Exposure Limits</b>	: Japan Society for Occupational Health(2012) <sup>(1)</sup> 3mg/m <sup>3</sup> (Oil mist, mineral) ACGIH(2012) TWA[Inhalable fraction.] <sup>(2)</sup> 5mg/m <sup>3</sup> (Oil mist, mineral)
<b>Protective Equipment</b>	: Skin protection not ordinarily required beyond standard issue work clothes.
<b>Respiratory Protection</b>	: No respiratory protection is ordinarily required under normal conditions of use. Use appropriate equipment in response to the circumstances.
<b>Hand Protection</b>	: Use oil-proof protective hand gloves under prolonged or repeated skin contact.
<b>Eye Protection</b>	: Wear safety glasses or full face shield if splashes are likely to occur.

<b>Skin and Body Protection</b>	: Use oil-proof/long sleeved clothing under prolonged usage.
<b>Appropriate Sanitary Measures:</b>	: Remove immediately all contaminated clothing. Contaminated clothing must be laundered before reuse.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Physical state</b>	: Liquid at room temperature.
<b>Colour</b>	: Light yellow.
<b>Odour</b>	: Characteristic mineral oil.
<b>Odour threshold</b>	: Data not available.
<b>pH</b>	: Not applicable.
<b>Pour point</b>	: <-20°C
<b>Initial Boiling Point</b>	: Expected >250°C
<b>Flash point</b>	: ≥ 200°C (COC)
<b>Evaporation rate</b>	: Data not available.
<b>Flammability (solid, gas)</b>	: Not applicable.
<b>Upper / lower Flammability or Explosion limits</b>	: Typical 1 - 7 % (V) (based on mineral oil)
<b>Vapour pressure</b>	: Data not available.
<b>Vapour density</b>	: Data not available. Expected >1
<b>Density</b>	: Approx. 0.87g/cm <sup>3</sup> (15°C)
<b>Solubility</b>	: <b>Water:</b> Negligible.
<b>n-octanol/water partition coefficient (log Pow)</b>	: Data not available.
<b>Auto-ignition temperature</b>	: Data not available. Expected >320°C
<b>Decomposition Temperature</b>	: Data not available.

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## 10. STABILITY AND REACTIVITY

<b>Chemical Stability</b>	: Stable under normal condition.
<b>Hazardous Reactivity</b>	: Avoid contact with strong oxidizing agent.
<b>Conditions to Avoid</b>	: Avoid contact with halogens, strong acids, alkalis, and oxidizing materials.
<b>Incompatible Materials</b>	: Data not available.
<b>Hazardous Decomposition Products</b>	: Hazardous decomposition products are not expected to form during normal storage. Generates smoke, carbon monoxide, sulfurous acid gas etc. during combustion.

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## 11. TOXICOLOGICAL INFORMATION

<b>Basis for Assessment</b>	Information given is based on data on the components and the toxicology of similar products. Unless indicated otherwise, the data presented is representative of the main component of a whole product, rather than for individual component(s). Individual components contained above cut-off value is described on Section 3.
<b>Acute Toxicity</b>	1 Oral Expected to be of low toxicity: LD <sub>50</sub> > 5000 mg/kg , Rat <sup>(3)</sup> 2 Dermal Expected to be of low toxicity: LD <sub>50</sub> > 5000 mg/kg , Rabbit <sup>(3)</sup> 3 Inhalation(Vapour) Data not available 4 Inhalation(Mist) Low toxicity: LC <sub>50</sub> > 5 mg/l , 4h, Rat <sup>(3)</sup>
<b>Skin Corrosion/Irritation</b>	: Not classified as a skin irritation (rabbit test). <sup>(3)</sup> Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.
<b>Serious Eye Damage/Irritation</b>	: Not classified as an eye irritation (rabbit test). <sup>(3)</sup>
<b>Respiratory or Skin Sensitisation</b>	: No data available concerning respiratory sensitisation. Not classified as a skin sensitisation (Buehler test; guinea pig). <sup>(3)</sup>
<b>Germ Cell Mutagenicity</b>	: The mutagenic potential of the product category 'other lubricant base oils' has been extensively studied in a range of "in vivo" and "in vitro" assays. The majority of the studies showed no evidence of mutagenic activity. <sup>(3)</sup>
<b>Carcinogenicity</b>	: Product contains mineral oils of types shown to be noncarcinogenic in animal skin-painting studies. <sup>(3)</sup> Highly refined mineral oils are not classified as carcinogenic by the International Agency for Research on Cancer (IARC monographs: Group 3) <sup>(4)</sup> , ACGIH <sup>(5)</sup> and EU Directives. <sup>(6)</sup>
<b>Reproductive and Developmental Toxicity</b>	: Results of developmental and reproductive toxicity studies showed no evidence of developmental or reproductive toxicity in rats. <sup>(3)</sup>
<b>Specific target organ toxicity - single exposure</b>	: Acute studies do not indicate any specific organ toxicity following single exposure. <sup>(3)</sup>
<b>Specific target organ toxicity - repeated exposure</b>	: The repeat dose toxicity has been investigated by dermal and inhalation routes for periods between 4 weeks and up to 2 years. No systemic effects showed. <sup>(3)</sup>
<b>Aspiration Hazard</b>	: Not classified as a hydrocarbon with kinetic viscosity ≤ 20.5mm <sup>2</sup> /s measured at 40°C. Not considered an aspiration hazard.

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## 12. ECOLOGICAL INFORMATION

<b>Basis for Assessment</b>	Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the main component of a whole product, rather than for individual component(s). Individual components contained above cut-off value is described on Section 3.
<b>Caution</b>	: Poorly soluble mixture. May cause physical fouling of aquatic organisms. The Water Accommodated Fraction (WAF) is applied following tests..
<b>Toxicity</b>	: Fish(Fathead minnow, 96h) LL <sub>50</sub> >100mg/L <sup>(3)</sup> : Fish(Fathead minnow, 14d) NOEL >100mg/L <sup>(3)</sup> : Crustacea (Daphnia magna, 48h) EL <sub>50</sub> /NOEL >10,000mg/L <sup>(3)</sup> : Crustacea (Daphnia magna, 21d) NOEL >10mg/L <sup>(3)</sup> : Algae(Pseudokirchneriella subcapitata) NOEL >100mg/L <sup>(3)</sup> : In a static 4-day microorganism luminescence inhibition study, no significant luminescence inhibition was observed. <sup>(3)</sup>
<b>Acute Aquatic Toxicity</b>	: Not expected to be a hazard.
<b>Chronic Aquatic Toxicity</b>	: Not expected to be a hazard.
<b>Mobility</b>	: Generally floats on water. : Lubricating oil components have estimated log Koc >3, indicating these components are likely to be adsorbed onto soil and sediment and are not likely to leach to ground water.
<b>Persistence/degradability</b>	: Another lubricant base oil was determined to be inherently biodegradable but not readily biodegradable, with a mean degradation of 31% by day 28.
<b>Bioaccumulative Potential</b>	: Not available as highly refined base oil.
<b>Hazardous to ozone layer</b>	: Not classified because this product not contained substances listed on Montreal Protocol and Ozone Layer Protection Law.

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### 13. DISPOSAL CONSIDERATIONS

<b>Material Disposal</b>	1 Waste disposal yourself or entrust the industrial waste treatment company who obtained the prefectural governor's permission or municipal corporation. Disposal should be in accordance with applicable regional, national, and local laws and regulations. 2 Do not dispose into the environment, in drains or in water courses. 3 For landfill disposal, destroy by fire and confirm cinders agreed to Waste Disposal Law. 4 In event of burning this material, ensure to carryout work in safe place with guards in position, and select a method that would not cause any harm or damage to others during combustion or explosion.
<b>Container Disposal</b>	: Purify and recycle or performs suitable disposal in accordance with the standard of related laws and regulations. Disposal with remove content completely.

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### 14. TRANSPORT INFORMATION

<b>International Restriction</b>	
<b>UN Class, Shipping Name</b>	: Not Dangerous Goods.
<b>UN Number</b>	: Not applicable.
<b>Marine Pollutant</b>	: Yes.
<b>Domestic Restriction</b>	: Since domestic laws and regulations shown below are applicable, containers and transportation methods shall be required to follow each and every regulation.
<b>Land Fire Service Law: Container:</b>	Dangerous goods. Group 4 (flammable liquid), Class 4 petroleum, Danger grade III If product classified as dangerous goods, use containers (other than tanker, tank car and tank truck) for transportation usage, shall meet the Clause 2, Notice Attachment 3, concerning dangerous materials.
<b>Sea</b>	: Ship Safety Law: Not Dangerous Goods.
<b>Air</b>	: Civil Aeronautics Act: Not Dangerous Goods.
<b>Specific safety measures and conditions for transportation</b>	1 Caution: Flammable. 2 Transport remarkably with containers may not cause friction or agitation. 3 Display signage on vehicle and provide with fire fighting equipment, if and when required to transport more than the specified quantity. Total piled height of vehicle shall be less than 3 meters. 4 Consolidation of this material with dangerous goods belonging to the 1st and 6th Classification is prohibited. 5 Abide by other laws and regulations that are applicable.

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### 15. REGULATORY INFORMATION

<b>International Information</b>	
<b>EINECS/ELINCS (EC)</b>	: All components listed or polymer exempt.
<b>TSCA (USA)</b>	: All components listed or in compliance.

<b>METI (JAPAN)</b>	: All components listed or in compliance.
<b>Domestic Information</b>	
<b>Fire Service Law</b>	: Dangerous goods. Group 4 (flammable liquid), Class 4 petroleum, Danger grade III
<b>Pollutant Release and Transfer Register (PRTR) Law</b>	: Not applicable
<b>Industrial Safety and Health Law</b>	: Labeling(Delivery of Documents): Mineral oil 90-100%
<b>Poisonous and Deleterious Substance Control Law</b>	: Not applicable
<b>Marine Pollution Protection Law</b>	: Waste Oil Regulation.
<b>Sewage Control Law</b>	: Mineral Oil Disposal Regulation. (5mg/L)
<b>Water Pollution Prevention Law</b>	: Oil Disposal Regulation. (5mg/L)
<b>Waste Disposal and Public Cleaning Law</b>	: Industrial Waste Regulation.

## 16. OTHER INFORMATION

- Subscribe "%" in this document means weight percentage.

### [Quotation]

1. Recommendation of Occupational Exposure Limits (2012), Japanese Society of Occupational Health
2. Thresholds limit values for chemical substances and physical agents and biological exposure indices, ACGIH (2012)
3. ECHA (European Chemicals Agency), website "ECHA CHEM", Information on Registered Substances (2011). SDS of EU suppliers (2011)
4. IARC Monographs Programme on the Evaluation of Carcinogenic Risk to Humans (2006)
5. ACGIH documentation (2006)
6. EC Directive 67/548/EEC Annex I, EU CLP Regulation(EC) No.1272/2008 Annex VI Table3.1,Table3.2

### [Reference]

- Globally Harmonized System of Classification and Labelling of Chemicals (GHS) 4th revised edition, UNITED NATIONS(2011)
- Japanese Standards Association (JSA), JIS Z 7253:2012, JIS Z 7252:2014
- National Institute of Technology and Evaluation (nite), "GHS Information"
- Ministry of Economy, Trade and Industry, Chemical Management site.
- Ministry of Health, Labour and Welfare, "Label and SDS information for GHS model"

Safety Data Sheet (SDS) about hazardous chemical is provided for a entrepreneur as reference information for safety handling. Refer to this document and perform suitable handling. Nothing in this document shall reduce the user's responsibility to satisfy itself as to the suitability, accuracy, reliability, and completeness of such information for its particular use. There is no warranty against intellectual property infringement. The information contained in this document is based upon data believed to be reliable through our supply chain at the time. So, we could not guarantee all about the contents. This document is based on JIS Z7253:2012, and is not a guarantee of safety. Contents of SDS updated periodically. SDS compliance is required as a rule to all business enterprises engaged in transaction of chemicals (including products containing them) with other businesses. Retailer/ Wholesaler must provide newest SDS to customers.

**[Technical contact]** Shell Lubricants Japan K.K. / Lubricant Customer Service Center  
TEL.0120-064-315 (Japanese domestic only) / csc@shell-lubes.co.jp

**[SDS Author]** Shell Lubricants Japan K.K. / Quality Assurance Division  
TEL.+81-3-5531-5770, FAX.+81-3-5531-5757

**[SDS Request]** As a rule, the direct delivery entrepreneur must provide the newest SDS to customer.  
Please contact not directly manufacturer but your supply chain company.



**Safety Data Sheet:** Mineral Oil

**Waste Stream:** Waste Mineral Oil

**EPA Waste Sheet Profile Number:** 20145060-038

## SAFETY DATA SHEET

### GASSTOP EXP

Product Trade Name:

Revision Date: 02-Jun-2015

Revision Number: 18

#### 1. Identification

##### 1.1. Product Identifier

Product Trade Name: GASSTOP EXP  
Synonyms: None  
Chemical Family: Blend  
Internal ID Code: HM004586

##### 1.2 Recommended use and restrictions on use

Application: Fluid Loss Additive

Uses Advised Against: No information available

##### 1.3 Manufacturer's Name and Contact Details

Manufacturer/Supplier: Halliburton Energy Services Inc.  
P.O. Box 1431  
Duncan, Oklahoma 73536-0431  
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Stewardship  
Telephone: 1-580-251-4335  
e-mail: fdunexchem@halliburton.com

##### 1.4. Emergency telephone number

Emergency Telephone Number: (281) 575-5000

#### 2. Hazard(s) Identification

##### 2.1 Classification in accordance with paragraph (d) of §1910.1200

As adopted by the competent authority, this product does not require an SDS or hazard warning label.

Not classified

##### 2.2. Label Elements

Hazard Pictograms

Signal Word: Not Classified

Hazard Statements: Not Hazardous

##### Precautionary Statements

Prevention: None

Response: None

**Storage** None

**Disposal** None

**Contains****Substances**

Highly refined mineral oil

**CAS Number**

Proprietary

**2.3 Hazards not otherwise classified**

None known

**3. Composition/information on Ingredients**

Substances	CAS Number	PERCENT (w/w)	GHS Classification - US
Highly refined mineral oil	Proprietary	30 - 60%	Asp. Tox. 1 (H304) Aquatic Chronic 4 (H413)

The exact percentage (concentration) of the composition has been withheld as proprietary.

**4. First-Aid Measures****4.1. Description of first aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. Not a hazard under normal use conditions.
<b>Eyes</b>	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
<b>Skin</b>	Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and discard.
<b>Ingestion</b>	Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration.

**4.2 Most important symptoms/effects, acute and delayed**

No significant hazards expected.

**4.3. Indication of any immediate medical attention and special treatment needed**

**Notes to Physician** Treat symptomatically.

**5. Fire-fighting measures****5.1. Extinguishing media****Suitable Extinguishing Media**

Water fog, carbon dioxide, foam, dry chemical.

**Extinguishing media which must not be used for safety reasons**

Do NOT spray pool fires directly with water. A solid stream of water directed into hot burning liquid can cause splattering.

**5.2 Specific hazards arising from the substance or mixture****Special Exposure Hazards**

Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce toxic gases.

**5.3 Special protective equipment and precautions for fire-fighters**

**Special Protective Equipment for Fire-Fighters**

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

**6. Accidental release measures****6.1. Personal precautions, protective equipment and emergency procedures**

Use appropriate protective equipment.

See Section 8 for additional information

**6.2. Environmental precautions**

Prevent from entering sewers, waterways, or low areas.

**6.3. Methods and material for containment and cleaning up**

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

**7. Handling and storage****7.1. Precautions for Safe Handling****Handling Precautions**

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.

**Hygiene Measures**

Handle in accordance with good industrial hygiene and safety practice.

**7.2. Conditions for safe storage, including any incompatibilities****Storage Information**

Store away from oxidizers. Keep container closed when not in use. Store in a well ventilated area. Store between 40.5 F (4.7 C) and 120.5 F (49 C).

**8. Exposure Controls/Personal Protection****8.1 Occupational Exposure Limits**

Substances	CAS Number	OSHA PEL-TWA	ACGIH TLV-TWA
Highly refined mineral oil	Proprietary	5 mg/m <sup>3</sup>	TWA: 5 mg/m <sup>3</sup>

**8.2 Appropriate engineering controls**

**Engineering Controls** Use in a well ventilated area.

**8.3 Individual protection measures, such as personal protective equipment**

**Personal Protective Equipment** If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

**Respiratory Protection** Not normally needed. But if significant exposures are possible then the following respirator is recommended:

Dust/mist respirator. (N95, P2/P3)

**Hand Protection** Chemical-resistant protective gloves (EN 374)

**Skin Protection** Rubber apron.

**Eye Protection** Chemical goggles; also wear a face shield if splashing hazard exists.

**Other Precautions** None known.

**9. Physical and Chemical Properties****9.1. Information on basic physical and chemical properties**

<b>Physical State:</b> Liquid	<b>Color:</b> Yellowish
<b>Odor:</b> Mild	<b>Odor Threshold:</b> No information available

<u>Property</u> <u>Remarks/ - Method</u>	<u>Values</u>
<b>pH:</b>	No data available
<b>Freezing Point/Range</b>	< -9 °C / < 15 °F
<b>Melting Point/Range</b>	No data available
<b>Boiling Point/Range</b>	301 - 427 °C
<b>Flash Point</b>	185 °C / 365 °F ASTM D 92
<b>Flammability (solid, gas)</b>	No data available
upper flammability limit	7%
lower flammability limit	1%
<b>Evaporation rate</b>	No data available
<b>Vapor Pressure</b>	< 0.1 mmHg
<b>Vapor Density</b>	> 10 (air = 1)
<b>Specific Gravity</b>	1.057
<b>Water Solubility</b>	Insoluble in water
<b>Solubility in other solvents</b>	No data available
<b>Partition coefficient: n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	360 °C / 680 °F
<b>Decomposition Temperature</b>	No data available
<b>Viscosity</b>	No data available
<b>Explosive Properties</b>	No information available
<b>Oxidizing Properties</b>	No information available

**9.2. Other information**

<b>VOC Content (%)</b>	No data available
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**10. Stability and Reactivity****10.1. Reactivity**

Not expected to be reactive.

**10.2. Chemical Stability**

Stable

**10.3. Possibility of Hazardous Reactions**

Will Not Occur

**10.4. Conditions to Avoid**

None anticipated

**10.5. Incompatible Materials**

Strong oxidizers.

**10.6. Hazardous Decomposition Products**

Carbon monoxide and carbon dioxide.

**11. Toxicological Information****11.1 Information on likely routes of exposure****Principle Route of Exposure** Eye or skin contact, inhalation. Ingestion.

## 11.2 Symptoms related to the physical, chemical and toxicological characteristics

### Acute Toxicity

#### Product Information

Under certain conditions of use, some of the product ingredients may cause the following:

#### Inhalation

May cause mild respiratory irritation.

#### Eye Contact

May cause mild eye irritation.

#### Skin Contact

May cause mild skin irritation.

#### Ingestion

Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.

**Chronic Effects/Carcinogenicity** No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

## 11.3 Toxicity data

### Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Highly refined mineral oil	Proprietary	> 2000 mg/kg (Rat) >5000 mg/kg (Rat) (similar substance)	> 15000 mg/kg (Rodent) > 2000 mg/kg (Rabbit) (similar substance)	> 0.210 mg/L (Rat) (similar substance)

Substances	CAS Number	Skin corrosion/irritation
Highly refined mineral oil		Non-irritating to the skin (similar substances)

Substances	CAS Number	Eye damage/irritation
Highly refined mineral oil		Non-irritating to the eye (similar substances)

Substances	CAS Number	Skin Sensitization
Highly refined mineral oil		Not confirmed to cause skin or respiratory sensitization. (similar substances)

Substances	CAS Number	Respiratory Sensitization
Highly refined mineral oil		No information available

Substances	CAS Number	Mutagenic Effects
Highly refined mineral oil		In vitro tests did not show mutagenic effects (similar substances)

Substances	CAS Number	Carcinogenic Effects
Highly refined mineral oil		Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Highly refined mineral oil		No information available

Substances	CAS Number	STOT - single exposure
Highly refined mineral oil		No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Highly refined mineral oil		No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Highly refined mineral oil		Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.

## 12. Ecological Information

**12.1. Toxicity****Ecotoxicity Effects****Product Ecotoxicity Data**

No data available

**Substance Ecotoxicity Data**

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Highly refined mineral oil	Proprietary	No information available	LC50 (96h) >1000 mg/L (Oncorhynchus mykiss) LC50 (96h) > 100 mg/L (Lepomis macrochirus)	No information available	No information available

**12.2. Persistence and degradability**

Substances	CAS Number	Persistence and Degradability
Highly refined mineral oil	Proprietary	(15 - 35% @ 28d)

**12.3. Bioaccumulative potential**

Substances	CAS Number	Log Pow
Highly refined mineral oil	Proprietary	5.71

**12.4. Mobility in soil**

Substances	CAS Number	Mobility
Highly refined mineral oil	Proprietary	KOC > 3

**12.5 Other adverse effects**

No information available

**13. Disposal Considerations****13.1. Waste treatment methods****Disposal Method**

Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations.

**Contaminated Packaging**

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

**14. Transport Information****US DOT**

UN Number: Not restricted  
 UN Proper Shipping Name: Not restricted  
 Transport Hazard Class(es): Not applicable  
 Packing Group: Not applicable  
 Environmental Hazards: Not applicable

**US DOT Bulk**

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**DOT (Bulk)** Not applicable

**Canadian TDG**

**UN Number:** Not restricted  
**UN Proper Shipping Name:** Not restricted  
**Transport Hazard Class(es):** Not applicable  
**Packing Group:** Not applicable  
**Environmental Hazards:** Not applicable

**IMDG/IMO**

**UN Number:** Not restricted  
**UN Proper Shipping Name:** Not restricted  
**Transport Hazard Class(es):** Not applicable  
**Packing Group:** Not applicable  
**Environmental Hazards:** Not applicable

**IATA/ICAO**

**UN Number:** Not restricted  
**UN Proper Shipping Name:** Not restricted  
**Transport Hazard Class(es):** Not applicable  
**Packing Group:** Not applicable  
**Environmental Hazards:** Not applicable

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:** Not applicable

**Special Precautions for User:** None

<b>15. Regulatory Information</b>
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**US Regulations**

<b>US TSCA Inventory</b>	All components listed on inventory or are exempt.
<b>EPA SARA Title III Extremely Hazardous Substances</b>	Not applicable
<b>EPA SARA (311,312) Hazard Class</b>	None
<b>EPA SARA (313) Chemicals</b>	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
<b>EPA CERCLA/Superfund Reportable Spill Quantity</b>	Not applicable.
<b>EPA RCRA Hazardous Waste Classification</b>	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
<b>California Proposition 65</b>	All components listed do not apply to the California Proposition 65 Regulation.
<b>MA Right-to-Know Law</b>	One or more components listed.
<b>NJ Right-to-Know Law</b>	One or more components listed.
<b>PA Right-to-Know Law</b>	Does not apply.

## Canadian Regulations

**Canadian DSL Inventory** All components listed on inventory or are exempt.

## 16. Other information

### Preparation Information

**Prepared By** Chemical Stewardship  
Telephone: 1-580-251-4335  
e-mail: fdunexchem@halliburton.com

**Revision Date:** 02-Jun-2015

**Reason for Revision** SDS sections updated:  
2

### **Additional information**

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

### **Key or legend to abbreviations and acronyms**

bw – body weight  
CAS – Chemical Abstracts Service  
EC50 – Effective Concentration 50%  
ErC50 – Effective Concentration growth rate 50%  
LC50 – Lethal Concentration 50%  
LD50 – Lethal Dose 50%  
LL50 – Lethal Loading 50%  
mg/kg – milligram/kilogram  
mg/L – milligram/liter  
NIOSH – National Institute for Occupational Safety and Health  
NTP – National Toxicology Program  
OEL – Occupational Exposure Limit  
PEL – Permissible Exposure Limit  
ppm – parts per million  
STEL – Short Term Exposure Limit  
TWA – Time-Weighted Average  
UN – United Nations  
h - hour  
mg/m<sup>3</sup> - milligram/cubic meter  
mm - millimeter  
mmHg - millimeter mercury  
w/w - weight/weight  
d - day

### **Key literature references and sources for data**

www.ChemADVISOR.com/  
NZ CCID  
BIBRA  
OSHA  
SIDS

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**End of Safety Data Sheet**

**Safety Data Sheet:** Freon R134A

**Waste Stream:** Refrigerant

**EPA Waste Sheet Profile Number:** 20145060-039

# SAFETY DATA SHEET

## Refrigerant Gas R134a

Version 2

Revision Date: 20.02.12



## SAFETY DATA SHEET REFRIGERANT R134A

### SECTION 1: IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

#### 1.1. Product Identifier

**Product Name:** REFRIGERANT R134a

**Synonyms:** 1,1,1,2 Tetrafluoroethane  
HFC-134a  
Norflurane

**EC Number:** 212-337-0

**CAS Number:** 811-97-2

**REACH Registration Number:** 01-2119459374-33-0002

If REACH registration numbers do not appear the substance is either exempt from registration, does not meet the minimum volume threshold for registration or the registration has not yet come due.

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

**Use:** Refrigerant  
**Advised Against:** No specific uses advised again have been identified, other than restrictions in the F-Gas Regulations.

#### 1.3. Details of the supplier of the safety data sheet

**Company name:** National Refrigerants Ltd.  
4 Watling Close  
Sketchley Meadows Business Park  
Hinckley LE10 3EZ  
Tel: +44(0)1455 630790  
Fax: +44(0) 1455 630791  
Email: [sds@nationalref.com](mailto:sds@nationalref.com)

#### 1.4. Emergency telephone number

Emergency Tel: +44(0) 1865 407333

### SECTION 2: HAZARDS IDENTIFICATION

#### 2.1. Classification of the substance of mixture

Regulation (EC) No. 1272/2008



Warning

H280 Contains gas under pressure; may explode if heated  
P410+P403 Protect from sunlight. Store in a well-ventilated place.

**Directives 67/458/EEC or** This substance is not classified as dangerous according to Directive 67/548/EEC.

# SAFETY DATA SHEET

## Refrigerant Gas R134a

Version 2

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**1999/45/EC:**

**Most important adverse effect:** Rapid evaporation of the liquid may cause frostbite.  
Vapour is heavier than air and can cause suffocation.

### 2.2. Label elements

**Label elements under CHIP:**

**Risk phrases** R58: May cause long-term adverse effects in the environment  
**Safety phrases** None

### 2.3. Other hazards

**Directives 67/548/EEC or 1999/45/EC:** Not a hazardous substance according to EC directives 67/548/EEC or 1999/45/EC.  
**Special labelling of certain mixtures:** Contains fluorinated greenhouse gases covered by the Kyoto Protocol

## SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

### 3.1. Substances

**Hazardous Ingredients:** 1,1,1,2-tetrafluoroethane 99.9%

### 3.2 Mixtures

## SECTION 4: FIRST AID MEASURES

### 4.1. Description of first aid measures

**Skin contact:** Rapid evaporation of liquid may cause frostbite. Take off all contaminated clothing immediately if not stuck to the skin. Flush area with lukewarm water. Do not use hot water. If frostbite has occurred call a physician.

**Eye contact:** Rapid evaporation of liquid in contact with the eye will damage it. Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention.

**Ingestion:** This is not considered a potential route of exposure.

**Inhalation:** Remove from exposure, move to fresh air, and lie down. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.

### 4.2. Most important symptoms and effects, both acute and delayed

**Skin contact:** Low exposure to liquid will cause redness and pain. High exposure to liquid will cause frostbite, blisters and severe pain.

**Eye contact:** Exposure to liquid will cause severe pain and cornea damage.

**Ingestion:** Not a route of exposure.

**Inhalation:** High vapour concentrations cause severe headache, dizziness and unconsciousness.

**Delayed/immediate effects:** May cause cardiac arrhythmia.

### 4.3. Indication of any immediate medical attention and special treatment needed

**Immediate/special treatment:** Burns pack should be available on the premises.

## SECTION 5: FIRE-FIGHTING MEASURES

# SAFETY DATA SHEET

## Refrigerant Gas R134a

Version 2

Revision Date: 20.02.12



### 5.1. Extinguishing media

**Extinguishing media:** This product is not flammable. (ASHRAE 34) All extinguishing agents are suitable. Use measures that are appropriate to local and surrounding environment. Cool cylinders/tanks with water spray.

### 5.2. Special hazards arising from the substance or mixture

**Special hazards arising from the mixture** Pressure build-up in cylinders/tanks.  
Hazardous thermal decomposition products: carbon oxides, hydrogen fluoride, carbonyl fluoride.

### 5.3. Advice for fire-fighters

**Advice for fire-fighters:** In the event of fire wear self-contained breathing apparatus.  
Wear neoprene gloves during cleaning work after a fire.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

### 6.1. Personal precautions, protective equipment and emergency procedures

**Personal precautions:** Evacuate personnel to safe areas.  
Ventilate the area.

### 6.2. Environmental precautions

**Environmental precautions:** Should not be released into the atmosphere.

### 6.3. Methods and material for containment and cleaning up

**Clean-up procedures:** Material evaporates.

### 6.4. Reference to other sections

**Reference to other sections:** For handling and protection measures refer to Section 7 of SDS. Refer to Section 8 of SDS.  
For disposal methods refer to Section 13.

## SECTION 7: HANDLING AND STORAGE

### 7.1. Precautions for safe handling

**Handling requirements:** *Advice on handling:*  
Avoid breathing vapours or mist.  
Avoid liquid contact with skin and clothing.  
Provide sufficient air exchange and/or exhaust in work rooms.  
*Advice on protection against fire and explosion:*  
No special measures against fire required.

### 7.2. Conditions for safe storage, including any incompatibilities

**Storage conditions:** Keep valves tightly closed.  
Store in cool, dry well ventilated place.  
Temperature not to exceed 45°C.

**Suitable packaging:** Store in original cylinder only.  
Protect from contamination.

### 7.3. Specific end use(s)

**Specific end use(s)** No data available.

## SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

### 8.1. Control parameters

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### Hazardous ingredients:

1,1,1,2-TETRAFLUOROETHANE (HFC134a)

Workplace exposure limits

State	8 hour TWA	15 min. STEL
UK	1000 ppm (4240 mg/m <sup>3</sup> )	-

### 8.2. Derived No Effect Level (DNEL)

**1,1,1,2-Tetrafluoroethane:** Type of Application (Use): Workers  
Exposure Routes: Inhalation  
Health Effects: Chronic effects, Systemic toxicity.  
Value: 2476 mg/m<sup>3</sup>

Type of Application (Use): Consumers  
Exposure Routes: Inhalation  
Health Effects: Chronic effects, Systemic toxicity.  
Value: 2476 mg/m<sup>3</sup>

### 8.3 Predicted No Effect Concentration

**1,1,1,2-tetrafluoroethane:** Value: 0.1 mg/l  
Compartment: Fresh water.

Value: 0.01 mg/l  
Compartment: Marine water.

Value: 1 mg/l  
Compartment: Water  
Remarks: Intermittent use/release.

Value: 0.75 mg/l  
Compartment: Fresh water sediment.

Value: 73 mg/l  
Compartment: Water  
Remarks: Sewage treatment plants.

### 8.4. Exposure Controls

**Engineering measures:** Ensure adequate ventilation, especially in confined areas.  
**Respiratory protection:** For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

**Hand protection:** Heat insulating gloves  
**Eye protection:** Safety glasses with side shields. Wear a face shield in addition where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.

**Skin protection:** Wear clothing that covers legs and arms.  
**Environmental:** Gas escapes to be kept to the minimum by engineering processes and operating methods.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### 9.1. Information on basic physical and chemical properties

**State:** Liquefied gas under pressure.  
**Colour:** Clear colourless liquid and vapour.  
**Odour:** Slight, ether like.  
**Molecular weight:** 102.02 g/mol  
**Boiling Point/range:** -26.2°C

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<b>Flash Point:</b>	Non-flammable
<b>Ignition Temperature:</b>	n/a Non flammable
<b>Upper explosive limit/upper flammability limit:</b>	n/a Non flammable
<b>Vapour pressure:</b>	4.909 Bar (4909 hPa) at 21°C
<b>Liquid Density:</b>	1200 kg/m <sup>3</sup> at 25°C
<b>Vapour Density:</b>	5.368 kg/m <sup>3</sup> at 21°C
<b>Water solubility:</b>	1.5 g/l
<b>Vapour Density (Air = 1)</b>	3.5

### SECTION 10. STABILITY AND REACTIVITY

#### 10.1. Reactivity

**Reactivity:** Stable under recommended storage and transport conditions.

#### 10.2. Chemical stability

**Chemical stability:** Stable under normal conditions.

#### 10.3. Possibility of hazardous reactions

**Hazardous reactions:** Hazardous reactions will not occur under recommended storage and transport conditions. May react with aluminium.

#### 10.4. Conditions to avoid

**Conditions to avoid:** Heat, hot surfaces, flames.

#### 10.5. Incompatible material

**Materials to avoid:** Alkali metals, alkaline earth metals, powdered metals, powdered metal salts.

#### 10.6. Hazardous decomposition products

**Hazardous decomposition products:** Thermal decomposition yields toxic products which can be corrosive in the presence of moisture.

### SECTION 11: TOXICOLOGICAL INFORMATION

#### 11.1 Information on Toxicological effects

**Acute Oral Toxicity:** 1,1,2-Tetrafluoroethane  
Not Applicable.

**Acute inhalation toxicity:** 1,1,1,2-Tetrafluoroethane  
LC<sub>50</sub>/rat: 567000 ppm  
/dog: Cardiac sensitization.

**Acute Dermal toxicity:** 1,1,1,2-Tetrafluoroethane  
Not Applicable

**Skin Irritation:** 1,1,1,2-Tetrafluoroethane  
Rabbit  
Classification: Not classified as irritant.  
Result: Slight irritation.

**Eye Irritation:** 1,1,1,2-Tetrafluoroethane  
Rabbit  
Classification: Not classified as an irritant.  
Result: Slight irritation  
Not expected to cause eye irritation based on expert review of the properties of the substance.

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Human  
Classification: Not classified as irritant.  
Result: No eye irritation.

**Sensitization:** 1,1,1,2-Tetrafluoroethane  
Guinea pig  
Classification: Not a skin sensitized.  
Result: Did not cause sensitization on laboratory animals.  
Not expected to cause sensitization based on expert review of the properties of the substance.

Did not cause sensitization on laboratory animals. There are no reports of human respiratory sensitization.

**Repeated Dose Toxicity:** 1,1,1,2-Tetrafluoroethane  
Inhalation rat  
No toxicologically significant effects were found.

**Mutagenicity Assessment** 1,1,1,2-Tetrafluoroethane  
Animal testing did not show any mutagenic effects, Tests on bacterial or mammalian cell cultures did not show mutagenic effects.

**Carcinogenicity Assessment:** 1,1,1,2-Tetrafluoroethane  
Not classified as a human carcinogen.

**Toxicity to reproduction Assessment:** 1,1,1,2-Tetrafluoroethane  
No toxicity to reproduction.

**Human Experience:** Excessive exposure may affect human health as follows:

Inhalation  
Severe shortness of breath, narcosis, irregular cardiac activity.

**Other information:** May cause cardiac arrhythmia. Rapid evaporation of the liquid may cause frostbite. Inhalation of decomposition products in high concentration may cause shortness of breath (lung oedema).

### SECTION 12. ECOLOGICAL INFORMATION

Where sections are blank no data is available

#### 12.1. Toxicity

**Toxicity to fish:** 1,1,1,2-Tetrafluoroethane  
LC<sub>50</sub>/96 h/Oncorhynchus mykiss (rainbow trout): 450 mg/l

**Toxicity to Aquatic plants:** 1,1,1,2-Tetrafluoroethane  
EC<sub>50</sub>/72 h/Algae: >118 mg/l  
Information given is based on data obtained from similar substances.

**Acute Toxicity to aquatic Invertebrates:** 1,1,1,2-Tetrafluoroethane  
EC<sub>50</sub>/48 h/Daphnia magna (water flea): 980 mg/l

**Ecotoxic values:** When discharged may contribute to the greenhouse effect.

#### 12.2. Persistence and degradability

**Persistence and Degradability:** Biodegradability  
/28 d  
Biodegradation: 3%  
Method: Closed Bottle test  
Not readily biodegradable.

#### 12.3. Bio accumulative potential

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**Bio-accumulative potential:** No data available.

### 12.4. Mobility in soil

**Mobility:** No data available.

### 12.5. Results of PBT and vPvB assessment

**PBT & vPvB identification:** This substance is not considered to be persistent, bio accumulating nor toxic (PBT).  
This substance is not considered to be very persistent nor very bio accumulating (vPvB).

### 12.6. Other adverse effects

**Other adverse effects:**  
**Global Warming Potential (GWP) (CO<sub>2</sub> = 1)** 1370

**Ozone Depletion Potential (ODP) (R11 = 1)** 0

## SECTION 13. DISPOSAL CONSIDERATIONS

### 13.1. Waste treatment methods

**Disposal operations:** Do not allow product to be released into the environment.  
**Recovery Operations:** Consult the manufacturer or supplier for information regarding recovery and recycling of the product. If recovery is not possible, incinerate at a licensed installation.  
**Disposal of packaging:** De-gas and return cylinders to suppliers.  
**N.B.** The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

## SECTION 14. TRANSPORT INFORMATION

### 14.1. ADR

**Proper Shipping Name:** Refrigerant R134a or 1,1,1,2-Tetrafluoroethane  
**UN Number:** 3159  
**Class:** 2  
**Classification Code:** 2A  
**Labelling No.:** 2.2  
**HI Number:** 20  
**Tunnel Code:** (C/E)

### 14.2. IATA\_C

**Proper Shipping Name:** Refrigerant R134a or 1,1,1,2-Tetrafluoroethane  
**UN Number:** 3159  
**Labelling No.:** 2.2

### 14.3. IMDG

**Proper Shipping Name:** Refrigerant R134a or 1,1,1,2-Tetrafluoroethane  
**UN Number:** 3159  
**Class:** 2.2  
**Labelling Number:** 2.2

## SECTION 15. REGULATORY INFORMATION

### 15.1. Safety, health and environment regulations/legislation specific for the substance or mixture

**Special labelling of certain mixtures:** Contains fluorinated greenhouse gases covered by the Kyoto Protocol.

### 15.2. Chemical Safety Assessment

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**Chemical safety assessment:** A chemical safety assessment has been carried out by the supplier of this mixture.

**16. OTHER INFORMATION**

**Other information:** This safety sheet is prepared in accordance with Commission Regulation (EU) No. 453/2010.  
\* Indicates text in SDS which has changed since the last revision.

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# SAFETY DATA SHEET

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### GENERAL SAFETY & HANDLING DATA

#### 1. GENERAL

Only trained persons should handle compressed gases. Observe all regulations and local requirements regarding the storage of Cylinders. Do not remove or deface labels provided by the supplier for the identification of the Cylinder contents. Ascertain the identity of the gas before using it. Know and understand the properties and hazards associated with each gas before using it. When doubt exists as to the correct handling procedure for a particular gas contact the supplier.

#### HANDLING AND USE

Wear stout gloves. Never lift a Cylinder by the cap or guard unless the supplier states it is designed for that purpose. Use trolley or other suitable device or technique for transporting heavy Cylinders, even for a short distance. Where necessary wear suitable eye and face protection. The choice between safety glasses, chemical goggles, or full face shield will depend on the pressure and nature of the gas being used,

Where necessary for toxic gases see that self-contained positive pressure breathing apparatus or full face airline respirator is available in the vicinity of the working area. Employ suitable pressure regulating device on all Cylinders when gas is being emitted to systems with lower pressure rating than that of the Cylinder. Ascertain that all electrical systems in the area are suitable for service with each gas.

Never use direct flame or electrical heating devices to raise the pressure of a Cylinder, Cylinders should not be subjected to temperatures above 45°C. Never re-compress a gas mixture without consulting the supplier. Never attempt to transfer gases from one Cylinder to another. Do not use Cylinders as rollers or supports, or for any other purpose other than to contain the gas as supplied. Never permit oil, grease or other readily combustible substances to come into contact with valves of Cylinders containing oxygen or other oxidants. Keep Cylinder valves clean and free from contaminants particularly oil and water.

Do not subject Cylinders to mechanical shocks which may cause damage to their valves or safety devices.

Never attempt to repair or modify Cylinder valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close the Cylinder valve whenever gas is not required even if the Cylinder is still connected to the equipment.

#### 2. STORAGE

Cylinders should be stored in a well-ventilated area. Some gases will require a purpose built area. Store Cylinders in a location free from fire risk and away from sources of heat and ignition. Designate as a no smoking area.

Gas Cylinders should be segregated in the storage according to the various categories.

The storage area should be kept clear and access should be restricted to authorized persons only, the area should be clearly marked as a storage area and appropriate hazard warning signs displayed (Flammable, Toxic etc.).

The amount of flammable or toxic gases should be kept to a minimum. Flammable gases should be stored away from other combustible materials.

Cylinders held in storage should be periodically checked for general condition and leakage.

Cylinders in storage should be properly secured to prevent toppling or rolling. Vertical storage is recommended where the Cylinder is designed for this. Cylinder valves should be tightly closed and, where appropriate, valves should be capped or plugged. Protect Cylinders stored in the open against rusting and extremes of weather. Cylinders should not be stored in conditions likely to encourage corrosion. Store full and empty Cylinders separately and arrange full Cylinders so that the oldest stock is used first.

FOR FURTHER INFORMATION CONTACT YOUR NEAREST DISTRIBUTION CENTRE

**Safety Data Sheets:** Lime; Sodium Hypochlorite

**Waste Stream:** Caustic

**EPA Waste Profile Sheet Number:** 20145060-040



# Safety Data Sheet

## LIME

### 1. Identification

#### 1.1 Product identifier

Product name LIME  
Product code PID904

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Drilling fluid additive.  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I L.L.C.

P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

Prepared by  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Bethicia Prasek

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

Environmental hazards Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard statements**

- H315 - Causes skin irritation
- H318 - Causes serious eye damage
- H335 - May cause respiratory irritation

**Precautionary statements**

- P280 - Wear eye protection/ face protection
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P310 - Immediately call a POISON CENTER or doctor/ physician

**Supplementary precautionary statements**

- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P321 - Specific treatment (see supplemental first aid instructions on this label)
- P332 + P313 - If skin irritation occurs: Get medical advice/ attention
- P362 - Take off contaminated clothing and wash before reuse
- P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P310 - Immediately call a POISON CENTER or doctor/physician
- P261 - Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray
- P271 - Use only outdoors or in a well-ventilated area
- P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
- P312 - Call a POISON CENTER or doctor/physician if you feel unwell
- P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
- P501 - Dispose of contents/ container to an approved waste disposal plant

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

**3. Composition/information on Ingredients**

**3.1 Substances**

Component	CAS-No	Weight % - range
Calcium hydroxide	1305-62-0	100

**3.2 Mixtures**

Not Applicable

**Comments**

The exact percentage (concentration) of composition has been withheld as a trade secret

**4. First aid measures**

**4.1 First-Aid Measures**

<b>Inhalation</b>	Move to fresh air. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Get medical attention immediately if symptoms occur.
<b>Ingestion</b>	Do not induce vomiting. If conscious, give 2 glasses of water. Get immediate medical attention.
<b>Skin contact</b>	Take off contaminated clothing and shoes immediately. Rinse immediately with plenty of water for at least 30 minutes. Get immediate medical attention.
<b>Eye contact</b>	Rinse immediately with plenty of water, also under the eyelids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**Main symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

<b>Notes to physician</b>	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Do not give chemical antidotes. Asphyxia from glottal edema may occur. Marked decrease in blood pressure may occur with moist rales, frothy sputum, and high pulse pressure
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**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which shall not be used for safety reasons**

None known.

**5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Calcium oxide.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**6. Accidental release measures**

**6.1 Personal precautions, protective equipment and emergency procedures**

Wear suitable protective equipment. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Prevent further leakage or spillage if safe to do so.

**6.2 Environmental precautions**

Prevent product from entering drains.

**Environmental exposure controls**

No information available.

**6.3 Methods and materials for containment and cleaning up**

**Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

**Methods for cleaning up**

Avoid dust formation. Sweep up and shovel into suitable containers for disposal.

**6.4 Reference to other sections**

No information available.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Do not get in eyes, on skin or on clothing. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Keep away from direct sunlight. Protect from moisture.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

Component Information

Component	ACGIH TLV	OSHA PEL
Calcium hydroxide 1305-62-0 ( 100 )	5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup> (resp); 15 mg/m <sup>3</sup> (total)

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering measures to reduce exposure**

Ensure adequate ventilation, especially in confined areas.

**Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Neoprene, Nitrile.
<b>Respiratory protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.  If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear suitable protective clothing and gloves.
<b>Hygiene measures</b>	Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid powder
<b>Appearance</b>	Opaque
<b>Color</b>	White
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	12.4	
Melting/freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.08 - 2.34	
Bulk density	No information available	
Water solubility	Slightly soluble in water.	
Solubility in other solvents	Partly miscible	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Log Pow	No information available	

**Explosive properties** No information available  
**Oxidizing properties** No information available

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** No information available  
**Density** No information available

**10. Stability and reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid extreme temperatures.

**10.5 Incompatible materials**

Acids.

**10.6 Hazardous decomposition products**

Calcium oxide.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Irritating to respiratory system.  
**Eye contact** Causes burns. Corrosive to the eyes and may cause severe damage including blindness.  
**Skin contact** Causes skin irritation.  
**Ingestion** Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium hydroxide	= 7340 mg/kg ( Rat )	No data available	No data available

Component	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Calcium hydroxide	No data available	No data available	No data available	No data available

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	No evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Eye contact.
<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.
<b>Aspiration hazard</b>	Not Applicable.

## 12. Ecological information

### 12.1 Toxicity

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium hydroxide	= 160 mg/L LC50 Gambusia affinis 96 h	No information available	No information available

### 12.2 Persistence and degradability

No product level data available.

### 12.3 Bioaccumulative potential

No product level data available.

### 12.4 Mobility in soil

No information available.

### 12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1 UN Number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG)</b>	Not regulated
<b>UN No. (ICAO)</b>	Not regulated

**14.2 Proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**15. Regulatory information**

**International inventories**

<b>USA (TSCA)</b>	Complies
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Canada (DSL)	Complies
European Union (EINECS and ELINCS)	Complies
Philippines (PICCS)	Does not Comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Does not Comply

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Immediate (acute) health hazard.

Component	SARA 302 / TPQs	SARA 313	CERCLA RQ
Calcium hydroxide	N/A	N/A	N/A

**State Comments**

Proposition 65: This product is not known to contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer and/or reproductive toxicity at levels that are expected to pose a significant risk under anticipated use conditions.

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other information**

<b>Supersedes date</b>	17/Jun/2015
<b>Revision date</b>	25/Sep/2015
<b>Version</b>	9
<b>The following sections have been revised:</b>	1, 14, 15, 16.

**HMIS classification**

Health	3
Flammability	0
Physical hazard	0

N/A - Not Applicable, N/D - Not Determined.

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.



# ALLIED UNIVERSAL CORPORATION

Headquarters: 3901 NW 115<sup>th</sup> Avenue, Miami, Florida 33178 Phone: (305) 888 - 2623

## MATERIAL SAFETY DATA SHEET

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR § 1910.1200.

TODAY'S DATE: 09/06/07 MSDS NUMBER: 0001

24 HOUR EMERGENCY CHEMICAL SPILL OR RELEASE PHONE NUMBERS:

Allied Universal Corp. at 1-305-483-7732 (Digital Beeper) and/or CHEMTREC at 1-800-424-9300

### SECTION 1 CHEMICAL PRODUCT/COMPANY IDENTIFICATION

## Sodium Hypochlorite

**Product Names:** Aqua Guard Chlorinating Sanitizer, Aqua Guard Bleach, Liquid Chlorine Solution, Liquid Bleach, Hypochlorite, Hypo and Chlorine Bleach.

**Listed Strengths:** 10.5%, 12.5% and 15%

**CAS Number:** 7681-52-9

**Date MSDS Revised:** August 2007 (previous revision 11/04)

**Product Use:** Disinfectant and sanitizer, see product label for all approved uses & instructions.

**NSF Approval:** Yes. Certified to NSF/ANSI Standard 60. Maximum use in Potable Water is 84 mg/L for 12.5% bleach and 100 mg/L for 10.5% bleach.

**NSF Non-Food Compounds Approval:** Yes

### SECTION 2 HAZARD INGREDIENTS/IDENTITY INFORMATION

**Hazardous Ingredient(s):** % (w/w) as Sodium Hypochlorite : 10.5-16%

**Exposure Standards:** None established for Sodium Hypochlorite, as Chlorine exposure standards are:

<b>PEL (OSHA):</b>	1 ppm as Cl <sub>2</sub>	<b>STEL (OSHA):</b>	3 ppm as Cl <sub>2</sub>
<b>TLV (ACGIH):</b>	0.5 ppm as Cl <sub>2</sub>	<b>TWA (ACGIH):</b>	0.5 ppm as Cl <sub>2</sub>
<b>WEEL (AIHA):</b>	2 mg/m <sup>3</sup> , 15 minute TWA as Cl <sub>2</sub>	<b>STEL (ACGIH):</b>	1 ppm as Cl <sub>2</sub>

**Emergency Overview:** May cause burns to the eyes, skin and mucous membranes.

### SECTION 3 PHYSICAL/CHEMICAL CHARACTERISTICS

<b>Alternate Name(s):</b>	Bleach
<b>Chemical Name:</b>	Sodium Hypochlorite
<b>Chemical Family:</b>	Oxidizing Agent
<b>Molecular Formula:</b>	Na-O-Cl
<b>Form:</b>	Liquid
<b>Appearance:</b>	Water clear to a slight greenish-yellow, or light yellow aqueous solution
<b>Odor:</b>	Chlorine odor
<b>pH:</b>	11-14, dependent upon % weight as Sodium Hypochlorite
<b>Vapor Pressure:</b>	Not available
<b>Vapor Density (Air=1):</b>	Not available
<b>Boiling Point:</b>	Approximately 230° F (110° C)
<b>Freezing Point:</b>	14 F (8% w/w Cl <sub>2</sub> solution), 7 F (10% w/w Cl <sub>2</sub> solution), -3 F (12% w/w Cl <sub>2</sub> solution)
<b>Solubility (Water):</b>	Completely Soluble
<b>Solubility (Other):</b>	Reacts with Many Organic Solvents
<b>Density:</b>	Appx. 10 lbs. per gallon
<b>Evaporation Rate:</b>	Not Available
<b>Specific Gravity:</b>	1.126 (8% w/w Cl <sub>2</sub> solution), 1.163 (10% w/w Cl <sub>2</sub> solution), 1.202 (12% w/w Cl <sub>2</sub> solution), 1.25 (15% w/w Cl <sub>2</sub> solution)
<b>Molecular Weight:</b>	74.5

### SECTION 4 STABILITY & REACTIVITY DATA

<b>Chemical Stability</b>	Stable <u>  X  </u>	Unstable <u>      </u>
<b>Incompatibility (Conditions to Avoid):</b> Stability decreases with heat and light exposure.		
<b>Incompatibility (Materials to Avoid):</b> May react violently with strong acids. Other incompatibles include strong caustics, ammonia, urea, reducing agents, organics, ether and oxidizable materials. Reaction with metals (nickel, iron, cobalt and copper) may produce oxygen gas, which supports combustion. May react with organohalogen compounds to		

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form spontaneously combustible compounds. May react explosively with nitro- and chloro-organic compounds as well as acids and reducing agents. Acidification liberates chlorine gas.

**Hazardous Decomposition or Byproducts:** Chlorine gas. Decomposes with heat and reacts with acids. Hazardous gases/vapors produced are hypochlorous acid, chlorine and hydrochloric acid. Composition depends upon temperature and decrease in pH. Additional decomposition products, which depend on pH, temperature and time, are sodium chloride and chlorate, and oxygen.

**No Mechanical Shock or Impact**

**No Static Discharge**

**Oxidizer: No if <12% by weight,  
Yes if > than 12% by weight**

**Hazardous Polymerization**

**May Occur \_\_\_\_\_**

**Will Not Occur  X**

**Note:** Sodium Hypochlorite reacts violently with amines and ammonium salts. Solutions are reactive with common cleaning products such as toilet bowl cleaners, rust removers, vinegar, acids, organics and ammonia products to produce hazardous gases such as chlorine and other chlorinated species.

## SECTION 5 POTENTIAL HEALTH EFFECTS AND FIRST AID INFORMATION

**GENERAL:** May cause immediate pain. Exposure to the skin may cause sensitization or other allergic responses. If the eye is not irrigated immediately after it has been exposed permanent eye damage may occur. Strict adherence to first aid measures following any exposure is essential. SPEED IS ESSENTIAL!

<b>ROUTE(S) OF ENTRY AND POTENTIAL HEALTH EFFECTS</b>	<b>EMERGENCY &amp; FIRST AIDE PROCEDURES</b>
<b>INHALATION:</b> Strong irritating to mucous membranes in the nose, throat and respiratory tract. Prolonged contact can cause chronic irritation, pulmonary edema and central nervous system depression. Repeated inhalation exposure may cause impairment of lung function and permanent lung damage.	<b>If inhaled,</b> move expose person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. If breathing is difficult, have trained person administer oxygen. Call a poison control center or medical physician for further treatment advice. Have the product label or MSDS with you when calling or going for medical treatment.
<b>SKIN CONTACT:</b> Prolonged and repeated exposure to dilute solutions often causes irritation, redness, pain and drying and cracking of the skin. Human evidence has indicated that an ingredient in this product can cause skin sensitization. Depending upon the concentration and how soon after exposure the skin is washed with water, skin contact may cause burns and tissue destruction.	<b>If on skin or clothing,</b> take off all contaminated clothing and rinse skin immediately with plenty of water for 15-20 minutes. If irritation persists, repeat flushing. Do not transport victim unless the recommended irrigation period is completed unless flushing can be continued during transport. Call a poison control center or medical physician for treatment advice. Have the product label or MSDS with you when calling or going for medical treatment.
<b>EYE CONTACT:</b> Strongly irritating to eyes. Exposure to vapor can cause tearing, conjunctivitis and burning of the eyes. Eye contact may cause a corneal injury. The severity of the effects depend on the concentration and how soon after exposure the eyes are washed with water. In severe exposure cases, glaucoma, cataracts and permanent blindness may occur.	<b>If in eyes,</b> hold eye open and rinse slowly and gently with plenty of water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye for 10-15 minutes. Do not transport victim until the recommended flushing period is completed unless irrigation can be continued during transport. Call a poison control center or medical physician for further treatment advice. Have the product label and/or MSDS with you when calling or going to medical treatment.
<b>INGESTION:</b> Corrosive. Can cause severe corrosion of and damage to the gastrointestinal tract (including mouth, throat, and esophagus). Exposure is characterized by nausea, vomiting, abdominal pain, diarrhea, bleeding, and/or tissue ulceration.	<b>If swallowed,</b> call poison control center or medical physician immediately for treatment advice. Have the product label or MSDS with you when calling or going for medical treatment. Have exposed person sip a glass of water if able to swallow, and dilute immediately by giving milk, melted ice cream, starch paste or antacids such as milk of magnesia. Avoid sodium bicarbonate because of carbon dioxide release. DO NOT INDUCE VOMITING, LAVAGE OR ACIDIC ANTIDOTES unless told to do so by poison control center or medical physician. DO NOT give anything by mouth to an unconscious person. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water.

**NOTE TO PHYSICIAN(S):** Pre-existing medical conditions may be aggravated by exposures affecting target organs. There are no known chronic effects. Probable mucosal damage may contraindicate the use of gastric lavage. In addition to the alkalinity of this product, the continued generation of chlorine gas after ingestion can damage further the stomach mucous, depending on the amount ingested. Consideration may be given to removal of the product from the stomach, taking care to avoid perforation of esophagus or stomach. An ounce of 1% sodium thiosulfate or milk of magnesia is helpful.

## SECTION 6 TOXICOLOGICAL DATA

**ANIMAL DATA:** Inhalation 0.25-hour LC50 - 10.5 mg/L in rats; Acute Dermal LD50 - 10,000 mg/kg in rabbits; Acute Oral LD50 - 8910 mg/kg in rats

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**SUMMARY:** The concentrated solution is corrosive to skin, and a 5% solution is a severe eye irritant. Solutions containing more than 5% available chlorine are classified by DOT corrosive (please see section 10 of this MSDS). Toxicity described in animals from single exposures by ingestion include muscular weakness, and hypoactivity. Repeated ingestion exposure in animals caused an increase in the relative weight of adrenal glands in one study, but no pathological changes were observed in two other studies. Long-term administration of compound in drinking water of rats caused depression of the immune system. No adverse changes were observed in an eight week dermal study of a 1% solution in guinea pigs. Tests in animals demonstrate no carcinogenic activity by either the oral or dermal routes. Tests in bacterial and mammalian cell cultures demonstrate mutagenic activity.

**CARCINOGENICITY:** None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as carcinogen.

**MUTAGENICITY:** Sodium Hypochlorite has been shown to produce damage to genetic material when tested in vitro. Studies in vivo have shown no evidence of mutagenic potential for this material. It is judged that the risk of genetic damage is insignificant for sodium hypochlorite because of its biological activity, lack of mutagenicity in vivo, and failure to produce carcinogenic response.

## SECTION 7 FIRE AND EXPLOSION HAZARD DATA

<b>Flash Point:</b> This product does not flash		<b>Flammable Limits (Lower):</b> Not Applicable	
<b>Flammable Limits (Upper):</b> Not Applicable		<b>Auto Ignition Temperature:</b> Not Applicable	
<b>Decomposition Temperature:</b> Not Applicable		<b>Rate of Burning:</b> Not Available	
<b>Explosive Power:</b> Not Available	<b>Sensitivity to Mechanical Impact:</b> Not expected to be sensitive to mechanical impact	<b>Sensitivity to Static Discharge:</b> Not expected to be sensitive to static discharge	
<b>Fire and Explosion Hazards:</b> This material is non-flammable but is decomposed by heat and light, causing a pressure build-up which could result in an explosion. When heated, it may release chlorine gas or hydrochloric acid. Vigorous reaction with oxidizable or organic materials may result in fire.		<b>Extinguishing Media:</b> Use agents appropriate for surrounding fire. Foam, dry chemical, carbon dioxide, water fog or spray. If leak or spill has not ignited, use water spray to disperse the vapors and to protect persons attempting to stop the leak.	
<b>Fire Fighting Procedures:</b> Water spray should be used to cool containers and may be used to knock down escaping vapor. Remove storage vessels from the fire zone.		<b>Fire Fighting Protective Equipment:</b> Full protective clothing, including a NIOSH approved self-contained breathing apparatus, must be worn in a fire involving this material. Toxic gas vapors are produced upon decomposition.	

## SECTION 8 ECOLOGICAL INFORMATION

The toxicity and corrosivity of this product is a function of concentration and the concentration's pH.

**ECOTOXICOLOGICAL INFORMATION:** Toxic to aquatic life. 96-hour LC50: fathead minnows: 0.090-5.9 mg/L, bluegill sunfish: 0.10-2.48 mg/L, shore crab: 1.418 mg/L, grass shrimp: 52.0 mg/L, scud: 0.145-4.0 mg/L, water flea: 2.1 mg/L.

**ENVIRONMENTAL EFFECTS:** Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers. May be an aesthetic nuisance due to color. Mammals and birds, exposed wildlife would be subject to skin irritation and burns due to the corrosive nature of this material.

## SECTION 9 DISPOSAL CONSIDERATIONS

Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State, and Local regulations. Do not burn. Do not flush to surface water or sanitary sewer system. If pH of material is equal to or greater than a 12.5, the material is a RCRA Hazardous Waste D002, corrosive.

## SECTION 10 TRANSPORT INFORMATION

**U.S. DOT Basic Shipping Description:** Hypochlorite Solutions, 8, UN1791, III

**U.S. DOT Hazardous Substance:** Yes, RQ 100 pounds (Sodium Hypochlorite)

**U.S. DOT Marine Pollutant:** No

**U.S. DOT Required Label:** Corrosive (see column 6, 49 CFR §172.101)

**U.S. DOT Packaging Exception:** Yes, if package meets the criteria of a limited quantity or consumer commodity as defined by 49 CFR §171.8, §173.144 and .154, and §172.312 and .316

**N. AMERICAN EMERGENCY GUIDE PAGE NUMBER:** 154

**Transportation Emergency Phone Numbers:** CHEMTREC 1-800-424-9300

## SECTION 11 PRECAUTIONS FOR SAFE HANDLING AND STORAGE

**PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:** Take all precautions to avoid personal contact. Keep container closed except when transferring material. Locate safety shower and eyewash station close to chemical handling area. Use normal good industrial hygiene and housekeeping practices, wash thoroughly after handling. Store in a cool, dry, well-ventilated area, away from incompatibles (minimum distance of 20-25 feet per NFPA Code 1) and direct sunlight. Keep container properly labeled at all times. Vented containers must be used and must be kept closed when not

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being used. Long-term storage is impossible without decomposition. Only use containers made from tinted glass, polyethylene & FRP. Keep out of reach of children.

**PROCESS HAZARDS:** Not Available

**STORAGE TEMPERATURE:** Store containers below 29°C and above freezing point. Do not expose sealed containers above 40°C. Try to store in the dark at the lowest possible temperature, but keep from freezing, to slow-down decomposition.

## SECTION 12 EXPOSURE CONTROLS/PERSONAL PROTECTION

**ENGINEERING CONTROLS:** Full handling precautions should be taken at all times. Provide good room ventilation plus local exhaust at points of emission and low level floor exhaust in immediate handling area. Where engineering controls are not feasible, use adequate local exhaust ventilation wherever mist, spray or vapor may be generated.

**PERSONAL PROTECTIVE EQUIPMENT:**

**Eye:** Use chemical safety goggles when there is potential for contact (splashing), faceshield recommended – ANSI Z87.1

**Skin:** Gloves and protective clothing (apron, boots, and bodysuits) made from rubber, vinyl, neoprene or PVC. Standard work clothing closed at the neck and wrist while wearing impervious equipment.

**Respiratory (Specify Type):** A NIOSH/MSHA approved air purifying respirator with an acid gas cartridge or canister may be permissible under circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is potential for uncontrolled releases, exposure levels are not known, or other circumstances where air purifying respirators may not provide adequate protection.

**Other:** Eyewash, shower station (ANSI Z358.1) must be provided within the immediate work area.

## SECTION 13 ACCIDENTAL RELEASE MEASURES

Ventilate enclosed area. Collect product for recovery or disposal. For release to land, contain discharge by constructing dikes or applying inert absorbent; for release to water, utilize damming and/or water diversion to reduce the spread of contamination; and, for release to air, vapors may be suppressed by the use of a water fog. All run-off water must be captured for treatment and disposal. Collect contaminated soil and water, and absorbent for disposal. Notify applicable government authority if release is reportable or could adversely affect the environment. Please follow all Local, State and Federal Laws for clean-up and disposal of all contaminated material. **Deactivating Chemicals:** Sodium Sulfite, Sodium Thiosulfate and Sodium Bisulfite.

## SECTION 14 REGULATORY INFORMATION

**OSHA CLASSIFICATION, 29 CFR §1900-1910:**

**Physical Hazards:** Reactivity **Health Hazards:** Acute - Skin Sensitizer, Corrosive

**CERCLA AND SARA REGULATIONS, 40 CFR §300-373:**

**Reportable Quantity =** 100 lb.

**CERCLA Hazardous Material:** Yes

**Title III Hazard Classifications:** Acute - yes, Chronic - no, Fire - yes, Reactivity - yes & Sudden Release of Pressure - No. This product may be reportable under the requirements of 40 CFR §370.

**SARA Extremely Hazardous Substance:** No **SARA Toxic Chemical:** No

**CA Prop 65:** No

**FDA 21 CFR 178.1010:** Yes, Approved as Sanitizer

**NSF Whitebook (former USDA Approval) Listing:** Aqua Guard Chlorinating Sanitizer 10.5% - 3D, B1, B2, D1, D2, G4, G7, GX, Q4, Aqua Guard Bleach 12.5% - 3D, B1, B2, D1, D2, G4, GX, Q4

**EPA "CLEAN AIR ACT":** This product does not contain nor is it manufactured with ozone depleting substances. It is not defined as a Hazardous Air Pollutant per 40 CFR 112.

**EPA Pesticide:** The 10.5% and 12.5% sodium hypochlorite products are registered with the U.S. EPA as a pesticide, as required under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). It is a violation of Federal law to use this product for pesticidal applications in a manner inconsistent with the FIFRA labeling.

**NPCA-HMIS RATING:** HEALTH: 3

FLAMMABILITY: 0

REACTIVITY: 2

**NFPA RATING:** NONE AT THIS TIME

## SECTION 15 REFERENCES

Suppliers' Material Safety Data Sheets and EPA Labeling Requirements

Olin and OxyChem Sodium Hypochlorite Handbook

Chlorine Institute Sodium Hypochlorite Pamphlet #96

Chlorine Institute Product Stewardship Bulletins for Sodium Hypochlorite

This information contained herein, while not guaranteed, is offered only as a guide to the handling of this specific material and has been prepared in good faith by product knowledgeable personnel. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. Though Allied Universal Corporation is happy to respond to questions regarding safe handling of Allied's products, safe handling and use remains the responsibility of the product's consumers and/or customers. No warranty of merchantability or fitness for purpose, or any other kind, express or implied, is made regarding performance, stability or otherwise. Allied Universal Corp. will not be liable for any damages, losses, injuries or consequential damages that may result from the use of or reliance on any information contained herein. No suggestions for use are intended as, and nothing herein shall be construed as a recommendation to infringe any existing patents or violate any federal, state or local laws, rules, regulations or ordinances.

## **APPENDIX J ANALYTICAL RESULTS**

Waste Stream: Drill Cuttings/Mud Slops  
EPA Waste Profile Sheet Number: 20140506-009

# ECOTOX Environmental Services Ltd.

## Mud Slop 1 Drill Cuttings from EEPGL

### Quality Analysis Report

**Date of Report: 9<sup>th</sup> April 2021**

**Client: Tiger Tanks Trinidad Unlimited**

Project Code: ECO-TTTU-285

Test Conducted By:



213 Caroni Savannah Road, Charlieville, Chaguanas, Trinidad, W.I.  
Tel.: (868) 672-6620 Fax: (868) 665-8620 E-mail: [admin@ecotoxes.com](mailto:admin@ecotoxes.com), [www.ecotoxes.com](http://www.ecotoxes.com)

*Nafeesa J. Ali*

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Nafeesa Ali

Laboratory Manager

A handwritten signature in black ink, appearing to read "Mikael Dookie", is written over a yellow dotted rectangular background.

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Mikael Dookie

Operations Manager/Chemist

**Date of Report:** 9<sup>th</sup> April 2021  
**Client:** Tiger Tanks Trinidad Unlimited  
**Client Address:** La Bidco Estate, La Brea, Trinidad, W.I.  
**Project Code:** ECO-TTTU-285  
**Report No.:** ECO-TTTU-285

## **1.0 Introduction**

ECOTOX Environmental Services Limited (ECOTOX) was contracted by Tiger Tanks Trinidad Unlimited (TTTU) to conduct analysis of one Mud Slop 1 Drill Cuttings from EEPGL sample for pH, Total Oil and Grease, Total Petroleum Hydrocarbons and TCLP<sup>1</sup> Extracted Heavy Metals. Samples were logged into the ECOTOX sample tracking system and assigned sample identification numbers (Table #1). The samples were appropriately stored until the tests were initiated.

**Table #1: Client I.D. and Sample Details**

<b>Client Sample ID</b>	<b>ECOTOX Sample ID</b>	<b>Sample Collection Date / Time</b>
<b>Mud Slop 1 Drill Cuttings from EEPGL</b>	<b>2101108</b>	<b>25<sup>th</sup> March 2021 / 8:00 a.m.</b>

The samples were collected on the 25<sup>th</sup> March 2021, by a representative from Tiger Tanks Guyana Rentals Inc. Samples were collected and preserved according to recommended procedures as stipulated in the United States Environmental Protection Agency Methods for the requested parameters. The samples were appropriately stored in a cooler, on ice at  $4 \pm 2^{\circ}\text{C}$ , for transportation to the laboratory. The samples were received by ECOTOX on the 8<sup>th</sup> February 2021. On receipt by the laboratory, samples were logged into the ECOTOX sample tracking system and assigned sample identification numbers. The samples were appropriately stored (refrigerator  $4 \pm 2^{\circ}\text{C}$ ) until the tests were initiated.

<sup>1</sup> Toxicity Characteristic Leaching Procedure - a sample extraction method for chemical analysis employed as an analytical method to simulate leaching through a landfill.

## 2.0 Results

Tests were done in accordance with those stipulated in the Standard Methods for the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) and the United States Environmental Protection Agency Standard Methods for the requested parameters. Standard test procedures were followed for all analyses conducted with several quality control measures implemented for each parameter investigated. The results for the requested analyses are listed below in Table #2. Replicate analyses, blanks, spikes and standard reference materials were included during tests to assess the accuracy and precision of the analytical results obtained. Refer to Appendix A for method description and quality control and assurance measures. Refer to Appendix B, for Chain of Custody/Sample Receipt information.

**Table #2: Waste Characterization Results**

<b>Parameter</b>	<b>Maximum Permissible Limit (mg/Kg)</b>	<b>2101108 Mud Slop 1 Drill Cuttings from EEPGL 25<sup>th</sup> March 2021</b>
<b>pH (Hydrogen Ion, H<sup>+</sup>)</b>	<b>6 - 12<sup>2</sup> (H<sup>+</sup>)</b>	<b>10.60</b>
<b>Total Petroleum Hydrocarbons (mg/Kg)</b>	<b>Not Listed<sup>2</sup></b>	<b>32,256.5</b>
<b>Total Oil &amp; Grease (mg/Kg)</b>	<b>&lt; 3% or &lt; 30,000 ppm<sup>2</sup></b>	<b>51,383.4</b>
<b>TCLP Extractable Arsenic (mg/L)</b>	<b>5.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Barium (mg/L)</b>	<b>100 mg/L<sup>3</sup></b>	<b>1.870</b>
<b>TCLP Extractable Cadmium (mg/L)</b>	<b>1.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Chromium (mg/L)</b>	<b>5.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Lead (mg/L)</b>	<b>5.0 mg/L<sup>3</sup></b>	<b>0.076</b>
<b>TCLP Extractable Mercury (mg/L)</b>	<b>0.2 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Selenium (mg/L)</b>	<b>1.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Silver (mg/L)</b>	<b>5.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>

<sup>2</sup> Louisiana Administrative Code (LAC), Title 43, part XIX, Office of Conservation – General Operations Subpart 1. Statewide Order No. 29-B; Section 313, E, Burial or Trenching of Treated Pit Solid Phase Contents – Pit Closure Techniques and Onsite Disposal of Exploration and Production Waste Standard (November 2019).

<sup>3</sup> TCLP United States Environmental Protection Agency Resource Recovery and Conservation Act, RCRA-8 Metals Maximum Permissible Limits (Maximum Concentration of Contaminants).

### 3.0 Appendix A - Quality Control and Quality Assurance Procedures for Analyses Performed

All sampling and tests procedures employed by ECOTOX for the duration of this project were a direct adaptation from standard procedures as outlined in the SMEWW – Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 23<sup>rd</sup> Edition, 2017; and US Environmental Protection Agency Standard Methods. The following will outline a brief description of the procedures used. The relative standard deviation (RSD) was less than 10.0 % for all analyses conducted. Standard reference materials and spiked solutions were used with 85 –115 % recovery obtained during testing. The following table will illustrate the analyses to be performed and necessary details for each.

As outlined in **Laboratory Manual for the Analysis of Exploration and Production Waste** (Department of Natural Resources, May 2005), Analytical Methodology Table (Refer to below):

ANALYTICAL METHODOLOGY REFERENCE TABLE LAC 43:XIX.Subpart 1	
Parameter	Method
<u>Soils / Sediment / Sludges / Reusable Material</u>	
pH	SW-846 9045C, EPA 150.1 <sup>A</sup>
TPH (Total Petroleum Hydrocarbons)	SW-846 1664 HEM/SGT / SW-846 9071
Leachable TPH Test	LDNR Lab Procedures for Analysis of E&P Waste
Leachable Chlorides Test	LDNR Lab Procedures for Analysis of E&P Waste
Electrical Conductivity (EC)	LDNR Lab Procedures for Analysis of E&P Waste
Sodium Absorption Ratio (SAR)	LDNR Lab Procedures for Analysis of E&P Waste
Exchangeable Sodium Percentage (ESP)	LDNR Lab Procedures for Analysis of E&P Waste
Cation Exchange Capacity (CEC)	LDNR Lab Procedures for Analysis of E&P Waste
Benzene	SW-846 8021
TCLP Benzene	SW-846 8021/1311
NORM	EMSL-LV-0539-17 <sup>B</sup>
Reactive Sulfide	SW-846 7.3.4
<u>Total Metals and/or Leachable Metals</u>	
TCLP Extraction	SW-846 1311
Arsenic (As)	SW-846 6010/6020/7000
True Total Barium (Ba)	LDNR Lab Procedures for Analysis of E&P Waste
Barium (Ba)	SW-846 6010/6020/7000
Cadmium (Cd)	SW-846 6010/6020/7000
Chromium (Cr)	SW-846 6010/6020/7000
Copper (Cu)	SW-846 6010/6020/7000
Lead (Pb)	SW-846 6010/6020/7000
Mercury (Hg)	SW-846 7470/7471
Molybdenum (Mo)	SW-846 6010/6020/7000
Nickel (Ni)	SW-846 6010/6020/7000
Selenium (Se)	SW-846 6010/6020/7000
Silver (Ag)	SW-846 6010/6020/7000
Sodium (Na)	SW-846 6010/6020/7000
Zinc (Zn)	SW-846 6010/6020/7000
Soluble Cations (Na, Ca, Mg)	LDNR Lab Procedures for Analysis of E&P Waste
Soluble Anions (Cl, CO <sub>3</sub> , HCO <sub>3</sub> , SO <sub>4</sub> )	SW-846 9056/9253, SM 2320B*

**Table #3: Methodology Listing – Sampling – Solid Waste Matrices**

Item	Test Method and Description
Test Method Reference	<p>SOLID- As outlined and guided by the following reference methods:</p> <ul style="list-style-type: none"> <li>• ASTM D6051 – 15. Standard Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities.</li> <li>• RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment, EPA530-D-02-002, August 2002.</li> <li>• US EPA SW 846 Compendium of Hazardous Waste Testing Methods, Test Methods for Evaluating Solid Waste.</li> <li>• US EPA Hazardous Waste Incineration Measurement Guidance Manual, Volume III of the Hazardous Waste Incineration Guidance, Section 3.3 “Sampling”, EPA/625/6-89/021, June 1989.</li> <li>• US EPA Hazardous Waste Incineration Measurement Guidance Manual, Volume III of the Hazardous Waste Incineration Guidance, Section 3.3.1.2 “Viscous Liquids, Slurries, Sludges, and Solid Waste Samples”, EPA/625/6-89/021, June 1989, as follows: Incinerator Ash, Moist or Dry Solids - Trowel (Scoop) Method</li> </ul>
Test Description	<p>Composite Sample – Solid/Sludge  <i>Composite Gross Sample</i>  <i>Reduction of Gross Sample: Coning and quartering procedure:</i>                      A composite sample will be collected from no more than 3-bags per homogenous waste type and sent to the lab for analysis.</p>
Sample Collection & Preservation	<p><b><u>Borosilicate (Glass), PTFE<sup>4</sup> Lined Cap (8 ounces)</u></b> – Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler. Cool, &lt; 6°C, in dark.</p> <p>Samples to be stored cool 4 ± 2°C, but not freezing.</p>
Maximum Holding Time/Storage	<p>Samples should be stored field-moist at 4 ± 2°C for 14-days.                      Preserved Metal TCLP digest holding time = 6 months, 4 ± 2°C.                      TOG/TPH samples holding time = 14 days, 4 ± 2°C.</p>
Transportation	<p>After collection, sample handling should be minimized. Field Technicians should use extreme care to ensure that samples are not contaminated during storage. Environmental and waste samples are typically stored in coolers. To reduce the risk of cross contamination, sample containers should be placed inside of sealed, plastic bags before being placed in the cooler. If ice is required for preservation of the samples, the ice should be contained in a plastic bag or some equivalent container to prevent the potential for cross contamination of the samples by water produced from melting ice. If ice is used, the coolers should be checked regularly and water should be drained as needed. Custody of samples will be maintained. If analysis is to be delayed for more than six (6) hours, samples must be stored in a cooler with ice to maintain sample temperature of 4 ± 2°C. All samples must therefore be transported to the laboratory in this manner.</p>

<sup>4</sup> Polytetrafluoroethylene.

**Table #4: Methodology Listing – Total Petroleum Hydrocarbons**

Parameter	Test Method and Description
<p>Test Method Reference and Description</p>	<p>As outlined in <b>Laboratory Manual for the Analysis of Exploration and Production Waste</b> (Department of Natural Resources, May 2005) Analytical Methodology Reference Table, page 2.</p> <p>As outlined in <b>US EPA Method 9071B</b>, n-Hexane Extractable Material (HEM) for Sludge, Sediment, and Solid Samples. Quantification of oil and grease in soil, sediments, sludges, and other solid materials amenable to chemical drying and solvent extraction with n-hexane. “Oil and grease” is a conventional pollutant under 40 CFR 401.16 and generally refers to substances, including biological lipids and mineral hydrocarbons that have similar physical characteristics and common solubility in an organic extracting solvent. As such, oil and grease is an operationally defined parameter, and the results will depend entirely on the extracting solvent and method of extraction. Method 9071 employs n-hexane as the extraction solvent with Soxhlet extraction and the results of this method are appropriately termed “n-hexane extractable material (HEM).”</p> <p>As outlined in <b>US EPA 3540C – Soxhlet Extraction Method</b>. Method 3540 is a procedure for extracting non-volatile and semi volatile organic compounds from solids such as soils, sludges, and wastes. The Soxhlet extraction process ensures intimate contact of the sample matrix with the extraction solvent. The solid sample is mixed with anhydrous sodium sulfate, placed in an extraction thimble or between two plugs of glass wool, and extracted using an appropriate solvent in a Soxhlet extractor. The extract is then dried, concentrated (if necessary), and, as necessary, exchanged into a solvent compatible with the clean-up or determinative step being employed.</p> <p>As outlined in <b>5520F – Hydrocarbons (TPH)</b>. Silica gel has the ability to adsorb polar materials. If a solution of hydrocarbons and fatty materials in a nonpolar solvent is mixed with silica gel, the fatty acids are removed selectively from solution. The materials not eliminated by silica gel adsorption are designated hydrocarbons by this test.</p>
<p>Quality/Assurance Control Measures</p>	<ul style="list-style-type: none"> <li>• Duplicate/Triplicate analyses,</li> <li>• Method Blank, Laboratory Fortified Blank.</li> <li>• Routine and Random Duplicates/Triplicates.</li> <li>• Determine Method Detection Limit for sample analyte.</li> <li>• Instrument Operational Range – Upper and Lower Limits</li> <li>• Calibration &amp; Verification Procedures and Standards.</li> <li>• Equipment Maintenance and Preventative Maintenance Procedures.</li> </ul>

**Table #5: Methodology Listing – TCLP<sup>5</sup> Extractable Metals**

Parameter	Test Method and Description
<p>Test Method Reference and Description</p>	<p>As outlined in <b>Laboratory Manual for the Analysis of Exploration and Production Waste</b> (Department of Natural Resources, May 2005), Analytical Methodology Reference Table, page 2.</p> <p>As outlined in <b>US EPA Method Number 1311</b>. Toxicity characteristic leaching procedure (TCLP) is a soil sample extraction method for chemical analysis employed as an analytical method to simulate leaching through a landfill. The testing methodology is used to determine if a waste is characteristically hazardous.</p> <p>The solid phase is extracted with an amount of extraction fluid equal to 20 times the weight of the solid phase. The extraction fluid employed is a function of the alkalinity of the solid phase of the waste. Following extraction, the liquid extract is separated from the solid phase by filtration through a 0.6 to 0.8 µm glass fiber filter.</p> <p>The TCLP Extract is analyzed for metals as outlined in:  <b>As, Ba, Cd, Cr, Pb, Zn, Se &amp; Ag</b> – US EPA SW-846 Test Method 7000B and SMEWW<sup>6</sup> Method 3111B, D: Flame Atomic Absorption Spectrophotometry.</p> <p><b>Mercury:</b>  Hg – US EPA Method 7470 - Cold-Vapor Atomic Absorption Spectrometry 7471B-Solids or Semisolid Waste Cold-Vapor Atomic Absorption Spectrometry. Free mercury atoms in a carrier gas are excited by a collimated ultraviolet light source at a wavelength of 53.7 nanometres. The excited atoms re-radiate their absorbed energy (fluoresce) at this same wavelength. Unlike the directional excitation source, the fluorescence is omnidirectional and may thus be detected using a photomultiplier tube or UV photodiode. The technique differs from the more conventional atomic absorption (AA) technique in that it is more sensitive, more selective, and is linear over a wide range of concentrations.</p> <p><b>Arsenic</b>  Hydride Generation/Atomic Absorption Spectrometry and ECOTOX SOP Method W-M-As. This method is applicable to the determination of arsenic by conversion to its hydride by sodium borohydride reagent and transport into an atomic absorption atomizer. Arsenous acid, the As (III) oxidation state of arsenic is instantaneously converted by sodium borohydride reagent in acid solution to its volatile hydride. The hydride is purged continuously by argon or nitrogen into a quartz cell heated electrically or by the flame of an atomic absorption spectrometer and converted to the gas-phase atoms. The sodium borohydride reducing agent, by rapid generation of the elemental hydrides in an appropriate reaction cell, minimizes dilution of the hydrides by the carrier gas and provides rapid, sensitive determination of arsenic. At room temperature and solution pH values of 1 or less, arsenic acid, the As(V) oxidation state of arsenic, is reduced relatively slowly by sodium borohydride to As (III), which is then instantaneously converted to arsine. Organic and inorganic forms of arsenic are first oxidized to As(V) by acid digestion. The As(V) then is quantitatively reduced to As (III) with sodium or potassium iodide before reaction with sodium borohydride.</p>
<p>Quality/Assurance Control Measures</p>	<ul style="list-style-type: none"> <li>• Duplicate/Triplicate analyses,</li> <li>• Method Blank, Laboratory Fortified Blank.</li> <li>• Routine and Random Duplicates/Triplicates.</li> <li>• Determine Method Detection Limit for sample analyte.</li> <li>• Instrument Operational Range – Upper and Lower Limits</li> <li>• Calibration &amp; Verification Procedures and Standards.</li> <li>• Equipment Maintenance and Preventative Maintenance Procedures.</li> </ul>

<sup>5</sup> Toxicity characteristic leaching procedure.

<sup>6</sup> SMEWW – Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 2017, 23<sup>rd</sup> Edition.

**Table #6: Methodology Listing – pH**

Parameter	Test Method and Description
Test Method Reference and Description	<p>As outlined in <b>Laboratory Manual for the Analysis of Exploration and Production Waste</b> (Department of Natural Resources, May 2005) Analytical Methodology Reference Table, page 2.</p> <p>As outlined in <b>US EPA Method SW-846 Test Method 9045C: Soil and Waste pH</b>.</p> <p>Sample Preparation and pH measurement of waste materials:</p> <p>To 20 grams waste sample in a 50-mL beaker, add 20 mL of reagent water, cover and continuously stir for 5 minutes. Let waste suspension stand for about 15 minutes to allow most of the suspended waste to settle from the suspension or filter or centrifuge off aqueous phase for pH measurement.</p> <p>pH measurement by pH Meter.</p>
<b>Quality/Assurance Control Measures</b>	<ul style="list-style-type: none"> <li>• Duplicate analyses,</li> <li>• Method Blank, Laboratory Fortified Blank.</li> <li>• Routine and Random Duplicates/Triplicates.</li> <li>• Determine Method Detection Limit for sample analyte.</li> <li>• Instrument Operational Range – Upper and Lower Limits</li> <li>• Calibration &amp; Verification Procedures and Standards.</li> <li>• Equipment Maintenance and Preventative Maintenance Procedures.</li> </ul>

The following is a table of the calculated detection limits and the associated bias for each of the analyses performed.

**Table #7: List of Parameters with Associated Instrument Detection Limits and Bias**

Parameter	Detection Limit/Range	Bias
pH	0.01 H <sup>+</sup>	± 0.01 H <sup>+</sup>
OG/TPH	0.1 ppm	±0.1 ppm
TCLP Metals	0.005 ppm	±0.005 ppm

# 4.0 Appendix B – Chain of Custody



**ECOTOX**  
ENVIRONMENTAL CONSULTANTS

## ANALYTICAL REQUEST FORM CHAIN OF CUSTODY

Laboratory Address: #213 Caroni Savannah Rd, Charlotteville,  
Trinidad, West Indies.  
Tel: (868)-672-6620 Fax: (868) 665-8620; (868) 221-9149  
e-mail: admin@ecotox.com, info@ecotox.com

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CLIENT: Tiger Tanks Trinidad Unlimited (for Tiger Tanks  
Guyana, Rentals Inc.)

REPORT TO: Mr. Sheero Singh

ADDRESS: #126 Quamina & Carmichael Streets, Georgetown,  
Guyana.

PHONE: 592-501-0520 FAX:

PROJECT NAME: Waste Testing

PROJECT NUMBER: 295

SAMPLED BY: Nandkishore Singh

INVOICE TO:

BILLING ADDRESS:

P.O. NUMBER:

COCI#:

**TURNAROUND REQUEST in Business Days**

Analysis

10	<input checked="" type="checkbox"/>	5	<input type="checkbox"/>	3	<input type="checkbox"/>	2	<input type="checkbox"/>	1	<input type="checkbox"/>	<1
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STZ

Microbiological Analysis

10	<input type="checkbox"/>	7	<input type="checkbox"/>	5	<input type="checkbox"/>	3	<input type="checkbox"/>	2	<input type="checkbox"/>	1
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STZ

OTHER:

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CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	REQUESTED ANALYSIS										MATRIX (W.S.O)	# OF CONT.	COMMENTS	ECOTOX ID	
		TPH	oil & Grease	TCP	As, Ba, Cr, Pb, Hg, Se, Ag, Cd	PH										
1. Mud slop Drill Cuttings	25/12/01 @ 8:00 AM	<input checked="" type="checkbox"/>	5	1	Plastic	210110F										
2. From BEPGL	4:00 AM															
3. #. ARDU																
4. 7100546																
5.																
6.																
7.																
8.																
9.																
10.																

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RELINQUISHED BY: K. Ramrattan

PRINT NAME: K. Ramrattan FIRM: TRG

RELINQUISHED BY: \_\_\_\_\_ FIRM: \_\_\_\_\_

PRINT NAME: \_\_\_\_\_ FIRM: \_\_\_\_\_

RECEIVED BY: [Signature]

DATE: 25/12/01 TIME: 7:00 AM

RELINQUISHED BY: \_\_\_\_\_ FIRM: \_\_\_\_\_

PRINT NAME: \_\_\_\_\_ FIRM: \_\_\_\_\_

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ADDITIONAL INFO/SPECIAL REQUESTS:

PAGE 3 OF 7

Waste Stream: Completion Fluids/Contaminated Brine  
EPA Waste Profile Sheet Number: 20140506-021

# ECOTOX Environmental Services Ltd.

Frac Tank Flow back Fluids from

Frac Tank #59487

## Wastewater Quality Analysis Report

**Date of Report: 13<sup>th</sup> April 2021**

Client: Tiger Tanks Trinidad Unlimited (TTTU)

Project Code: ECO-TTTU-289

Test Conducted By:



213 Caroni Savannah Road, Charlieville, Chaguanas, Trinidad, W.I.

Tel.: (868) 672-6620 Fax: (868) 665-8620 E-mail: [admin@ecotoxes.com](mailto:admin@ecotoxes.com), [www.ecotoxes.com](http://www.ecotoxes.com)

*Nafeesa J. Ali*

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Nafeesa Ali

Laboratory Manager

*Mikael Dookie*

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Mikael Dookie

Environmental Chemist

**Date of Report:** 13<sup>th</sup> April 2021  
**Client:** Tiger Tanks Trinidad Unlimited  
**Client Address:** La Bidco Estate, La Brea, Trinidad, W.I.  
**Project Code:** ECO-TTTU-289  
**Project Number:** ECO-TTTU-289

**Table 1: Sample Details and I.D. Codes**

Client Sample I.D.	ECOTOX Sample ID	Sample Collection Date / Time
Frac Tank Flow back Fluids from Frac Tank #59487	2101112	25 <sup>th</sup> March 2021 / 8:00 a.m.

## 1. Summary:

ECOTOX was contracted by Tiger Tanks Trinidad Unlimited to conduct analytical testing of one Frac Tank Flow back Fluids from Frac Tank #59487 sample for pH, Flash Point, Total Oil and Grease, Total Petroleum Hydrocarbons, Chemical Oxygen Demand, Biological Oxygen Demand, BTEX and TCLP Extractable Metals. This report summarizes the test results for the samples taken.

The samples were collected on the 25<sup>th</sup> March 2021, by a representative of Tiger Tanks Guyana Rentals Inc. Samples were collected and preserved according to recommended procedures as stipulated in the Standard Methods for the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) for the requested parameters. The samples were appropriately stored in a cooler, on ice at  $\leq 6^{\circ}\text{C}$ , for transportation to the laboratory. The samples were received by ECOTOX on the 1<sup>st</sup> April 2021. On receipt by the laboratory, samples were logged into the ECOTOX sample tracking system and assigned sample identification numbers. The samples were appropriately stored (refrigerated  $\leq 6^{\circ}\text{C}$ ) until the tests were initiated.

## 2. Results:

Tests were done in accordance with those stipulated in the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) standard methods and the US EPA. Standard test procedures were followed for all analyses conducted with several quality control measures implemented for each parameter tested. The results for the requested analyses are listed below in Table 2. Replicate analyses, blanks and other reference materials were included during tests to assess the accuracy and precision of the analytical results obtained. Refer to Appendix A for description of methods and quality assurance and control measures. Chain of Custody form is displayed in Appendix B.

**Table 2: Analysis of Wastewater Samples**

Parameter	Maximum Permissible Limits <sup>1</sup>	Client Sample Name: Frac Tank Flow back Fluids from Frac Tank #59487 Wastewater  Ecotox Sample I.D.: 2101112
<b>Date of Sample Collection</b>		<b>25<sup>th</sup> March 2021</b>
<b>Time of Sample Collection</b>		<b>8:00 a.m.</b>
pH (H <sup>+</sup> ions)	5 – 9 H <sup>+</sup> ions	8.00
Total Petroleum Hydrocarbons (TPH) (mg/L)	≤ 40 mg/L	> 10%
Total Oil & Grease (TO&G) (mg/L)	Not Listed	> 10%
Biological Oxygen Demand (BOD) (mg/L)	≤ 50 mg/Ls	5,630.4
Chemical Oxygen Demand (COD) (mg/L)	≤ 50 mg/Ls	13,166.9
TCLP Extractable Arsenic (mg/L)	Not Listed	< 0.005
TCLP Extractable Barium (mg/L)	Not Listed	< 0.005
TCLP Extractable Cadmium (mg/L)	Not Listed	< 0.005
TCLP Extractable Chromium (mg/L)	Not Listed	0.409
TCLP Extractable Lead (mg/L)	Not Listed	< 0.005
TCLP Extractable Mercury (mg/L)	Not Listed	< 0.005
TCLP Extractable Selenium (mg/L)	Not Listed	< 0.005
TCLP Extractable Silver (mg/L)	Not Listed	< 0.005
Flash Point (°C)	Not Listed	99.0
Benzene (µg/L)	Not Listed	1.40
Toluene (µg/L)	Not Listed	1.76
Ethylbenzene (µg/L)	Not Listed	4.39
Xylene (µg/L)	Not Listed	9.19

NOTE: 1% = 10,000 ppm

<sup>1</sup> Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment.

**Table 3: Analysis of Wastewater Samples**

<b>Parameter</b>	<b>Maximum Permissible Limits<sup>2</sup></b>	<b>Client Sample Name: Frac Tank Flow back Fluids from Frac Tank #59487 Wastewater  Ecotox Sample I.D.: 2101112</b>
<b>Date of Sample Collection</b>		<b>25<sup>th</sup> March 2021</b>
<b>Time of Sample Collection</b>		<b>8:00 a.m.</b>
<b>Naphthalene (mg/L)</b>	<b>Not Listed</b>	<b>2,108.5</b>
<b>Acenaphthylene (mg/L)</b>	<b>Not Listed</b>	<b>43.2</b>
<b>Acenaphthene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Fluorene (mg/L)</b>	<b>Not Listed</b>	<b>100.6</b>
<b>Anthracene (mg/L)</b>	<b>Not Listed</b>	<b>4.6</b>
<b>Phenanthrene (mg/L)</b>	<b>Not Listed</b>	<b>80.1</b>
<b>Fluoranthene (mg/L)</b>	<b>Not Listed</b>	<b>3.1</b>
<b>Pyrene (mg/L)</b>	<b>Not Listed</b>	<b>6.4</b>
<b>Benzo(a)anthracene (mg/L)</b>	<b>Not Listed</b>	<b>2.5</b>
<b>Chrysene (mg/L)</b>	<b>Not Listed</b>	<b>35.1</b>
<b>Benzo(b)fluoranthene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Benzo(k)fluoranthene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Benzo(a)pyrene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Dibenz(ah)anthracene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Benzo(ghi)perylene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Ideno(1,2,3-c,d)pyrene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>

<sup>2</sup> Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment.

## 4. Appendix A

### Quality Control and Quality Assurance Procedures for Analyses Performed

All sampling and tests procedures employed by ECOTOX for the duration of this project were a direct adaptation from standard procedures as outlined in the Standard Methods for the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) The following will outline a brief description of the procedures used.

**Table 4A. Description of Parameters Investigated and Associated Quality Control Measures**

Parameter	Test Method and Description	Quality Control Measures.
Sampling	As outlined in SMEWW # 1060 Grab Samples	Duplicate Samples were taken, preserved with 50% Sulphuric Acid to pH 2 or otherwise as outlined in WPR 2000.
Total Oil and Grease / Total Petroleum Hydrocarbons	<b>N-Hexane Extractable Material (Non-polar Material) Total Oil and Grease by Extraction and Gravimetry (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGTHEM; USEPA Method 1664 Revision A. February 1999.</b> The term "n-hexane extractable material" reflects that this method can be used to determine materials other than oils and greases. Similarly, the term "silica gel treated n-hexane extractable material" reflects that this method can be used to determine material that is not adsorbed by silica gel (non-polar material). A 1-L sample is acidified to pH <2 with Hydrochloric Acid or Sulphuric Acid and serially extracted three times with n-hexane in a separatory funnel. The extract is dried over sodium sulfate. The solvent is distilled from the extract and the HEM is desiccated and weighed. If the HEM is to be used for determination of SGT-HEM, the HEM is re-suspended in n-hexane. For SGT-HEM determination, an amount of silica gel proportionate to the amount of HEM is added to the solution containing the re-suspended HEM to remove polar materials. The solution is filtered to remove the silica gel, the solvent is distilled, and the SGT-HEM is desiccated and weighed.	Duplicate analyses, multiple blanks and spikes.
Biological Oxygen Demand	As outlined in <b>SMEWW Method # 5210 B 5-Day BOD Test Method.</b> Quantification of the relative oxygen requirements of wastewaters, effluents, and polluted waters after 5 Days of incubating diluted samples at 20 ± 1°C.	Standard Reference Material. Blanks. Controls.
Total Chemical Oxygen Demand (COD) - Modified for Chloride Correction	As outlined in <b>SMEWW Method # 5220 D Closed Reflux, Colorimetric Method.</b> Used to indirectly measure the amount of organic compounds in water as nearly all organic compounds can be fully oxidized to carbon dioxide with a strong chemical oxidizing agent under acidic conditions. In the process of oxidizing the organic substances found in the water sample, potassium dichromate is reduced (since in all redox reactions, one reagent is oxidized and the other is reduced), forming Cr <sup>3+</sup> . The amount of Cr <sup>3+</sup> is determined after oxidation is complete, and is used as an indirect measure of the organic contents of the water sample.  EQUIPMENT used - Block Digester, relevant glassware and chemicals for digestion procedure, UV-VIS Spectrophotometer.	Duplicate analysis, standard reference material – Potassium hydrogen phthalate standard, multiple banks per batch.

**Table 4B. Description of Parameters Investigated and Associated Quality Control Measures**

Parameter	Test Method and Description	Quality Control Measures.
pH	<p><b>As outlined in SMEWW Method # No. 4500-H<sup>+</sup> pH Value B Electrometric Method.</b> The basic principle of electrometric pH measurement is determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.</p>	Calibration/Standard Solutions.
TCLP Extractable Metals	<p>As outlined in <b>US EPA Method Number 1311</b>. The TCLP is designed to determine the mobility of both organic and inorganic analytes present in liquid, solid, and multiphasic wastes. For liquid wastes, after filtration through a 0.6 to 0.8 µm glass fiber filter, is defined as the TCLP extract.</p> <p>The TCLP Extract is analyzed for metals as outlined in:            As, Ba, Cd, Cr, Pb, Se &amp; Ag – US EPA SW-846 Test Method 7000B and SMEWW Method 3111B, D: Flame Atomic Absorption Spectrophotometry.</p> <p>Hg – US EPA Method 7470 - Cold-Vapor Atomic Absorption Spectrometry 7471B-Solids or Semisolid Waste Cold-Vapor Atomic Absorption Spectrometry.</p> <p>As – US EPA Method 7061 Hydride Generation/Atomic Absorption Spectrometry.</p>	Standard addition, blanks, triplicate analyses, standard reference water solutions.
BTEX	<p>As outlined in US EPA Method Number 8260D, Volatile Organic Compounds By Gas Chromatography/Mass Spectrometry. VOCs are introduced into the GC by one of the preparation methods mentioned in Sec. 1.2. The analytes may be introduced directly to a capillary column, cryofocused on a capillary pre-column before being flash evaporated to a capillary column for analysis, or desorbed from a trap and sent to an injection port operating in the split mode for injection to a capillary column. The column is temperature-programmed to separate the analytes, which are then detected with a MS interfaced to the GC.</p> <p>Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard (IS) using an appropriate calibration curve for the intended application</p>	Method blanks, surrogates, reference materials.
PAHs	<p>As outlines in US EPA Method Number 610. A measured volume of sample, approximately 1 L, is extracted with methylene chloride using a separatory funnel. The methylene chloride extract is dried and concentrated to a volume of 10 mL or less. The extract is then separated GC. A flame ionization detector is used with GC. GC (Gas chromatograph) an analytical system complete with temperature programmable gas chromatograph suitable for on-column or splitless injection and all required accessories including syringes, analytical columns, gases, detector, and strip-chart recorder. A data system is recommended for measuring peak areas.</p>	Method blanks, surrogates, reference materials.
Flash Point	<p>ASTM E502-21 – Standard Test Method for Selection and Use of ASTM Standards for the Determination of Flash Point of Chemicals by Closed Cup Method.</p>	<p>Testing conducted by Trinidad &amp; Tobago Bureau of Standards.</p> <p>Report# 20210171</p>

The following is a table of the calculated detection limits and the associated bias for each of the analyses performed.

**Table 5: List of Parameters with Associated Instrument Detection Limits and Bias.**

Parameter	Detection Limit/Range	Bias
pH (H <sup>+</sup> ions)	0.02 H <sup>+</sup> ions	±0.01 H <sup>+</sup> ions
Total Petroleum Hydrocarbons (TPH) (mg/L)	0.05 mg/L	±0.01 mg/L
Total Oil & Grease (TO&G) (mg/L)	0.05 mg/L	±0.01 mg/L
Biological Oxygen Demand (BOD) (mg/L)	< 2 mg/L	There is no measurement for establishing the BOD test's bias <sup>3</sup> . Check using GGA Standard (85 to 115% Recovery), Dilution water blanks.
Chemical Oxygen Demand (COD) (mg/L)	2.9 mg/L	± 2.9 mg/L
TCLP Extractable Arsenic (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Barium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Cadmium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Chromium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Lead (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Mercury (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Selenium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Silver (mg/L)	0.005 mg/L	± 0.005 mg/L
BTEX	0.005 mg/L	± 0.005 mg/L
PAHs	0.005 mg/L	± 0.005 mg/L
Flash Point (°C)	± 0.5 (°C)	

<sup>3</sup> SMEWW 23<sup>rd</sup> Edition: 5210 Biological Oxygen Demand (BOD) Approved by Standard Methods Committee, 2016. The GGA check prescribed in 5210B.6b is intended to be a reference point for evaluating dilution-water quality, seed effectiveness, and analytical technique.

## 5. APPENDIX B

### Sample Collection & Preservation

As Outlined in Method #1060, Collection and Preservation of Samples, Standard Methods for Examination of Water and Wastewater, 23<sup>rd</sup> Edition (2017).

## COLLECTION AND PRESERVATION OF SAMPLES (1060)/Collection of Samples

TABLE 1060.I. SUMMARY OF SPECIAL SAMPLING AND HANDLING REQUIREMENTS\*

Determination	Container†	Minimum Sample Size mL	Sample Type‡	Preservation§	Maximum Storage Recommended	Regulatory
Acidity	P, G(B), FP	100	g	Cool, $\leq 6^{\circ}\text{C}$	24 h	14 d
Alkalinity	P, G, FP	200	g	Cool, $\leq 6^{\circ}\text{C}$	24 h	14 d
BOD	P, G, FP	1000	g, c	Cool, $\leq 6^{\circ}\text{C}$	6 h	48 h
Boron	F, P (PTFE) or quartz	1000	g, c	$\text{HNO}_3$ to $\text{pH} < 2$	28 d	6 months
Bromide	P, G, FP	100	g, c	None required	28 d	28 d
Carbon, organic, total	G (B), P, FP	100	g, c	Analyze immediately; or cool $\leq 6^{\circ}\text{C}$ , and add HCl, $\text{H}_3\text{PO}_4$ , or $\text{H}_2\text{SO}_4$ to $\text{pH}$	7 d	28 d
Carbon dioxide	P, G	100	g	Analyze immediately	0.25 h	N.S.
COD	P, G, FP	100	g, c	Analyze as soon as possible, or add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$ ; Cool, $\leq 6^{\circ}\text{C}$	7 d	28 d
Chloride	P, G, FP	50	g, c	None required	N.S.	28 d
Chlorine, total, residual	P, G	500	g	Analyze immediately	0.25 h	0.25 h
Chlorine dioxide	P, G	500	g	Analyze immediately	0.25 h	N.S.
Chlorophyll	P, G	500	g	Unfiltered, dark, $\leq 6^{\circ}\text{C}$ Filtered, dark, $-20^{\circ}\text{C}$ (Do not store in frost-free freezer)	24–48 h 28 d	N.S.
Color	P, G, FP	500	g, c	Cool, $\leq 6^{\circ}\text{C}$	48 h	48 h
Specific conductance	P, G, FP	500	g, c	Cool, $\leq 6^{\circ}\text{C}$	28 d	28 d
Cyanide Total	P, G, FP	1000	g, c	Analyze within 15 min. Add NaOH to $\text{pH} > 12$ if sample is to be stored, Cool, $\leq 6^{\circ}\text{C}$ , in dark. Add thiosulfate if residual chlorine present	24 h	14 d; 24 h if sulfide present
Amenable to chlorination	P, G, FP	1000	g, c	Remove residual chlorine with thiosulfate and cool $\leq 6^{\circ}\text{C}$	stat	14 d; 24 h if sulfide present
Fluoride	P	100	g, c	None required	28 d	28 d
Hardness	P, G, FP	100	g, c	Add $\text{HNO}_3$ or $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$	6 months	6 months
Iodine	P, G	500	g	Analyze immediately	0.25 h	N.S.
Metals	P(A), G(A), FP (A)	1000	g, c	For dissolved metals filter immediately, add $\text{HNO}_3$ to $\text{pH} < 2$	6 months	6 months
Chromium VI	P(A), G(A), FP (A)	250	g	Cool, $\leq 6^{\circ}\text{C}$ , $\text{pH}$ 9.3–9.7, ammonium sulfate buffer preservative as specified in method 3500-Cr to extend to 28 days HT	28 d	28 d
Copper by colorimetry	—*	—	g, c	—	—	—
Mercury	P(A), G(A), FP(A)	500	g, c	Add $\text{HNO}_3$ to $\text{pH} < 2$ , Cool $\leq 6^{\circ}\text{C}$	28 d	28 d
Nitrogen Ammonia	P, G, FP	500	g, c	Analyze as soon as possible or add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$ , Cool, $\leq 6^{\circ}\text{C}$	7 d	28 d
Nitrate	P, G, FP	100	g, c	Analyze as soon as possible; Cool, $\leq 6^{\circ}\text{C}$	48 h	48 h (14 d for chlorinated samples)
Nitrate + nitrite	P, G, FP	200	g, c	Add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$ , Cool, $\leq 6^{\circ}\text{C}$	1–2 d	28 d
Nitrite	P, G, FP	100	g, c	Analyze as soon as possible; Cool, $\leq 6^{\circ}\text{C}$	none	48 h
Organic, Kjeldahl	P, G, FP	500	g, c	Cool, $\leq 6^{\circ}\text{C}$ , add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$	7 d	28 d
Odor	G	500	g	Analyze as soon as possible; Cool $\leq 6^{\circ}\text{C}$	6 h	24 h (EPA Manual drinking water)
Oil and Grease	G, wide-mouth calibrated	1000	g	Add HCl or $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$ , Cool, $\leq 6^{\circ}\text{C}$	28 d	28 d

## COLLECTION AND PRESERVATION OF SAMPLES (1060)/Collection of Samples

TABLE 1060.I. CONT.

Determination	Container†	Minimum Sample Size mL	Sample Type‡	Preservation§	Maximum Storage Recommended	Regulatory
Organic Compounds						
MBAS	P, G, FP	250	g, c	Cool $\leq 6^{\circ}\text{C}$	48 h	48 h as per CFR 136
Pesticides*	G(S), PTFE-lined cap	1000	g, c	Cool, $\leq 6^{\circ}\text{C}$ add 1000 mg ascorbic acid/L if residual chlorine present (0.008 % sodium thiosulfate in CFR 136)	7 d	7 d until extraction; 40 d after extraction
Phenols	P, G, PTFE-lined cap	500	g, c	Cool, $\leq 6^{\circ}\text{C}$ , add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$	*	28 d until extraction, 2 d after extraction
Purgeables* by purge and trap	G, PTFE-lined cap	2x40	g	Cool, $\leq 6^{\circ}\text{C}$ ; add HCl to $\text{pH} < 2$ ; add 1000 mg ascorbic acid/L if residual chlorine present (0.008% sodium thiosulfate in CFR 136)	7 d	14 d
Base/neutral & acids	G(S) amber	1000	g, c	Cool, $\leq 6^{\circ}\text{C}$ , 0.008 % sodium thiosulfate in CFR 136 if chlorine is present	7 d	7 d until extraction; 40 d after extraction
Oxygen, dissolved	G, BOD bottle	300	g	Analyze immediately	0.25 h	0.25 h
Electrode				Titration may be delayed after acidification	8 h	8 h
Winkler						
Ozone	G	1000	g	Analyze immediately	0.25 h	N.S.
pH	P, G	50	g	Analyze immediately	0.25 h	0.25 h
Phosphate	G(A)	100	g	For dissolved phosphate filter immediately; Cool, $\leq 6^{\circ}\text{C}$	48 h	48 h as per EPA manual for DW.
Phosphorus, total	P, G, FP	100	g, c	Add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$ and cool, $\leq 6^{\circ}\text{C}$	28 d	28 d
Salinity	G, wax seal	240	g	Analyze immediately or use wax seal	6 months	N.S.
Silica	F, P (PTFE) or quartz	200	g, c	Cool $\leq 6^{\circ}\text{C}$ , do not freeze	28 d	28 d
Sludge digester gas	G, gas bottle	—	g	—	N.S.	
Solids <sup>9</sup>	P, G	200	g, c	Cool, $\leq 6^{\circ}\text{C}$	7 d	2-7 d; see cited reference
Sulfate	P, G, FP	100	g, c	Cool, $\leq 6^{\circ}\text{C}$	28 d	28 d
Sulfide	P, G, FP	100	g, c	Cool, $\leq 6^{\circ}\text{C}$ ; add 4 drops 2N zinc acetate/100 mL; add NaOH to $\text{pH} > 9$	28 d	7 d
Temperature	P, G, FP	—	g	Analyze immediately	0.25 h	0.25 h
Turbidity	P, G, FP	100	g, c	Analyze same day; store in dark up to 24 h, Cool, $\leq 6^{\circ}\text{C}$	24 h	48 h

\* For determinations not listed, use glass or plastic containers; preferably refrigerate during storage and analyze as soon as possible.

† P = plastic (polyethylene or equivalent); G = glass; G(A) or P(A) = rinsed with 1 + 1  $\text{HNO}_3$ ; G(B) = glass, borosilicate; G(S) = glass, rinsed with organic solvents or baked; FP = fluoropolymer (polytetrafluoroethylene (PTFE, Teflon) or other fluoropolymer

‡ g = grab; c = composite.

§ Cool = storage at,  $> 0^{\circ}\text{C}$ ,  $\leq 6^{\circ}\text{C}$  (above freezing point of water); in the dark; analyze immediately = analyze usually within 15 min of sample collection.

|| See citation<sup>10</sup> for possible differences regarding container and preservation requirements. N.S. = not stated in cited reference; star = no storage allowed; analyze immediately (within 15 min).

Some drinking water (DW) and treated wastewater (WW) matrices may be subject to positive interference as a result of preservation. If such interference is demonstrable, samples should be analyzed as soon as possible without preservation. Do not hold for more than 15 minutes without demonstrating that cyanide (CN) is stable for longer periods in a specific matrix.

NOTE: This table is intended for guidance only. If there is a discrepancy between this table and the method, the information in the current method takes precedence. If performing the method for compliance purposes, be aware that alternative preservation and holding-time requirements may exist. If so, the regulatory requirements should be used.

6. Appendix C - Chain of Custody

		<b>ANALYTICAL REQUEST FORM CHAIN OF CUSTODY</b>				Laboratory Address: #213 Caroni Savannah Rd, Charlieville, Trinidad, West Indies. Tel: (868)-672-6620 Fax: (868) 665-8620; (868) 221-9149 e-mail: admin@ecotoxes.com, md@ecotoxes.com						
CLIENT: Tiger Tanks Trinidad Unlimited (for Tiger Tanks Guyana Rentals Inc.)			INVOICE TO:		COC#:							
REPORT TO: Mr. Shane Singh			BILLING ADDRESS:		<b>TURNAROUND REQUEST in Business Days</b>							
ADDRESS: #126 Quamina & Carmichael Streets, Georgetown, Guyana.			P.O. NUMBER:		Analysis							
PHONE: 592-501-0620 FAX:					<input type="checkbox"/> 10 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 5 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> <1							
PROJECT NAME: <i>Waste Testing</i>			REQUESTED ANALYSIS							Microbiological Analyses		
PROJECT NUMBER: <i>289</i>										<input type="checkbox"/> 10 <input type="checkbox"/> 7 <input type="checkbox"/> 5 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1		
SAMPLED BY: <i>Nandkishore Singh</i>										Please Specify		
CLIENT SAMPLE IDENTIFICATION		SAMPLING DATE/TIME	PH + Flash Point	BOD	COD	oil & Grease + TPH	BTX	TCLP As, Ba, Cr, Pb, Hg, Se, Ag, Cd	MATRIX (W.S.O)	# OF CONT.	COMMENTS	ECOTOX ID
1. Frac Tank		<i>25/3/2021 @ 8:00 AM</i>							<i>W</i>	<i>5</i>	<i>1 @ Amber</i>	<i>210112</i>
2. Flow back		<i>9:00 AM</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<i>2 @ 500ml plastic</i>	
3. Fluids											<i>2 @ Vials</i>	
4. FRAC TANK												
5. #59487												
6.												
7.												
8.												
9.												
10.												
RELINQUISHED BY: <i>K. Ramrattan</i>			DATE: <i>25/3/21</i>		RECEIVED BY: <i>[Signature]</i>			DATE: <i>1-4-21</i>				
PRINT NAME: <i>Kenny Ramrattan</i> FIRM: <i>TAG</i>			TIME: <i>7:00 AM</i>		PRINT NAME: <i>CARISA Grooms</i> FIRM:			TIME: <i>11:09 am</i>				
RELINQUISHED BY:			DATE:		RELINQUISHED BY:			DATE:				
PRINT NAME: FIRM:			TIME:		PRINT NAME: FIRM:			TIME:				
ADDITIONAL INFO/SPECIAL REQUESTS:											PAGE 7 OF 7	

Waste Stream: Oily Water  
EPA Waste Profile Sheet Number: 20140506-027

# ECOTOX Environmental Services Ltd.

Oily Water from Frac Tank #35907

## Wastewater Quality Analysis Report

**Date of Report: 13<sup>th</sup> April 2021**

Client: Tiger Tanks Trinidad Unlimited (TTTU)

Project Code: ECO-TTTU-287

Test Conducted By:



213 Caroni Savannah Road, Charlieville, Chaguanas, Trinidad, W.I.  
Tel.: (868) 672-6620 Fax: (868) 665-8620 E-mail: [admin@ecotoxes.com](mailto:admin@ecotoxes.com), [www.ecotoxes.com](http://www.ecotoxes.com)

*Nafeesa J. Ali*

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Nafeesa Ali

Laboratory Manager

*Mikael Dookie*

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Mikael Dookie

Environmental Chemist

**Date of Report:** 13<sup>th</sup> April 2021  
**Client:** Tiger Tanks Trinidad Unlimited  
**Client Address:** La Bidco Estate, La Brea, Trinidad, W.I.  
**Project Code:** ECO-TTTU-287  
**Project Number:** ECO-TTTU-287

**Table 1: Sample Details and I.D. Codes**

Client Sample I.D.	ECOTOX Sample ID	Sample Collection Date / Time
Oily Water from Frac Tank #35907	2101110	25 <sup>th</sup> March 2021 / 8:00 a.m.

## 1. Summary:

ECOTOX was contracted by Tiger Tanks Trinidad Unlimited to conduct analytical testing of one Oily Water from Frac Tank #35907 sample for pH, Flash Point, Total Oil and Grease, Total Petroleum Hydrocarbons, Chemical Oxygen Demand, Biological Oxygen Demand, BTEX and TCLP Extractable Metals. This report summarizes the test results for the samples taken.

The samples were collected on the 25<sup>th</sup> March 2021, by a representative of Tiger Tanks Guyana Rentals Inc. Samples were collected and preserved according to recommended procedures as stipulated in the Standard Methods for the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) for the requested parameters. The samples were appropriately stored in a cooler, on ice at  $\leq 6^{\circ}\text{C}$ , for transportation to the laboratory. The samples were received by ECOTOX on the 1<sup>st</sup> April 2021. On receipt by the laboratory, samples were logged into the ECOTOX sample tracking system and assigned sample identification numbers. The samples were appropriately stored (refrigerated  $\leq 6^{\circ}\text{C}$ ) until the tests were initiated.

## 2. Results:

Tests were done in accordance with those stipulated in the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) standard methods and the US EPA. Standard test procedures were followed for all analyses conducted with several quality control measures implemented for each parameter tested. The results for the requested analyses are listed below in Table 2. Replicate analyses, blanks and other reference materials were included during tests to assess the accuracy and precision of the analytical results obtained. Refer to Appendix A for description of methods and quality assurance and control measures. Chain of Custody form is displayed in Appendix B.

**Table 2: Analysis of Wastewater Samples**

Parameter	Maximum Permissible Limits <sup>1</sup>	Client Sample Name: Oily Water from Frac Tank #35907 Wastewater  Ecotox Sample I.D.: 2101110
Date of Sample Collection		25 <sup>th</sup> March 2021
Time of Sample Collection		8:00 a.m.
pH (H <sup>+</sup> ions)	5 – 9 H <sup>+</sup> ions	9.00
Total Petroleum Hydrocarbons (TPH) (mg/L)	≤ 40 mg/L	> 10%
Total Oil & Grease (TO&G) (mg/L)	Not Listed	> 10%
Biological Oxygen Demand (BOD) (mg/L)	≤ 50 mg/Ls	6,080.4
Chemical Oxygen Demand (COD) (mg/L)	≤ 50 mg/Ls	13,195.4
TCLP Extractable Arsenic (mg/L)	Not Listed	< 0.005
TCLP Extractable Barium (mg/L)	Not Listed	< 0.005
TCLP Extractable Cadmium (mg/L)	Not Listed	< 0.005
TCLP Extractable Chromium (mg/L)	Not Listed	0.516
TCLP Extractable Lead (mg/L)	Not Listed	< 0.005
TCLP Extractable Mercury (mg/L)	Not Listed	< 0.005
TCLP Extractable Selenium (mg/L)	Not Listed	< 0.005
TCLP Extractable Silver (mg/L)	Not Listed	< 0.005
Flash Point (°C)	Not Listed	96.1
Benzene (µg/L)	Not Listed	1.62
Toluene (µg/L)	Not Listed	2.01
Ethylbenzene (µg/L)	Not Listed	4.68
Xylene (µg/L)	Not Listed	9.33

NOTE: 1% = 10,000 ppm

<sup>1</sup> Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment.

**Table 3: Analysis of Wastewater Samples**

<b>Parameter</b>	<b>Maximum Permissible Limits<sup>2</sup></b>	<b>Client Sample Name: Oily Water from Frac Tank #35907 Wastewater  Ecotox Sample I.D.: 2101110</b>
<b>Date of Sample Collection</b>		<b>25<sup>th</sup> March 2021</b>
<b>Time of Sample Collection</b>		<b>8:00 a.m.</b>
<b>Naphthalene (mg/L)</b>	<b>Not Listed</b>	<b>2,145.0</b>
<b>Acenaphthylene (mg/L)</b>	<b>Not Listed</b>	<b>43.2</b>
<b>Acenaphthene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Fluorene (mg/L)</b>	<b>Not Listed</b>	<b>122.0</b>
<b>Anthracene (mg/L)</b>	<b>Not Listed</b>	<b>6.1</b>
<b>Phenanthrene (mg/L)</b>	<b>Not Listed</b>	<b>88.1</b>
<b>Fluoranthene (mg/L)</b>	<b>Not Listed</b>	<b>3.5</b>
<b>Pyrene (mg/L)</b>	<b>Not Listed</b>	<b>11.1</b>
<b>Benzo(a)anthracene (mg/L)</b>	<b>Not Listed</b>	<b>2.1</b>
<b>Chrysene (mg/L)</b>	<b>Not Listed</b>	<b>46.1</b>
<b>Benzo(b)fluoranthene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Benzo(k)fluoranthene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Benzo(a)pyrene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Dibenz(ah)anthracene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Benzo(ghi)perylene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Ideno(1,2,3-c,d)pyrene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>

<sup>2</sup> Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment.

## 4. Appendix A

### Quality Control and Quality Assurance Procedures for Analyses Performed

All sampling and tests procedures employed by ECOTOX for the duration of this project were a direct adaptation from standard procedures as outlined in the Standard Methods for the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) The following will outline a brief description of the procedures used.

**Table 4A. Description of Parameters Investigated and Associated Quality Control Measures**

Parameter	Test Method and Description	Quality Control Measures.
Sampling	As outlined in SMEWW # 1060 Grab Samples	Duplicate Samples were taken, preserved with 50% Sulphuric Acid to pH 2 or otherwise as outlined in WPR 2000.
Total Oil and Grease / Total Petroleum Hydrocarbons	<b>N-Hexane Extractable Material (Non-polar Material) Total Oil and Grease by Extraction and Gravimetry (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGTHEM; USEPA Method 1664 Revision A. February 1999.</b> The term "n-hexane extractable material" reflects that this method can be used to determine materials other than oils and greases. Similarly, the term "silica gel treated n-hexane extractable material" reflects that this method can be used to determine material that is not adsorbed by silica gel (non-polar material). A 1-L sample is acidified to pH <2 with Hydrochloric Acid or Sulphuric Acid and serially extracted three times with n-hexane in a separatory funnel. The extract is dried over sodium sulfate. The solvent is distilled from the extract and the HEM is desiccated and weighed. If the HEM is to be used for determination of SGT-HEM, the HEM is re-suspended in n-hexane. For SGT-HEM determination, an amount of silica gel proportionate to the amount of HEM is added to the solution containing the re-suspended HEM to remove polar materials. The solution is filtered to remove the silica gel, the solvent is distilled, and the SGT-HEM is desiccated and weighed.	Duplicate analyses, multiple blanks and spikes.
Biological Oxygen Demand	As outlined in <b>SMEWW Method # 5210 B 5-Day BOD Test Method.</b> Quantification of the relative oxygen requirements of wastewaters, effluents, and polluted waters after 5 Days of incubating diluted samples at 20 ± 1°C.	Standard Reference Material. Blanks. Controls.
Total Chemical Oxygen Demand (COD) - Modified for Chloride Correction	As outlined in <b>SMEWW Method # 5220 D Closed Reflux, Colorimetric Method.</b> Used to indirectly measure the amount of organic compounds in water as nearly all organic compounds can be fully oxidized to carbon dioxide with a strong chemical oxidizing agent under acidic conditions. In the process of oxidizing the organic substances found in the water sample, potassium dichromate is reduced (since in all redox reactions, one reagent is oxidized and the other is reduced), forming Cr <sup>3+</sup> . The amount of Cr <sup>3+</sup> is determined after oxidation is complete, and is used as an indirect measure of the organic contents of the water sample.  EQUIPMENT used - Block Digester, relevant glassware and chemicals for digestion procedure, UV-VIS Spectrophotometer.	Duplicate analysis, standard reference material – Potassium hydrogen phthalate standard, multiple banks per batch.

**Table 4B. Description of Parameters Investigated and Associated Quality Control Measures**

Parameter	Test Method and Description	Quality Control Measures.
pH	<p><b>As outlined in SMEWW Method # No. 4500-H<sup>+</sup> pH Value B Electrometric Method.</b> The basic principle of electrometric pH measurement is determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.</p>	Calibration/Standard Solutions.
TCLP Extractable Metals	<p>As outlined in <b>US EPA Method Number 1311</b>. The TCLP is designed to determine the mobility of both organic and inorganic analytes present in liquid, solid, and multiphasic wastes. For liquid wastes, after filtration through a 0.6 to 0.8 µm glass fiber filter, is defined as the TCLP extract.</p> <p>The TCLP Extract is analyzed for metals as outlined in:            As, Ba, Cd, Cr, Pb, Se &amp; Ag – US EPA SW-846 Test Method 7000B and SMEWW Method 3111B, D: Flame Atomic Absorption Spectrophotometry.</p> <p>Hg – US EPA Method 7470 - Cold-Vapor Atomic Absorption Spectrometry 7471B-Solids or Semisolid Waste Cold-Vapor Atomic Absorption Spectrometry.</p> <p>As – US EPA Method 7061 Hydride Generation/Atomic Absorption Spectrometry.</p>	Standard addition, blanks, triplicate analyses, standard reference water solutions.
BTEX	<p>As outlined in US EPA Method Number 8260D, Volatile Organic Compounds By Gas Chromatography/Mass Spectrometry. VOCs are introduced into the GC by one of the preparation methods mentioned in Sec. 1.2. The analytes may be introduced directly to a capillary column, cryofocused on a capillary pre-column before being flash evaporated to a capillary column for analysis, or desorbed from a trap and sent to an injection port operating in the split mode for injection to a capillary column. The column is temperature-programmed to separate the analytes, which are then detected with a MS interfaced to the GC.</p> <p>Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard (IS) using an appropriate calibration curve for the intended application</p>	Method blanks, surrogates, reference materials.
PAHs	<p>As outlines in US EPA Method Number 610. A measured volume of sample, approximately 1 L, is extracted with methylene chloride using a separatory funnel. The methylene chloride extract is dried and concentrated to a volume of 10 mL or less. The extract is then separated GC. A flame ionization detector is used with GC. GC (Gas chromatograph) an analytical system complete with temperature programmable gas chromatograph suitable for on-column or splitless injection and all required accessories including syringes, analytical columns, gases, detector, and strip-chart recorder. A data system is recommended for measuring peak areas.</p>	Method blanks, surrogates, reference materials.
Flash Point	<p>ASTM E502-21 – Standard Test Method for Selection and Use of ASTM Standards for the Determination of Flash Point of Chemicals by Closed Cup Method.</p>	<p>Testing conducted by Trinidad &amp; Tobago Bureau of Standards.</p> <p>Report# 20210171</p>

The following is a table of the calculated detection limits and the associated bias for each of the analyses performed.

**Table 5: List of Parameters with Associated Instrument Detection Limits and Bias.**

Parameter	Detection Limit/Range	Bias
pH (H <sup>+</sup> ions)	0.02 H <sup>+</sup> ions	±0.01 H <sup>+</sup> ions
Total Petroleum Hydrocarbons (TPH) (mg/L)	0.05 mg/L	±0.01 mg/L
Total Oil & Grease (TO&G) (mg/L)	0.05 mg/L	±0.01 mg/L
Biological Oxygen Demand (BOD) (mg/L)	< 2 mg/L	There is no measurement for establishing the BOD test's bias <sup>3</sup> . Check using GGA Standard (85 to 115% Recovery), Dilution water blanks.
Chemical Oxygen Demand (COD) (mg/L)	2.9 mg/L	± 2.9 mg/L
TCLP Extractable Arsenic (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Barium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Cadmium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Chromium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Lead (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Mercury (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Selenium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Silver (mg/L)	0.005 mg/L	± 0.005 mg/L
BTEX	0.005 mg/L	± 0.005 mg/L
PAHs	0.005 mg/L	± 0.005 mg/L
Flash Point (°C)	± 0.5 (°C)	

<sup>3</sup> SMEWW 23<sup>rd</sup> Edition: 5210 Biological Oxygen Demand (BOD) Approved by Standard Methods Committee, 2016. The GGA check prescribed in 5210B.6b is intended to be a reference point for evaluating dilution-water quality, seed effectiveness, and analytical technique.

## 5. APPENDIX B

### Sample Collection & Preservation

As Outlined in Method #1060, Collection and Preservation of Samples, Standard Methods for Examination of Water and Wastewater, 23<sup>rd</sup> Edition (2017).

COLLECTION AND PRESERVATION OF SAMPLES (1060)/Collection of Samples

TABLE 1060.I. SUMMARY OF SPECIAL SAMPLING AND HANDLING REQUIREMENTS\*

Determination	Container†	Minimum Sample Size mL	Sample Type‡	Preservation§	Maximum Storage Recommended	Regulatory
Acidity	P, G(B), FP	100	g	Cool, ≤6°C	24 h	14 d
Alkalinity	P, G, FP	200	g	Cool, ≤6°C	24 h	14 d
BOD	P, G, FP	1000	g, c	Cool, ≤6°C	6 h	48 h
Boron	F, P (PTFE) or quartz	1000	g, c	HNO <sub>3</sub> to pH<2	28 d	6 months
Bromide	P, G, FP	100	g, c	None required	28 d	28 d
Carbon, organic, total	G (B),P, FP	100	g, c	Analyze immediately; or cool ≤6°C, and add HCl, H <sub>3</sub> PO <sub>4</sub> , or H <sub>2</sub> SO <sub>4</sub> to pH	7 d	28 d
Carbon dioxide	P, G	100	g	Analyze immediately	0.25 h	N.S.
COD	P, G, FP	100	g, c	Analyze as soon as possible, or add H <sub>2</sub> SO <sub>4</sub> to pH<2; Cool, ≤6°C	7 d	28 d
Chloride	P, G, FP	50	g, c	None required	N.S.	28 d
Chlorine, total, residual	P, G	500	g	Analyze immediately	0.25 h	0.25 h
Chlorine dioxide	P, G	500	g	Analyze immediately	0.25 h	N.S.
Chlorophyll	P, G	500	g	Unfiltered, dark, ≤6°C Filtered, dark, -20°C (Do not store in frost-free freezer)	24-48 h 28 d	N.S.
Color	P, G, FP	500	g, c	Cool, ≤6°C	48 h	48 h
Specific conductance	P, G, FP	500	g, c	Cool, ≤6°C	28 d	28 d
Cyanide Total	P, G, FP	1000	g, c	Analyze within 15 min. Add NaOH to pH>12 if sample is to be stored, Cool, ≤6°C, in dark. Add thiosulfate if residual chlorine present	24 h	14 d; 24 h if sulfide present
Amenable to chlorination	P, G, FP	1000	g, c	Remove residual chlorine with thiosulfate and cool ≤6 °C	stat	14 d; 24 h if sulfide present
Fluoride	P	100	g, c	None required	28 d	28 d
Hardness	P, G, FP	100	g, c	Add HNO <sub>3</sub> or H <sub>2</sub> SO <sub>4</sub> to pH<2	6 months	6 months
Iodine	P, G	500	g	Analyze immediately	0.25 h	N.S.
Metals	P(A), G(A), FP (A)	1000	g, c	For dissolved metals filter immediately, add HNO <sub>3</sub> to pH<2	6 months	6 months
Chromium VI	P(A), G(A), FP (A)	250	g	Cool, ≤6°C, pH 9.3-9.7, ammonium sulfate buffer preservative as specified in method 3500-Cr to extend to 28 days HT	28 d	28 d
Copper by colorimetry	—*	—	g, c	—	—	—
Mercury	P(A), G(A), FP(A)	500	g, c	Add HNO <sub>3</sub> to pH<2, Cool ≤6°C	28 d	28 d
Nitrogen Ammonia	P, G, FP	500	g, c	Analyze as soon as possible or add H <sub>2</sub> SO <sub>4</sub> to pH<2, Cool, ≤6°C	7 d	28 d
Nitrate	P, G, FP	100	g, c	Analyze as soon as possible; Cool, ≤6°C	48 h	48 h ( 14 d for chlorinated samples)
Nitrate + nitrite	P, G, FP	200	g, c	Add H <sub>2</sub> SO <sub>4</sub> to pH<2, Cool, ≤6°C	1-2 d	28 d
Nitrite	P, G, FP	100	g, c	Analyze as soon as possible; Cool, ≤6°C	none	48 h
Organic, Kjeldahl	P, G, FP	500	g, c	Cool, ≤6°C, add H <sub>2</sub> SO <sub>4</sub> to pH<2	7 d	28 d
Odor	G	500	g	Analyze as soon as possible; Cool ≤6°C	6 h	24 h (EPA Manual drinking water)
Oil and Grease	G, wide-mouth calibrated	1000	g	Add HCl or H <sub>2</sub> SO <sub>4</sub> to pH<2, Cool, ≤6°C	28 d	28 d

## COLLECTION AND PRESERVATION OF SAMPLES (1060)/Collection of Samples

TABLE 1060.I. CONT.

Determination	Container†	Minimum Sample Size mL	Sample Type‡	Preservation§	Maximum Storage Recommended	Regulatory
Organic Compounds						
MBAS	P, G, FP	250	g, c	Cool $\leq 6^{\circ}\text{C}$	48 h	48 h as per CFR 136
Pesticides*	G(S), PTFE-lined cap	1000	g, c	Cool, $\leq 6^{\circ}\text{C}$ add 1000 mg ascorbic acid/L if residual chlorine present (0.008 % sodium thiosulfate in CFR 136)	7 d	7 d until extraction; 40 d after extraction
Phenols	P, G, PTFE-lined cap	500	g, c	Cool, $\leq 6^{\circ}\text{C}$ , add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$	*	28 d until extraction, 2 d after extraction
Purgeables* by purge and trap	G, PTFE-lined cap	2x40	g	Cool, $\leq 6^{\circ}\text{C}$ ; add HCl to $\text{pH} < 2$ ; add 1000 mg ascorbic acid/L if residual chlorine present (0.008% sodium thiosulfate in CFR 136)	7 d	14 d
Base/neutral & acids	G(S) amber	1000	g, c	Cool, $\leq 6^{\circ}\text{C}$ , 0.008 % sodium thiosulfate in CFR 136 if chlorine is present	7 d	7 d until extraction; 40 d after extraction
Oxygen, dissolved	G, BOD bottle	300	g	Analyze immediately	0.25 h	0.25 h
Electrode				Titration may be delayed after acidification	8 h	8 h
Winkler						
Ozone	G	1000	g	Analyze immediately	0.25 h	N.S.
pH	P, G	50	g	Analyze immediately	0.25 h	0.25 h
Phosphate	G(A)	100	g	For dissolved phosphate filter immediately; Cool, $\leq 6^{\circ}\text{C}$	48 h	48 h as per EPA manual for DW.
Phosphorus, total	P, G, FP	100	g, c	Add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$ and cool, $\leq 6^{\circ}\text{C}$	28 d	28 d
Salinity	G, wax seal	240	g	Analyze immediately or use wax seal	6 months	N.S.
Silica	F, P (PTFE) or quartz	200	g, c	Cool $\leq 6^{\circ}\text{C}$ , do not freeze	28 d	28 d
Sludge digester gas	G, gas bottle	—	g	—	N.S.	
Solids <sup>9</sup>	P, G	200	g, c	Cool, $\leq 6^{\circ}\text{C}$	7 d	2-7 d; see cited reference
Sulfate	P, G, FP	100	g, c	Cool, $\leq 6^{\circ}\text{C}$	28 d	28 d
Sulfide	P, G, FP	100	g, c	Cool, $\leq 6^{\circ}\text{C}$ ; add 4 drops 2N zinc acetate/100 mL; add NaOH to $\text{pH} > 9$	28 d	7 d
Temperature	P, G, FP	—	g	Analyze immediately	0.25 h	0.25 h
Turbidity	P, G, FP	100	g, c	Analyze same day; store in dark up to 24 h, Cool, $\leq 6^{\circ}\text{C}$	24 h	48 h

\* For determinations not listed, use glass or plastic containers; preferably refrigerate during storage and analyze as soon as possible.

† P = plastic (polyethylene or equivalent); G = glass; G(A) or P(A) = rinsed with 1 + 1  $\text{HNO}_3$ ; G(B) = glass, borosilicate; G(S) = glass, rinsed with organic solvents or baked; FP = fluoropolymer (polytetrafluoroethylene (PTFE, Teflon) or other fluoropolymer

‡ g = grab; c = composite.

§ Cool = storage at,  $> 0^{\circ}\text{C}$ ,  $\leq 6^{\circ}\text{C}$  (above freezing point of water); in the dark; analyze immediately = analyze usually within 15 min of sample collection.

|| See citation<sup>10</sup> for possible differences regarding container and preservation requirements. N.S. = not stated in cited reference; star = no storage allowed; analyze immediately (within 15 min).

Some drinking water (DW) and treated wastewater (WW) matrices may be subject to positive interference as a result of preservation. If such interference is demonstrable, samples should be analyzed as soon as possible without preservation. Do not hold for more than 15 minutes without demonstrating that cyanide (CN) is stable for longer periods in a specific matrix.

Note: This table is intended for guidance only. If there is a discrepancy between this table and the method, the information in the current method takes precedence. If performing the method for compliance purposes, be aware that alternative preservation and holding-time requirements may exist. If so, the regulatory requirements should be used.

6. Appendix C - Chain of Custody

		<b>ANALYTICAL REQUEST FORM CHAIN OF CUSTODY</b>				Laboratory Address: #213 Caroni Savannah Rd, Charlieville, Trinidad, West Indies. Tel: (868)-672-6620 Fax: (868) 665-8620; (868) 221-9149 e-mail: admin@ecotoxes.com, md@ecotoxes.com							
CLIENT: Tigor Tanks Trinidad Unlimited (for Tiger Tanks Guyana Rentals Inc.)			INVOICE TO:			COC#:							
REPORT TO: Mr. Shane Singh			BILLING ADDRESS:			<b>TURNAROUND REQUEST in Business Days</b>							
ADDRESS: #126 Quamina & Carmichael Streets, Georgetown, Guyana.			P.O. NUMBER:			Analysis							
PHONE: 592-501-0620 FAX:			REQUESTED ANALYSIS			STD.							
PROJECT NAME: Waste Testing		PH + Flash Point		BOD		COD		oil & Grease + TPH		BTEX		TCLP As, Ba, Co, Pb, Hg, Se Ag, Cd	
PROJECT NUMBER: 287		SAMPLING DATE/TIME		✓		✓		✓		✓		✓	
SAMPLED BY: Nandkishore Singh		25/3/2011 @ 8:00 AM -		✓		✓		✓		✓		✓	
CLIENT SAMPLE IDENTIFICATION		SAMPLING DATE/TIME		PH + Flash Point		BOD		COD		oil & Grease + TPH		BTEX	
1. oily water from frac		25/3/2011 @ 8:00 AM -		✓		✓		✓		✓		✓	
2. Tank #		9:00 AM		✓		✓		✓		✓		✓	
3. 35907		9:00 AM		✓		✓		✓		✓		✓	
4.		9:00 AM		✓		✓		✓		✓		✓	
5.		9:00 AM		✓		✓		✓		✓		✓	
6.		9:00 AM		✓		✓		✓		✓		✓	
7.		9:00 AM		✓		✓		✓		✓		✓	
8.		9:00 AM		✓		✓		✓		✓		✓	
9.		9:00 AM		✓		✓		✓		✓		✓	
10.		9:00 AM		✓		✓		✓		✓		✓	
RELINQUISHED BY: K. Ramrattan			DATE: 25/3/11			RECEIVED BY: [Signature]			DATE: 1-4-21				
PRINT NAME: KENNY RAMRATTAN			FIRM: TRG			TIME: 7:00 AM			PRINT NAME: CAROLINA GOODMAN				
RELINQUISHED BY:			DATE:			FIRM:			TIME: 11:09 AM				
PRINT NAME:			FIRM:			RELINQUISHED BY:			DATE:				
ADDITIONAL INFO/SPECIAL REQUESTS:			TIME:			PRINT NAME:			FIRM:				
											PAGE 5 OF 7		

# ECOTOX Environmental Services Ltd.

Oily Water from Frac Tank #44296

## Wastewater Quality Analysis Report

**Date of Report: 13<sup>th</sup> April 2021**

Client: Tiger Tanks Trinidad Unlimited (TTTU)

Project Code: ECO-TTTU-288

Test Conducted By:



213 Caroni Savannah Road, Charlieville, Chaguanas, Trinidad, W.I.  
Tel.: (868) 672-6620 Fax: (868) 665-8620 E-mail: [admin@ecotoxes.com](mailto:admin@ecotoxes.com), [www.ecotoxes.com](http://www.ecotoxes.com)

*Nafeesa J. Ali*

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Nafeesa Ali

Laboratory Manager

*Mikael Dookie*

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Mikael Dookie

Environmental Chemist

**Date of Report:** 13<sup>th</sup> April 2021  
**Client:** Tiger Tanks Trinidad Unlimited  
**Client Address:** La Bidco Estate, La Brea, Trinidad, W.I.  
**Project Code:** ECO-TTTU-288  
**Project Number:** ECO-TTTU-288

**Table 1: Sample Details and I.D. Codes**

<b>Client Sample I.D.</b>	<b>ECOTOX Sample ID</b>	<b>Sample Collection Date / Time</b>
<b>Oily Water from Frac Tank #44296</b>	<b>2101111</b>	<b>25<sup>th</sup> March 2021 / 8:00 a.m.</b>

## 1. Summary:

ECOTOX was contracted by Tiger Tanks Trinidad Unlimited to conduct analytical testing of one Oily Water from Frac Tank #44296 sample for pH, Flash Point, Total Oil and Grease, Total Petroleum Hydrocarbons, Chemical Oxygen Demand, Biological Oxygen Demand, BTEX and TCLP Extractable Metals. This report summarizes the test results for the samples taken.

The samples were collected on the 25<sup>th</sup> March 2021, by a representative of Tiger Tanks Guyana Rentals Inc. Samples were collected and preserved according to recommended procedures as stipulated in the Standard Methods for the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) for the requested parameters. The samples were appropriately stored in a cooler, on ice at  $\leq 6^{\circ}\text{C}$ , for transportation to the laboratory. The samples were received by ECOTOX on the 1<sup>st</sup> April 2021. On receipt by the laboratory, samples were logged into the ECOTOX sample tracking system and assigned sample identification numbers. The samples were appropriately stored (refrigerated  $\leq 6^{\circ}\text{C}$ ) until the tests were initiated.

## 2. Results:

Tests were done in accordance with those stipulated in the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) standard methods and the US EPA. Standard test procedures were followed for all analyses conducted with several quality control measures implemented for each parameter tested. The results for the requested analyses are listed below in Table 2. Replicate analyses, blanks and other reference materials were included during tests to assess the accuracy and precision of the analytical results obtained. Refer to Appendix A for description of methods and quality assurance and control measures. Chain of Custody form is displayed in Appendix B.

**Table 2: Analysis of Wastewater Samples**

Parameter	Maximum Permissible Limits <sup>1</sup>	Client Sample Name: Oily Water from Frac Tank #44296 Wastewater  Ecotox Sample I.D.: 2101111
Date of Sample Collection		25 <sup>th</sup> March 2021
Time of Sample Collection		8:00 a.m.
pH (H <sup>+</sup> ions)	5 – 9 H <sup>+</sup> ions	8.00
Total Petroleum Hydrocarbons (TPH) (mg/L)	≤ 40 mg/L	> 10%
Total Oil & Grease (TO&G) (mg/L)	Not Listed	> 10%
Biological Oxygen Demand (BOD) (mg/L)	≤ 50 mg/Ls	5,420.4
Chemical Oxygen Demand (COD) (mg/L)	≤ 50 mg/Ls	13,124.1
TCLP Extractable Arsenic (mg/L)	Not Listed	< 0.005
TCLP Extractable Barium (mg/L)	Not Listed	< 0.005
TCLP Extractable Cadmium (mg/L)	Not Listed	< 0.005
TCLP Extractable Chromium (mg/L)	Not Listed	0.694
TCLP Extractable Lead (mg/L)	Not Listed	< 0.005
TCLP Extractable Mercury (mg/L)	Not Listed	< 0.005
TCLP Extractable Selenium (mg/L)	Not Listed	< 0.005
TCLP Extractable Silver (mg/L)	Not Listed	< 0.005
Flash Point (°C)	Not Listed	87.0
Benzene (µg/L)	Not Listed	1.41
Toluene (µg/L)	Not Listed	1.98
Ethylbenzene (µg/L)	Not Listed	3.92
Xylene (µg/L)	Not Listed	8.45

NOTE: 1% = 10,000 ppm

<sup>1</sup> Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment.

**Table 3: Analysis of Wastewater Samples**

<b>Parameter</b>	<b>Maximum Permissible Limits<sup>2</sup></b>	<b>Client Sample Name: Oily Water from Frac Tank #44296 Wastewater  Ecotox Sample I.D.: 2101111</b>
<b>Date of Sample Collection</b>		<b>25<sup>th</sup> March 2021</b>
<b>Time of Sample Collection</b>		<b>8:00 a.m.</b>
<b>Naphthalene (mg/L)</b>	<b>Not Listed</b>	<b>1,953.0</b>
<b>Acenaphthylene (mg/L)</b>	<b>Not Listed</b>	<b>49.1</b>
<b>Acenaphthene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Fluorene (mg/L)</b>	<b>Not Listed</b>	<b>101.0</b>
<b>Anthracene (mg/L)</b>	<b>Not Listed</b>	<b>4.5</b>
<b>Phenanthrene (mg/L)</b>	<b>Not Listed</b>	<b>90.2</b>
<b>Fluoranthene (mg/L)</b>	<b>Not Listed</b>	<b>4.6</b>
<b>Pyrene (mg/L)</b>	<b>Not Listed</b>	<b>8.4</b>
<b>Benzo(a)anthracene (mg/L)</b>	<b>Not Listed</b>	<b>3.7</b>
<b>Chrysene (mg/L)</b>	<b>Not Listed</b>	<b>33.5</b>
<b>Benzo(b)fluoranthene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Benzo(k)fluoranthene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Benzo(a)pyrene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Dibenz(ah)anthracene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Benzo(ghi)perylene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>
<b>Ideno(1,2,3-c,d)pyrene (mg/L)</b>	<b>Not Listed</b>	<b>&lt; 0.005</b>

<sup>2</sup> Guyana National Bureau of Standards Interim Guidelines for Industrial Effluent Discharge into the Environment.

## 4. Appendix A

### Quality Control and Quality Assurance Procedures for Analyses Performed

All sampling and tests procedures employed by ECOTOX for the duration of this project were a direct adaptation from standard procedures as outlined in the Standard Methods for the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) The following will outline a brief description of the procedures used.

**Table 4A. Description of Parameters Investigated and Associated Quality Control Measures**

Parameter	Test Method and Description	Quality Control Measures.
Sampling	As outlined in SMEWW # 1060 Grab Samples	Duplicate Samples were taken, preserved with 50% Sulphuric Acid to pH 2 or otherwise as outlined in WPR 2000.
Total Oil and Grease / Total Petroleum Hydrocarbons	<b>N-Hexane Extractable Material (Non-polar Material) Total Oil and Grease by Extraction and Gravimetry (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGTHEM; USEPA Method 1664 Revision A. February 1999.</b> The term "n-hexane extractable material" reflects that this method can be used to determine materials other than oils and greases. Similarly, the term "silica gel treated n-hexane extractable material" reflects that this method can be used to determine material that is not adsorbed by silica gel (non-polar material). A 1-L sample is acidified to pH <2 with Hydrochloric Acid or Sulphuric Acid and serially extracted three times with n-hexane in a separatory funnel. The extract is dried over sodium sulfate. The solvent is distilled from the extract and the HEM is desiccated and weighed. If the HEM is to be used for determination of SGT-HEM, the HEM is re-suspended in n-hexane. For SGT-HEM determination, an amount of silica gel proportionate to the amount of HEM is added to the solution containing the re-suspended HEM to remove polar materials. The solution is filtered to remove the silica gel, the solvent is distilled, and the SGT-HEM is desiccated and weighed.	Duplicate analyses, multiple blanks and spikes.
Biological Oxygen Demand	As outlined in <b>SMEWW Method # 5210 B 5-Day BOD Test Method.</b> Quantification of the relative oxygen requirements of wastewaters, effluents, and polluted waters after 5 Days of incubating diluted samples at 20 ± 1°C.	Standard Reference Material. Blanks. Controls.
Total Chemical Oxygen Demand (COD) - Modified for Chloride Correction	As outlined in <b>SMEWW Method # 5220 D Closed Reflux, Colorimetric Method.</b> Used to indirectly measure the amount of organic compounds in water as nearly all organic compounds can be fully oxidized to carbon dioxide with a strong chemical oxidizing agent under acidic conditions. In the process of oxidizing the organic substances found in the water sample, potassium dichromate is reduced (since in all redox reactions, one reagent is oxidized and the other is reduced), forming Cr <sup>3+</sup> . The amount of Cr <sup>3+</sup> is determined after oxidation is complete, and is used as an indirect measure of the organic contents of the water sample.  EQUIPMENT used - Block Digester, relevant glassware and chemicals for digestion procedure, UV-VIS Spectrophotometer.	Duplicate analysis, standard reference material – Potassium hydrogen phthalate standard, multiple banks per batch.

**Table 4B. Description of Parameters Investigated and Associated Quality Control Measures**

Parameter	Test Method and Description	Quality Control Measures.
pH	<p><b>As outlined in SMEWW Method # No. 4500-H<sup>+</sup> pH Value B Electrometric Method.</b> The basic principle of electrometric pH measurement is determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.</p>	Calibration/Standard Solutions.
TCLP Extractable Metals	<p>As outlined in <b>US EPA Method Number 1311</b>. The TCLP is designed to determine the mobility of both organic and inorganic analytes present in liquid, solid, and multiphasic wastes. For liquid wastes, after filtration through a 0.6 to 0.8 µm glass fiber filter, is defined as the TCLP extract.</p> <p>The TCLP Extract is analyzed for metals as outlined in:            As, Ba, Cd, Cr, Pb, Se &amp; Ag – US EPA SW-846 Test Method 7000B and SMEWW Method 3111B, D: Flame Atomic Absorption Spectrophotometry.</p> <p>Hg – US EPA Method 7470 - Cold-Vapor Atomic Absorption Spectrometry 7471B-Solids or Semisolid Waste Cold-Vapor Atomic Absorption Spectrometry.</p> <p>As – US EPA Method 7061 Hydride Generation/Atomic Absorption Spectrometry.</p>	Standard addition, blanks, triplicate analyses, standard reference water solutions.
BTEX	<p>As outlined in US EPA Method Number 8260D, Volatile Organic Compounds By Gas Chromatography/Mass Spectrometry. VOCs are introduced into the GC by one of the preparation methods mentioned in Sec. 1.2. The analytes may be introduced directly to a capillary column, cryofocused on a capillary pre-column before being flash evaporated to a capillary column for analysis, or desorbed from a trap and sent to an injection port operating in the split mode for injection to a capillary column. The column is temperature-programmed to separate the analytes, which are then detected with a MS interfaced to the GC.</p> <p>Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard (IS) using an appropriate calibration curve for the intended application</p>	Method blanks, surrogates, reference materials.
PAHs	<p>As outlines in US EPA Method Number 610. A measured volume of sample, approximately 1 L, is extracted with methylene chloride using a separatory funnel. The methylene chloride extract is dried and concentrated to a volume of 10 mL or less. The extract is then separated GC. A flame ionization detector is used with GC. GC (Gas chromatograph) an analytical system complete with temperature programmable gas chromatograph suitable for on-column or splitless injection and all required accessories including syringes, analytical columns, gases, detector, and strip-chart recorder. A data system is recommended for measuring peak areas.</p>	Method blanks, surrogates, reference materials.
Flash Point	<p>ASTM E502-21 – Standard Test Method for Selection and Use of ASTM Standards for the Determination of Flash Point of Chemicals by Closed Cup Method.</p>	<p>Testing conducted by Trinidad &amp; Tobago Bureau of Standards.</p> <p>Report# 20210171</p>

The following is a table of the calculated detection limits and the associated bias for each of the analyses performed.

**Table 5: List of Parameters with Associated Instrument Detection Limits and Bias.**

Parameter	Detection Limit/Range	Bias
pH (H <sup>+</sup> ions)	0.02 H <sup>+</sup> ions	±0.01 H <sup>+</sup> ions
Total Petroleum Hydrocarbons (TPH) (mg/L)	0.05 mg/L	±0.01 mg/L
Total Oil & Grease (TO&G) (mg/L)	0.05 mg/L	±0.01 mg/L
Biological Oxygen Demand (BOD) (mg/L)	< 2 mg/L	There is no measurement for establishing the BOD test's bias <sup>3</sup> . Check using GGA Standard (85 to 115% Recovery), Dilution water blanks.
Chemical Oxygen Demand (COD) (mg/L)	2.9 mg/L	± 2.9 mg/L
TCLP Extractable Arsenic (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Barium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Cadmium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Chromium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Lead (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Mercury (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Selenium (mg/L)	0.005 mg/L	± 0.005 mg/L
TCLP Extractable Silver (mg/L)	0.005 mg/L	± 0.005 mg/L
BTEX	0.005 mg/L	± 0.005 mg/L
PAHs	0.005 mg/L	± 0.005 mg/L
Flash Point (°C)	± 0.5 (°C)	

<sup>3</sup> SMEWW 23<sup>rd</sup> Edition: 5210 Biological Oxygen Demand (BOD) Approved by Standard Methods Committee, 2016. The GGA check prescribed in 5210B.6b is intended to be a reference point for evaluating dilution-water quality, seed effectiveness, and analytical technique.

## 5. APPENDIX B

### Sample Collection & Preservation

As Outlined in Method #1060, Collection and Preservation of Samples, Standard Methods for Examination of Water and Wastewater, 23<sup>rd</sup> Edition (2017).

COLLECTION AND PRESERVATION OF SAMPLES (1060)/Collection of Samples

TABLE 1060.I. SUMMARY OF SPECIAL SAMPLING AND HANDLING REQUIREMENTS\*

Determination	Container†	Minimum Sample Size mL	Sample Type‡	Preservation§	Maximum Storage Recommended	Regulatory
Acidity	P, G(B), FP	100	g	Cool, ≤6°C	24 h	14 d
Alkalinity	P, G, FP	200	g	Cool, ≤6°C	24 h	14 d
BOD	P, G, FP	1000	g, c	Cool, ≤6°C	6 h	48 h
Boron	F, P (PTFE) or quartz	1000	g, c	HNO <sub>3</sub> to pH<2	28 d	6 months
Bromide	P, G, FP	100	g, c	None required	28 d	28 d
Carbon, organic, total	G (B),P, FP	100	g, c	Analyze immediately; or cool ≤6°C, and add HCl, H <sub>3</sub> PO <sub>4</sub> , or H <sub>2</sub> SO <sub>4</sub> to pH	7 d	28 d
Carbon dioxide	P, G	100	g	Analyze immediately	0.25 h	N.S.
COD	P, G, FP	100	g, c	Analyze as soon as possible, or add H <sub>2</sub> SO <sub>4</sub> to pH<2; Cool, ≤6°C	7 d	28 d
Chloride	P, G, FP	50	g, c	None required	N.S.	28 d
Chlorine, total, residual	P, G	500	g	Analyze immediately	0.25 h	0.25 h
Chlorine dioxide	P, G	500	g	Analyze immediately	0.25 h	N.S.
Chlorophyll	P, G	500	g	Unfiltered, dark, ≤6°C Filtered, dark, -20°C (Do not store in frost-free freezer)	24-48 h 28 d	N.S.
Color	P, G, FP	500	g, c	Cool, ≤6°C	48 h	48 h
Specific conductance	P, G, FP	500	g, c	Cool, ≤6°C	28 d	28 d
Cyanide Total	P, G, FP	1000	g, c	Analyze within 15 min. Add NaOH to pH>12 if sample is to be stored, Cool, ≤6°C, in dark. Add thiosulfate if residual chlorine present	24 h	14 d; 24 h if sulfide present
Amenable to chlorination	P, G, FP	1000	g, c	Remove residual chlorine with thiosulfate and cool ≤6 °C	stat	14 d; 24 h if sulfide present
Fluoride	P	100	g, c	None required	28 d	28 d
Hardness	P, G, FP	100	g, c	Add HNO <sub>3</sub> or H <sub>2</sub> SO <sub>4</sub> to pH<2	6 months	6 months
Iodine	P, G	500	g	Analyze immediately	0.25 h	N.S.
Metals	P(A), G(A), FP (A)	1000	g, c	For dissolved metals filter immediately, add HNO <sub>3</sub> to pH<2	6 months	6 months
Chromium VI	P(A), G(A), FP (A)	250	g	Cool, ≤6°C, pH 9.3-9.7, ammonium sulfate buffer preservative as specified in method 3500-Cr to extend to 28 days HT	28 d	28 d
Copper by colorimetry	—*	—	g, c	—	—	—
Mercury	P(A), G(A), FP(A)	500	g, c	Add HNO <sub>3</sub> to pH<2, Cool ≤6°C	28 d	28 d
Nitrogen Ammonia	P, G, FP	500	g, c	Analyze as soon as possible or add H <sub>2</sub> SO <sub>4</sub> to pH<2, Cool, ≤6°C	7 d	28 d
Nitrate	P, G, FP	100	g, c	Analyze as soon as possible; Cool, ≤6°C	48 h	48 h ( 14 d for chlorinated samples)
Nitrate + nitrite	P, G, FP	200	g, c	Add H <sub>2</sub> SO <sub>4</sub> to pH<2, Cool, ≤6°C	1-2 d	28 d
Nitrite	P, G, FP	100	g, c	Analyze as soon as possible; Cool, ≤6°C	none	48 h
Organic, Kjeldahl	P, G, FP	500	g, c	Cool, ≤6°C, add H <sub>2</sub> SO <sub>4</sub> to pH<2	7 d	28 d
Odor	G	500	g	Analyze as soon as possible; Cool ≤6°C	6 h	24 h (EPA Manual drinking water)
Oil and Grease	G, wide-mouth calibrated	1000	g	Add HCl or H <sub>2</sub> SO <sub>4</sub> to pH<2, Cool, ≤6°C	28 d	28 d

## COLLECTION AND PRESERVATION OF SAMPLES (1060)/Collection of Samples

TABLE 1060.I. CONT.

Determination	Container†	Minimum Sample Size mL	Sample Type‡	Preservation§	Maximum Storage Recommended	Regulatory
Organic Compounds						
MBAS	P, G, FP	250	g, c	Cool $\leq 6^{\circ}\text{C}$	48 h	48 h as per CFR 136
Pesticides*	G(S), PTFE-lined cap	1000	g, c	Cool, $\leq 6^{\circ}\text{C}$ add 1000 mg ascorbic acid/L if residual chlorine present (0.008 % sodium thiosulfate in CFR 136)	7 d	7 d until extraction; 40 d after extraction
Phenols	P, G, PTFE-lined cap	500	g, c	Cool, $\leq 6^{\circ}\text{C}$ , add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$	*	28 d until extraction, 2 d after extraction
Purgeables* by purge and trap	G, PTFE-lined cap	2x40	g	Cool, $\leq 6^{\circ}\text{C}$ ; add HCl to $\text{pH} < 2$ ; add 1000 mg ascorbic acid/L if residual chlorine present (0.008% sodium thiosulfate in CFR 136)	7 d	14 d
Base/neutral & acids	G(S) amber	1000	g, c	Cool, $\leq 6^{\circ}\text{C}$ , 0.008 % sodium thiosulfate in CFR 136 if chlorine is present	7 d	7 d until extraction; 40 d after extraction
Oxygen, dissolved	G, BOD bottle	300	g	Analyze immediately	0.25 h	0.25 h
Electrode				Titration may be delayed after acidification	8 h	8 h
Winkler						
Ozone	G	1000	g	Analyze immediately	0.25 h	N.S.
pH	P, G	50	g	Analyze immediately	0.25 h	0.25 h
Phosphate	G(A)	100	g	For dissolved phosphate filter immediately; Cool, $\leq 6^{\circ}\text{C}$	48 h	48 h as per EPA manual for DW.
Phosphorus, total	P, G, FP	100	g, c	Add $\text{H}_2\text{SO}_4$ to $\text{pH} < 2$ and cool, $\leq 6^{\circ}\text{C}$	28 d	28 d
Salinity	G, wax seal	240	g	Analyze immediately or use wax seal	6 months	N.S.
Silica	F, P (PTFE) or quartz	200	g, c	Cool $\leq 6^{\circ}\text{C}$ , do not freeze	28 d	28 d
Sludge digester gas	G, gas bottle	—	g	—	N.S.	
Solids <sup>9</sup>	P, G	200	g, c	Cool, $\leq 6^{\circ}\text{C}$	7 d	2-7 d; see cited reference
Sulfate	P, G, FP	100	g, c	Cool, $\leq 6^{\circ}\text{C}$	28 d	28 d
Sulfide	P, G, FP	100	g, c	Cool, $\leq 6^{\circ}\text{C}$ ; add 4 drops 2N zinc acetate/100 mL; add NaOH to $\text{pH} > 9$	28 d	7 d
Temperature	P, G, FP	—	g	Analyze immediately	0.25 h	0.25 h
Turbidity	P, G, FP	100	g, c	Analyze same day; store in dark up to 24 h, Cool, $\leq 6^{\circ}\text{C}$	24 h	48 h

\* For determinations not listed, use glass or plastic containers; preferably refrigerate during storage and analyze as soon as possible.

† P = plastic (polyethylene or equivalent); G = glass; G(A) or P(A) = rinsed with 1 + 1  $\text{HNO}_3$ ; G(B) = glass, borosilicate; G(S) = glass, rinsed with organic solvents or baked; FP = fluoropolymer (polytetrafluoroethylene (PTFE, Teflon) or other fluoropolymer.

‡ g = grab; c = composite.

§ Cool = storage at,  $> 0^{\circ}\text{C}$ ,  $\leq 6^{\circ}\text{C}$  (above freezing point of water); in the dark; analyze immediately = analyze usually within 15 min of sample collection.

|| See citation<sup>10</sup> for possible differences regarding container and preservation requirements. N.S. = not stated in cited reference; star = no storage allowed; analyze immediately (within 15 min).

Some drinking water (DW) and treated wastewater (WW) matrices may be subject to positive interference as a result of preservation. If such interference is demonstrable, samples should be analyzed as soon as possible without preservation. Do not hold for more than 15 minutes without demonstrating that cyanide (CN) is stable for longer periods in a specific matrix.

NOTE: This table is intended for guidance only. If there is a discrepancy between this table and the method, the information in the current method takes precedence. If performing the method for compliance purposes, be aware that alternative preservation and holding-time requirements may exist. If so, the regulatory requirements should be used.

6. Appendix C - Chain of Custody

		<b>ANALYTICAL REQUEST FORM CHAIN OF CUSTODY</b>				Laboratory Address: #213 Caroni Savannah Rd, Charleiville, Trinidad, West Indies. Tel: (868)-672-6620 Fax: (868) 665-8620; (868) 221-9149 e-mail: admin@ecotoxes.com, md@ecotoxes.com															
CLIENT: Tiger Tanks Trinidad Unlimited (for Tiger Tanks Guyana Rentals Inc.) REPORT TO: Mr. Shame Singh ADDRESS: #126 Quamina & Carmichael Streets, Georgetown, Guyana. PHONE: 592-501-0620 FAX:			INVOICE TO: BILLING ADDRESS: P.O. NUMBER:		COC#:																
PROJECT NAME: <u>Waste Testing</u> PROJECT NUMBER: <u>288</u> SAMPLED BY: <u>Nandkishore Singh</u>			REQUESTED ANALYSIS				<b>TURNAROUND REQUEST in Business Days</b> Analysis <input type="checkbox"/> 10 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 5 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> <1 STD.														
CLIENT SAMPLE IDENTIFICATION		SAMPLING DATE/TIME		PH + Flash Point		BOD		COD		oil & Grease + TPH		BTEX		TCLP As, Ba, Cr, Pb, Hg, Se, Ag, Cd		Microbiological Analyses <input type="checkbox"/> 10 <input type="checkbox"/> 7 <input type="checkbox"/> 5 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 STD. Please Specify					
1. <u>Oily Waster from</u>		<u>25/3/2021 @ 8:00AM-</u>												MATRIX (W.S.O)		# OF CONT.		COMMENTS		ECOTOX ID	
2. <u>Frac Tank #</u>		<u>9:00 AM</u>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<u>W</u>		<u>5</u>		<u>1: Amber</u>		<u>210111</u>	
3. <u>44296</u>																		<u>2: 500ml plastic</u>			
4.																		<u>2: vials</u>			
5.																					
6.																					
7.																					
8.																					
9.																					
10.																					
RELINQUISHED BY: <u>K. Ramrattan</u> PRINT NAME: <u>KENNY RAMRATTAN</u> FIRM: <u>T RG</u>			DATE: <u>25/3/21</u> TIME: <u>7:00AM</u>		RECEIVED BY: <u>[Signature]</u> PRINT NAME: <u>CARISSA GROOMAN</u> FIRM:			DATE: <u>3-4-21</u> TIME: <u>11:09AM</u>													
RELINQUISHED BY: PRINT NAME: FIRM:			DATE: TIME:		RELINQUISHED BY: PRINT NAME: FIRM:			DATE: TIME:													
ADDITIONAL INFO/SPECIAL REQUESTS:																			PAGE 6 OF 7		

Waste Stream: Produced Solids  
EPA Waste Profile Sheet Number: 20140506-031

# ECOTOX Environmental Services Ltd.

## Produced Sand from EEPGL

## Quality Analysis Report

Date of Report: 9<sup>th</sup> April 2021

Client: Tiger Tanks Trinidad Unlimited

Project Code: ECO-TTTU-286

Test Conducted By:



213 Caroni Savannah Road, Charlieville, Chaguanas, Trinidad, W.I.  
Tel.: (868) 672-6620 Fax: (868) 665-8620 E-mail: [admin@ecotoxes.com](mailto:admin@ecotoxes.com), [www.ecotoxes.com](http://www.ecotoxes.com)

*Nafeesa J. Ali*

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Nafeesa Ali

Laboratory Manager

A handwritten signature in black ink, appearing to read "Mikael Dookie". The signature is written in a cursive style and is set against a light yellow, textured background.

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Mikael Dookie

Operations Manager/Chemist

**Date of Report:** 9<sup>th</sup> April 2021  
**Client:** Tiger Tanks Trinidad Unlimited  
**Client Address:** La Bidco Estate, La Brea, Trinidad, W.I.  
**Project Code:** ECO-TTTU-286  
**Report No.:** ECO-TTTU-286

## **1.0 Introduction**

ECOTOX Environmental Services Limited (ECOTOX) was contracted by Tiger Tanks Trinidad Unlimited (TTTU) to conduct analysis of one Produced Sand from EEPGL sample for pH, Total Oil and Grease, Total Petroleum Hydrocarbons and TCLP<sup>1</sup> Extracted Heavy Metals. Samples were logged into the ECOTOX sample tracking system and assigned sample identification numbers (Table #1). The samples were appropriately stored until the tests were initiated.

**Table #1: Client I.D. and Sample Details**

<b>Client Sample ID</b>	<b>ECOTOX Sample ID</b>	<b>Sample Collection Date / Time</b>
<b>Produced Sand from EEPGL</b>	<b>2101109</b>	<b>25<sup>th</sup> March 2021 / 8:00 a.m.</b>

The samples were collected on the 25<sup>th</sup> March 2021, by a representative from Tiger Tanks Guyana Rentals Inc. Samples were collected and preserved according to recommended procedures as stipulated in the United States Environmental Protection Agency Methods for the requested parameters. The samples were appropriately stored in a cooler, on ice at  $4 \pm 2^{\circ}\text{C}$ , for transportation to the laboratory. The samples were received by ECOTOX on the 8<sup>th</sup> February 2021. On receipt by the laboratory, samples were logged into the ECOTOX sample tracking system and assigned sample identification numbers. The samples were appropriately stored (refrigerator  $4 \pm 2^{\circ}\text{C}$ ) until the tests were initiated.

<sup>1</sup> Toxicity Characteristic Leaching Procedure - a sample extraction method for chemical analysis employed as an analytical method to simulate leaching through a landfill.

## 2.0 Results

Tests were done in accordance with those stipulated in the Standard Methods for the Examination of Water and Wastewater 23<sup>rd</sup> Edition (2017) and the United States Environmental Protection Agency Standard Methods for the requested parameters. Standard test procedures were followed for all analyses conducted with several quality control measures implemented for each parameter investigated. The results for the requested analyses are listed below in Table #2. Replicate analyses, blanks, spikes and standard reference materials were included during tests to assess the accuracy and precision of the analytical results obtained. Refer to Appendix A for method description and quality control and assurance measures. Refer to Appendix B, for Chain of Custody/Sample Receipt information.

**Table #2: Waste Characterization Results**

<b>Parameter</b>	<b>Maximum Permissible Limit (mg/Kg)</b>	<b>2101109 Produced Sand from EEPGL 25<sup>th</sup> March 2021</b>
<b>pH (Hydrogen Ion, H<sup>+</sup>)</b>	<b>6 - 12<sup>2</sup> (H<sup>+</sup>)</b>	<b>7.01</b>
<b>Total Petroleum Hydrocarbons (mg/Kg)</b>	<b>Not Listed<sup>2</sup></b>	<b>32,002.5</b>
<b>Total Oil &amp; Grease (mg/Kg)</b>	<b>&lt; 3% or &lt; 30,000 ppm<sup>2</sup></b>	<b>66,150.6</b>
<b>TCLP Extractable Arsenic (mg/L)</b>	<b>5.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Barium (mg/L)</b>	<b>100 mg/L<sup>3</sup></b>	<b>1.075</b>
<b>TCLP Extractable Cadmium (mg/L)</b>	<b>1.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Chromium (mg/L)</b>	<b>5.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Lead (mg/L)</b>	<b>5.0 mg/L<sup>3</sup></b>	<b>0.164</b>
<b>TCLP Extractable Mercury (mg/L)</b>	<b>0.2 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Selenium (mg/L)</b>	<b>1.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>
<b>TCLP Extractable Silver (mg/L)</b>	<b>5.0 mg/L<sup>3</sup></b>	<b>&lt; 0.005</b>

<sup>2</sup> Louisiana Administrative Code (LAC), Title 43, part XIX, Office of Conservation – General Operations Subpart 1. Statewide Order No. 29-B; Section 313, E, Burial or Trenching of Treated Pit Solid Phase Contents – Pit Closure Techniques and Onsite Disposal of Exploration and Production Waste Standard (November 2019).

<sup>3</sup> TCLP United States Environmental Protection Agency Resource Recovery and Conservation Act, RCRA-8 Metals Maximum Permissible Limits (Maximum Concentration of Contaminants).

### 3.0 Appendix A - Quality Control and Quality Assurance Procedures for Analyses Performed

All sampling and tests procedures employed by ECOTOX for the duration of this project were a direct adaptation from standard procedures as outlined in the SMEWW – Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 23<sup>rd</sup> Edition, 2017; and US Environmental Protection Agency Standard Methods. The following will outline a brief description of the procedures used. The relative standard deviation (RSD) was less than 10.0 % for all analyses conducted. Standard reference materials and spiked solutions were used with 85 –115 % recovery obtained during testing. The following table will illustrate the analyses to be performed and necessary details for each.

As outlined in **Laboratory Manual for the Analysis of Exploration and Production Waste** (Department of Natural Resources, May 2005), Analytical Methodology Table (Refer to below):

ANALYTICAL METHODOLOGY REFERENCE TABLE LAC 43:XIX.Subpart 1	
Parameter	Method
<u>Soils / Sediment / Sludges / Reusable Material</u>	
pH	SW-846 9045C, EPA 150.1 <sup>^</sup>
TPH (Total Petroleum Hydrocarbons)	SW-846 1664 HEM/SGT / SW-846 9071
Leachable TPH Test	LDNR Lab Procedures for Analysis of E&P Waste
Leachable Chlorides Test	LDNR Lab Procedures for Analysis of E&P Waste
Electrical Conductivity (EC)	LDNR Lab Procedures for Analysis of E&P Waste
Sodium Absorption Ratio (SAR)	LDNR Lab Procedures for Analysis of E&P Waste
Exchangeable Sodium Percentage (ESP)	LDNR Lab Procedures for Analysis of E&P Waste
Cation Exchange Capacity (CEC)	LDNR Lab Procedures for Analysis of E&P Waste
Benzene	SW-846 8021
TCLP Benzene	SW-846 8021/1311
NORM	EMSL-LV-0539-17 <sup>®</sup>
Reactive Sulfide	SW-846 7.3.4
<u>Total Metals and/or Leachable Metals</u>	
TCLP Extraction	SW-846 1311
Arsenic (As)	SW-846 6010/6020/7000
True Total Barium (Ba)	LDNR Lab Procedures for Analysis of E&P Waste
Barium (Ba)	SW-846 6010/6020/7000
Cadmium (Cd)	SW-846 6010/6020/7000
Chromium (Cr)	SW-846 6010/6020/7000
Copper (Cu)	SW-846 6010/6020/7000
Lead (Pb)	SW-846 6010/6020/7000
Mercury (Hg)	SW-846 7470/7471
Molybdenum (Mo)	SW-846 6010/6020/7000
Nickel (Ni)	SW-846 6010/6020/7000
Selenium (Se)	SW-846 6010/6020/7000
Silver (Ag)	SW-846 6010/6020/7000
Sodium (Na)	SW-846 6010/6020/7000
Zinc (Zn)	SW-846 6010/6020/7000
Soluble Cations (Na, Ca, Mg)	LDNR Lab Procedures for Analysis of E&P Waste
Soluble Anions (Cl, CO <sub>3</sub> , HCO <sub>3</sub> , SO <sub>4</sub> )	SW-846 9056/9253, SM 2320B*

**Table #3: Methodology Listing – Sampling – Solid Waste Matrices**

Item	Test Method and Description
Test Method Reference	<p>SOLID- As outlined and guided by the following reference methods:</p> <ul style="list-style-type: none"> <li>• ASTM D6051 – 15. Standard Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities.</li> <li>• RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment, EPA530-D-02-002, August 2002.</li> <li>• US EPA SW 846 Compendium of Hazardous Waste Testing Methods, Test Methods for Evaluating Solid Waste.</li> <li>• US EPA Hazardous Waste Incineration Measurement Guidance Manual, Volume III of the Hazardous Waste Incineration Guidance, Section 3.3 “Sampling”, EPA/625/6-89/021, June 1989.</li> <li>• US EPA Hazardous Waste Incineration Measurement Guidance Manual, Volume III of the Hazardous Waste Incineration Guidance, Section 3.3.1.2 “Viscous Liquids, Slurries, Sludges, and Solid Waste Samples”, EPA/625/6-89/021, June 1989, as follows: Incinerator Ash, Moist or Dry Solids - Trowel (Scoop) Method</li> </ul>
Test Description	<p>Composite Sample – Solid/Sludge  <i>Composite Gross Sample</i>  <i>Reduction of Gross Sample: Coning and quartering procedure:</i>                      A composite sample will be collected from no more than 3-bags per homogenous waste type and sent to the lab for analysis.</p>
Sample Collection & Preservation	<p><b><u>Borosilicate (Glass), PTFE<sup>4</sup> Lined Cap (8 ounces)</u></b> – Fill bottle to top with minimal amount of air remaining in bottle. Stopper tightly and store on ice in cooler. Cool, &lt; 6°C, in dark.</p> <p>Samples to be stored cool 4 ± 2°C, but not freezing.</p>
Maximum Holding Time/Storage	<p>Samples should be stored field-moist at 4 ± 2°C for 14-days.                      Preserved Metal TCLP digest holding time = 6 months, 4 ± 2°C.                      TOG/TPH samples holding time = 14 days, 4 ± 2°C.</p>
Transportation	<p>After collection, sample handling should be minimized. Field Technicians should use extreme care to ensure that samples are not contaminated during storage. Environmental and waste samples are typically stored in coolers. To reduce the risk of cross contamination, sample containers should be placed inside of sealed, plastic bags before being placed in the cooler. If ice is required for preservation of the samples, the ice should be contained in a plastic bag or some equivalent container to prevent the potential for cross contamination of the samples by water produced from melting ice. If ice is used, the coolers should be checked regularly and water should be drained as needed. Custody of samples will be maintained. If analysis is to be delayed for more than six (6) hours, samples must be stored in a cooler with ice to maintain sample temperature of 4 ± 2°C. All samples must therefore be transported to the laboratory in this manner.</p>

<sup>4</sup> Polytetrafluoroethylene.

**Table #4: Methodology Listing – Total Petroleum Hydrocarbons**

Parameter	Test Method and Description
<p>Test Method Reference and Description</p>	<p>As outlined in <b>Laboratory Manual for the Analysis of Exploration and Production Waste</b> (Department of Natural Resources, May 2005) Analytical Methodology Reference Table, page 2.</p> <p>As outlined in <b>US EPA Method 9071B</b>, n-Hexane Extractable Material (HEM) for Sludge, Sediment, and Solid Samples. Quantification of oil and grease in soil, sediments, sludges, and other solid materials amenable to chemical drying and solvent extraction with n-hexane. “Oil and grease” is a conventional pollutant under 40 CFR 401.16 and generally refers to substances, including biological lipids and mineral hydrocarbons that have similar physical characteristics and common solubility in an organic extracting solvent. As such, oil and grease is an operationally defined parameter, and the results will depend entirely on the extracting solvent and method of extraction. Method 9071 employs n-hexane as the extraction solvent with Soxhlet extraction and the results of this method are appropriately termed “n-hexane extractable material (HEM).”</p> <p>As outlined in <b>US EPA 3540C – Soxhlet Extraction Method</b>. Method 3540 is a procedure for extracting non-volatile and semi volatile organic compounds from solids such as soils, sludges, and wastes. The Soxhlet extraction process ensures intimate contact of the sample matrix with the extraction solvent. The solid sample is mixed with anhydrous sodium sulfate, placed in an extraction thimble or between two plugs of glass wool, and extracted using an appropriate solvent in a Soxhlet extractor. The extract is then dried, concentrated (if necessary), and, as necessary, exchanged into a solvent compatible with the clean-up or determinative step being employed.</p> <p>As outlined in <b>5520F – Hydrocarbons (TPH)</b>. Silica gel has the ability to adsorb polar materials. If a solution of hydrocarbons and fatty materials in a nonpolar solvent is mixed with silica gel, the fatty acids are removed selectively from solution. The materials not eliminated by silica gel adsorption are designated hydrocarbons by this test.</p>
<p>Quality/Assurance Control Measures</p>	<ul style="list-style-type: none"> <li>• Duplicate/Triplicate analyses,</li> <li>• Method Blank, Laboratory Fortified Blank.</li> <li>• Routine and Random Duplicates/Triplicates.</li> <li>• Determine Method Detection Limit for sample analyte.</li> <li>• Instrument Operational Range – Upper and Lower Limits</li> <li>• Calibration &amp; Verification Procedures and Standards.</li> <li>• Equipment Maintenance and Preventative Maintenance Procedures.</li> </ul>

**Table #5: Methodology Listing – TCLP<sup>5</sup> Extractable Metals**

Parameter	Test Method and Description
<p>Test Method Reference and Description</p>	<p>As outlined in <b>Laboratory Manual for the Analysis of Exploration and Production Waste</b> (Department of Natural Resources, May 2005), Analytical Methodology Reference Table, page 2.</p> <p>As outlined in <b>US EPA Method Number 1311</b>. Toxicity characteristic leaching procedure (TCLP) is a soil sample extraction method for chemical analysis employed as an analytical method to simulate leaching through a landfill. The testing methodology is used to determine if a waste is characteristically hazardous.</p> <p>The solid phase is extracted with an amount of extraction fluid equal to 20 times the weight of the solid phase. The extraction fluid employed is a function of the alkalinity of the solid phase of the waste. Following extraction, the liquid extract is separated from the solid phase by filtration through a 0.6 to 0.8 µm glass fiber filter.</p> <p>The TCLP Extract is analyzed for metals as outlined in:  <b>As, Ba, Cd, Cr, Pb, Zn, Se &amp; Ag</b> – US EPA SW-846 Test Method 7000B and SMEWW<sup>6</sup> Method 3111B, D: Flame Atomic Absorption Spectrophotometry.</p> <p><b>Mercury:</b>  Hg – US EPA Method 7470 - Cold-Vapor Atomic Absorption Spectrometry 7471B-Solids or Semisolid Waste Cold-Vapor Atomic Absorption Spectrometry. Free mercury atoms in a carrier gas are excited by a collimated ultraviolet light source at a wavelength of 53.7 nanometres. The excited atoms re-radiate their absorbed energy (fluoresce) at this same wavelength. Unlike the directional excitation source, the fluorescence is omnidirectional and may thus be detected using a photomultiplier tube or UV photodiode. The technique differs from the more conventional atomic absorption (AA) technique in that it is more sensitive, more selective, and is linear over a wide range of concentrations.</p> <p><b>Arsenic</b>  Hydride Generation/Atomic Absorption Spectrometry and ECOTOX SOP Method W-M-As. This method is applicable to the determination of arsenic by conversion to its hydride by sodium borohydride reagent and transport into an atomic absorption atomizer. Arsenous acid, the As (III) oxidation state of arsenic is instantaneously converted by sodium borohydride reagent in acid solution to its volatile hydride. The hydride is purged continuously by argon or nitrogen into a quartz cell heated electrically or by the flame of an atomic absorption spectrometer and converted to the gas-phase atoms. The sodium borohydride reducing agent, by rapid generation of the elemental hydrides in an appropriate reaction cell, minimizes dilution of the hydrides by the carrier gas and provides rapid, sensitive determination of arsenic. At room temperature and solution pH values of 1 or less, arsenic acid, the As(V) oxidation state of arsenic, is reduced relatively slowly by sodium borohydride to As (III), which is then instantaneously converted to arsine. Organic and inorganic forms of arsenic are first oxidized to As(V) by acid digestion. The As(V) then is quantitatively reduced to As (III) with sodium or potassium iodide before reaction with sodium borohydride.</p>
<p>Quality/Assurance Control Measures</p>	<ul style="list-style-type: none"> <li>• Duplicate/Triplicate analyses,</li> <li>• Method Blank, Laboratory Fortified Blank.</li> <li>• Routine and Random Duplicates/Triplicates.</li> <li>• Determine Method Detection Limit for sample analyte.</li> <li>• Instrument Operational Range – Upper and Lower Limits</li> <li>• Calibration &amp; Verification Procedures and Standards.</li> <li>• Equipment Maintenance and Preventative Maintenance Procedures.</li> </ul>

<sup>5</sup> Toxicity characteristic leaching procedure.

<sup>6</sup> SMEWW – Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 2017, 23<sup>rd</sup> Edition.

**Table #6: Methodology Listing – pH**

<b>Parameter</b>	<b>Test Method and Description</b>
Test Method Reference and Description	<p>As outlined in <b>Laboratory Manual for the Analysis of Exploration and Production Waste</b> (Department of Natural Resources, May 2005) Analytical Methodology Reference Table, page 2.</p> <p>As outlined in <b>US EPA Method SW-846 Test Method 9045C: Soil and Waste pH</b>.</p> <p>Sample Preparation and pH measurement of waste materials:</p> <p>To 20 grams waste sample in a 50-mL beaker, add 20 mL of reagent water, cover and continuously stir for 5 minutes. Let waste suspension stand for about 15 minutes to allow most of the suspended waste to settle from the suspension or filter or centrifuge off aqueous phase for pH measurement.</p> <p>pH measurement by pH Meter.</p>
<b>Quality/Assurance Control Measures</b>	<ul style="list-style-type: none"> <li>• Duplicate analyses,</li> <li>• Method Blank, Laboratory Fortified Blank.</li> <li>• Routine and Random Duplicates/Triplicates.</li> <li>• Determine Method Detection Limit for sample analyte.</li> <li>• Instrument Operational Range – Upper and Lower Limits</li> <li>• Calibration &amp; Verification Procedures and Standards.</li> <li>• Equipment Maintenance and Preventative Maintenance Procedures.</li> </ul>

The following is a table of the calculated detection limits and the associated bias for each of the analyses performed.

**Table #7: List of Parameters with Associated Instrument Detection Limits and Bias**

<b>Parameter</b>	<b>Detection Limit/Range</b>	<b>Bias</b>
pH	0.01 H <sup>+</sup>	± 0.01 H <sup>+</sup>
OG/TPH	0.1 ppm	±0.1 ppm
TCLP Metals	0.005 ppm	±0.005 ppm

# 4.0 Appendix B – Chain of Custody



**ANALYTICAL REQUEST FORM  
CHAIN OF CUSTODY**

**CLIENT:** Tiger Tanks Trinidad Unlimited (for Tiger Tanks Guyana Rentals Inc.)

**REPORT TO:** Mr. Shane Singh

**ADDRESS:** #126 Queenina & Carmichael Streets, Georgetown, Guyana.

**PHONE:** 492-501-0620 **FAX:**

**PROJECT NAME:** WASTE TESTING

**SAMPLED BY:** Alond Kishore Singh

**INVOICE TO:**

**BILLING ADDRESS:**

**P.O. NUMBER:**

**REQUESTED ANALYSIS**

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	TPH	oil & Grease	TCLP As, Bb, Cs, Pb, Hg, Se, Ag, Cd	PH
1. Produced Sand from EEPGL	25/12/2021 @ 8:00 AM	✓	✓	✓	✓
2. TB 0184	9:00 AM				
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

**RELINQUISHED BY:** V. Ramsooan  
**PRINT NAME:** V. Ramsooan  
**FIRM:** TRG

**DATE:** 25/12/21  
**TIME:** 3:00 AM

**RECEIVED BY:** [Signature]  
**PRINT NAME:** [Signature]  
**FIRM:** [Signature]

**DATE:** 1-4-21  
**TIME:** 11:00 AM

**LABORATORY ADDRESS:** #213 Caroni Savannah Rd, Charlevoix, Trinidad, West Indies.  
**Tel:** (868)-672-6620 **Fax:** (868) 665-8620; (868) 221-9149  
**e-mail:** admin@ecotox.com, msd@ecotox.com

**TURNAROUND REQUEST in Business Days**

**COCF:**

**ANALYSIS:**

10  5  3  2  1  <

10  7  5  3  2  1

**Microbiological Analyses**

10  7  5  3  2  1

**OTHER:**  Please Specify

MATRIX (W.S.O)	# OF CONT.	COMMENTS	ECOTOX ID
S	1	Plastic	2101001

**ADDITIONAL INFO/SPECIAL REQUESTS:**

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