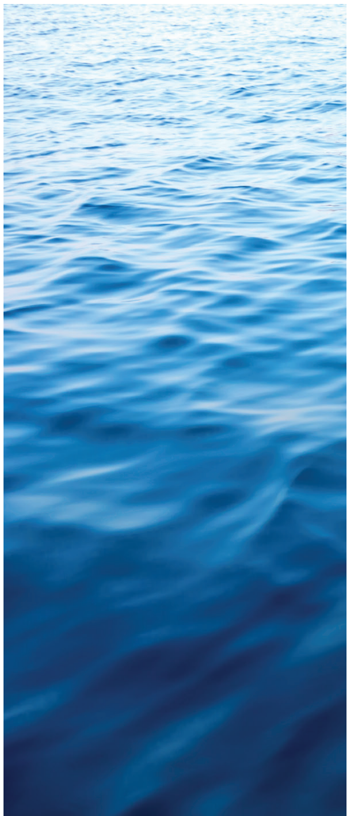

Environmental Impact Assessment

Payara Development Project

Esso Exploration and Production Guyana Limited

Volume III

ERM

GSEC GROUND STRUCTURES ENGINEERING CONSULTANTS INC.

EMC

July 2020
Revision 4

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Volume III of this Environmental Impact Assessment is hereby submitted by Esso Exploration and Production Guyana Limited (EEPGL).

EEPGL Country Manager	ARoutledge Alistair Routledge	July 20, 2020 Date

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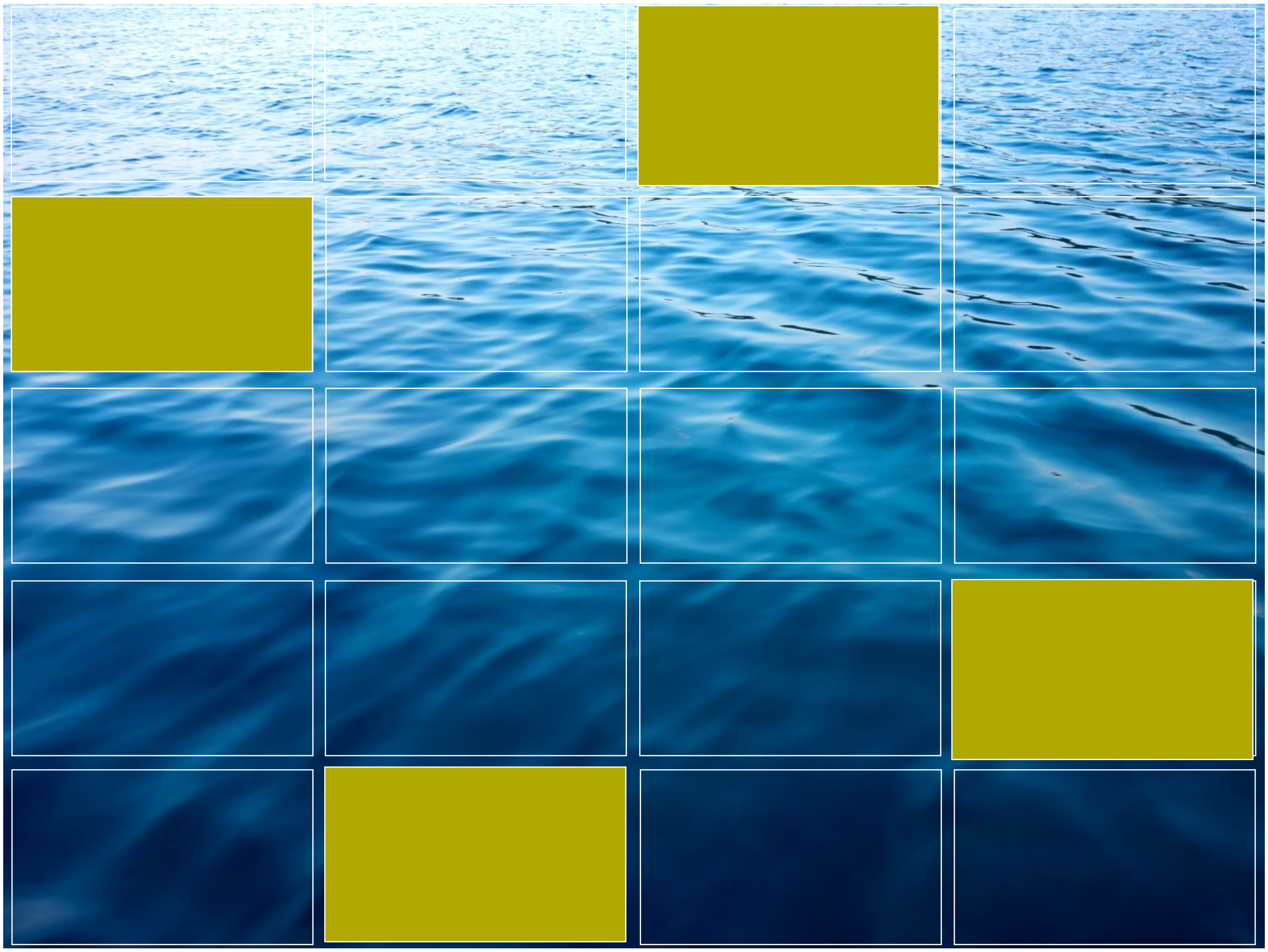

Environmental and Socioeconomic Management Plan

Payara Development Project

Esso Exploration and Production Guyana Limited

July 2020—Revision 4

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Todd H. Hall

ERM Partner

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The business of sustainability

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Approved by:

EEPGL Country Manager

Alistair Routledge July 20, 2020
Date

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LIST OF ACRONYMS

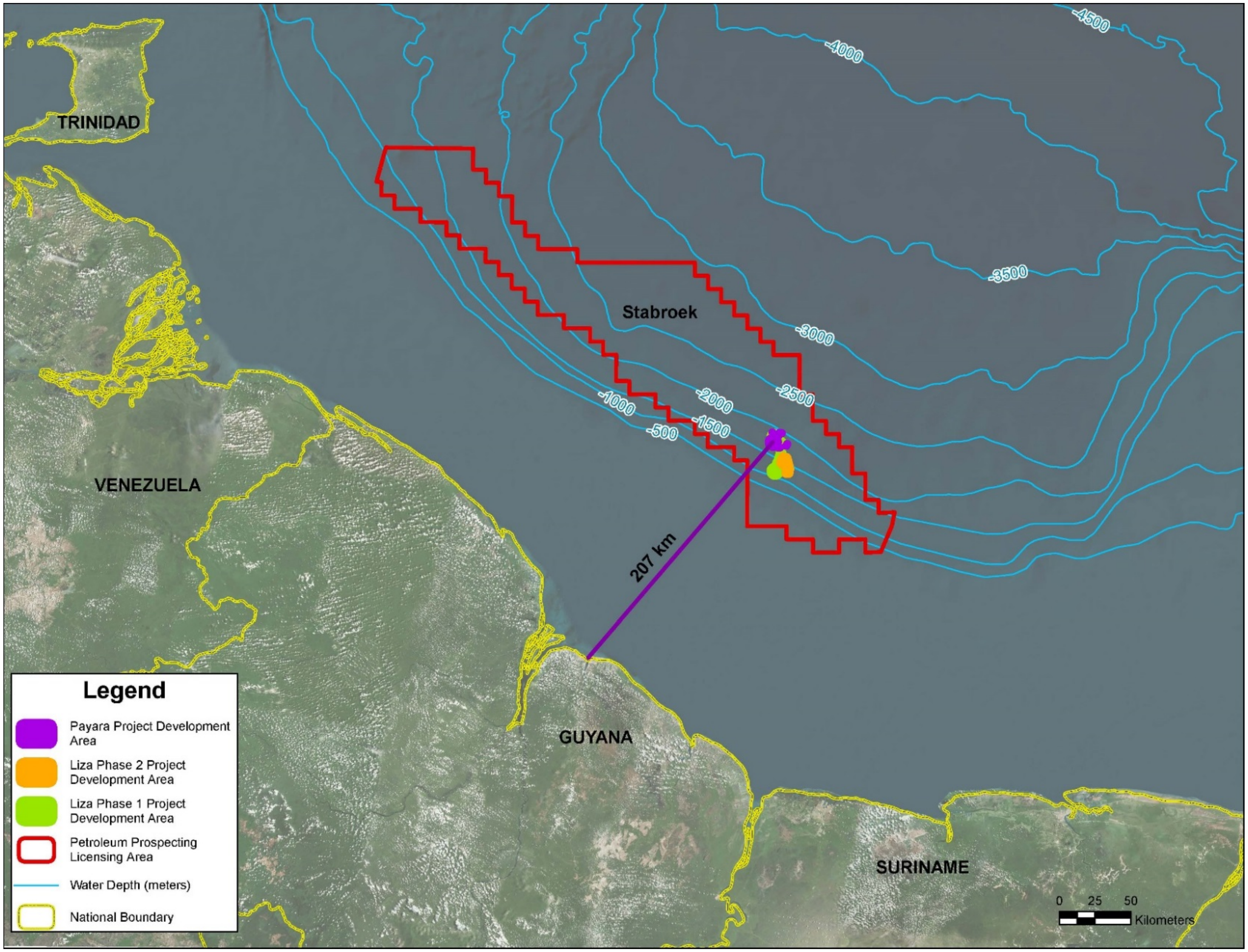
°C	degrees Celsius
AART	Americas Regional Response Team
CGM	Community Grievance Mechanism
CHS	Cultural Heritage Specialist
CO_2	carbon dioxide
DP	dynamic positioning
EEPGL	Esso Exploration and Production Guyana Limited
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EPA	Guyana 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
WMP	Waste Management Plan for Guyana Development Projects

1.0 INTRODUCTION AND SCOPE

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 Authorisation (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), which is planned to occur approximately 190 kilometers offshore from the Georgetown coastline. EEPGL subsequently applied for and received a second Environmental Authorisation 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. EEPGL is currently applying to the EPA for an Environmental Authorisation for a third development in the eastern half of the Stabroek Block, in the Payara, Pacora, Liza Deep, and northern area of the Liza fields (hereafter referred to as the Payara Development Project, or the Project), which is located approximately 207 kilometers (128 miles) northeast of the coastline of Georgetown, Guyana.

The scope of this Environmental and Socioeconomic Management Plan (ESMP) is to cover the Payara development, which will include up to 45 development wells (including production wells, water injection wells, and gas re-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 7,800 hectares where work may be performed and a sea surface area of approximately 5,000 to 5,500 hectares where work may be performed. Figure 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 1-1. Location of the Payara Project Development Area within the Stabroek Block



EEPGL has prepared a separate Environmental Impact Assessment (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.

2.0 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; and
- Identify environmental, socioeconomic, and regulatory training and awareness requirements for the Project and contractors.

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.

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, the requirements for environmental review of projects that could potentially impact the environment, and the penalties for environmental infractions. 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. 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 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. Since the shift in oversight responsibilities from the Ministry of Natural Resources to the Ministry of the Presidency, the Department of Energy, under the Ministry of the Presidency, has been playing a lead role in matters regarding the oil and gas sector. In this regard, the GGMC, through the Petroleum Unit, has been working closely with the Department of Energy on oil and gas-related matters.

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 also highlights the importance of maintaining ecosystem services of national and global importance and public participation in protected areas and conservation, and 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 ("Petroleum 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.
- The 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 2-1.

Table 2-1. Resource-Specific Environmental and Social Laws

Title	**Objective**	**Relevance to the Project**
Biological Resources		
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.
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 supportive mechanism cognizant of the national goals for wildlife protection, conservation, management, sustainable use, and external trade.
Physical Resources		
Environmental Protection Water Quality Regulations, 2000	Focused on setting effluent standards, reporting requirements, penalties for violations of standards, and permitting requirements for discharges.	Regulates discharges of listed substances, which could include substances used as part of the Project.
Environmental Protection Air Quality Regulations, 2000	Sets ambient air quality standards, reporting requirements, penalties for violations of standards, and permitting	Regulates emissions that could be generated by the Project.

Title	Objective	Relevance to the Project
	requirements for stationary and mobile sources of air emissions.	
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.
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.	Regulated facilities include any offshore installation and any other installation, whether floating or resting on the seabed.
Pesticides and Toxic Chemicals Control Act No. 13 of 2000, as amended in 2007	Provides for the formation of a Pesticides and Toxic Chemicals Control Board; establishes requirements for registration, licensure, and trade in pesticides and toxic chemicals. Amended in 2007 to provide rules for the exportation of pesticides and toxic chemicals.	Establishes regulations pertaining to the use of toxic chemicals and pesticides. Pesticides will not be required for the Project, but small amounts of toxic chemicals may be used.
Pesticides and Toxic Chemicals Regulations, 2003	Deems pesticides or toxic chemicals as prohibited if they are a contravention of any known requirement of the laws of the country in which they were manufactured or produced or banned by the United Nations. Restricts manufacturing, importing, advertising, selling, using, storing or transporting any controlled substance unless they are registered and a license is obtained for the manufacturing and importing.	Requires all toxic chemicals to be registered with the Pesticides and Toxic Chemicals Control Board before being used in Project-related applications. Requires an import license to be obtained for importation of any toxic materials.
Public Health		
Occupational Safety and Health Act, 1997	Legally defines the responsibilities of workers and management with respect to keeping workplaces safe.	Generally applies to Project workers and Project-related activities.
Food & Drug Regulations (Food and Drug Act), 1971	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.
Social/Cultural Resources		
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

Title	Objective	Relevance to the Project
		historic or national cultural significance that could be impacted by the Project (e.g., shipwrecks and other such marine features).

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 Framework of the Green State Development Strategy outlines Vision 2030 for "greening" Guyana, guided by seven key thematic areas focused on structural transformation, resilient infrastructure, sustainable management of natural resources, transition to renewable energy, human health and wellbeing, governance, and international cooperation.
- 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 Development Strategy sets priorities for Guyana's economic and social development policies for the next decade. The draft document contains technical analysis of problems and future prospects in all sectors of the economy and in areas of social concern.
- 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.
- The National Solid Waste Management Strategy (2013-2024) establishes a strategic framework to guide Government decision making with respect to waste management and serve as the foundation for establishing a sustainable waste and resource recovery system for Guyana.

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). Effective and consistent application of these policies will constitute the primary safeguards against occupational hazards for Project workers, and all Project workers and contractors will receive training on implementation of these principles and will be required to adhere to them in the daily execution of their duties.

ExxonMobil's OIMS Framework[1] 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

[1] https://corporate.exxonmobil.com/Energy-and-environment/Tools-and-processes/Risk-management-and-safety/Operations-Integrity-Management-System

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 2-1 provides a high level description of the OIMS Framework and its 11 essential elements.

Figure 2-1. The OIMS Framework

2.4.1 Occupational Safety & Health Management

OIMS establishes expectations and requirements for identifying and managing occupational safety and health risks associated with its operations. Examples of the key elements of EEPGL's occupational safety and health programs that will be utilized during the Project life cycle (at least 20 years) are discussed in Table 2-2. The occupational safety and health program elements in Table 2-2 are focused on personnel safety and health risks associated with the offshore drilling, installation, production operations, and decommissioning stages of the Project; design considerations are not included.

Table 2-2. Key Occupational Safety and Health Management Elements

Program Element	Description
SAFETY	
Personal Protective Equipment (PPE)	Used to reduce personal exposure to hazards when engineering and administrative controls are not feasible or are not effective in reducing exposure to an acceptable level. A PPE program addresses the hazards to be encountered; the selection, maintenance, and use of PPE; the training of personnel; and monitoring of the program to ensure ongoing effectiveness. Includes basic and specialty PPE.

Program Element	Description
Confined Space Entry	Controls hazards associated with personnel entering spaces not designed for human occupancy, where egress is limited, and where hazards pose a risk to injury or illness from hazardous substances or conditions (e.g., hazardous atmosphere, fire, exposure to hazardous substance, temperature, physical hazards, etc.). Includes controls such as atmospheric testing, forced air ventilation, attendants, signage, entry permits, etc.
Energy Isolation	Utilizes controls to prevent the unexpected energizing, start-up, or release of stored energy (e.g., hydraulic, pneumatic, thermal, chemical, gravity, mechanical) while working with plant and equipment that have one or more energy sources. Also known as Lockout/Tagout.
Electrical	Controls hazards encountered by personnel who install, use, maintain, repair, or test various types of permanent and temporary plant and equipment, as well as other personnel who work in the proximity of such plant and equipment. Includes controls such as electrical codes, classified areas, qualified persons, signage, specialty PPE, grounding, guarding, etc.
Hot Work	Utilizes controls necessary to safely perform “hot work” (work methods that produce ignition sources; sparks, flame, heat) in the proximity of flammable gases, liquids, or materials. Includes controls such as safe welding areas, gas testing, fire watch, firefighting equipment, permits, etc.
Fall Protection	Manages the risk of personnel working above 1.8 meters and includes use of personal fall arrest systems and safe anchoring points.
Scaffolding, Work Platforms, Ladders, and Personnel Lifting Equipment	Scaffolding, work platforms, and ladders are utilized to elevate workers performing work at heights. Scaffolding and work platforms require controls for use of competent scaffold builders, standards for erection, safe work loads, and inspection/tagging systems. Includes safe work practices for ladders. Includes controls and safe work practices for mechanized personnel lifting (e.g., aerial lifting equipment, work baskets).
Dropped Objects Management	Uses control to prevent dropped objects such as tools, materials, and debris from falling onto work areas below, which could cause injury to personnel or damage to equipment. Includes controls such as overhead protection, hard barricades, soft barricades, tool tethering, etc.
Mechanized Lifting and Rigging	Includes the utilization of various types of mechanized lifting equipment (e.g., stationary cranes, mobile cranes, overhead cranes) by equipment operators and rigging personnel, as well as rigging apparatus (e.g., spreader bars, slings, straps, hooks). Utilizes controls related to operator and equipment certification, inspection and maintenance, load ratings, general safe work practices for routine lifts, and procedures for non-routine lifts.
Tools and Equipment	Identifies controls and safe work practices for managing the risks associated with various types of hand tools and portable equipment (e.g., hammering, chipping, welding, burning, cutting, cleaning, smoothing, breaking, shaping, torqueing). Includes inspection, maintenance, safety devices, etc.

Program Element	Description
Marine Transportation and Personnel Transfers	Includes controls and safe work practices associated with marine transportation of personnel by crew boat. Also includes controls and safe work practices for infield personnel movements between vessels or facilities (e.g., collapsible rope man-baskets, gangways).
Aviation Transportation	Includes controls and safe work practices associated with rotary wing aviation aspects (e.g., refueling operations, aircraft inspection and maintenance, design of helidecks, pilot training and credentials, weather criteria) and personnel transportation considerations (e.g., water survival training, helicopter egress training, in-flight aviation procedures).
Housekeeping	Utilizes controls and monitoring processes to eliminate various types of incidents, including fires, exposure to hazardous chemicals, dropped objects, and slips, trips, and falls.
Driving	Utilizes controls to manage ground transportation hazards in an urban environmental, including general driving rules, licensing, defensive driving training, fatigue management, alcohol and drug avoidance, inspection and maintenance, journey management, etc.
HEALTH	
Hazard Communication	Includes controls to verify that materials are reviewed for hazards prior to use, are communicated to potentially affected persons, and the necessary controls are implemented to provide safety and health protections. Includes making Safety Data Sheets available to personnel.
Respiratory Protection Program	Provides controls to ensure personnel select the appropriate respiratory protective equipment for certain activities. Certain respirators require training, fit testing, and use by medically qualified personnel.
Noise and Hearing Conservation Program	Identifies high noise areas (exposures above 85 decibels), evaluates personnel exposure, provides protective equipment, and implements appropriate engineering and administrative control measures to prevent occupational hearing loss.
Exposure Monitoring	Includes exposure monitoring to identify, analyze, and manage occupational health risks. Results of monitoring against defined criteria (e.g., threshold limit values) are communicated to personnel and effective control measures are established to mitigate worker risks.
Radiation Management	Establishes controls to safely manage use of radioactive sources, source materials, radiation producing devices, and naturally occurring radioactive materials.
Heat Stress Management	Utilizes controls and safe work practices to assess the work environment in order to reduce potential injury or illness where temperature extremes may result in significant health impacts on personnel.
Medical Screening and Fitness for Work	Includes controls to ensure personnel are fit for work, including general medical fitness-for-duty, job-specific fitness-for-duty, vaccinations, pre-screening for contagious diseases, alcohol and drug testing, etc.

Program Element	Description
Tuberculosis Control Program and Other Communicable Disease Concerns	Provides tuberculosis (TB) controls to promote early detection, isolations, and prompt treatment of TB cases at sites where TB transmission may exist and where personnel live together in congregated settings (e.g., offshore vessels). Includes other controls for other relevant communicable diseases of concern (e.g., Dengue, Zika, Lymphatic Filariasis) based on risk of exposure in the work location.
Water Safety	Includes controls to ensure potable water sources are safe for consumption on offshore vessels. Includes standards and periodic verification testing by qualified personnel.
Administrative Processes	
Contractor and Subcontractor Management	Includes a structured evaluation and selection process that addresses safety and health considerations, identifies the minimum safety and health requirements through contract language, provides performance monitoring during execution/operations, and provides a feedback mechanism to contractor/subcontractor management.
Orientation and Training	Training program includes a systematic means of providing, enhancing, and/or sustaining the safety and health knowledge and skills of personnel. Includes a training matrix, competency assessment, documentation of training, etc. Orientation program includes a structured induction process to ensure that personnel arriving at a work location for the first time understand the applicable safety and health expectations and requirements. Orientation program also includes an abridged version for visitors.
Simultaneous Operations	Includes a structured process to verify that simultaneous activities between different offshore teams (Drilling, Installation, Production, Logistics) are safely managed.
Work Management System	A work management system (also known as a permit-to-work system) is a systematic process for planning, executing, and controlling critical and/or non-routine tasks at a work location. Includes processes for work authorization and permit validity (duration, suspension, cancellation). Includes coordination meetings, pre-task planning, and assessment. Defines when certain types of work permits are required (e.g., hot work, confined space entry, energy isolation, critical mechanized lifts).
Worker Hazard Management Processes	Includes a suite of programs aimed at engaging workforce personnel in hazard management including: pre-shift safety meetings, job safety analysis, personal risk assessment, near miss and hazard condition reporting, behavioral observations, stop work authority, etc.
Inspections	Provides a systematic process for designated work site personnel to identify and resolve safety and health issues at a work location. Typically focuses on both physical conditions and personnel behaviors.
Audits	Includes structured verification processes to periodically evaluate the effectiveness of various types of safety and health policies, processes, procedures, and work practices, in order to identify opportunities for improvement and develop and steward action plans to drive improvement.

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 practice. Table 2-3 presents a summary of key environmental and socioeconomic performance criteria the Project will utilize.

Table 2-3. 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, 2nd Edition, 2000
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

Aspect	Performance Criteria to be Applied	International Standard That References Applied Performance Criteria
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: http://www.marlin.ac.uk/habitats/SNCB-benchmarks#toc_physical-pressure-other-
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
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

Aspect	Performance Criteria to be Applied	International Standard That References Applied Performance Criteria
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
Air Quality	Manage generation and release of emissions of any type through a combination of: • Energy use efficiency; • Process modification; • Selection of fuels or other materials; and • Application of emissions control techniques	World Bank General EHS General Guidelines (English)
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. Ecotoxicology, 5(1996): 253.)
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

Aspect	Performance Criteria to be Applied	International Standard That References Applied Performance Criteria
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 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.

Figure 2-2 illustrates the preliminary organizational structure that will support implementation of the ESMP. Key roles and responsibilities as it relates to the ESMP are outlined in Table 2-4.

This organizational structure and the associated organizational roles and responsibilities will be further defined in future revisions of this document, as needed, once the Project achieves a Final Investment Decision.

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.

EEPGL defines SSHE roles and responsibilities for its organizations and individuals to ensure they understand expectations.

Figure 2-2. Preliminary Organizational Structure—ESMP Responsibilities

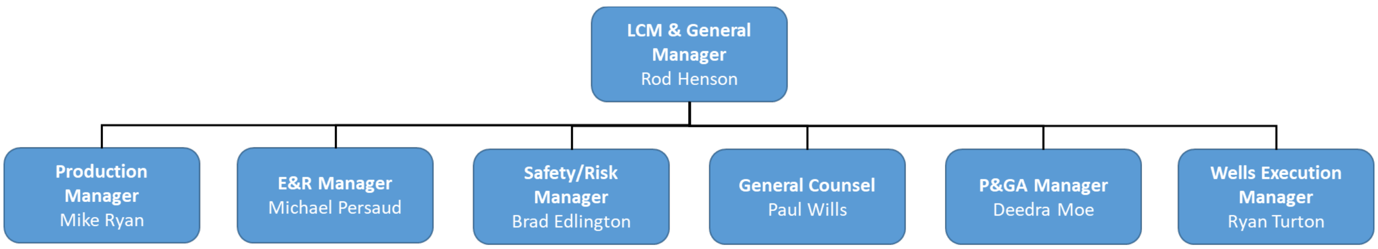


Table 2-4. ESMP Roles and Responsibilities

Role	Responsibilities
Lead Country Manager (LCM) & General Manager	• Approves the ESMP • Sets the expectation for the Production Organization to comply with the requirements of the ESMP
Production Manager	• Maintains awareness of the requirements in the ESMP with the Operations Organizations • Accountable for implementing the operational requirements of the ESMP • Provides resources to implement the operational requirements of the ESMP • Verifies the Operations Organization complies with the ESMP
E&R Manager	• Endorses the ESMP • Administrative owner of the ESMP documentation • Jointly accountable with Operations Management for implementation of the ESMP • Provides technical support to operational staff for safety, health, environmental, and regulatory compliance-related ESMP requirements • Coordinates interfaces with Government agencies and external stakeholders on safety, health, environmental, regulatory compliance matters • Manages OIMS implementation and execution such that EEPGL meets the Corporate OIMS expectations • Responsible for EEPGL SSHE stewardship and performance reporting

Role	Responsibilities
Safety & Risk Manager	• Endorses the ESMP • Responsible for EEPGL Safety stewardship and performance reporting • Participation in risk assessments associated with the Project • Participation in development of the emergency response and oil spill response plan development
General Counsel	• Endorses the ESMP • Evaluates application and interpretation of relevant laws, regulations, and other legal frameworks • Advises on appropriate mechanisms to ensure compliance with legal requirements by the company
Wells Execution Manager	• Endorses the ESMP • Implements the operational requirements of the ESMP within the Wells organization. • Responsible for implementation of operations integrity requirements related to Wells. • Coordinates with Wells contractor community to enhance local content.
Public and Government Affairs (P&GA) Manager	• Endorses the ESMP • Jointly accountable with Operations Management for implementation of the Socioeconomic Management Plan within the ESMP • Provides technical support to operational staff for socioeconomic-related ESMP requirements • Coordinates interfaces with Government agencies and external stakeholders with regards to public and government affairs matters

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.

EEPGL and its contractors will provide SSHE training and awareness programs that include:

- Country/site-specific inductions for new personnel and visitors;
- General training covering broad SSHE roles and responsibilities for all personnel;
- Management training directed at management and supervisory level personnel;
- Operational training for operational and engineering personnel; and
- Project- and job-specific training specific to those with direct duties and roles in SSHE, commensurate with their level of responsibility.

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 2-5 provides a conceptual overview of roles and responsibilities for EEPGL's competency, training, and awareness program.

Table 2-5. Training Roles and Responsibilities

Position	Responsibilities
Management	• Endorse overall training processes and procedures • Verify competent and trained personnel are available to support Project activities
Site Supervision	• Ensure their personnel have the required knowledge and skills to perform job tasks • Review and approve training plans for their personnel • Provide time/resources required for their personnel to complete/maintain training • Review training progress for their personnel on an annual basis • Consult with management on actions to take when a person does not meet the requisite knowledge/skills after training has occurred
Personnel	• Complete training requirements • Provide feedback on training received
SSHE Personnel	• Provide SSHE training programs with support from training resources
Training Resources	• Provide SSHE training programs with support from SSHE personnel • Assist with delivery of training (where appropriate) and evaluate training results

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.

3.0 PROJECT-SPECIFIC AND COUNTRY-SPECIFIC MANAGEMENT PLANS

In accordance with the structure of the ESMP as described in Section 11.3 of the Payara 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.

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.

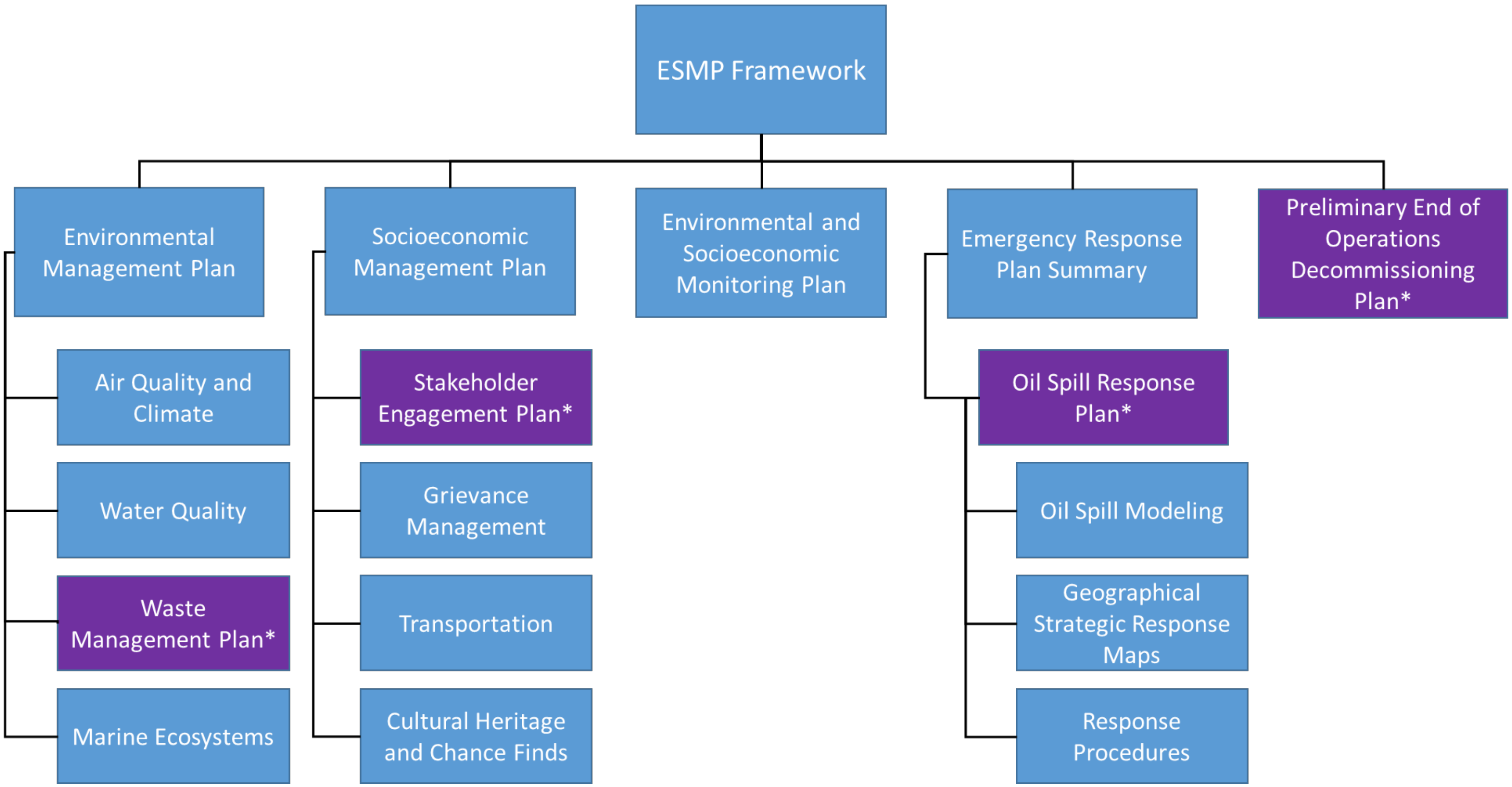
3.1.2.1 Air Quality and Climate Management

EEPGL will implement measures to manage potential impacts on air quality and climate as listed in Table 3-1.

3.1.2.2 Water Quality Management Measures

EEPGL will implement measures to manage potential impacts on marine water quality as listed in Table 3-2.

Figure 3-1. ESMP Structure



* Due to the fact that the applicability of these documents extends beyond the Project, these are stand-alone plans, and are provided as separate documents.

Table 3-1. 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, re-inject produced gas that is not used as fuel gas on the FPSO into the reservoir, to avoid routine flaring.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Implement a flare minimization plan.	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	Adopt highly efficient combustion equipment using 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: • Ensure flare equipment is properly inspected, well maintained, monitored, certified, and function-tested prior to and throughout operations; • Install the flare at a safe distance from storage tanks containing flammable liquids or vapors and accommodation units; • Ensure combustion equipment is designed and built to appropriate engineering codes and standards; • Do not operate the flare outside design operating ranges; • Use efficient flare tips and optimize the size and number of burning nozzles; • Minimize risk of pilot blowout by ensuring sufficient exit velocity and provision of wind guards; • Use a reliable pilot ignition system; • Install high-reliability instrument pressure protection systems, as appropriate, to reduce overpressure events and avoid or reduce flaring situations; • Operate the flare to control odor and visible smoke emissions; • Record volumes of hydrocarbons flared and submit a copy of the record to the EPA annually • Maximize efficiency of flaring through flare tip design to ensure correct ratio of fuel and air are present to support efficient combustion; • Implement burner maintenance and replacement programs to ensure continuous maximum flare efficiency; • Minimize liquid carryover and entrainment in the gas flare stream with a suitable liquid separation system, with sufficient holding capacity for	FPSO

Source of Impact	Receptor	Management Measure	Involved Facility
		liquids that may accumulate, and which is designed in accordance with good engineering practice; • 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; • Implement source gas reduction measures (i.e., gas re-injection into reservoir) to the extent possible to avoid or reduce flaring from FPSO; • 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; • Minimize flame lift off and/or flame lick.	
Emissions to Atmosphere	Air Quality and Climate	In the event of an emergency or equipment breakdown on the FPSO, or when facility upset conditions arise, excess gas should not be vented but rather should be sent to an efficient flare gas system, where practical and operationally safe.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Develop equipment strategies and execute a maintenance program to minimize equipment breakdowns and plant upsets which could result in flaring and make provisions for equipment sparing and plant turn-down protocols where practical.	FPSO
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. Two WHRUs provide sufficient heat for the entire FPSO, but the Project is designed to use WHRUs on three of the four turbine generators, which adds spare capacity to ensure achieving maximum uptime and reducing flaring.	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

Source of Impact	Receptor	Management Measure	Involved Facility
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	Install volatile organic compound (VOC) recovery on the FPSO cargo tanks, which results in a reduction in FPSO cargo tank emissions.	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[2] is performed, implement the following measures: • Flow only the minimum volume of hydrocarbons required for the test and reduce the test duration to the extent practical; • Use an efficient test flare burner head equipped with an appropriate combustion enhancement system to minimize incomplete combustion, black smoke, and hydrocarbon fallout3 to the sea; • Record volumes of hydrocarbons flared and make available to the EPA upon request; • Provide adequate gas sensors that are appropriately located during testing operations, to ensure all sources of gas can be detected; • 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; • 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	Drill Ships

[2] 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.
[3] Hydrocarbons that are deposited on the ocean surface due to both wet and dry deposition processes

Source of Impact	Receptor	Management Measure	Involved Facility
		• Provide sufficient compressed air to the oil burner for efficient flaring assignment.	
Emissions to Atmosphere	Air Quality and Climate	Regularly maintain equipment, marine vessels, vehicles, and helicopters and operate them in accordance with manufacturers' specifications 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	Regularly inspect and service shorebase cranes and construction equipment to reduce air emissions to the extent reasonably practicable.	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	Utilize low-sulfur fuels for major Project vessels.	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	Notify the EPA via email, correspondence and/or telephone within 24 hours after process upset events or unplanned maintenance occur which result in a flaring event on the FPSO sustaining a volume of at least 10 million standard cubic feet per day. Capture volumes from minor flaring events not requiring notification in aggregate in annual emissions reporting.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Avoid routine venting (excludes tank flashing emissions, standing/working/ breathing losses) except during safety and emergency conditions.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Maximize efficiency of flaring through flare tip design to ensure correct ratio of fuel and air are present to support efficient combustion.	FPSO
Emissions to Atmosphere	Air Quality and Climate	Operate incinerators in accordance with the manufacturers' operating manuals and Waste Management Plan. Ensure that incinerators are operated only by trained personnel.	Drill Ships

Table 3-2. Water Quality Management Measures

<table>
<tr><th>Source of Impact</th><th>Receptor</th><th>Management Measure</th><th>Involved Facility</th></tr>
<tr><td>Operational Discharges</td><td>Marine Water Quality</td><td>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.</td><td>FPSO</td></tr>
<tr><td>Operational Discharges</td><td>Marine Water Quality</td><td>Design cooling water discharges from FPSO to avoid increases in ambient water temperature of more than 3 degrees Celsius at 100 meters (approximately 328 feet) from discharge point.</td><td>FPSO</td></tr>
<tr><td>Operational Discharges</td><td>Marine Water Quality</td><td>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.</td><td>FPSO</td></tr>
<tr><td>Operational Discharges</td><td>Marine Water Quality</td><td>Implement chemical selection processes and principles that exhibit recognized industry safety, health, and environmental standards. Use low-hazard substances and consider the Offshore Chemical Notification Scheme as a resource for chemical selection in Project production operations. The chemical selection process is aligned with applicable Guyanese laws and regulations and includes;
Review of Safety Data Sheets;
Evaluation of alternate chemicals;
Consideration of hazard properties, while balancing operational effectiveness and meeting performance criteria, including:
Using the minimum effective dose of required chemicals; and
Minimum safety risk relative to flammability and volatility;
Risk evaluation of residual chemical releases into the environment.</td><td>Drill Ships, FPSO, Installation/ Decommissioning Vessels, Other Marine Vessels</td></tr>
<tr><td>Operational Discharges</td><td>Marine Water Quality</td><td>Adhere to operational controls regarding material storage, wash-downs, and drainage systems.</td><td>Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels</td></tr>
<tr><td>Wastewater Discharge to Sea</td><td>Marine Water Quality</td><td>Measure 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.</td><td>FPSO</td></tr>
</table>

Source of Impact	Receptor	Management Measure	Involved Facility
Wastewater Discharge to Sea	Marine Water Quality	Ensure wastewater released from the onboard sewage treatment plant complies with aquatic discharge standards in accordance with MARPOL 73/78 regulations.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Wastewater Discharge to Sea	Marine Water Quality	Treat bilge water in accordance with MARPOL to comply with an oil in water content of less than 15 parts per million as applicable.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Wastewater 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	Ensure there is no visible oil sheen from commissioning-related discharges (i.e., flowlines/risers commissioning fluids, including hydrotesting waters) or FPSO cooling water discharge.	All Marine Vessels, SURF, FPSO
Drilling and Operational Discharges	Marine Water Quality	Ensure all vessel wastewater discharges (e.g., storage displacement water, ballast water, bilge water, deck drainage) comply with International Maritime Organization (IMO)/MARPOL 73/78 requirements.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels

Source of Impact	Receptor	Management Measure	Involved Facility
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' guidelines, in order to maximize efficiency and minimize malfunctions, and unnecessary discharges into the environment.	Drill Ships, FPSO, Installation/ Decommissioning Vessels, Other Marine Vessels
Hydrocarbon Spills	Marine Water Quality	Use a certified marine-bonded, double-carcass floating hose system that complies with the recommendations of Oil Companies International Marine Forum Guide to Manufacturing and Purchasing Hoses for Offshore Moorings 2009 Edition or later.	FPSO
Hydrocarbon Spills	Marine Water Quality	With respect to prevention of spills of hydrocarbons and chemicals during the drilling stage: • Change liquid hydrocarbon transfer hoses periodically; • Use dry-break connections on liquid hydrocarbon bulk transfer hoses; • Use a liquid hydrocarbon checklist before every bulk transfer; • Perform required inspections and testing of all equipment prior to deployment/installation; • Use overbalanced drilling fluids to control wells while drilling; • Perform operational training certification (including well-control training) for drill ship supervisors and engineers; • Regularly audit field operations on the drill ships to ensure application of designed safeguards	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

Source of Impact	Receptor	Management Measure	Involved Facility
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	Ensure FPSO offloading to tankers occurs within an environmental operating limit that is established to ensure 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 international offshore petroleum industry standards.	Drill ships
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: • Regularly (e.g., monthly) check pipes, storage tanks, and other equipment associated with storage or transfer of hydrocarbons/chemicals for leaks. • Regularly inspect and service shorebase cranes and construction equipment to mitigate the potential for spills to the extent reasonably practicable.	Shorebases
Hydrocarbon Spills	Marine Water Quality	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.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels, Shorebases

Source of Impact	Receptor	Management Measure	Involved Facility
Hydrocarbon Spills	Marine Water Quality	Implement the OSRP in the unlikely event of an oil spill, including: • Conducting air quality monitoring during emergency response; • Requiring use of appropriate Personal Protective Equipment by response workers; and • Implementing a Wildlife Oil Response Program, as needed.	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. The EEPGL Waste Management Plan (WMP) is provided as a stand-alone document separate from this ESMP. The WMP governs waste management associated with EEPGL's development drilling, installation, commissioning, production, and decommissioning activities in Guyana—inclusive of the Liza Phase 1, Liza Phase 2, and Payara projects.

3.1.2.4 *Marine Ecosystems*

EEPGL will implement measures to manage potential impacts on marine ecosystems as listed in Table 3-3.

In addition to the measures listed in Table 3-3, most if not all of the water quality management measures listed in Table 3-2 and several of the waste management measures listed in the WMP 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 3-3. 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	• 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. • Provide standing instruction to Project-dedicated vessel masters to avoid any identified rafting seabirds when transiting to and from PDA.	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Collision Between Vessels and Marine Species	Marine Mammals, Marine Turtles	• 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).	Drill Ships, FPSO, Installation / Decommissioning Vessels, Other Marine Vessels
Auditory Impacts on Marine Species	Marine Mammals, Marine Turtles, Marine Fish	• During pile-driving activities, gradually increase the intensity of hammer energy to allow sensitive marine organisms to vacate the area before injury occurs (i.e., soft starts). Gradually increase intensity of seismic impulses and hammer energy (during pile driving) to allow sensitive species to vacate area before injury occurs (i.e., soft starts) in accordance with Joint Nature Conservation Committee guidelines (JNCC 2017). • 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. • 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).	Drill Ships, FPSO, Installation/ Decommissioning Vessels, Other Marine Vessels

Source of Impact	Receptor	Management Measure	Involved Facility
		• Adhere to the JNCC Guidelines (2017) during the conduct of seismic-related activities. • Where reasonably practicable, ensure that sound-making devices or equipment are equipped with silencers or mufflers and 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. Ensure lighting on vessels adheres to maritime safety regulations/standards.	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, and Payara 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. <u>Complaint</u>—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. <u>Concern</u>—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. <u>Issue</u>—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. <u>Request</u>—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. <u>Guidance</u>—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:

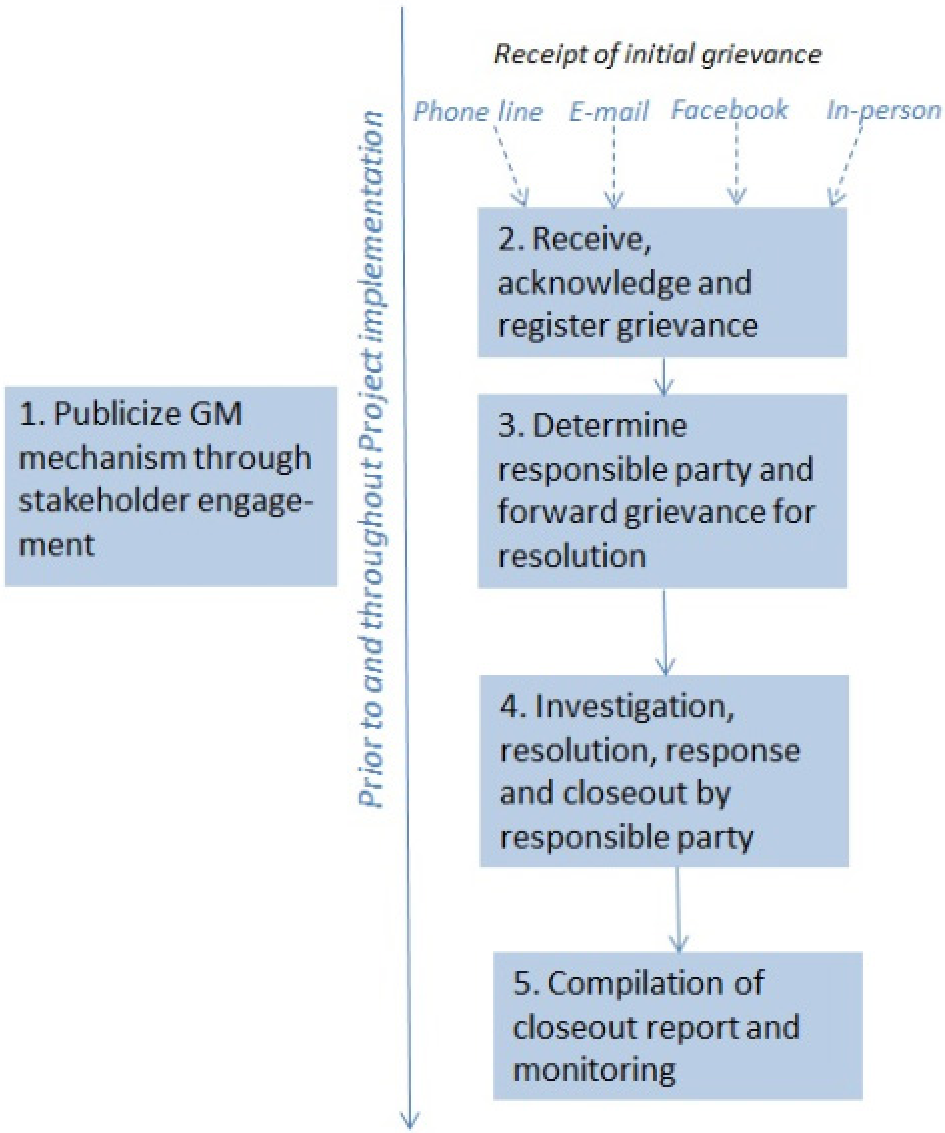
- Type of grievance—issue, concern, compliant (e.g., property damage, work conditions, noise, traffic);
- Brief description of grievance;
- Status of grievance (registered, assessed, under investigation, in resolution, closed);
- Date grievance was received; and
- Date the incident occurred, if applicable.

The CGM procedure is depicted in Figure 3-2. As shown on Figure 3-2, 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;
2. Via EEPGL telephone— (592) 231 2866
3. Via EEPGL email—Guyanastaff@exxonmobil.com
4. Via ExxonMobil Guyana Facebook—https://www.facebook.com/exxonmobilguyana
5. Via EEPGL website—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.

Figure 3-2. EEPGL's Five-Step Grievance Management Procedure



GM = grievance mechanism

Receipt, registration, prioritization, and resolution of grievances using the CGM should adhere to the following guidelines:

a. 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.

b. Details should be compiled, electronically if possible, and registers of chain of custody and communication must be established.

c. 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.

d. 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.

e. Where necessary/relevant, an interview with the grievant could be helpful to obtain further details.

f. Specified timeframes should be established for confirming receipt of the grievance, completing the investigation, and providing a resolution.

g. 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 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 3-4.

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 3-5.

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 3-6.

3.2.2.6 Cultural Heritage Management and Chance Finds

Cultural Heritage Management Plan

EEPGL will implement a Cultural Heritage Management Plan aligned with international best practice and the National Trust of Guyana's "Guidelines for the protection of Monuments and Sites"[4] 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.

[4] Guyana National Trust. "Guidelines for the Protection of Monuments and Sites." Revised 2017.

Table 3-4. 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[5]
Project Procurement	Guyanese Population	Procure Project goods and services locally 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, ensure they are manifested and safely transferred 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

[5] "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
Waste Generation	Waste Management	To address future waste capacity constraints in Georgetown relative to Project's predicted waste management needs: • Continue to enable increases to existing local waste management capacity for hazardous wastes, and explore use of new local hazardous waste treatment facility or facilities, or identify suitable alternative solutions; • Issue a Request for Information (completed in October 2019) followed by the issuance of an Invitation to Tender to provide additional third-party commercial waste management facilities and services in Guyana, with the award planned for 1Q2020. These may include a thermal desorption unit, incinerators, wastewater treatment plant, waste skips, containers, and trucks, among others needed to manage and treat hazardous and non-hazardous waste liquids, solids, and semi-solids; and • Continue to monitor the Ministry of Communities' construction of Cell 2 at the Haags Bosch landfill, which is expected to be completed and operational in the first half of 2020, and/or (if approved by the EPA) construction of additional landfill sites in Georgetown, or identify suitable alternative (interim) local solutions for non-hazardous waste management.	Waste management contractors
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. Ensure CGM is well publicized and understood by the public.	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

NA = not applicable

Table 3-5. Marine Transportation Management Measures

Source of Impact	Receptor	Management Measure	Involved Facility
Marine Casualty Event (Collision)	Non-Project Marine Vessels	• Use a Class 3 Dynamic Positioning (DP) system, which includes numerous redundancies. • Ensure rigorous personnel qualifications and training. • Use sea trials and acceptance criteria. • Implement DP proving trials. • Conduct a System Failure Mode and Effects Analysis. • Conduct a DP failure consequence analysis. • Establish well-specific operations guidelines.	Drill Ships
Marine Casualty Event (Collision)	Non-Project Marine Vessels	• 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. Use only properly registered and well-maintained double-hull vessels. • Utilize support tugs to aid tankers in maintaining station during approach/ departure from FPSO and during offloading operations. • Use a hawser with a quick release mechanism to moor the FPSO to the tanker at a safe separation distance during offloading operations.	FPSO, Offloading Tankers
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	• 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. • Issue Notices to Mariners via the Maritime Administration Department, 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. • 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. • Equip Project vessels with radar systems and communication mechanisms to communicate with third-party mariners.	Shorebases, FPSO, Drill Ships, Installation / Decommissioning Vessels, Other Support Vessels

Source of Impact	Receptor	Management Measure	Involved Facility
		• 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. • Implement a SEP that includes a CGM process for stakeholders, including local fishing interests.	

Table 3-6. 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	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: • Definition of typical, primary travel routes for ground transportation in Georgetown area; • Development of an onshore logistics/journey management plan to reduce potential conflicts with local road traffic when transporting goods to/from onshore support facilities; • 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;	

Source of Impact	Receptor	Management Measure	Involved Facility
		• Designation and enforcement of speed limits through speed governors, global positioning system, or other monitoring systems for Project-dedicated vehicles; • Avoidance of deliveries during typical peak-traffic hours as well as scheduled openings of the Demerara Harbour Bridge, to the extent reasonably practicable; • Monitoring and management of driver fatigue; • Definition of vehicle inspection and maintenance protocols that include all applicable safety equipment for Project-dedicated vehicles; and • Community outreach to communicate information relating to major delivery events or periods.	

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.

All 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 3-3. The CHS will determine if the potential chance find is cultural heritage and, if so, assign it to a chance finds tier. Figure 3-4 provides a detailed flow diagram of the Chance Find Procedure. All chance finds will follow the two-tiered hierarchy that is presented in Table 3-7.

Figure 3-3. Chance Find Reporting From

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 3-4. Chance Find Procedure Flow Chart

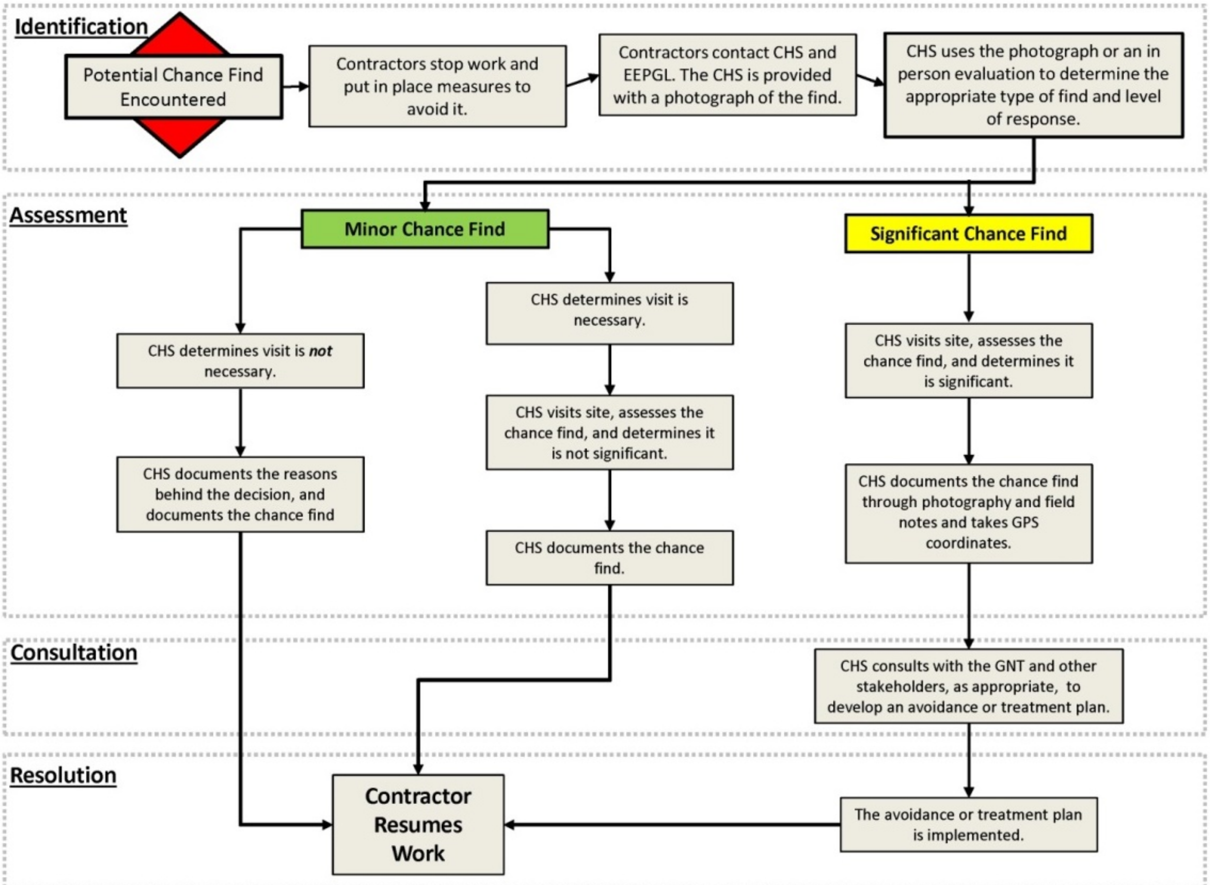


Table 3-7. Two-tiered Chance Find Hierarchy

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)

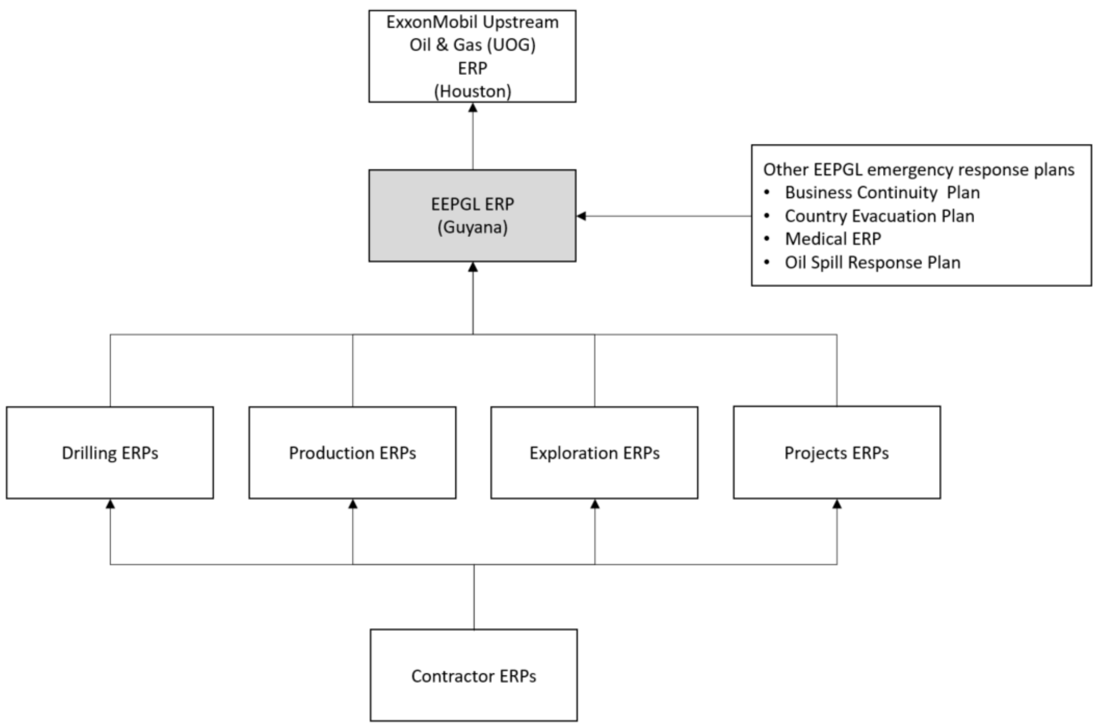
Where contractors or subcontractors serve as the dominant on-site organization at a worksite or for an activity, they are required to develop site specific ERPs, which are bridged into the EEPGL ERP.

Figure 3-5 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 3-5. Hierarchy of Emergency Response Plans



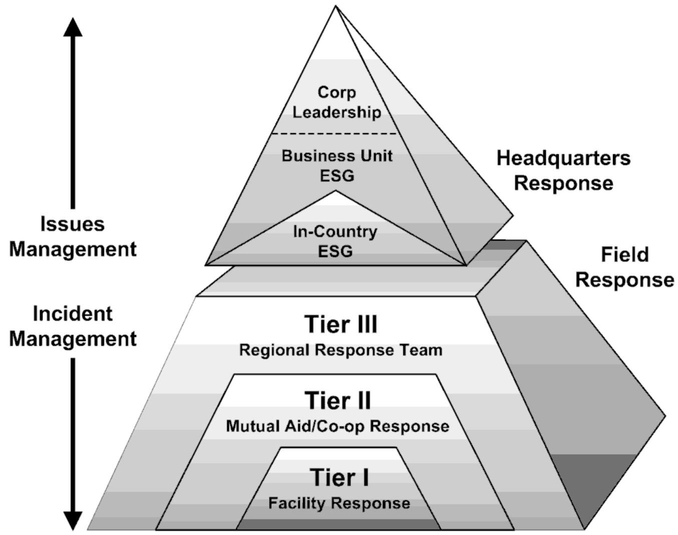
3.3.2 Document Ownership and Administration

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 3-6.

Figure 3-6. 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 3-8.

Table 3-8. 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 EPRs.

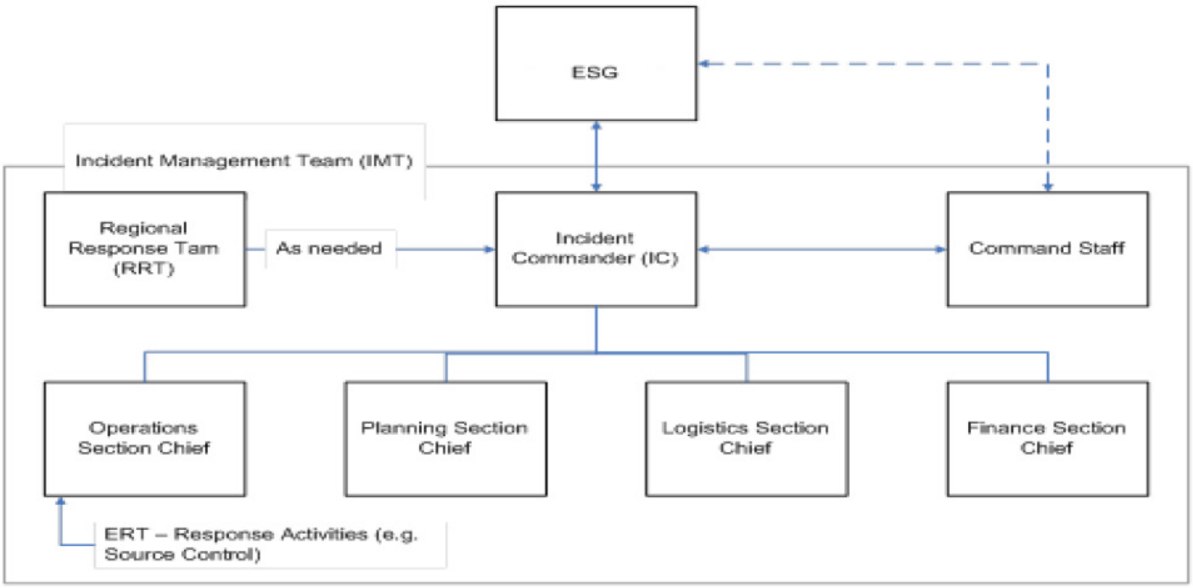
3.3.5.2 *Incident Management Team*

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 3-7 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 3-7. 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.
    1. Operations Section Chief is responsible for the management of response to the incident. The Operations Section Chief provides guidance to the Site ERT.
    2. Planning Section Chief is responsible for the collection, evaluation, and dissemination of response information and maintaining status of assigned resources.
    3. Finance Section Chief is responsible for all financial and cost analysis aspects.
    4. 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.

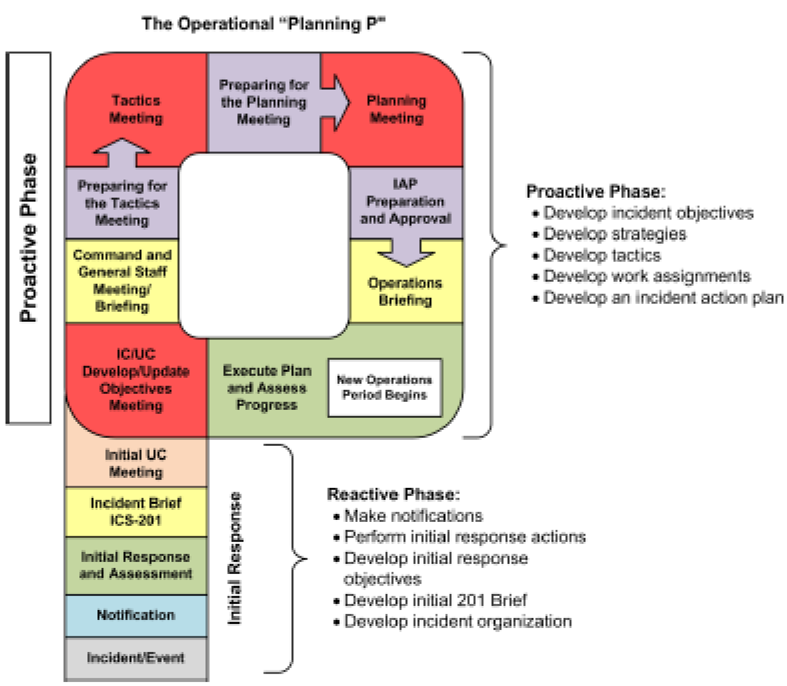
EEPGL maintains an evergreen list of the EEPGL IMT members with backups, all of which are trained in ICS. The ICS utilizes a proven, standardized process and suite of tools to manage an emergency event. Standardization allows for efficient and effective interfaces between multiple organizations/personnel 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 3-8.

Figure 3-8. 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.

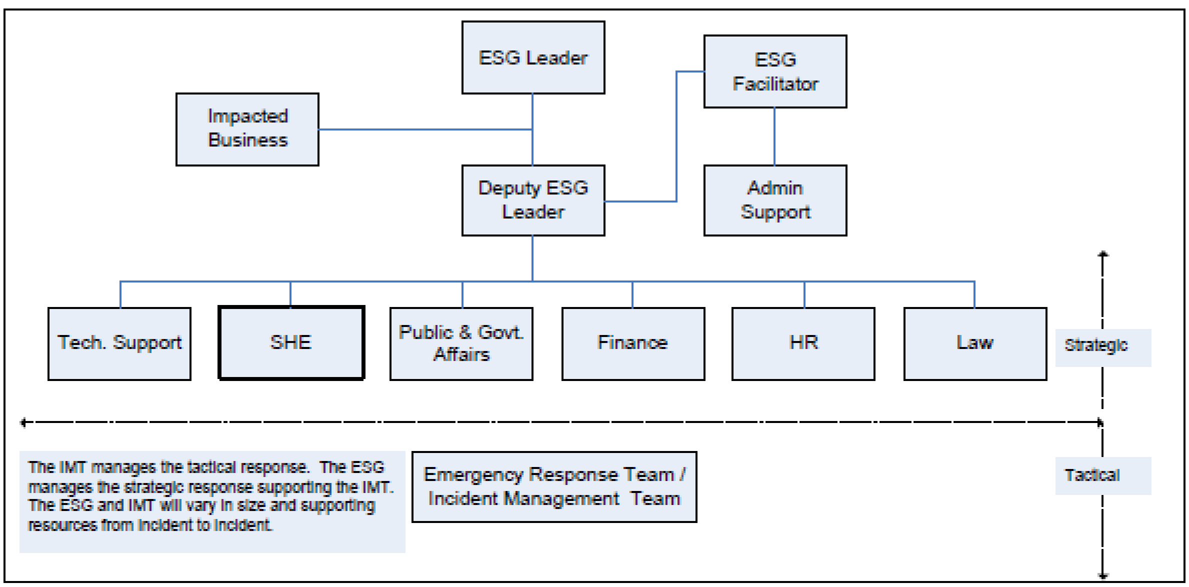
ESG organizations are located in Georgetown (Guyana) and Houston (United States). The Georgetown-based ESG is managed by the EEPGL in-country management team, while the Houston-based ESG is managed by the ExxonMobil UOG management team.

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 3-9 illustrates EEPGL ESG organizational structure, which is consistent with the UOG ESG. Positions are assigned as needed to match strategic support requirements.

Figure 3-9. 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, and Payara 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 3-9 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 3-9 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.

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Table 3-9. Environmental and Socioeconomic Monitoring Measures

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
Various Receptors						
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
Air Quality and Climate						
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_2] 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_2-equivalents that would be generated through combustion. This method is consistent with industry standard practices. 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_2 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.	GHG emissions will be calculated annually for the previous year.	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. a.) 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. b.) 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. 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.

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
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.
Combustion Emissions	Keep records of non-routine flaring of produced 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.	Continuous	EEPGL	Total amount of gas flared, composition 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.
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
Water Quality						
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 industry standard procedures. 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.

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
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.
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	Thermal dynamic modeling of cooling water discharge and produced water discharge has been completed. Modeling results depict that as long as temperature of cooling water discharge or produced water discharge does not exceed 50°C, ambient water temperature will not rise by more than 3°C at 100 meters. Temperature transmitter on cooling water system and produced water system upstream of discharge point will provide an instantaneous measurement.	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 an industry standard method 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.

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
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 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 mg/L 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.
Waste						
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.

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
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.
Waste	Conduct waste facility audits and inspections periodically.	Waste Management Facility	Inspections of contractor onshore waste management facility will occur periodically, at least annually. Comprehensive audits will be performed at a minimum of every 3 years with more frequent audits performed based on performance. Waste facility audits will be documented and made available upon request.	Annually	EEPGL	Inspections and audits will be documented and kept on file and provided upon request.
Marine Ecosystems						
Marine Mammals, Riverine Mammals, and Marine Turtles	Monitor on an ongoing basis visual detections of Marine Mammals, Riverine Mammals, and Marine Turtles	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.
Socioeconomic Receptors						
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 Department of Energy.
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 Department of Energy.
Various	Monitor frequency of engagement with stakeholders, including fisherfolk, coastal communities, vulnerable groups, and Indigenous populations.	NA	Use EEPGL's stakeholder engagement database and update SEP at various stages of each major project or EEPGL activity.	Continuously	EEPGL	None
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

Source of Potential Impact	Activity	Involved Facilities	How Monitoring is Performed	Frequency of Monitoring	Responsible Party	Reporting
Various	Monitor average time for 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
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
Vehicle and Vessel Traffic						
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 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.

Reporting is summarized in Table 3-10.

Table 3-10. Summary of Reporting

Reporting Requirement	Description
Project SSHE Status Report	EEPGL will provide a high-level Project SSHE Status Report on a semi-annual basis that includes a summary of the Project activities completed during the period, key SSHE-related performance metrics, and highlights of SSHE accomplishments, improvement initiatives, and lessons learned. The content and structure of the Project SSHE Status Report will be developed in collaboration with the EPA.
Monthly Reports	Monthly Shared Environmental Logistics Report: Helicopter and Marine Vessel Fuel Consumption and Effluent Discharge Summary
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	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: • Air emissions (including GHGs); • Waste types/volumes, disposal methods/locations; • Discharges types/volumes (e.g., wastewater, drill cuttings/fluids, etc.); • Fuel consumption; • Marine species observations; • Spills (e.g., hydrocarbons, chemicals) and non-compliances that may have occurred.
Emergency/incident notification and reporting	All environmental incidents and excursions will be appropriately documented and reported to the relevant authorities, in line with regulations.
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.

4.0 REFERENCES

EPA (Guyana Environmental Protection Agency). 2000. Integrated Coastal Zone Management Action Plan. Accessed: 14 February 2018. Retrieved from: http://www.mangrovesgy.org/home/images/stories/Documents/ICZM%20Action%20Plan.pdf

JNCC (Joint Nature Conservation Committee). 2017. JNCC Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys. Accessed: May 2018. Retrieved from: http://jncc.defra.gov.uk/pdf/jncc_guidelines_seismicsurvey_aug2017.pdf

Esso Exploration and Production Guyana Limited
Waste Management Plan for Guyana Development Projects

July 2020

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Acronyms and Abbreviations

Name	Description
EEPGL	Esso Exploration and Production Guyana Limited
EPA	Guyana Environmental Protection Agency
ESMP	Environmental and Socioeconomic Management Plan
FPSO	floating production, storage, and offloading (vessel)
HW	hazardous waste
MARPOL	International Convention for the Prevention of Pollution by Ships, 1973, as modified by the Protocol of 1978
PPE	personal protective equipment
SDS	safety data sheet
SURF	subsea, umbilicals, risers, and flowlines
WMP	Waste Management Plan

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1 INTRODUCTION

The objective of this Waste Management Plan (WMP) is to govern waste management associated with Esso Exploration and Production Guyana Limited's (EEPGL's) development drilling, installation, commissioning, production, and decommissioning activities in Guyana (collectively "Projects")—inclusive of the Liza Phase 1, Liza Phase 2, and Payara projects—in a manner that meets regulatory requirements and manages impacts on the surrounding environment. This WMP has been prepared in conjunction with the Environmental and Socioeconomic Management Plans (ESMPs) developed for use in executing EEPGL's approved and proposed development projects and outlines EEPGL's approach for the proper handling, storage, and disposal of hazardous and non-hazardous wastes. It is an evergreen document and will be updated as needed (i.e., as additional projects are proposed).

This document:

- Defines and categorizes the different types of waste that may be generated by offshore development and production activities;
- Specifies and documents the management and disposal practices that apply to each category of waste; and
- Specifies and documents the monitoring and reporting guidelines that apply to each category of waste.

This WMP is applicable to the management of wastes generated during all development project phases, including development well drilling; subsea, umbilicals, risers, and flowlines (SURF) and floating production, storage, and offloading (FPSO) vessel installation; FPSO commissioning, production operations, and decommissioning. Descriptions of the individual development projects covered under this WMP and estimated annual waste quantities are included in Attachment A. The scope of this document covers waste management procedures and practices from the points of generation—both offshore and onshore - through storage, treatment, transportation, recycling, re-use, and disposal. Planned discharges (e.g., produced water, cooling water) are managed under the ESMP and under individual vessel-specific Garbage Management Plans, and are therefore outside the scope of this document. Other non-effluent wastes that cannot be managed offshore at the point of generation will be transported to onshore waste management facilities operated by qualified permitted third-party waste management service providers for further segregation, consolidation, treatment, transportation and/or disposal to the final approved recycling, reuse, or disposal facilities.

2 SCOPE AND OBJECTIVES

The scope of the WMP includes the following:

- Identifying the sources and processes that generate recoverable materials and wastes;
- Identifying opportunities to avoid waste generation and minimize both the quantities and associated hazards of waste generated;
- Identifying those recoverable materials eligible for recycling, reclaiming, and reuse;
- Identifying the hazards associated with each waste type;
- Estimating the annual quantities for each recoverable material and expected waste type over the various Project stages;
- Selecting approved containers and ensuring proper segregation of materials and wastes;
- Identifying preferred management, storage, treatment, and disposal methods for wastes;
- Identifying and assessing acceptable waste management facilities;
- Identifying and assessing acceptable waste management service providers for transporting recoverable materials received at the shorebases from points of origin such as the FPSOs; drill ships; and installation, supply, and support vessels that cannot be managed offshore to the final recycling, reclaiming, handling, storage, treatment, and disposal facilities approved by EEPGL;
- Providing the process knowledge and Safety Data Sheets (SDSs) to ensure safe handling of materials and wastes - to reduce the risk of worker exposure or a release to the environment, including personal protective equipment (PPE).
- Ensuring proper reporting and recordkeeping is performed through the utilization of multiple logbooks and records to document the generation, storage, transportation, and final disposition of recoverable materials and wastes, including an annual waste summary report and incorporation of waste summary information in end-of-activity reports (i.e. End of Well, End of Survey, or End of Stage Reports).

The objectives of this WMP are as follows:

- Verify EEPGL manages the recoverable materials and wastes generated in accordance with internationally accepted standards and applicable local (i.e., Guyana) regulations;
- Verify contractors, including drill ship; FPSO; and installation, supply, and support vessel contractors, manage their recoverable materials and waste in accordance with their individual vessel-specific Garbage Management Plans, internationally accepted standards, and applicable Guyanese laws and waste regulations.
- Provide practical methods for handling, storing, transporting, recycling, and disposing of wastes, with prioritization on waste avoidance and reduction.

3 EEPGL ROLES AND RESPONSIBILITIES

EEPGL is the Owner of this WMP and is responsible for its implementation, maintenance, and periodic update as necessary.

EEPGL's obligations include:

- Verify drilling, installation, hook-up & commissioning, production operations, and decommissioning conform to the requirements of this WMP;
- Ensure recoverable materials and wastes are properly characterized and profiled based on process knowledge and the sampling and analysis of hazardous wastes as required per the WMP;
- Perform routine inspections and periodic self-assessments to verify compliance with applicable regulations;
- Identify qualified third-party waste service providers capability of the storage, transportation, treatment, recycling, reuse, and disposal of wastes;
- Perform periodic audits/assessments of third-party waste service providers utilized by EEPGL to verify they are properly permitted and have similar processes and procedures in place in their own individual WMPs;
- Verify that vessel owners and operators supporting EEPGL properly track and manage waste from the point of generation offshore through storage, treatment, reuse, and, if needed, transportation to shore for further handling.
- Confirm chain of custody and manifest records are kept, documenting the subsequent transfer of recoverable materials and wastes at the shorebase to the third-party waste service providers who will perform the final transport, storage, segregation, consolidation, recycle, reuse, treatment, and disposal of materials and wastes in accordance with their WMPs; and
- Verify that Contractors managing waste on behalf of EEPGL have in place programs for keeping recoverable materials and waste records; and required annual reports are prepared, reviewed, and submitted to the Guyana Environmental Protection Agency (EPA) as required, and copies are retained by EEPGL for its records, as related to waste generated from EEPGL activities.

3.1 EEPGL SPECIFIC RESPONSIBILITIES

In accordance with its specific responsibilities as relates to this WMP, EEPGL:

- Will promote sufficient resourcing (e.g., people, time, expertise and finances) to manage and monitor waste issues, including oversight of FPSOs', drill ships', EEPGL-supporting vessels' and waste service providers' contractual obligations relevant to waste management;
- Will confirm that the WMP is implemented, maintained, and periodically reviewed and updated as needed;
- Will identify the permits required and support timely applications to the appropriate authorities;
- Will require that permits/licenses are in place prior to carrying out applicable work;
- Will keep relevant third parties informed as the projects progress;
- Will inform EEPGL Management Team of waste management issues;
- Will write procedures for area-specific issues;
- Will aid in the alignment, implementation and oversight of WMP-specified duties associated with activities where waste is generated (e.g., drill ships; FPSOs; installation, supply, and support vessels); onshore logistics; and waste service providers;
- Will monitor third parties used for the offshore and onshore transport of recoverable materials and disposal of wastes;
- Will review the WMP procedures developed by contractors and subcontractors;
- Will undertake and carry out internal audits on waste management in line with the program of audits agreed upon by EEGPL and ensure remedial actions are closed out;
- Will monitor that contractors maintain necessary permits associated with their waste management activities;
- Will monitor that waste management contractors maintain proper documentation in accordance with requirements for generation, transportation, and disposal of wastes;
- Will promote with waste management contractors the maintenance of proper documentation in accordance with contractual obligations for generation, transportation, and disposal of wastes;
- Will provide waste-related input to WMP procedures;
- Will control hierarchical waste management approach integral to the EEPGL waste management strategy; and
- Will confirm that waste records are maintained for review.

3.2 MARINE VESSEL OWNER/OPERATOR-SPECIFIC RESPONSIBILITIES (SUPPLY, SUPPORT, AND INSTALLATION VESSELS; DRILL SHIPS; AND FPSOs)

In accordance with their specific responsibilities as relates to this WMP, marine vessel owner/operators:

- Will ensure that the correct equipment and containers are on site/vessel, as required;
- Will ensure that equipment and recoverable material/waste storage areas are well maintained and inspected;
- Will be responsible for the completion and maintenance of waste manifests as they are progressed through the chain of custody process;
- Will carry out inspections as necessary to ensure any waste issues are identified and managed accordingly. This includes ensuring wastes are correctly segregated;
- Will carry out or supervise waste monitoring ensuring that waste records are fully completed and correctly stored and filed. This includes ensuring waste is manifested separate from cargo with details recorded as to type of waste, volume of waste, characteristics of waste, and final destination.
- Will ensure required labels and placards are in use and are correct. This will need to be coordinated with the waste contractors;
- Will have designated personnel to coordinate with shorebase operators;
- Will maintain an up-to-date recoverable material/waste inventory;
- Will maintain and inspect recoverable material/waste storage areas;
- Will ensure remedial actions identified by monitoring and inspections offshore and/or at the shorebases are closed out;
- Will keep copies of necessary permits associated with waste management activities; and
- Will notify EEPGL Logistics Representative of recoverable materials/wastes to be transported to shore.

3.3 WASTE SERVICE PROVIDER-SPECIFIC RESPONSIBILITIES

In accordance with their specific responsibilities as relates to this WMP, waste service providers:

- Will spot-check and inspect loads (e.g., bags, containers, skips, totes, and tanks) to verify they conform to the paperwork, bill of ladings, and trip tickets prepared by the generator of the recoverable materials and wastes for transport to the shorebase;
- Will ensure loads are properly labeled by the generator and identify the hazards of such materials and wastes;
- Will oversee the safe offloading and transfer of recoverable materials and waste to vehicles for final transport, storage, recycling, recovery, treatment, or disposal;
- Will ensure that any transfers are recorded;
- Will manage the completion of manifests and other documents to record the final disposition of materials and wastes, with copies to EEPGL and regulatory authorities, and will maintain the original records as required;
- Will perform periodic self-assessments of waste management activities;
- Will provide guidance, training, and local capacity building on waste management issues, as requested by EEPGL;
- Will ensure waste transport vehicles are thoroughly inspected and placarded before they leave the shorebases or other EEPGL project locations for disposal facilities;
- Will supervise waste transfer operations to ensure they are correctly implemented;
- Will provide a point of contact to the EEPGL Logistics Supervisor; and
- Will ensure proper inspection, maintenance, and use of its equipment.

Supplementing the detailed responsibilities above, Table 1 summarizes the overall roles in the waste management process.

Table 1: Summary Roles—Waste Management

Task	Waste Service Providers	Operators*	EEPGL
Implement WMP	R	R	A
Designate waste storage areas	R/A	R/A	C
Minimize waste	R/A	R/A	C
Correctly use equipment and containers on site; ensure wastes are correctly segregated; required labels and placards are used	R/A	R/A	C
Designate personnel to coordinate with shorebase operators and waste contractor	I	R/A	C
Properly use required waste transfer and disposal forms	R	R	A
Keep up to date with waste laws and requirements	R/A	I	R/A
Maintain waste inventory	R	I	A
Document date waste is removed from site	R	A	I
Coordinate contractor procedures	I	R	R/A
Provide periodic waste training	R	R	A
Assess waste facilities and service providers	I	I	R/A

Responsible (R), Accountable (A), Consulted (C), Informed (I)
* Includes operators of FPSOs, Drill Ships, Marine Vessels, and prime Contractors supporting the offshore development drilling activities, construction, installation, and commissioning of offshore facilities

4 REGULATORY REQUIREMENTS AND GUIDELINES

This document supports the ESMPs prepared for EEPGL's development projects. The WMP has been developed to comply with the requirements of the laws of Guyana, applicable international conventions, and local guidelines, including:

- Environmental Protection Act of 1996;
- Regulations made under the Environmental Protection Act 1996 (No. 11 of 1996) of 2000;
- Environmental Guidelines for the Transportation, Storage and Occupational Handling of Chemical/Industrial Hazardous Waste of 2011 (as appropriate);
- Environmental Guidelines for Removal, Treatment & Disposal of Oily Sludge of 2011 (as applicable) (as appropriate);
- Environmental Guidelines for the Storage, Transportation & Occupational Handling of Biomedical Waste of 2011 (as appropriate and as applicable to medical waste that may be generated);
- MARPOL 73/78—International Convention for the Prevention of Pollution from Ships, Revised Annex V, Ship Garbage Management Plans and Record Books;
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (if applicable, no such shipments are currently planned); and

Further details on these laws and conventions are contained in the following sections.

4.1 LOCAL REGULATORY REQUIREMENTS AND WASTE DEFINITIONS

This WMP deals with recoverable materials and wastes that will be generated from the drilling, installation, hook-up and commissioning, production, and decommissioning activities for EEPGL's development projects. Limited recoverable materials and wastes will also be generated by support operations conducted at the shorebases, offices, and warehouses utilized to support offshore operations, and this WMP applies to those support operations as well.

The definition of a hazardous waste per the Guyana Hazardous Waste Regulation, 2000 Part I, 2(e) is:

> "A 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 unless they do not contain any of characteristics contained in Schedule II and includes waste that is:

(i) Hazardous industrial waste;

(ii) Acute hazardous waste chemical;

(iii) Hazardous waste chemical;

(iv) Severely toxic waste;

(v) Flammable waste;

(vi) Corrosive waste;

(vii) Reactive waste;

(viii) Radioactive waste;

(ix) Clinical waste; or

(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."

Further descriptions of such wastes can be found in Schedule I of this regulation.

- A "liquid industrial waste" means a waste that is both liquid and industrial waste but does not include:

  (i) Hauled sewage;

  (ii) Waste from the operation of sewage works;

  (iii) Waste from the operation of water works;

  (iv) Waste that is produced in any month in an amount less than twenty-five litres or otherwise accumulated in an amount less than twenty-five litres;

  (v) Waste directly discharged by a generator from a waste generation facility into a sewage works or sewage system;

  (vi) Waste that results directly from food processing and preparation operations, including food packaging, food preserving and restaurants;

  (vii) Drilling fluids and produced waters associated with the exploration or production of crude oil or natural gas;

  (viii) Processed organic waste; or

  (ix) Asbestos waste.

- A "clinical waste" means:
  - (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;
  - (ii) Any part of the carcass of an animal infected with a communicable disease;
  - (iii) Non-anatomical waste infected with communicable disease; or
  - (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;
- A "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; and
- An "incinerator waste" means the residue from incineration, other than incinerator ash and fly-ash.

Additional regulations and guidelines govern specific wastes, including chemical, industrial, and biomedical wastes. EEPGL and its contractors may generate, as a result of offshore clinic operations and associated medical treatment, small quantities of sharps or other biological material or biomedical waste (also referred to as "Red Bag Waste" due to the color of the containers used and special labeling to denote such a potential biohazard). Such wastes could be incinerated offshore or brought to shore for proper treatment and disposal per the Guyana biomedical waste guidelines.

As noted above, sewage and other planned discharges are excluded from these chemical/industrial hazardous waste guidelines. Planned discharges from EEPGL offshore operations have been described in and will be managed under the ESMPs for EEGPL's development projects and under individual vessel-specific Garbage Management Plans.

4.2 NATIONAL ENVIRONMENTAL LEGISLATION

In 1996, the Environmental Protection Act (hereinafter referred to as the Act) was enacted to implement the environmental provisions of the Guyana Constitution. The Act authorized the formation of the EPA as the lead agency on environmental matters in Guyana (FAO, 2013).

Environmental compliance of EEPGL's development projects will be regulated under several statutes. These statutes contain measures that must be implemented to ensure compliance with applicable policies, guidelines, and legislation in Guyana. They include the Maritime Zone Act of 2010 No 18: 2010 and the Act of 1996 (as amended in 2005).

4.3 GUYANA PERMITS AND LICENSES

EEPGL's development projects will be governed under the provisions of the Petroleum Sharing Contract, Joint Operating Agreement, Liza Production License for the Stabroek Block, and Environmental Authorisations that have been issued by the EPA upon review and approval of the project-specific environmental impact assessments and supporting plans, including this WMP. These documents may contain general and specific waste management commitments, obligations, and conditions. The WMP will be updated as needed upon issuance of the project-specific Environmental Authorisations to reflect any additional requirements contained in those documents.

4.4 INTERNATIONAL CONVENTIONS

4.4.1 MARPOL 73/78

EEPGL will operate its offshore activities consistent with the provisions of the MARPOL 73/78 Convention.

The MARPOL 73/78 Convention ("the Convention") places restraints on the contamination of the sea, land, and air by ships. The Convention includes two protocols dealing with reports on incidents involving harmful substances and arbitration, and six annexes that contain regulations for the prevention of various forms of pollution. Table 2 provides short descriptions of each Convention annex.

Table 2: MARPOL 73/78 Annexes[1]

MARPOL Annex	Description
Annex I: Regulations for the Prevention of Pollution by Oil	Prevention of pollution by oil from operational measures as well as from accidental releases.
Annex II: Control of Pollution by Noxious Substances	Details the criteria and measures for the control of pollution by noxious liquid substances carried in bulk.
Annex III: Prevention of Pollution by harmful Substances Carried by Sea in Packaged Form	Contains general requirements for the issuing of detailed standards on packing, marking, labelling, documentation, stowage, quantity limitation, exception, and notifications.
Annex IV: Prevention of Pollution by Sewage from Ships	Requirements to control pollution of the sea by sewage and grey water.
Annex V: Prevention of Pollution by Garbage from Ships	Deals with different types of garbage and specifies the distances from land and the manner in which they may be disposed of.
Annex VI: Prevention of Air Pollution from Ships	Sets limits on certain air pollutants and prohibits deliberate emissions of ozone depleting substances.

[1] International Maritime Organization (IMO). (2015). International Convention for the Prevention of Pollution of Ships (MARPOL). Accessed 9 December 2015 at http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx.

Where offshore vessels are equipped with incinerators, solid combustible waste (except for food waste) suitable for incineration will be managed on the drill ships and FPSOs as the first preference - where offshore incineration is an option; the remainder will be stored on board and sent back to shore for treatment or disposal in accordance with local regulations. Food waste will be comminuted or ground prior to discharge. Black water / sewage will be treated, including chlorination, per MARPOL standards and discharged overboard. Management and monitoring measures implemented to ensure treatment standards for these discharges are described in the project-specific ESMPs.

The primary provisions of MARPOL 73/78 relevant to waste management for EEPGL's development projects are those applicable to offshore vessels, as follows:

- Waste Management Plan: A formal WMP shall be developed and enforced by the Unit owner;
- Waste Record Book: wastes generated should be recorded in the Waste Record Book;
- Plastic Waste and General Waste (except Food Waste): The disposal to the sea of all plastics, including but not limited to synthetic ropes, synthetic fishing nets, and plastic garbage bags, and all other general waste, including paper products, rags, glass, metal, bottles, crockery, dunnage, lining and packing materials, is prohibited;
- Food Waste: The disposal to the sea of food wastes that have been passed through a comminuter or grinder shall be made not less than 12 nautical miles from the nearest land. Such comminuted or ground food waste shall be capable of passing through a screen with openings no greater than 25 mm; and
- When waste to be disposed of is a mix of waste types having different disposal requirements, the more stringent requirements shall apply.

4.4.2 BASEL CONVENTION

The objective of the Basel Convention is to control the transboundary movements of hazardous waste and their disposal and by such protect human health and the environment against the adverse effects of hazardous waste if not managed correctly. Its scope covers a wide range of wastes defined as “hazardous wastes” based on their origin and/or composition and their characteristics, as well as two types of wastes defined as “other wastes” – household waste and incinerator ash.

The primary provisions of the Basel Convention center around the following principles:

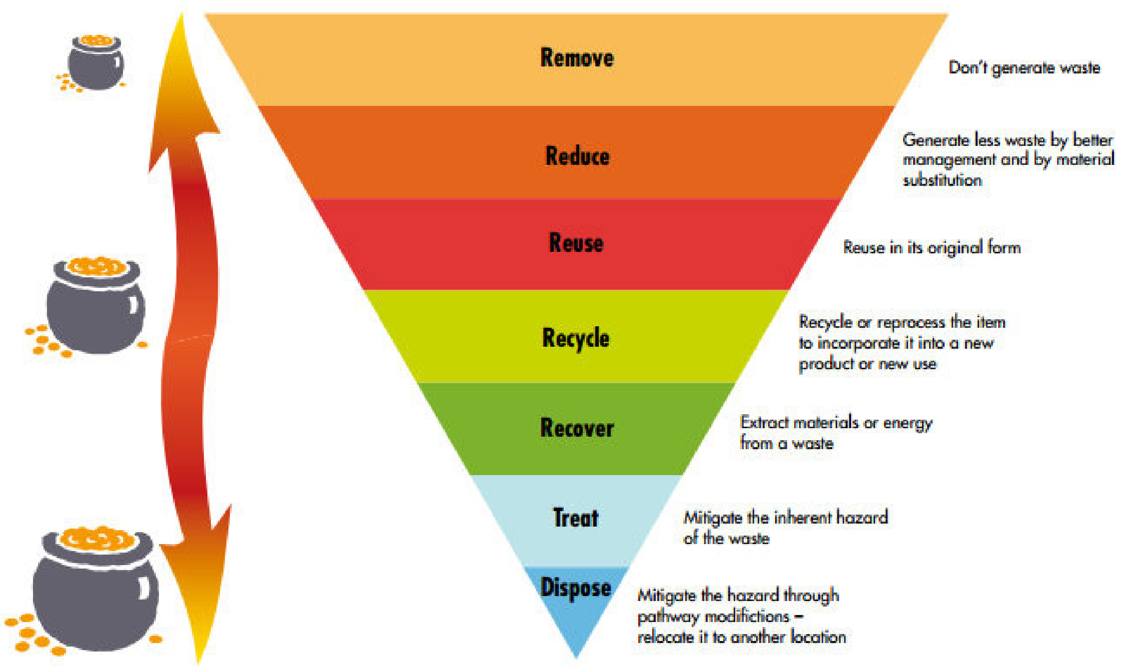
- The reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;
- The restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management; and
- A regulatory system applying to cases where transboundary movements are permissible.

Guyana became a signatory to the Basel Convention on March 7, 2001.

5 WASTE MANAGEMENT STRATEGY

The WMP is underpinned by EEPGL's commitment to the waste management hierarchy, which is described below.

1. Generation of waste should be Avoided, Prevented, or Reduced at the source whenever feasible;
2. Wastes that are not Prevented should be Reused or Recycled in an environmentally safe manner, whenever feasible;
3. Wastes that are not Prevented or Recycled should be Treated in an environmentally safe manner, whenever feasible; and
4. Finally, Disposal should be employed as a last option and when employed, should be conducted in an environmental responsible manner.



Source: OGP. (2009). Guidelines for waste management with special focus on areas with limited infrastructure. Accessed 21 November 2015 at http://www.ogp.org.uk/pubs/413.pdf.

Figure 1: Waste Management Hierarchy

EEPGL will encourage its contractors and suppliers (e.g., of equipment, materials, goods and services) to minimize packaging on products wherever possible, or to package products in recyclable materials, to limit waste generation at each stage of its development projects. Whenever practicable, surplus and unused materials will be returned to a vendor or recycled as the means of management (i.e., reused for the same or a new purpose, converted into a new product), enabling reduction in the consumption of a new product or raw material.

Where possible, measures will be implemented to minimize contractor waste generation. These include:

- Avoiding single use items where reusable items could be used (e.g., using washable plates rather than paper plates);
- Purchasing supplies with minimal or recyclable packaging;
- Using reusable and/or biodegradable materials;
- Ordering only what is needed;
- Storing products properly to prevent spillage or contamination;
- Keeping product containers in good condition, clearly labeled; and
- Maintaining good housekeeping and maintenance of facilities.

5.1 WASTE CATEGORIES

Descriptions of the recoverable materials, common waste types, and categories expected to be generated by EEPGL's development projects have been summarized in Table 3.

Table 3: Recoverable Materials, Waste Types, and Categories

#	Waste Category	Waste Types
1	Non-hazardous wastes	General & domestic trash, incinerator ash & residue (must be tested), production solids (e.g. scale, sand), dry filters, abrasive blast media, filter media, desiccant/drying agents
2	Recyclable materials	Wood, paper, cardboard, glass, aluminum cans, plastic, scrap metal including metal packaging, clean empty steel drums, empty/punctured aerosol cans
3	Hazardous waste liquids	Used lube/motor oil, contaminated hydrocarbons (crude, diesel, etc.), oily water, contaminated water-based drilling fluid, non-aqueous drilling fluid, drilling slops, well treatment & completion fluids, waste brines, treatment chemicals, liquid paint waste, drum/container rinse, acid & caustic solutions, hydraulic fluid
4	Hazardous waste solids	Production solids & sludges, oily trash/debris, oily/wet filters, drums/containers with chemical residues, dried paint waste, consumables (e.g. non-empty aerosol cans, oil filters, grease tubes, dope brushes)
5	Special hazardous wastes	Medical/biological waste, batteries (including alkaline, lead-acid, nickel-cadmium), fluorescent light bulbs & ballasts, mercury and mercury-containing equipment, radioactive waste including Naturally Occurring Radioactive Material, electronic waste

5.2 WASTE MANAGEMENT PRACTICES

The key waste management practices covered by this WMP include:

- Proper waste classification and identification;
- Proper handling, segregation, and storage;
- Proper recycling, reclaiming, or recovery; and
- Proper treatment and disposal.

Each of the categories and individual types of wastes listed above has been summarized, with the preferred waste management practices to be used, in Table 4.

Table 4: Preferred Waste Management Practices

Preferred Waste Management Practices	Recoverable Materials and Waste Streams
Recycle	Plastic, glass, scrap metal including empty steel drums and empty/punctured aerosol cans
Landfill	General trash, used PPE, dessicant and other drying agents, filter media, abrasive blast media, uncontaminated cement, incinerator ash and other hazardous waste treatment residues that have been tested to ensure they are safe for land disposal
Recycle into FPSO Process	When possible, the following will be recycled into the FPSO production/separation process: used lube/motor oil, used glycol, oily water, *de minimis* quantities of off-spec product/materials, by-products, oil slops
Offshore Incineration, Non-hazardous Wastes (where applicable)	Wood, paper, cardboard, general trash
Offshore Incineration, Hazardous Wastes (where applicable)	Used lube/motor oil (when not possible to recycle into FPSO process), contaminated hydrocarbons (crude, diesel, etc.), oil filters and oily debris (rags, gloves, wood, vegetation, sorbent pads, paper, etc.), paint waste, medical waste
Onshore Treatment*	Drilling slops (mixture of used drilling muds, water, cement spacer, additives), oil-contaminated cement and completion brines, used drilling muds not discharged w/ cuttings, production sludges and solids, tank bottom sludge, pigging waste, used and unused chemicals/solvents, hazardous drum rinse, oily water, contaminated drums, containers, packaging, non-empty aerosol cans, batteries (lead acid, nickel-cadmium, lithium, mercury cell), electrical/electronic waste, mercury-containing equipment (e.g. thermometers and other instruments; should be very little), radioactive/NORM waste (only in case that it is produced)

*After treatment of hazardous wastes, the residual non-hazardous solid wastes that are not recycled, reclaimed, or reused will be transported for disposal in an approved landfill.

5.3 WASTE CLASSIFICATION

Proper waste management begins with an accurate classification of each waste, which is critical for safe storage, transportation, and treatment/disposal planning. This will be based on generator processes and process knowledge, review of manufacturers' SDSs, product specifications, and select laboratory testing and analysis, as required to ensure the hazards are known for each waste including whether they are flammable, corrosive (acid or base), reactive (oxidizer, pyrophoric, reducer), and/or toxic.

Whenever supporting analytical results are necessary to initially profile and characterize a waste stream, the following analytical tests will commonly be performed:

- Ignitability (flashpoint);
- Corrosivity (pH);
- Toxicity (Toxicity Characteristic Leaching Procedure metals, and in some cases volatiles); and
- Reactivity (reactive sulfides, reactive cyanides).

The disposal contractor will be consulted to ensure 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 PPE. Samples will be packaged in appropriate containers and properly labeled. A chain of custody form (sample provided in Attachment E) must accompany samples during transport.

5.4 HANDLING OF WASTES

Personnel involved in the handling of hazardous/scheduled wastes must recognize and understand the associated potential hazards and will be trained to a level commensurate with their job duties.

Standard PPE for hazardous/scheduled waste-handling activities includes the following:

- Gloves: leather or chemically resistant (depending on the type of waste);
- Safety glasses, goggles or face shield;
- Hard hat;
- Steel-toed shoes or boots; and
- Coveralls or other suitable work clothes.

Additional PPE may be required for specific hazardous/scheduled wastes (e.g., latex boot covers, respirator). Further information is also contained in the SDSs.

5.5 HANDLING OF HAZARDOUS MATERIALS

Hazardous materials will be stored in designated areas where the potential for damage to containers is minimized (e.g., paint stored in paint locker, acids stored in enclosed areas, etc.). Additionally, hazardous materials will be stored in areas with adequate containment.

Any hazardous materials transported for use will not be accepted by the drill ships; FPSOs; installation, supply and support vessels, or other users unless the following requirements are met:

- Appropriate SDSs must accompany the materials;
- Materials have been accounted for under the Guyana Revenue Authority Investment Development Agreement;
- Applicable requirements have been met for materials import, customs clearance, and use; and
- Materials have been approved under the Guyana Pesticides and Toxic Chemicals Control Act of 2000 (if applicable).

Hazardous materials will be transported in proper containers affixed with a hazardous waste label and placard(s) indicating the applicable hazard class(es). Placards containing internationally recognized symbols exist for the following hazard classes (see Attachment I):

1. Explosives
2. Flammable liquids
3. Flammable solids or waste solids other than explosives which may be readily combustible
4. Oxidizing substances
5. Organic peroxides
6. Poisonous substances
7. Infectious substances
8. Corrosives
9. Toxic gases
10. Toxic substances which if inhaled or ingested may cause delayed or chronic effects
11. Ecotoxic substances which, if released, may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon systems; and
12. Materials capable, after disposal, of yielding another material that possesses any of the characteristics specified in items 1–11.

Containers with hazardous materials transferred to and from the drill ships; FPSOs; installation, supply, and support vessels, and onshore work locations must be clearly identified on cargo manifests, properly placarded per the hazard classes listed above, and accompanied by SDSs, as applicable.

5.6 WASTE SEGREGATION AND STORAGE

Waste generated will be collected in appropriately labeled bin collectors, tanks, bottles, drums, or other designated receptacle. Proper containers will be used for hazardous and non-hazardous materials, chemicals, and wastes. For liquid hazardous materials and wastes, spill prevention controls will be in place to prevent a release to the environment during marine transport, handling, and storage—including use of primary containers in good condition as well as a second barrier of protection for liquid hazardous materials and wastes in the form of certified offshore CCUs (cargo carrying units). All vessels are equipped with spill response materials in the event of a spill from a container on the deck of the vessel.

Non-hazardous waste, including recyclables, will be physically separated from Hazardous Waste (HW) and segregated by type in order to:

- Maximize the possibilities for waste recycling or reuse;
- Minimize the possibility of contamination of non-hazardous wastes by HW;
- Ensure that waste storage is contained; and
- Ensure the proper management of each specific waste;

Additionally, the following segregation and storages practices will be utilized:

- Wastes will be stored in containers that are in good condition and compatible with characteristics of the materials in question;
- Sealable containers will be provided for hazardous/scheduled wastes;
- Incompatible wastes will be segregated to minimize potential chemical reactions;
- Containers bearing wastes will be labeled in accordance with regulatory requirements; and
- Different types of HW will be stored separately from each other and from non-hazardous waste.

Containers bearing wastes will be labeled with the following information:

- Classification (i.e., hazardous or non-hazardous);
- Name/description of the waste
- Applicable hazardous waste characteristics (see list in Section 6.5);
- Physical state of the waste (i.e., solid or liquid).

In addition to the requirements stated above, HW containers will be labeled with the following information:

- Name and address of EEPGL;
- Placard(s) corresponding to the applicable hazard class(s) (during transport only); and
- Packaging or start of accumulation date.

HWs will be labelled in the specified format as follows:

- The size of the label should not be less than 20 centimeters (cm) x 30 cm [7.9 inches (in) x 11.8 in];
- Labels should have a yellow background with black lettering conspicuously marked in paint or another permanent form of marking;
- The material of the label should be scratch proof, resistant to tampering and able to withstand open weather exposure;
- Generally, the label should be attached to the side of the vessel, container, tank, or containment building. In case of a vessel, container, tank, or containment building that is used repeatedly, the label should ideally be a plate that is hung on the side of it. For containment buildings, hazardous wastes types contained in the building should be included on the plate;
- The label should identify the hazardous characteristic(s) of the waste (e.g., flammable, corrosive, toxic)

The basic label form is provided below in Table 5. Labelling procedures should be completed at the location where the waste was generated and should be retained at the destination treatment, storage, and disposal facilities.

Table 5: Basic Label Form

Hazardous Waste		
Waste Information	Waste type / description	Name and/or description of the waste/material
	Waste Classification	Hazardous or non-hazardous
	Hazard Class	Name of the hazard class (see placards in Attachment I; e.g. Toxic, Corrosive, Flammable, Explosive, Reactive, Infectious)
	Physical Form	Liquid, Solid, or Sludge
	Quantity	Quantity of the hazardous waste contained in the vessel, container or tank
	Packaging date	Date the hazardous waste is packed in the vessel, container or tank
	Shipping date	Date the hazardous waste must be removed from the storage area and transported off site if applicable
	Waste transport record number	Manifest number if transported off site
Container Information	Capacity	Maximum capacity or volume of the container
	Material	Material that a vessel, container or tank is made of
Generator Information	Name	Name of the waste generator (company name)
	Address	Address of the waste generator
	Telephone #	Telephone number of the waste generator

5.7 WASTE TRACKING PROCESS

A Marine Transport Manifest (sample included in Attachment F) will be used for vessel shipments of hazardous and non-hazardous wastes and must contain the types and quantities of hazardous and non-hazardous wastes being transported.

Additionally, a waste manifest (sample included in Attachment G) and waste information data sheet (sample included in Attachment H) will be completed and must accompany shipments of hazardous and non-hazardous wastes. This includes over-water shipments as well as land shipments. The purpose of this manifest is to track each shipment of waste from the point of generation to the point of final treatment, recycling or disposal. EEPGL is responsible for completing waste manifests prior to shipment.

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 record of used oil generated (See Attachments C and D). The Garbage Record Books 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.

Vessels must retain copies of Marine Transport Manifests and waste manifests with the Waste/Garbage Record Book for a minimum of two years.

5.8 WASTE TRANSFER TO SHORE

Marine vessels used to transport waste will be required to have necessary licenses and approval from the Guyana authorities. Crews on vessels that transport hazardous waste will have training in basic emergency response, and knowledge of labeling and placarding requirements.

Vessels transporting waste will carry both a completed Marine Transport Manifest (see Attachment F), a completed waste manifest (see example in Attachment G), and a waste information data sheet (see Attachment H). These documents will contain the name, description, and quantity of wastes being transported.

Waste containers will be labeled per the requirements described in Section 6.6. Hazardous waste containers will be affixed with the appropriate placard(s) corresponding to the hazard class(es) of the waste being transported.

EEPGL will confirm vessel waste transporters and shipments meet the requirements above and that vessel crews have completed and documented compliance with the minimum training requirements.

5.9 WASTE TRANSFER FROM SHORE TO OFFSITE WASTE MANAGEMENT FACILITY

Vehicles used to transport waste from the shore to offsite waste management facilities will be required to have necessary licenses and approval from the Guyana authorities. Crews that transport hazardous waste will have training in basic emergency response and knowledge of labeling and placarding requirements. Vehicles transporting waste will carry a completed waste manifest (see example in Attachment G). This document will contain the names, descriptions, and quantities of wastes being transported.

Waste containers will be labeled per the requirements described in Section 6.6. Hazardous waste containers will be affixed with the appropriate placard(s) corresponding to the hazard class(es) of the waste being transported.

EEPGL will confirm vehicle waste transporters and shipments meet the requirements above and that crews have completed and documented compliance with the minimum training requirements.

6 WASTE MANAGEMENT METHODS

The following treatment and disposal methods may be employed to manage EEPGL development project waste:

- **Offshore:**
  - Incineration (where applicable);
  - Discharge (macerated food);
  - Other methods allowed by Environmental Permit.
- **Onshore:**
  - Incineration;
  - Other thermal treatment (e.g., thermal desorption);
  - Neutralization;
  - Stabilization (e.g., solidification);
  - Bioremediation;
  - Liquid waste treatment;
  - Burial disposal (landfill);
  - Beneficial reuse.

EEPGL's contracted waste service providers will be expected to furnish required equipment and facilities for the storage, handling, transportation, treatment, and disposal of hazardous and non-hazardous waste brought onshore. In some cases (e.g., special hazardous wastes), waste may need to be shipped to other approved facilities owned and/or operated by a different service provider.

6.1 INCINERATION/THERMAL TREATMENT

Thermal treatment, including incineration, is a preferred technology for the management of combustible solid wastes and liquid wastes. It can be performed utilizing a variety of incinerators (single and dual chamber), thermal desorption units, or other thermal treatment technologies. The design basis for the drill ships and FPSOs may include incinerators designed to handle the types and quantities of combustible wastes specified in this WMP and capable of destroying hazardous constituents in those waste streams. EEPGL's contracted waste service providers may also utilize incineration or other forms of thermal treatment for hazardous and non-hazardous wastes that cannot be managed offshore. Incinerator ash and residue will be analyzed as described in Section 6.3 to assess suitability for land disposal prior to shipment to the landfill. There can be an expected 75 - 85 percent reduction by volume for incinerated solid wastes, and a significantly higher percent reduction for incinerated liquid wastes.

6.2 NEUTRALIZATION

Neutralization is an effective treatment method for certain waste acids and caustics; it involves mixing of the waste with other materials to raise or lower the pH to a more neutral level. Appropriate health and safety considerations must be taken and specific controls put in place when performing neutralization. It is important to verify that waste liquids can be safely neutralized prior to mixing with materials, which can often result in an exothermic reaction. Commonly used chemicals for neutralization are 98 percent sulfuric acid (to neutralize a base) and 50 percent sodium hydroxide or calcium hydroxide (lime) (to neutralize an acid).

6.3 STABILIZATION

Stabilization can be any process used to alter the physical or chemical properties of a waste to render it more amenable for land disposal or further treatment. One form of stabilization is solidification, in which waste is physically or chemically bound or encapsulated in a stabilizing material to form a hardened block that will reduce the tendency of constituents of concern (e.g., metals) to be released or leached into the environment. Common binding agents or stabilizing materials are cement, clay, fly ash, or asphalt. Stabilization/solidification is sometimes used as a secondary treatment following incineration for wastes that may have residual leachable constituents after volatiles and hydrocarbons have been removed through thermal treatment.

6.4 BIOREMEDIATION

Bioremediation can be an effective form of treatment for organic wastes, such as hydrocarbon or hydrocarbon-contaminated wastes (e.g., hydrocarbon-impacted soil). Bioremediation is often performed in open pits or other open spaces where naturally occurring or added organisms are used to break down the organic material in the waste until biodegradable constituents are reduced to a level suitable for land disposal. A synthetic liner is one example of a potential barrier to protect groundwater sources beneath the bioremediation area, and other engineering controls are often considered during facility design as measures to reduce potential runoff or other migration of potential contaminants outside of the designated bioremediation area. EEPGL has strict criteria for which wastes are eligible for bioremediation (generally only exploration and production wastes in which hydrocarbons are demonstrated through analytical testing to be the only hazardous constituent present). Once the hydrocarbon content of bioremediated waste is reduced to 5 percent or less, it can become eligible for beneficial reuse.

6.5 LIQUID WASTE TREATMENT

There are a variety of forms of industrial liquid waste treatment that can be used to remove hazardous constituents from liquid wastes, making them more amenable to land disposal. A properly designed treatment plant is the preferred management method for large volume liquid wastes, such as slops, oily water, or washwater from vessel tank cleanouts.

6.6 BURIAL DISPOSAL (LANDFILL)

Non-hazardous solid wastes that are not recycled, reclaimed, or reused will be transported for disposal in an approved and permitted landfill. Wastes must be demonstrated to meet standards for land disposal through generator knowledge or analytical testing prior to landfilling. In Guyana, the Haags Bosch Landfill has been permitted by the Guyana EPA and is managed by the Ministry of Communities. Should additional engineered landfills become available in Guyana, those will be assessed and reviewed for use.

6.7 BENEFICIAL REUSE

It may be possible to use production wastes for beneficial purposes. EEPGL has strict standards for when a waste is eligible for beneficial reuse. Untreated wastes that are demonstrated through analytical testing to meet certain criteria (e.g., hydrocarbon content less than 5 percent and other constituents of concern below levels that could cause harm to the environment) can be eligible for beneficial reuse. Wastes that do not initially meet these criteria may be treated to meet the standard. Such reuse can offer important environmental benefits such as waste minimization (avoids unnecessarily using up landfill space), dust suppression, and improved road maintenance.

7 SPILL AND EMERGENCY RESPONSE

EEPGL, other waste generators (e.g., marine vessel 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 risk scenarios. The action steps and the resources applied increase as the seriousness of the emergency or release increases. Tier I (lowest level) emergencies will be handled by local resources. In the case of scenarios outside the local capability (i.e., Tiers II and III), EEPGL will activate its Regional Response Team. The Regional Response Team is a large group of responders that have been trained for response actions around the world. The Emergency Response Plans also include required internal and external incident communications processes and contact numbers.

7.1 OIL SPILL CLEANUP – WASTE MANAGEMENT

Waste generated as a result of oil spill cleanup activities will be managed in accordance with this WMP, EEPGL's Oil Spill Response Plan, and Guyana laws and local regulations. The typical waste streams associated with a cleanup could include recovered product not able to be reintroduced into the system, oily water, absorbent materials, decontamination materials, contaminated trash and debris, general trash and debris, and affected vegetation/foliage, among others. Should a significant oil spill occur, an incident-specific WMP may be developed as part of the response. Additional waste management provisions including procedures for the disposition of deceased wildlife can be found in the EEPGL Oil Spill Response Plan.

8 WASTE MONITORING AND REPORTING GUIDELINES

Monitoring and reporting of those recoverable materials and wastes and their final management are critical components to the successful implementation of this WMP.

8.1 WASTE MONITORING

The waste monitoring program will be facilitated by regular inspections conducted by EEPGL. A summary of monitoring guidelines is provided in Table 6.

Table 6: Waste-Monitoring Guidelines

Monitoring Activity	Frequency	Originator	Documentation
Record type and quantity of each new individual waste stream onboard	Any time new waste is generated	Dedicated personnel on vessels	Waste/Garbage Record Book; Oil Record Book; Incinerator Log
Inspect waste storage area and containers; log inspections	Daily	Dedicated personnel on vessels, at shorebases, and at Waste Management Service Provider's facilities	Daily inspection log
Document marine waste transfer	Each instance waste is transported	Dedicated personnel on vessels and at shorebases	Marine Transport Manifest and Waste Manifest
Sample and perform analytical testing	As needed to properly classify waste	Waste Management Service Provider / EEPGL	Chain of Custody; Laboratory analysis results
Complete Recoverable Material and Waste Summaries	Monthly; Annual	Waste Management 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	End of Survey, End of Well, End of Stage Reports, EPA Recording and Reporting Form, any other reports required by Environmental Permit
Waste facility audits & inspections	Periodic	EEPGL	Inspection logs & 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 Books;
- Maintenance of required incinerator logs;
- Maintenance of Marine Transport Manifests and waste manifests 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 Attachment B;
- Maintenance of monthly waste inventories;
- Preparation of annual waste management summary reports;
- Routine inspections and periodic assessments of Waste Management Service Provider's facilities; and
- Maintenance of hazardous substances / chemical inventory register and transboundary shipment forms, if required. These forms should be kept by EEPGL personnel at either the shorebases or venture office.

Any issue of non-compliance will be tracked and documented in a monthly report.

9 WASTE TRAINING

General training will be conducted for EEPGL personnel, contractors, and any others - as appropriate - that will be involved with recoverable material and waste generation and management during the life of EEPGL's development projects. This training will cover:

- EEPGL Waste Management Practices;
- Environmental Permit requirements;
- Typical waste streams;
- Identification, classification, and labelling of hazardous and non-hazardous waste;
- Handling, segregation, storage, and treatment/disposal options;
- PPE requirements; and
- Waste management during normal operating conditions, as well as emergencies.

In addition to the general waste management training, additional offshore- and onshore-specific waste training will be provided to the appropriate personnel.

9.1 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 regulations as well as EEPGL's responsible waste management practices. Topics to be covered in these trainings will include, but not be limited to:

- Opportunities to minimize waste generation;
- Waste generation offshore and potential impacts on marine life;
- 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.

9.2 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 cover more specific topics, including:

- Application of Guyana laws and guidelines;
- Opportunities to minimize onshore waste generation;
- Waste generation onshore and potential risks to health, safety, and the environment;
- Specific types of hazardous and non-hazardous wastes that can be generated offshore and sent to shore for treatment/disposal, as well as potential waste generated from onshore activities;
- 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.

ATTACHMENT A PROJECT DESCRIPTIONS, WASTES, MANAGEMENT METHODS, AND ESTIMATED ANNUAL QUANTITIES

A.1 Liza Phase 1 Project

A.1.1 Project Description

The Liza Phase 1 Project proposes to develop the offshore resource by drilling approximately 17 subsea development wells and using a FPSO vessel to process, store, and offload recovered oil. The FPSO will be connected to the wells via associated equipment, collectively referred to as subsea, umbilicals, risers, and flowlines (SURF), to 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 the injection wells.

The Liza Phase 1 Project consists of five primary stages: drilling, installation, hook-up and commissioning, production operations, and decommissioning. The Liza Phase 1 Project will generate a variety of recoverable materials as well as solid, semi-solid, and liquid wastes that are both hazardous and non-hazardous, which will vary over time by Liza Phase 1 Project stage. Updated estimated recoverable materials, waste types, and volumes to be generated during each stage of the Liza Phase 1 Project are provided herein.

Waste volumes generated will increase early in the Liza Phase 1 Project as concurrent drilling and SURF installation activities occur from 2018 - 2019, which are then followed by the hookup and commissioning of the FPSO. Waste volumes will then begin to decrease as drilling activities conclude in 2020, and will significantly decrease thereafter during the stage of production operations alone from 2021 to approximately 2040. When production operations cease, some waste will be generated during the decommissioning stage.[2]

[2] Any dates specified in this document are based on the current Liza Phase 1 Project schedule, which is subject to change. They are provided to help conceptualize anticipated duration of each Liza Phase 1 Project stage.

Summary Liza Phase 1 Project Waste Estimate

	Volume By Year / Metric Tonnes				
Waste Generated by Category	**2019**	**2020**	**2021**	**2022-2039**	**2040**
Non-Hazardous (total) [a]	580	630	330	330	330
Hazardous (total) [a]	3180	2090	300	300	300
Totals by Management Method / Final Destination					
Landfill	330	400	220	220	220
Recycle (if feasible) or Landfill	310	290	130	130	130
Solids Thermal Treatment at Approved Third Party Facility / Landfill *	420	270	70	70	70
Liquids Wastewater Treatment / Thermal Treatment and/or Discharge Onshore at Approved Third Party Facility	2680	1740	180	180	180
Special Waste / Send to Approved Facility	10	20	20	20	20

*After treatment of hazardous wastes onshore, the residual non-hazardous solid wastes that are not recycled, reclaimed, or reused will be transported for disposal in an approved landfill.

[a] Totals may not sum exactly due to rounding.

Liza Phase 1 Project Waste Future Estimates, Hazardous Wastes*

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes				
Waste Stream	**Waste Source**	**Primary Management Method Anticipated**	**Alternate Management Methods Anticipated**	**2019**	**2020**	**2021**	**2022-2039**	**2040**
Contaminated drums, containers, packaging (metal)	Operations and general maintenance	Rinse - Recycle		10	10	10	10	10
Contaminated drums, containers, packaging (plastic)	Operations and general maintenance	Rinse - Landfill		60	50	10	10	10
Batteries (Lead Acid, Nickel-Cadmium, Lithium, Mercury Cell)	Instruments and small equipment	Send to approved/ permitted facility	Store pending availability of such facilities or transboundary shipment	10	20	20	20	20
Electrical/electronic waste	Instruments and computer related equipment	Send to approved/ permitted facility	Store pending availability of such facilities or transboundary shipment	3	1	1	1	1
Mercury-containing equipment	Asset maintenance	Send to approved/ permitted facility	Store pending availability of such facilities or return to supplier/vendor	<1	<1	<1	<1	<1
Radioactive waste	Naturally Occurring Radioactive Material	Send to approved/ permitted facility	Store pending availability of such facilities or transboundary shipment	0	1	1	1	1
Fluorescent bulbs	Replacement of light tubes	Thermal treatment (onshore)		<1	<1	<1	<1	<1

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes				
Waste Stream	**Waste Source**	**Primary Management Method Anticipated**	**Alternate Management Methods Anticipated**	**2019**	**2020**	**2021**	**2022-2039**	**2040**
Aerosol Cans	General maintenance activities	Thermal treatment (onshore)		2	1	1	1	1
Contaminated hydrocarbons (contaminated crude, diesel, etc.)	General maintenance activities and spill response	Thermal treatment (onshore)	When practicable, recycle into FPSO process	20	10	5	5	5
Medical waste	First aid and routine clinical procedures	Thermal treatment (onshore)	Offshore incineration (where practicable)	1	1	1	1	1
Oil sludge/Tank bottom sludge	Operations and vessel equipment maintenance	Thermal treatment (onshore)		50	20	20	20	20
Oily Debris (rags, filter, gloves, wood, vegetation, sorbent pads, paper, etc.)	Routine operations & maintenance, rags and oil spill clean-up activities	Thermal treatment (onshore)	Offshore incineration (where practicable)	50	50	40	40	40
Paint waste	Equipment and facilities activities and maintenance during all phases	Thermal treatment (onshore)		10	4	1	1	1
Sack Waste (contaminated)	Mixing chemicals / muds	Thermal treatment (onshore)		2	1	0	0	0
Slops containing used drilling muds (NAF), cement spacer, chemical additives, washwater	Drilling operations	Thermal treatment (onshore)		280	160	0	0	0
Used lube oil/motor oil	Equipment and vehicle maintenance and repair (of internal-combustion engines, pumps, and compressors)	Thermal treatment (onshore)	When practicable, recycle into FPSO process	10	10	10	10	10

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes				
Waste Stream	Waste Source	Primary Management Method Anticipated	Alternate Management Methods Anticipated	2019	2020	2021	2022-2039	2040
Unused or contaminated solvents/ chemicals	Operations, wastewater or water treatment systems, laboratories	WWT / Thermal Treatment (onshore)		10	60	60	60	60
Oil contaminated completion fluids	Well completion activities	WWT / Thermal Treatment (onshore)	When practicable, recycle into FPSO process	20	10	0	0	0
Glycol	Operations and vessel equipment maintenance	WWT / Thermal Treatment (onshore)	When practicable, recycle into FPSO process	3	10	10	10	10
Oily water	Tank and operating equipment cleaning	WWT / Thermal Treatment (onshore)	When practicable, recycle into FPSO process	10	10	10	10	10
Vessel Tank Cleanout (Liquids)	Drilling operations, general maintenance activities	WWT / Thermal Treatment (onshore)		2620	1630	100	100	100
Wash water	Pipe cleaning	WWT / Thermal Treatment (onshore)		20	20	5	5	5

*After treatment of hazardous wastes, the residual non-hazardous solid wastes that are not recycled, reclaimed, or reused will be transported for disposal in an approved landfill.

Liza Phase 1 Project Waste Future Estimates: Non-Hazardous Wastes

Waste Information: Non-Hazardous Wastes				Volume By Year / Metric Tonnes				
Waste Stream	**Waste Source**	**Primary Management Method Anticipated**	**Alternate Management Methods Anticipated**	**2019**	**2020**	**2021**	**2022-2039**	**2040**
Bulk Solids (Uncontaminated)	Barite, cement, blast media, dessicant, silica. Vessel dry bulk Tank cleaning	Landfill		120	80	10	10	10
General/Domestic Trash (non-recyclable)	Discarded items from kitchen, living quarters, bathroom, laundry, warehouse, offices	Landfill		130	260	200	200	200
Sack Waste (uncontaminated)	Cement mixing processes	Landfill		10	10	0	0	0
Incinerator Ash (offshore)	Incinerator (FPSO)	Landfill		0	0	0	0	0
Scrap metal	Equipment maintenance, metal packaging	Recycle (if feasible)	Landfill	120	110	50	50	50
Dry Filters	General Maintenance	Recycle (if feasible)	Landfill	2	10	10	10	10
Paper & Cardboard	Paper & Cardboard packaging, documents	Recycle (if feasible)	Landfill	30	20	20	20	20
Wood	Wooden pallets, construction, general maintenance	Recycle (if feasible)	Landfill	140	110	30	30	30
Recyclable domestic trash (plastic & glass)	Discarded items from, kitchen, living quarters, bathroom, laundry, warehouse, offices	Recycle (if feasible)	Landfill	20	20	20	20	20

A.2 Liza Phase 2 Project

A.2.1 Project Description

The Liza Phase 2 Project proposes to develop the offshore resource by drilling approximately 30 subsea development wells and using a FPSO vessel to process, store, and offload recovered oil. The FPSO will be connected to the wells via associated equipment, collectively referred to as SURF, to 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 the injection wells.

The Liza Phase 2 Project consists of five primary stages: drilling, installation, hook-up and commissioning, production operations, and decommissioning. The Liza Phase 2 Project will generate a variety of recoverable materials as well as solid, semi-solid, and liquid wastes that are both hazardous and non-hazardous, which will vary over time by Liza Phase 2 Project stage. Updated estimated recoverable materials, waste types, and volumes to be generated during each stage of the Liza Phase 2 Project are provided herein.

As per the current Liza Phase 2 Project schedule, waste could be generated as early as 2020. Waste volumes generated will increase early in the project as concurrent drilling and SURF installation activities occur from 2020 - 2022, which are then followed by the hookup and commissioning of the FPSO. Waste volumes will then begin to decrease as drilling activities conclude in 2023 and significantly decrease thereafter during the stage of production operations alone from 2024 to approximately 2042. When production operations cease, some waste will be generated during the decommissioning stage.[3]

[3] Any dates specified in this document are based on the current Liza Phase 2 Project schedule, which is subject to change. They are provided to help conceptualize anticipated duration of each Liza Phase 2 Project stage.

Liza Phase 2 Project Waste Estimates

	Volume By Year / Metric Tonnes					
Waste Generated by Category	**2020**	**2021**	**2022**	**2023**	**2024-2041**	**2042**
Non-Hazardous (total) [a]	1050	1050	1220	830	530	530
Hazardous (total) [a]	6210	6200	6350	3370	480	480
Totals by Management Method / Final Destination						
Landfill	630	630	740	520	350	350
Recycle (if feasible) or Landfill	550	550	620	390	210	210
Solids Thermal Treatment at Approved Third Party Facility / Landfill*	720	720	760	410	120	120
Liquids Wastewater Treatment / Thermal Treatment and/or Discharge Onshore at Approved Third Party Facility	5340	5340	5430	2850	300	290
Special Waste / Send to Approved Facility	20	20	30	30	40	40

*After treatment of hazardous wastes onshore, the residual non-hazardous solid wastes that are not recycled, reclaimed, or reused will be transported for disposal in an approved landfill.
[a] Totals may not sum exactly due to rounding.

Liza Phase 2 Project Waste Estimates, Hazardous Wastes *

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes					
Waste Stream	Waste Source	Primary Management Method Anticipated	Alternate Management Methods Anticipated	2020	2021	2022	2023	2024-2041	2042
Contaminated drums, containers, packaging (metal)	Operations and general maintenance	Rinse - Recycle		10	10	10	10	20	20
Contaminated drums, containers, packaging (plastic)	Operations and general maintenance	Rinse - Landfill		120	120	130	70	20	20
Batteries (Lead Acid, Nickel-Cadmium, Lithium, Mercury Cell)	Instruments and small equipment	Send to approved/permitted facility	Store pending availability of such facilities or transboundary shipment	10	10	20	20	30	30
Electrical/electronic waste	Instruments and computer related equipment	Send to approved/permitted facility	Store pending availability of such facilities or transboundary shipment	2	2	3	1	2	2
Mercury-containing equipment	Asset maintenance	Send to approved/permitted facility	Store pending availability of such facilities or return to supplier/vendor	0	0	0	0	0	0
Radioactive waste	Naturally Occurring Radioactive Material	Send to approved/permitted facility	Store pending availability of such facilities or transboundary shipment	0	0	0	1	1	1
Fluorescent bulbs	Replacement of light tubes	Thermal treatment (onshore)		1	1	1	0	0	0

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes					
Waste Stream	**Waste Source**	**Primary Management Method Anticipated**	**Alternate Management Methods Anticipated**	**2020**	**2021**	**2022**	**2023**	**2024-2041**	**2042**
Aerosol Cans	General maintenance activities	Thermal treatment (onshore)		1	1	2	1	2	2
Contaminated hydrocarbons (contaminated crude, diesel, etc.)	General maintenance activities and spill response	Thermal treatment (onshore)	When practicable, recycle into FPSO process	30	30	40	20	10	10
Medical waste	First aid and routine clinical procedures	Thermal treatment (onshore)	Offshore incineration (where practicable) [a]	1	1	1	1	1	1
Oil sludge/Tank bottom sludge	Operations and vessel equipment maintenance	Thermal treatment (onshore)		50	50	60	30	20	20
Oily Debris (rags, filter, gloves, wood, vegetation, sorbent pads, paper, etc.)	Routine operations & maintenance, rags and oil spill clean-up activities	Thermal treatment (onshore)	Offshore incineration (where practicable) [a]	50	50	80	60	70	70
Paint waste	Equipment and facilities activities and maintenance during all phases	Thermal treatment (onshore)		10	10	10	10	2	2
Sack Waste (contaminated)	Mixing chemicals / muds	Thermal treatment (onshore)		5	5	5	2	0	0
Slops containing used drilling muds (NAF), cement spacer, chemical additives, washwater	Drilling operations	Thermal treatment (onshore)		560	560	560	280	0	0

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes					
Waste Stream	**Waste Source**	**Primary Management Method Anticipated**	**Alternate Management Methods Anticipated**	**2020**	**2021**	**2022**	**2023**	**2024-2041**	**2042**
Used lube oil/motor oil	Equipment and vehicle maintenance and repair (of internal-combustion engines, pumps, and compressors)	Thermal treatment (onshore)	When practicable, recycle into FPSO process	10	10	10	10	10	10
Unused or contaminated solvents/chemicals	Operations, wastewater or water treatment systems, laboratories	WWT / Thermal Treatment (onshore)		4	4	30	60	90	90
Oil contaminated completion fluids	Well completion activities	WWT / Thermal Treatment (onshore)	When practicable, recycle into FPSO process	30	30	30	20	0	0
Glycol	Operations and vessel equipment maintenance	WWT / Thermal Treatment (onshore)	When practicable, recycle into FPSO process	2	2	10	10	20	20
Oily water	Tank and operating equipment cleaning	WWT / Thermal Treatment (onshore)	When practicable, recycle into FPSO process	20	20	20	20	20	20
Vessel Tank Cleanout (Liquids)	Drilling operations, general maintenance activities	WWT / Thermal Treatment (onshore)		5250	5250	5300	2720	160	160
Wash water	Pipe cleaning	WWT / Thermal Treatment (onshore)		40	40	40	20	10	10

* After treatment of hazardous wastes onshore, the residual non-hazardous solid wastes that are not recycled, reclaimed, or reused will be transported for disposal in an approved landfill.
[a] The Liza Phase 2 FPSO and development drill ships are not anticipated to have incinerators onboard.

Liza Phase 2 Project Waste Estimates, Non-Hazardous Wastes

Waste Information: Non-Hazardous Wastes				Volume By Year / Metric Tonnes					
Waste Stream	Waste Source	Primary Management Method Anticipated	Alternate Management Methods Anticipated	2020	2021	2022	2023	2024-2041	2042
Bulk Solids (Uncontaminated)	Barite, cement, blast media, dessicant, silica. Vessel dry bulk Tank cleaning	Landfill		250	250	250	130	10	10
General/Domestic Trash (non-recyclable)	Discarded items from kitchen, living quarters, bathroom, laundry, warehouse, offices	Landfill		240	240	340	310	320	320
Sack Waste (uncontaminated)	Cement mixing processes	Landfill		20	20	20	10	0	0
Incinerator Ash (offshore)	Incinerator (FPSO)	Landfill [a]		0	0	0	0	0	0
Scrap metal	Equipment maintenance, metal packaging	Recycle (if feasible)	Landfill	230	230	250	160	80	80
Dry Filters	General Maintenance	Recycle (if feasible)	Landfill	2	2	10	10	20	20
Paper & Cardboard	Paper & Cardboard packaging, documents	Recycle (if feasible)	Landfill	30	30	40	30	30	30
Wood	Wooden pallets, construction, general maintenance	Recycle (if feasible)	Landfill	270	270	280	160	50	50
Recyclable domestic trash (plastic & glass)	Discarded items from, kitchen, living quarters, bathroom, laundry, cwarehouse, offices	Recycle (if feasible)	Landfill	30	30	30	30	30	30

[a] The Liza Phase 2 FPSO and development drill ships are not anticipated to have incinerators onboard.

A.3 Payara Project

A.3.1 Project Description

The Payara Project proposes to develop the offshore resource by drilling up to approximately 45 subsea development wells and using a FPSO vessel to process, store, and offload recovered oil. The FPSO will be connected to the wells via associated equipment, collectively referred to as SURF, to 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 the injection wells.

The Payara Project consists of five primary stages: drilling, installation, hook-up and commissioning, production operations, and decommissioning. The Payara Project will generate a variety of recoverable materials as well as solid, semi-solid, and liquid wastes that are both hazardous and non-hazardous, which will vary over time by Payara Project stage. Estimated recoverable materials, waste types, and volumes to be generated during each stage of the Payara Project are provided herein.

As per the current project schedule, waste could be generated as early as 2020. Waste volumes generated will increase early in the Payara Project as concurrent drilling and SURF installation activities occur from 2021 - 2023, which are then followed by the hookup and commissioning of the FPSO. Waste volumes will then begin to decrease as drilling activities conclude in 2025 and significantly decrease thereafter during the stage of production operations alone in 2026 to approximately 2044. When production operations cease, some waste will be generated during the decommissioning stage.[4]

[4] Any dates specified in this document are based on the current Payara Project schedule, which is subject to change. They are provided to help conceptualize anticipated duration of each Payara Project stage.

Summary Payara Project Waste Estimate

Waste Generated by Category	Volume By Year / Metric Tonnes							
	2020	2021	2022	2023	2024	2025	2026-2043	2044
Non-Hazardous (total) [a]	250	1070	1100	1320	1340	1340	530	530
Hazardous (total) [a]	1530	6240	6270	6420	6430	6430	480	480
Totals by Management Method / Final Destination								
Landfill	150	640	640	810	830	830	350	350
Recycle (if feasible) or Landfill	130	570	590	650	660	660	210	210
Solids Thermal Treatment at Approved Third Party Facility / Landfill*	170	750	770	750	750	750	120	120
Liquids Wastewater Treatment / Thermal Treatment and/or Discharge Onshore at Approved Third Party Facility	1330	5340	5350	5500	5510	5510	290	290
Special Waste / Send to Approved Facility	2	20	20	30	30	30	40	40

*After treatment of hazardous wastes onshore, the residual non-hazardous solid wastes that are not recycled, reclaimed, or reused will be transported for disposal in an approved landfill.

[a] Totals may not sum exactly due to rounding.

Payara Project Waste Estimates, Hazardous Wastes *

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes							
Waste Stream	Waste Source	Primary Management Method Anticipated	Alternate Management Methods Anticipated	2020	2021	2022	2023	2024	2025	2026 - 2043	2044
Contaminated drums, containers, packaging (metal)	Operations and general maintenance	Rinse - Recycle		1	10	10	20	20	20	20	20
Contaminated drums, containers, packaging (plastic)	Operations and general maintenance	Rinse - Landfill		30	120	130	130	130	130	20	20
Batteries (Lead Acid, Nickel-Cadmium, Lithium, Mercury Cell)	Instruments and small equipment	Send to approved/permitted facility	Store pending availability of such facilities or transboundary shipment	2	10	20	30	30	30	30	30
Electrical/electronic waste	Instruments and computer related equipment	Send to approved/permitted facility	Store pending availability of such facilities or transboundary shipment	0	3	3	2	2	2	2	2
Mercury-containing equipment	Asset maintenance	Send to approved/permitted facility	Store pending availability of such facilities or return to supplier/ vendor	<1	<1	<1	<1	<1	<1	0	0

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes							
Waste Stream	**Waste Source**	**Primary Management Method Anticipated**	**Alternate Management Methods Anticipated**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026 - 2043**	**2044**
Radioactive waste	Naturally Occuring Radioactive Material	Send to approved/permitted facility	Store pending availability of such facilities or transboundary shipment	0	0	0	1	1	1	1	1
Fluorescent bulbs	Replacement of light tubes	Thermal treatment (onshore)		0	1	1	1	1	1	0	0
Aerosol Cans	General maintenance activities	Thermal treatment (onshore)		0	2	3	1	1	1	2	2
Contaminated hydrocarbons (contaminated crude, diesel, etc.)	General maintenance activities and spill response	Thermal treatment (onshore)	When practicable, recycle into FPSO process	10	30	40	40	40	40	10	10
Medical waste	First aid and routine clinical procedures	Thermal treatment (onshore)	Offshore incineration (where practicable) [a]	0	1	2	1	1	1	1	1
Oil sludge/Tank bottom sludge	Operations and vessel equipment maintenance	Thermal treatment (onshore)		10	60	70	50	50	50	20	20
Oily Debris (rags, filter, gloves, wood, vegetation, sorbent pads, paper, etc.)	Routine operations & maintenance, rags and oil spill clean-up activities	Thermal treatment (onshore)	Offshore incineration (where practicable) [a]	10	70	80	80	80	80	70	70

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes							
Waste Stream	**Waste Source**	**Primary Management Method Anticipated**	**Alternate Management Methods Anticipated**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026 - 2043**	**2044**
Paint waste	Equipment and facilities activities and maintenance during all phases	Thermal treatment (onshore)		3	10	10	10	10	10	2	2
Sack Waste (contaminated)	Mixing chemicals / muds	Thermal treatment (onshore)		1	5	5	5	5	5	0	0
Slops containing used drilling muds (NAF), cement spacer, chemical additives, washwater	Drilling operations	Thermal treatment (onshore)		140	560	560	560	560	560	0	0
Used lube oil/motor oil	Equipment and vehicle maintenance and repair (of internal-combustion engines, pumps, and compressors)	Thermal treatment (onshore)	When practicable, recycle into FPSO process	2	10	10	10	20	20	10	10
Unused or contaminated solvents/chemicals	Operations, wastewater or water treatment systems, laboratories	WWT / Thermal Treatment (onshore)		0	5	10	50	60	60	90	90
Oil contaminated completion fluids	Well completion activities	WWT / Thermal Treatment (onshore)	When practicable, recycle into FPSO process	10	30	30	30	30	30	0	0
Glycol	Operations and vessel equipment maintenance	WWT / Thermal Treatment (onshore)	When practicable, recycle into FPSO process	0	2	3	10	10	10	20	20

Waste Information: Hazardous Wastes				Volume By Year / Metric Tonnes							
Waste Stream	**Waste Source**	**Primary Management Method Anticipated**	**Alternate Management Methods Anticipated**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026 - 2043**	**2044**
Oily water	Tank and operating equipment cleaning	WWT / Thermal Treatment (onshore)	When practicable, recycle into FPSO process	3	20	20	20	20	20	20	20
Vessel Tank Cleanout (Liquids)	Drilling operations, general maintenance activities	WWT / Thermal Treatment (onshore)		1310	5250	5250	5340	5350	5350	160	160
Wash water	Pipe cleaning	WWT / Thermal Treatment (onshore)		10	40	40	40	40	40	810	10

* After treatment of hazardous wastes onshore, the residual non-hazardous solid wastes that are not recycled, reclaimed, or reused will be transported for disposal in an approved landfill.

[a] The Payara FPSO and development drill ships are not anticipated to have incinerators onboard.

Payara Project Waste Estimates, Non-Hazardous Wastes

Waste Information: Non-Hazardous Wastes				Volume By Year / Metric Tonnes							
Waste Stream	**Waste Source**	**Primary Management Method Anticipated**	**Alternate Management Methods Anticipated**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026 - 2043**	**2044**
Bulk Solids (Uncontaminated)	Barite, cement, blast media, dessicant, silica. Vessel dry bulk Tank cleaning	Landfill		62	248	248	255	256	256	13	13
General/Domestic Trash (non-recyclable)	Discarded items from kitchen, living quarters, bathroom, laundry, warehouse, offices	Landfill		55	242	249	406	421	421	320	320

Waste Information: Non-Hazardous Wastes				Volume By Year / Metric Tonnes							
Waste Stream	Waste Source	Primary Management Method Anticipated	Alternate Management Methods Anticipated	2020	2021	2022	2023	2024	2025	2026 - 2043	2044
Sack Waste (uncontaminated)	Cement mixing processes	Landfill		5	22	22	22	22	22	0	0
Incinerator Ash (offshore)	Incinerator (FPSO)	Landfill [a]		0	0	0	0	0	0	0	0
Scrap metal	Equipment maintenance, metal packaging	Recycle (if feasible)	Landfill	54	229	231	262	265	265	78	78
Dry Filters	General Maintenance	Recycle (if feasible)	Landfill	0	2	2	10	11	11	16	16
Paper & Cardboard	Paper & Cardboard packaging, documents	Recycle (if feasible)	Landfill	5	34	39	37	37	37	26	26
Wood	Wooden pallets, construction, general maintenance	Recycle (if feasible)	Landfill	66	266	267	290	293	293	46	46
Recyclable domestic trash (plastic & glass)	Discarded items from, kitchen, living quarters, bathroom, laundry, warehouse, offices	Recycle (if feasible)	Landfill	4	30	35	34	34	34	30	30

[a] The Payara FPSO and development drill ships are not anticipated to have incinerators onboard.

ATTACHMENT B GUYANA 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 Website: 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.

EPA-EMD2012HWRRF1R1

A. IDENTIFICATION INFORMATION			
Generator's Permit Reference Number:			
Company Name:			
Project Address:		Region	
Mailing Address (if Different):		Region	
Contact Personnel			
Name :			
Designation:			
Telephone number:			
FAX:			
Email:			

B. OPERATION DETAIL
Brief description of operating process and raw materials (specifically hazardous materials and quantity) used:
No. of Years of Operation: 1-4 years ☐ 5-19 years ☐ over 20 years ☐

C. HAZARDOUS MATERIALS/ CHEMICALS (All Parts of This Section Must Be Completed)

Types of Hazardous Materials/ Chemical	Hazardous Characteristics	Quantity of Hazardous Materials/Chemical		Physical Characteristics	Chemical Characteristics	Type of Storage

EPA-EMD2012HWRRF1R1

D. HAZARDOUS WASTES (All Parts of this Section Must Be Completed)						
Type of Hazardous Wastes generated	**Hazardous Characteristics**	**Quantity of Hazardous Waste Generated**		**Physical Characteristics**	**Chemical Characteristics**	**Type of Storage**
		Mass (kg/gallons)	**Volume (m^3)**			

E. SPILLS/CHEMICALS RELEASE		
Date/s of Incident	**Type and Approximate Amount of Waste Lost (kg/gallons)**	**Measures Taken to Resolve the Incident**

OTHER	
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)	

ATTACHMENT C 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:

ATTACHMENT D 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:

ATTACHMENT E SAMPLE CHAIN OF CUSTODY FORM FOR SAMPLES

CHAIN-OF-CUSTODY RECORD

1. Facility Information:

   Facility Name____

2. Sample Information:

   Time Sample Collected __________:__________ [ ] AM or [ ] PM (Check One)

   Date Sample Collected ____/____/____ (Month/Day/Year)

   Name of Sampler (Print) ____

   Signature of Sampler ____

   Sampler's Company Name ____

   Analysis Information: ____

3. Chain-of-Custody: (To be completed by each person relinquishing sample)

Name (Please Print)	Signature	Facility	Relinquished To (Name / Facility)	Date mm/dd/yr	Time

4. Laboratory Shipping Information:

   Laboratory Name: ____

   Laboratory Address: ____

   ____

   Date Shipped: ____/____/____ (Month/Day/Year)

   Estimated Arrival Date: ____/____/____ (Month/Day/Year)

   Estimated Arrival Time: Collected ________:______ [ ] AM or [ ] PM (Check One)

ATTACHMENT F SAMPLE MARINE TRANSPORT MANIFEST

Generator:		**From**	
Prepared Date:	Day-Month-Year		
Shipped Date:	Day-Month-Year	Well Nr/Ref:	
Lease Holder:	EEPGL	VESSEL:	

MANIFEST Nr:	**GUY-18-XXX**
OPERATOR REF	Vessel Owner-Operator
OTHER REF:	
DESTINATION:	Georgetown Supply Base

ITEM	QTY	WASTE CAT	DG REF	UN CODE	PACKING	S/N ID/REF	OTHER REF	DESCRIPTION	OWNER
1	1	n/a	n/a	n/a	n/a	13220		Containers c/w:	
	8	8	n/a	n/a	Bags			Old Grout Bag, Non Hazardous, Non Recyclable	
	6	8	n/a	n/a	Big Bags			Sack Room Waste, Non Hazardous, Non Rec	
2	1	n/a	n/a	n/a	n/a	13190		Containers c/w:	
	6	1	n/a	n/a	Big Bags			General - Non Hazardous - Non Recyclable	
3	1	n/a	n/a	n/a	n/a	13258		Containers c/w:	
	1	3	n/a	n/a	Skip			Wood - Non Hazardous - Non Recyclable	
4	1	n/a	n/a	n/a	n/a	13262		Containers c/w:	
	1	3	n/a	n/a	Skip			Wood - Non Hazardous - Non Recyclable	
5	1	n/a	n/a	n/a	n/a	13195		Containers c/w:	
	6	8	n/a	n/a	Big Bags			Sack Room Waste, Non Hazardous, Non Rec	
									Sub Totals

1st Transporter	2nd Transporter	Final Destination	
DATE:	VEHICLE REG/ID:	DATE	VEHICLE REG/ID:	Totals
NAME:		NAME	
SIGN:		SIGN	

Grand Totals

Final destination receiver to return a completed signed copy to originator.

Waste Categories

Glass
d - Aluminium
8 Chemical Waste
9 Hospital Waste
Oily Effluents
Hydraulic / Lube Oil / Fuel
14 Mud
15 Waste Water Mud
Tetra Pack
Vegetable Oil
Others

Declaration: I hereby declare that the information contained herein, is true and correct, to the best of my knowledge:

Signature: ______________________

Vessel Name: ______________________ *Name: (Print)* ______________________

ATTACHMENT G SAMPLE WASTE MANIFEST FORM

WASTE GENERATOR INFORMATION

Generator: ____________________

Address: ____________________

Contact Information: Office ________ Mobile ________ email ________

Contact Person: ________ Position ________

Manifest Number: ________

WASTE INFORMATION (To be completed by waste generator)

Waste Description: ☐ Hazardous ☐ Non Hazardous

(Provide a brief description) ____________________

Process Generating Waste: ____________________

____

Physical State ☐ Solid ☐ Liquid ☐ Sludge ☐ Other ________

Physical Properties Colour ________

Odour ________

MSDS ☐ Yes ☐ No

Special Handling Requirements ☐ Yes ☐ No

Waste Volume ☐ ______ Barrels (42 Gal.) ☐ ______ Drum (55 Gal.) ☐ ______ Gallons

☐ ______ Cubic Meters ☐ ______ Pounds

DISPOSAL INFORMATION (To be completed by TTTU)

Disposal Option ☐ Recycling ☐ Thermal Desorption

☐ Incineration ☐ Landfill

Disposal Facility ☐ Tiger Tanks ☐ Haag Bosch

☐ Other (Recycling) ________

Haulage /Storage ☐ Truck ☐ HWS Skip ☐ Cuttings Box ☐ Other

WASTE RECEIPT AT GENERATORS FACILITY

Physical State ☐ Solid ☐ Liquid ☐ Sludge ☐ Other ________

Physical Properties Colour ________

Odour ________

MSDS ☐ Yes ☐ No

Waste Volume ☐ ______ Barrels (42 Gal.) ☐ ______ Drum (55 Gal.) ☐ ______ Gallons

☐ ______ Cubic Meters ☐ ______ Pounds

Dispatched By: ________ Signature ________ Date ______

Received By: ________ Signature ________ Date ______

ATTACHMENT H SAMPLE WASTE INFORMATION DATA SHEET

GENERATOR INFORMATION

Generator: ______________________________ Date ________________

Address: ____

Contact Information: Office __________ Mobile ___________email_____________________

Contact Person: __________________________ Position______________________________

Waste Manifest Number : _____________________

WASTE INFORMATION

MSDS to be provided for all chemical drums, buckets and tote tanks for disposal.

Waste Description		***WMF***	***DN***	***Volume***			***Comments***
				lbs	*units*	m^3	
Hazardous Waste Liquids							
Oil contaminated water based drilling fluid							
Liquid oil residue / slops							
Oil contaminated completion brines							
Oil contaminated produce water or water							
Non-aqueous drilling fluid							
Contaminated deck drainage or other oily water							
Liquid treatment/ chemicals							
Solvents /paints/ Glycols							
Acid/ caustic solutions							
Used lube oil/motor oil/ grease							
Surplus fuels Heli, contaminated diesel							
Oil sludge							
Hydrocarbon contaminated sand							
SOBM / cement slops							
Hazardous waste solid/ other							
Contaminated solid products with oil or grease	*Rags*						
	Clothing						
	Absorbent pads						
	Wood						
	Used oil						
	Grease tubes						
	Dope brushes						
	Filter						
	Other						
Storage mediums contaminated	*Metal drums/ container*						
	Plastic drums/ container						

with hazardous waste such as chemicals, oils, paints	*Cardboard drums/ container*						
	Totes						
	Buckets						
	Threaded protectors						
	Biohazard/ Medical waste						
	Aerosol cans						
	Chemical drums						
Batteries	*Alkaline/ Lead acid batteries*						
	Ni-Cd/ Lithium Batteries						
Bulbs/ White Fluorescent tubes							
Light Ballast electronic equipment							
Recyclables	*Paper/ cardboard*						
	Scrap metal						
	Plastic bottles						
	Glass bottles						
	Aluminum can						
	Plastic packaging and wood						
Non- hazardous General waste/ other							
Water base drilling fluid							
Non- contaminated cement							
Other non-hazardous liquids							
Non-hazardous waste	*Food / Sanitary waste*						
	Sewage						
	Non- hazardous sludge/slops						
	Non hazardous solid industrial waste/ general trash						

ATTACHMENT I HAZARD CLASS SYMBOLS FOR HAZARDOUS WASTES AND MATERIALS

Esso Exploration and Production Guyana Limited

Stakeholder Engagement Plan for Guyana Operations

July 2020

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Contents

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Figures

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 Liza- and Payara-related Stakeholder Engagement Activities through February 2020, 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, 2012). 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.

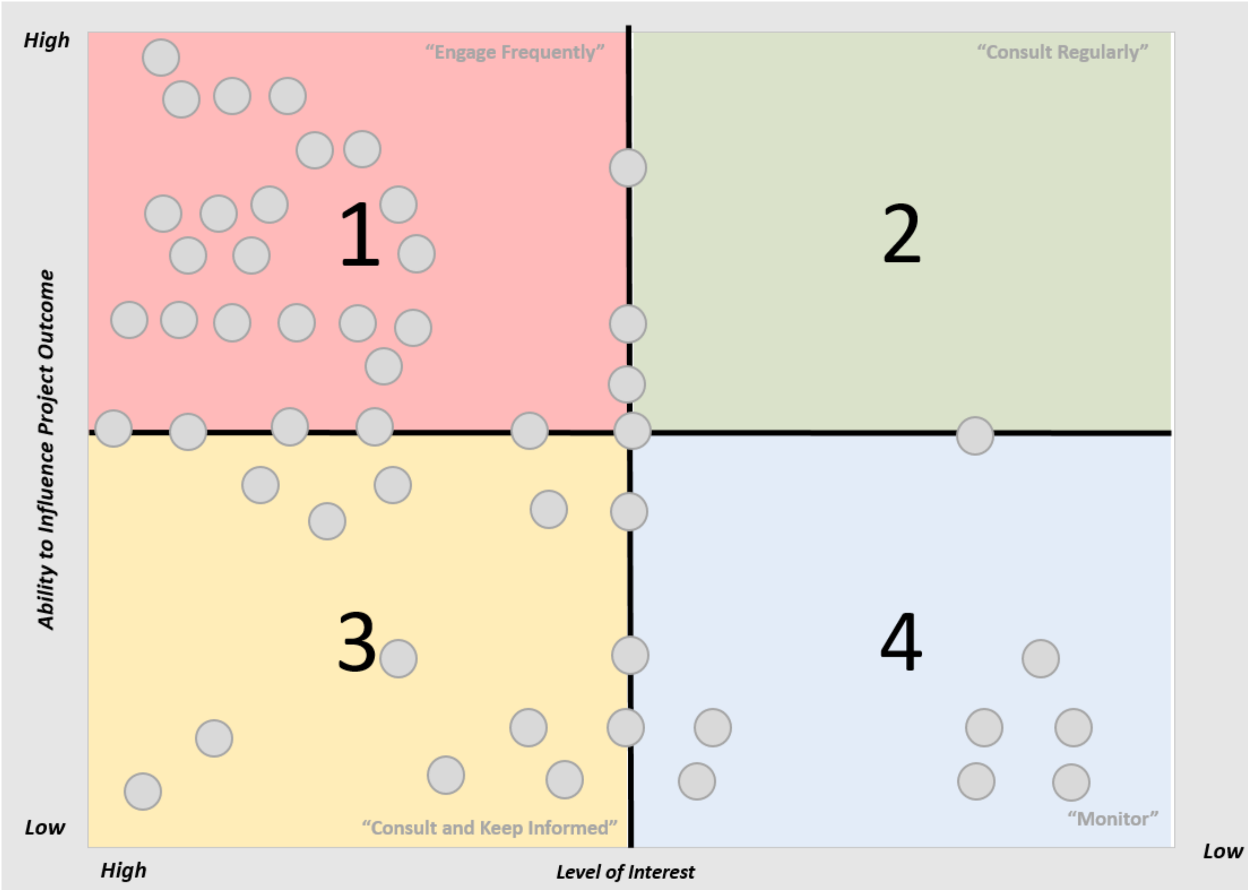

Figure 1: Example Stakeholder Map

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.

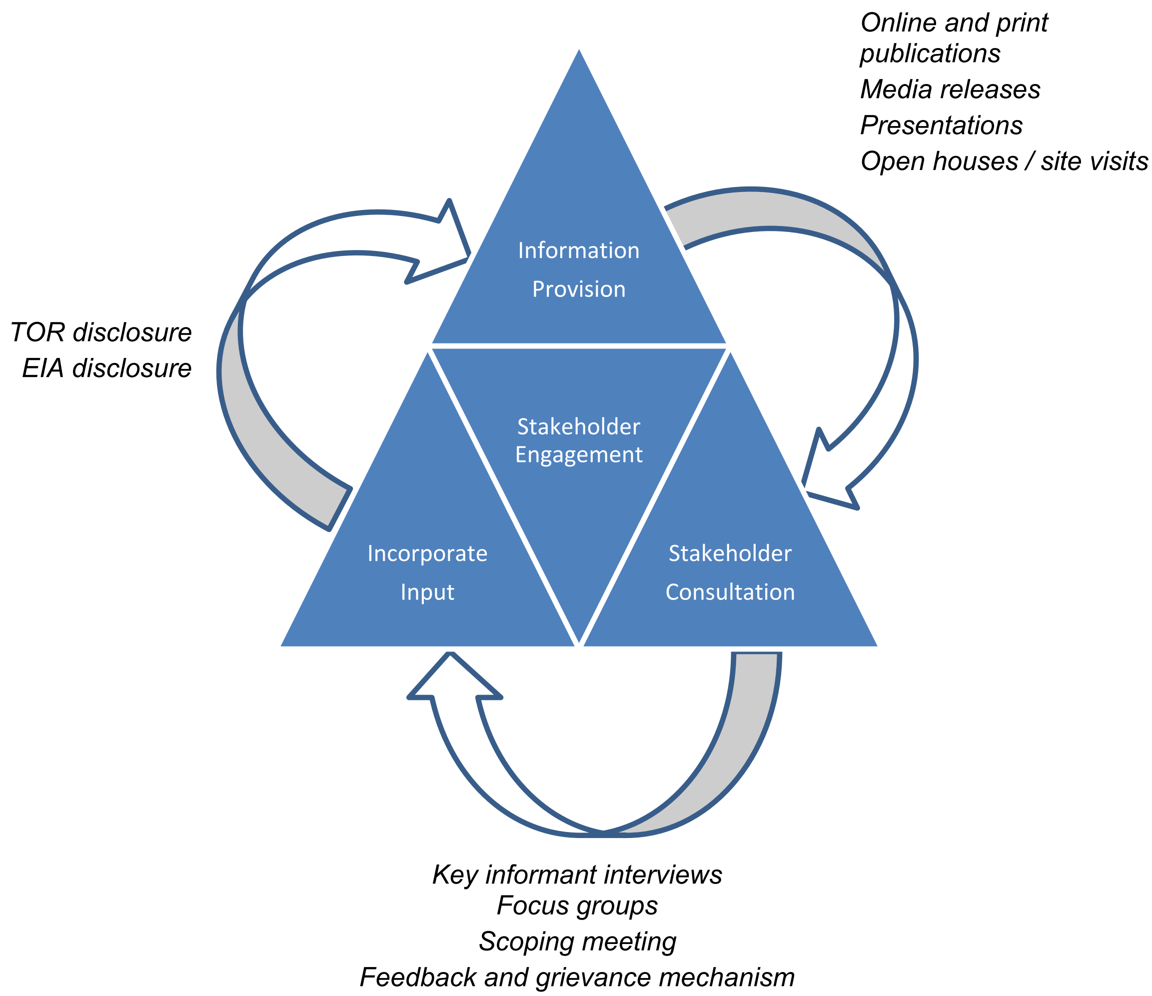

Figure 2: Example Stakeholder Engagement Strategy for EIA Development

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 Attachments C and D.

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 E.

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

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
Website: 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
EEPGL	
Lead Country Manager	• Review and approve the SEP • Assist in implementation of the SEP
Public and Government Affairs Manager	• Review and approve SEP to ensure alignment with current affiliate stakeholder engagement information, philosophies, activities, and relationships • Own and steward the affiliate's feedback mechanism, including the management of grievances • Assist in the development and implementation of the SEP • Assist in documentation of engagements conducted • Help maintain a comprehensive archive on captured data
Safety, Security, Health, and Environment Manager	• Review and approve the SEP • Review and authorize any financial provisions for stakeholder engagement (tied to SEA/EIA –related stakeholder engagement)
Environmental, Regulatory, & Socioeconomic (ER&S) Leads	• Review, approve and steward the SEP to ensure it meets permitting requirements • Assist in the definition, development and implementation of the SEP, ensuring correct application of EEPGL internal requirements • Periodically review progress in the development and implementation of stakeholder engagement activities • Periodically review the SEP, monitoring outcomes, and elaborate where necessary

Role	Responsibilities
Service Department and Business Leads/Advisors and Contractors	• Conduct engagements as directed by the affiliate and/or ER&S Leads • Complete all reporting including outcomes and stakeholder input for all engagements
Houston-based ExxonMobil Management	
Project Leadership	• Provide adequate resources to implement the SEP • Ensure that the SEP is designed, developed and implemented as per legal requirements and ExxonMobil requirements for all operations
Environmental and Social Consultants	
Environmental and Social Consultants	• Engage with stakeholders to explain the EIA process and collect information required to complete a robust EIA • Document all engagements conducted • 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.).

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 Authorisation 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 Liza and Payara Engagements). 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 Authorisation 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, and Payara 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
Public Meeting	26 March 2019	Regions 3 and 4
Public Meeting	28 March 2019	Region 2

More information on the attendees and issues raised at the public scoping consultation meetings is summarized in Attachment A (Synopsis of Liza and Payara Engagements).

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 Toshaos 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/River stown	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/ Pouderoyen			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

Source: Esri - World Ocean Map, National Geographic World Map

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

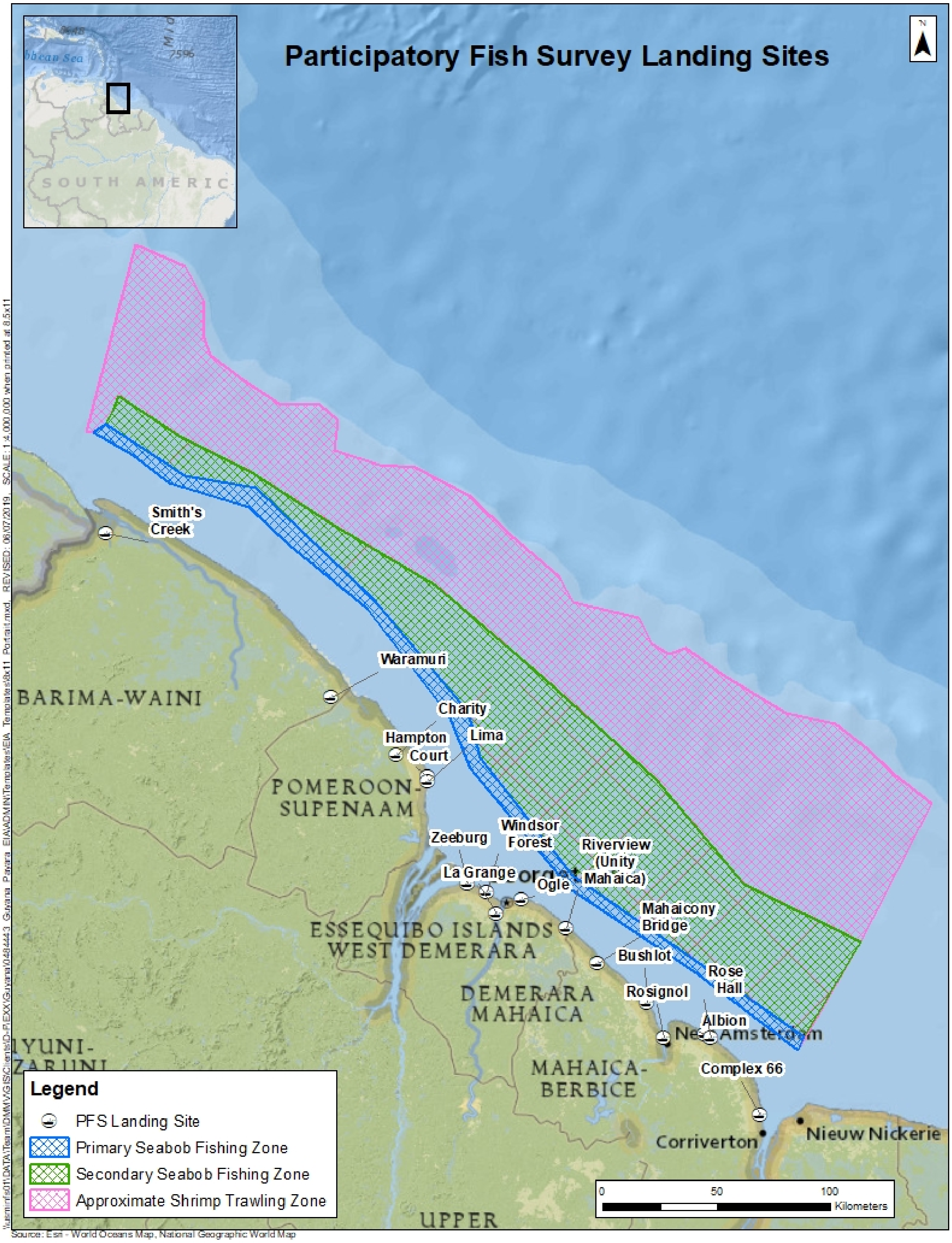

Figure 4: Landing Site Focus Group Locations for Participatory Fishing Study

Information on key informant engagements aimed at obtaining existing conditions information for EIA development is summarized in Attachment A (Synopsis of Liza and Payara Engagements).

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
Payara		
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

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 Liza and Payara Engagements).

4.7 Post-EIA Engagements

Conditions such as requirements for additional engagements may be included as part of the EPA's Environmental Authorisation. Information on these and other engagements conducted as part of Post-EIA requirements is summarized in Attachment A (Synopsis of Liza and Payara Engagements).

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.

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ATTACHMENT A SYNOPSIS OF LIZA AND PAYARA 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)	• First Deepwater well in Guyana • Resource-or constituency – related concerns
		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
		• Ministry of Labor, Human Services and Social Security • Special Department of Occupational, Safety and Health Department	Occupational, Health and Safety requirements
		Ministry of Local Government and Regional Development	Potential effect on communities
		Guyana Defense Forces and Guyana Police Forces	• Port Security issues • Road Safety through Town
		Ministry of Local Government – Solid Waste Management Department	Capacity and stability of waste management facility
		Ministry of Public Works, and Maritime Administration Department (MARAD)	• Maritime issues, maritime traffic • Security issues, incidents
		Transportation and Harbors Division, and Harbour Master	Wharf/Port access and development
		National Trust Department	• Cultural heritage issues • Archaeological finds

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)	• Risk and impact to Mangrove ecosystem • Impacts on coastal livelihood artisan fishing, beekeeping and sea defense protection
		Guyana Marine Conservation Society (GMCS) and Volunteer Youth Corp (Math and Science Initiative)	• Potential disturbance to sea coastline and transboundary movement • Community and social benefits from Project • Impacts of sound and noise from exploration on marine turtles and other sensitive biodiversity • Blowout prevention and emergency response
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	• Marine sound • Waste management • Effluent discharge standards • Oil spill preparedness and response
	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]	• Presidential briefing • Continue to build public support for the Project and confidence EEPGL capability. • Identify potential roadblocks/issues before they cause project risk.	President of Guyana	• Legislative requirements, policy requirements, general compliance and project support. • Economic development and local workforce and supplier participation in the project
	• General briefing • Ensure timelines and process is well understood. • Identify potential roadblocks/ issues before they cause project risk.	EPA/GGMC	• Legislative requirements, policy requirements, general compliance and project support. • Capacity concerns due to increasing activities in sector • Evolving regulations and legislation that can affect the agency • Pressure to evolve regulations to meet international standards
	EIA information sharing and baseline data collection interviews	Ministry of Agriculture, Department of Fisheries	• Potential overlap of Project activity with new deep-sea tuna fishery • Potential security concerns related to illegal fishing vessels entering floating production, storage, and offloading vessel exclusion zone
		Ministry of Communities	No Project-specific concerns/issues identified
		Ministry of Public Health	• Potential for added burden on Guyanese health system • Potential for social investment in the health sector
		Department of Tourism	• Possible changes to Guyana's image as a "green" nation
		Ministry of Social Protection	• Proper fulfilment of Occupational Health and Safety requirements for contractors; ensure contracts are clear on who is responsible

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
			• Proper payment and documentation for worker insurance coverage • Potential for informal communities to arise, with potential for prostitution or other exploitation
		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	• Current land speculation in relation to the Project • Guyana Land and Surveys Commission vetting of any new data produced
		Bureau of Statistics	Project information required to develop economic indicators for the country's new petroleum sector
		National Trust of Guyana	• No Project-specific concerns or issues identified • Interest in Corporate Social Responsibility support
		Private Sector Commission	• Ensure appropriate local content targets • Accountability and involvement in proper management and investment of the country's revenues from the Project • EPA capacity • Retention of institutional knowledge and experience from this Project
		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	• EPA/EEPGL transparency; availability of data and studies conducted to date for the Project • Recommendation for consultation with indigenous communities
		Conservation International	• Short timeline of the EIA and lack of EPA capacity • Appropriate use of mitigation hierarchy • Participation of ExxonMobil in the sustainable development of the country
		World Wildlife Fund	No Project-specific issues or concerns identified
		Association of Trawler Owners and Seafood Processors	No Project-specific concerns identified; the Project will be well seaward of trawling activity

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
		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	• Main concern for rice industry is improved access to lower cost fuel, which is a significant industry input. • 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
		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	• Interested in whether fuel costs will go down • Potential for damage to livelihoods in event of a spill for those residing near the mouth of the Pomeroon River
		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.	• Potential for oil spills and their impact on those directly and indirectly employed by fishing • Expected communication from EEPGL sooner, given that exploration has been ongoing
		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	• Use of Kingston seawall area for festivals and religious ceremonies • Local employment, including skills and technology transfer
		Guyana Hindu Dharmic Sabha	• Use of seashore for religious ceremonies, including funerals • Community investment
		Region 2 Development Council	• Importance of face to face consultation with Region 1 and 2 local stakeholders • Potential for spills • EPA capacity

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
			• Community investment
	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.	• Oil spill response procedures and capabilities • Process for updating Terms of Reference (ToR) to reflect scoping comments • Other potential uses of produced gas • Government revenues from Project • Local employment
	Six (6) Public EIA scoping meetings (Regions 1-6) led by EPA	Various national, regional and local agency representatives as well as private citizens.	• National and local benefits, proper management/oversight of revenues • Local employment • Oil spill response procedures and capability • Impacts on fishing • MMO data availability • Impact of potential natural disaster on Project infrastructure and development area • Recommendations to increase public participation at scoping meetings • Other potential uses for produced gas
	Agency-specific EIA disclosure meetings	Guyana Marine Conservation Society	• Coastal sensitivity mapping process, and ways to improve quality of maps
		EPA	• Air monitoring equipment and methodology • Rationale for EIA conclusions on air emissions impact on public health • Economic impacts of cooling water discharges to fish e.g. yellowfin tuna • Details of water modeling assumptions and limits
		Ministry of Natural Resources	• Factors considered in oil spill modeling • Possibility of piping gas to shore or locating a refinery in Guyana
		Community Development Council and MARAD	• Definition of routine discharges • Engagement with neighboring countries that could be impacted by spills (T&T, Venezuela) • Liability for cleanup/restoration in event of a spill
		Ministry of Indigenous Peoples' Affairs	• Possibility of piping gas to shore or locating a refinery in Guyana • Likelihood of oil spills reaching the coast • Capacity-building needs to allow proper use of government revenues: Engineering, IT, infrastructure, environmental protection • How to use Project benefits to optimize and protect Guyana's natural riches

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
		National Trust of Guyana	No Project-specific issues or concerns identified
		Ministry of Communities	• Oil spill impacts on fish and commercial fisheries • Waste management – request for guidance on influencing cultural and behavioral changes with respect to waste management practices in the country
		Guyana Hindu Dharmic Sabha	• Estimate of local employment • Request info on local opportunities • Procedure for removing fishing boats from exclusion zone • Frequency/duration of disruption to fishing during Project vessel transits • Publicizing of Grievance Mechanism
		Ministry of Public Health	• Estimate of local employment • Why is a refinery not considered for Guyana • Clarification about potential health impacts of air emissions
	One (1) multi-agency EIA disclosure meeting	MARAD, GGMC, Ministry of Natural Resources, Community Development Council, Ministry of Agriculture (Dept of Fisheries)	• Time required for recovery of benthic species • Request to see remotely operated vehicle images • Chemical discharges and their toxicity • Species that could be introduced by ballast water • Potential for impacts within the mixing zone
	Two (2) Public EIA disclosure meetings led by Environmental Resources Management		• Potential oil spills - how would they be responded to/compensated. • Benefit sharing – how would this be distributed among regions • Timeframe in which Guyanese will experience socioeconomic benefits • Request for social scholarships, jobs, job training, and extra help to better plan for the environment • Wastes generated and their potential impacts • Management of drill cuttings • Seismic survey impacts on whales • Approach if impacts are found to be greater than predicted – would operations be stopped • Potential impacts on fishing livelihoods, sustainaibility of fisheries for future generations. • Process for monitoring air pollution • Liability in the event of an oil spill moving to another country's coast • Rationale for low spill potential • Consider use of fisherfolk and other citizens in environmental monitoring efforts • Transparency regarding revenue sharing agreement

<table>
<tr><th colspan="4">SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES</th></tr>
<tr><th>Project Activity</th><th>Objective / Desired Outcome</th><th>Stakeholders / Audience</th><th>Potential Concerns, Issues & Sensitivities</th></tr>
<tr><td rowspan="8">Liza Phase 1 EIA Post-Permit Studies [June 2017 to May 2018]</td><td>Coordination and Planning Workshop</td><td>EPA, PAC, GMCS, CI, National Toshoas Council, University of Guyana</td><td>Development of methdologies for the coastal mapping studies, including ecosystem servies and biodiversity, and turtle telemetry</td></tr>
<tr><td rowspan="7">Consultations for planning and execution of post-permit studies</td><td>EPA</td><td>Coordination and approvals of Post-Permit Studies methodologies and timelines, including paricipation from EPA staff</td></tr>
<tr><td>Ministry of Agriculture (Department of Fisheries)</td><td>Representative from Department of Fisheries to participate in Coastal Fishing Study consultations and execution</td></tr>
<tr><td>Various fishing associations, boat owners, and equipment suppliers</td><td>Provision of information regarding potential boat rentals and equipment procurement.</td></tr>
<tr><td>• 39 coastal regional, democratic and village council meetings in Regions 1-4
• More than 369 neighborhood and village council leaders and community members engaged</td><td>• Ecosystem Services Basline data collection and field verification
• Requests for more information and updates on EEPGL’s activities and the oil and gas sector in general
• Requests for copies of the coastal sensitivity map once completed</td></tr>
<tr><td>Protected Areas Commission</td><td>Coordination and approvals of Turtle Telemetry Study conducted on Shell Beach Protected Area</td></tr>
<tr><td>Fisherfolk througout Regions 2-6</td><td>Participatory fishing study survey to determine</td></tr>
<tr><td>Liza Phase 1 Development Drilling [April 2018]</td><td></td><td>Fisheries Department, fishing associations, boat owners, fisherfolk througout Regions 2-6</td><td>• Discuss Notice to Mariners pertaining to Development Drilling start date of 1 May 2018
• Identify and communicate with maritime users who might not ordinarily receive Notices to Mariners
• Record locations of fisheries activities and to check for adherence to communications protocol and grievances follow up</td></tr>
<tr><td rowspan="2">Liza Phase 2 Development EIA
[January 2018 to August 2018]</td><td>One Agency ToR scoping meeting led by EPA</td><td>Multiple public and private agencies and non-governmental organizations including EPA, GGMC, Ministry of Public Health, Ministry of the Presidency, GMCS, WWF, CI, others.</td><td>• Status of Liza Phase 1 Post-Permit studies
• Cumulative Impacts
• Timelines for the ToR and EIA study
• Public benefits as a result of oil wealth and how that influences their behavior
• How EIA studies will account for cycles on an annual and multi-year basis</td></tr>
<tr><td>Continued engagement; scoping discussions (January 2018)</td><td>• Twenty-four (24) coastal regional, democratic and village council meetings in Regions 5 and 6
• More than 167 neighborhood and village council leaders and community members engaged</td><td>• Ecosystem Services Basline data collection and field verification
• Requests for more information and updates on EEPGL’s activities and the oil and gas sector in general
• Requests for copies of the coastal sensitivity map once completed</td></tr>
</table>

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
	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.	• Production schedule and drilling locations • National and local benefits, proper management/oversight of revenues • Local employment and training • Oil spill response procedures and capability including compensation and insurance • Impacts on coastal zones, mammals, fishing and other livelihoods • Waste management procedures including independent monitors • Impact of potential seismicity and natural disasters • Recommendations to increase public participation at scoping meetings • Considerations given to socioeonomic resources • Responsibility of regulatory agencies and dissemination of information • Regional and other country concerns
	Scoping and baseline data collection interviews (April and May 2018)	• 14 coastal regional and village council meetings in Region 1 • More than 167 neighborhood and village council leaders and community members engaged	• Ecosystem Services Basline data collection and field verification • Discussion on oil spill response and training, including potential impacts on Shell Beach • Requests for copies of the coastal sensitivity map once completed
		PAC	• Details pertaining to Liza Phase 1 post-permit studies • Potential impacts on Shell Beach • Participation of Amerindian villages surrounding Shell Beach Protected Area, including updates on previous exercises conducted • Access to turtle tracking information
		GMCS	• Expansion of marine mammal observation over larger geographic area • How will Liza Phase 1 post-permit studies be utilized in the EIA and shared • Oil spill modeling should take into consideration seasons and cumulative effects • EEPGL insurance and protocols in the event of a disaster
		GGMC	• Details on exclusion zones for workovers • Changes in boundary/area for harvesting of certain fish species • Oil spill modeling should take nto consideration cumualtive effects • Environmental studies should consider monitoring • Worker health and safety and emergency response • Hazardous waste handling

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
		Conservation International	• Synergy between Liza Phase 1 post-permit studies and a CI Mangrove Study planned for area from Guyana coast to North of Brazil. • Potential involvement of University of Guyana students in future studies to allow for capacity-building • Availability of data resulting from current and ongoing studies
		Ministry of Agriculture, Fisheries Department	• Need for Notice to Mariners to be supplemented by targeted information sharing through engagement • Protocols for encroachment on safety exclusion zones
		Fishing associations, boat owners, fisherfolk throughout Regions 2-6	• Oil spill response protocols and compensation • Protocols for encroachment on safety exclusion zones
		National Trust of Guyana	• Chance Find Procedure and Cultural Heritage Monitoring Programme previously shared was reviewed and is acceptable • Indicated that its own procedures have been published although guidelines are subject to change during revisions • Queried what mechanism will be in place to detect cultural heritage offshore if encountered • Clarified point of contact for further engagements is the Chief Executive Officer
		WWF	• Questions about methodology and data for coastal mapping • Expect EIA to be more rigid in terms of analysis (modelling and extrapolation) • 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 • Results of the marine turtle telemetry will be useful to the for PAC's marine turtle conservation plan
	Continued engagement with Region 1 coastal communities (June 2018)	Shell Beach Protected Area residents; Protected Areas Commission Rangers.	• Review of turtle telemetry programming • Oil spill response and training requirements • Impacts on marine mammals and mitigations
	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.	• Results of the oil spill modeling and compensation in the event of an unmitigated spill • Impacts on biodiversity, especially marine mammals • Impacts on livelihoods, with a particular focus on fishing and agriculture

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
	EIA workshop with EPA and Environmental Assessment Board(August 2018)	EPA, Environmental Assessment Board, Ramboll Consulting	• Question and answer session led by techincal specialists
All Projects [November 2018]	Ongoing engagement related to improving capacity of social infrastructure	Ministry of Tourism	• Communicate EEPGL's health, safety, and security standards and requirements for lodging and accommodations
Liza Phase 1 Development Drilling [January 2019]	Ongoing Monitoring – Stakeholder Engagement	Fisheries Department, fishing associations, cooperatives, boat owners, artisinal and commerical fisherfolk througout Regions 1-6	• Discuss Notice to Mariners pertaining to Development Drilling updated January 2019 • Identify and communicate with maritime users who might not ordinarily receive Notices to Mariners; check for adherence to communications protocol and grievances follow up
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	• Presentation on the methodology, techniques, and findings of the Liza Phase 1 Post-Permit Turtle Telemetry Program (conducted in 2018) • Training on telemetry devices and computer tracking systems • Discuss future turtle research and programming ideas
	Geographic information system and coastal mapping capacity building (March 2019)	NAREI, EPA	• Presented coastal mapping efforts and mangrove research • Reviewed geographic information system survey data platforms and methodologies
	Coordination on Ecosystem Services Validation Efforts in Region 1 (April 2019)	Ministry of Indigenous Affairs; National Toshaos Council; Region 1 leadership	• Discuss planning and methodology for Ecosystem Services validation efforts • Ensuring participation in focus group meetings at the Village level by members of vulnerable populations
	Ecosystem Services Validation Efforts (May to July 2019) • Discuss and validate 2017/2018 Ecosystem services baseline data information and associated Coastal Resources Mapping • Provide updated data relating to ecosystems benefits and socioeconomics		
	Region 2 validation of 2017/2018 ecosystem services data (May 2019)	60 stakholders in 6 Neighborhood Democratic Councils (NDCs): Charity/Urasara; Evergreen/Paradise; Aberdeen/Zorg-en-Vlygt; Anna Regina Town Council; Annandale/Riverstown; Good Hope/Pomona	• Seabed disturbance after decommissioning • Impacts from drilling to irrigation and saltwater intrusion along Pomeroon River • Socioeconomic impacts, including "Dutch Disease" • Coastal erosion and impacts on sea defense • Oil spill response procedures, impacts on livelihoods, compensation • Request more frequent engagement • Sargassum weed proliferation of the marine space and canals and connection to drilling • Hurricane and seismic concerns as a result of drilling • Employment and training opportunities

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
	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	• Biodiversity baseline data and environmental impacts • Impacts and genesis of the Sargassum weed on the local environment • Oil spill response procedures, impacts on livelihoods, compensation • Employment and training opportunities
	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	• National and local benefits as a result of oil and gas revenue • Oil spill response procedures, impacts on livelihoods, compensation • Government's gas to shore project site selection and refinery questions • Hurricane and seismic concerns as a result of drilling • Employment and training opportunities • Offshore and nearshore safety exclusion zones • Impacts on mangroves and sea defense systems
	Region 1 validation of 2017/2018 ecosystem services data (June 2019)	175 stakeholders, National Toshaos 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	• More information/awareness required on oil and gas in easy to understand format and tools (e.g., brocuhures) • Concerns regarding oil spills, environmental impacts, turtles, crabbing and fishing, hinterland communities • Profit sharing and cost of exploration activities • EPA Scoping/Disclosure meetings held in Mabaruma should have also occurred in Moruca Sub-region, which has a larger population.
	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	• 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 • Oil spill prevention, preparedness, response procedures, impacts on coastal livelihoods, insurance, and compensation • Employment and training opportunities including opportunities for retrenched sugar workers and for young persons • Seismic and land subsistence concerns as a result of drilling • Impacts of hurricanes on the FPSO; sea turtles; and mangroves
	Region 3 validation of 2017/2018 ecosystem services data (July 2019)	110 stakeholders in 10 NDCs: Wakenaam (island); Leguan; Mora/Parika; Hydronie/Good Hope; Greenwich Park/Vergenoegen; Tuschen/Uitvlugt; Stewartville/Cornelia Ida; Hague/Blankenburg; La Jalousie/Nouvelle Flanders; Best/Klien/Pouderoyen	• Oil spill response procedures, impacts on livelihoods, compensation • Employment, training, and community development opportunities • Project location and details related to FPSO components • More frequent engagement and dissemination of information • Seabed and marine life disturbance • Offshore and industrial waste management

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
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.	• Production schedule and drilling locations • National and local benefits, proper management/oversight of revenues • Local employment and training • Oil spill response procedures and capability including compensation and insurance • Impacts on environmental resources, coastal zones, mammals • Impacts on socioeconomic resources, including fishing and other livelihoods • Waste management procedures including independent monitors • Recommendations to increase public participation at scoping meetings and enhance stakeholder engagement process • Responsibility of regulatory agencies and dissemination of information in EIA process and environmental monitoring • Consideration of cumulative impacts and lessons learned from Liza 1 and Liza 2 developments
	Scoping and baseline data collection on fisheries through Participatory Fishing Study focus groups (April–July 2019)	• 100+ fisherfolk at 16 fisheries landing sites in Regions 1 to 6: Smith's Creek; Waramuri • Charity; Hampton Court; Lima; Zeeburg; Windsor Forest; LaGrange; Ogle; Riverview (Unity/Mahaica); Mahaicony; Bush Lot; Rosignol; Albion; Rose Hall; Complex 66	• Obtain biological and socioeconomic data from fisherfolk regarding artisanal and commercial fishing activities • Engagement continues on a monthly basis in Region 1 and bi-monthly basis in Regions 2-6
	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	• Obtain biological and socioeconomic data from fishing cooperatives • Discuss Payara project and general EEPGL-related offshore activities • Engagement continues on a monthly basis
	Continued engagement with Region 1—Year 2 Turtle Telemetry Research (May 2019)	Shell Beach Protected Area residents; PAC Rangers; EPA; University of Guyana	• Participation in turtle telemetry programming and field efforts • Impacts on marine mammals and mitigations
	Scoping and baseline data collection key informant interviews (May and June 2019)	Bureau of Statistics	• 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 • Requested copies of the reports of studies conducted in support of the EIA
		Ministry of Agriculture	• Shared views on how the oil and gas sector may impact the agricultural sector • Provided information on projects to develop the agricultural sector, including value-added initiatives

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
			• Shared statistics for the agricultural sector
		GGMC	• 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 • Methods for managing increased vessel traffic in Georgetown Harbour • Probabilities of significant oil spills occurring in Guyana • Security for floating production, storage, and offloading vessel against foreign military vessels
		Conservation International	• Requested the EIA assess critical habitats that need special treatment under International Finance Corporation • Cumulative research effort, in particular for biological studies, that was conducted in support of the Liza Phase 1, Liza Phase 2, and Payara projects • Goal of the EIA towards environmental management • Volumes of waste that will be disposed at the Haags Bosch Landfill • Expressed need for a non-technical Executive Summary • Concerns on traffic congestion and safety in the vicinity of the Guyana Shorebase Inc. • Rquested access to the data and reports of the studies conducted in support of the EIA.
		Ministry of Agriculture, Fisheries Department	• Shared plans for enhancing the management of Guyana's fisheries sector and further development of the sector, including deep-sea fishing • Outlined the challenges facing the fishing industry • Indicated some of the concerns for the fishing sector as it pertains to oil and gas • Requested copies of the reports of the studies conducted in support of the EIA (those related to the fisheries sector)
		NAREI	• Shared feedback on mangrove coverage in the coastal sensitivity maps prepared as part of the Liza Phase 1 Post-Permit Ecosystem Services Study • Provided information on a mangrove mapping project that is being implemented in collaboration with CI • Shared plans for additional mangrove restoration activities, including in Region 1
		National Trust of Guyana	• Shared concerns on how the oil and gas sector may influence cultural heritage sites in Georgetown • Shared plans for reconsidering the current system for historical preservation of these sites

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
			• Provided data on cultural heritage sites and archaeological sites in Guyana.
		WWF	• 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.
		Centre for Local Business Development (CLBD)	• Overview on their Supplier Registration Portal • 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); • Views on how the CLBD contributes to local content • How the oil and gas sector is likely to contribute to national development in Guyana
		University of Guyana, Department of Engineering	• Avocated for one cumulative EIA instead of multiple EIAs for each development project • Shared plans for developing courses to prepare students for employment in oil and gas • Welcomed partnerships with EEPGL and the Consultants to share knowledge and experiences with students
		Ministry of Social Protection	• Highlighted the need to ensure the welfare, health, and safety of Guyanese workers • Shared information on the process to develop occupational health and safety regulations for the oil and gas sector
		Guyana Lands and Surveys Commission	• Indicated perceptions of how the oil and gas sector has impacted the demand for land in Region 4, particularly in Georgetown • Shared plans for enhancing the system for integrated land use planning in Guyana
		Ministry of Business Department of Tourism	• Shared views on how the oil and gas sector may impact tourism in Guyana • Provided plans for development of tourism initiatives in Regions 1 to 6
		Ministry of Communities	• Suggested that the EIA consider how oil and gas may influence the socioeconomic conditions of Regions 7 to 10 • Suggested the EIA should include a study on commercial sex workers in relation to the oil and gas sector • Shared plans for the housing and water sectors
		Ogle Airport	• Obtained data on aiport capacity; monthly passenger count; runway dimensions; helicopter landing zones demand and associated constraints

SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
		Protected Areas Commission	• Shared views that the NTC and GMCS should be included in engagement in Region 1. • Enquired about the methods of biological and socioeconomic baseline data collection in indigenous communities. • 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.
	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	• 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.
	EEGPL-led public informational meeting/targeted engagement with Region 3 stakeholders (July 2019)	Region 3 community leaders and members in Wakenaam and Leguan	• Job opportunities, oil spill response, split revenues, and benefits for Guyanese people (training / scholarships). • Social support for schools in Wakenaam requested.
	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	• Obtain seasonal biological and socioeconomic data from fisherfolk regarding artisanal and commercial fishing activities • Engagement continues on a monthly basis in Region 1 and bi-weekly basis in Regions 2-6 • Discuss Payara project and general EEPGL-related offshore activities and provide
	EEPGL-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.	• Provide opportunity for the general public to learn more about the Payara Project and engage one-on-one with experts on key topics • Questions were asked of experts one-on-one related to biological resources, physical resources, socioeoncomic resources, unplanned events, and local content opportunties, among others
	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.	• Project description details • Local employment and training • Oil spill response procedures,capabilities and responsibilities • Impacts on environmental resources, marine life, coastal zones, fisheries • Impacts on socioeconomic resources, including fishing and other livelihoods • Waste management procedures including independent monitors
	Ecosystem Serivces 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 etforts	• Provision of packages to each of the local community groups who paricipated in the Ecosystem Services Study, including finalized maps, analysis and thank you letters • Provision of EEPGL and Project related material, including community feedback mechanism information

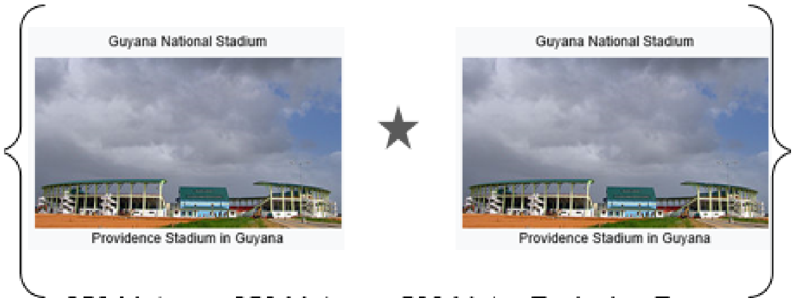
SYNOPSIS OF PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES			
Project Activity	**Objective / Desired Outcome**	**Stakeholders / Audience**	**Potential Concerns, Issues & Sensitivities**
	EIA and other government agency meetings to review EIA (January and February 2020)	Various government entities, including third party reviewers	• Discussed questions and suggestions for amendments to EIA that were provided by the EPA, EAB, NGOs, members of the public and third-party reviewers.

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?



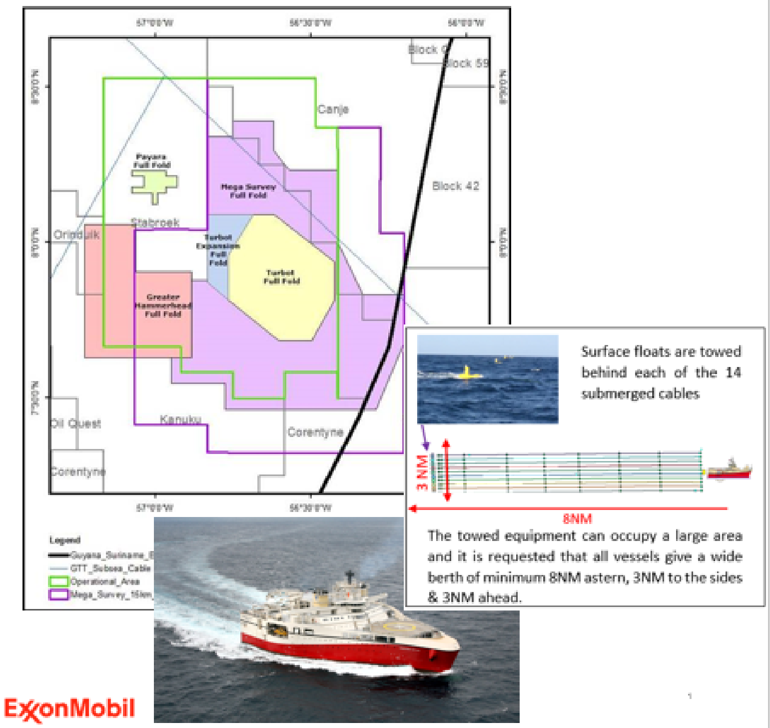
250 Meters + 250 Meters = 500 Meter Exclusion Zone or ¼ of a Nautical Mile

- **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



ExxonMobil

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.

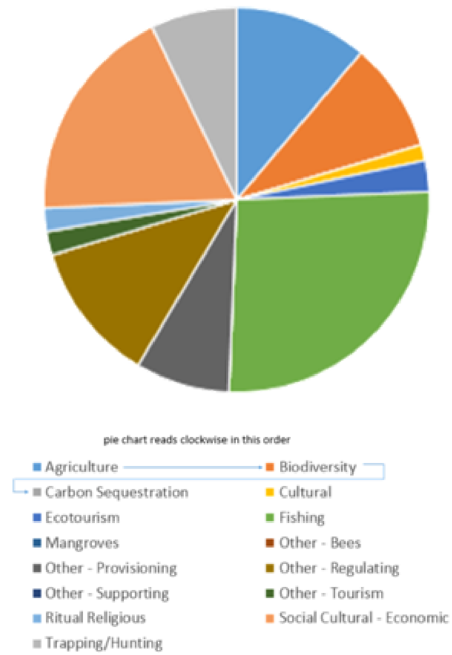
The Study was able to, for the first time, map exact locations of where ecosystem services exist along the coast. Over 700 community leaders and members, from National Democratic Councils, Village Councils, Town Councils, Regional Democratic Councils participated in the Study.

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

Source: EMC

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

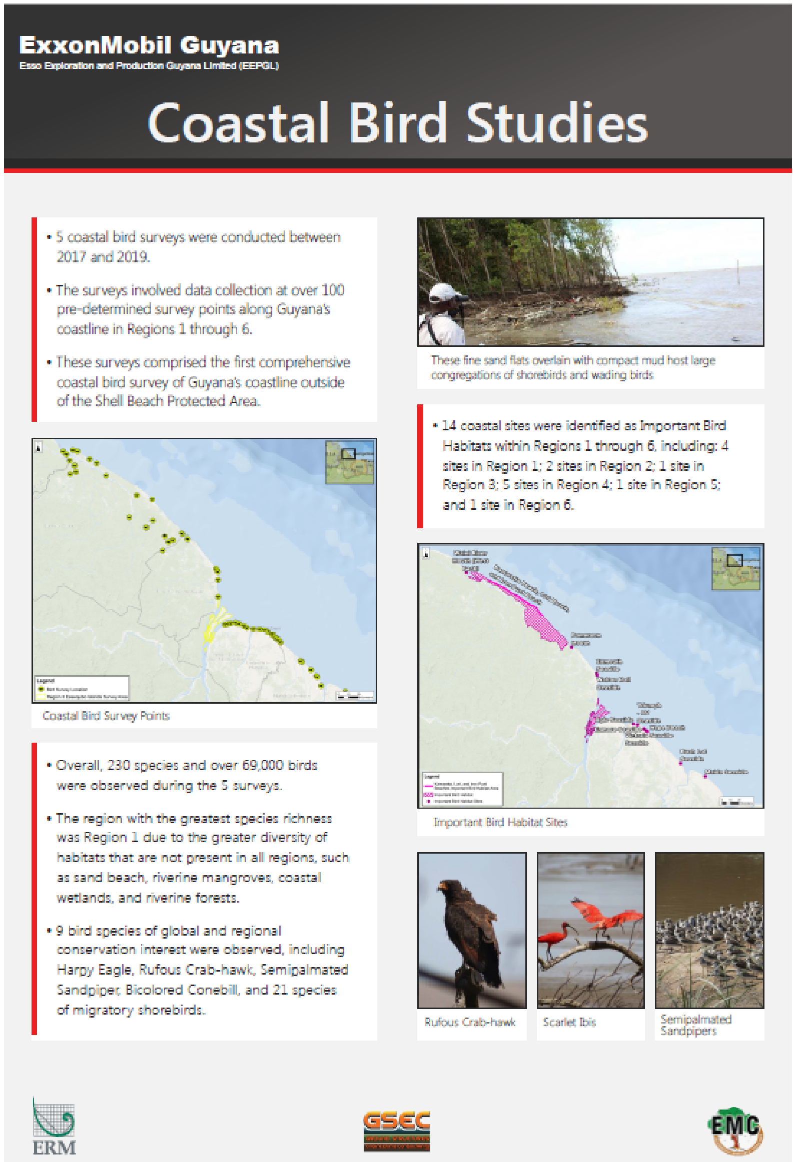
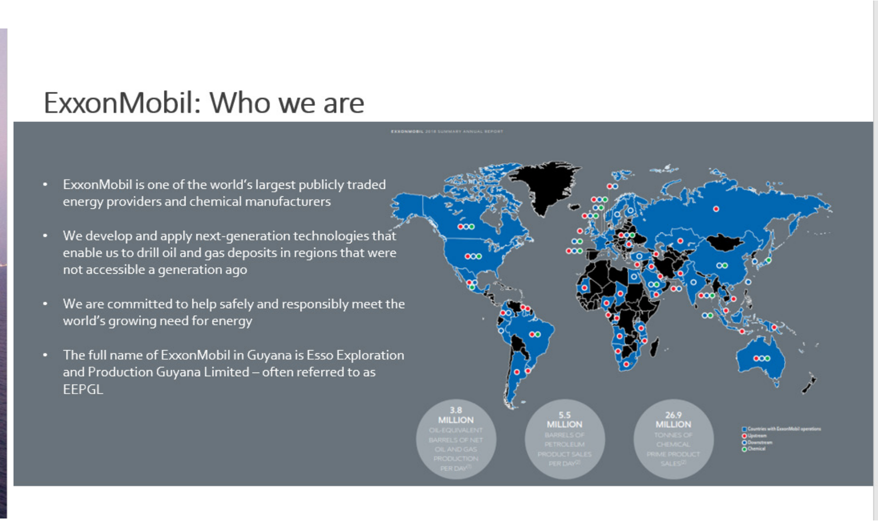


Figure C-3: Examples of Posters and Handouts for Payara EIA Public Informational Sessions and Open House



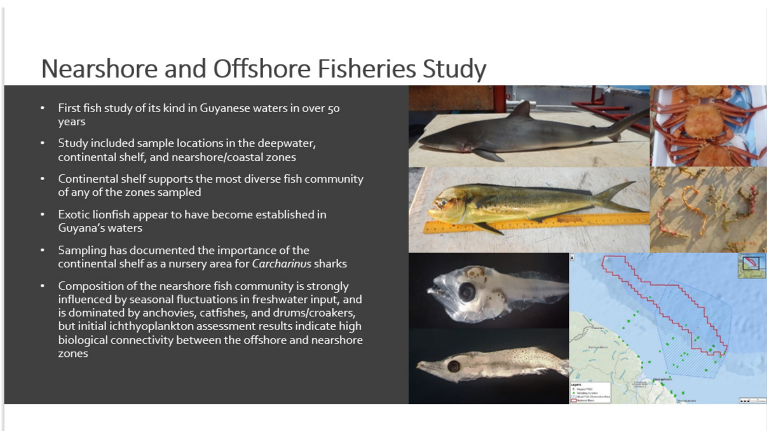


Figure C-4: EEPGL's 27-Page Informational Guide Provided to Members of the Public in 2019

For information or inquires

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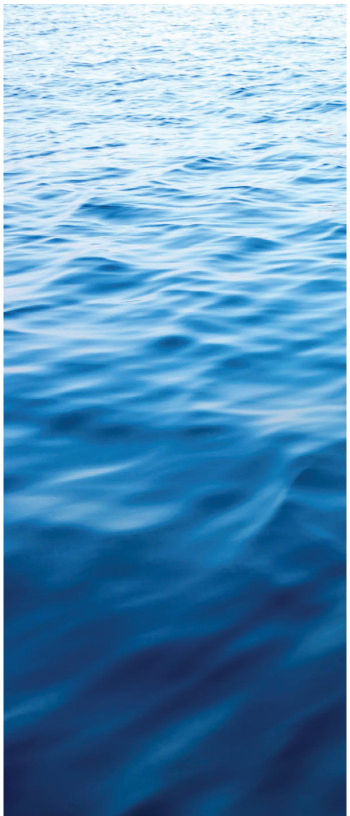
Figure C-5: Sharing EEPGL's Community Feedback Mechanism through Presentations, Brochures, Handouts, and Cards

ATTACHMENT D PAYARA EIA NON-TECHNICAL SUMMARY



Environmental Impact Assessment

Payara Development Project

Esso Exploration and Production Guyana Limited

Non-Technical Summary

ERM

GSEC GROUND STRUCTURES ENGINEERING CONSULTANTS INC.

EMC

September 2019

PAYARA DEVELOPMENT PROJECT

In addition to Liza Phase 1 and Phase 2 projects, EEPGL is planning for a third new development project within the Stabroek Block – referred to as Payara, which is ~200km from the coast.

EEPGL is currently seeking environmental authorization through the Environmental Protection Agency (EPA) for the initial production phase, which is expected to start in 2023 and continue for ~20 years.

The development plan for Payara includes a Floating Production, Storage, and Offloading Vessel (FPSO) and Subsea, Umbilicals, Risers, and Flowlines (SURF) production system (example depicted below), with tankers taking the oil to global markets.

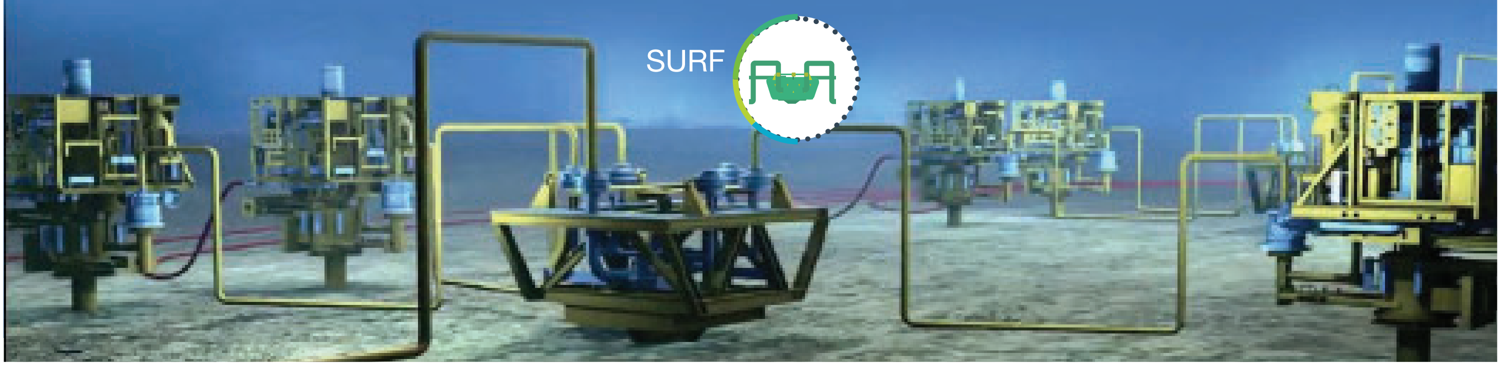
- Floating Production, Storage, and Offloading Vessel
- Subsea, Umbilicals, Risers, and Flowlines
- Export Tankers
- Drill Ships

DRILL SHIP

FPSO

EXPORT TANKER

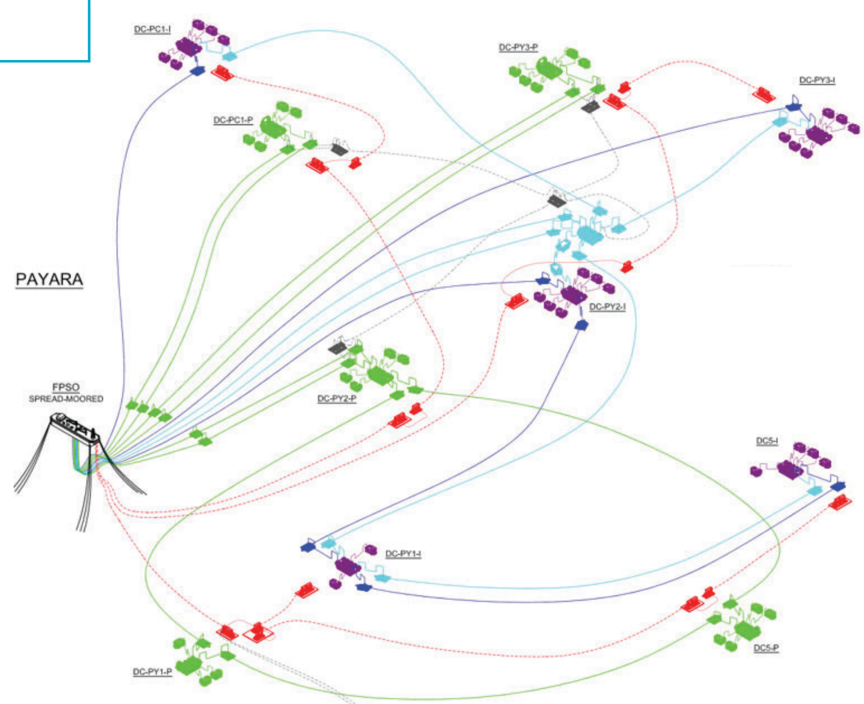
SURF



PAYARA DEVELOPMENT PROJECT

PAYARA FACILITIES PROJECTIONS	
Oil Production Capacity	220,000 barrels per day
FPSO Oil Storage Capacity	2.0 million barrels
Offloading Frequency by Export Tankers	Every 4–6 days
Wells	Up to 45 wells

- Production
- Water Injection
- Gas Injection
- WAG
- Umbilical
- Flying Lead
- Future/Optional



Payara SURF Field Layout

PRELIMINARY WORKFORCE LEVELS	
Well drilling	~600 persons at peak utilizing up to two Drill Ships
FPSO and SURF Mobilization/ Installation/Hookup	~600 persons at peak
Production Operations, including FPSO and conventional export tankers	~100-140 persons at peak, with an additional 25-30 persons onboard the tanker
Decommissioning	~60 persons at peak

APPROACH TO EIA

1 The purpose of the EIA is to provide an independent, factual and technical basis required by the EPA to make an informed decision on EEPGL's Application for Environmental Authorisation.

2 The project includes activities during drilling and installation, production, and decommissioning

3 The activities will have potential impacts on resources offshore and onshore in the greater Georgetown area. The resources are categorized into one of three categories:

- Physical resources
- Biological resources
- Socioeconomic resources

4 These resources include, but are not limited to:

- Air Quality and Climate
- Marine Water Quality
- Marine Benthos and Marine Geology and Sediments
- Seabirds
- Marine Fish
- Marine Mammals
- Riverine Mammals
- Marine Turtles
- Ecological Balance and Ecosystems
- Employment and Livelihoods
- Community Health and Wellbeing
- Marine Use and Transportation
- Social Infrastructure and Services
- Waste Management Infrastructure Capacity

5 Receptors are studied to determine existing conditions

6 Potential impacts are assessed

7 Potential impacts will be reduced through management measures, embedded controls and mitigation measures such as:

- Stakeholder engagement
- Notices to mariners
- Use of low-toxicity drilling fluids

8 The project's potential residual impacts are assessed and given one of six ratings:

POSITIVE, NONE, NEGLIGIBLE, MINOR, MODERATE, MAJOR

PROJECT ACTIVITIES

The Project activities and potential unplanned events listed below may potentially interact with existing resources/ receptors

These interactions could potentially create direct, indirect, or cumulative environmental or socioeconomic impacts.

DEVELOPMENT DRILLING STAGE

- Drill ship and drilling operations (power, drill cuttings, discharges)
- Vertical Seismic Profiling operations
- Remotely operated vehicle operations
- Offshore and onshore waste management

Installation of FPSO/SURF components:

- Marine installation vessels and FPSO
- Remotely operated vehicle operations
- Installation of SURF equipment
- Hook-up and commissioning
- Offshore and onshore waste management

PRODUCTIONS OPERATIONS STAGE

- FPSO Vessel Operations (power, flaring, discharges, seawater and gas injection, chemical use)
- Oil offloading to conventional tankers (power, venting, intake, discharges)
- Offshore and onshore waste management

DECOMMISSIONING STAGE

- Marine decommissioning vessels and FPSO (power, discharges, waste disposal)
- Well plugging and abandonment
- Disconnection of mooring system and SURF equipment
- Onshore waste management

LOGISTICAL SUPPORT

Also, across all Project stages, the project will require logistical support

- Supply and support vessel/aircraft operations
- Onshore fuel transfers from suppliers
- Utilization of shorebases
- Onshore waste management, recycling, treatment, and disposal

AIR QUALITY AND CLIMATE

WHAT COULD POTENTIALLY BE IMPACTED

- Onshore Communities
- Greenhouse gases ("GHG") levels

SUMMARY OF POTENTIAL IMPACTS

Peak emissions during production approximately **1,354 kilotonnes** of carbon dioxide-equivalents per year

All onshore concentrations predicted to be less than **2%** of World Health Organization guidelines

EXISTING CONDITIONS

Legend
Onshore Air Monitoring Site
0 10 20 Kilometers

Onshore monitoring sites

Measured concentrations were well within World Health Organization guidelines

Offshore air quality test near Project Development Area

Concentrations of CO, SO_2, H_2S, and NO_2 were all **below** laboratory reporting limits

Most abundant elements measured were **sodium** and **chlorine** (Sea salt likely source)

MANAGEMENT MEASURES

- Maintain equipment, vehicles and vessels
- Use less toxic materials when possible
- Re-inject recovered natural gas

POTENTIAL RESIDUAL IMPACTS

	Drilling & Installation	Production	Decomissioning
Onshore air quality impacts from Project pollutant emissions	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE
Increases in Guyana's national GHG emissions from Project GHG emissions	NEGLIGIBLE	MODERATE	NEGLIGIBLE

MARINE WATER QUALITY

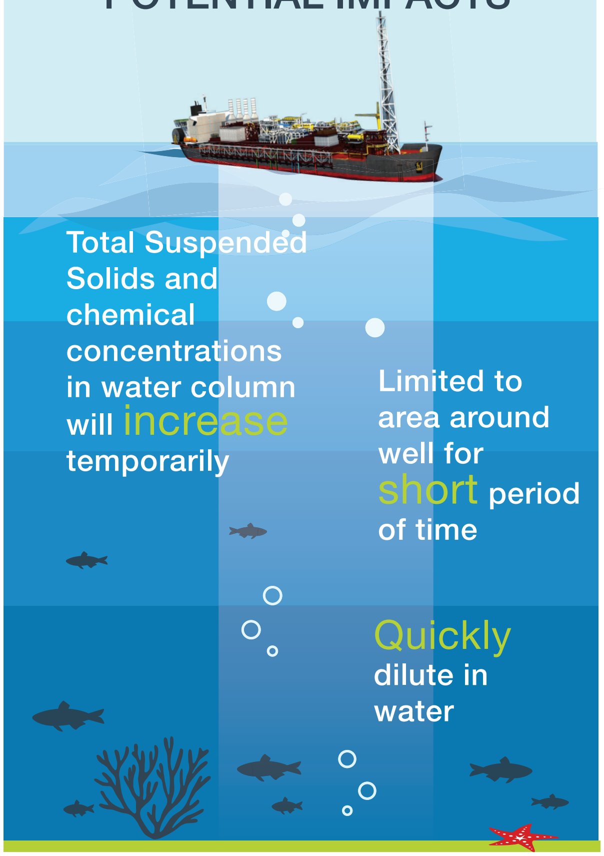
WHAT COULD POTENTIALLY BE IMPACTED

Marine fauna

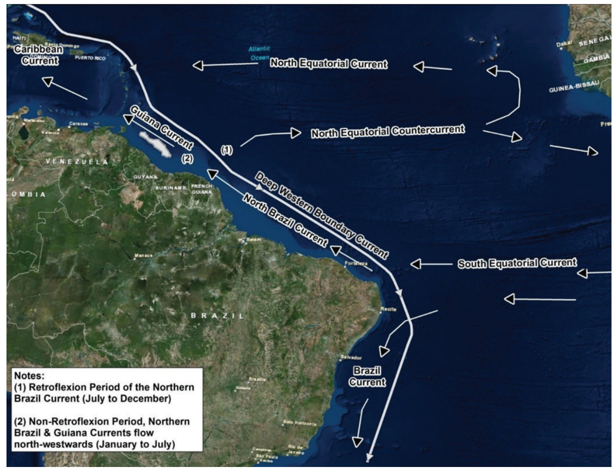
Photosynthetic organisms

Water clarity remained reasonably constant throughout all water profiles

SUMMARY OF POTENTIAL IMPACTS



EXISTING CONDITIONS



Offshore Oceanic currents

Legend
- Deep Western Boundry Current
- Direction of Water Current
- Stabroek Licencing Area

Water profiling at all sampling stations identified a generally stratified water column, with thermocline, halocline, and oxygen boundary increasing with water depth

Surface temperatures were relatively consistent across stations, but the lower water column temperatures decreased proportionally with water depth

Dissolved solids, organic carbon, and oxygen demand decreased and water clarity improved with depth

MANAGEMENT MEASURES

- Water based drilling fluids
- Regular inspection and maintenance
- Leak detection equipment

POTENTIAL RESIDUAL IMPACTS

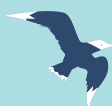
	Drilling & Installation	Production	Decomissioning
Reduced health of marine animals from turbid water	MINOR	MINOR	—
Reduced water quality & temp. changes	NEGLIGIBLE	NEGLIGIBLE	—

SEABIRDS INCLUDING SPECIAL STATUS SPECIES

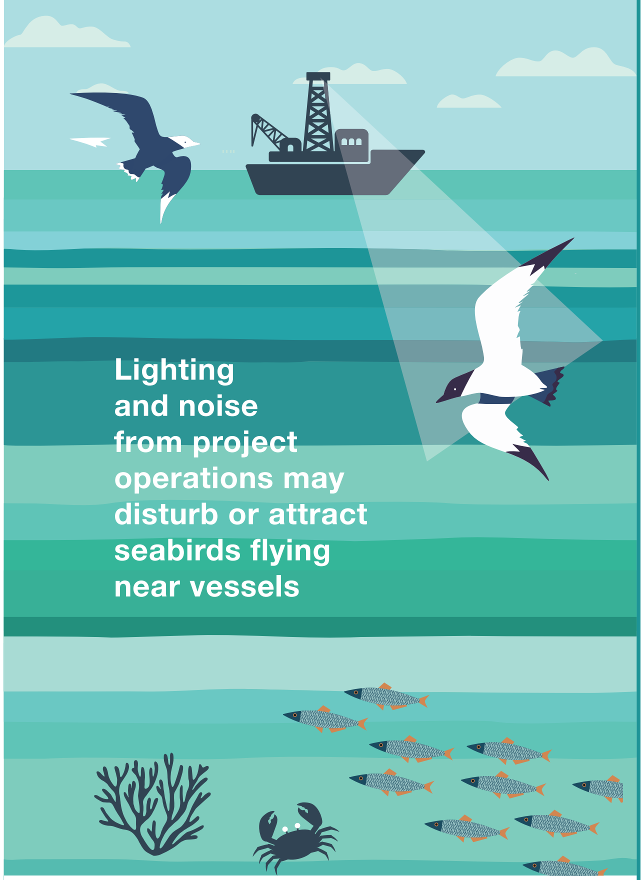
WHAT COULD POTENTIALLY BE IMPACTED

33 seabird species

SUMMARY OF POTENTIAL IMPACTS

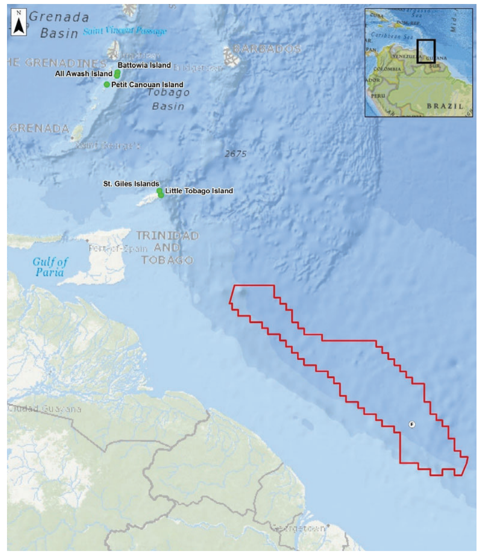


Seabirds may collide with vessels



Lighting and noise from project operations may disturb or attract seabirds flying near vessels

EXISTING CONDITIONS



Important Marine Bird Areas

The Stabroek Block and surrounding offshore area serve as habitat for **migratory and non-migratory** seabirds

Bridled Tern

- First record of species in Guyana
- Observed near Stabroek Block April 2018

Leach's Storm-Petrel

- Listed as vulnerable
- Observed near Stabroek block October 2017

Species richness varies seasonally, with peaks in the **fall and spring** migration periods

MANAGEMENT MEASURES

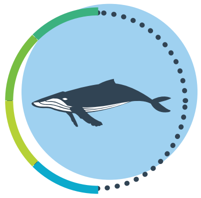
- Directional lighting - downcast
- Treatment of planned discharges to applicable standards

POTENTIAL RESIDUAL IMPACTS

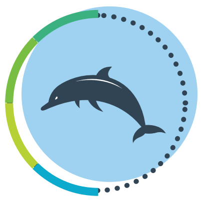
	Drilling & Installation	Production	Decomissioning
Mortality/injury from attraction to vessels	NEGLIGIBLE	MINOR	NEGLIGIBLE
Disturbance	NEGLIGIBLE	MINOR	NEGLIGIBLE
Using vessels as resting areas	—	POSITIVE	—

MARINE MAMMALS INCLUDING SPECIAL STATUS SPECIES

WHAT COULD POTENTIALLY BE IMPACTED



Whales
5 species

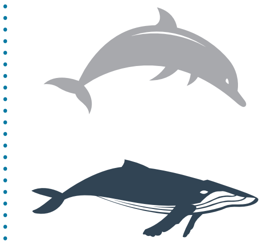


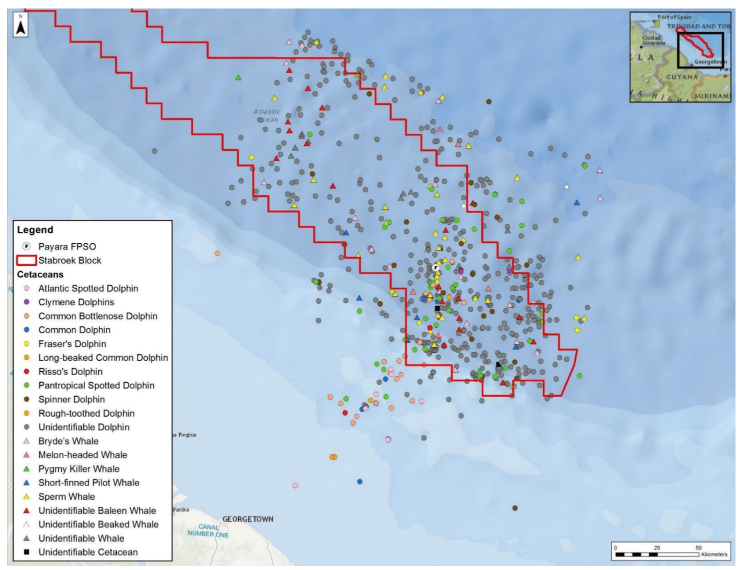
Dolphins
10 species

EXISTING CONDITIONS

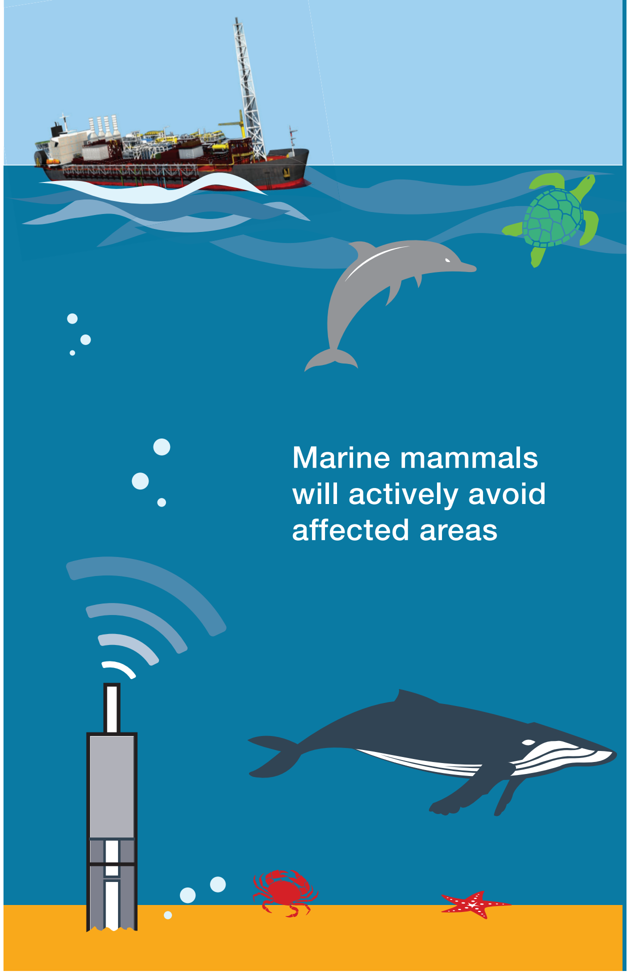
Over a
5-year study
there have been a total of
1,322 marine mammal
detections recorded.

15 species of marine mammals
have been confirmed in the Stabroek Block.





SUMMARY OF POTENTIAL IMPACTS



Marine mammals will actively avoid affected areas

MANAGEMENT MEASURES

Slow start up to allow marine mammals to depart the area

Reduce speed of vessels within 300 meters

POTENTIAL RESIDUAL IMPACTS

	Drilling & Installation	Production	Decomissioning
Behavioral Disturbance from vessel sound	MINOR	In all stages of the project	
Behavioral Disturbance from pile driving	MODERATE	—	—

RIVERINE MAMMALS INCLUDING SPECIAL STATUS SPECIES

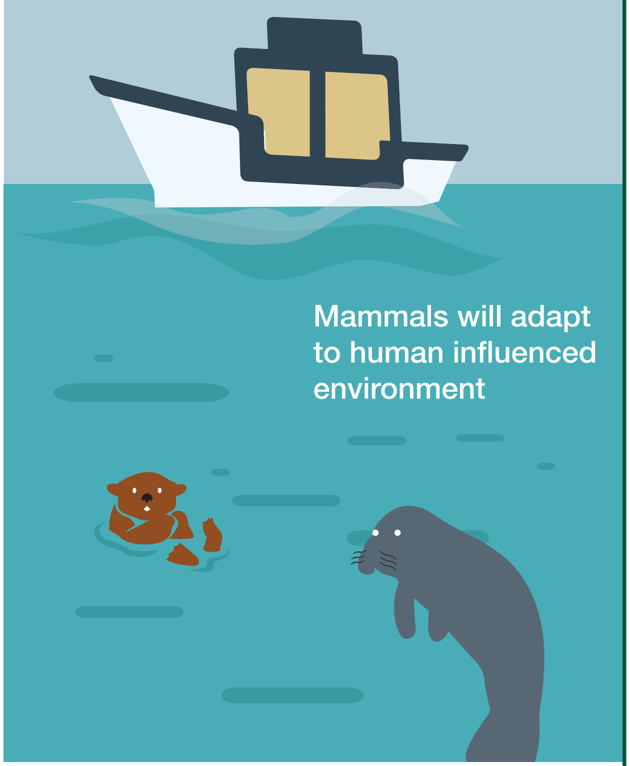
WHAT COULD POTENTIALLY BE IMPACTED

Manatees and Otters

SUMMARY OF POTENTIAL IMPACTS

1–4%

Increase in marine traffic in Georgetown Harbour due to project vessel movement



EXISTING CONDITIONS

The West Indian manatee and the neotropical otter are known to occur in the Demerara Harbour

Riverine mammals of the harbour are expected to adapt to the constantly changing and human-influenced environments

MANAGEMENT MEASURES

- Awareness training to Project-dedicated marine personnel
- Regularly maintain equipment, vessels, vehicles and helicopters
- Monitor on an ongoing basis
- Reduced speed of vessels when entering harbour

POTENTIAL RESIDUAL IMPACTS

Behavioral changes or displacement due to harbour traffic

MINOR

In all stages of the project

MARINE TURTLES

WHAT COULD POTENTIALLY BE IMPACTED

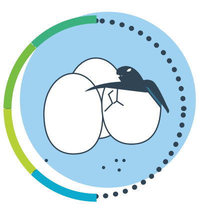
OFFSHORE

A total of five marine turtle species are found in Guyana and the surrounding region

Green Leatherback Hawksbill

Olive Ridley Loggerhead

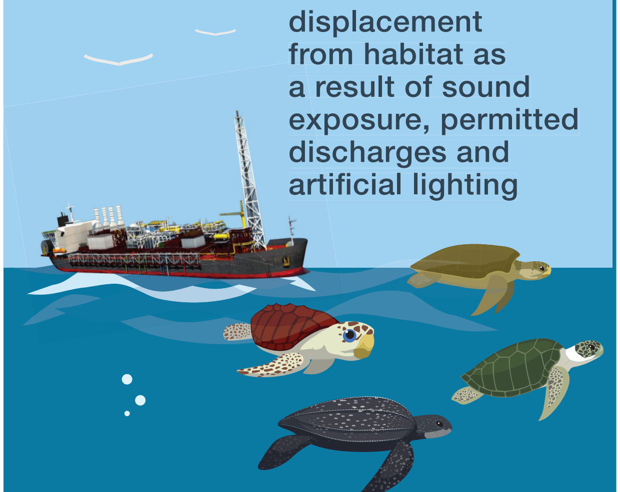
NEST ON GUYANA'S BEACHES



- Green
- Leatherback
- Hawksbill
- Olive Ridley

SUMMARY OF POTENTIAL IMPACTS

Disturbance and displacement from habitat as a result of sound exposure, permitted discharges and artificial lighting



Turtles offshore will actively avoid affected areas before injury

EXISTING CONDITIONS

TURTLE TRACKING

In 2018, scientists tagged 4 green turtles and 3 leatherback turtles with satellite tags at Shell Beach during the nesting season. (Data from the 2019 Turtle Tagging Effort are not yet available.)

In addition to tracking, 13 distinct marine turtle detections were made by Marine Observers in the Stabroek Block from 2015-2018

Turtles showed **strong fidelity** to nesting and foraging sites

Green turtles migrated as far as **2,500 km** to Brazil

The leatherback turtle that was tracked the farthest traveled **3,600km**

MANAGEMENT MEASURES

Use Marine Mammal Observers

Use "soft starts" to allow marine turtles to vacate area before sound producing activities

Treat discharges to applicable standards

POTENTIAL RESIDUAL IMPACTS

Disturbance or injury from offshore project activities

In all stages of the project

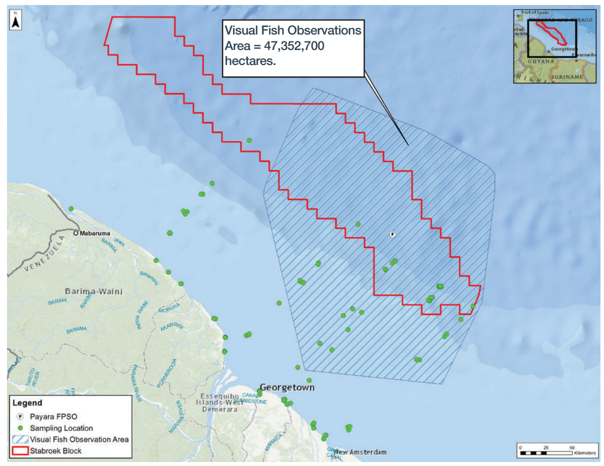
MARINE FISH INCLUDING SPECIAL STATUS SPECIES

WHAT COULD POTENTIALLY BE IMPACTED

- Fish in the middle of the ocean
- Fish at the seafloor
- Migratory species
- Resident species

EXISTING CONDITIONS

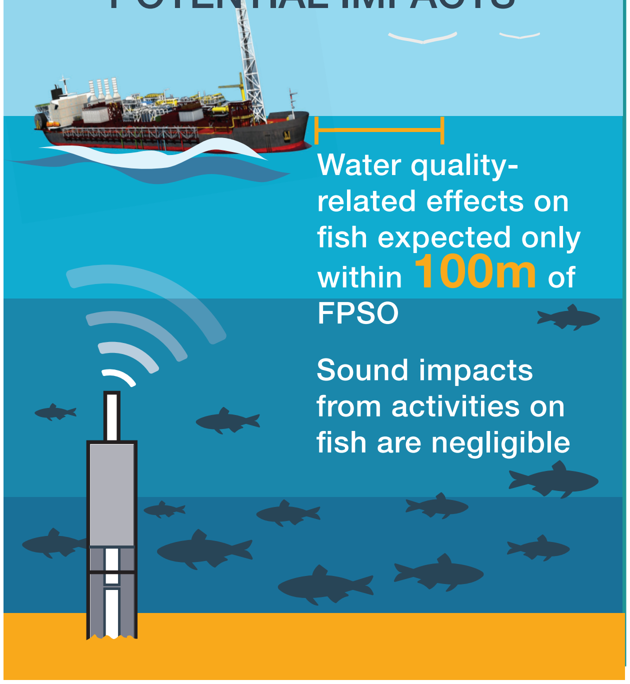
Deepwater fish diversity is **low** near Project Development Area and the mid ocean fish community is **typical** of the region.



MANAGEMENT MEASURES

- Water based drilling fluids and low-toxicity non-aqueous fluid
- Treating cuttings prior to discharge
- Soft start procedures for pile driving
- Physical screening on vessels for seawater intakes

SUMMARY OF POTENTIAL IMPACTS



Water quality-related effects on fish expected only within **100m** of FPSO

Sound impacts from activities on fish are negligible

POTENTIAL RESIDUAL IMPACTS

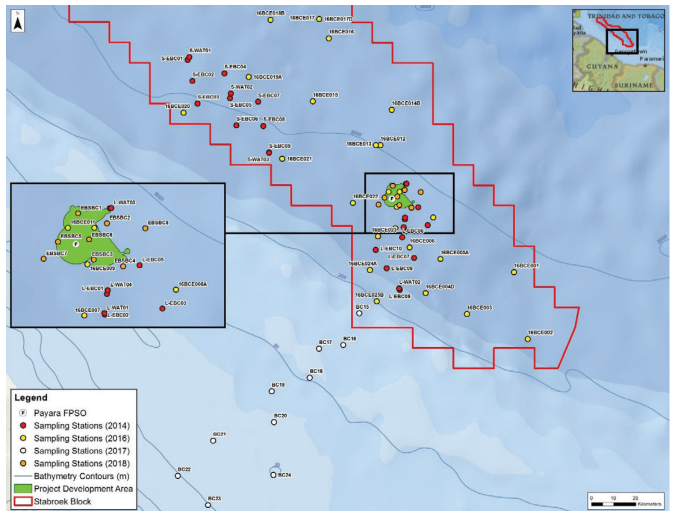
	Drilling & Installation	Production	Decomissioning
Attraction to Artificial Light	NEGLIGIBLE – In all stages of the project		
Sound from vessel traffic	NEGLIGIBLE – In all stages of the project		
Changes in distribution due to water quality	MINOR	NEGLIGIBLE	NEGLIGIBLE
Changes in seafloor habitat	—	NEGLIGIBLE	—
Loss of young fishes in ballast water intakes	—	NEGLIGIBLE	—

MARINE BENTHOS

WHAT COULD POTENTIALLY BE IMPACTED

- Giant marine isopods
- Shrimp and red crabs
- Corals and Sponges
- Other seafloor species

EXISTING CONDITIONS



Abundance of burrowing species in Project Development Area is **low**

Polychaete worms and arthropods **most common** species groups

116-200 organisms per square meter in the Stabroek Block

over **1,000** organisms per square meter on the continental shelf

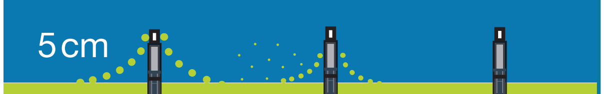
This organism density is **below** the range of typical abundances for similar habitats globally

SUMMARY OF POTENTIAL IMPACTS

Marine benthos around wellheads may be smothered by cuttings accumulating faster than **5cm per month**

Only **0.01 %** of the PDA will exceed that threshold

Over time, cuttings will be swept away naturally and seafloor **will return** to natural conditions



MANAGEMENT MEASURES

- Utilize low toxicity drilling fluids
- Monitor discharges including drill cuttings, treated wastewater, and FPSO cooling water

POTENTIAL RESIDUAL IMPACTS

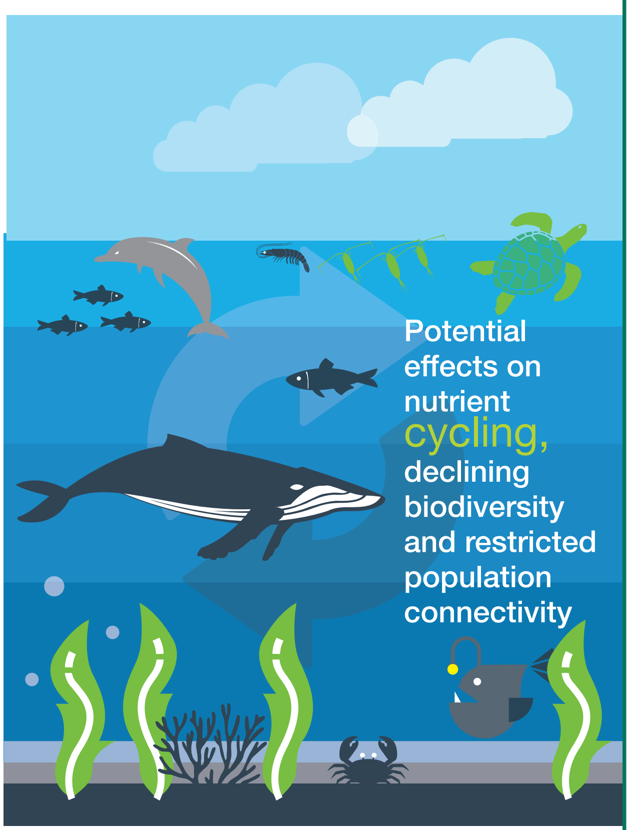
	Drilling & Installation	Production	Decomissioning
Smothering	MINOR	—	—
Disturbance or Injury	NEGLIGIBLE	—	—
Presence of Artificial substrate	—	POSITIVE	POSITIVE

ECOLOGICAL BALANCE AND ECOSYSTEMS

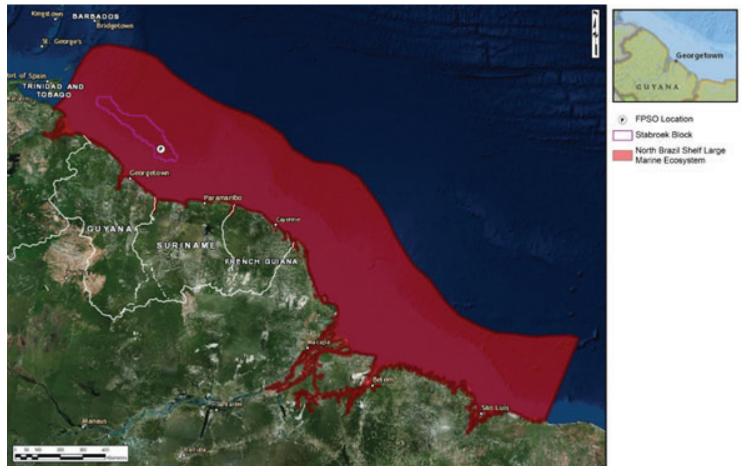
WHAT COULD POTENTIALLY BE IMPACTED

- Marine Nutrient Cycle
- Population Connectivity
- Biodiversity

SUMMARY OF POTENTIAL IMPACTS



EXISTING CONDITIONS



The Project is within the Amazonian-Orinoco Influence Zone, an Ecologically or Biologically Significant Area (EBSA)

The zone's uniqueness and biological productivity are driven largely by the influence of freshwater inputs from the Amazon River and the nutrients they carry

MANAGEMENT MEASURES

- Ensure discharges meet international standards
- Treat discharges to applicable standards
- Perform daily inspections

POTENTIAL RESIDUAL IMPACTS

	Drilling & Installation	Production	Decomissioning
Changes in marine nutrient cycle	NEGLIGIBLE	In all stages of the project	
Impacts on Population Connectivity	NEGLIGIBLE	In all stages of the project	
Introduction of invasive species	—	MINOR	—

EMPLOYMENT AND LIVELIHOODS

WHAT COULD POTENTIALLY BE IMPACTED

Fishing vessel operators in the Project Area

Fishing vessel operators in the Project AOI

SUMMARY OF POTENTIAL IMPACTS

Increased local business activity, employment and spending

Minor limitations for commercial fisherfolk in remote offshore areas due to marine safety exclusion zones (only 12 local vessels known)

Potential disruption of fishing activities close to the shore due to project vessel transit

EXISTING CONDITIONS

2018 gross national income per capita $4,760[1]

KEY ECONOMIC SECTORS AND CONTRIBUTION TO GDP, 2018[2]

20.39% Mining and Quarrying

17.4% Agriculture, Fishing, and Forestry

12.8% Wholesale and Retail Trade

11.9% Construction

8.97% Public Administration

7.33% Transportation and Storage

MANAGEMENT MEASURES

- Employ Guyanese where practical
- Issue notices to mariners for major marine vessel movements
- Stakeholder engagement across fishing community
- Procure goods and services locally

POTENTIAL RESIDUAL IMPACTS

Economic incentives for general population	POSITIVE	In all stages of the project
Disruptions to commercial fisherfolk	NEGLIGIBLE	In all stages of the project
Disruptions to artisanal fisherfolk	MINOR	In all stages of the project

[1]Reference: https://data.worldbank.org/country/guyana [2]Reference: https://www.bankofguyana.org.gy

COMMUNITY HEALTH AND WELLBEING

WHAT COULD POTENTIALLY BE IMPACTED

General population

Workforce

SUMMARY OF POTENTIAL IMPACTS

The small workforce is not expected to impact public safety or spread disease

Potential public anxiety over oil and gas sector risks, such as spills

EXISTING CONDITIONS

LEADING CAUSES OF MORTALITY IN 2017

Heart disease

Stroke

Diabetes

2017 LIFE EXPECTANCY

for all births increased from 64 years in 2012 to

WOMEN 73.4 years

MEN 67.8 years

11.9% of total 2019 budget was allocated to the health sector[1]

Most Common Communicable Diseases in 2012:

Malaria

TB

HIV

Challenges related to decentralized healthcare system, unreliable emergency care, and lack of medical supplies

MANAGEMENT MEASURES

Worker code of conduct

Dedicated Project medical providers

Worker health screening

Stakeholder engagement

POTENTIAL RESIDUAL IMPACTS

Public anxiety over oil and gas risks (primarily outside of Georgetown)	MINOR	In all stages of the project
Potential for reduced access to emergency and health services in Georgetown and vicinity as a result of a small workforce	MINOR	In all stages of the project

[1]Reference: Department of Public Information Guyana, 2018

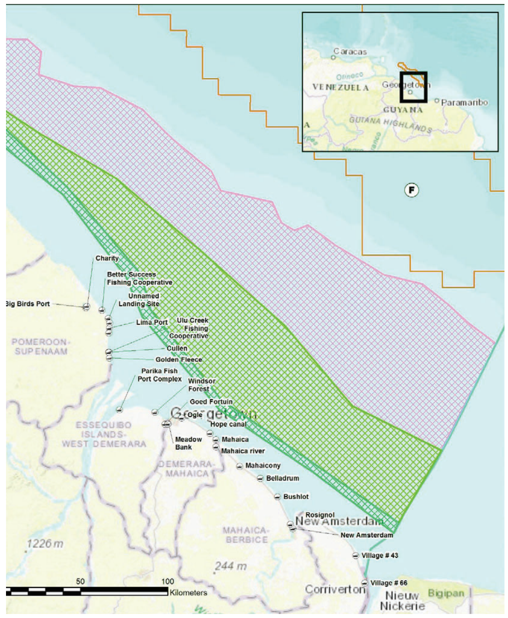
MARINE USE AND TRANSPORTATION

WHAT COULD POTENTIALLY BE IMPACTED

Marine users

Commercial and artisanal fisherfolk

EXISTING CONDITIONS



Legend
FPSO Location
Fishing Ports and Landings
Territorial Waters Boundary
Stabroek Block
Primary Seabob Fishing Zone
Secondary Seabob Fishing Zone
Approximate Shrimp Trawling Zone

Fish Landing Sites and Ports along Coastal Guyana

Only 12 commercial vessels in deepsea near exclusion zones

Approximately 140 vessels per day around Georgetown Harbour

SUMMARY OF POTENTIAL IMPACTS

FPSO Marine Safety Exclusion zone represents only 0.2% of Stabroek Block

Vessel activity in Georgetown Harbour as a result of project vessel movements will increase by only 1 to 4%

MANAGEMENT MEASURES

FPSO

2 nautical mile safety zone

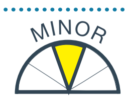
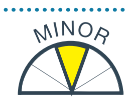
DRILL SHIP

500m safety zone

Stakeholder engagement

Notices to mariners

POTENTIAL RESIDUAL IMPACTS

Disturbance to commercial cargo vessel movement		In all stages of the project
Disturbance to commercial fishing vessel movement		In all stages of the project
Disturbance to subsistence fishing vessel movement		In all stages of the project

SOCIAL INFRASTRUCTURE AND SERVICES

WHAT COULD POTENTIALLY BE IMPACTED

General population of Georgetown and vicinity

Leisure and business travelers to Guyana

SUMMARY OF POTENTIAL IMPACTS

Presence of small workforce in Georgetown during development and operations has potential to cause:

- Minimal increase of vehicle traffic in and around Georgetown and demand on airport use
- Minimal increase of demand for housing and lodging in and around Georgetown

EXISTING CONDITIONS

Lodging in Georgetown consists of over 900 rooms in the most frequented hotels

Airports have capacity; in 2018, Ogle Airport had 18,600 flight landings

Housing capacity as of 2012 consisted of 94,531dwelling units in Region 4

Road conditions vary widely and most intersections are not signalled

Traffic congestion is a chronic problem and many types of vehicles share the same travel lanes

MANAGEMENT MEASURES

- Community and traffic safety programs
- EEPGL Safety and Security standards shared with hotels

POTENTIAL RESIDUAL IMPACTS

	Drilling & Installation	Production	Decomissioning
Lodging capacity in /around Georgetown	MINOR	NEGLIGIBLE	NEGLIGIBLE
Demand on housing and utilities	MINOR	NEGLIGIBLE	NEGLIGIBLE
Ground and air transportation congestion	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE

WASTE MANAGEMENT INFRASTRUCTURE CAPACITY

WHAT COULD POTENTIALLY BE IMPACTED

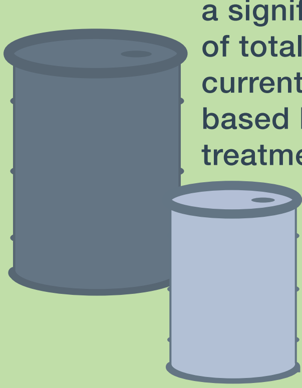
Non-Project users of Georgetown-based hazardous waste treatment facilities

Non-Project users of Georgetown-based landfill facilities

SUMMARY OF POTENTIAL IMPACTS

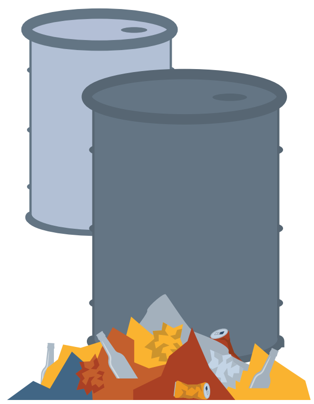
Project represents **<2%** of total current demand on Georgetown-based non-hazardous waste landfill facilities

EEPGL cumulative operations represent a significant portion of total demand for current Georgetown-based hazardous waste treatment facilities.



EXISTING CONDITIONS

EEPGL and Government recognize the need for **increased** Georgetown-based hazardous waste treatment and landfill capacity

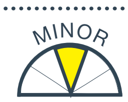


Multiple initiatives and listed measures are being implemented to **avoid potential shortfalls** in near and longer-term Georgetown-based waste management capacity needs

MANAGEMENT MEASURES

- Enable increases to existing local waste management capacity for hazardous wastes
- Explore use of new local hazardous waste treatment facilities
- Continue to implement waste management plan
- Monitor construction of new landfill cell and/or identify suitable local and regional alternatives

POTENTIAL RESIDUAL IMPACTS

Georgetown-based hazardous waste treatment capacity		In all stages of the project
Georgetown-based landfill capacity		In all stages of the project

UNPLANNED EVENTS

Defined as an event that is not planned to occur as part of the Project (e.g., accidents), but that has the potential to occur.

The consequence/severity of the unplanned event is measured in terms of the sensitivity of the resource and the magnitude of the impact.

Consequence / Severity

Likelihood	Low	Medium	High
Unlikely	MINOR	MINOR	MODERATE
Possible	MINOR	MODERATE	MAJOR
Likely	MODERATE	MAJOR	MAJOR

ONSHORE VEHICULAR ACCIDENT

Residual Risk Level

MINOR	MODERATE
Social Infrastructure & Services	Community Health & Wellbeing

MANAGEMENT MEASURES

- Defined travel routes
- Pre-trip planning
- Driver Training
- Reduce speed
- Monitoring driver fatigue
- Inspection & maintenance
- Community outreach

ACCIDENTAL DISCHARGE OF UNTREATED WASTEWATER FROM THE FPSO

Residual Risk Level

MINOR

- Marine Water Quality
- Special Status Seabirds and Fish
- Marine Fish
- Ecological Balance & Ecosystems
- Seabirds
- Marine Mammals
- Marine Turtles
- Marine Turtles

MANAGEMENT MEASURES

- Inspection & maintenance
- Leak detection equipment

MARINE VESSEL COLLISION

Residual Risk Level

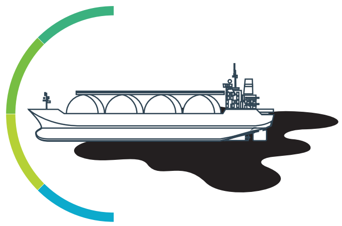
MINOR	MODERATE
Riverine Mammals; Economic Conditions; Employment & Livelihoods; Community Health & Wellbeing; Marine Use & Transportation; Special Status Seabirds	Marine Mammals; Marine Turtles

MANAGEMENT MEASURES

- Defined claims process
- Notice to mariners
- Community outreach
- Standard navigation procedures
- Safety exclusion zones
- Supervision of mooring/ offloading activities
- Use of support tugs
- Use of radar and proper ship-to-ship communication
- Reduce speed
- Training

UNPLANNED EVENTS CONTUNUED

HYDROCARBON SPILL



Residual Risk Level

MINOR

- Marine Geology and Sediment
- Coastal Habitats
- Coastal Wildlife
- Special Status Fish Species
- Seabirds
- Marine Mammals
- Riverine Mammals
- Marine Fish
- Marine Benthos
- Ecological Balance & Ecosystems
- Economic Conditions
- Employment & Livelihoods
- Community Health & Wellbeing
- Marine Use and Transportation
- Social Infrastructure & Services
- Waste Management Infrastructure Capacity
- Cultural Heritage
- Land Use
- Ecosystem Services
- Indigenous Peoples
- Air Quality & Climate
- Protected

MODERATE

- Special Status Species Seabirds
- Marine Water Quality
- Marine Turtles

MANAGEMENT MEASURES

- Use of support tugs
- Proper supervision of mooring/offloading activities
- Water based drilling fluids
- Use of radar and proper ship-to-ship communication
- Training
- Defined claims process
- Inspection & maintenance
- Community outreach
- Leak detection equipment
- Notice to mariners
- Safety exclusion zones
- Use of proper safety equipment
- Standard navigation procedures
- Secondary containment
- Blowout preventers
- Implementation of OSRP
- Use of checklists and guidelines
- Livelihood restoration

HELICOPTER STRIKE

Residual Risk Level

MINOR

- Special Status Species Seabirds
- Seabirds

MANAGEMENT MEASURES

- Visual Avoidance

CUMULATIVE IMPACTS

WHAT COULD BE IMPACTED

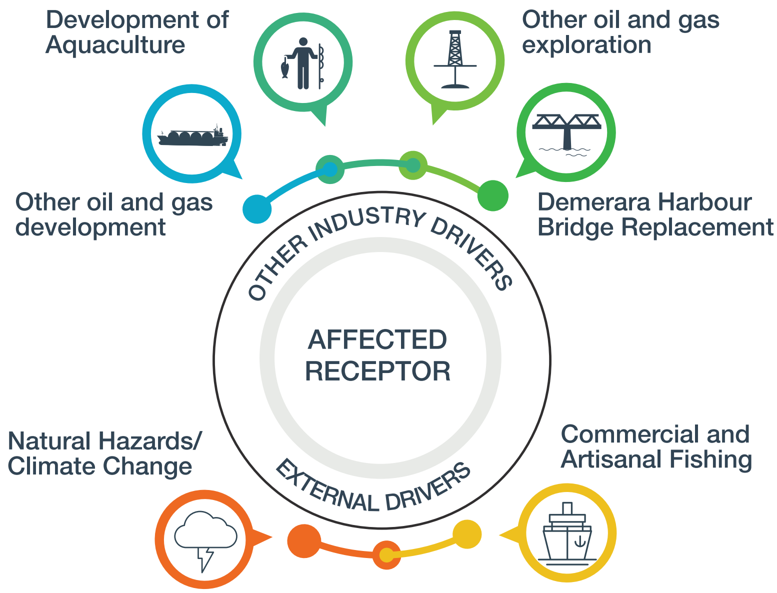
- Air Quality and Climate
- Marine Water Quality
- Marine Benthos and Marine Geology and Sediments
- Seabirds
- Marine Fish
- Marine Mammals
- Riverine Mammals
- Marine Turtles
- Ecological Balance and Ecosystems
- Employment and Livelihoods
- Community Health and Wellbeing
- Marine Use and Transportation
- Social Infrastructure and Services
- Waste Management Infrastructure Capacity

SUMMARY OF POTENTIAL IMPACTS

- Increased GHG emissions
- Fishery declines
- Disturbance of marine ecosystem
- Reduced water quality
- Impacts on public health and safety
- Traffic congestion
- Wildlife injury/ mortality
- Reduced access to public services
- Demand for housing

SOURCES OF POTENTIAL CUMULATIVE IMPACTS

Cumulative impacts are driven by the combined effects of multiple forces acting on a receptor



PRIORITY RANKING PROCESS

Management needs for affected resources are prioritized as follows:

HIGH

Resource is expected to be adversely impacted by other forces and potentially by the Project. Actions should be implemented in the short-term.

MEDIUM

Resource could potentially be impacted by other forces and potentially by the Project. Actions should be implemented in the medium-term.

LOW

Resource could potentially be impacted by other forces, but the contributions from the Project would be expected to be minor or absent. No additional actions are required.

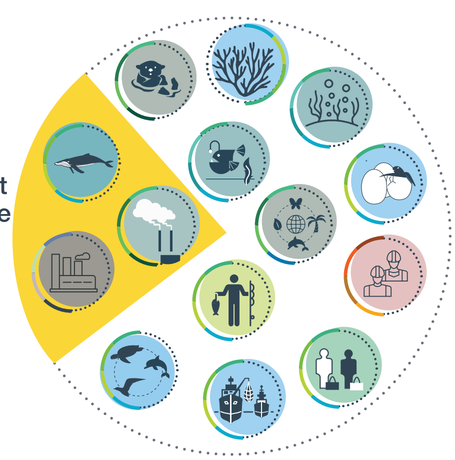
PRIORITY RANKING SUMMARY

MEDIUM PRIORITY

Climate

Marine Mammals

Waste Management Infrastructure Capacity



LOW PRIORITY

Riverine Mammals
Marine Benthos
Marine Water Quality
Marine Fish
Special Status Species
Marine Turtles
Ecological Balance and Ecosystems
Employment and Livelihoods
Community Health & Wellbeing
Marine Use and Transportation
Social Infrastructure and Services

ATTACHMENT E 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.

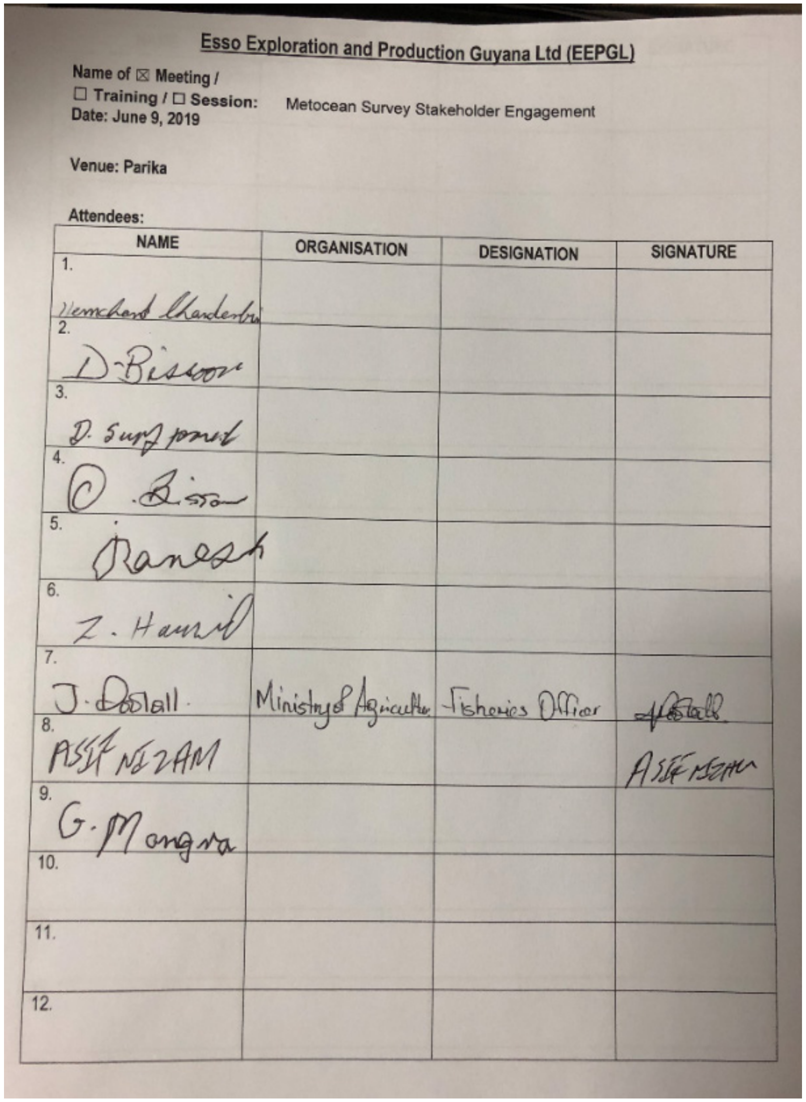
  The oil and gas sector will benefit the local workforce. Guyanese could be expected to benefit in resources and skills and over the next 5 years expertise would be built up in Guyana.
- **Impact to Fisheries:** It was queried whether the livelihoods of fisherfolk would be negatively affected by the FPSO.
- **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 E-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. Hemchand Chanderbi			
2. D. Bisson			
3. D. Surjpaul			
4. O. Bisso			
5. Ranesh			
6. Z. Hamid			
7. J. Doolall	Ministry of Agriculture	Fisheries Officer	J Doolall
8. ASIF NIZAM			ASIF NIZAM
9. G. Mangra			
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 Female
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 Telephone Newsletter Web Presentation Letter Email Social media Texting/Instant messaging
Purpose (please circle)	Regulatory driven [Phase 1] Discretionary
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 E-2: Examples of Sign-In Sheets and Engagement Records to Track Engagement Efforts

Attachment: Questions on Guyana's Hospitality Sector

1. What is your current bed count?

2. What is your average capacity rate?
   ☐ Under 50% ☐ 40-70% ☐ Above 70%
3. Please provide the average price points for different types of rooms.

4. What amenities do you offer?

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?
   ☐ Under 50% ☐ 40-70% ☐ Above 70%
   - For foreign guests, do you have this broken down by CARICOM and other?
   - Has this fluctuated over the last year? Two years? Three years?
6. Have you seen a change in vacancy and room rates in the last year? Two years? Three years?
   ☐ Yes ☐ No
   - If yes, what do you believe caused this change?
7. Have you noticed any changes to your vacancy rate and origin of guests that could be linked to Guyana's recent oil developments?

8. Do you provide permanent housing to residents (locals and/or expats) of the Georgetown metro area?
   ☐ Yes ☐ No
   - If yes, approximately how many?
   - Have you noticed a trend with this population in the last year? Two years?
9. Do you have any plans for expansion?

Entity	Baseline Data Needed
Bureau of Statistics	1. 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? 2. What are some of the main findings of the Guyana Labour Force Survey? Will there be 2018 surveys? 3. 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? When will new data be available? 4. Do you have any data related to impacts of oil and gas sector (e.g. Influx, migration, spending, indirect contribution to GDP, etc)?
Department of Tourism	1. Is there updated visitor information for 2018? 2. Please describe tourism opportunities available along Guyana's coast and initiative being pursued. 3. Is expanding opportunities for tourism along Guyana's coastline part of marketing Guyana as a tourism destination? What of potential tourism in Region 1? 4. How do you see the link between oil and gas development and tourism? Do you have any recommendations? 5. Has there been any forecasting of accommodation and an assessment of current levels of accommodation?
Conservation International	1. Can you provide an update on the project (Guyana Resilient and One) being supported from the ExxonMobil Foundation? What are the focus areas and progress made? 2. Please share updates, recent successes and challenges of the project you are implementing to map North Brazil Shelf Mangroves. 3. What are your views on the Payara project?

Figure E-3: Engagement Templates for Various Baseline Data Collection Scopes of Work (Socioeconomic Resources)

ERM

DRAFT FOR DISCUSSION

EMC

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?

DRAFT FOR DISCUSSION

Ecosystem Service	Types and Extent of Usage		General Location & Frequency
Fishing	Fish		
	Shrimp		
	Crabs		
	Other		
Wildlife Trapping	Mammals		
	Birds		
	Ducks		
Bird Hunting	Shore birds		
	Ducks		
	Song birds		
Biodiversity	Nature/Mangrove Reserve		
	Wildlife Habitat		
Apiculture	Honey		
Mangroves	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 m2 per month)		
Ecotourism	Relaxing		
	Bird watching		
	Family Outings		
Carbon Sequestration	Vegetation cover		

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

2

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

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Esso Exploration and Production Guyana Limited

Payara Development Project

Preliminary End of Operations Decommissioning Plan

July 2020

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Contents

Figures

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1 INTRODUCTION

Esso Exploration and Production Guyana Limited (EEPGL)[1], 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 1).

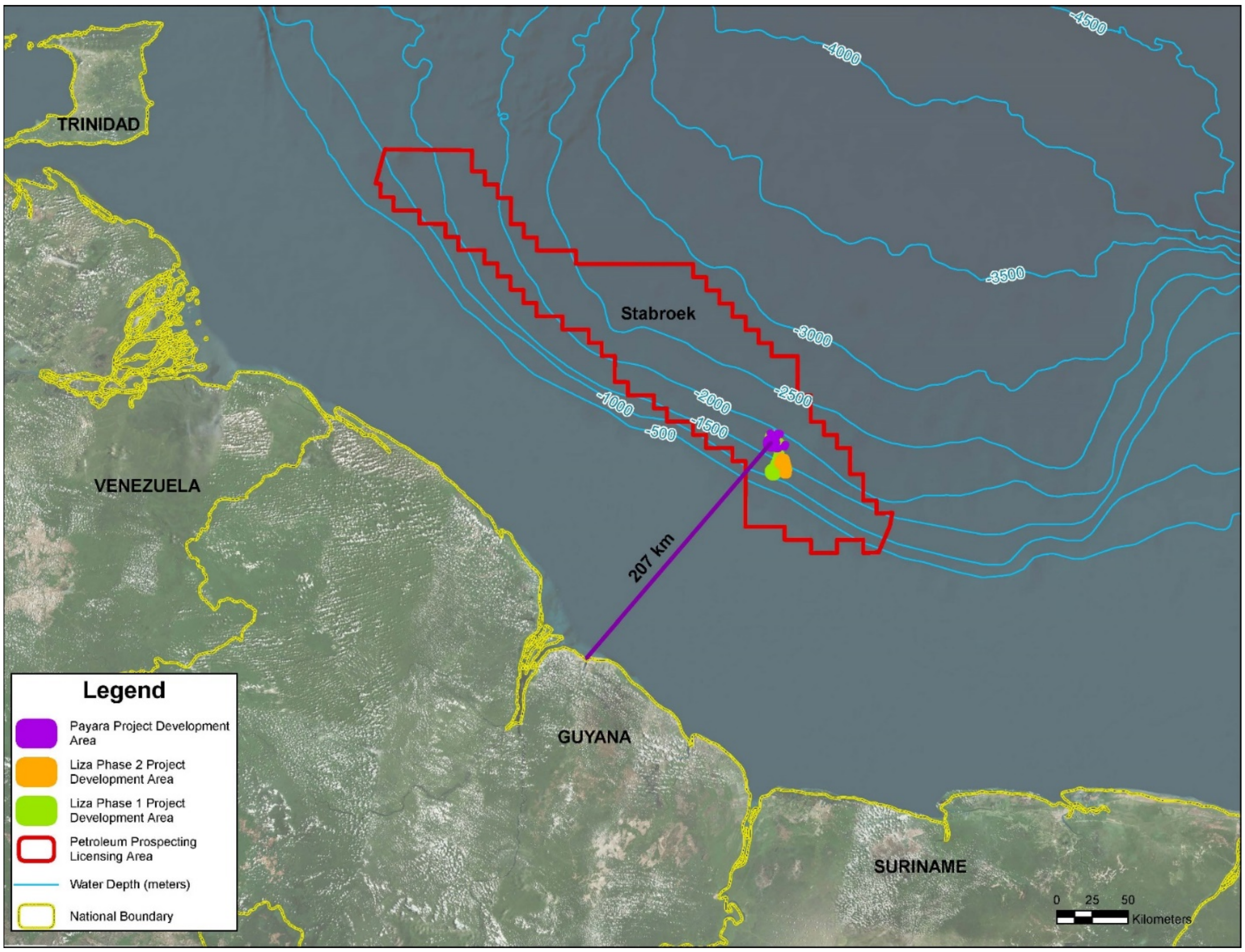

Figure 1: Location of the Payara Project Location within Stabroek Block

[1] *EEPGL will be the operator of the Project, and is used in this Environmental Impact Assessment to represent the co-venturers.*

1.1 Purpose and Objectives

The purpose of this Preliminary End of Operations Decommissioning Plan (Plan) is to provide a preliminary plan for the proposed abandonment and decommissioning of 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. ExxonMobil divides decommissioning into two categories: Well Plug and Abandonment and Facilities Decommissioning. Both are discussed in this document. Commercial considerations are not within the scope of this deliverable.

The objectives of this Plan are to:

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

1.2 Project Overview

The Project will consist of the drilling of approximately 41 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 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 2 are further described in the relevant drilling, SURF, and FPSO sections in Chapter 2 of the Payara Development Project Environmental Impact Assessment (EIA).

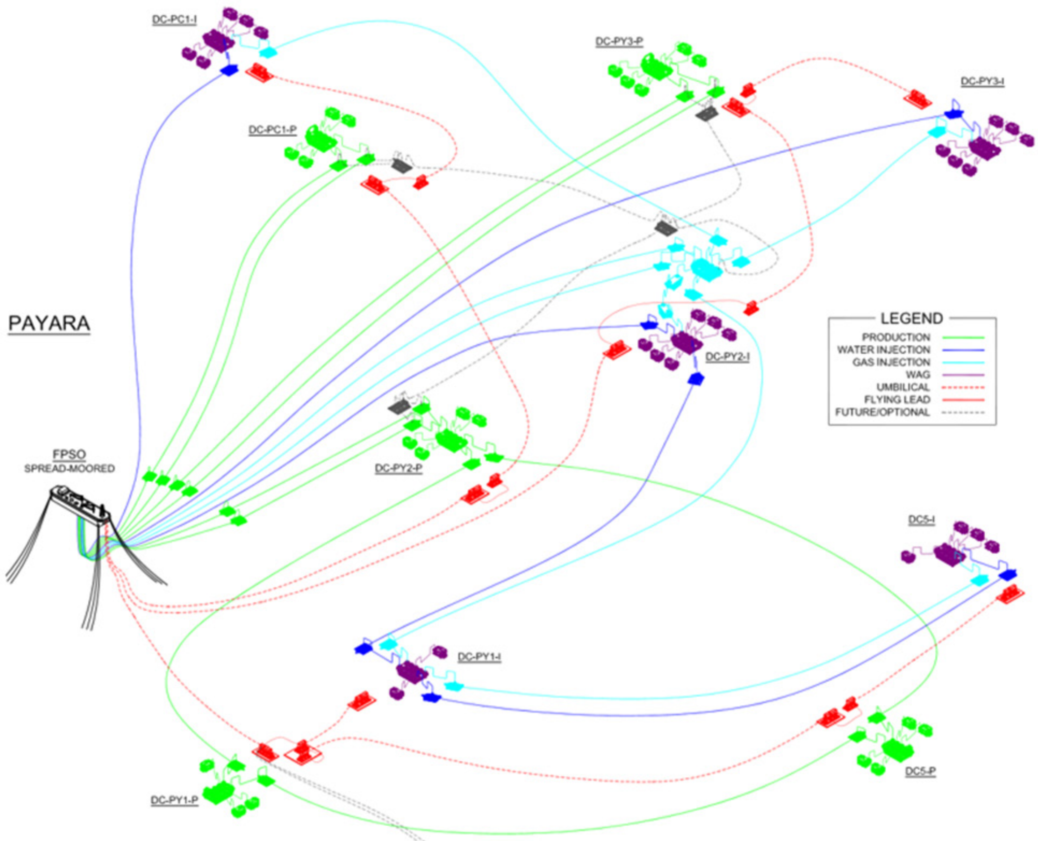

Figure 2: Preliminary Payara Field Layout

1.3 Scope

The scope of this Plan covers the preliminary plans for the plugging and abandonment (P&A) of the development wells and the decommissioning of Project production facilities. As the Project approaches the end of field life (i.e., 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 the laws and regulations in effect at that time, while also considering the technology and infrastructure available at that time. This Plan was developed as part of the Project's Environmental and Socioeconomic Management Plan (ESMP), and as described in the Project EIA.

The current scope of abandonment and decommissioning includes:

- Subsurface—approximately 41 development wells;
- Subsea—trees, manifolds, jumpers, flowlines, umbilical, risers, and other subsea equipment;
- FPSO vessel—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 (UNCLOS);
- Basel Convention on the Transboundary Movement of Hazardous Wastes and their Disposal;
- International Maritime Organization (IMO) Guidelines for the Removal of Offshore Installations and Structures (1989).

Globally, ExxonMobil employs “best practices” for decommissioning and abandonment. For offshore facilities this includes utilizing the International Maritime Organisation Resolution A.672 Guidelines & Standards for the Removal of Offshore Installations & Structures on the Continental Shelf & in the Exclusive Economic Zone as a basic standard worldwide. This embodies that where a decision to allow an offshore installation, structure, or parts thereof, to remain on the sea-bed, this should be based on a case-by-case evaluation (by the coastal State with jurisdiction over the installation or structure)

For wells 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 plugging and abandonment 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).

Section 2 of the ESMP and Chapter 3 of the EIA 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, typically a few years in advance, 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 at that time which will provide the basis and required information to prepare a detailed plan for decommissioning. As part of that planning process, EEPGL will also perform comparative assessments of facilities components, as described by Oil & Gas UK's document Guidelines for Comparative Assessment in Decommissioning Programs. Where there may be multiple decommissioning options, including facility components left in situ, these assessments will assist in arriving at the final decommissioning recommendation. The comparative assessment is designed to evaluate five (5) criteria including safety, environmental, technical, impact to other users of the sea, and economics - and to select the best option for the final decommissioning plan. Consultation with stakeholders would also be conducted by EEPGL during decommissioning planning. A revised 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 (Plugging and Abandonment) 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 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) is 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, logged or otherwise, as appropriate for the specific barrier element in question. A representative P&A Schematic from ongoing Stabroek exploration / appraisal is shown in Figure 3 to illustrate this. The schematic depicts zones isolated with full lateral coverage (rock-to-rock) for

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

Figure 4 has also been included to depict a representative P&A schematic for what is envisioned for Payara Development well P&As.

There are a range of complexities associated with Well P&As. Because of this, EEPGL employs an approach for the Preliminary End of Operations Decommissioning 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 which require riser based heavy-well intervention (HWI) or P&A using a drilling rig.

In all cases, it is currently envisioned that the wellhead and tubing head will be left in place, consistent with current industry deep water practice where the top of the tubing head is lower than the SURF infrastructure.

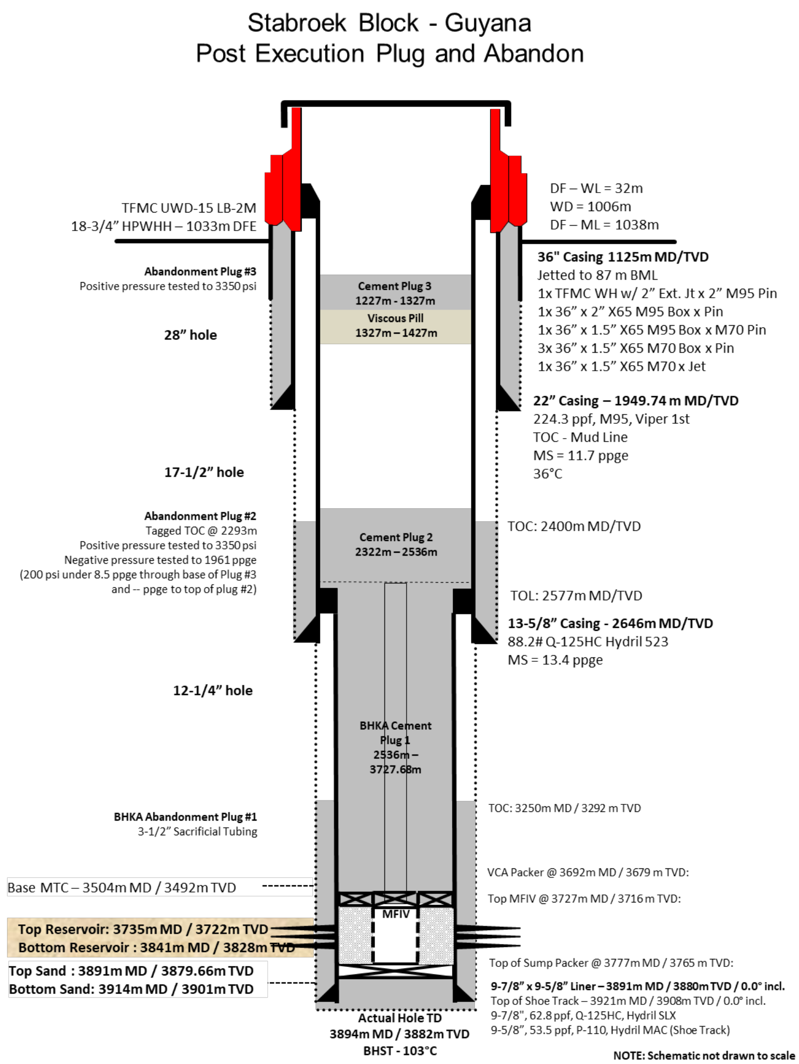

Figure 3: Representative P&A Schematic

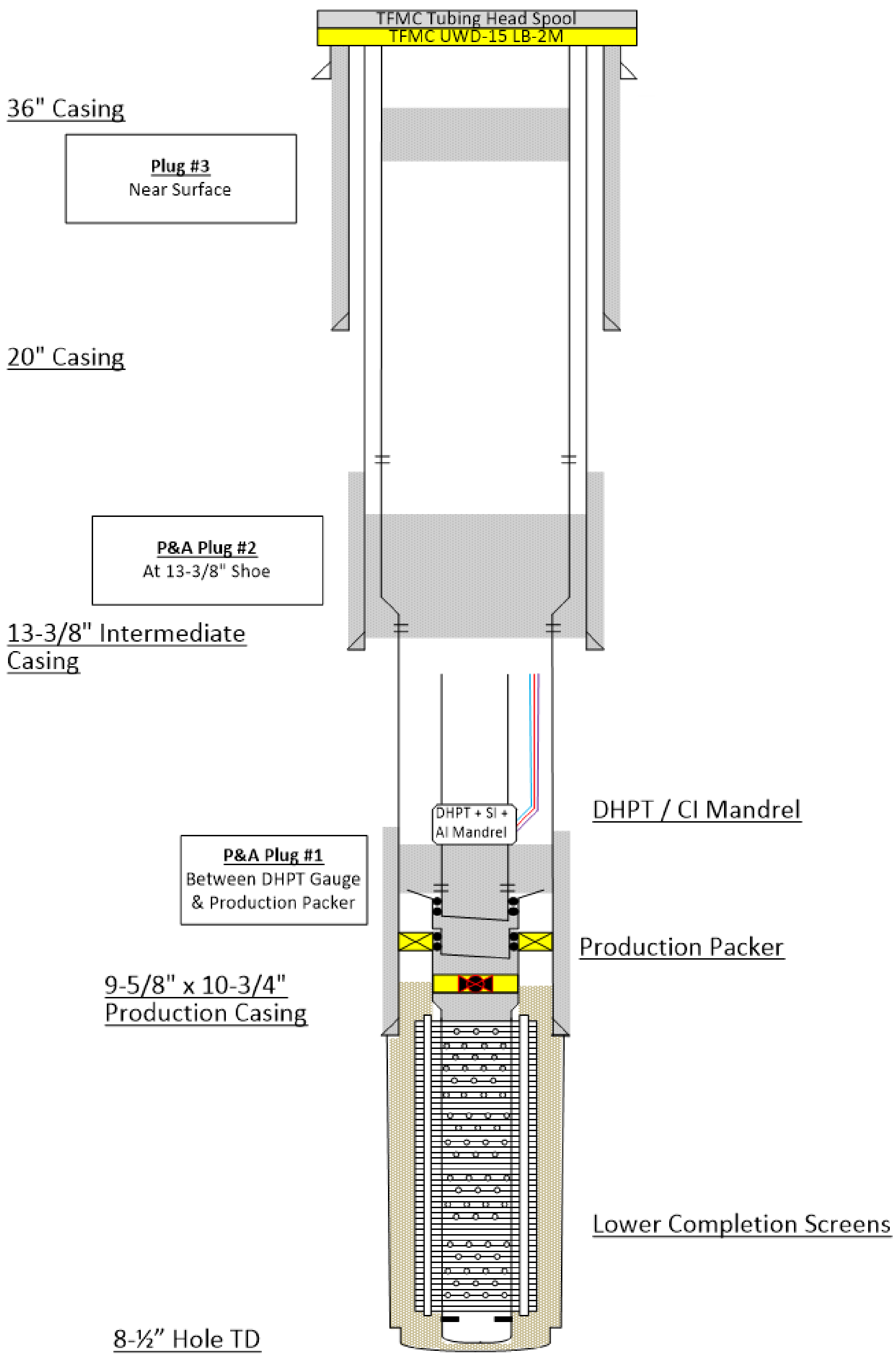

Figure 4: Representative Development Well P&A Schematic

3.3 Subsea Equipment

As part of the decommissioning process, all risers, pipelines, umbilicals, and other subsea equipmentwill be safely and properly isolated, de-energized, and flushed to remove hydrocarbons and other 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 as shown in Figure 2, 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. As stated previously, the five (5) criteria for assessment (safety, environmental, technical, impact to other users of the sea, and economics) must all be considered to arrive at the final recommendation.

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 Payara 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
- Risers, 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. If unable to be re-used, then decommissioning would involve delivery to a ship recycling facility that meets industry recognized requirements such as those listed in Section 2. As stated previously, comparative assessments will be done during detailed decommissioning planning to determine the final state of risers and mooring lines attached to the FPSO.

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). Details on waste management can be found in the Waste Management Plan for Guyana Development Projects which will continue to apply through decommissioning activities.

4 MITIGATION AND MONITORING

EEPGL will implement measures to manage potential decommissioning-related impacts by efficient and proper decommissioning practices and procedures to minimize any potential issues. Additional mitigations from the EIA are listed in Sections 4.1 and 4.2.

There will be areas of disturbance at the sea surface and potentially on the seafloor associated with the end of operations activities, as noted in the EIA. The Project area 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 area. All disturbances at the sea surface will be temporary in nature. Disturbances at the seafloor would be associated with the decommissioning of development wells, FPSO mooring lines, and SURF equipment.

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 assessment performed by EEPGL.

- Maintain marine safety exclusion zones with a 500 m (~1,640 ft.) 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' specifications 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;
- Ensure wastewater released from the onboard sewage treatment plant complies with aquatic discharge standards in accordance with MARPOL 73/78 regulations;
- For those wastes that cannot be reused, treated, or discharged/disposed on the major decommissioning vessels, ensure they are manifested and safely transferred 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 to ensure compliance with an oil-in-water content of less than 15 parts per million, as applicable;
- 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;
- Provide standing instructions to Project-dedicated vessel masters to reduce their speed within 300 meters (984 feet) of observed 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;
- Ensure Project workers are subjected 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;

- Issue Notices to Mariners via the Maritime Administration Department, the Trawler's Association, and fishing co-ops for 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;
- Promptly remove damaged vessels (associated with any vessel incidents) to minimize impacts on marine use, transportation, and safety;
- 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 Post Decommissioning Monitoring Program

It is envisioned that an inspection will be performed following final P&A of wells and decommissioning of facilities. The scope and frequency of offshore post-decommissioning inspection should be determined by the Entities under Contract, but as a minimum would be performed twice (utilizing an ROV, Drones, or other available technologies) within 15 months of the completion of all decommissioning work. The first inspection is envisioned to 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.

5 SCHEDULE

End of operations/decommissioning planning activities are expected to begin approximately three to five years before the end of field life. End of field life could be caused by a variety of factors including end of production license period, end of production license extension period, or economic end of field life. 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 approval. The updated plan would be approved prior to the commencement of abandonment and decommissioning activities.. The notional schedule for decommissioning is shown below.

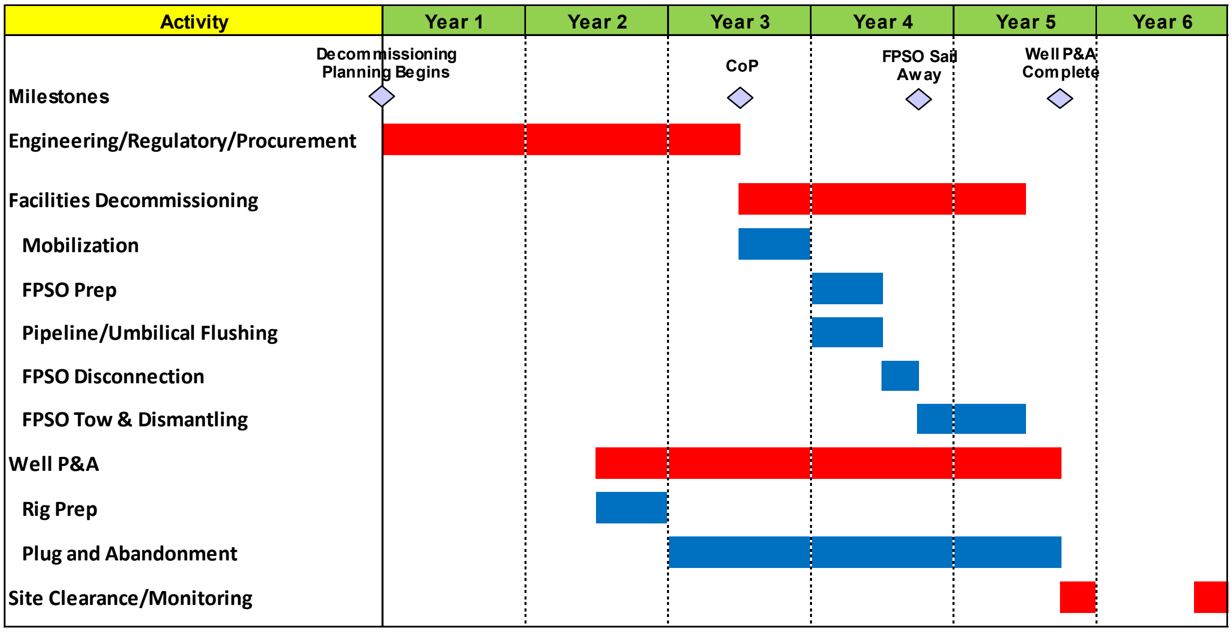

Figure 5: Nominal Payara Decommissioning Schedule

6 INFORMATION MANAGEMENT AND REPORTING

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

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

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

- 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.);
- 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 newsletter, 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 plugging and abandonment 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 shall 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.

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Esso Exploration and Production Guyana Limited (EEPGL) Oil Spill Response Plan for Guyana Operations

July 2020

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Endorsement and Approval

Endorsed by:

EEPGL Wells Manager

Olatunji Adeola

7/17/2020
Date

EEPGL Production Manager

Mike Ryan

Jul 17, 2020
Date

Approved by:

EEPGL Country Manager

Alistair Routledge

July 20, 2020
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."

Amendment Record

For each revision of EEPGL's Oil Spill Response Plan (OSRP), EEPGL will insert approval signatures and details in the table below. 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	Page Number	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.	Multiple	J. Simons
Rev 2	May 10, 2017	Final edits/revisions based on comments received to Liza Phase 1 FPSO Development Project EIA and OSRP.	Multiple	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).	Multiple	R. Henson
Rev 4	September 2018	Final edits/revisions based on comments received on Liza Phase 2 Development Project EIA and OSRP.	Multiple	R. Henson
Rev 5	August 2019	Amended to reflect inclusion of Payara Development Project.	Multiple	R. Henson
Rev 6	November 2019	Amended to include WCD for Liza Phase 1 and Liza Phase 2	Multiple	R. Henson
Rev 7	July 2020	Edits/revisions based on comments received on Payara Development Project EIA and OSRP	Multiple	A. Routledge

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)

Contents

Appendices

Tables

Figures

Acronyms and Abbreviations

Name	Description
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
NADF	Non-aqueous Drilling Fluid
NEBA	Net Environmental Benefit Analysis

Name	Description
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

1 INTRODUCTION

This Oil Spill Response Plan (OSRP) outlines plans and procedures, in the event of an oil spill incident, for 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]), ExxonMobil Corporate support teams, and third party support organizations.

This document is a country-wide OSRP which covers all of EEPGL's operations in Guyana, including exploration activities and development projects. This OSRP describes the equipment and facilities to be used to support oil spill response, and how EEPGL will work together with the appropriate Guyana agencies to respond to oil spills of differing severity levels. This document supersedes previously published OSRPs.

2 SCOPE

2.1 Covered Operations

This document covers all of EEPGL's business operations in Guyana, and is focused on those operations where there is a risk of an oil spill to the environment. As such, this document covers operations related to:

- Exploration operations (e.g., exploration and appraisal drilling, seismic surveys)
- Liza Phase 1 Development Project (inclusive of all phases, e.g., drilling, installation, production operations, decommissioning)
- Liza Phase 2 Development Project (inclusive of all phases, e.g., drilling, installation, production operations, decommissioning)
- Payara Development Project (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)

This OSRP will be updated periodically to cover other EEPGL operations and development projects as they are planned and executed.

At the time of publication of this document, EEPGL is performing a technical study to identify potential enhancements for well source control in the event of a well control event with loss of containment. Upon approval of the proposed well source control initiative(s) by the Government of Guyana, this OSRP will be updated and the agreed upon initiatives will be fully described in this document when they are operationally available for deployment.

2.2 Geographic Response Area

Oil spill modeling has determined the geographic areas that could be potentially impacted by the various types of oil spill scenarios that could be encountered in EEPGL's operations. Based on this modeling, the geographic response area generally covers Guyana's territorial waters North/Northwest of Georgetown where a full operational response would, as required, be implemented. Although it is unlikely that a fully mitigated oil spill would reach outside of Guyana's territorial waters, EEPGL's geographic response area could also include other regional territories including those of Venezuela, Trinidad and Tobago, and the Lesser Antilles. EEPGL has the capability to broaden its geographic response area as needed. See Appendix A for the results of modeling efforts for the Payara Development Project.

EEPGL will manage and coordinate an oil spill response from Georgetown, Guyana. EEPGL has the capability to setup support operations from multiple countries in the region, where it is safe to operate, and where the authorities allow such support within their jurisdictions.

2.3 Incident Management

The response management overview graphic (Figure 1) and supporting information provides guidance for an appropriate field and issues management response. This model depicts the interaction of both the field (tactical) response levels and Headquarters (strategic) support structure.

ExxonMobil tactical response teams include the Emergency Response Team (ERT), Incident Management Team (IMT), and Regional Response Team (RRT). Strategic response teams include the Region Emergency Support Group (ESG) and Business Unit ESG. Additional information for each team is available in the EEPGL Emergency Response Plan (ERP).

The makeup of the members of each response team is determined in advance to accommodate various emergency scenarios including oil spill response. Each team has core members (e.g., leadership, technical, administrative) identified, as well as backup personnel, all of whom are trained and participate in structured exercises, drills, and simulations to ensure competency and readiness. The specific makeup of each response team is included in the associated plan document. Sections 8.1 through 8.3 further describe the ERT, IMT, and RRT. A description of the membership of the IMT and supporting RRT within the Incident Commanded Structure (ICS) is included in Section 8.3.

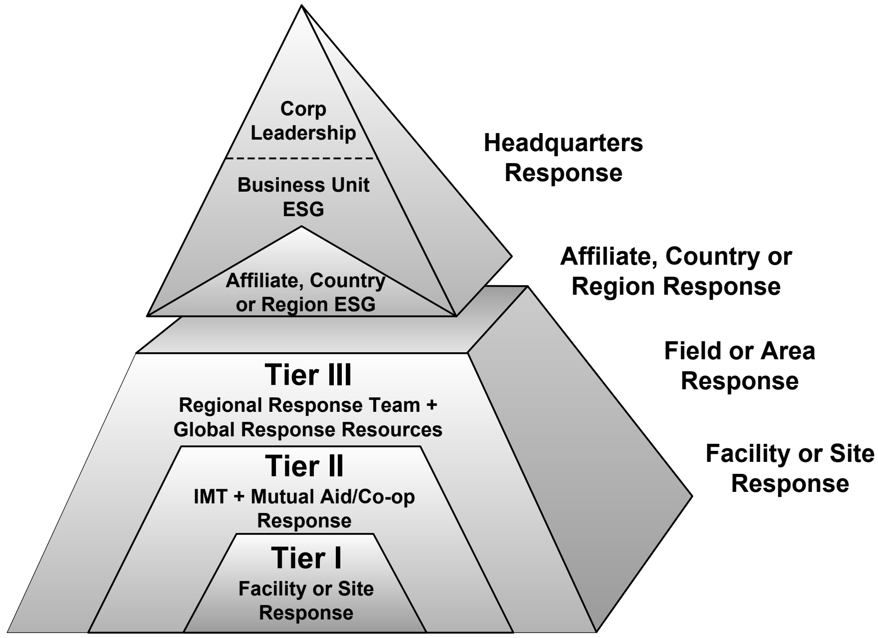

Figure 1: Emergency Management Overview

ExxonMobil has a tiered response approach to oil spill planning globally. Table 1 summarizes the tiered response approach and chain of command for operational coordination of an incident adopted by EEPGL.

Table 1: Tiered Oil Spill Response Approach

Tier	Description	Operational Coordination of Incident
I	Incident is small, under control, and may involve a local company-managed resource response. (Local Response)	On-scene ERT (may be EEPGL or contractor) is responsible for managing the incident.
II	Incident is large, under control, or spill source not immediately under control, and involves mutual aid cooperative response. (Regional Response)	EEPGL onshore IMT is responsible for managing the incident, supported by the on-scene ERT and regional/international Oil Spill Response Organizations (OSROs).
III	Incident is large, is not under control, and requires response by the appropriate RRT and specialized resources. (International Response)	EEPGL onshore IMT, complemented by RRT, is responsible for managing 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.

Figure 2 depicts the emergency response escalation model, which further defines the operational coordination responsibilities in Table 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.

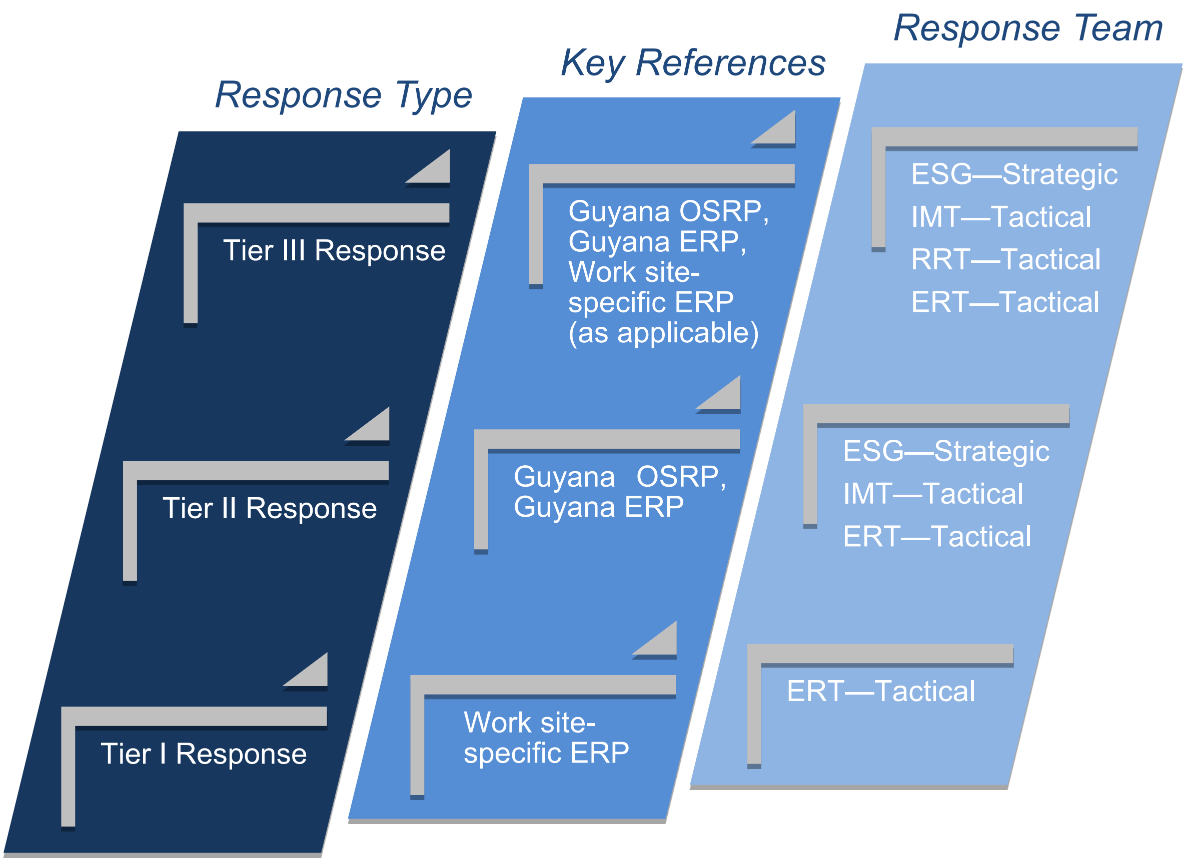

Figure 2: Emergency Response Escalation Model

Each ERT will manage Tier I spill responses using the site-specific ERP and resources located on vessels and in port facilities in Guyana and, as appropriate, in Trinidad. Such resources, as well as dispersant application from vessels, will also be used for larger Tier II or III spills until supplemental oil spill response resources arrive on-scene.

For incidents that may exceed Tier I capabilities, EEPGL would activate its onshore IMT and its contractor Oil Spill Response Limited (OSRL) in Southampton, UK[1] (refer to forms in Appendix C, Forms C.3 and C.4), as well as other regional Oil Spill Response Organizations (OSROs), to provide immediate incident management support as well as access to its OSROs'

1 OSRL merged with the Clean Caribbean and Americas (CCA) cooperative in 2013. The hertitage 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.

global oil spill technical response teams and equipment. EEPGL retains overall operational coordination of its spill response when OSROs are mobilized.

At all stages of the response operation, EEPGL will work 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 on a routine basis to ensure open lines of communication are maintained and clear roles and responsibilities are understood and consistent with the agreed emergency response planning for offshore petroleum operations. In recognition of the CDC recently preparing a Guyana National Oil Spill Contingency Plan (still in draft stage at the time of issue of this document), updates to this OSRP will be performed periodically, if needed to maintain alignment by EEPGL.

To supplement its in-country oil spill response resources, EEPGL will pursue the set-up or bolstering of a cooperative with regional OSRO(s) to support Tier II+ oil spill response, 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.

This OSRP is supported by the EEPGL ERP which provides a structured and systematic process for responding to incidents in Guyana. The ERP outlines plans and procedures for engagement between the incident site, EEPGL, and ExxonMobil management and the relevant authorities in Guyana. The ERP covers 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.

2.4 Response Plan Relationships

2.4.1 EEPGL Emergency Response Plan

The EEPGL ERP establishes a structured process for responding to events that pose, or could pose, a threat to people, environment, assets, or reputation impacted by EEPGL activities.

The ERP provides guidelines to assist project, drilling, exploration, and facilities management in effectively responding to an emergency such as an oil spill. This plan is a country-level plan that is mainly focused on emergency response activities conducted at the EEPGL Emergency Response Center(s). The EEPGL ERP also references work site-specific ERPs (e.g., Drillship ERP, Installation Vessel ERP, Floating Production, Storage, and Offloading vessel [FPSO] ERP).

2.4.2 Country National Plan

A draft Guyana National Oil Spill Contingency Plan identifies the CDC as the lead agency for oil spill response operations, which also houses the National Emergency Operating Centre (NEOC). However, the draft has not yet been formally adopted. The draft has been reviewed by EEPGL and it has been determined to be consistent with the range of oil spill responses that could be necessary during the lifetime of EEPGL's Guyana offshore projects. Responsibilities in the maritime sector are split between several departments and ministries including the EPA, Guyana Energy Agency (GEA), and Guyana Coast Guard (GCG). The Lands and Surveys Department of the Ministry of Agriculture has jurisdiction in river waters. The Transport and Harbors Department of the Ministry of Public Works, Communications, and Regional Development is responsible for port areas and territorial waters. However, the GCG enforces all maritime regulations and is a key operational organization in any marine incident, investigating reports of pollution in navigable waters on behalf of the relevant ministry and department. In addition, the Guyana Defense Force and the Fire Service also assume some operational responsibility for pollution response.

By developing a national strategy for disaster risk reduction and management, the CDC aims to be compliant with global and regional systems such as United Nations' International Strategy for Disaster Reduction and the Caribbean Disaster Emergency Response Agency's Comprehensive Disaster Management Framework.

2.4.3 Legal Framework

National laws, regulations, and conventions are applicable to EEPGL's activities in Guyana territorial waters in the case of marine pollution.

Applicable National laws and regulations include, but are not limited to:

- National Constitution of Guyana;
- The Environmental Protection Act 1996;
- The Guyana Geology and Mines Commission Act 1979;
- 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

Specific regulatory reporting requirements are covered in EEPGL's ERP and in the EIAs of the Liza Phase 1, Liza Phase 2, and Payara Development Projects.

2.5 OSRP Owner Responsibility

Owner and Administrator: The EEPGL Country Manager is the Owner of the EEPGL OSRP and the EEPGL Environment and Regulatory (E&R) Manager is the Plan Administrator.

Plan Review: The OSRP Administrator and Owner review and update this plan on an annual basis. The plan will also be reviewed and updated any time there is a significant change to: EEPGL in-country operations (i.e., the addition of an additional project/asset), spill response strategy/tactics, spill response contractor capabilities, and/or regulatory requirements; or as a result of application of key learnings from a response or exercise/simulation/drill.

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).

- 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 a spill or release. Further discussions of such duties and responsibilities are outlined in Section 3. Hard copies of such site-specific ERPs and SOPEPs will be maintained at the physical assets' locations or onboard the vessels, with a copy of the FPSO SOPEPs and Drillship SOPEPs also maintained at EEPGL's Office.

3 INITIAL RESPONSE ACTIONS

3.1 On-Scene Initial Response Actions

Figure 3 describes the immediate actions of on-scene ERT personnel upon discovery of a spill, including the initial situation analysis and identification of actual or potential health and safety hazards. More detailed site-specific procedures can be found in each ERP.

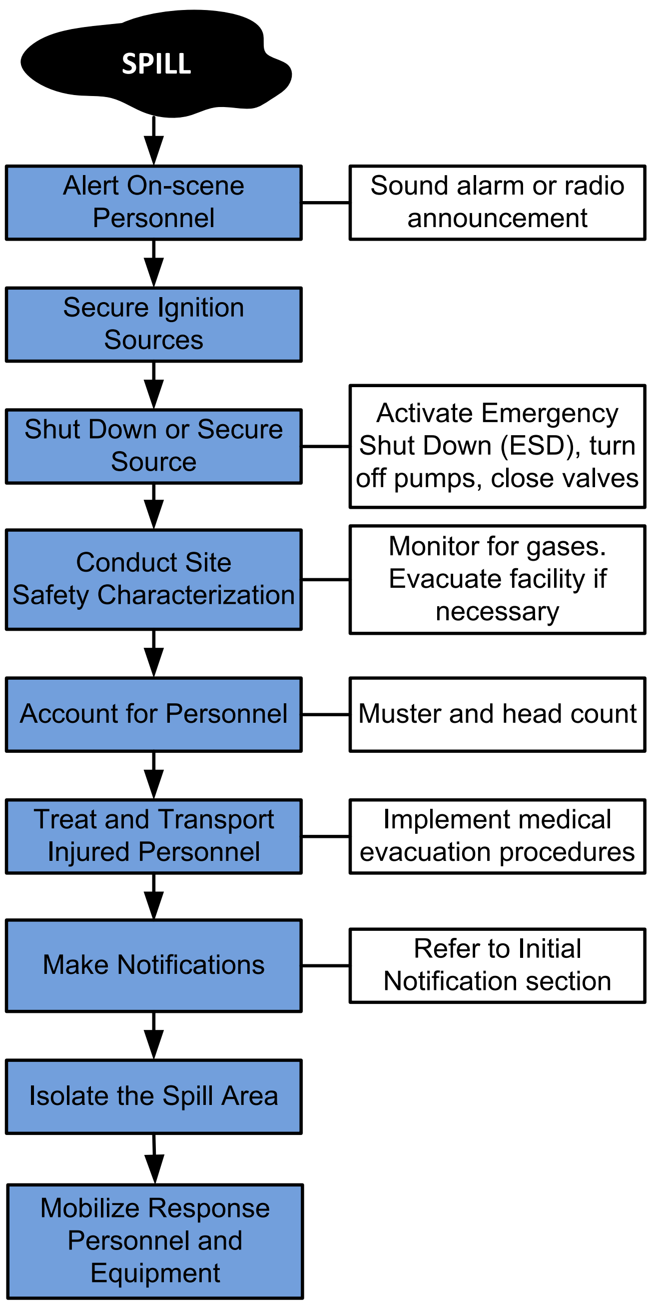

Figure 3: On-Scene Response Actions (Sample)

3.2 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 2.

Table 2: Incident Commander Initial Checklist

✓	Action
	Notify EEPGL Duty Manager immediately (use Initial Spill Report Form C.1, Appendix C).
	Request resources, if required, 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 3).

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 IMT, and this onshore emergency organization will take over the overall operational coordination for the incident, supported as appropriate by regional/international OSROs and the RRT.

3.3 Initial Notifications

The notifications matrix details which organizations to notify for each incident Tier, once initial on-scene response actions have been addressed Table 3). The EEPGL ERP provides specific internal and external incident reporting requirements. Protocols for activating each response team, and its named members, are included in the EEPGL ERP. Table 4 provides contact details for the entities listed in the notifications matrix. Contact information for named individuals is not included in a public document.

As described in the draft Guyana National Oil Spill Contingency Plan, the Government of Guyana will be responsible for notifying the government authorities of other jurisdictions where an EEPGL oil spill originating in Guyanese waters may potentially impact other jurisdictions. EEPGL will provide the Government of Guyana with the appropriate information for such government-to-government notifications for both initial and follow-up notifications.

Table 3: Notifications Matrix

Regulatory Notification	Reporting Threshold	External Organizations								Timing
		Dept of Energy	GGMC	EPA	CDC	MARAD	Harbor Master	GEA	OSRL Boots & Coots	
Spills / Process Safety Releases										
Hydrocarbon Liquid (On-Land)	> 600 BBL Oil (On -Site) > 10 BBL Oil (Offsite)		X	X	X			X		Immediate
Hydrocarbon Liquid (On-Water)	> 1 BBL Oil	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	X				Immediate
Gas/Vapor Release	Requiring site evacuation		X	X	X	X				Immediate
Well Control Event	> 24 hour *(estimated duration)*		X	X	X	X			X	Immediate

Table 4: Regulatory Authorities Contact Details

Organization	Country	Contact Details
Civil Defence Commission (CDC)	Guyana	+592 226 8488 (All Hours)
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)
Department of Energy (DE)	Guyana	+592 225 6689 (Business Hours) +592 620 0559 (A/H)
OSRL	USA	+1 954 983 9880 (All Hours)
Boots & Coots	USA	+1 844 307-8094 (All Hours)

3.4 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 for an example IMT with Source Control Branch.

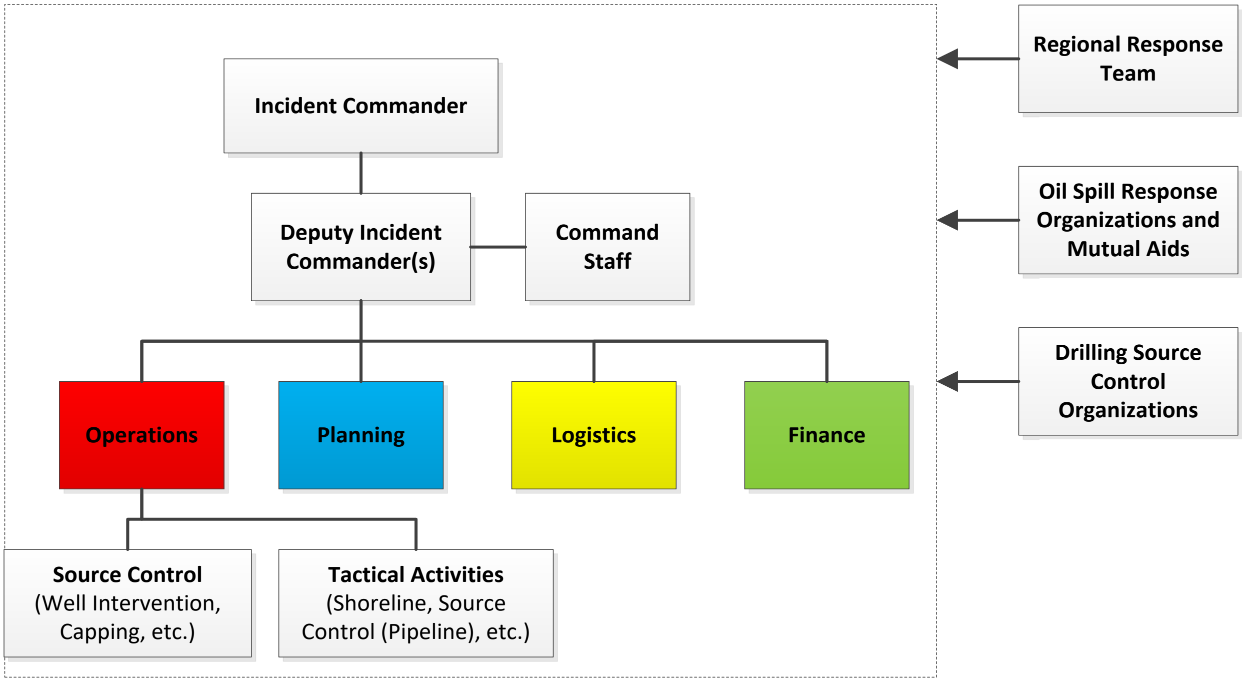

Figure 4: Example Incident Management Team (IMT) with Source Control Branch

3.5 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.

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'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.

The Source Control Branch will estimate the volume and rate of a subsea well release.

4 OIL SPILL SCENARIOS

The following tables describe potential hydrocarbon release scenarios in terms of location, hydrocarbon type, volume, and potential environmental impact. The 17 spill release scenarios shown in Table 5 below are taken from both the Payara Development Project Environmental Impact Assessment (EIA) and the revised worst case discharge (WCD) modeling for the Payara, Liza Phase 1 and Liza Phase 2 projects. These scenarios are generally representative of the range of oil spill risks from FPSO Development Projects, Exploration Drilling, and Production Operations, with the exception of the WCD scenarios. Modeling of the WCD scenarios supports oil spill response planning, but it is highly unlikely for a WCD to occur.

The range of oil spill risks is similar for the Payara, Liza Phase 1, and Lisa Phase 2 projects. Tier III events are addressed at length in both spill modeling and Net Environmental Benefit Analysis (NEBA), although it is recognized that Tier III well control events are rare. Offshore oil well blowouts that cause large-scale oil spills are rare events. Most blowout accidents release a relatively small amount of oil into the environment before the well is brought under control by operators or the well is sealed by natural processes. Many blowouts release relatively small volumes of oil into the environment over brief periods of time. Based on international data, 96% of blowouts have durations of less than 5 days; 25% have durations of less than 12 hours.

Ultimately, the key has been to prevent oil spills rather than respond to them, and spill control technology has advanced to reduce, control, and eliminate accidental releases. That process continues within the oil industry today and future advances will further reduce the frequency, release volume, and duration of accidental releases.

The following are examples of locations that could experience a hydrocarbon release during EEPGL operations in Guyana (or Trinidad):

- 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 6 provides details of potentially appropriate response actions for each identified scenario. Section 8 details resources available to EEPGL.

Hydrocarbons that could potentially be released during development drilling and production operations include crude oil, marine diesel, fuel oil, aviation fuel, lubricating oil, and non-aqueous drilling fluid. These scenarios are outlined in Table 5. The most appropriate response strategy for a given incident will depend, in part, on the properties of the hydrocarbon spilled. 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.

Table 5: Possible Hydrocarbon Release Scenarios by Tier

#	Tier	Location	Possible Scenario	Potential Impact [a]	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	6.4 Onshore/Nearshore Response 6.9 Waste Management 6.11 Decontamination 6.12 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	6.4 Onshore/Nearshore Response 6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.9 Waste Management 6.11 Decontamination 6.12 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	6.4 Onshore/Nearshore Response 6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.9 Waste Management 6.11 Decontamination 6.12 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	6.4 Onshore/Nearshore Response 6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.9 Waste Management 6.11 Decontamination 6.12 Demobilization

#	Tier	Location	Possible Scenario	Potential Impact [a]	Potential Response Strategies
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	6.4 Onshore/Nearshore Response 6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.9 Waste Management 6.11 Decontamination 6.12 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	6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.6 Offshore Containment and Recovery 6.7 Wildlife Response 6.9 Waste Management 6.11 Decontamination 6.12 Demobilization
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	6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.6 Offshore Containment and Recovery 6.7 Wildlife Response 6.9 Waste Management 6.11 Decontamination 6.12 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	6.1 Surveillance and Monitoring 6.2 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	6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.6 Offshore Containment and Recovery 6.7 Wildlife Response 6.9 Waste Management 6.11 Decontamination 6.12 Demobilization

#	Tier	Location	Possible Scenario	Potential Impact [a]	Potential Response Strategies
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	6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.6 Offshore Containment and Recovery 6.7 Wildlife Response 6.9 Waste Management 6.11 Decontamination 6.12 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	6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.5 Dispersant Application 6.6 Offshore Containment and Recovery 6.7 Wildlife Response 6.9 Waste Management 6.11 Decontamination 6.12 Demobilization
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	6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.5 Dispersant Application 6.6 Offshore Containment and Recovery 6.7 Wildlife Response 6.9 Waste Management 6.11 Decontamination 6.12 Demobilization
13	III	Drill ship /well offshore	Offshore release of crude oil from well control event (30-day duration at 20,000 bbl per day—Most Credible WCD)	Oil enters Atlantic Ocean; possible shoreline impact	6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.5 Dispersant Application 6.6 Offshore Containment and Recovery 6.7 Wildlife Response 6.8 In-situ Burning 6.9 Waste Management 6.11 Decontamination 6.12 Demobilization

#	Tier	Location	Possible Scenario	Potential Impact [a]	Potential Response Strategies
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	6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion 6.4 Onshore/Nearshore Response 6.5 Dispersant Application 6.6 Offshore Containment and Recovery 6.7 Wildlife Response 6.8 In-situ Burning 6.9 Waste Management 6.11 Decontamination 6.12 Demobilization
15	II	Drill ship / well offshore	Offshore release of up to 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	6.1 Surveillance and Monitoring 6.2 Assisted Natural Dispersion

bbl = barrel(s); NADF = non-aqueous drilling fluid; WCD = worst case discharge
[a] Potential impact is based on modeling of an **unmitigated** spill scenario.

The properties of the crude oil are provided in the modeling results in Appendix A. These modeling results, along with previous spill experience of different oil types, were used to complete the predicted impacts of each spill scenario.

Hydrocarbon releases of less than 100 barrels (bbl) (Scenarios 1, 2, 4, 5, 6, 7, 8, 9, and 10) would be expected to be quickly brought under control, and would be managed with locally available spill control equipment. Several of the scenarios (9 and 10) are contained on the deck of the vessel and are not expected to enter the ocean, so were not modeled. The diesel fuel releases into the Demerara River represent another non-persistent fuel material and were not modeled. These releases are known to be transient with a short duration in this river environment. These spills of diesel would not represent an active response beyond possible diversion booming, depending upon season and species of animals in the area. The focus of Scenario 8 would be the safety, rescue, and recovery of the helicopter crew. The helicopter 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. However, there is not considered to be potential for any long-term or ecosystem-level impacts on ecologically important or protected species. These spills are, therefore, not considered further in the assessment of risks from potential hydrocarbon spills.

A hydrocarbon release under Scenario 15 would involve a spill of up to approximately 2,200 bbl of non-aqueous drilling fluid (NADF) into the ocean near the seafloor. Under this scenario, the spill would be limited to the capacity of the drilling riser. The potential impacts of a release of this nature would primarily occur at or near the seabed, and may include localized smothering and toxicity that would affect benthic species, although this disturbance would occur in the same area where disturbance from drilling and cuttings discharges would have already occurred. Any dispersion of the NADF would also result in localized impacts on water quality and sensitive planktonic or fish 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 would involve a spill of approximately 500 bbl of diesel into an adjacent river or water body where a shorebase is located. Due to the rapid natural dispersion and evaporation of diesel, combined with dilution by water movement and tidal exchange, impacts would be limited in duration and would reduce with 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 all involve an oil spill requiring the implementation of both local and regional response resources as well as OSRL's and/or other OSROs' global oil spill technical response teams and equipment, which are further described in Sections 5 through 7. Oil spill modeling was performed for scenarios involving offshore release of 50 bbl (Scenarios 5, 6, or 9) and 250 bbl of marine diesel (Scenario 7), 50 bbl of crude oil (Scenario 10), 2,500 bbl of crude oil during offloading from an FPSO to a tanker (Scenario 12), and larger well control incidents (Scenarios 13 and 14).

Oil spill modeling results for selected scenarios of the Payara Development Project are provided in Appendix A.

5 RESPONSE STRATEGIES

5.1 Response Strategy Overview

An oil spill response includes a range of response tools and techniques, response strategies, and tactics. It can be constrained by physical conditions, prevailing weather and sea conditions, and safety considerations. EEPGL will evaluate each deployment in terms of feasibility, effectiveness, and potential to reduce negative environmental impact (i.e., net environmental benefit). EEPGL will respond with the intent of minimizing the negative impacts of the response and cleanup, as determined by a NEBA (see Section 5.2), which is an evaluation tool that supports decision making. In the event of a release, EEPGL and ExxonMobil technical experts will complete a spill-specific NEBA for submission to the Guyana EPA as soon as practical.

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 and initial response actions are implemented, and will monitor the incident and consider all appropriate response strategies, including containment and recovery as well as use of oil dispersants to appropriately respond to the incident.

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, and surface/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 authorization and the ExxonMobil Oil Spill Dispersant Guidelines will govern the application of dispersants.

The following flowchart (Figure 5) provides an overview of actions that would be taken by the ERT and EEPGL IMT in the event of an emergency. A final decision on all necessary actions to be implemented will be determined on a case-by-case basis tailored to the particular incident and individual circumstances.

5.2 Net Environment Benefit Analysis (NEBA)

EEPGL has completed a NEBA for Tier III scenarios resulting from a loss of well control during the drilling of a production well as well as a Tier II scenario resulting from a crude oil spill associated with an FPSO loading hose malfunction. This analysis has been performed for the Payara, Liza Phase 2, and Liza Phase 1 projects. The response analyses for these releases demonstrate EEPGL’s ability to respond to smaller spills and are a key input to overall incident response planning and the preparation of this OSRP.

NEBA is a process that compares the impacts of oil in the environment as well as spill response performance when applying different available response options. These options would include removing the oil from the environment utilizing burning and mechanical recovery. They also include the use of oil dispersants that make oil more readily available to natural biodegradation processes, and may include, in some cases, leaving the oil to degrade naturally. 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). One of the key aspects of the NEBA is to determine the combination of response strategies that will encounter the highest amount of oil that enters the environment. In many cases, this drives the location of the response close to the source of the release because that is where oil is most concentrated and most amenable to multiple response strategies and technologies.

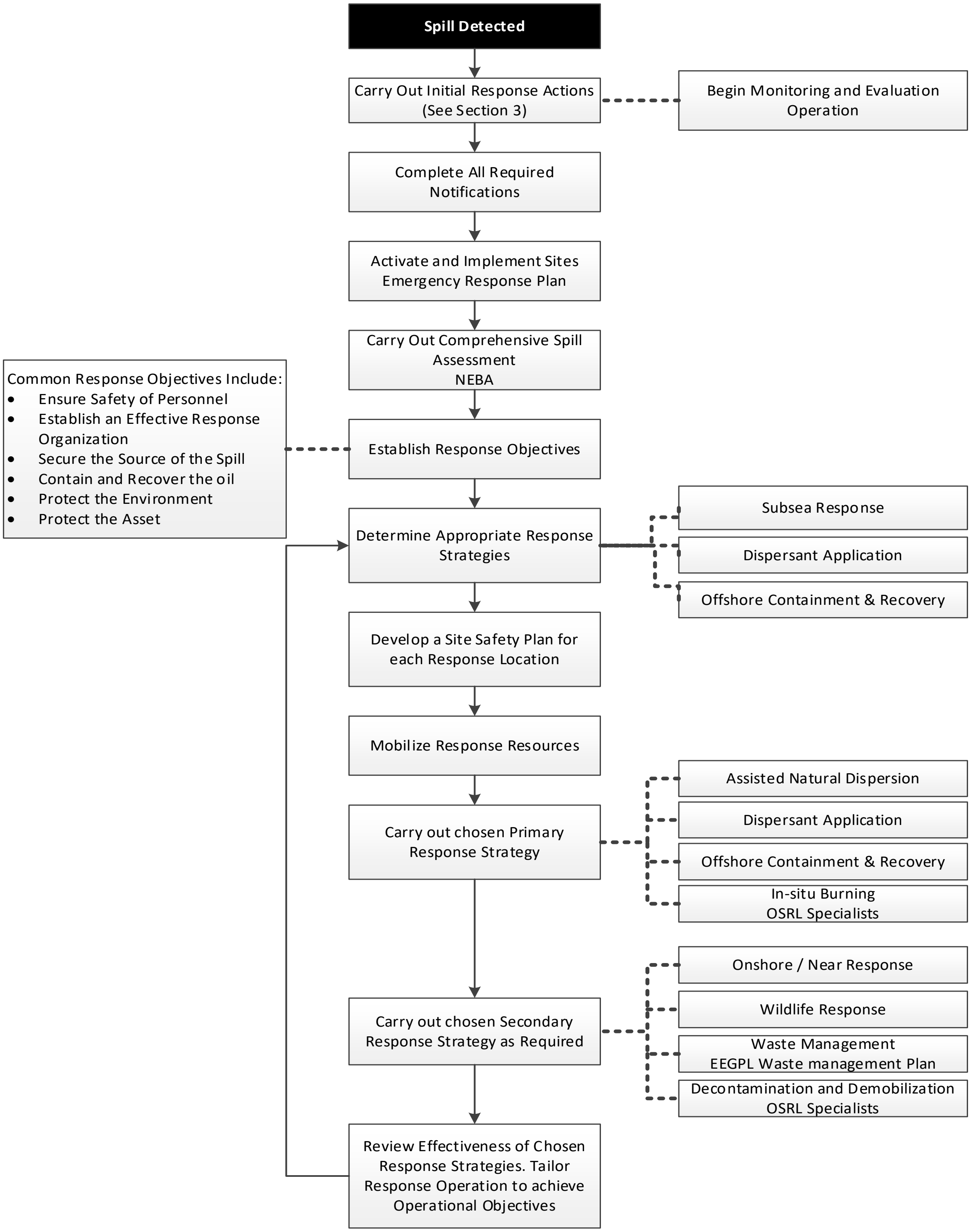

Figure 5: Emergency Response Generic Actions Flowchart

The encounter rate of different response alternatives is the highest with dispersant strategies. Dispersant application at the well head, and with aircraft and vessel spraying at the water surface, is far more effective in preventing shoreline stranding and effects on birds and marine mammals than mechanical recovery or burning, which both require the utilization of booms - which typically exhibit low encounter rates with oil in the environment. The process requires that the performance of the spill response options is weighed against shoreline impacts and potential persistent environmental effects that would result in lieu of those offshore response strategies. The recovery time of nearshore and on-shore habitats and species must be considered against the recovery time of near-surface plankton and invertebrate communities. The loss of fish eggs and larvae need to be assessed with respect to the potential population-level effects that might result from exposure to surface oil vs. exposure to a spike of dispersed oil. All of these factors should be weighed by experts with an understanding of the species and habitat recovery times, other potential environmental impacts, and potential socio-economic impacts associated with the oil spill response alternatives.

The use of NEBA will ensure EEPGL selects the most appropriate response techniques available to minimize overall environmental impact based on the conditions and sensitivities of an actual incident. In select situations, the NEBA may be updated and re-evaluated again at the time of a significant spill (Tier III) to further refine and optimize the response strategies to be used given the specific conditions and circumstances existing at the time of the event.

Refer to Section 8 for a list of available resources and Appendix G for the NEBA Report.

5.3 Appropriate Response Strategies

EEPGL will respond to a release as far offshore and as expeditiously as possible, using all appropriate tools and tactics to minimize shoreline impact. The safety of responders also needs to be considered in the evaluation of response strategies. Response tactics depend upon a variety of environmental conditions. In consultation with the Guyana EPA, EEPGL will develop Incident Response Plans that could include the following response strategies for an offshore release:

- Respond with 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 primary 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.

The 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. Mechanical recovery will necessitate OSRO/OSRL activation.

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.

Figure 6 below 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 6: Cone of Response Diagram

5.4 Transboundary Impacts

EEPGL will proactively work 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 draft 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;
- 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.

Any communications with other affected governments will be made through or with the Guyana Ministry of Foreign Affairs.

6 RESPONSE STRATEGY IMPLEMENTATION

The following sections describe the implementation of each response strategy available to EEPGL.

6.1 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 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. Depending on the type of operation involved in the spill, this could include FPSOs, drill ships, tankers, tugs, installation vessels, marine support vessels, etc. EEPGL will request updated oil spill modeling from response and/or or support organizations. For Tier II or Tier III incidents, EEPGL will scale-up to a full surveillance plan using helicopters, fixed wing aircraft, and satellite imagery.

The EEPGL 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.

The Air Operations Branch Director is responsible for addressing response considerations including flight authorizations and restrictions, air clearances, government support, aerial logistics, and operational constraints (e.g., weather, visibility). All aviation operations must follow the Site Safety Plan and additional emergency procedures specific to the operation.

Figure 7 illustrates the key steps involved in surveillance and monitoring; refer to the ExxonMobil IMH and the OSRL Field Guides for further details. Refer to Section 8 for a list of available resources.

Figure 7: Surveillance and Monitoring Key Steps

6.2 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.

6.3 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.

- 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.

6.4 Onshore/Nearshore Response

6.4.1 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 8 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.

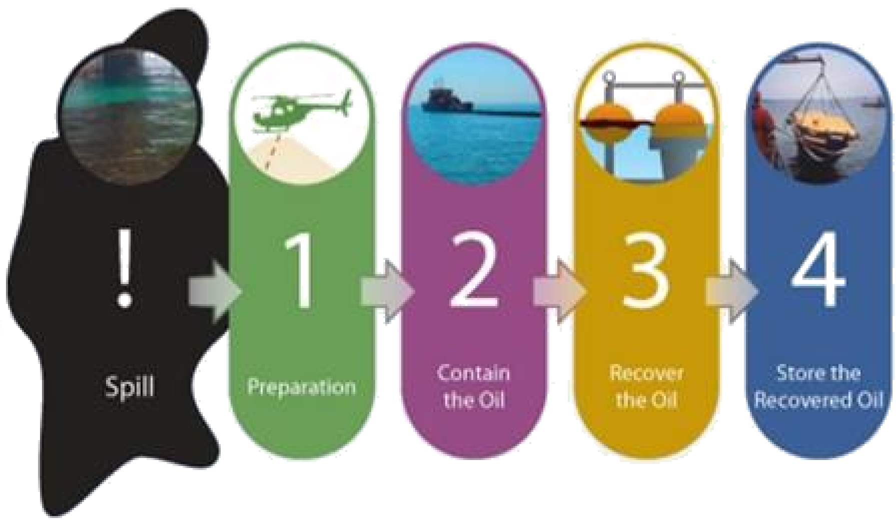

Figure 8: Harbor Containment and Recovery Key Steps

6.4.2 Shoreline Response

EEPGL will implement a shoreline response if released hydrocarbons show the potential to affect a shoreline, prioritizing environmentally or socioeconomically sensitive areas. These are 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 and indigenous peoples depend, as assessed in the EIAs for the FPSO Development Projects (Liza Phase 1, Liza Phase 2, and Payara).

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 to protect sensitive areas and provide collection points for hydrocarbon recovery. Initial equipment (e.g., dispersant, mechanical recovery) will come from in-country and/or regional sources and will be supplemented as necessary via OSRL from Ft. Lauderdale, FL, and other bases.

EEPGL has pre-identified the environmentally and socioeconomically sensitive areas that could be impacted by a major oil spill. Coastal Sensitivity Maps have been developed which identify sensitive habitats/wildlife areas/features associated with the coastlines in the geographic response area. The Coastal Sensitivity Maps are included as an appendix to the EIAs for each of the Liza Phase 2 and Payara Development Projects. 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 (see Section 7.2 and Appendix D). The IMT will use this information for response planning, including development of protection strategies.

Figure 9 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 8 for a list of available resources.

Figure 9: Shoreline Response Key Steps

6.4.3 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.

6.4.3.1 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.

6.4.3.2 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 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.

6.4.3.3 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.

6.4.3.4 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.

6.4.3.5 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.

6.4.3.6 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.

6.4.3.7 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.

6.4.3.8 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.

6.4.3.9 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.

6.5 Dispersant Application

Dispersants have been used successfully to reduce shoreline and surface impact during many oil spill incidents in industry. 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. Although dispersants are pre-authorized for use by the EPA (per OSRP Rev 4 plan approval by the EPA in September 2018), EEPGL will only apply dispersants if there is a direct advantage to protecting environmental or socioeconomic sensitivities (determined using NEBA, Section 5.2 and Appendix G) 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. OSRL 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 well blowout, 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, 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 C, Form C.2.

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 (Appendix B) 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 will work with the EPA to develop a dispersant application, monitoring, and evaluation strategy as part of a spill response strategy. Appendix C 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 (Form C.3), Dispersant Use Planning Form—Application Tactics (Form C.4), and Dispersant Use Request Form (Form C.6).

Figure 10 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 10: Dispersant Application Key Steps

6.5.1 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 that the magnitude of the effect on an organism caused by a chemical compound is 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 6.5.2 through 6.5.5 discuss the potential toxic effects of dispersants. Additional analysis on the potential impacts of dispersant use is described in the EIAs for the Liza Phase 2 and Payara Development Projects.

6.5.2 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).

6.5.3 Exposure to Oil, Dispersed Oil, and Water-Soluble Compounds from Oil

Once an oil spill has occurred, it is inevitable that 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 (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.

6.5.4 Effect of Using Dispersants

Dispersing more of the oil as small droplets in the water column by the use of dispersant 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).

6.5.5 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 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 USEPA 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 6 lists these constituents and the following discussion explains how that determination was reached.

Table 6: Chemical Constituents of Corexit® Dispersants

Chemical Abstr acts Service Registry Number [a]	
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	Dioctyl 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

[a] 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.

6.5.6 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 (µg/L) limit of detection. The USEPA reported only one sample that exceeded the limit of detection (at 26 µg/L).[2] This is important because it

[2] 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 µg/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.

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"[3] ingredient, and as an indirect and direct food additive (Dickey and Dickhoff, undated).

6.5.7 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 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 [µg/g]), shrimp and crabs (500 µg/g), and oysters (500 µg/g) (Dickey and Dickhoff undated). This is not surprising given the low DSS concentrations in water measured by the USEPA.

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

6.6 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

[3] 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.

the containment and recovery systems. Barges will store and transport recovered waste in accordance with the Waste Management Plan (refer to Section 6.9).

The 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. Offshore mechanical recovery will necessitate OSRO/OSRL activation, who will provide the resources required.

Figure 11 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 8, for a list of available resources.

Figure 11: Containment and Recovery Key Steps

6.7 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 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 the EIAs for the FPSO Development Projects (Liza Phase 1, Liza Phase 2, and Payara). 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. Opportunities to engage and train further members of the local oil spill response contractor(s) as well as potential members of the potentially affected communities will be evaluated to expand such local resources.

6.8 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 12 illustrates the key steps involved in burning operations; refer to the ExxonMobil IMH and OSRL Field Guide for detailed information. Refer to Section 8, for a list of available resources.

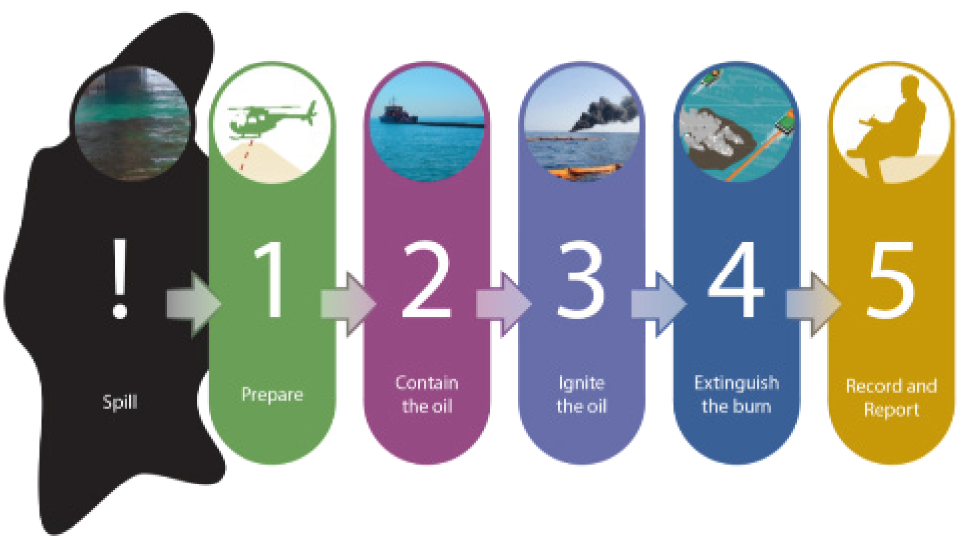

Figure 12: In Situ Burning Key Steps

6.9 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 has developed 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. The preferred method of disposal for deceased wildlife is through incineration, and consultation with local wildlife experts and Government Agencies would inform final disposition of carcasses. Wastes collected in countries outside of Guyana will be handled according to the regulations required specific to that location. EEPGL will implement their Waste Management Plan and OSRP, both of which include provisions for the collection, segregation, storage, treatment, transportation, and disposal of both solid municipal and industrial hydrocarbon-contaminated wastes.

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 13 illustrates the key steps involved in waste management; refer to the ExxonMobil IMH and OSRL Field Guide for detailed information. Refer to Section 8, for a list of available resources.

Figure 13: Waste Management Key Steps

6.10 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 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 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 the OSRL SWIS, Oceaneering, 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;[4] and
- CSSs and auxiliary equipment.

Figure 14 illustrates the key steps involved with a subsea response.

Figure 14: Subsea Response Key Steps

6.11 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.

[4] Dispersant will be mobilized simultaneously through the OSRL GDS service via the EEPGL IMT. For detailed information on the implementation of a subsea response, see the Guyana Wells Emergency Response Logistics Mobilization Plan that has been provided in Appendix H.

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 that have been used at the site 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 IMH and OSRL Field Guide.

6.12 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.

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).

7 RESPONSE STRATEGIES

7.1 Methodology

EEPGL, supported by The Response Group (TRG) or a similar organization, will utilize a Geographic Response Plan (GRP) for the coastlines of Guyana, Trinidad and Tobago, and Venezuela to support EEPGL operations. The geographical footprint of the GRP was based on projected impacts from the oil spill stochastic modeling of a well control event with loss of containment scenario and the initially impacted shorelines, as outlined in this OSRP. Once the scope of coverage was defined, TRG conducted a full desktop review in detail at a scale of 1:5,000 to determine any potentially impacted sensitivities along the coastline.

Once the data from the Liza Phase 1, Liza Phase 2, and Payara Development Project EIAs were received in geographic information system (GIS) format, the data were overlaid to confirm the response actions by location. By combining the environmental GIS data into the GRP, responding organizations can review locations of sensitivities, access points, and response actions, as well as resource requirements in one document. The GRP also defines the equipment needs (totals) for each division to support efficient resource ordering practices upon implementation of the plan. To further support response activities, the GRP also provides an appendix to response methods by shoreline type to support response activities and decision-making on impacted areas that might be outside the scope of the GRP.

7.2 Divisions and Maps

The GRP is a comprehensive document (500+ pages) that is managed outside of the OSRP for efficiency purposes. However, several example maps and tables are included in Appendix D to provide users with a conceptual overview. As shown in Appendix D, each country (e.g., Guyana, Trinidad and Tobago, Venezuela) is broken up into multiple divisions, based on geopolitical boundaries and cities or points of interest. Each of these divisions contains detailed strategies for spill response and shoreline protection. These strategies were developed to support three primary functions: (1) enhance the safety of the public, (2) protect the environment, and (3) provide responders with a planning tool to support the initial response actions in the event of a spill.

Response teams will have access to the GRP maps during an emergency event through the Incident Action Plan software.

8 RESPONSE RESOURCES

Table 7 lists or otherwise describes the international, regional, and local resources available to EEPGL for each potential response strategy. ExxonMobil and its subsidiary companies (including EEPGL) are members of OSRL, Marine Well Containment Company (MWCC), Marine Spill Response Corporation (MSRC); in addition, ExxonMobil and it subsidiary companies (including EEPGL) have contracts in place with Boots & Coots, Wild Well Control, Add Energy, and other OSRO vendors, and, as members/customers, have access to worldwide stocks of equipment. 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. Tables 8, 9, 10, 11, and 12 provide a further summary of the representative oil spill response equipment to be provided on the FPSOs. Both EEPGL and its OSRO contractors have robust inspection and maintenance programs to ensure that oil spill response equipment identified in this plan is maintained in a state of operational readiness. Also, EEPGL and its OSRO contractors will replace oil spill response equipment identified in this plan that is retired, sold, or deemed unfit for use (i.e., unable to be repaired, obsolete) in order to maintain a state of operational readiness.

Table 7: Oil Spill Response Resources [a]

Response Strategy	Resources Available	Quantity	Location
Surveillance and Monitoring	Heliport / Shorebase	2	Guyana Airport / Shorebase (Examples: Correia International Airport / GYSBI Shorebase or similar, Guyana)
	Helicopters	5	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 8.3.2, OSRL	
Assisted Natural Dispersion	PSVs / FSV marine support vessels (each of 17 vessels have mounted dispersant application monitors and one tote of dispersant)	17	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 8.3.2, OSRL	
	1,200-ft 8" x 16" Solid Float Containment Boom (24 ea. 50-ft Sections)	2	Georgetown Shorebase
	1,200 ft 6" x 12" TC Solid Float Containment Boom (12 ea. 100ft Sections)	2	Georgetown Shorebase

Response Strategy	Resources Available	Quantity	Location
	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 8.3.2, Oil Spill Response Limited	
	GDS	Refer to: Section 8.3.3, GDS	
	OSRL Offshore boom Offshore skimmers Temporary storage Trained personnel	Refer: Section 8.3.2, Oil Spill Response Limited	

Response Strategy	Resources Available	Quantity	Location
	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
Wildlife	OSRL	Wildlife response equipment	Refer: Section 8.3.2, OSRL
	Sea Alarm Foundation	Technical expertise	Georgetown Shorebase
	ExxonMobil Biomedical Sciences, Inc.	Wildlife expertise	Refer: WRP (0)

Response Strategy	Resources Available	Quantity	Location
In-Situ Burning	OSRL Fire resistant boom Ignition equipment Trained personnel	Refer: Section 8.3.2, OSRL	
Waste Management	Waste contractor	NA	Guyana
	OSRL	Refer: Section 8.3, OSRL	
Subsea Response	OSRL SWIS 15k air-freightable capping stack 15k capping stack SIRT	Refer: Section 8.3, Subsea Well Response	Norway and Brazil
	Boots & Coots GRIP 15k capping stack	Refer: Section 8.3, Subsea Well Response	Houston
	ROV contractor ROVs onboard Technicians (4 person crew per Drill Ship)	2 per Drill Ship	TBD Houston, TX
	Trendsetter Engineering Inc. Engineers/technicians to support capping equipment mobilization and installation	NA	
	Additional available equipment: Wild Well Control WellCONTAINED Blowout Prevention (BOP) Intervention Subsea Dispersant application kit Debris removal kit CSS		See WellCONTAINED™
	Relief Well: Halliburton Boots & Coots active ranging technology	NA	Houston, TX
	Crude Oil Tanker	1	Infield (During scheduled tanker offloading)

Response Strategy	Resources Available		Quantity	Location
	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	NA	
Multi strategy use	Drillship		Up to 4	Infield
	FPSO [a]		1	Infield (See Table 7 for a list of the common spill response equipment kept onboard)

ft = foot/feet
Multi strategy use
[a] 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 8: Oil Spill Response Equipment Supplied with FPSO—Oil Containment Boom

GENERAL	QUANTITY	1
	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
CONTAINER	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.
REEL	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
		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 50m sections)
	MATERIAL	Reinforced double faced Neoprene
	MINIMUM HEIGHT	1500mm (inflated)
	FREEBOARD	600mm
	DRAFT	900mm
	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
CERTIFIC-ATION	BOOM	ASTM F1523 - 94(2007)
		ASTM F1093—99(2012)
		ASTM F2438 - 04(2010)
		ASTM F962 - 04(2010)
	CONTAINER	ISO/ABS (IACS)

Table 9: Oil Spill Response Equipment Supplied with FPSO—Skimmer System

GENERAL	QUANTITY	1
	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
SKIMMER	TYPE	High capacity disc skimmer.
	RECOVERY RATE	52 m3/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.
POWER PACK	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 29L 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.
TRANS -FER PUMP	TYPE	Rotary lobe.
	DRIVE	Hydraulic motor.
	DISCHARGE	4.5 bar maximum.
	SOLIDS HANDLING	20 mm maximum.
HOSE KIT	HYDRAULIC	1 x 3/8” NB x 15 m long with quick release couplings on both ends.
		1 x ¾” NB x 15 m long with quick release couplings on both ends.
		1 x 1” NB x 15 m long with quick release couplings ton 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).
CERTIFIC-ATION	SKIMMER	ASTM F1778 - 97(2008)

Table 10: Oil Spill Response Equipment Supplied with FPSO—Floating Storage

GENERAL	QUANTITY	2
	CAPACITY	50 m3
	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	18m3
	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.
		Inflator / Deflator unit (ATEX approved).
		Repair kit.
		Weatherproof aluminium alloy storage container (stackable) with certified.
		Lifting points.
		Relief valve inflation unit.

Table 11: Oil Spill Response Equipment Supplied with FPSO—Dispersant Spray System

GENERAL	QUANTITY	1
	TYPE	Portable lightweight oil dispersant sprayer.
	MANUFACTURER	Vikoma (or equivalent).
	MODEL	Vikospray 1000 (or equivalent).
	WEIGHT	100 kg
SPRAY UNIT	APPLICATION	For both concentrate and dilute dispersant application.
	LANCES (QTY)	2
	ACCESSORIES	Suction hose.
		Trolley mounted.
		Operation/maintenance manuals
PUMP UNIT	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.
HOSE KIT	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 10m hose and lance.

Table 12: Oil Spill Response Equipment Supplied with FPSO—Offshore Container

GENERAL	QUANTITY	1
	TYPE	10’ offshore container for skimmer and dispersant spray systems, inflator.
		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.
CERTIFI-CATION	CONTAINER	ISO/ABS (IACS)

8.1 Tier I Resources

8.1.1 Mobilization

Each onsite 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

8.2 Tier II Resources

The EEPGL 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.

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 8.3 (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 draft Guyana National Oil Spill Contingency Plan, some of which have recently procured oil spill response equipment.

8.3 Tier III Resources

8.3.1 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 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. 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 15). The organization is led 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.

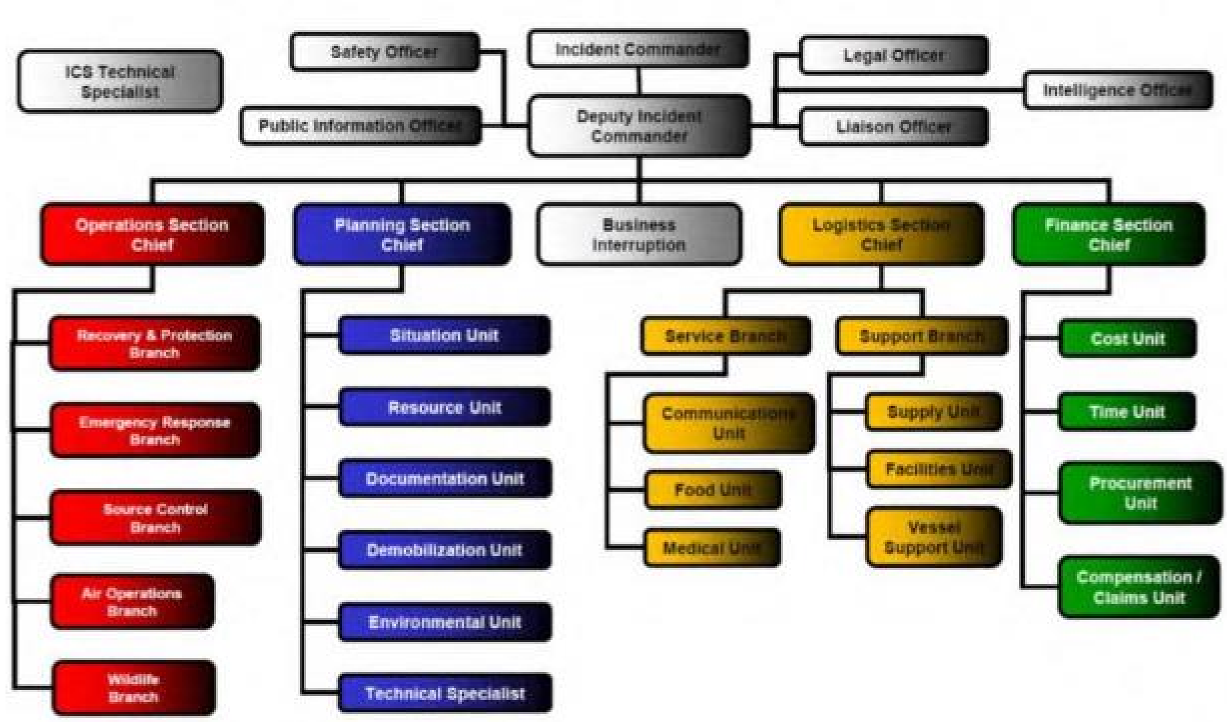

Figure 15: Sample Incident Command System Organization

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.

8.3.2 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 13 summarizes the OSRL service level agreement (SLA) available to EEPGL.

Table 13: OSRL Service Level Agreement Summary

<table>
<tr><th>Service</th><th colspan="2">Service Standard</th><th colspan="2">EEPGL Membership Type: Participant</th></tr>
<tr><td rowspan="7">Response notification, mobilization, service and advice</td><td colspan="4">Notification of a spill should be placed to one of the following locations:</td></tr>
<tr><td>OSRL BASE</td><td colspan="3">Fort Lauderdale, USA</td></tr>
<tr><td>TELEPHONE</td><td colspan="3">+1 954 983 9880</td></tr>
<tr><td>FAX</td><td colspan="3">+1 954 987 3001</td></tr>
<tr><td>EMAIL</td><td colspan="3">dutymanagers@oilspillresponse.com</td></tr>
<tr><td>FORMS</td><td colspan="3">Refer to Appendix C: OSRL Notification Form C.7</td></tr>
<tr><td colspan="4">The Duty Manager will speak with and advise EEPGL immediately, or call EEPGL back within 10 minutes.</td></tr>
<tr><td>Nominated Contact</td><td colspan="2">OSRL must receive an official mobilization authorization from one of EEPGL's Nominated Call-Out Authorities (anyone can notify OSRL).</td><td colspan="2">EEPGL's Nominated Authority:
Greg DeMarco
Arthur Powers
Alfred Sly</td></tr>
<tr><td rowspan="2">Spill response equipment</td><td colspan="4">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, www.oilspillresponse.com and refer to the equipment stockpile status report http://www.oilspillresponse.com/activate-us/equipment-stockpile-status-report</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td>Dispersant stockpile</td><td colspan="4">If there was an incident, the spiller is entitled to 50% of the ~680 m³ 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.</td></tr>
<tr><td rowspan="4">World-wide transportation of equipment</td><td>Aircraft Type</td><td>Location</td><td>Dispersant Capacity</td><td>Range</td></tr>
<tr><td>C-130 Hercules
(1x aircraft)</td><td>Singapore, Seletar</td><td>13,000 liters</td><td>2,000 nm in 8 hours</td></tr>
<tr><td>Boeing 727
(2x aircraft)</td><td>UK, Doncaster</td><td>17,500 liters</td><td>2,400 nm in 6 hours</td></tr>
<tr><td colspan="4">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.</td></tr>
</table>

Service	Service Standard	EEPGL Membership Type: Par ticipant
Oil spill trajectory and tracking	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	
Response Personnel	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^3 = cubic meter

8.3.3 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 14 and providing the information requested.

Table 14: MSRC Contact Information

Company	Toll-Free	Main	Internet
Marine Spill Response Corporation (MSRC)	(800) 645-7745	(703) 332-6560	http://www.msrc.org
Spill Response Equipment	Dispersant aircraft, dispersants, mechanical response equipment, communications equipment, vessels, capping stacks		

8.3.4 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. Once deployed, final capping operations could occur to shut in the well. Boots & Coots should be activated by calling the number below in Table 15 and providing the information requested.

Table 15: Boots & Coots Contact Information

Company	Toll-Free	Main	Internet
Boots & Coots	(844) 307-8094	281-931-8884	http://www.bootsandcoots.com
Spill Response Equipment	Dispersant aircraft, dispersants, mechanical response equipment, communications equipment, vessels, capping stacks		

8.3.5 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 blowout contingency.

Table 16: Add Energy Contact Information

Company	Toll-Free	Main	Internet
Add Energy	24/7 Emergency Line: +47 66 98 32 90	+1 832 604 7326	https://addenergy.no/

8.3.6 Global Dispersant Stockpile

The Global Dispersant Stockpile (GDS) is an additional 5,000 cubic meters (m^3) of dispersant located across the OSRL bases and in France (see Table 17). The dispersant types are those with the largest worldwide approval. Copies of the Safety Data Sheets (Form C.2 in Appendix C) for all four of these products have been furnished as part of Appendix C.

Table 17: OSRL GDS Quantities and Locations

Dispersant	Quantity	Storage Location
Slickgone NS	350 m^3	Singapore
	500 m^3	Southampton, UK
	800 m^3	Saldanha, South Africa
Finasol OSR52	350 m^3	Singapore
	500 m^3	Southampton, UK
	1,500 m^3	Vatry, France
Corexit 9500	500 m^3	Rio de Janeiro, Brazil
	500 m^3	Fort Lauderdale, USA
Corexit 9527A	457 m^3	Georgetown*

*Georgetown oil dispersant stock scheduled to be in place in 2020

OSRL and EEPGL mobilization responsibilities depend on the location of the stockpile (see Figure 16). 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.

EEPGL is also in the process of completing the necessary logistics to mobilize additional dispersant currently stored in Houston, Texas, USA to Georgetown, Guyana. This will include approximately 457 m^3 of Corexit 9527A that is scheduled to be stored in 457 IBC tanks in 2020.

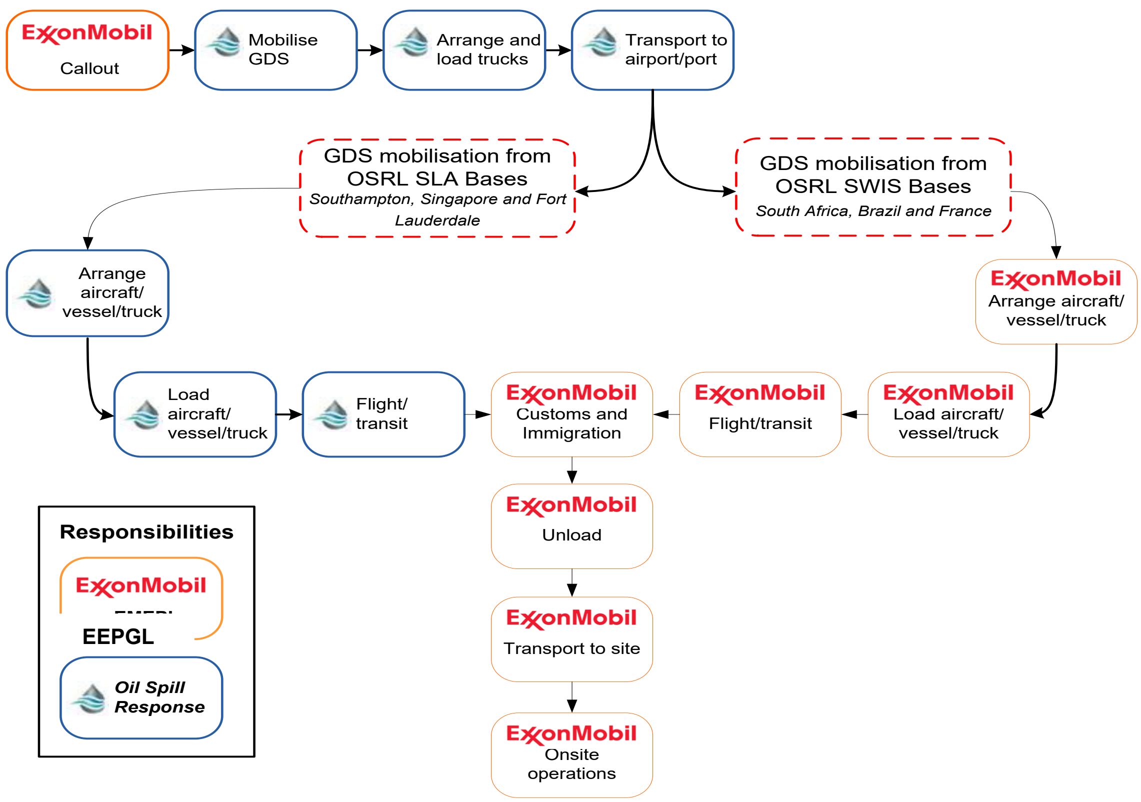

Figure 16: GDS Mobilization Responsibilities

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^3 is available to support both a subsea and/or surface response. This is consistent with data collected from the 2010 Macondo incident. The dispersant that is currently on hand in Georgetown and that will continue to be added to in 2020 will be sufficient to support the response to a WCD scenario with aerial dispersant application for 2 days, or subsurface dispersant application for 5 days. This will allow sufficient time to transport additional supply from OSRL in Ft. Lauderdale, and for transport to begin for further supplies external to the region. In the event significant amounts of dispersant are required prior to the arrival of the dispersant stocks in early 2020, dispersant can be airlifted 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.

8.3.7 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 (see Figures 17 and 18), 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;[5] 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 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 19).

[5] Dispersant must be mobilized simultaneously through the OSRL GDS service via EEPGL IMT.

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. 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.

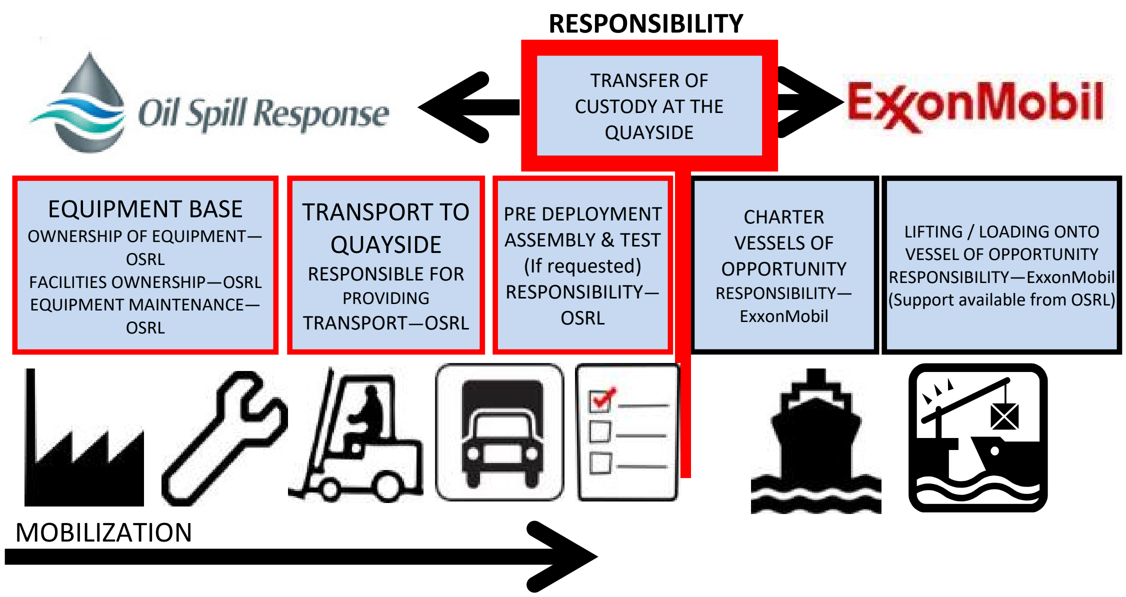

Figure 17: CSS Mobilization Responsibilities for OSRL and ExxonMobil

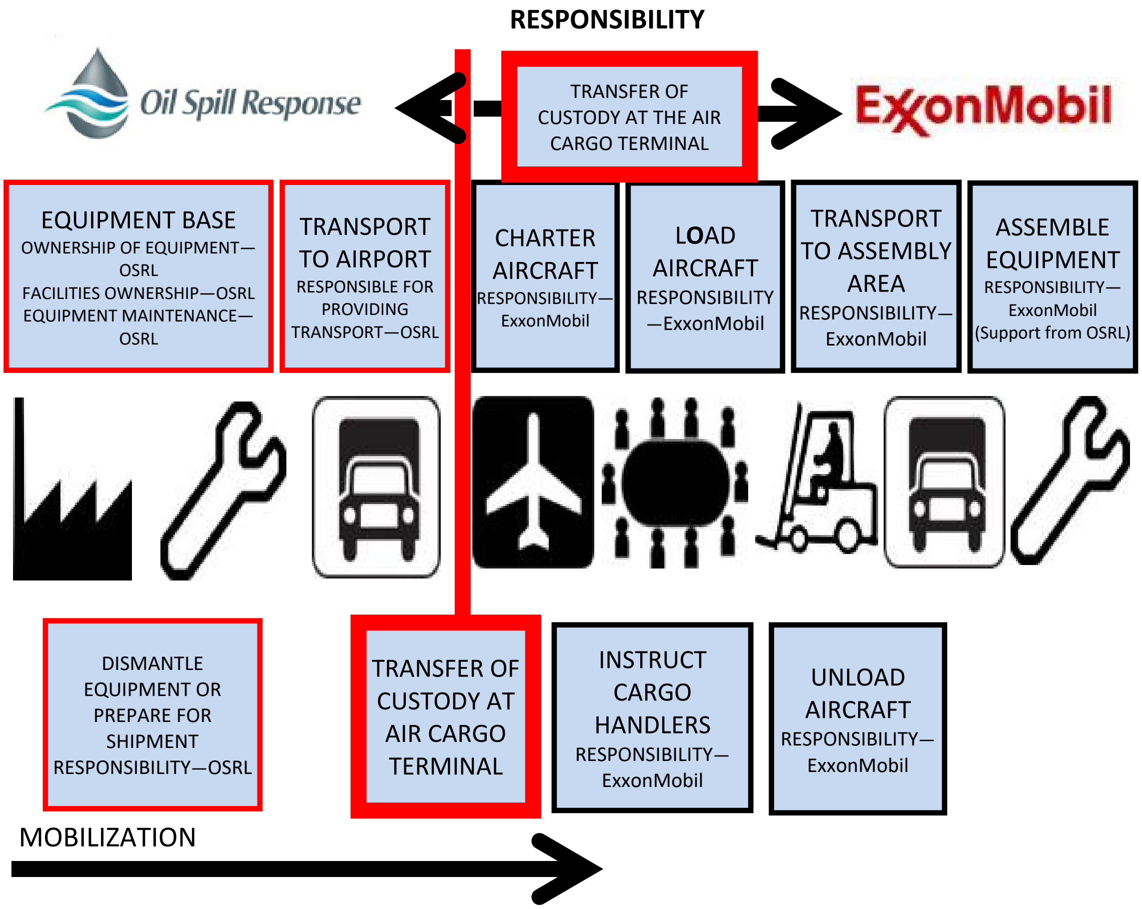

Figure 18: SIRT Mobilization Responsibilities for OSRL and ExxonMobil

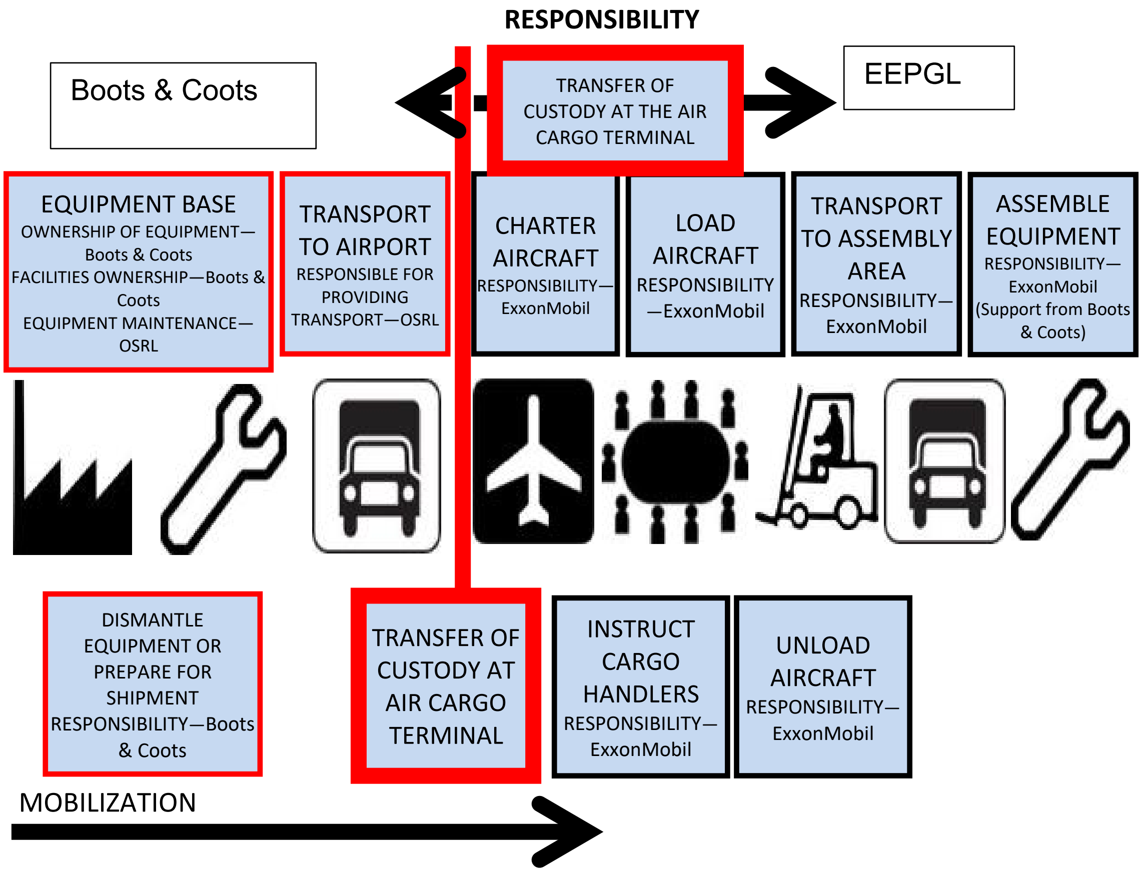

Figure 19: GRIP Mobilization Responsibilities for Boots & Coots and ExxonMobil

Additionally, 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.

Further details are outlined in the Drilling-specific ERP. EEPGL's Guyana Wells Emergency Response Logistics Mobilization Plan covering mobilization of subsea response equipment is provided in Appendix H of this OSRP.

In order to mobilize this equipment, the following flow charts (see Figures 20 and 21) should be considered.

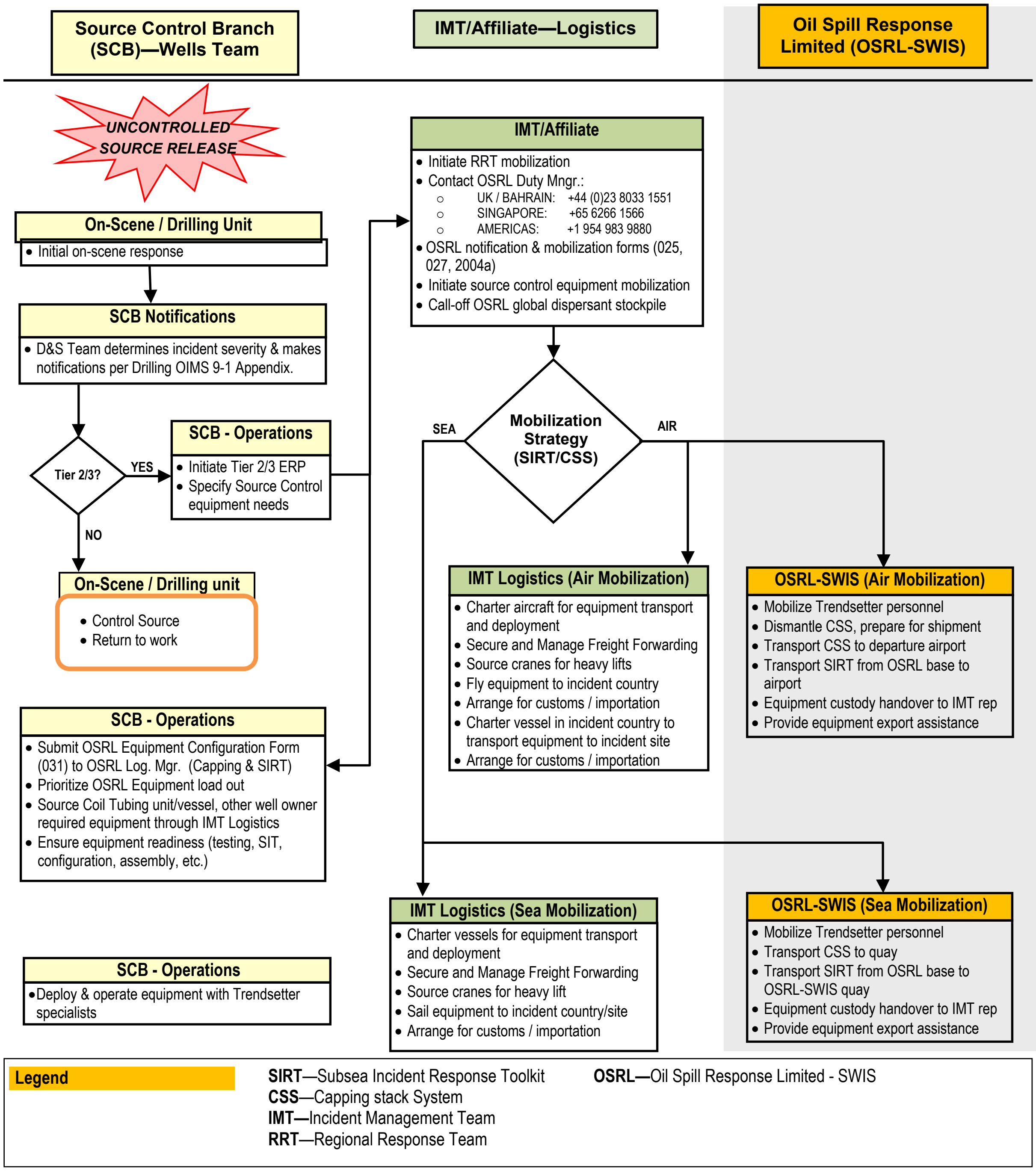

Figure 20: OSRL-SWIS Equipment Mobilization Process

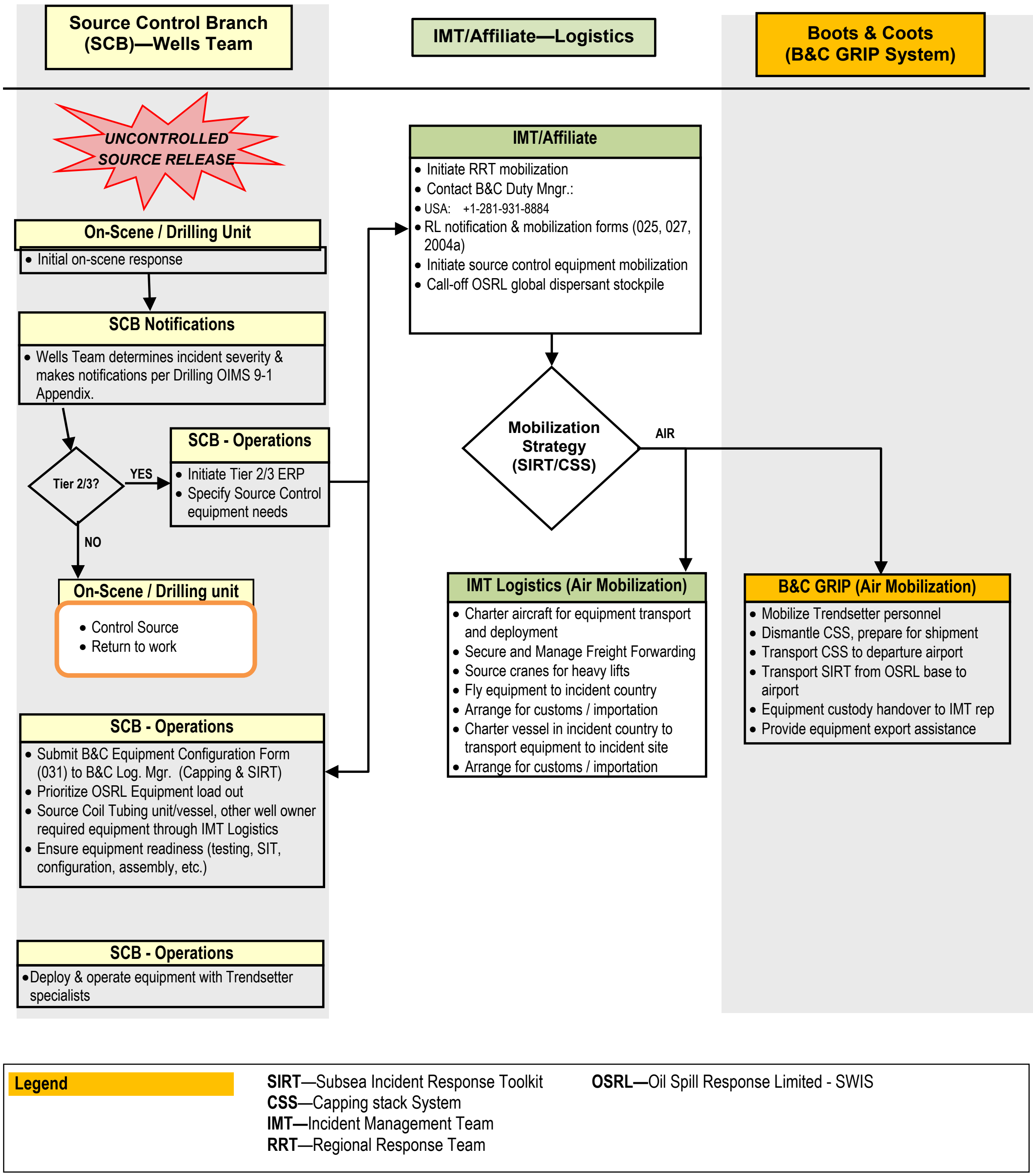

Figure 21: Boots & Coots Equipment Mobilization Process

9 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.

9.1 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 Table18 (or equivalent training such as XOM ICS 100/200 Computer Based Training [CBT]) based on their response position. Refresher training will be performed as needed or every 3 years.

Table18: 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.

9.2 Incident Command System Training

Key ERT and IMT members will receive the appropriate initial ICS Training listed in Table 19 based on their roles and responsibilities. Refresher training will be performed as needed or every 3 years.

Table19: 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.

9.3 Oil Spill Exercises

Oil spill response exercises test incident response personnel function and responsibilities. They improve oil spill incident response teams 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 SHE Manager, which is approved by the EEPGL Country Manager. A suggested guideline including schedule and type of oil spill exercise is outlined in Table 20.

Table 20: 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 [a, b]

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 [a, b]

[a] Covers exploration and production operations.
[b] A comprehensive exercise (2 days) was conducted by EEPGL in Georgetown in May 2018, where representatives from approximately 15 GoG agencies participated in Incident Command Structure (ICS) training and a simulated well control event. EEPGL conducted a similar exercise in Georgetown in August 2019 with GoG participation. A production operations-oriented simulated oil spill event was drilled.

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APPENDIX A PAYARA OIL SPILL MODELING RESULTS

This appendix describes the methodology and results of oil spill modeling conducted for several hydrocarbon release scenarios defined for the Payara Development Project. Similar release scenarios were modeled for the Liza Phase 1 and Liza Phase 2 Development Projects and the results of spill modeling were generally similar.

A.1 Payara Modeling Overview

A.1.1 OILMAPDEEP Model

OILMAPDEEP 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 blowout. 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 blowout plume and oil droplet sizes. The blowout 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.1.2 SIMAP Model

SIMAP, developed by RPS, is a fully three-dimensional and time-varying oil spill model system. 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 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 can be run in 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" 95th percentile scenarios of interest for examining impacts to particular resources.

A.1.3 Payara Spill Modeling Approach

A.1.3.1 Payara 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 transport. 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 that examines *many releases* from the same point utilizing historical data for wind and currents; and, (2) the **deterministic** mode that 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. The coastal sensitivity maps that were used to identify and characterize the resources/receptors with the potential to be impacted by a spill based on the modeling results have been provided in the Liza Phase 2 Project and in the Payara Development Project Environmental Impact Assessments (EIAs).

A.1.3.2 Payara 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 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 NAVGEM model prediction and current observations were compared to the Hybrid Coordinate Ocean

Model (HYCOM) model predictions previously utilized in modeling analyses. The field program had not yet started in 2015, which is the final year of the original 10-year model prediction data set provided by SAT-OCEAN; thus, an additional time period, corresponding to the mooring deployment period, of NAVGEM and HYCOM predictions was obtained for the direct comparison of the model predictions to the observations. As a correlation step, the NAVGEM predictions from the 2016-2017 field program period were compared to the 2006-2015 data set, and similarly HYCOM predictions from 2016-2017 were compared to the observation while HYCOM Reanalysis from 2005-2010 was compared with the SAT-OCEAN 2006-2015 data set.

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°×4° grid over the Stabroek Block region (56°-60°W, 7°-11°N). The horizontal resolution of the model is 1/64°, 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°N, 56.95°W) during 2015. Considering the extent of the historical record and calibration with measured data, these data are appropriately representative of the region and are expected to 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.1.4 Payara Oil 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 for six different scenarios at the Payara offshore location during two different seasons. Table A1 lists the scenarios that were modeled.

Unmitigated blowout scenarios consist of an assumed 30 days of oil and gas discharge at the wellhead. The blowouts were simulated using the OILMAPDEEP blowout model to determine the discharge plume geometry, define the oil droplet sizes, and provide inputs for the SIMAP model simulations. All blowout simulations were run for the identified discharge period plus an additional number of identified days after oil discharge ceased.

Table A1: Oil Spill Scenarios Defined for the Stochastic Oil Spill Modeling

Release Volume	Released Product	Season
50 bbl	Marine Diesel	Jun-Nov
250 bbl	Marine Diesel	Jun-Nov
50 bbl	Marine Diesel	Dec-May
250 bbl	Marine Diesel	Dec-May
50 bbl	Crude Oil	Jun-Nov
2,500 bbl	Crude Oil	Jun-Nov
50 bbl	Crude Oil	Dec-May
2,500 bbl	Crude Oil	Dec-May
Most Credible WCD: 20,000 bbl per day for 30 Days (Unmitigated)	Wellbore Fluids	Jun-Nov
Maximum WCD: 202,192 bbl per day (initial rate) for 30 Days (Unmitigated)	Wellbore Fluids	Jun-Nov
Most Credible WCD: 20,000 bbl per day for 30 Days (Unmitigated)	Wellbore Fluids	Dec-May
Maximum WCD: 202,192 bbl per day (initial rate) for 30 Days (Unmitigated)	Wellbore Fluids	Dec-May

A.1.5 Payara 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 (μm) thick. Table A2 lists approximate thickness and mass per unit area ranges for surface oil of varying appearance. Dull brown sheens are about 1 μm thick. Rainbow sheens are about 0.2-0.8 g/m^2 (0.2-0.8 μm thick) and silver sheens are 0.05-0.2 g/m^2 (0.05-0.2 μm thick; NRC 1985). Crude and heavy fuel oil that is greater than 1 millimeter (mm) thick appears as black oil. Light fuels and diesel that are 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 A2: Oil Thickness (μm) 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 A3. Socio-economic thresholds were used in all modeling for this project (1 μm for surface oiling and 1 μm for shoreline oiling). All predictions of the probability of shoreline oiling and sea surface contamination are based on these oil thickness thresholds.

Table A3: 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^2	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^2	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.1.6 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). The Federal Water Pollution Control Act and the Oil Pollution Act of 1990 regulations require the 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." WCD came to prominence in the aftermath of the 2010 Deepwater Horizon Oil Spill. 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.

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 Payara Project. 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 that would be in the wellbore during a well control event, which would partially constrain and restrict flow from the reservoir.

A.1.7 Overview of US GoM WCD Modeling Approach for Payara

EEPGL contracted GSI to calculate the WCD rates for the Payara Project using the US GoM practice as requested by the Guyana Department of Energy (DE).

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 blowout 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).

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. Refer to Appendix A.5 to review the GSI WCD calculation letter and detailed report for Payara.

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 A1: Summary of WCD Study Results for Payara

In consultation with EEPGL's oil spill modeling contractor (RPS), EEPGL identified two WCD scenarios that characterize a potential Project well-control scenario with loss of containment. These two scenarios were selected in order to characterize uncontrolled wellbore flows for Payara reservoirs with varying characteristics.

EEPGL then contracted RPS to model two WCD scenarios for the Project (as described in Appendices A.3.5, A.3.6, A.4.5, and A.4.6). EEPGL considers the 20,000 BPD discharge rate the most credible loss-of-well-control case, as it assumes debris and/or equipment is in the wellbore during the well control event, which is the most realistic operational condition that would be encountered. Such debris and/or equipment would partially restrict the flow from the reservoir. The 20,000 BPD loss-of-well-control scenario is very close to the lowest of the calculated WCD rates (and therefore would be expected to produce similar modeling results), so this scenario was modeled as the "Most Credible WCD." Additionally, the highest of the calculated WCD rates (202,192 bbl per day) was modeled as the "Maximum WCD."

The results of the Maximum WCD are intended to satisfy a request of the DE for EEPGL to provide a WCD calculation and modeling program for a well control scenario with loss of containment in alignment with the US GoM practice.

A.2 Payara Model Input Data

A.2.1 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. This can 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 A4 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 A4: Properties of the Crude Oil Used in the Spill Modeling

Density (g/cm^3 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^3 = grams per cubic centimeter

A.3 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^2 and 1,285,994 km^2) 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.

A.3.1 Payara Marine Diesel (June through November)

A.3.1.1 Payara Water Surface Results —50 Barrel Scenario (Unmitigated)

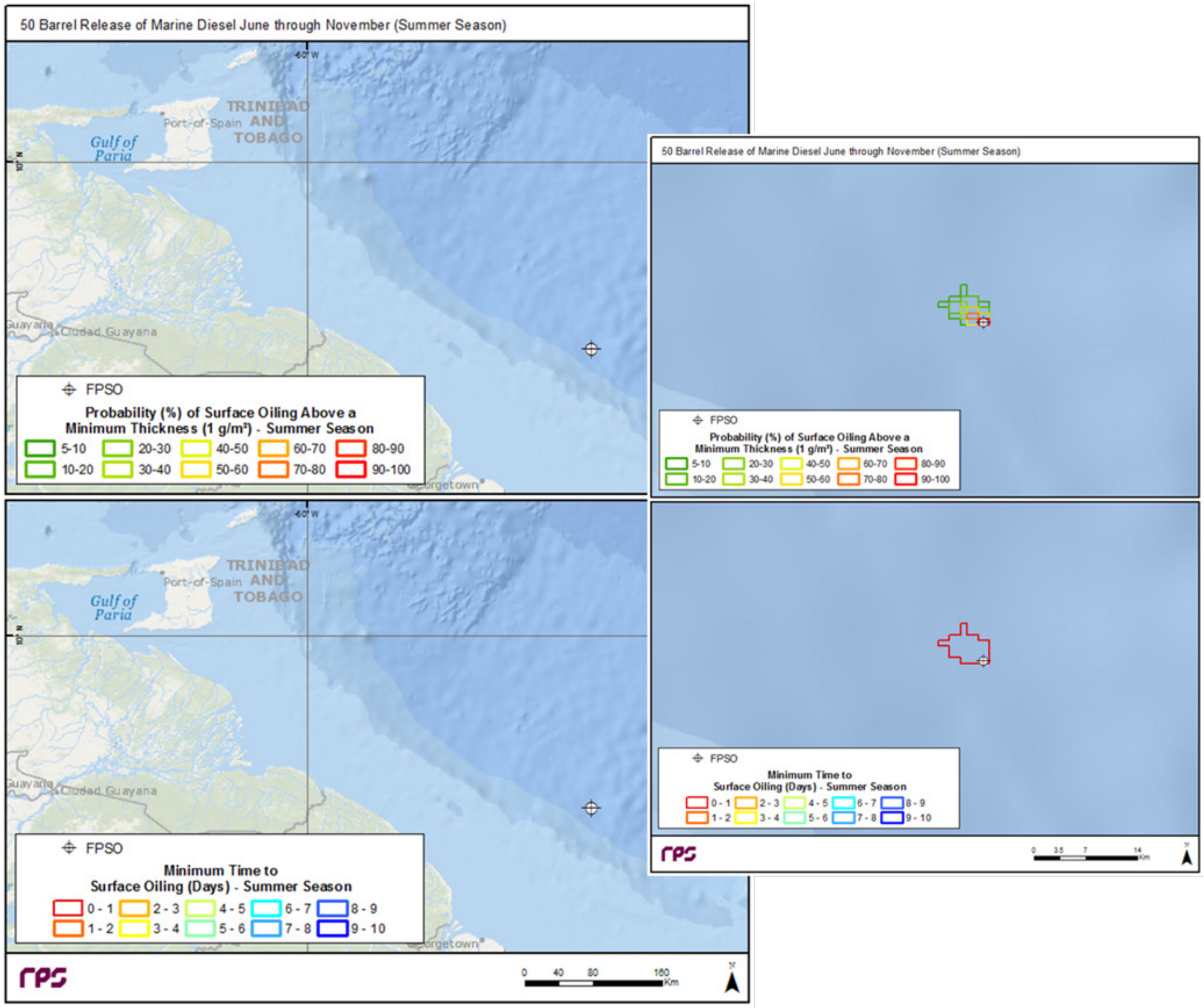


Figure A2: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from June through November for a 50 bbl release of Marine Diesel. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.1.2 Payara Water Surface Results —250 Barrel Scenario (Unmitigated)

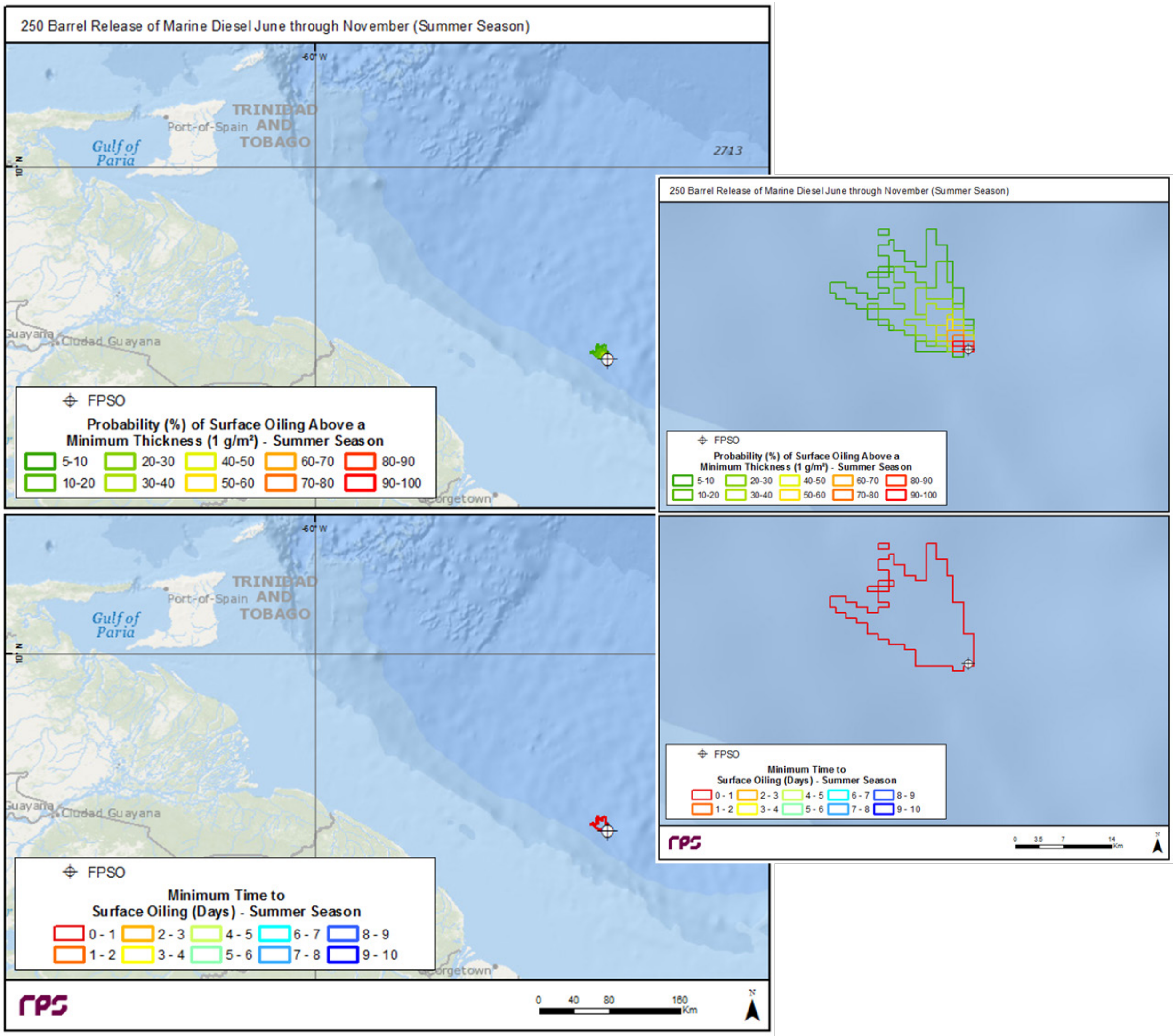


Figure A3: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from June through November for a 250 bbl release of Marine Diesel. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.2 Payara Marine Diesel (December through May)

A.3.2.1 Payara Water Surface Results —50 Barrel Scenario (Unmitigated)

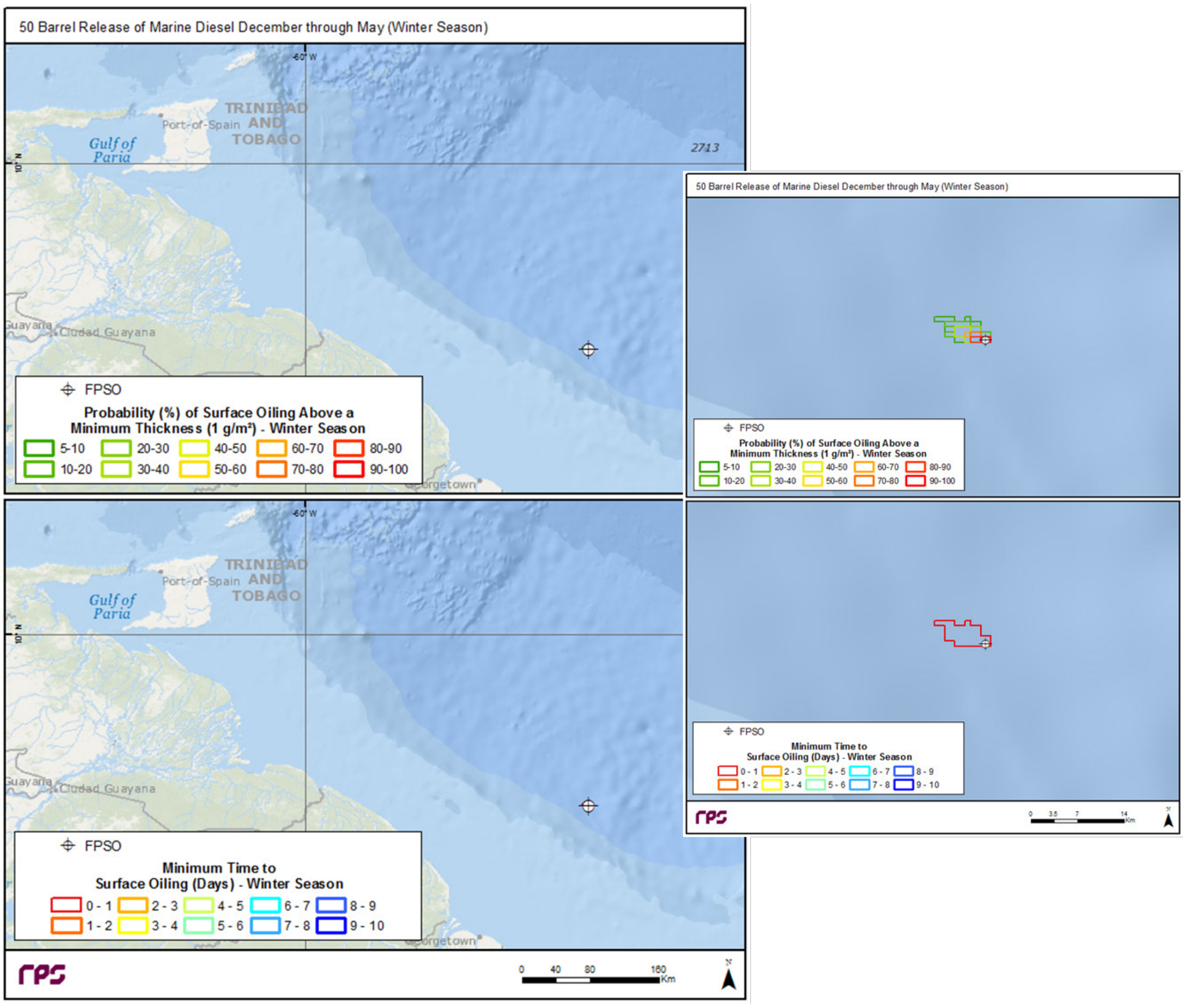


Figure A4: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 50 bbl release of Marine Diesel. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.2.2 Payara Water Surface Results —250 Barrel Scenario (Unmitigated)

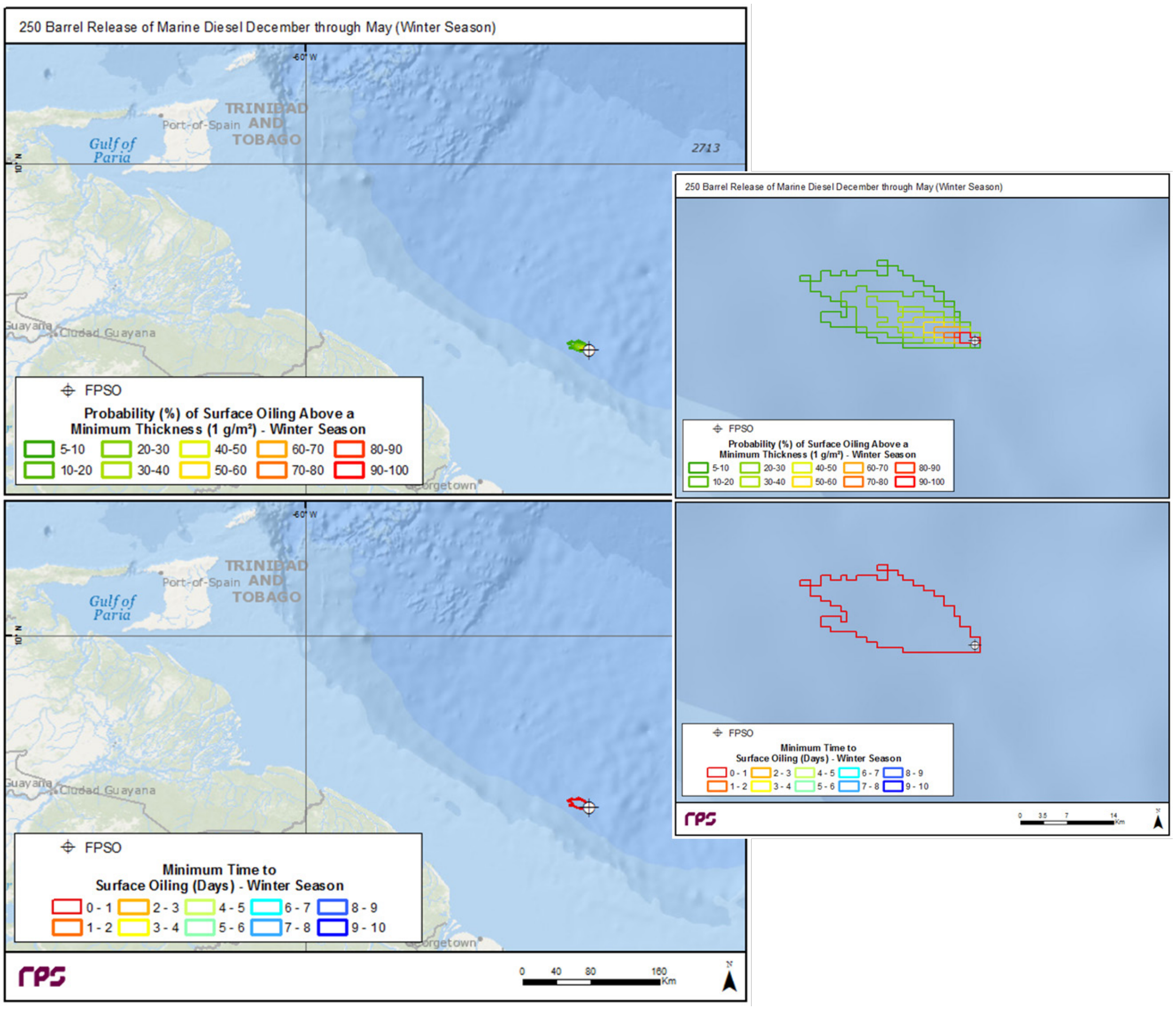


Figure A5: Top Panel—Probability of surface oiling above a minimum thickness of 1 μm from December through May for a 250 bbl release of Marine Diesel. Bottom Panel—Minimum time for surface oil thickness to exceed 1 μm. Inset Panel—Detail.

A.3.3 Payara Crude Oil (June through November)

A.3.3.1 Payara Water Surface Results —50 Barrel Scenario (Unmitigated)

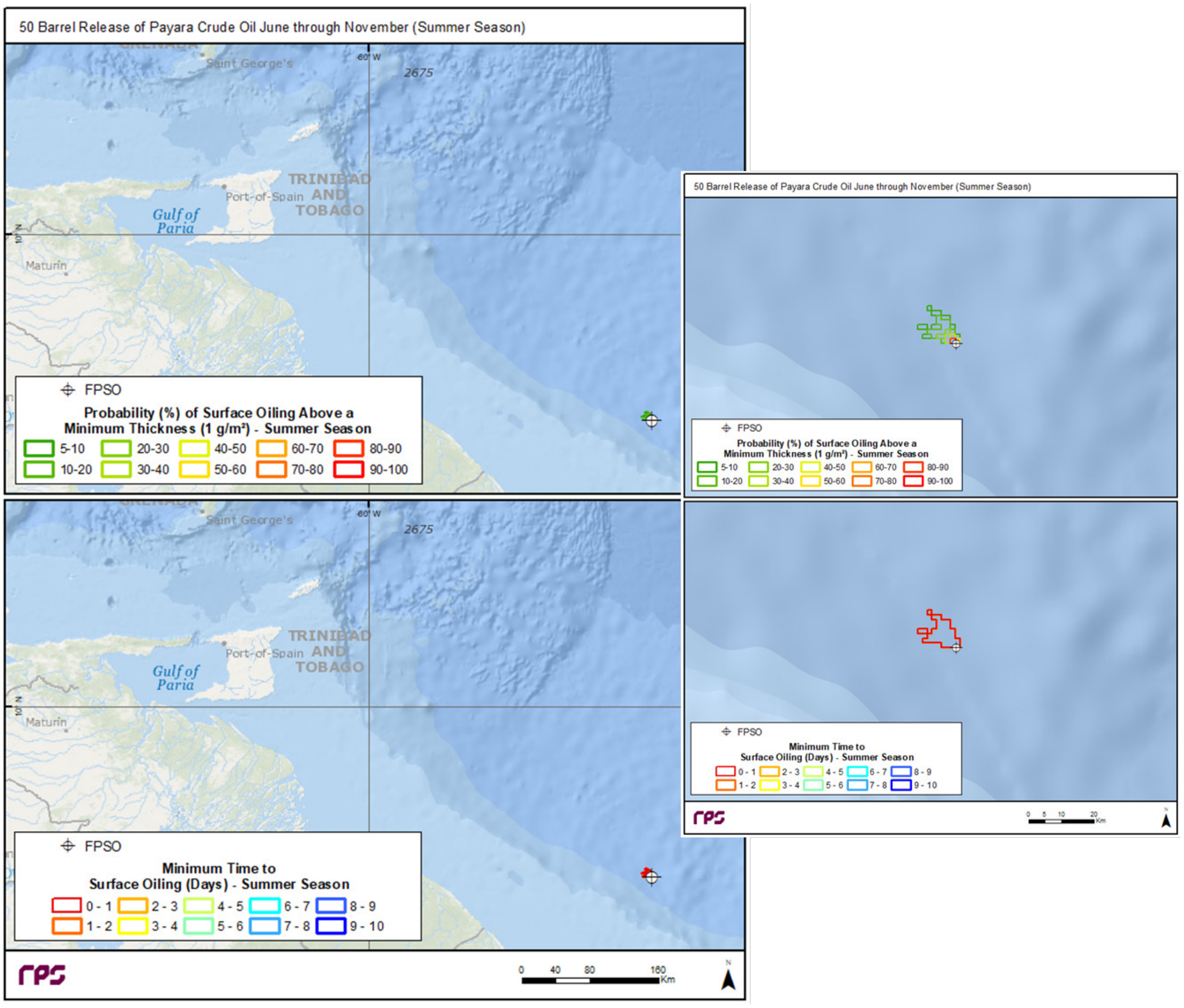


Figure A6: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from June through November for a 50 bbl release of Crude Oil. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.3.2 Payara Water Surface Results —2500 Barrel Scenario (Unmitigated)

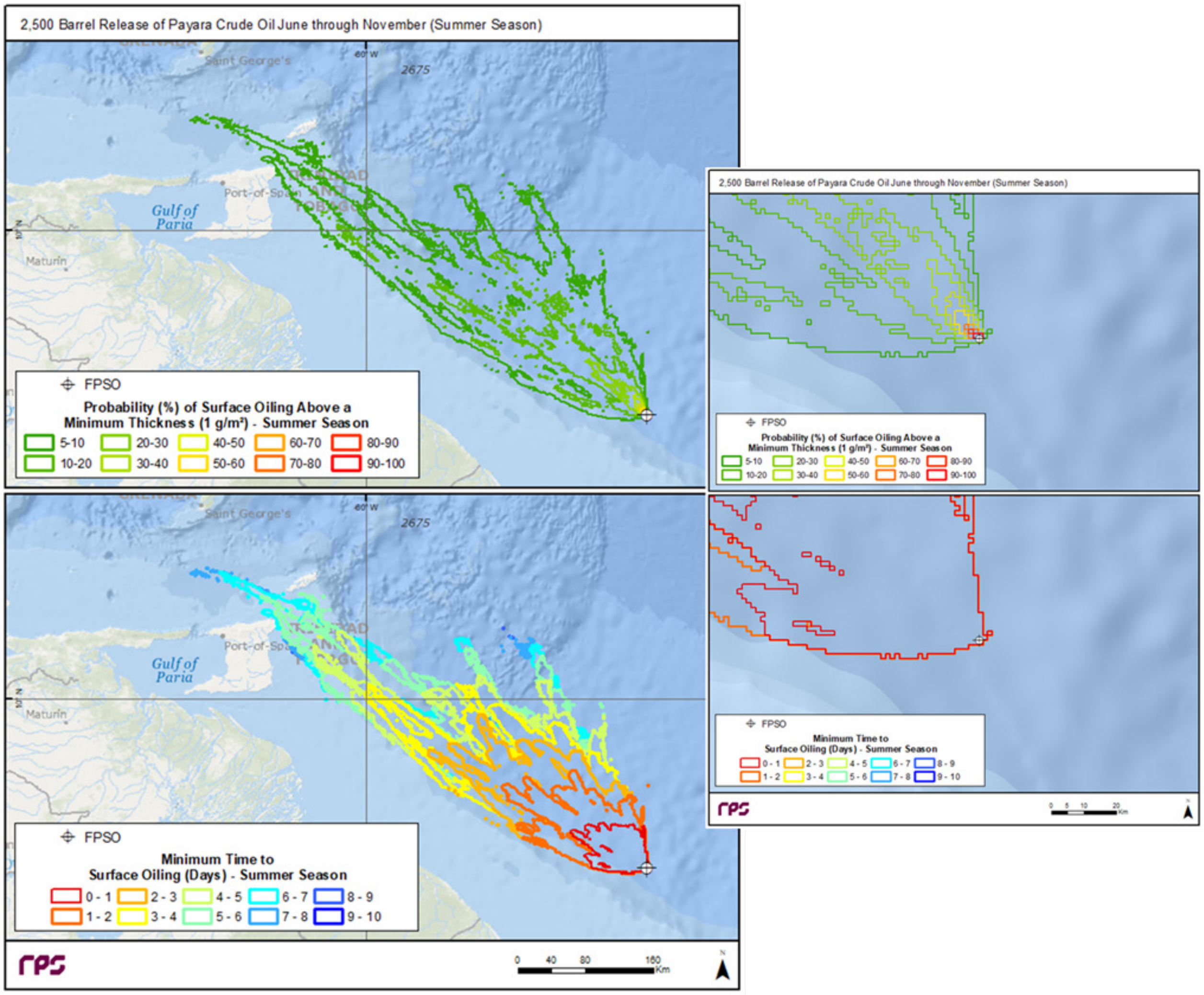


Figure A7: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from June through November for a 2500 bbl release of Crude Oil. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.4 Payara Crude Oil (December through May)

A.3.4.1 Payara Water Surface Results —50 Barrel Scenario (Unmitigated)

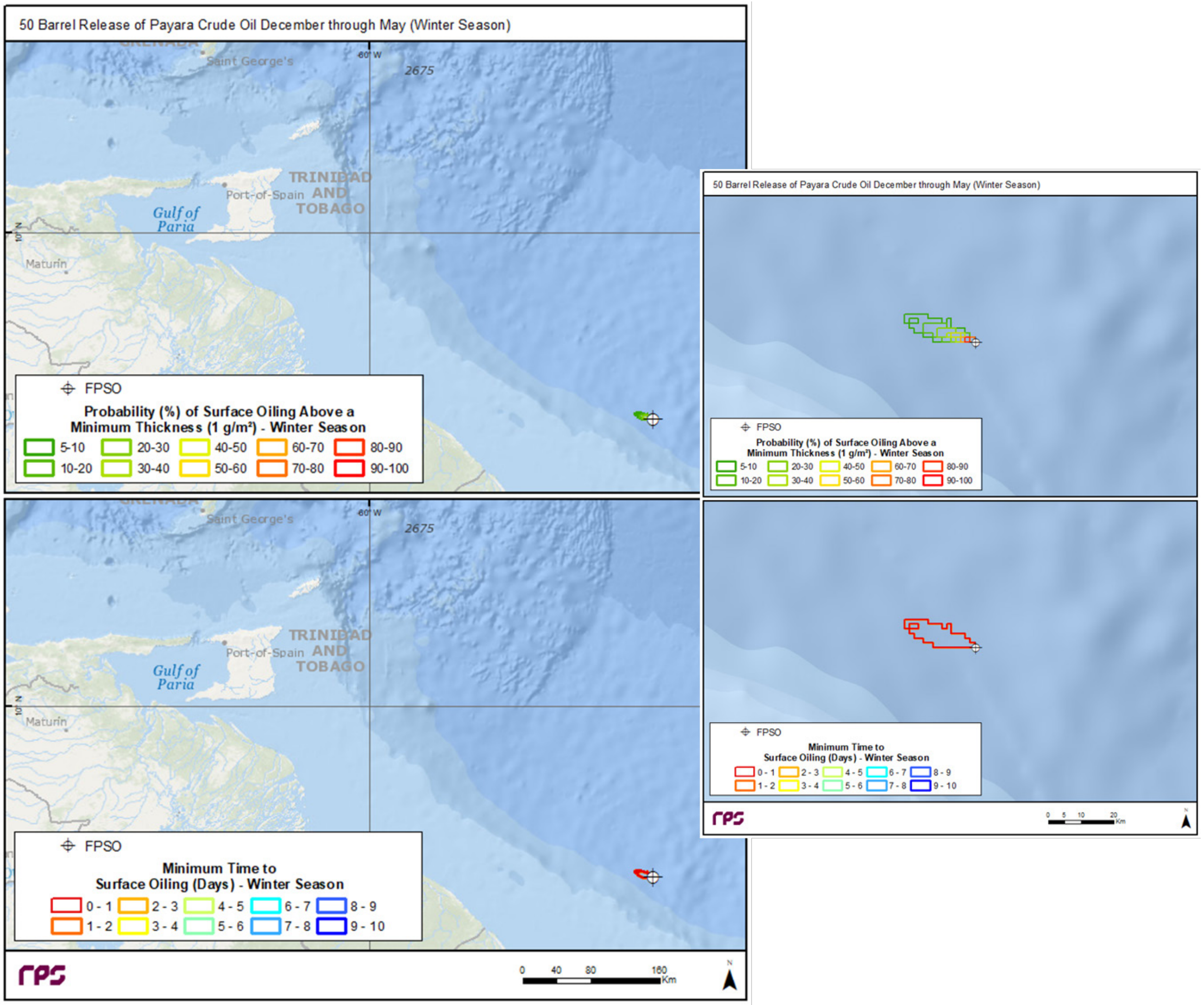


Figure A8: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 50 bbl release of Crude Oil. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.4.2 Payara Water Surface Results —2,500 Barrel Scenario (Unmitigated)

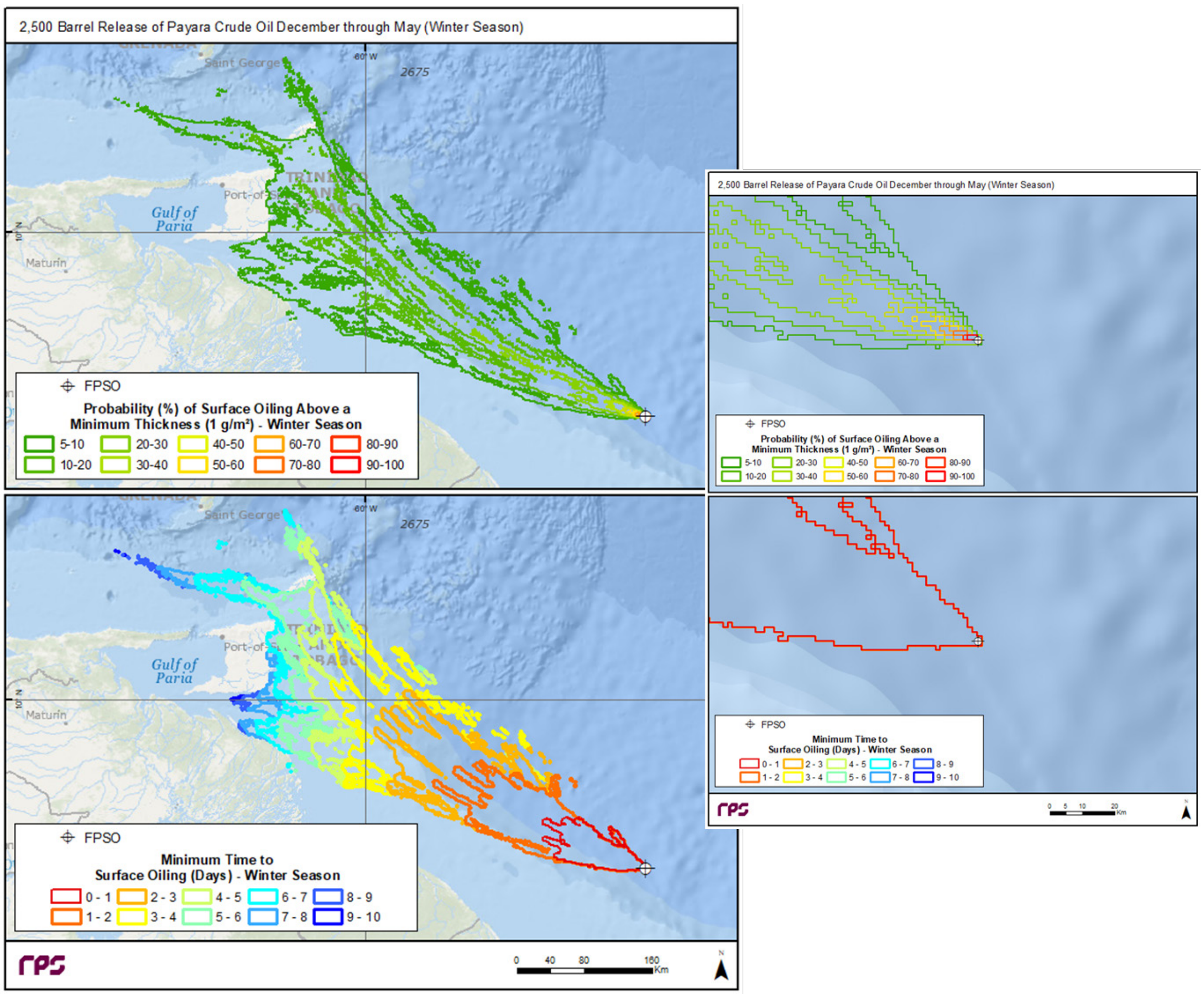


Figure A9: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 2,500 bbl release of Crude Oil. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.5 Payara Wellbore Fluids (June through November)

A.3.5.1 Payara Water Surface Results —Most Credible WCD: 20,000 BPD Scenario for 30 Days (Unmitigated)

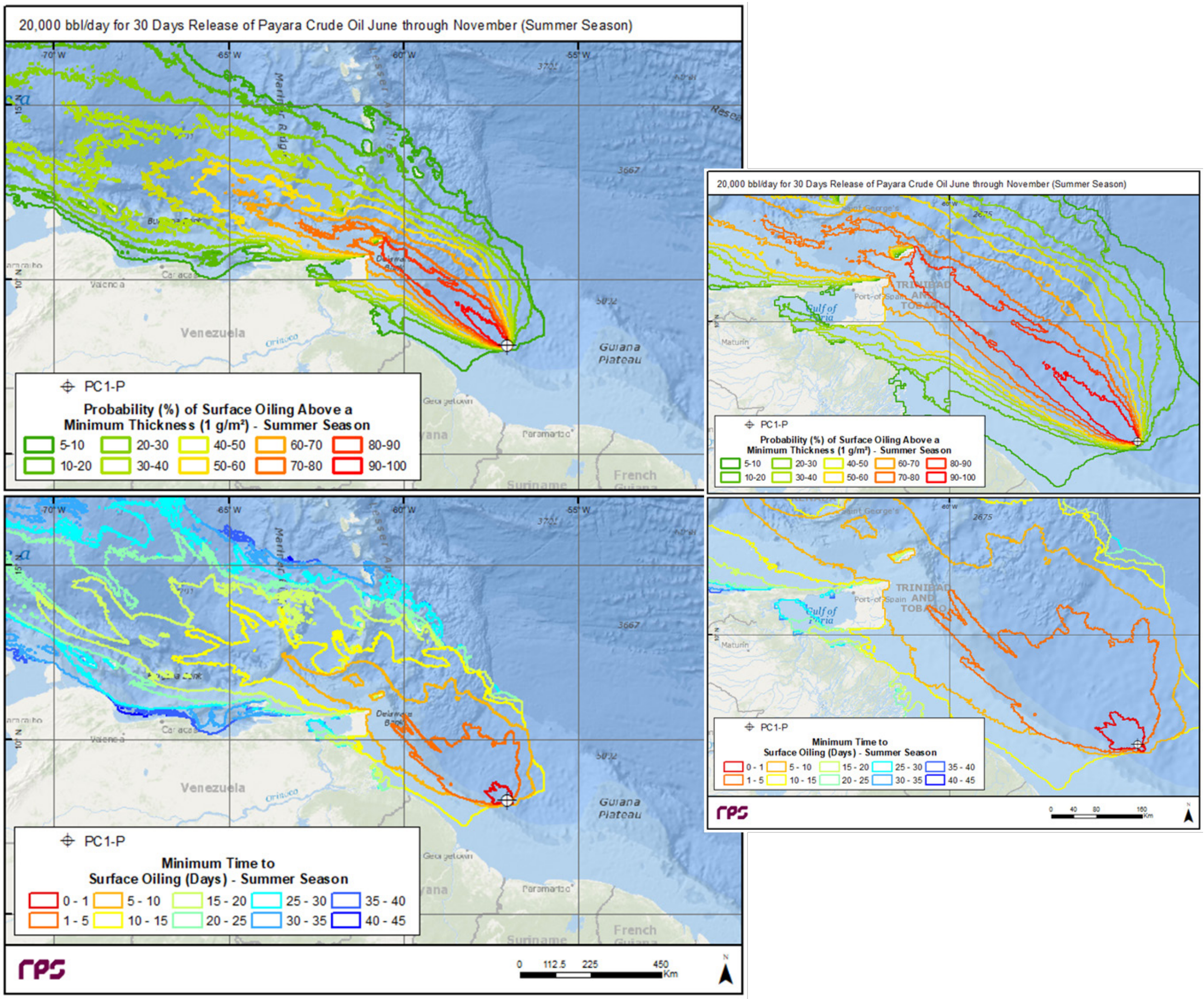


Figure A10: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from June through November for a 20,000 bbl/day release (Most Credible WCD) of Crude Oil. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.5.2 Payara Water Surface Results —Maximum WCD: 202,192 BPD Scenario for 30 Days (Unmitigat ed)

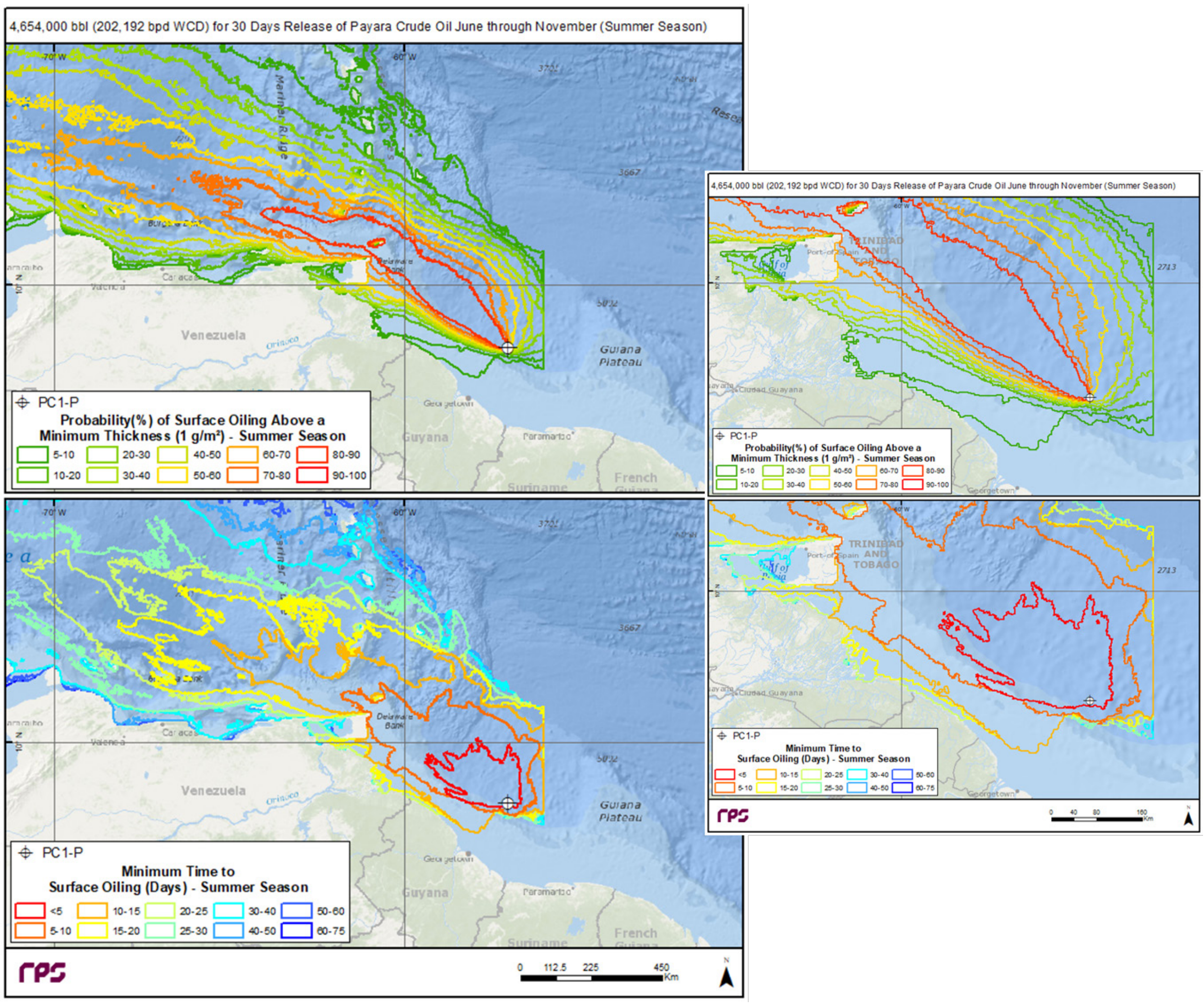


Figure A11: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from June through November for a 202,192 bbl/day release (Maximum WCD) of Crude Oil. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.6 Payara Wellbore Fluids (December through May)

A.3.6.1 Payara Water Surface Results —Most Credible WCD: 20,000 BPD Scenario for 30 Days (Unmitigated)

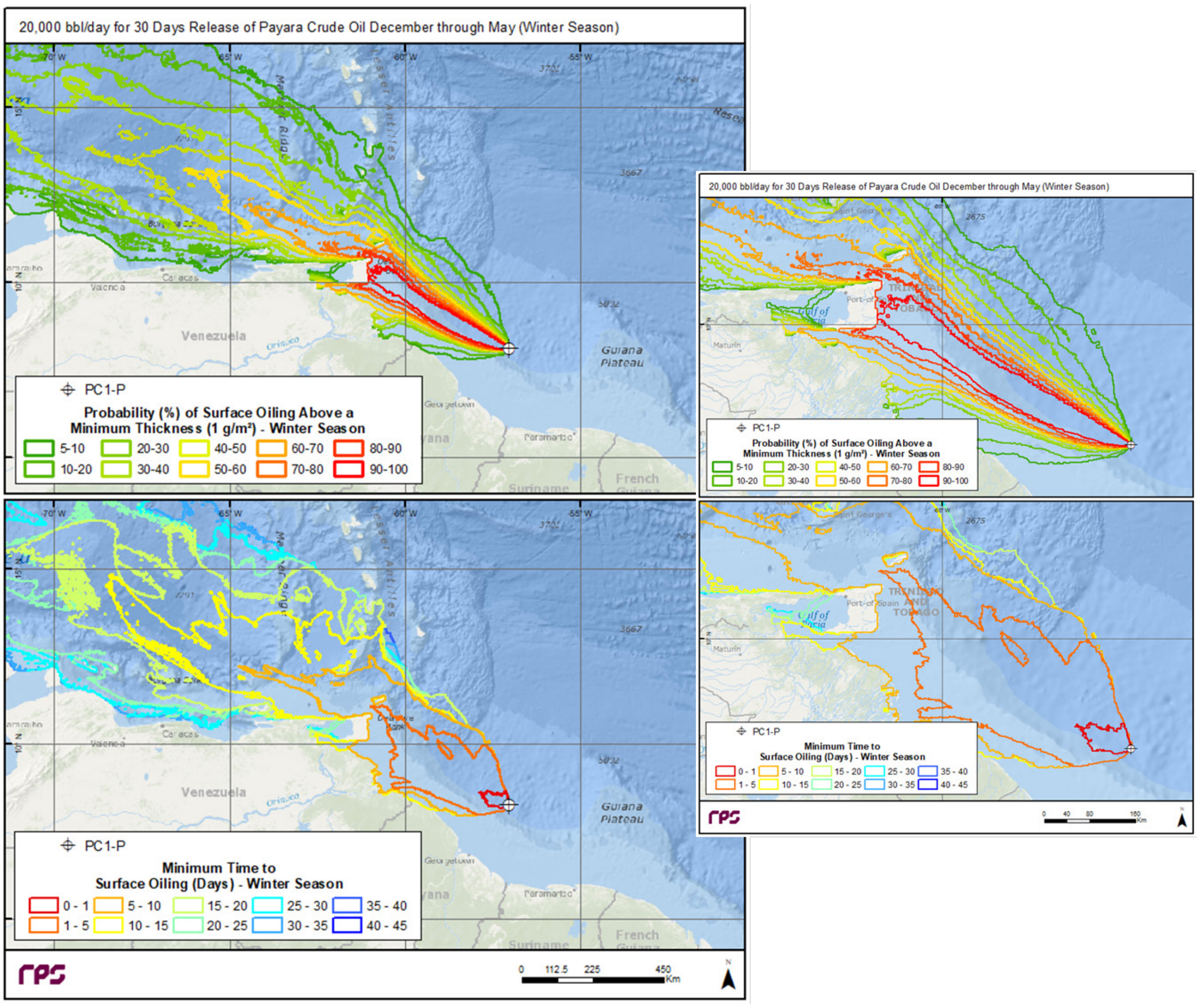


Figure A12: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 20,000 bbl/day release (Most Credible WCD) of Crude Oil for 30 days. Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.3.6.2 Payara Water Surface Results —Maximum WCD: 202,192 BPD Scenario for 30 Days (Unmitigated)

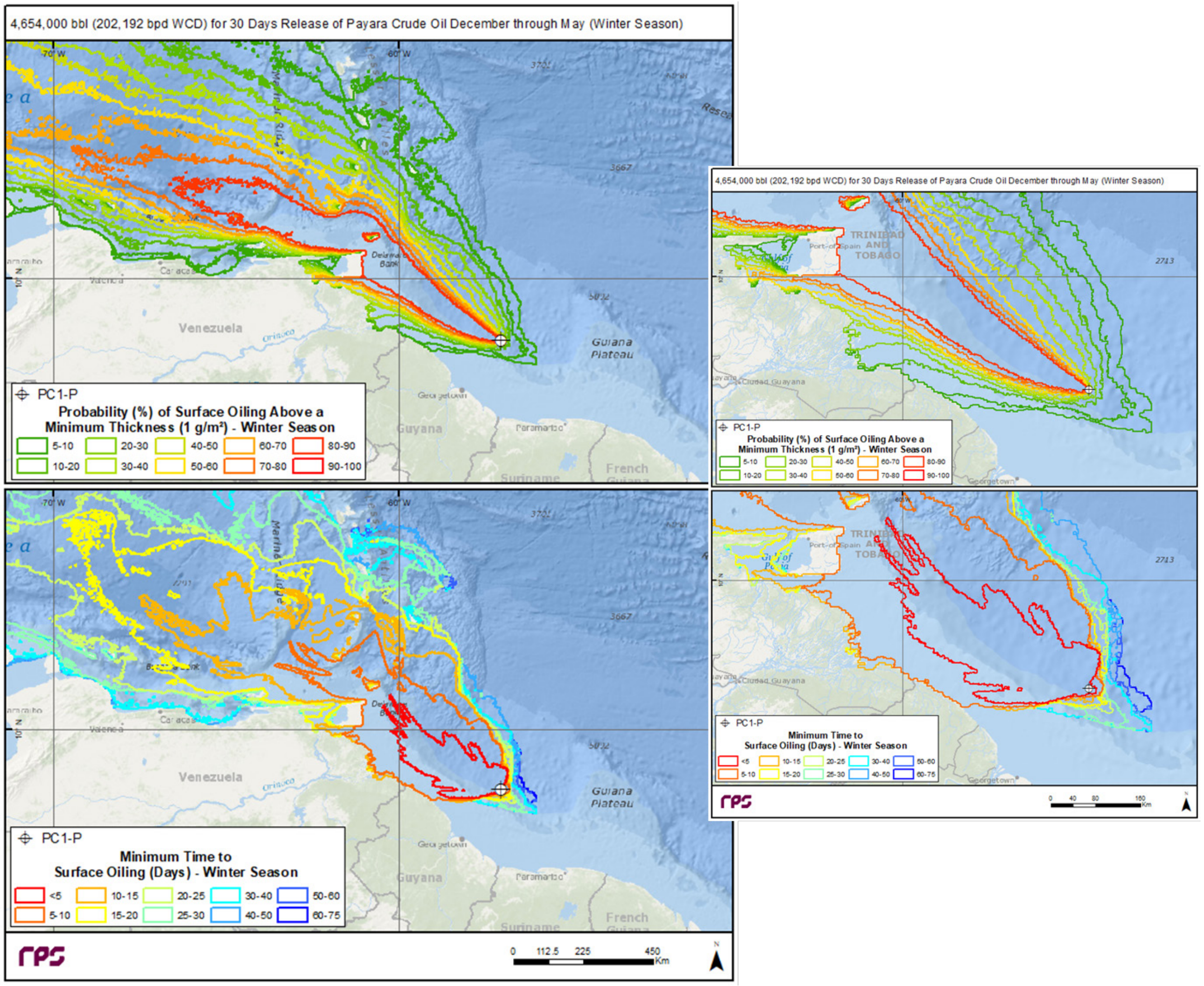


Figure A13: Top Panel—Probability of surface oiling above a minimum thickness of 1 µm from December through May for a 202,192 bbl/day release (Maximum WCD) of Crude Oil for 30 day release . Bottom Panel—Minimum time for surface oil thickness to exceed 1 µm. Inset Panel—Detail.

A.4 Payara Deterministic Model Results – Unmitigated and Mitigated

For each stochastic scenario, one deterministic trajectory/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 95th 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^2 and 1,285,994 km^2) 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, the 20,000 BPD Most Credible WCD loss-of-well-control scenario, and the 202,192 BPD Maximum WCD loss-of-well-control scenario. The 20,000 BPD Most Credible WCD is treated as a continuous daily release that discharges 600,000 bbl in the 30-day unmitigated scenario and 100,000 bbl in the 5-day mitigated 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 20,000 BPD Most Credible WCD scenario were modeled for 45 days. Scenarios for the mitigated 202,192 BPD Maximum WCD scenario were modeled for 54 days.

At the time the 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. Once 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 A5.

Table A5: 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
Mitigated Payara FPSO 2,500 bbl Payara Crude Release—Summer Season	0.0	62.4	0.0	23.4	13.7
Mitigated Payara FPSO 2,500 bbl Payara Crude Release—Winter Season	0.0	62.6	0.0	23.4	13.9
Payara Wellhead 600,000 bbl (20,000 bpd) Payara Crude Release—Summer Season (Most Credible WCD)	44.1	0.9	11.9	25.2	16.4

Scenario	Surface	Water Column	Ashore	Evaporated	Degradation
Payara Wellhead 600,000 bbl (20,000 bpd) Payara Crude Release—Winter Season (Most Credible WCD)	33.0	1.7	24.4	24.3	16.6
Mitigated Payara Wellhead 100,000 bbl (20,000 bpd) Payara Crude Release—Summer Season (Most Credible WCD)	0.0	39.8	0.0	17.7	42.4
Mitigated Payara Wellhead 100,000 bbl (20,000 bpd) Payara Crude Release—Winter Season (Most Credible WCD)	0.0	33.9	7.9	18.8	35.1
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
Mitigated 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
Mitigated 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

A.4.1 Payara Marine Diesel (June through November)

A.4.1.1 Payara 50 Barrel Scenario (Unmitigated)

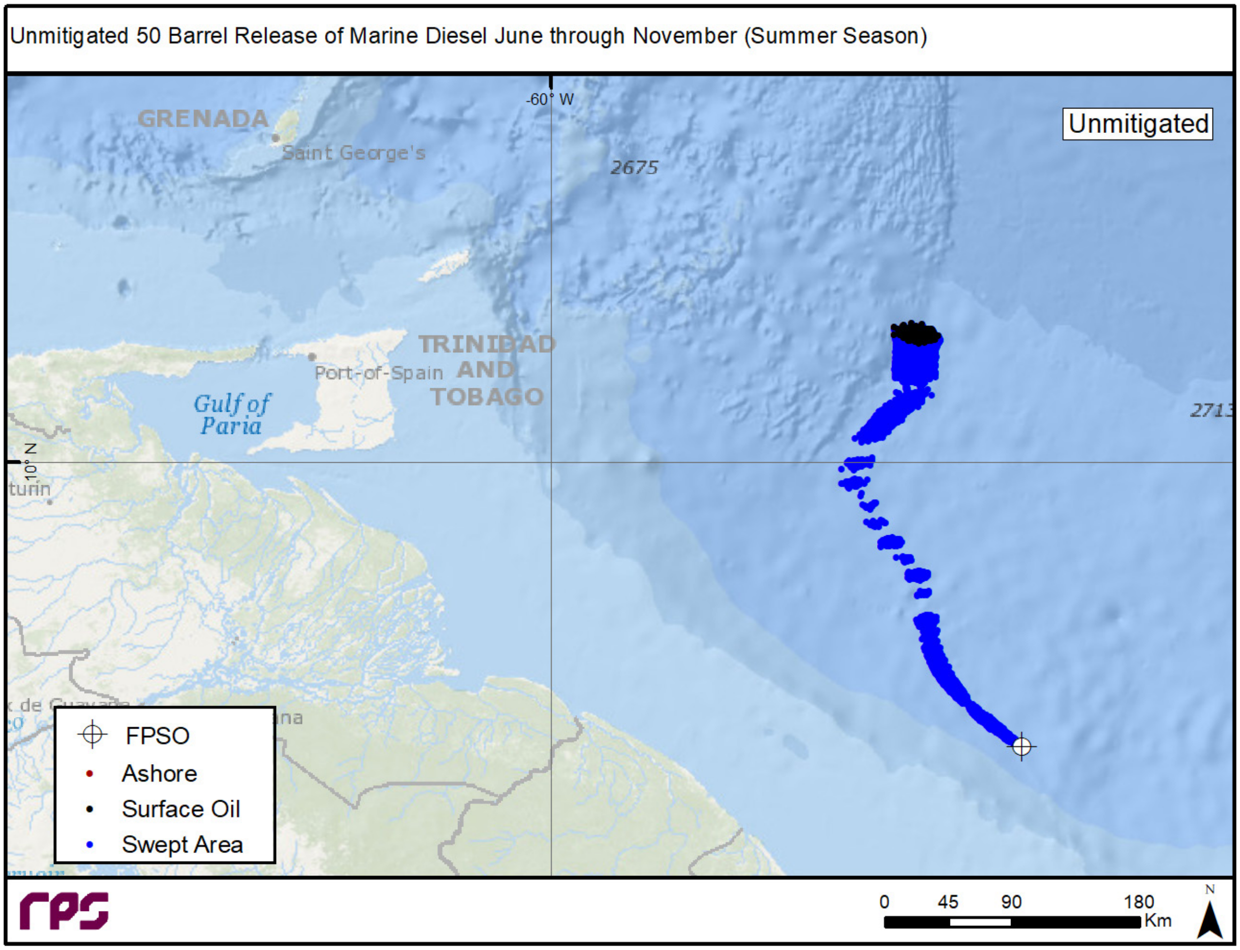


Figure A14: Unmitigated area swept results for the 95th percentile surface area oiled 50 bbl Marine Diesel release during Jun-Nov season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red (none in this scenario).

A.4.1.2 Payara 250 Barrel Marine Diesel Scenario (Unmitigated)

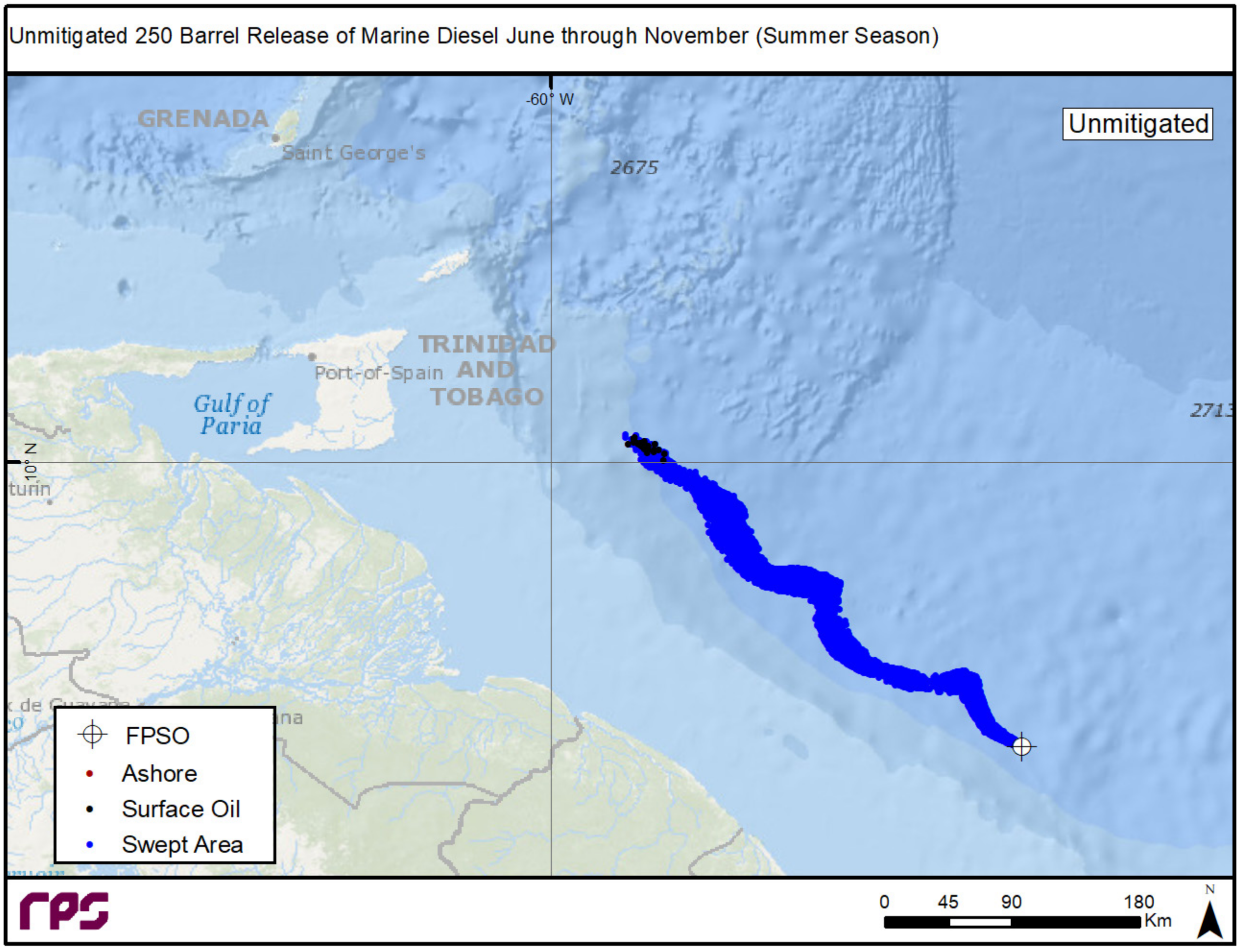


Figure A15: Area swept results for the 95th percentile surface area oiled 250 bbl Marine Diesel release during Jun-Nov season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red (none in this scenario).

A.4.2 Payara Marine Diesel (December through May)

A.4.2.1 Payara 50 Barrel Scenario (Unmitigated)

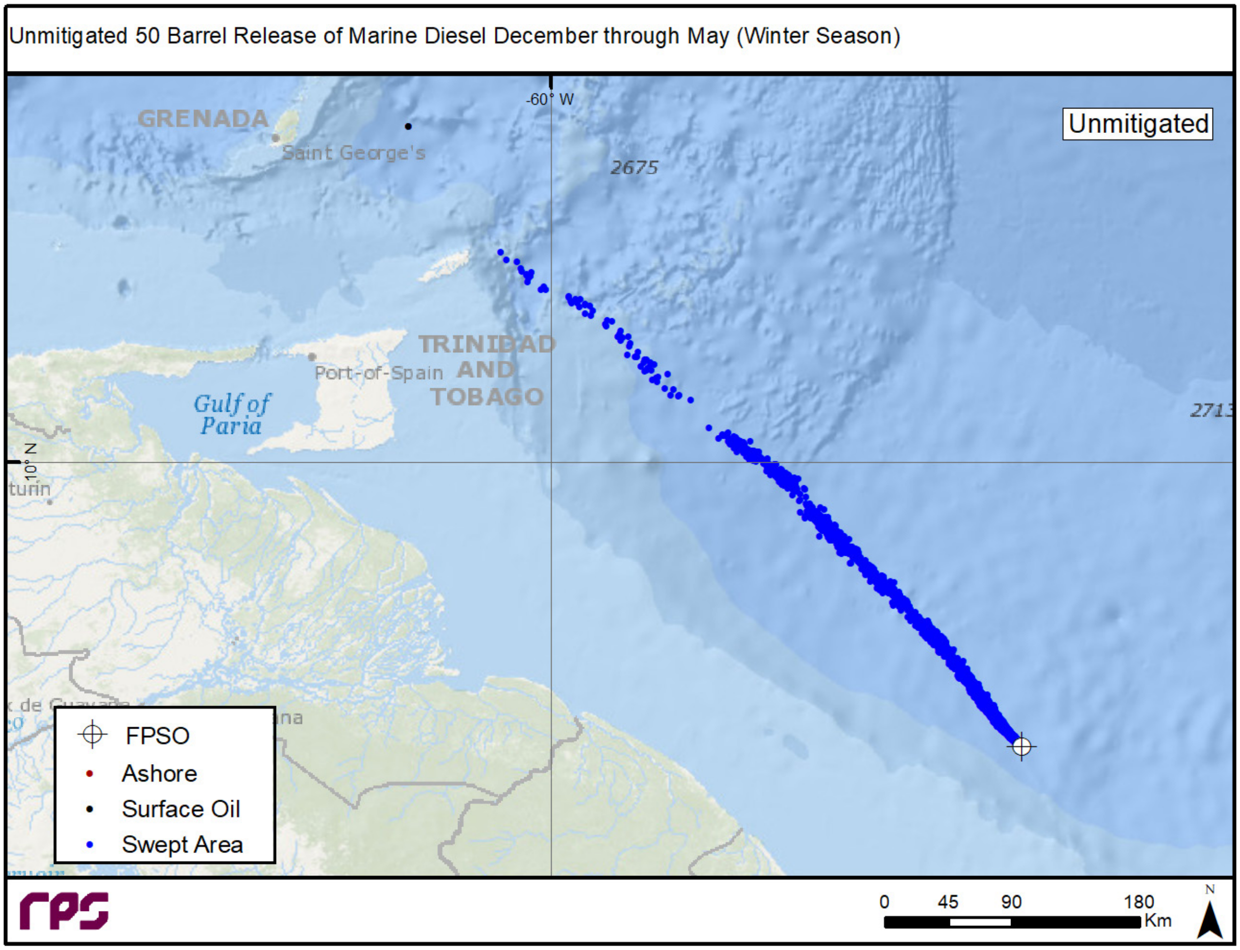


Figure A16: Unmitigated area swept results for the 95th percentile surface area oiled 50 bbl Marine Diesel release during Dec-May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red (none in this scenario).

A.4.2.2 Payara 250 Barrel Marine Diesel Scenario (Unmitigated)

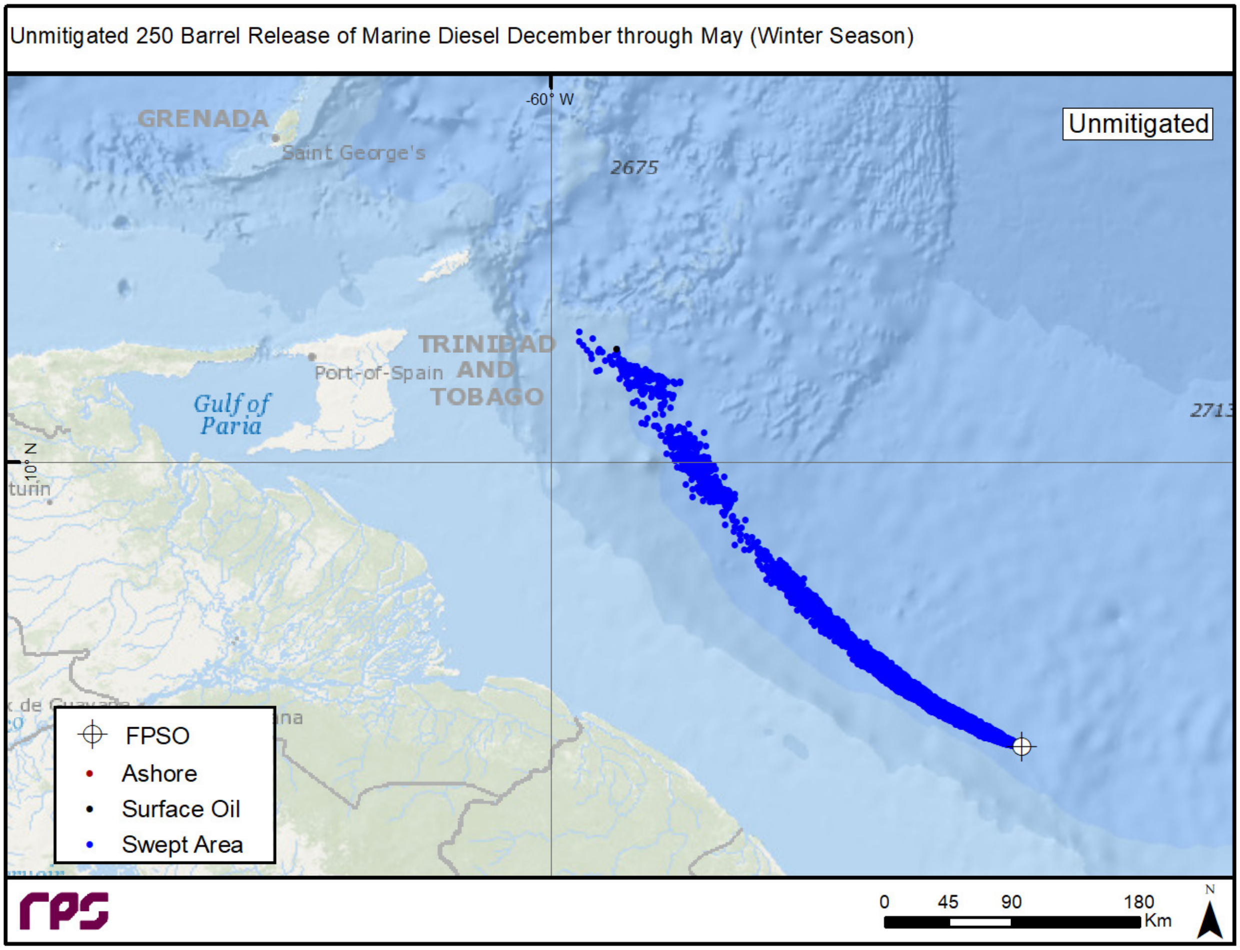


Figure A17: Unmitigated area swept results for the 95th percentile surface area oiled 250 bbl Marine Diesel release during Dec-May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red (none in this scenario).

A.4.3 Payara Crude Oil (June through November)

A.4.3.1 Payara 50 Barrel Scenario (Unmitigated)

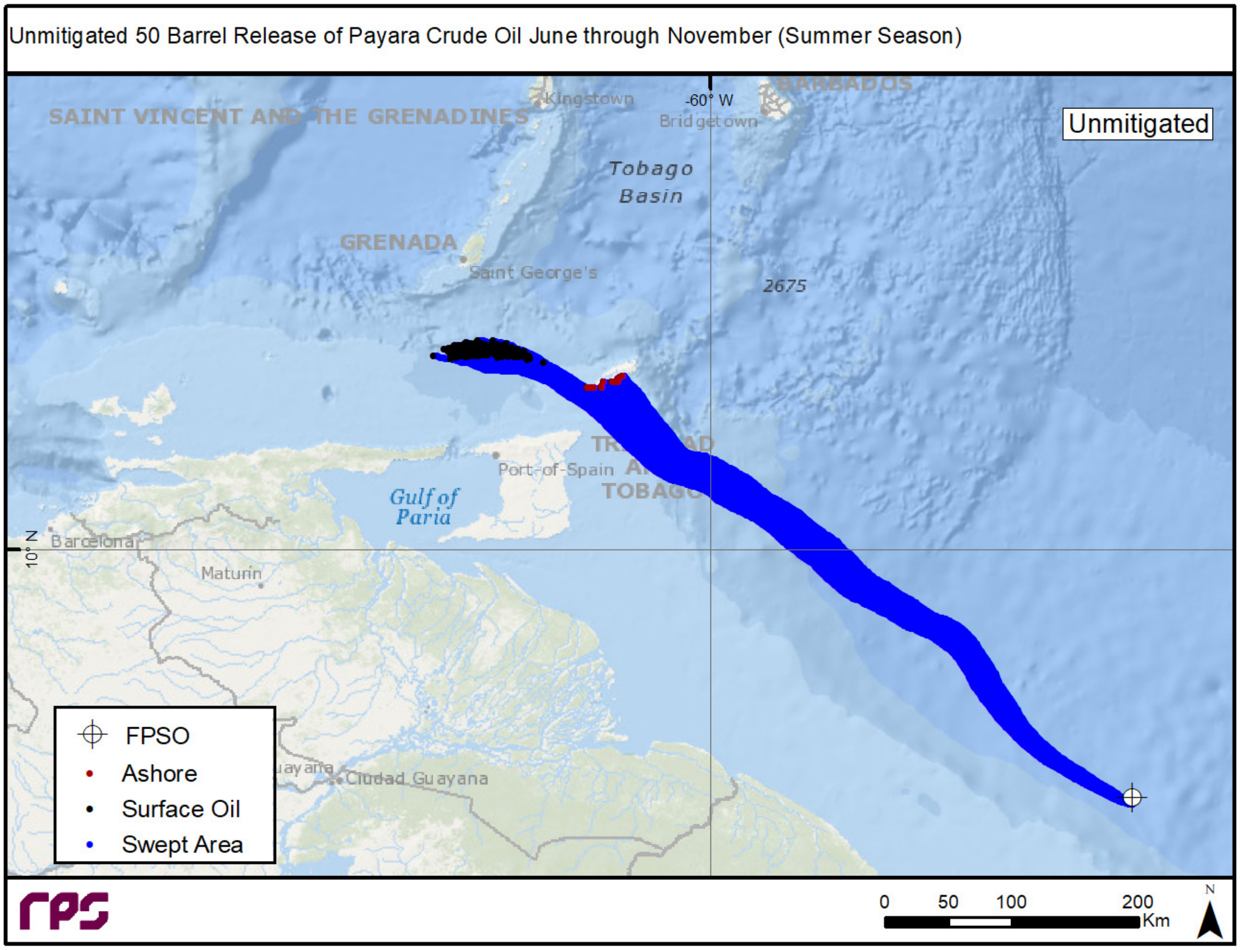


Figure A18: Unmitigated area swept results for the 95th percentile minimum time to shoreline 50 bbl Crude Oil release during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red.

A.4.3.2 Payara 2,500 Barrel Crude Oil Scenario (Unmitigated)

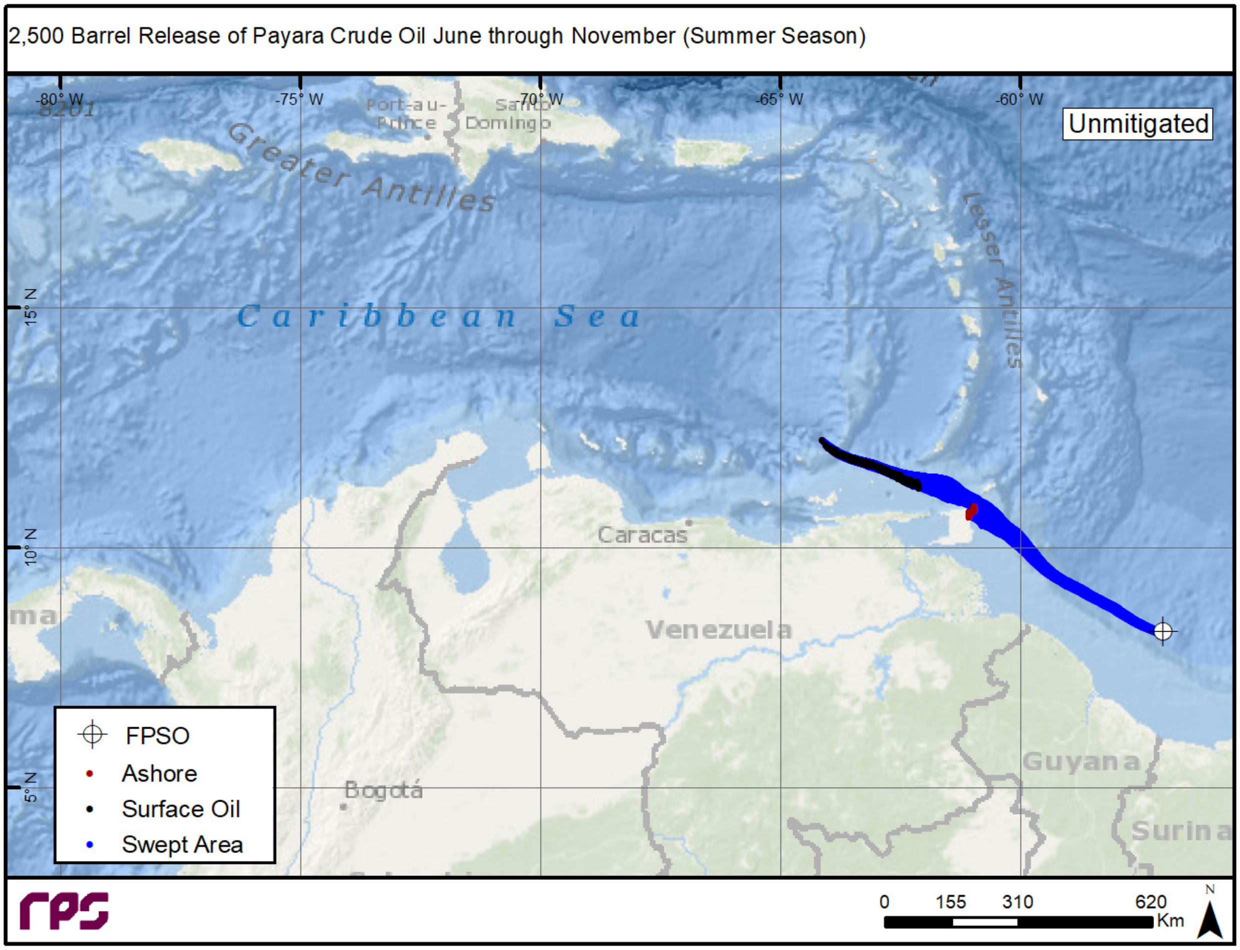


Figure A19: Unmitigated area swept results for the 95th percentile minimum time to shoreline 2,500 bbl Crude Oil release during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red.

A.4.3.3 Payara 2,500 Barrel Crude Oil Scenario (Mitigated)

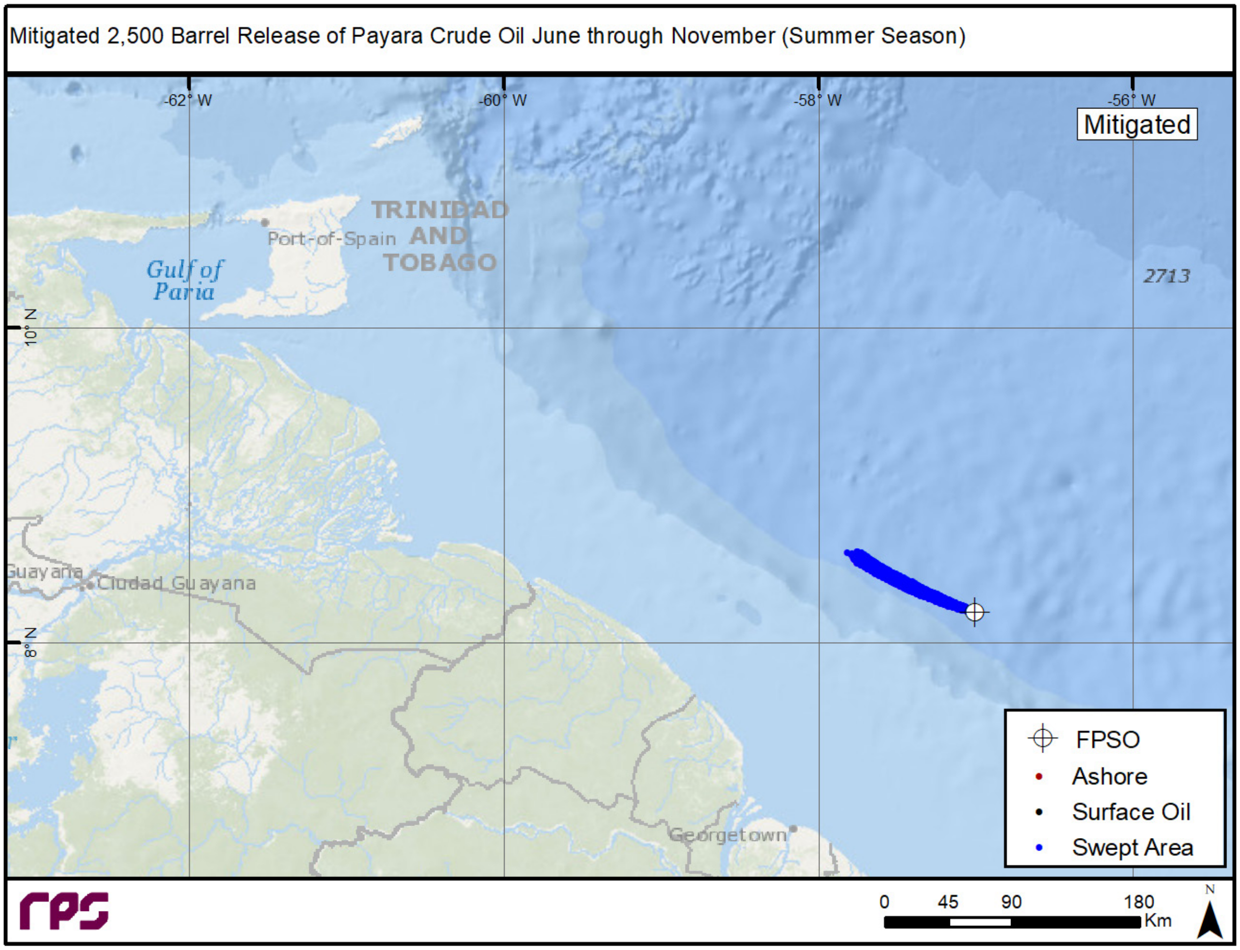


Figure A20: Mitigated area swept results for the 95th percentile minimum time to shoreline 2,500 bbl Crude Oil release during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black (none in this scenario), and shoreline oiling is displayed in red (none in this scenario).

A.4.4 Payara Crude Oil (December through May)

A.4.4.1 Payara 50 Barrel Crude Oil Scenario (Unmitigated)

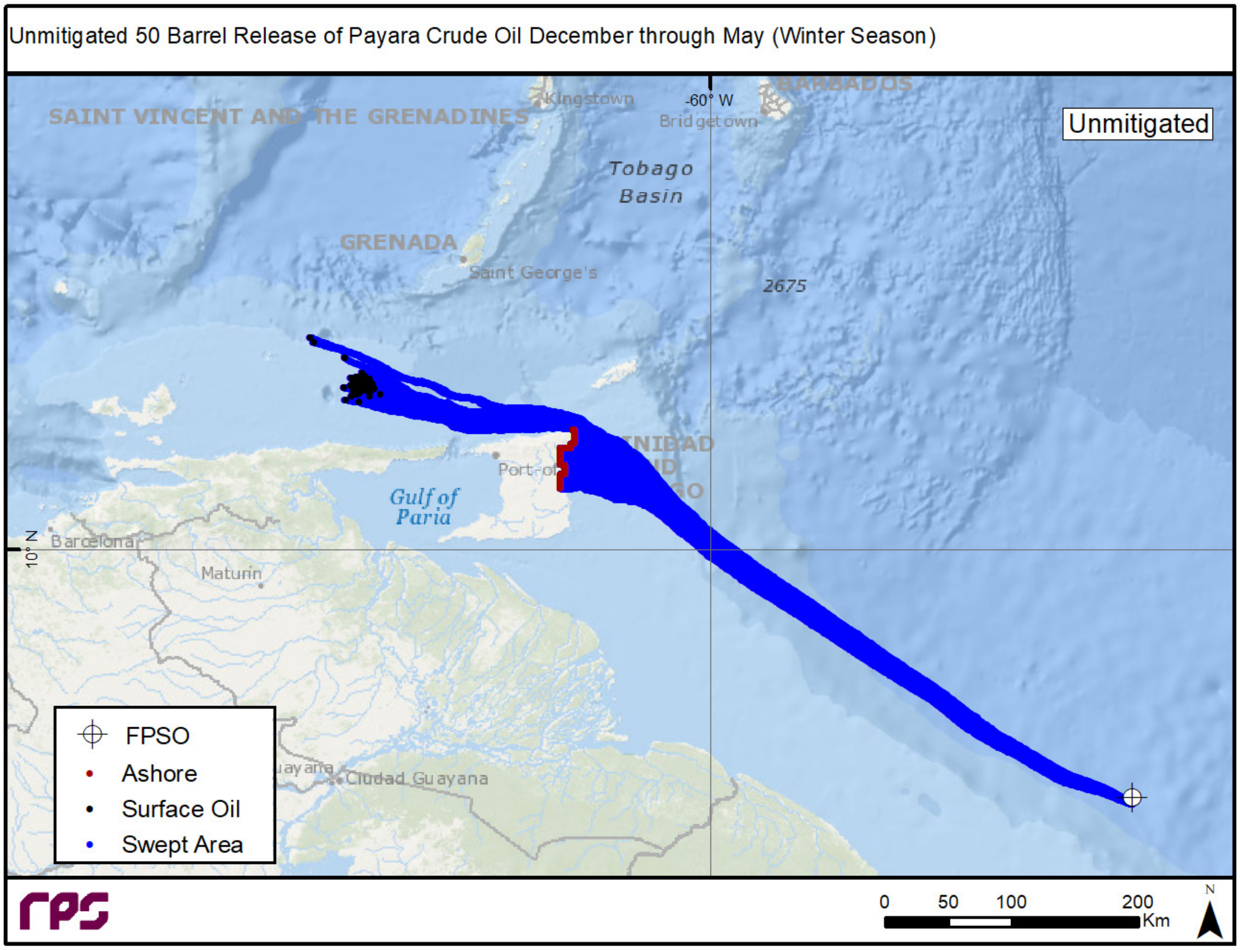


Figure A21: Unmitigated area swept results for the 95th percentile minimum time to shoreline 50 bbl Crude Oil release during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red.

A.4.4.2 Payara 2,500 Barrel Crude Oil Scenario (Unmitigated)

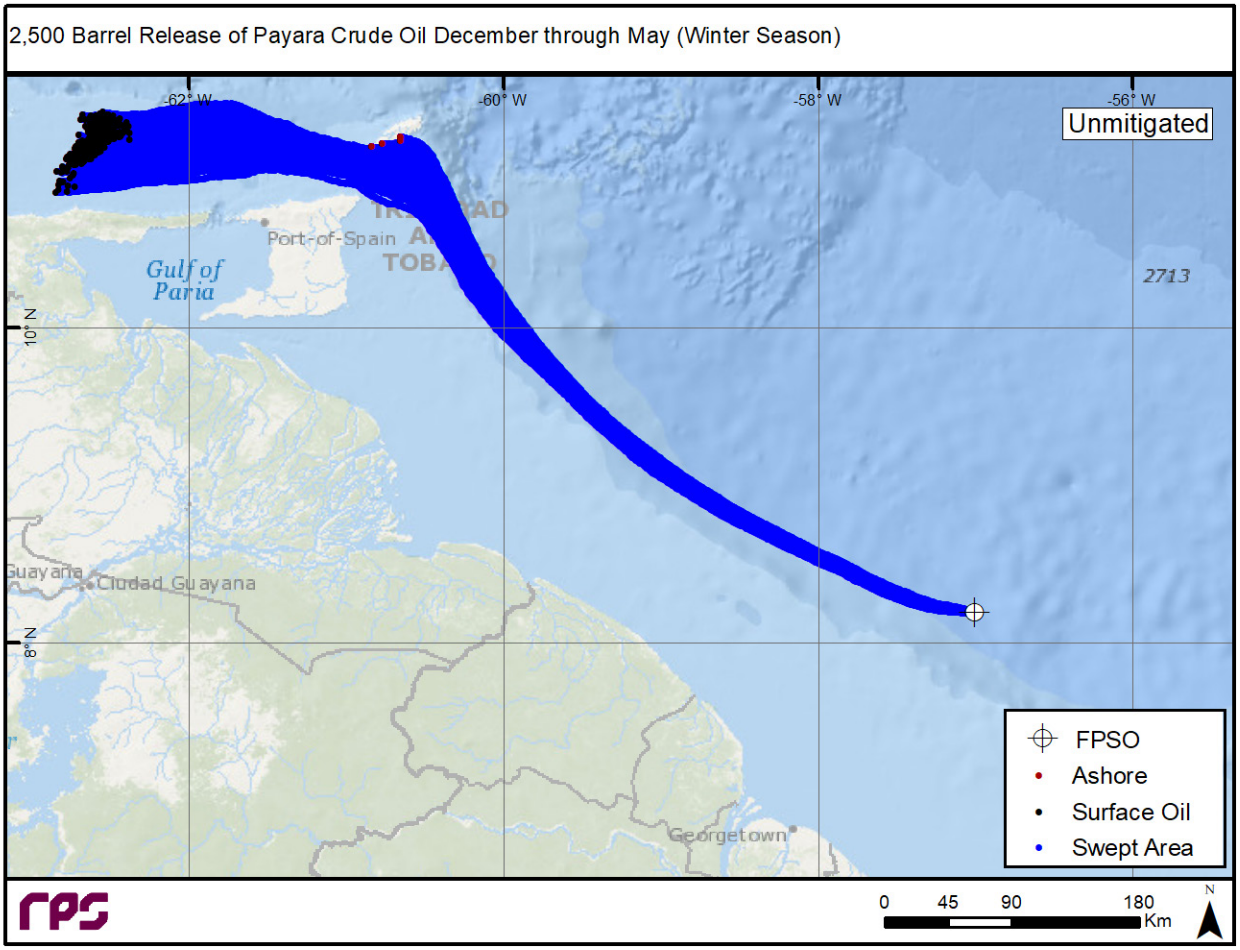


Figure A22: Unmitigated area swept results for the 95th percentile minimum time to shoreline 2,500 bbl Crude Oil release during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black, and shoreline oiling is displayed in red.

A.4.4.3 Payara 2,500 Barrel Crude Oil Scenario (Mitigated)

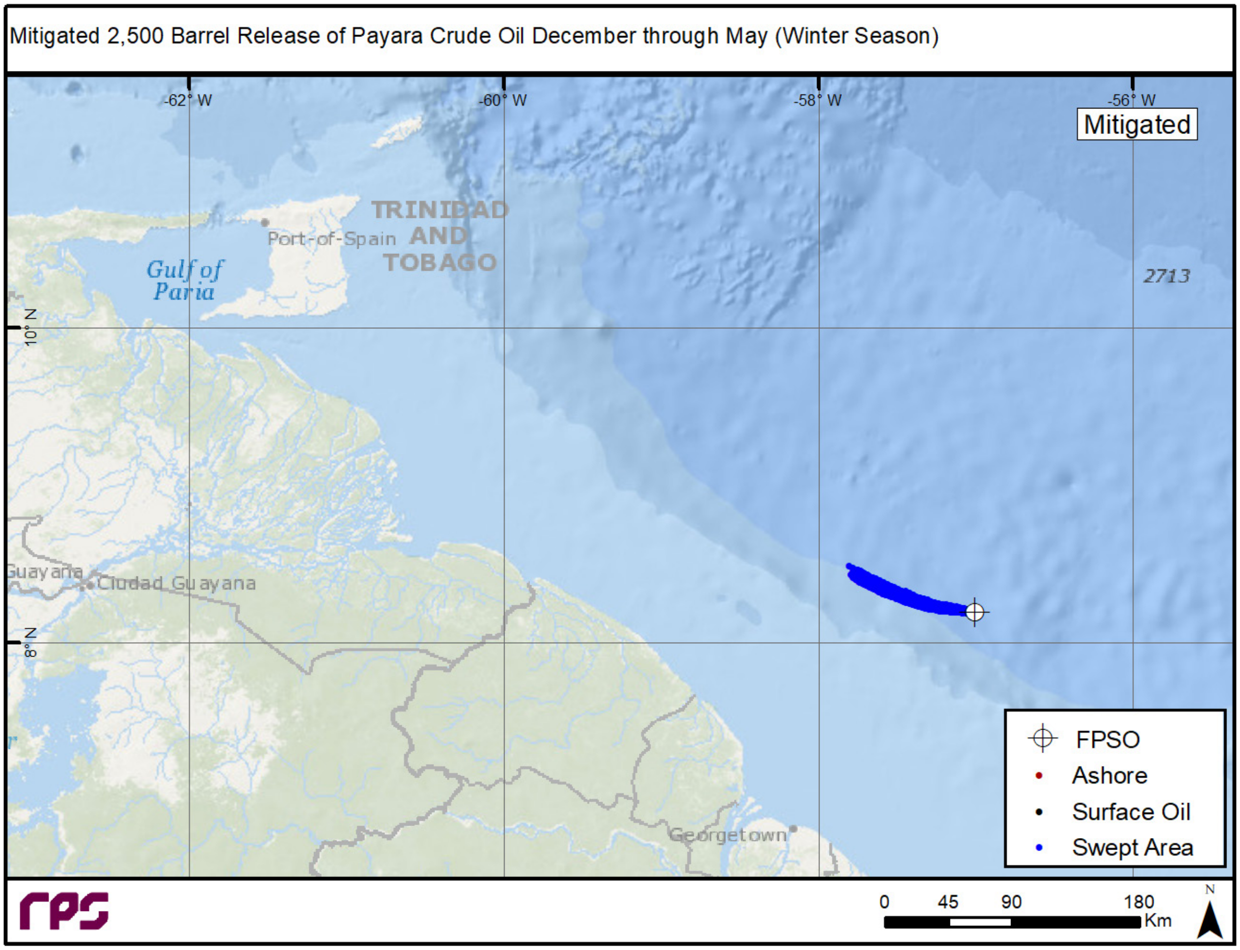


Figure A23: Mitigated area swept results for the 95th percentile minimum time to shoreline 2,500 bbl Crude Oil release during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of the 10-day scenario are presented in black (none in this scenario), and shoreline oiling is displayed in red (none in this scenario).

A.4.5 Payara Wellbore Fluids (June through November)

A.4.5.1 Payara Most Credible WCD: 20,000 BPD Crude Oil Scenario for 30 days (Unmitigated)

600,000 bbl (20,000 bpd for 30 Days) Release of Payara Crude Oil June through November (Summer Season)

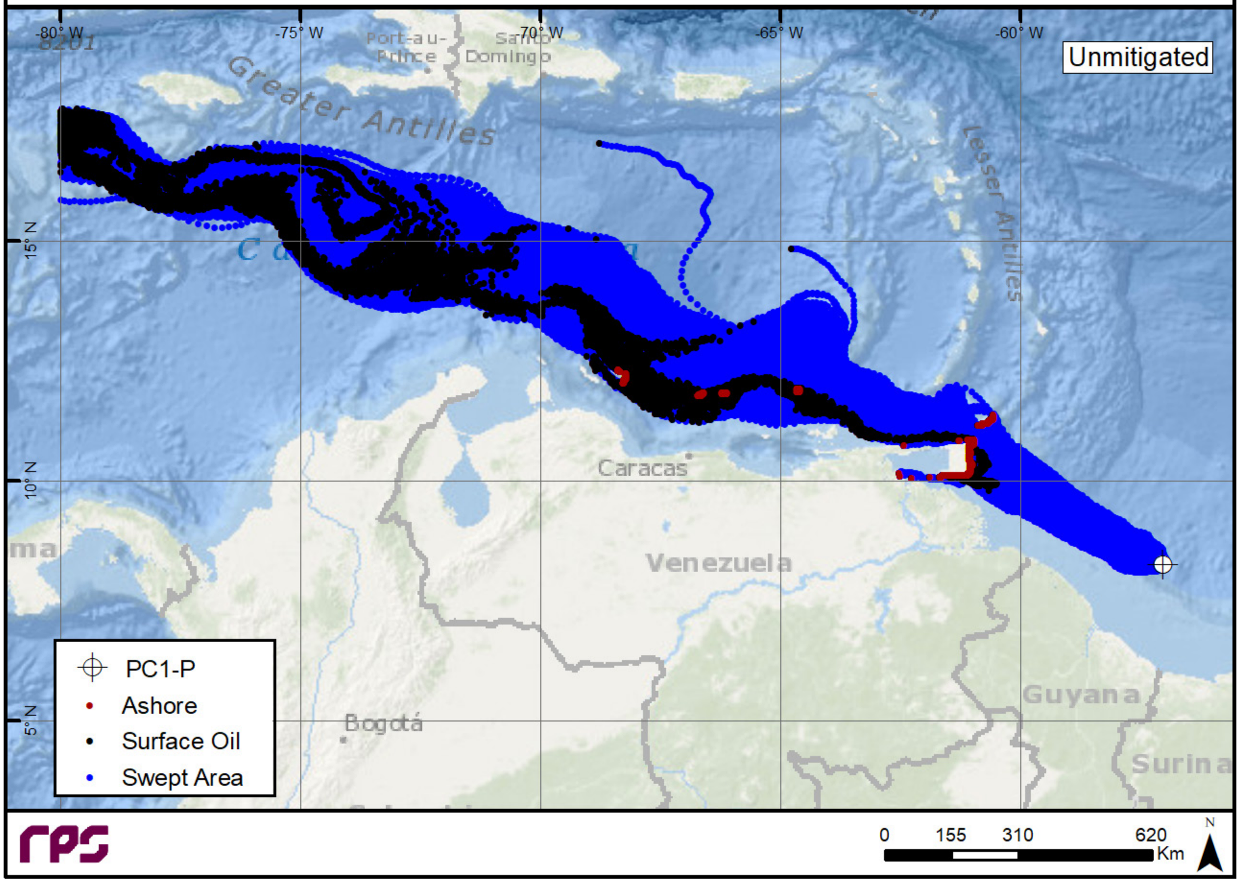


Figure A24: Unmitigated area swept results for the 95th percentile minimum time to shoreline 20,000 bbl/day Crude Oil release (Most Credible WCD) for 30 days during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 45-day scenario are presented in black, and shoreline oiling is displayed in red.

A.4.5.2 Payara Most Credible WCD: 20,000 BPD Crude Oil Scenario for 5 Days (Mitigated)

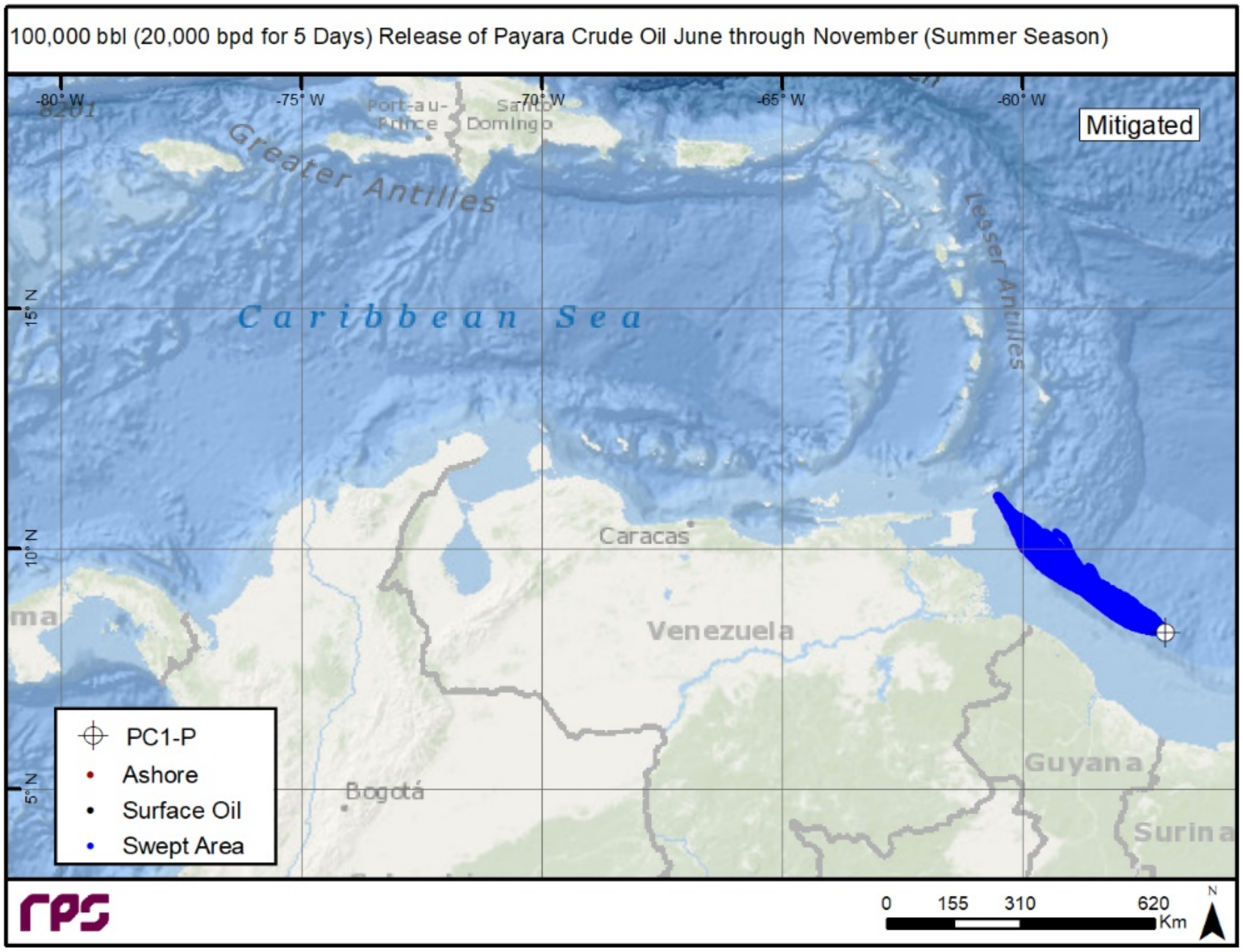


Figure A25: Mitigated area swept results for the 95th percentile minimum time to shoreline 20,000 bbl/day Crude Oil release (Most Credible WCD) for 5 days during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 45-day scenario are presented in black (none in this scenario), and shoreline oiling is displayed in red (none in this scenario).

A.4.5.3 Payara Maximum WCD: 202,192 BPD Crude Oil Scenario for 30 Days (Unmitigated)

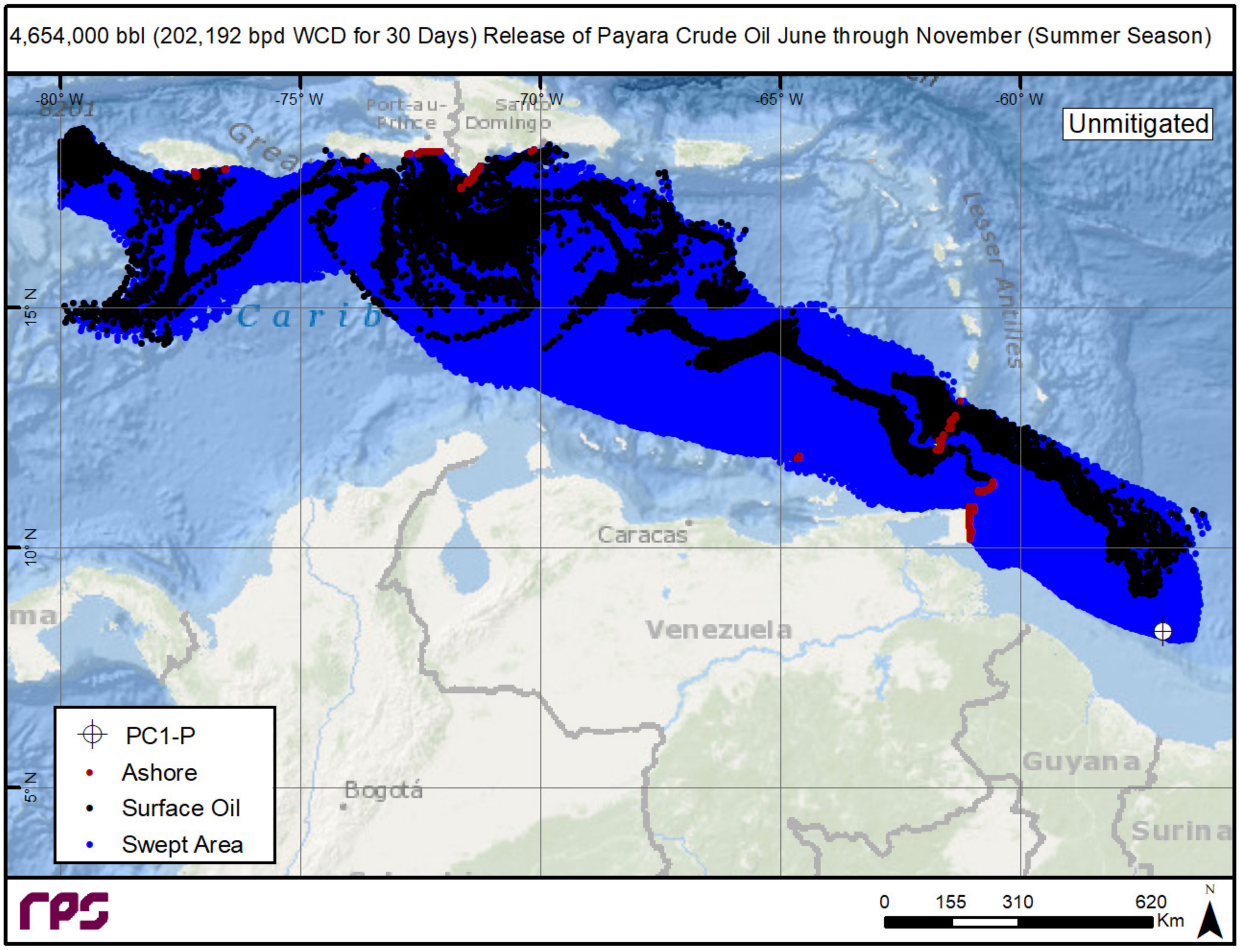


Figure A26: Unmitigated area swept results for the 95th percentile minimum time to shoreline 202,192 bbl/day Crude Oil release (Maximum WCD) for 30 days during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 54-day scenario are presented in black, and shoreline oiling is displayed in red.

A.4.5.4 Payara Maximum WCD: 202,192 BPD Crude Oil Scenario for 5 Days (Mitigated)

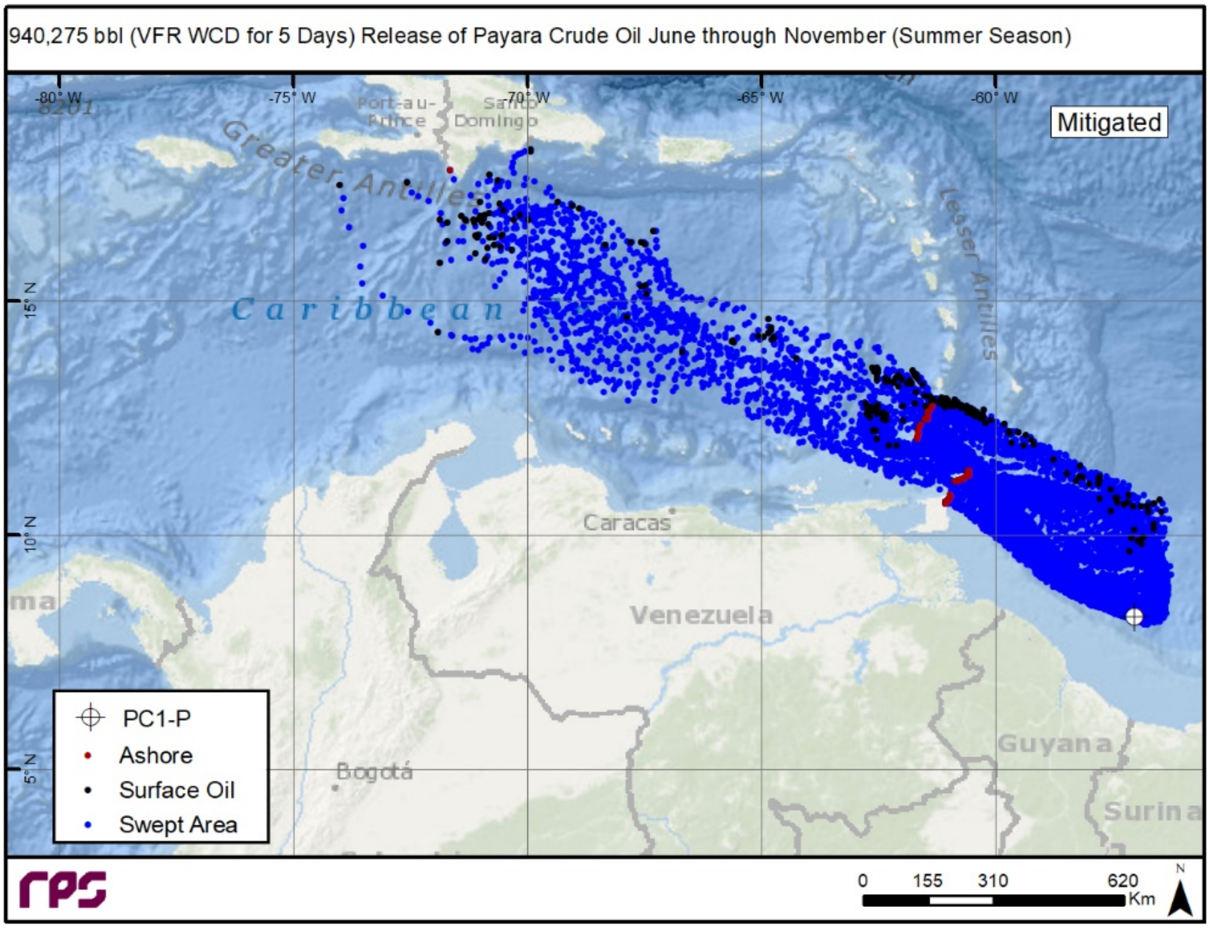


Figure A27: Mitigated area swept results for the 95th percentile minimum time to shoreline 202,192 bbl/day Crude Oil release (Maximum WCD) for 5 days during June through November season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 54-day scenario are presented in black, and shoreline oiling is displayed in red.

A.4.6 Payara Wellbore Fluids (December through May)

A.4.6.1 Payara Most Credible WCD: 20,000 BPD Crude Oil Scenario for 30 Days (Unmitigated)

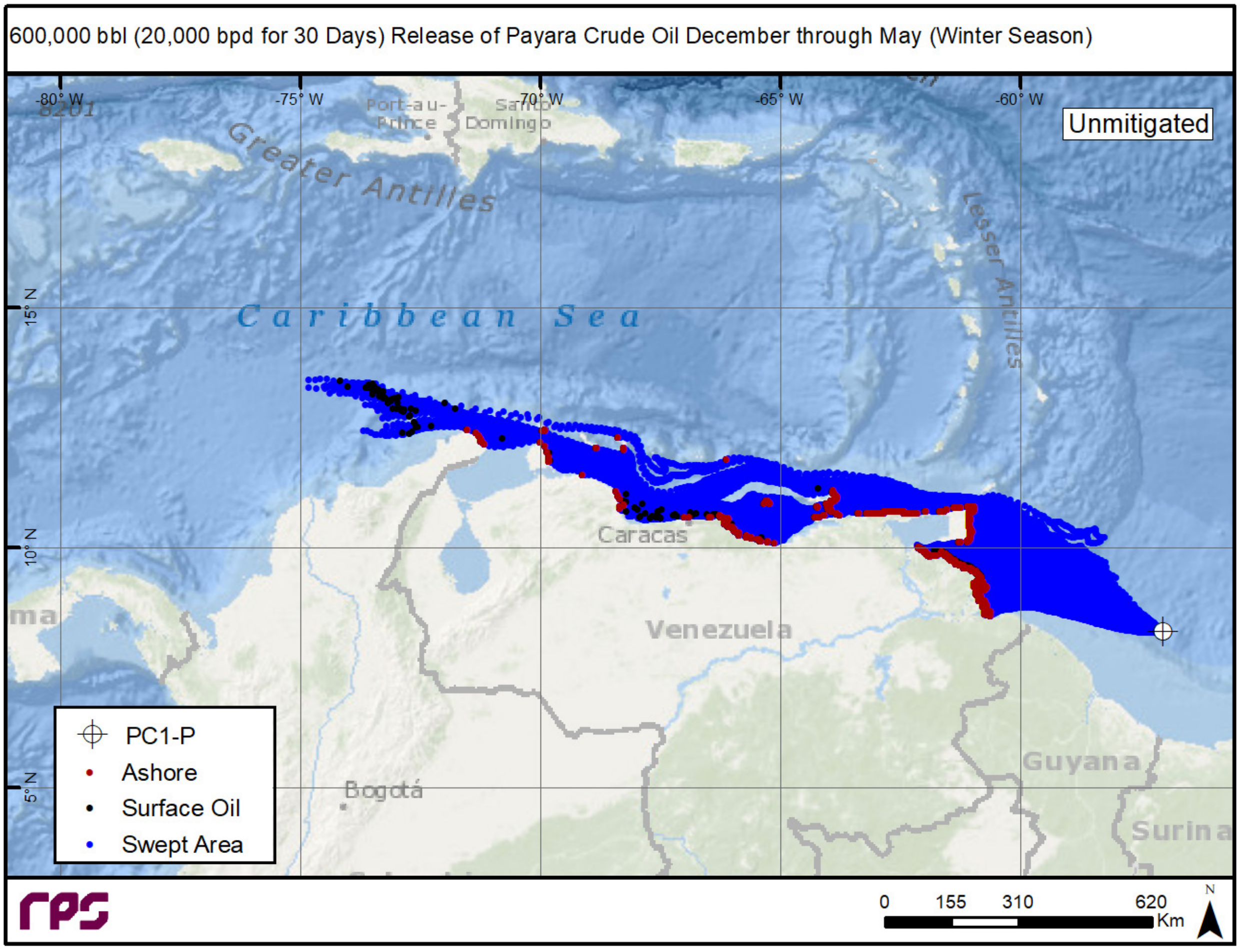


Figure A28: Unmitigated area swept results for the 95th percentile minimum time to shoreline 20,000 bbl/day Crude Oil release (Most Credible WCD) for 30 days during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 45-day scenario are presented in black, and shoreline oiling is displayed in red.

A.4.6.2 Payara Most Credible WCD: 20,000 BPD Crude Oil Scenario for 5 Days (Mitigated)

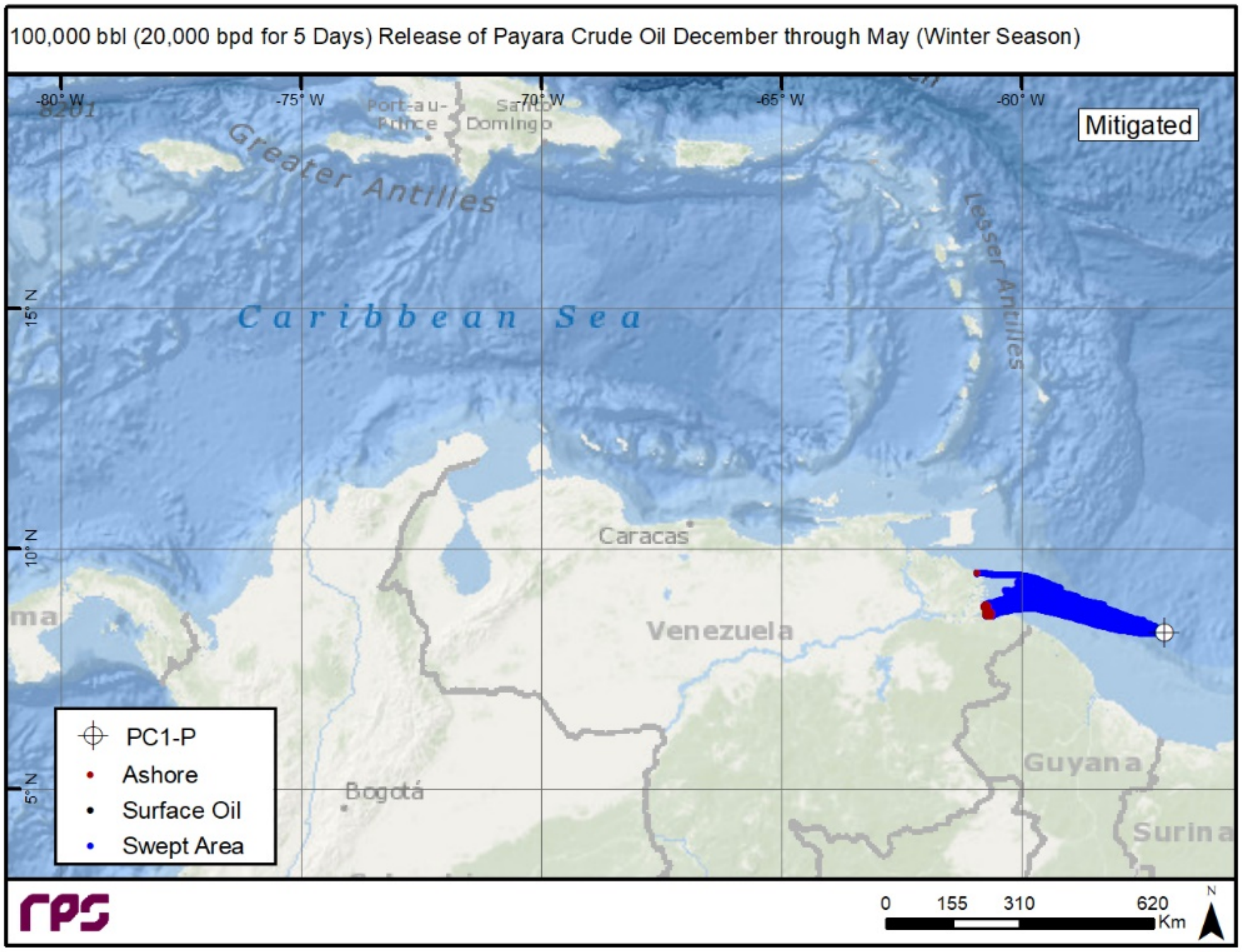


Figure A29: Mitigated area swept results for the 95th percentile minimum time to shoreline 20,000 bbl/day Crude Oil release (Most Credible WCD) for 5 days during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 45-day scenario are presented in black (none in this scenario), and shoreline oiling is displayed in red.

A.4.6.3 Payara Maximum WCD: 202,192 BPD Crude Oil Scenario for 30 Days (Unmitigated)

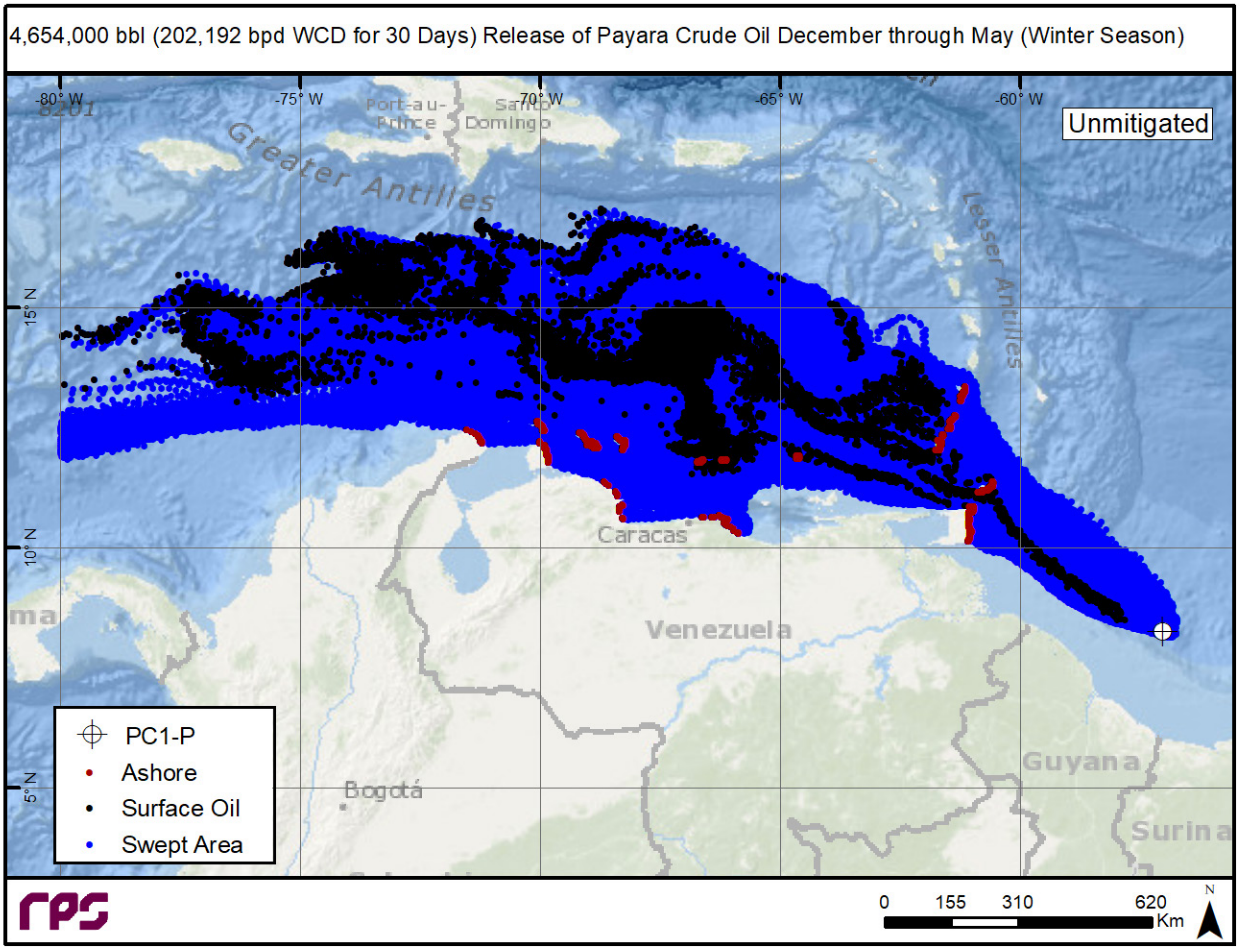


Figure A30: Unmitigated area swept results for the 95th percentile minimum time to shoreline 202,192 bbl/day Crude Oil release (Maximum WCD) for 30 days during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 54-day scenario are presented in black, and shoreline oiling is displayed in red.

A.4.6.4 Payara Maximum WCD: 202,192 Barrel per Day Scenario for 5 Days (Mitigated)

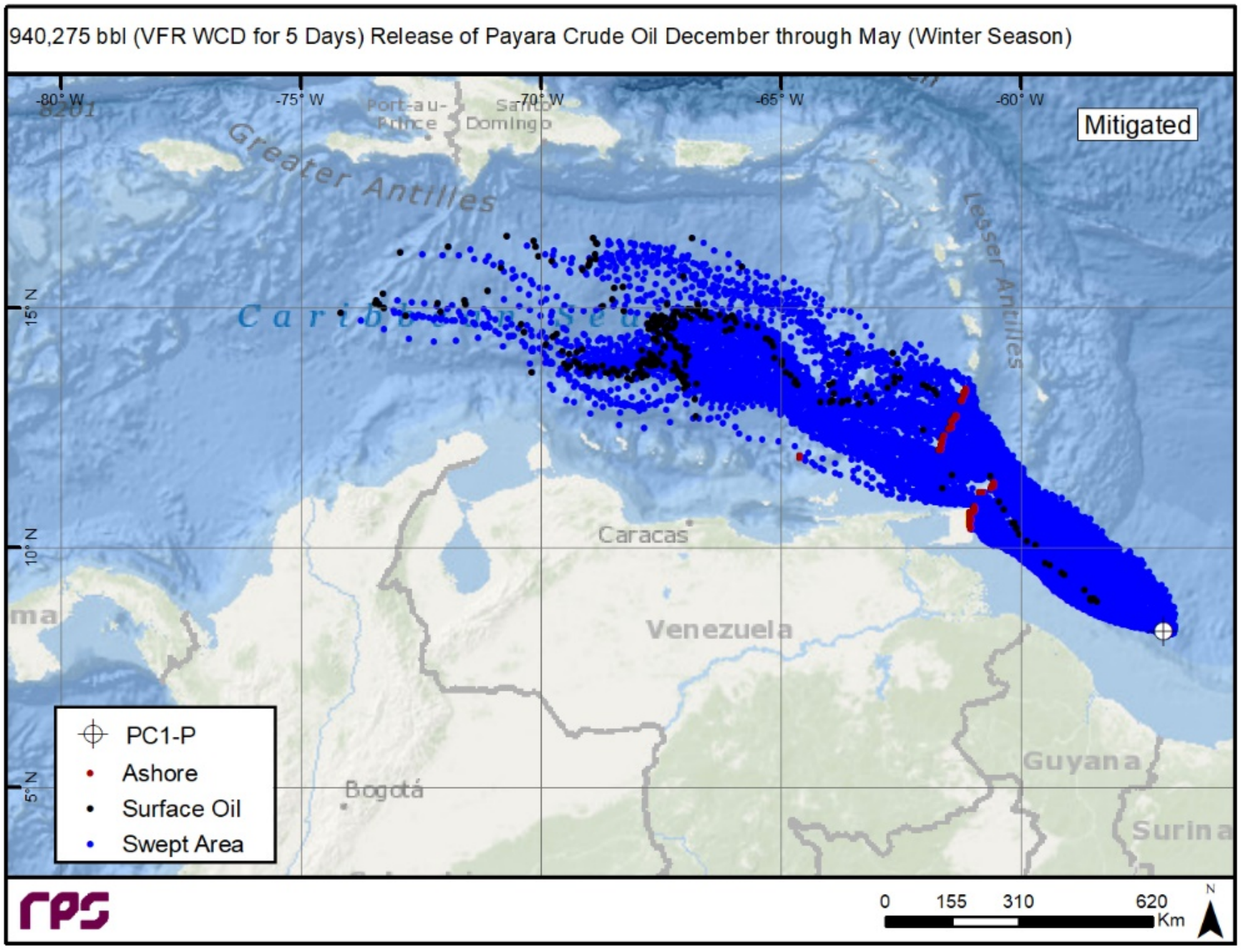


Figure A31: Mitigated area swept results for the 95th percentile minimum time to shoreline 202,192 bbl/day Crude Oil release (Maximum WCD) for 5 days during December through May season. Area swept is displayed in dark blue, surface oil droplets remaining at the end of a 54-day scenario are presented in black, and shoreline oiling is displayed in red.

A.5 GSI WCD Letter and Detailed Report for Payara

A.5.1 GSI WCD Summary Results Letter

Gemini Solutions INC
Simple Interface, Advanced Features

702 Morton Street
Richmond, TX 77469
281-238-5252
www.geminisi.com

Date: 5/31/2019

To: Guyana Projects Venture Team
22777 Springwoods Village Parkway
Spring, Texas,77389

From: Mr. James L Buchwalter, PhD, PE
Gemini Solutions, Inc.
702 Morton Street
Richmond, Texas, 77469

Subject: WCD Studies for Guyana – Payara project

Gemini Solutions Inc (GSI) has completed 6 worst case discharge studies (WCD) in Guyana for the Payara project.

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.

A summary of all results is shown below for the 6 WCD wells studied.

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

Details are attached outlining the data input for each WCD study, workflows, and all results.

A brief review of GSI experience in WCD modeling and the workflow used in these studies are included below.

Yours Truly,

James L Buchwalter, PhD, P.E.
President

GSI Qualifications in WCD Modeling

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.

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.

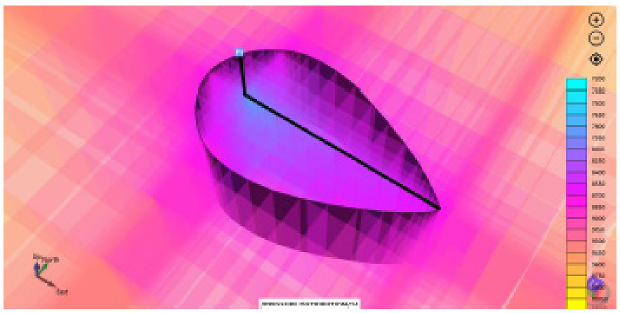
http://www.geminisi.com/downloads/bseemerlin.pdf

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 blowout open hole section. Within the open hole section Merlin WCD™ models rates, densities, and friction changes.

GSI Payara Field WCD Modeling Workflow

The workflow and software used in the Payara WCD calculations have been adopted by US government agencies (BOEM and BSEE).

A.5.2 Payara WCD Study Detailed Reports



GUYANA WCD MODELING
Payara Field

Gemini Solutions Inc
6-6-2019

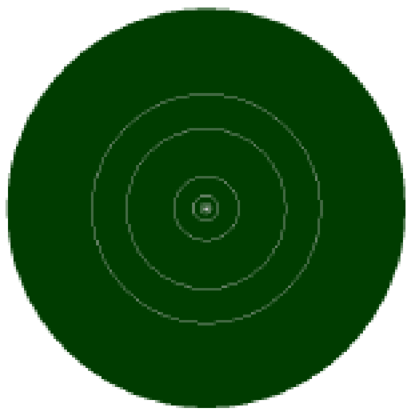
James L Buchwalter, PhD, PE & Taylor J. Seal
Gemini Solutions Inc

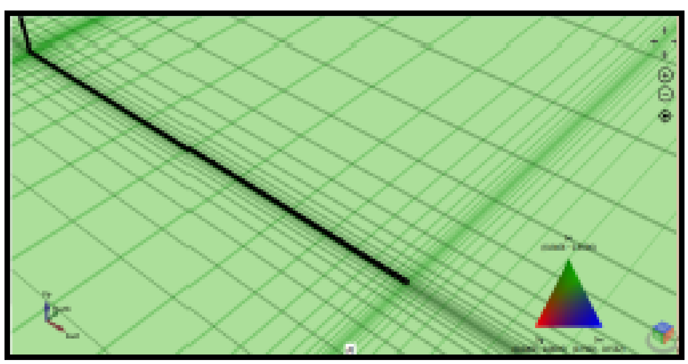
Contents

1

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.



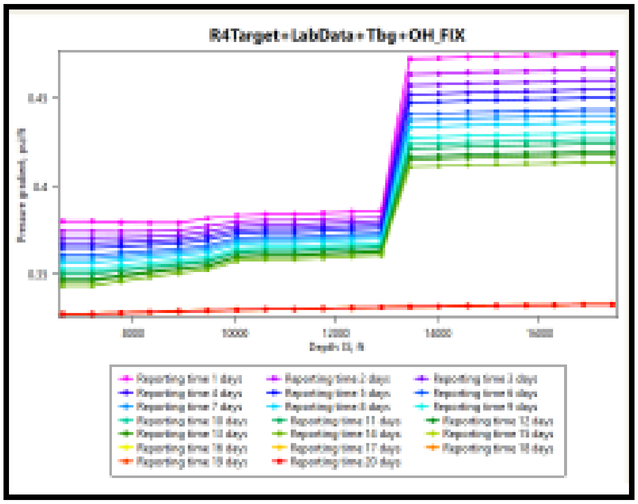


The Merlin WCD™ software includes modeling of cross flow during shut in conditions where fluids may move between producing sands after the well is capped.

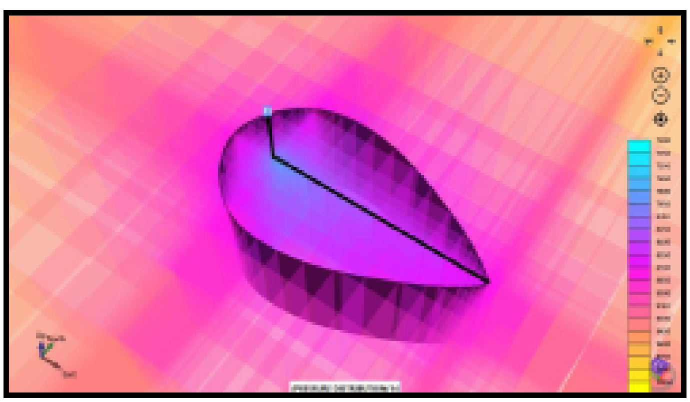
For these models PVT lab reports were provided for each open hole interval.

2

Beggs and Brill correlation was chosen for the tubing curve correlation. A sample distribution of pressure gradient profile through the vertical well bore 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 13163 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 heal to the toe of the well as production increases.



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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]	500.00
Porosity	[fraction]	0.27
Water Sat.	[fraction]	0.15
Rock Compress MSips	[1/psig]	3.00
Water Salinity	[ppm]	0.00
Fluids..		
Initial Pressure	[psia]	10975.00
Reservoir Temp	[°F]	250.00
Fluid type Oil/Water/Gas		Oil
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	15843.05
Oil data..		
Bubble Point Pressure (Optional)	[psia]	5497.10
Bo/FVF @ Initial Press (Optional)	[bbl/stb]	1.9283
Bo/FVF @ 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
Cond data..		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
Relative Perm Fractions..		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
Kr Endpoints..		
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
Fluids..		
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
Oil data..		
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]	2.3651
Oil API	[API]	20.40
Gas Specific Grav (Rel Air)	[1/wtr]	0.85
Cond data..		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
Relative Perm Fractions..		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
Kr Endpoints..		
Kro		1.00
Krg		1.00
Krw		0.70

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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
Fluids..		
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
Oil data..		
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
Cond data..		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
Relative Perm Fractions..		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
Kr Endpoints..		
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
Fluids..			
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
Oil data..			
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
Cond data..			
Condensate API	[API]		
Wet Gas Grav (Rel Air)	[1/wtr]		
Condensate Yield	[stb/MMscf]		
Relative Perm Fractions..			
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	
Kr Endpoints..			
Kro		1.00	0.05
Krg		1.00	1.00
Krw		1.00	0.70

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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
Fluids..		
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
Oil data..		
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
Cond data..		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
Relative Perm Fractions..		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
Kr Endpoints..		
Kro		1.00
Krg		1.00
Krw		1.00

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PC_P6 Target Sand – Horizontal Model

		Layer 1
Sand Name (Optional)		
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
Fluids..		
Initial Pressure	[psia]	10400.00
Reservoir Temp	[°F]	242.00
Fluid type Oil/Water/Gas		Oil
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	19927.45
Oil data..		
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
Cond data..		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
Relative Perm Fractions..		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
Kr Endpoints..		
Kro		1.00
Krg		1.00
Krw		1.00

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R4W Shallow Sand – Radial Model

		Layer 1
Sand Top SSTVD	[ft]	17178.84
Sand Base SSTVD	[ft]	17260.86
Net Thickness TVT	[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
Fluids..		
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
Oil data..		
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
Cond data..		
Condensate API	[API]	
Wet Gas Grav [Rel Air]	[1/wtr]	
Condensate Yield	[stb/MMscf]	
Relative Perm Fractions..		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
Kr Endpoints..		
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 TVT	[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
Fluids..		
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
Oil data..		
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
Cond data..		
Condensate API	[API]	
Wet Gas Grav [Rel Air]	[1/wtr]	
Condensate Yield	[stb/MMscf]	
Relative Perm Fractions..		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
Kr Endpoints..		
Kro		1.00
Krg		1.00
Krw		0.70

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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
Fluids..		
Initial Pressure	[psia]	10066.00
Reservoir Temp	[°F]	241.00
Fluid type Oil/Water/Gas		
Aquifer Size	[ac]	0.00
Hydrocarbon Size	[ac]	5553.13
Oil data..		
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
Cond data..		
Condensate API	[API]	
Wet Gas Grav (Rel Air)	[1/wtr]	
Condensate Yield	[stb/MMscf]	
Relative Perm Fractions..		
Residual Oil to Gas		0.05
Residual Oil to Wat		0.15
Critical Gas		0.05
Residual Gas to Wat		0.05
Kr Endpoints..		
Kro		1.00
Krg		1.00
Krw		0.70

12

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.

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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 fractors 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 (Mbbl) Day 45	5,365
Cap Pressure (psia) Day 22	6396.1
Max Cap Pressure (psia)	6660.7

OOIP (M bbl)	153,628
OGIP (MM cuft)	306,948
OWIP (M bbl)	50,157

14

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 fractors 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 (Mbbl) Day 45	858
Cap Pressure (psia) Day 22	5,392
Max Cap Pressure (psia)	5,095

OOIP (M bbl)	70,081
OGIP (MM cuft)	29,153
OWIP (M bbl)	42,095

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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 fractors 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	11106	**ft**	To Top of Structure
	3462	**m**	
Geology Specifications			
Parameter	**Value**	**Units**	**Notes**
Horizontal Well Length	2725	**ft**	TOS - Bottom of Survery
	831	**m**	
Water Depth	6234	**ft**	
	1900	**m**	
Salt Water Gradient	0.465	**psi/ft**	
P @ Mudline	2899	**psia**	
Oil Sand Top	17330	**ft**	
	5282	**m**	

WCD Rate (bbl/day)	184,562
Cum Oil. (Mbbl) Day 45	6,323
Cap Pressure (psia) Day 22	5,575
Max Cap Pressure (psia)	5,947

OOIP (M bbl)	266,106
OGIP (MM cuft)	302,152
OWIP (M bbl)	161,662

16

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 fractors 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	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 (Mbbl) Day 45	1,295
Cap Pressure (psia) Day 22	5,418
Max Cap Pressure (psia)	5,493

OOIP (M bbl)	108,808
OGIP (MM cuft)	76,666
OWIP (MM bbl)	1,222

17

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 fractors 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	TDS - 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 (Mbbl) 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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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 fractors 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 (Mbbl) Day 45	1,672
Cap Pressure (psia) Day 22	5587.4
Max Cap Pressure (psia)	6102.8

OOIP (M bbl)	221,919
OGIP (MM cuft)	92,943
OWIP (MM bbl)	2,595

20

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 fractors 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 (Mbbl) Day 45	6,113
Cap Pressure (psia) Day 22	5048.6
Max Cap Pressure (psia)	5160.3

OOIP (M bbl)	183,008
OGIP (MM cuft)	129,904
OWIP (M bbl)	92,860

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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 fractors 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. (Mbbl) Day 45	2,801
Cap Pressure (psia) Day 22	4318.1
Max Cap Pressure (psia)	4765.6

OOIP (M bbl)	104,416
OGIP (MM bbl)	43,950
OWIP (M bbl)	62,729

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A.6 References

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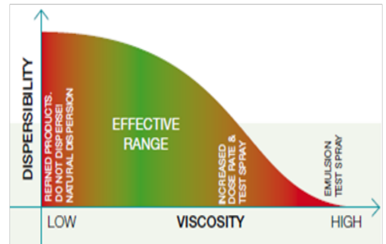
APPENDIX B DISPERSANT SPRAYING CONSIDERATIONS

OIL SPILL

Dispersant Spraying Considerations



EEPGL Actions

Is the oil amenable to dispersant?

Not all types of oil will respond to dispersant treatment in the same way, some will disperse very easily, but some will be more resistant. The chart indicates whether the spray operation will be successful, dependent on viscosity. **Conduct a basic dispersant effectiveness test 'jar test' to confirm dispersant application will be effective.**

Yes

Are there any sensitive resources?

Yes → Conduct a Net Environmental Benefit Analysis to determine if the decision to spray is going to have a net positive environmental and socioeconomic impact. If there are sensitive receptors, consider other response techniques

Nominated EEPGL party to conduct NEBA assessment

No

Is there a suitable window of opportunity to spray?

There is a window of opportunity where dispersant will be effective. The length of this window will vary according to:

Climate: In warm climates oil viscosity is reduced making the oil more amenable to dispersant, however oil has proven to be dispersible even in temperatures of 0°C

Weathering: Oil in the marine environment weathers gradually as the volatile light ends evaporate and emulsification occurs). The rate of weathering is determined by the oils' type, source of release and environmental conditions

EEPGL IMT Leader (or delegate) to get updates from On Scene IC / Master on the weathering of the oil. You can discuss with OSRL Technical Advisor for guidance.

Yes

Assess other Response options

Are the weather conditions suitable?

The minimum wave height should be about 0.2 m or conditions generating an active chop. Any sea condition less than this will require mixing energy provided by the vessel. The maximum wave height to apply dispersant is approximately 4 m (12 ft).

EEPGL ERT / IMT to check latest weather reports and background information in ESA

Yes

Can approval for dispersant spraying be secured?

EEPGL's IMT will review the results of the incident specific NEBA with the regulator prior to the application of dispersant.

EEPGL IMT reviews NEBA results with regulator prior to dispersant application

Yes

Are there adequate stockpiles of dispersant?

Yes → There must be adequate stocks of dispersant that have been stored appropriately. Dispersant should be stored out of direct sunlight. If possible avoid decanting into the vessels' tanks. Tote tanks and barrels should remain sealed. Do not mix different dispersant types.

°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

APPENDIX C FORMS

C.1 Initial Spill Report Form

Complete prior to conversation with Guyana Authorities and other agencies.

<table>
<tr><th colspan="6">Contact Details</th></tr>
<tr><td>Reportee</td><td colspan="2"></td><td>Company</td><td colspan="2"></td></tr>
<tr><td>Contact Number</td><td colspan="2"></td><td>Position</td><td colspan="2"></td></tr>
<tr><td>Alt. Contact Number</td><td colspan="5"></td></tr>
<tr><th colspan="6">Spill Details</th></tr>
<tr><td>Date / Time</td><td colspan="5"></td></tr>
<tr><td rowspan="4">Installation</td><td>Name</td><td colspan="4"></td></tr>
<tr><td>Operator</td><td colspan="4"></td></tr>
<tr><td>Licence Holder</td><td colspan="4"></td></tr>
<tr><td>Response Primacy</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Hydrocarbon Spilled</td><td>Type</td><td colspan="4"></td></tr>
<tr><td>Name of Product</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Location of Spill</td><td>Latitude</td><td></td><td>Block</td><td colspan="2"></td></tr>
<tr><td>Longitude</td><td></td><td>Field</td><td colspan="2"></td></tr>
<tr><td>Any Casualties / Damage to Installation</td><td colspan="2"></td><td>HSE been Advised?</td><td colspan="2">YES I NO</td></tr>
<tr><td>Source of Spill (If Known)</td><td colspan="5"></td></tr>
<tr><td>Cause of Spill (If Known)</td><td colspan="5"></td></tr>
<tr><td rowspan="2">Spill Quantity / Potential (If Known)</td><td>Quantity</td><td></td><td rowspan="2">Is it on going?</td><td rowspan="2" colspan="2">YES I NO</td></tr>
<tr><td>Potential</td><td></td></tr>
<tr><td>Has Installation been Shut down and / or will Incident affect Production</td><td colspan="5"></td></tr>
<tr><td>Appearance of Oil</td><td colspan="2"></td><td>Travel Direction of Spill (If Known)</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Possibility of Pollution reaching Shoreline / crossing Median Lines?</td><td>Where</td><td colspan="4"></td></tr>
<tr><td>Time</td><td colspan="4"></td></tr>
<tr><th colspan="6">Current Weather at Spill Location</th></tr>
<tr><td>Wind Direction & Speed</td><td colspan="5"></td></tr>
<tr><td>Sea State & Wave Height</td><td colspan="5"></td></tr>
</table>

C.2 Safety Data Sheets for Global Dispersants

NALCO

MATERIAL SAFETY DATA SHEET

PRODUCT

COREXIT® 9500

EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

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

2. COMPOSITION/INFORMATION ON INGREDIENTS

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	57-55-6	1.0 - 5.0
Organic sulfonic acid salt	Proprietary	10.0 - 30.0

3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

WARNING
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 www.nalco.com and request access
1 / 10

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MATERIAL SAFETY DATA SHEET

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SKIN CONTACT :
May cause irritation with prolonged contact.

INGESTION :
Not a likely route of exposure. Can cause chemical pneumonia if aspirated into lungs following ingestion.

INHALATION :
Repeated or prolonged exposure may irritate the respiratory tract.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
Frequent or prolonged contact with product may defat and dry the skin, leading to discomfort and dermatitis.

AGGRAVATION OF EXISTING CONDITIONS :
Skin contact may aggravate an existing dermatitis condition.

4. FIRST AID MEASURES

EYE CONTACT :
Immediately flush with plenty of water for at least 15 minutes. If symptoms develop, seek medical advice.

SKIN CONTACT :
Immediately wash with plenty of soap and water. If symptoms develop, seek medical advice.

INGESTION :
Do not induce vomiting: contains petroleum distillates and/or aromatic solvents. If conscious, washout mouth and give water to drink. Get medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. Get medical attention.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5. FIRE FIGHTING MEASURES

FLASH POINT :	181.4 °F / 83 °C (PMCC)
LOWER EXPLOSION LIMIT :	Not flammable
UPPER EXPLOSION LIMIT :	Not flammable

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MATERIAL SAFETY DATA SHEET

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EXTINGUISHING MEDIA :
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.

UNSUITABLE EXTINGUISHING MEDIA :
Do not use water unless flooding amounts are available.

FIRE AND EXPLOSION HAZARD :
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.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
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.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: 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).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

7. HANDLING AND STORAGE

HANDLING :
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.

STORAGE CONDITIONS :
Store away from heat and sources of ignition. Store separately from oxidizers. Store the containers tightly closed.

SUITABLE CONSTRUCTION MATERIAL :
Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

NALCO

MATERIAL SAFETY DATA SHEET

PRODUCT

COREXIT® 9500

EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

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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MATERIAL SAFETY DATA SHEET

PRODUCT

COREXIT® 9500

EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

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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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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Hazardous Waste: D018

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.

14. TRANSPORT INFORMATION

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.

LAND TRANSPORT :

For Packages Less Than Or Equal To 119 Gallons:

Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION

For Packages Greater Than 119 Gallons:

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

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	PRODUCT IS NOT REGULATED DURING TRANSPORTATION

15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Distillates, petroleum, hydrotreated light : Irritant
Propylene Glycol : Exposure Limit, Eye irritant
Organic sulfonic acid salt : Irritant

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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

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.

16. OTHER INFORMATION

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.

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

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	rmfs.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 Cédex 10 , Tel : 01.40.05.48.48. - MARSEILLE : Hopital Salvator, 249 bd Ste Marguerite 13274 Marseille cedex 5, Tel : 04.91.75.25.25. - LYON : Hopital Hédouard Herriot, 5 place d'Arsonvil, 69437 Lyon cedex 3, Tel : 04.72.11.69.11. - NANCY : Hopital 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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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 16

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	^	60-70	Xn;R65 R66 ***	Asp. Tox. 1 (H304)
docusate sodium***	209-406-4	no data available	577-11-7	0.2-5	Xi;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 menbranes.
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_2). 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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Hygiene measures	Ensure the application of strict rules of hygiene by the personnel exposed to the risk of contact with the product. When using, do not eat, drink or smoke. Do not dry hands with rags that have been contaminated with product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions	Keep away from heat. Keep at temperatures between 5 and 35 °C. Use only containers, seals, pipes, etc... made in a material suitable for use with aromatic hydrocarbons.
Materials to Avoid	Strong acids. Oxidizing agents.
Packaging material	Keep only in the original container or in a suitable container for this kind of product: steel , Stainless steel.

7.3. Specific end uses

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits	Ingredients with workplace control parameters
Legend	See section 16

DNEL Worker (Industrial/Professional)

Chemical Name	Short term, systemic effects	Short term, local effects	Long term, systemic effects	Long term, local effects
docusate sodium*** 577-11-7			31.3 mg/kg bw/day (dermal) 44.1 mg/m³ (inhalation)	

DNEL General population

Chemical Name	Short term, systemic effects	Short term, local effects	Long term, systemic effects	Long term, local effects
docusate sodium*** 577-11-7			18.8 mg/kg bw/day (dermal) 13 mg/m³ (inhalation) 18.8 mg/kg bw/day (oral)	

Predicted No Effect Concentration (PNEC)

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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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Boiling point/boiling range	180 - 240 °C 356 - 464 °F		
Flash point	>= 65 °C >= 149 °F		ISO 2719 ISO 2719.
Evaporation rate		No information available	
Flammability Limits in Air		No information available	
Vapor Pressure		No information available	
Vapor density		No information available	
Density	865 - 885 kg/m³	@ 20 °C	ISO 12185
Water solubility		No information available	
Solubility in other solvents		No information available	
logPow		Not applicable	
Autoignition temperature		No information available	
Viscosity, kinematic	7 - mm2/s	@ 40 °C	ISO 3104

Explosive properties	Not explosive
Oxidizing Properties	No information available
Possibility of hazardous reactions	No data available

9.2. Other information

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 menbranes.

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/m³ (vapour) (rat - OECD 403)
docusate 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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Reproductive toxicity Contains no ingredient listed as toxic to reproduction.

Repeated Dose Toxicity

Target Organ Effects (STOT)

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.

Aspiration toxicity The fluid can enter the lungs and cause damage (chemical pneumonitis, potentially fatal).

Other Information

Other adverse effects Frequent or prolonged skin contact destroys the lipoacid 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 ^	ErL50 (72h) > 1000 mg/l (Pseudokirchneriella subcapitata - OECD 201) EbL50 (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)	
docusate 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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TOTAL

SDS # : 30033

FINASOL OSR 51

Revision Date: 2012-02-22 **Version** 1.01

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 ^		NOELR (21d) = 1,22 mg/l (Daphnia magna - QSAR Petrotox)	NOELR (28d) = 0,17 mg/l (Oncorhynchus mykiss - QSAR 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

TOTAL

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General Information	No information available.

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.

14. TRANSPORT INFORMATION

ADR/RID	Not regulated
IMDG/IMO	Not regulated
ICAO/IATA	Not regulated

ADN

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

15. REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

European Union

TOTAL

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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

Version EU

TOTAL

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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

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 fulfil 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

Version EU

DASIC INTERNATIONAL LTD

SAFETY DATA SHEET

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	265-149-8	Xn; R65
Sodium dioctylsulphosuccinate	1-10%	577-11-7		Xi;R36 Xi;R38

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

Personal precautions	Wear suitable protective equipment. See section 8 for further information.
Environmental precautions	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.
Clean up methods	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

Handling	Wear protective clothing. See section 8 for further information.
Storage	Keep out of the reach of children. Avoid contact with: strong oxidising agents. Keep in a cool, dry, well ventilated area.
Suitable packaging	Store in original container.
Specific use	Obtain special instructions from the supplier.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits

Kerosine - odourless - distillates (petroleum), hydrotreated light	WEL 8-hr limit ppm: WEL 15 min limit ppm:	WEL 8-hr limit mg/m3: 1000 WEL 15 min limit mg/m3:

Engineering measures	Ensure adequate ventilation of the working area.
Respiratory protection	Not normally required. Wear suitable respiratory equipment when necessary. For short periods of work a combination of charcoal filter and particulate filter is suitable.
Hand protection	Chemical resistant gloves (PVC)
Eye protection	Approved safety goggles. Provide eye wash station.
Protective equipment	Apron (Plastic or rubber) Rubber boots.

9. PHYSICAL AND CHEMICAL PROPERTIES

Description	Viscous liquid.
Colour	Brown.
Odour	Mild.
Boiling point	192°C
Flash point	72°C
Relative density	0.87
Water solubility	slightly miscible in water.
Viscosity	Flow Time in 3mm ISO cup (ISO 2431) - 40

10. STABILITY AND REACTIVITY

Stability	Stable under normal conditions.
Conditions to avoid	Burning produces irritating, toxic and obnoxious fumes.
Materials to avoid	Strong oxidising agents.

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 classifed as dangerous for carriage.

15. REGULATORY INFORMATION

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.

NALCO Environmental Solutions LLC

SAFETY DATA SHEET

PRODUCT

COREXIT® EC9527A

EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **COREXIT® EC9527A**

APPLICATION : OIL SPILL DISPERSANT

COMPANY IDENTIFICATION : Nalco Environmental Solutions LLC
7705 Highway 90-A
Sugar Land, Texas
77478

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 2 / 2* FLAMMABILITY : 1 / 1 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme * = Chronic Health Hazard

2. COMPOSITION/INFORMATION ON INGREDIENTS

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)
2-Butoxyethanol	111-76-2	30.0 - 60.0
Organic sulfonic acid salt	Proprietary	10.0 - 30.0
Propylene Glycol	57-55-6	1.0 - 5.0

3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

WARNING
Can be an eye and skin irritant. Repeated or excessive exposure to butoxyethanol may cause injury to red blood cells (hemolysis), kidney or the liver. Harmful by inhalation, in contact with skin or if swallowed.
Do not get in eyes, on skin or on clothing. Do not take internally. Use with adequate ventilation. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water. Keep away from heat. Keep away from sources of ignition - No smoking.
May evolve oxides of carbon (COx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Can cause irritation.

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SKIN CONTACT :
Can cause moderate irritation. Harmful if absorbed through skin.

INGESTION :
May be harmful if swallowed. May cause liver and kidney effects and/or damage. There may be irritation to the gastro-intestinal tract.

INHALATION :
Harmful by inhalation. Repeated or prolonged exposure may irritate the respiratory tract.

SYMPTOMS OF EXPOSURE :
Acute :
Excessive exposure may cause central nervous system effects, nausea, vomiting, anesthetic or narcotic effects.
Chronic :
Repeated or excessive exposure to butoxyethanol may cause injury to red blood cells (hemolysis), kidney or the liver.

AGGRAVATION OF EXISTING CONDITIONS :
Skin contact may aggravate an existing dermatitis condition.

HUMAN HEALTH HAZARDS - CHRONIC :
Contains ethylene glycol monobutyl ether (butoxyethanol). Prolonged and/or repeated exposure through inhalation or extensive skin contact with EGBE may result in damage to the blood and kidneys.

4. FIRST AID MEASURES

EYE CONTACT :
Flush affected area with water. Get medical attention.

SKIN CONTACT :
Flush affected area with water. Get medical attention.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. Get medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

5. FIRE FIGHTING MEASURES

FLASH POINT : 163 °F / 72.7 °C (TCC)

This product does not sustain combustion per the method outlined in 49 CFR Appendix H.

EXTINGUISHING MEDIA :
This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of carbon (COx) under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Ensure all containers are labeled. Keep the containers closed when not in use.

STORAGE CONDITIONS :
Store the containers tightly closed.

SUITABLE CONSTRUCTION MATERIAL :
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 CONSTRUCTION MATERIAL :
Copper, Mild steel, Brass, Nylon, Buna-N, Natural rubber, Polyurethane, Ethylene propylene, EPDM, Fluoroelastomer, Chlorosulfonated polyethylene rubber

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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.

Substance(s)	Category:	ppm	mg/m3	Non-Standard Unit
2-Butoxyethanol	ACGIH/TWA	20		
	OSHA Z1/PEL	50	240	
	OSHA Z1/Skin*			
Propylene Glycol (Aerosol.)	WEEL/TWA		10	

* Can be absorbed through the skin.

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 :
Neoprene gloves Nitrile gloves Butyl gloves PVC gloves Breakthrough time not determined as preparation, consult PPE manufacturers.

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Use good work and personal hygiene practices to avoid exposure. 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. Always wash thoroughly after handling chemicals. When handling this product never eat, drink or smoke.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

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9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
APPEARANCE	Clear Amber
ODOR	Mild

SPECIFIC GRAVITY	0.98 - 1.02
DENSITY	8.2 - 8.5 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	6.1
VISCOSITY	160 cst @ 32 °F / 0 °C
POUR POINT	ASTM D-97 -66.9 °F / -55 °C
POUR POINT	< -40 °F / < -40 °C
BOILING POINT	340 °F / 171 °C
VAPOR PRESSURE	< 5 mm Hg @ 100 °F / 38 °C Same as water
EVAPORATION RATE	0.1 (water=1)

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 :
Extremes of temperature

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

11. TOXICOLOGICAL INFORMATION

The following toxicity information is for the product.

SENSITIZATION:
This product is not expected to be a sensitizer.

CARCINOGENICITY:
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC) or the National Toxicology Program (NTP). 2-Butoxyethanol is listed as an A3 carcinogen (confirmed animal carcinogen with unknown relevance to humans) by the American Conference of Governmental Industrial Hygienists (ACGIH). Upon further independent evaluation by IARC (2004) and IRIS (EPA Integrated Risk Information System) (2005) 2-butoxyethanol was found to be "not classifiable as to carcinogenicity to humans" and "not likely to be a human carcinogen", respectively.

HUMAN HAZARD CHARACTERIZATION:
Based on our hazard characterization, the potential human hazard is: High

TOXICOLOGICAL INFORMATION RELATED TO THE WHOLE PRODUCT AND ITS COMPONENTS:

Acute mammalian toxicity studies have been conducted under laboratory conditions that test the toxicity of the product following exposure that would not reflect those for humans under normal use situations. This information is provided below. Other information is also provided from third party sources related to the mammalian toxicity for the six components in the product.

ACUTE TOXICITY FOR THE PRODUCT MIXTURE:

ORAL (Rat): LD50 > 1,750 mg/kg

DERMAL (Rabbit): LD50 > 1,000 mg/kg

(Rat): LD50 > 2,000 mg/kg

DERMAL IRRITATION (Rabbit): Very mild irritant. No clinically significant effects beyond day 10 post-application.

INHALATION (Rat): LC50 < 2.08 mg/L

EYE IRRITATION(Rabbit): Moderate eye irritant, corneal opacity in 1/4 rabbits; all cornea, iris and conjunctival effects cleared in all rabbits by day 14.

ACUTE ORAL TOXICITY FOR THE COMPONENTS:

Component:	Polyol ester
Species:	Rat
LD50:	> 16,000 mg/kg
Remarks:	This data was sourced from the supplier MSDS.

Component:	2-Butoxyethanol
Species:	Rat
LD50:	1,746 mg/kg
Remarks:	This data was sourced from the supplier MSDS.

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Component:	2-Butoxyethanol
Species:	Guinea Pig
LD50:	1,400 mg/kg
Remarks:	This data was sourced from the supplier MSDS.

Component:	Oxyalkylated Fatty Acid Derivative
Species:	Rat
LD50:	> 38,000 mg/kg
Remarks:	This data was sourced from the supplier MSDS.

Component:	Oxyalkylate Polymer
Species:	Rat
LD50:	> 36,400 mg/kg
Remarks:	This data was sourced from the supplier MSDS.

Component:	Organic Sulfonic Acid Salt
Species:	Rat
LD50:	4,620 mg/kg
Remarks:	This data was sourced from an IUCLID Dataset searched on 6/2/2010.

Component:	Propylene glycol
Species:	Rat
LD50:	29,536 mg/kg
Remarks:	This data was sourced from an IUCLID Dataset searched on 6/3/2010.

Component:	Propylene glycol
Species:	Mouse
LD50:	22,000 mg/kg
Remarks:	This data was sourced from an IUCLID Dataset searched on 6/3/2010.

Component:	Propylene glycol
Species:	Rabbit
LD50:	18,500 mg/kg
Remarks:	This data was sourced from an IUCLID Dataset searched on 6/3/2010.

Component:	Propylene glycol
Species:	Dog
LD50:	22,000 mg/kg
Remarks:	This data was sourced from an IUCLID Dataset searched on 6/3/2010.

ACUTE DERMAL TOXICITY FOR THE COMPONENTS:

Component:	2-Butoxyethanol
Species:	Guinea Pig
LD50:	> 2,000 mg/kg
Remarks:	This data was sourced from the supplier MSDS.

Component: 2-Butoxyethanol
Species: Rat
LD50: 2,210 mg/kg
Remarks: This data was sourced from the supplier MSDS.

Component: 2-Butoxyethanol
Species: Rabbit
LD50: 99 - 610 mg/kg
Remarks: This data was sourced from the supplier MSDS.

Component: Organic Sulfonic Acid Salt
Species: Rabbit
LD50: 10,000 mg/kg
Remarks: This data was sourced from an IUCLID Dataset searched on 6/2/2010.

Component: Propylene glycol
Species: Rabbit
LD50: 20,800 mg/kg
Remarks: This data was sourced from an IUCLID Dataset searched on 6/3/2010.

ACUTE INHALATION TOXICITY FOR THE COMPONENTS:

Component: 2-Butoxyethanol
Species: Rat
LD50: 700 mg/l (7 hrs)
Remarks: This data was sourced from the supplier MSDS.

Component: Organic Sulfonic Acid Salt
Species: Rat
LD50: 20 mg/l (96 hrs)
Remarks: This data was sourced from an IUCLID Dataset searched on 6/2/2010.

CHRONIC TOXICITY DATA FOR THE COMPONENT: 2-Butoxyethanol

The principal health effects following acute exposure to 2-butoxyethanol are irritation of the eyes and respiratory tract. 2-butoxyethanol is readily absorbed through the skin. In laboratory animals exposed to 2-butoxyethanol via inhalation, blood (hemolysis) and secondary effects on the kidney and liver have been observed. When 2-butoxyethaol is ingested it is metabolized to butoxyacetic acid (BAA), which can cause hemolysis. BAA is rapidly excreted in urine in animals and humans with a urinary excretion half-life of approximately 3-6 hours in humans. Human red blood cells have been shown to be significantly less sensitive to hemolysis than those of rodents and rabbits. These effects are transient and when exposure is discontinued, these effects subside. 2-butoxyethanol does not cause adverse reproductive or birth effects in animals, unless exposures occur at levels high enough to induce significant maternal toxicity.

NALCO Environmental Solutions LLC

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PRODUCT

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12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product, unless otherwise indicated.

Acute Fish Results :

Species	Exposure	Test Type	Value	Test Descriptor
Turbot	96 hrs	LC50	50 mg/l	Product
Fathead Minnow	96 hrs	LC50	201 mg/l	Product
Inland Silverside	96 hrs	LC50	14.57 mg/l	Product
Common Mummichog	96 hrs	LC50	81 mg/l	Product

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	Test Type	Value	Test Descriptor
Acartia tonsa	48 hrs	LC50	23 mg/l	Product
Mysid Shrimp (Mysidopsis bahia)	48 hrs	LC50	24.14 mg/l	Product
Artemia	48 hrs	LC50	40 mg/l	Product

AQUATIC PLANT RESULTS :

Species	Exposure	Test Type	Value	Test Descriptor
Marine Algae (Skeletonema costatum)	72 hrs	EC50	9.4 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%	70 - 90%

The portion in water is expected to be soluble or dispersible.

BIOACCUMULATION POTENTIAL
Based on a review of the individual components, utilizing U.S. EPA models, this material is not expected to bioaccumulate.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Moderate
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Low

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If released into the environment, see CERCLA/SUPERFUND in Section 15.

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.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14. TRANSPORT INFORMATION

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.

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

15. REGULATORY INFORMATION

This section contains additional information that may have relevance to regulatory compliance. The information in this section is for reference only. It is not exhaustive, and should not be relied upon to take the place of an individualized compliance or hazard assessment. Nalco accepts no liability for the use of this information.

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 302 :
Notification of spills of this product is not required.

NALCO Environmental Solutions LLC

SAFETY DATA SHEET

PRODUCT

COREXIT® EC9527A

EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

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
X	Delayed (Chronic) Health Hazard
X	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 contains the following substance(s), (with CAS # and % range) which appear(s) on the List of Toxic Chemicals

Hazardous Substance(s)	CAS NO	% (w/w)
Glycol Ethers		30 - 60

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 :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

CLEAN AIR ACT, Sec. 112 (Hazardous Air Pollutants, as amended by 40 CFR 63), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

CALIFORNIA PROPOSITION 65 :
Substances listed under California Proposition 65 are not intentionally added or expected to be present in this product.

MICHIGAN CRITICAL MATERIALS :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

NALCO Environmental Solutions LLC

SAFETY DATA SHEET

PRODUCT

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EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

STATE RIGHT TO KNOW LAWS :
The following substances are disclosed for compliance with State Right to Know Laws:

2-Butoxyethanol	111-76-2
Propylene Glycol	57-55-6

INTERNATIONAL CHEMICAL CONTROL LAWS :

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.

AUSTRALIA
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

CHINA
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).

EUROPE
The substance(s) in this preparation are included in or exempted from the EINECS or ELINCS inventories

JAPAN
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
All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)

PHILIPPINES
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).

16. OTHER INFORMATION

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

NALCO Environmental Solutions LLC

SAFETY DATA SHEET

PRODUCT

COREXIT® EC9527A

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

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.

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.

Prepared By : Product Safety Department
Date issued : 03/01/2012

NALCO Environmental Solutions LLC

SAFETY DATA SHEET

PRODUCT
COREXIT® EC9527A

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

Version Number : 4.3

C.3 Dispersant Use Planning Form—Initial Incident Information

Incident Sheet for Dispersant Use Concurrence Requests				
Name of Incident: **Initial Time of Spill:** **Date**______/______/______ Time: ____:______ ______ Month Day Year 24 Hour Clock Time Zone				
Air Monitoring Data: (Maximum reported in Source Control area of operations)				
VOC:	Percent LEL:			
Incident Location:				
Distance (miles/km) and Direction to nearest land:	Lat: N/S Long: E/W			
Block Name: Block Number: Water Depth:				
Brief Description of Incident:				
Incident: Pipeline___ Transfer Operations___ Explosion___ Collision___ Blowout___ 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:				
Oil Characteristics:				
Name:	API Gravity:	GOR:	Pour Point:	Viscosity at release
Is the oil dispersible into the water column: Yes/No (circle one)				

Spill Description:	
Estimated Flow Rate (bopd): _______________ Estimated Spill Volume:________________ Product easily emulsified? Yes (___) No (___) Product already emulsified?No (___)	
Method used for estimate:	
Current On Site Weather Conditions (relative to subsea injection readiness)	
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 ___OF/C Water ___OF/C Dominant Current, net drifts (towards): Speed ___ knots; Direction ____ Water Depth (fathoms ___ Feet ___) 0-3 (___) 4-10 (___) 11-30 (___) 31-99 (___) >100 (___) Other considerations: Low Visibility (___) Rip Tides (___) Whirlpools (___) Eddies (___)	
Additional Data that could affect operations: (e.g., subsea currents speed and direction, oil seeps)	
Surface Slick/Subsurface Plume Modeling	
2-D/ 3-D Model(s) used:	
Expected slick/plume trajectory and behavior:	

C.4 Dispersant Use Planning Form—Application Tactics

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

Name of dispersant proposed for use: COREXIT EC9500A] (___) Other __________________

Application platform(s): Fixed-wing___ Helicopter ___ Vessel ___ Subsea ____

Safety plan for applicable platform in place? Yes (___) No (___)

Dispersant dosage goals:

Ratio of dispersant-to-oil (DOR): Surface 1:20 ☐ Subsea 1:70 ☐ Other: __________

Gallons per acre: ______ gals per acre Other: ___________

Time of dispersant application: Start Time _________ Day ___/___/____

Finish Time _________ Day ___/___/____

Estimate percentage of surface spill area to be treated (if known):

1-5% (___) 6-20% (___) 21-40% (___) 41-70% (___) 71-99% (___) 100% (___)

Gallons per minute: ______ gals per minute Other: __________

Time of dispersant application: Start Time _________ Day ___/___/____

Finish Time _________ Day ___/___/____

Estimate percentage of subsea volume treated (if known):

1-5% (___) 6-20% (___) 21-40% (___) 41-70% (___) 71-99% (___) 100% (___)

Dispersant Decision

Responsible Party Incident Commander ☐ Approve/Concur Signature:

____

Regulatory Agency Coordinator ☐ Approve/Concur Signature:

____

Regulatory Agency Coordinator ☐ Approve/Concur Signature:

____

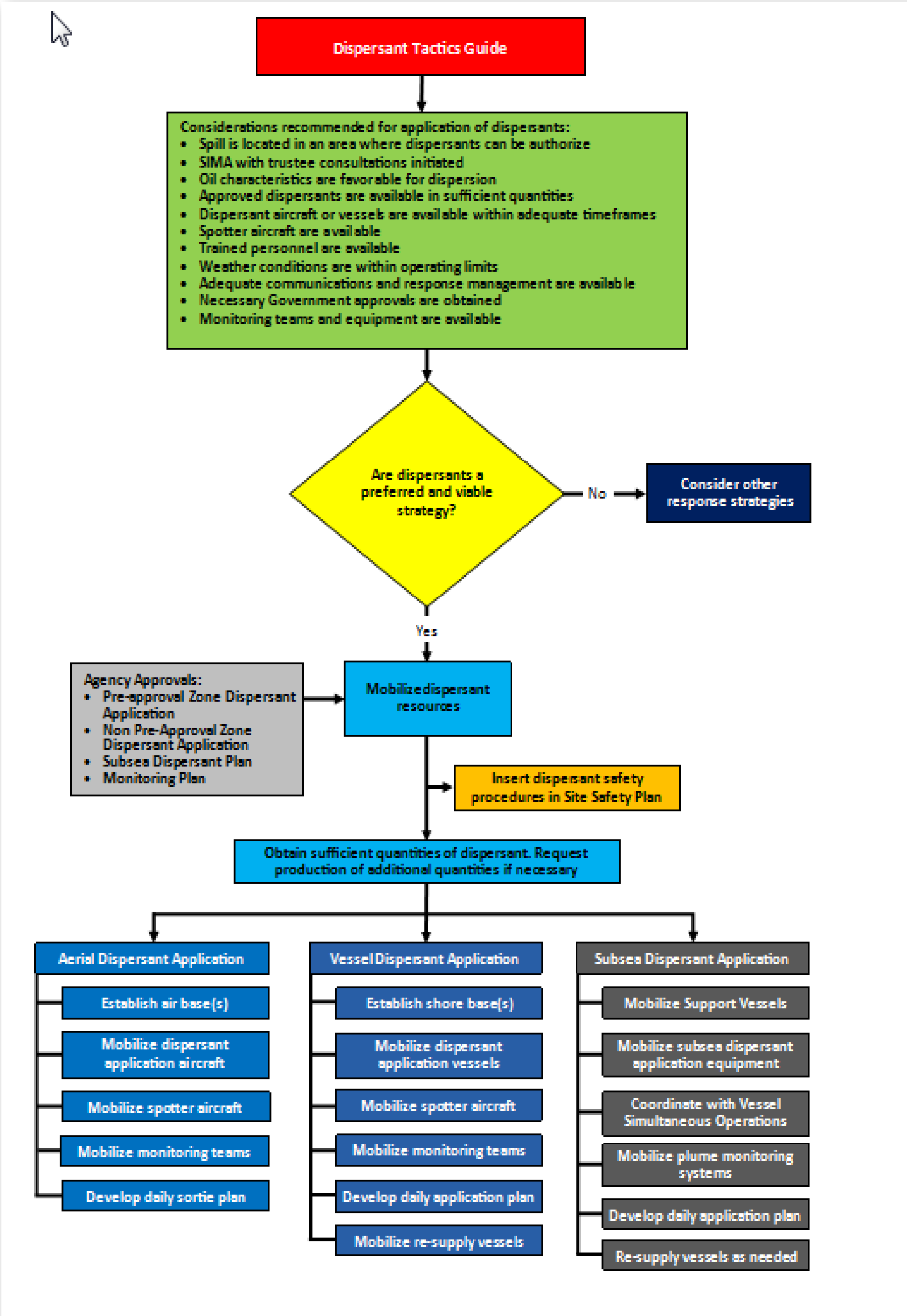
Additional consultation or concurrence, if needed

Agency/Contact	Concurrence/Consultation	Time/Date	Method (verbal/written)
____________	______________	____________	____________
____________	______________	____________	____________

Points of Contact for checklist:

Name	Position	Telephone	
Regulatory Agency	____________	____________	(_____)_____-__________
Regulatory Agency	____________	____________	(_____)_____-__________
Responsible Party	____________	____________	(_____)_____-__________
Other	____________	____________	(_____)_____-__________
Other	____________	____________	(_____)_____-__________

C.5 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

C.6 Dispersant Use Request Form

Dispersant Use Request Form		
Request from		
Name and Position	Contact Details	Date and Time of Request
Request made to		
Name and Position	Contact Details	Date and Time Request Received
Reason for Dispersant Use Request		
Use of dispersants provides the important advantage of removing oil from the surface of the water thereby minimizing the effects of an oil spill by dispersing oil before it reaches shorelines or sensitive areas. Removing oil from the surface of the water can reduce the potential for impacts to wildlife including birds and marine mammals that could be found on or near the sea surface and limits the action of wind on spill movement. Dispersants can be applied and are effective across a wide range of environmental, metrological and oceanographic condition, where mechanical responses are limited. Dispersants can also be applied rapidly over a greater area in a given time than other response options.		
Expected Dispersant Effectiveness		
Has a Dispersant Effectiveness Test or Test Spray Run been carried out? Yes/No (If yes attach results to request form).	In this section, discuss the type of oil product spilled and its relative dispersibility. Reference available technical information or describe whether experience suggests that the spilled product is dispersible and will still be dispersible in the time frame of anticipated application of dispersants.	
Based on the assessment of the Incident what is the estimated timeframe available for a dispersant spraying operation to be effective?		

Dispersant Use Request Form	
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 spaying 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.	

<table>
<tr><th colspan="3">Dispersant Use Request Form</th></tr>
<tr><th colspan="3">Dispersant Effectiveness Monitoring Program</th></tr>
<tr><td>Describe the level of dispersant effectiveness monitoring to be applied during the dispersant spraying operations.</td><td colspan="2">State how observations will be carried out and documented. Describe how the dispersant spraying operations results will be communicated to the regulatory approvers.</td></tr>
<tr><th colspan="3">Dispersant Spraying Operation Approval Decision</th></tr>
<tr><td>Approved

Provide Additional Comments as Required</td><td colspan="2">Not Approved

Provide Details on Why Approval was Not Granted</td></tr>
<tr><th>Decision Makers Name and Position</th><th>Contact Details</th><th>Date and Time</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

C.7 Oil Spill Response Limited (OSRL) Notification Form

OSRL NOTIFICATION FORM

WARNING! Ensure telephone contact has been established with OSRL's Duty Manager before using e-mail and fax communications.

Oil Spill Response

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	dutymanagers@oilspillresponse.com		
Section 1	**Obligatory Information Required -Please Complete All Details**		
Name of person in charge			
Position			
Company			
Contact telephone number			
Contact Mobile number			
Contact fax number			
E-mail address			
Section 2	**Spill Details**		
Location of spill			
Description of slick (size, direction, appearance)			
Latitude / longitude			
Situation (cross box)	❑ Land ❑ River ❑ Estuary ❑ Coastal ❑ Offshore ❑ Port		
Date & time of spill	❑ GMT ❑ Local		
Source of spill			
Quantity (if known)	❑ Cross box if estimate		
Spill status (cross box)	❑ On-going ❑ Controlled ❑ Unknown		
Action taken so far			
Product name			
Viscosity			
API / SG			
Pour point			
Asphaltene			
Section 3	**Weather**		
Wind speed & direction			
Sea state			
Sea temperature			
Tides			
Forecast			

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**

C.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	dutymanagers@oilspillresponse.com

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	

APPENDIX D GEOGRAPHICAL RESPONSE PLAN

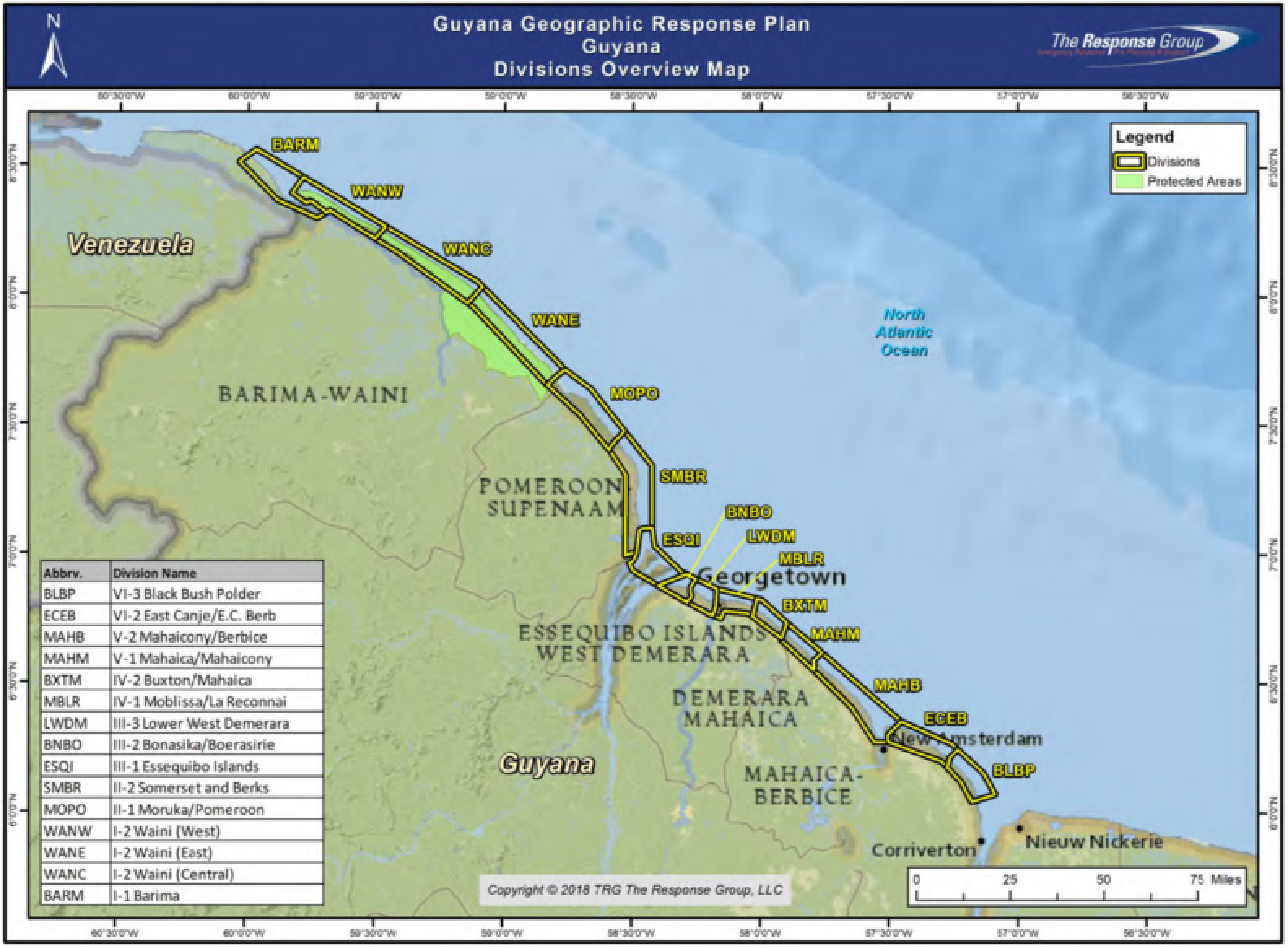
The Response Group (TRG) has generated a comprehensive Geographical Response Plan (GRP) for the coastlines of Guyana, Venezuela, and Trinidad and Tobago to support EEPGL offshore operations in the Guyana region. The geographical footprint of the GRP was based on projected impacts from the (unmitigated) 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 also 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 also 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 a large 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.

D.1 Example Guyana Geographical Response Plan Information



Abbrv.	Division Name
BLBP	VI-3 Black Bush Polder
ECEB	VI-2 East Canje/E.C. Berb
MAHB	V-2 Mahaicony/Berbice
MAHM	V-1 Mahaica/Mahaicony
BXTM	IV-2 Buxton/Mahaica
MBLR	IV-1 Moblissa/La Reconnai
LWDM	III-3 Lower West Demerara
BNBO	III-2 Bonasika/Boerasirie
ESQI	III-1 Essequibo Islands
SMBR	II-2 Somerset and Berks
MOPO	II-1 Moruka/Pomeroon
WANW	I-2 Waini (West)
WANE	I-2 Waini (East)
WANC	I-2 Waini (Central)
BARM	I-1 Barima


Guyana Geographic Response Plan
I-2 Waini West (Guyana)
Division Overview Map
N
The Response Group
59°50'0"W
59°45'0"W
59°40'0"W
59°35'0"W
59°30'0"W
8°25'0"N
8°20'0"N
8°15'0"N
Legend
Response Sites
Protection
Protected Areas
Divisions
Shoreline Type
10D-Scrub and Shrub Wetlands
WANW-3
WANW-2
WANW-1
I-2 Waini West
North Atlantic Ocean
Guyana
I
II
III
IV
V
VI
VII
X
0
2
4
6 Miles
Copyright © 2018 TRG The Response Group, LLC


Guyana Geographic Response Plan
I-2 Waini West Division: WANW-2
Protection Site - Strategy Map
The Response Group
Boom
Resources | Qty | Qty UoM | Size | Size UOM
Inflatable Boom | 900 | ft | 43 | Inch
Lat: 8° 19' 58.850" N
Long: 59° 37' 29.671" W
North Atlantic Ocean
WANW-2
300
300
300
I-2 WAINI
Legend
Response Sites
Protection
Boom
Inflatable Boom
0 1,000 2,000 3,000 Feet
Copyright © 2018 TRG The Response Group, LLC
bing

GRP Area Maintenance				GRP Area: WANW-2
Resources Required				
Area Of Operation	**Resource Kind**	**Description**	**Quantity**	**Size**
WANW-2	Boom Accessories	Boom Anchors	33 each	20 pound(s)
WANW-2	Boom	Inflatable Boom	900 feet	43 inch (es)
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	

Assignments

1.) Deploy (3) 300 ft sections of inflatable boom in a cascade formation to deflect spilled material away from the shoreline.

Location of Work

Latitude: 8° 19' 58.850" N
Longitude: 59° 37' 29.671" W

Special Environmental Considerations

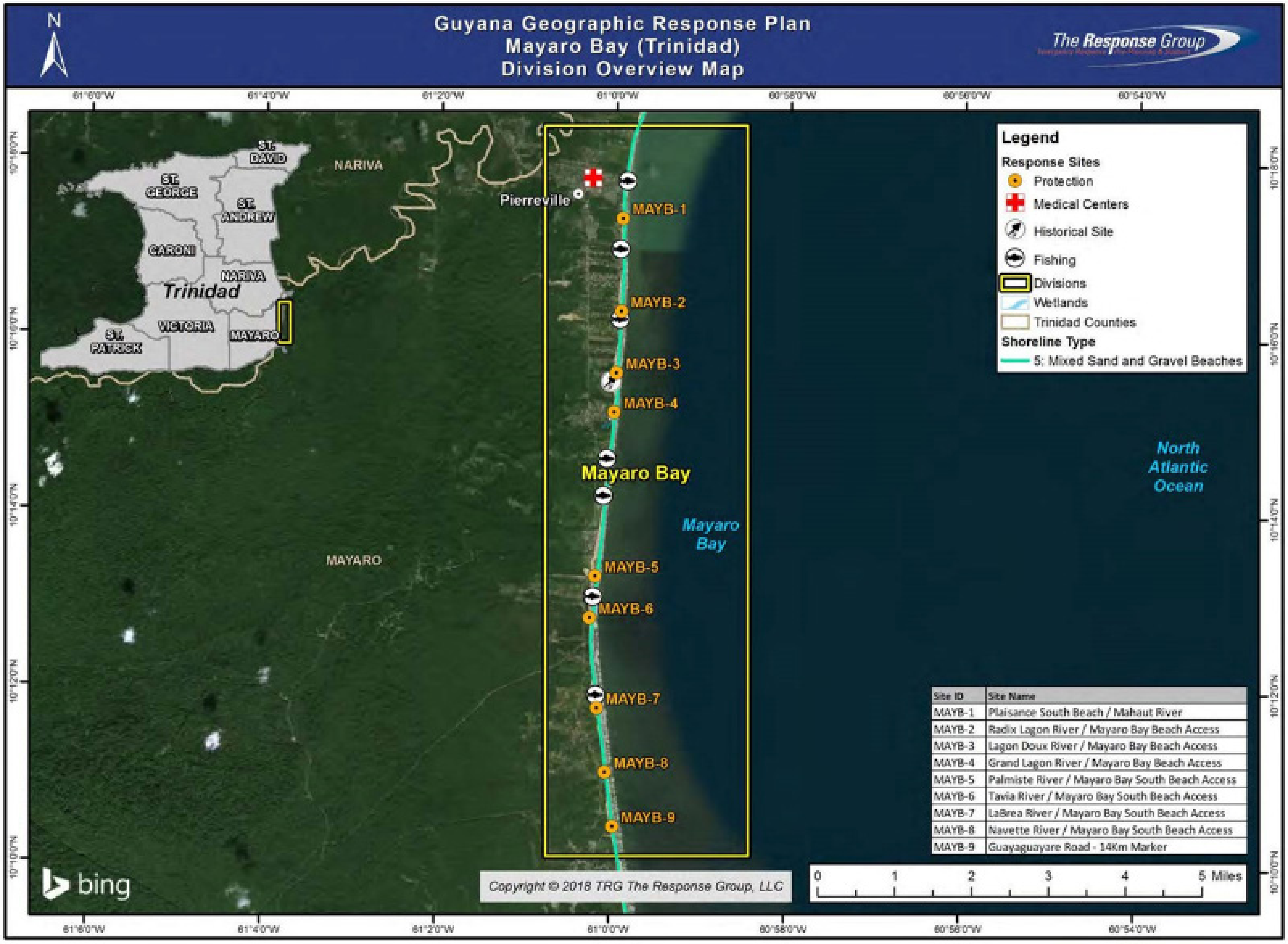
Shoreline Types:
10D. Scrub and Shrub Wetlands

GRP Area Maintenance

INCIDENT ACTION PLAN SOFTWARE™	Printed 5/1/2018 13:21	Page 1 of 1		© TRG

D.2 Example Trinidad and Tobago Geographical Response Plan Information


Guyana Geographic Response Plan
Trinidad
Divisions Overview Map
The Response Group
Abbrv. | Division Name
BALA | Balandra Bay
CANA | Canari Bay
GUAY | Guayaguayare
MATU | Matura Beach
MAYB | Mayaro Bay
NARI | Nariva
PRAD | Point Radix
TOCO | Toco
Legend
Divisions
Trinidad Counties
Caribbean Sea
Gulf of Paria
North Atlantic Ocean
Columbus Channel
Port of Spain
San Juan
Arima
Chaguanas
San Fernando
Point Fortin
ST. GEORGE
ST. DAVID
ST. ANDREW
CARONI
NARIVA
VICTORIA
MAYARO
ST. PATRICK
TRINIDAD AND TOBAGO
TOCO
BALA
MATU
NARI
PRAD
MAYB
GUAY
CANA
0 5 10 15 20 25 Miles
Copyright © 2018 TRG The Response Group, LLC



Site ID	Site Name
MAYB-1	Plaisance South Beach / Mahaut River
MAYB-2	Radix Lagon River / Mayaro Bay Beach Access
MAYB-3	Lagon Doux River / Mayaro Bay Beach Access
MAYB-4	Grand Lagon River / Mayaro Bay Beach Access
MAYB-5	Palmiste River / Mayaro Bay South Beach Access
MAYB-6	Tavia River / Mayaro Bay South Beach Access
MAYB-7	LaBrea River / Mayaro Bay South Beach Access
MAYB-8	Navette River / Mayaro Bay South Beach Access
MAYB-9	Guayaguayare Road - 14Km Marker

Guyana
Geographic Response Plan

Mayaro Bay Division – MAYB-1
Protection Site

Plaisance South Beach /
Mahaut River

Site Information

Site Name:
Plaisance South Beach / Mahaut River
Latitude:
10° 17' 20.677" N
Longitude:
60° 59' 54.923" W
County: Mayaro
Country: Trinidad
Population Density: Moderate
Land Use: Recreational, Residential
Existing Response Support Capabilities: None

Site Picture

Photo 1: Looking north at the Mahaut River.

Access Information

Site Access: Road, ATV
Road Type: Light Duty
Road Surface Type: Paved
Road Condition: All Weather
Access Type: Public
Bridge Height: N/A

Waterway Information

Type of Waterway: Bay, River
Waterway Name:
Mayaro Bay, Mahaut River
Average Current Speed: N/A
Waterway Width:
Low Water: ~ 30 ft (River)
High Water: ~ 50 ft (River)
Tidally Influenced: Yes
Shoreline Type: Mixed Sand and Gravel Beaches
Bank Slope: Slight
Bank Height: N/A

Response Information

Deployment Strategy: Protection
Low Water: Booming
High Water: Booming
Boom Required: 150 ft of Hard Boom, 250 ft of Shore Seal Boom
Recovery Method: N/A
Tank Truck Access: N/A
Pump / Hose Required: N/A
Recommended Staging Area: N/A
Nearest Boat Ramp & Dist.:
N/A

Site Contact Information

Organization: N/A

Phone: N/A

Cellular Service: Good

Site Description

Access Location Description: This site is located along Mayaro Bay near the mouth of Mahaut River. Access to site by foot or ATV off Manzanilla / Mayaro Road.

Hazards: Slips, trips, and falls. Underwater hazards and currents.

Obstructions / Limitations: Debris along shoreline.

Considerations

Associated Sensitivities: Sea turtle nesting area.

Strategy Considerations: Mahaut River is in a residential areas as well as a potential sea turtel 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).

The Response Group

MAYB-1

Guyana
Geographic Response Plan

Mayaro Bay Division – MAYB-1
Protection Site

Plaisance South Beach / Mahaut River

Site Pictures

Photo 2: Looking northeast at the Mahaut River.

Photo 3: Looking south from the Mahaut River outfall.

Strategy Map

Assignments

1.) Deploy 150 ft section of hard boom in a chevron configuration to protect the mouth of Mahaut River along Mayaro Bay.
2.) Deploy 250 ft section of shore seal boom protect the mouth of Mahaut River and shoreline.

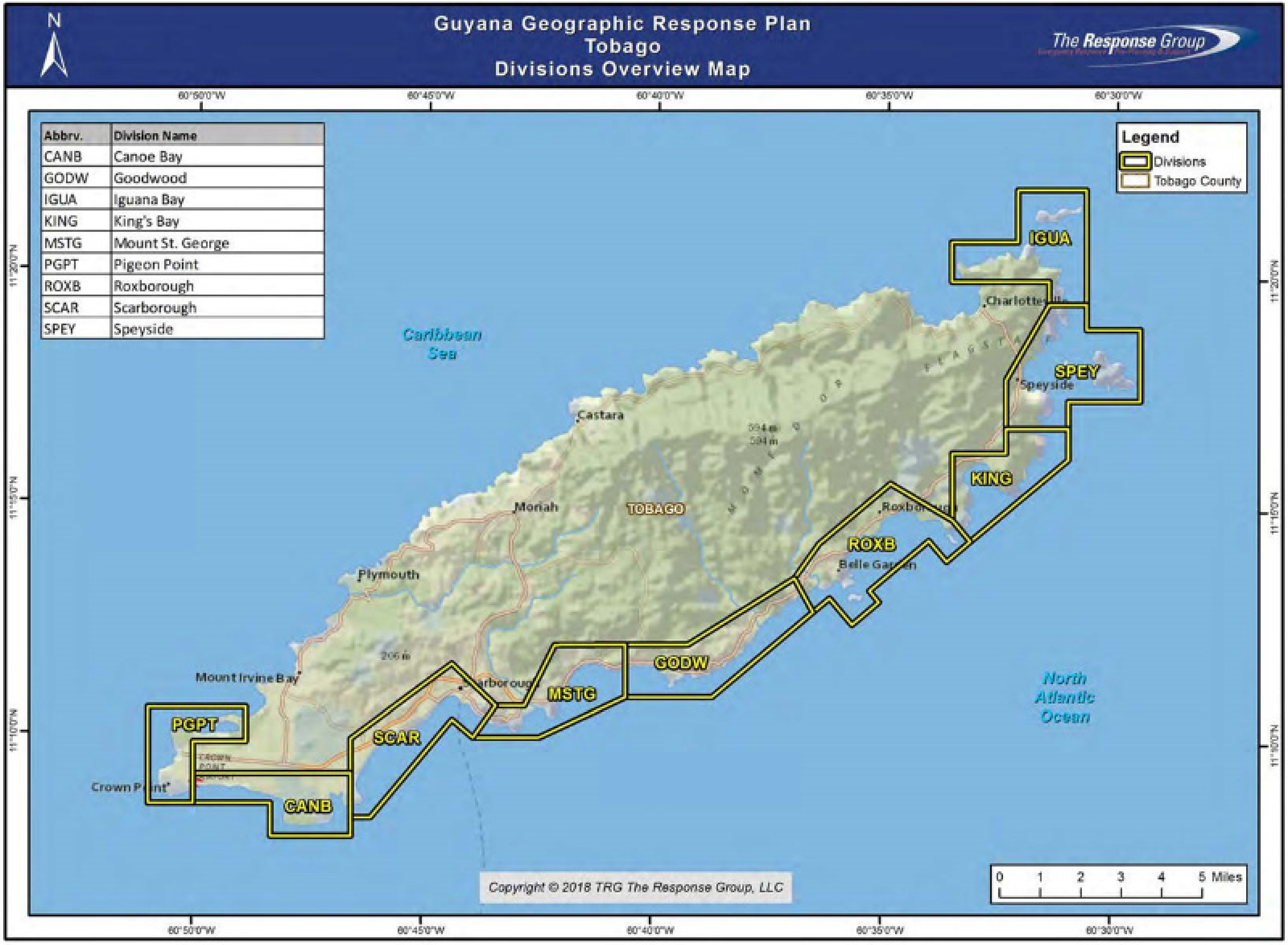
Resources Required

Type	Description	Qty.	Size
Boom Accessories	Anchor Stakes	6 ea	N/A
Boom Accessories	Boom Anchors	4 ea	40 lbs
Manpower: Supervisor	Supervisor	1 ea	N/A

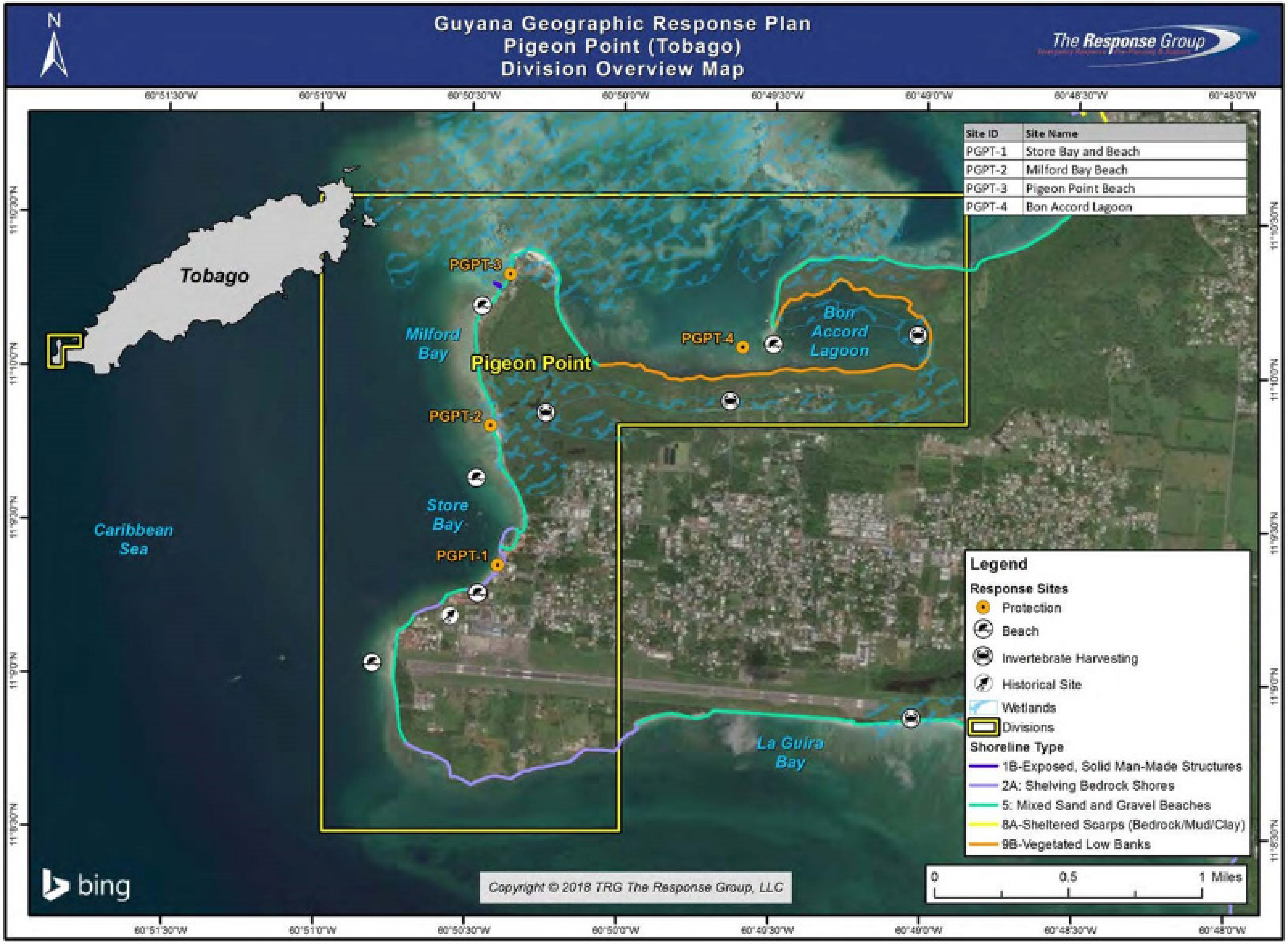
Type	Description	Qty.	Size
Boom	Hard Boom	150 ft	18 in
Manpower: Responder	Responder	5 ea	N/A
Boom	Shore Seal Boom	250 ft	22 in

The Response Group

MAYB-1



Abbrv.	Division Name
CANB	Canoe Bay
GODW	Goodwood
IGUA	Iguana Bay
KING	King's Bay
MSTG	Mount St. George
PGPT	Pigeon Point
ROXB	Roxborough
SCAR	Scarborough
SPEY	Speyside


Guyana Geographic Response Plan
Pigeon Point (Tobago)
Division Overview Map
The Response Group
N
Site ID | Site Name
PGPT-1 Store Bay and Beach
PGPT-2 Milford Bay Beach
PGPT-3 Pigeon Point Beach
PGPT-4 Bon Accord Lagoon
Tobago
Caribbean Sea
Milford Bay
Pigeon Point
Store Bay
Bon Accord Lagoon
La Guira Bay
PGPT-1
PGPT-2
PGPT-3
PGPT-4
Legend
Response Sites
Protection
Beach
Invertebrate Harvesting
Historical Site
Wetlands
Divisions
Shoreline Type
1B-Exposed, Solid Man-Made Structures
2A: Shelving Bedrock Shores
5: Mixed Sand and Gravel Beaches
8A-Sheltered Scarps (Bedrock/Mud/Clay)
9B-Vegetated Low Banks
0 0.5 1 Miles
bing
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Guyana
Geographic Response Plan

Pigeon Point Division – PGPT-4
Protection Site

Bon Accord Lagoon

Site Information

Site Name:
Bon Accord Lagoon
Latitude: 11° 10' 5.052" N
Longitude: 60° 49' 35.734" W
County: Tobago
Country: Tobago
Population Density: Moderate
Land Use: Recreational, Commercial
Existing Response Support Capabilities: Boat Ramp

Site Picture

Photo 1: Looking East across Bon Accord Lagoon

Access Information

Site Access: Road, Boat
Road Type: Light Duty
Road Surface Type: Paved
Road Condition: All Weather
Access Type: Public
Bridge Height: N/A

Waterway Information

Type of Waterway: Bay
Waterway Name: Bon Accord Lagoon
Average Current Speed: N/A
Waterway Width: Low Water: N/A
High Water: N/A
Tidally Influenced: Yes
Shoreline Type: Mixed Sand and Gravel Beaches, Vegetated Low Banks
Bank Slope: Slight
Bank Height: N/A

Response Information

Deployment Strategy: Protection
Low Water: Booming
High Water: Booming
Boom Required: 4,600 ft of Hard Boom
Recovery Method: N/A
Tank Truck Access: N/A
Pump / Hose Required: N/A
Recommended Staging Area: N/A
Nearest Boat Ramp & Dist.:
Bon Accord Lagoon Boat Ramp

Site Contact Information

Organization: N/A

Phone: N/A

Cellular Service: Good

Site Description

Access Location Description: This site is located along the shoreline of Bon Accord Lagoon between Pigeon Point and No Man's Island.

Hazards: Slips, trips, and falls. Underwater hazards and currents.

Obstructions / Limitations: Debris along shoreline including wood.

Considerations

Associated Sensitivities: Mangrove Trees

Strategy Considerations: Environmentally sensitive sheltered lagoon with mangroves lining 80% of the shoreline. Boats anchor offshoreline 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.

The Response Group

PGPT-4

Guyana
Geographic Response Plan

Pigeon Point Division – PGPT-4
Protection Site

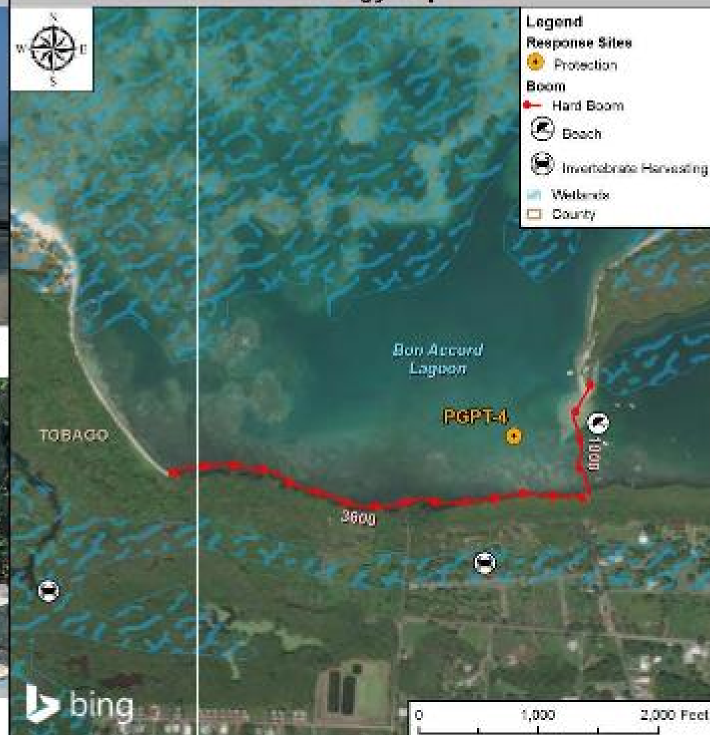
Bon Accord Lagoon

Site Pictures

Photo 2: Looking North down the beach towards Pigeon Point

Photo 3: Looking North towards the boat ramp

Strategy Map



Assignments

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.

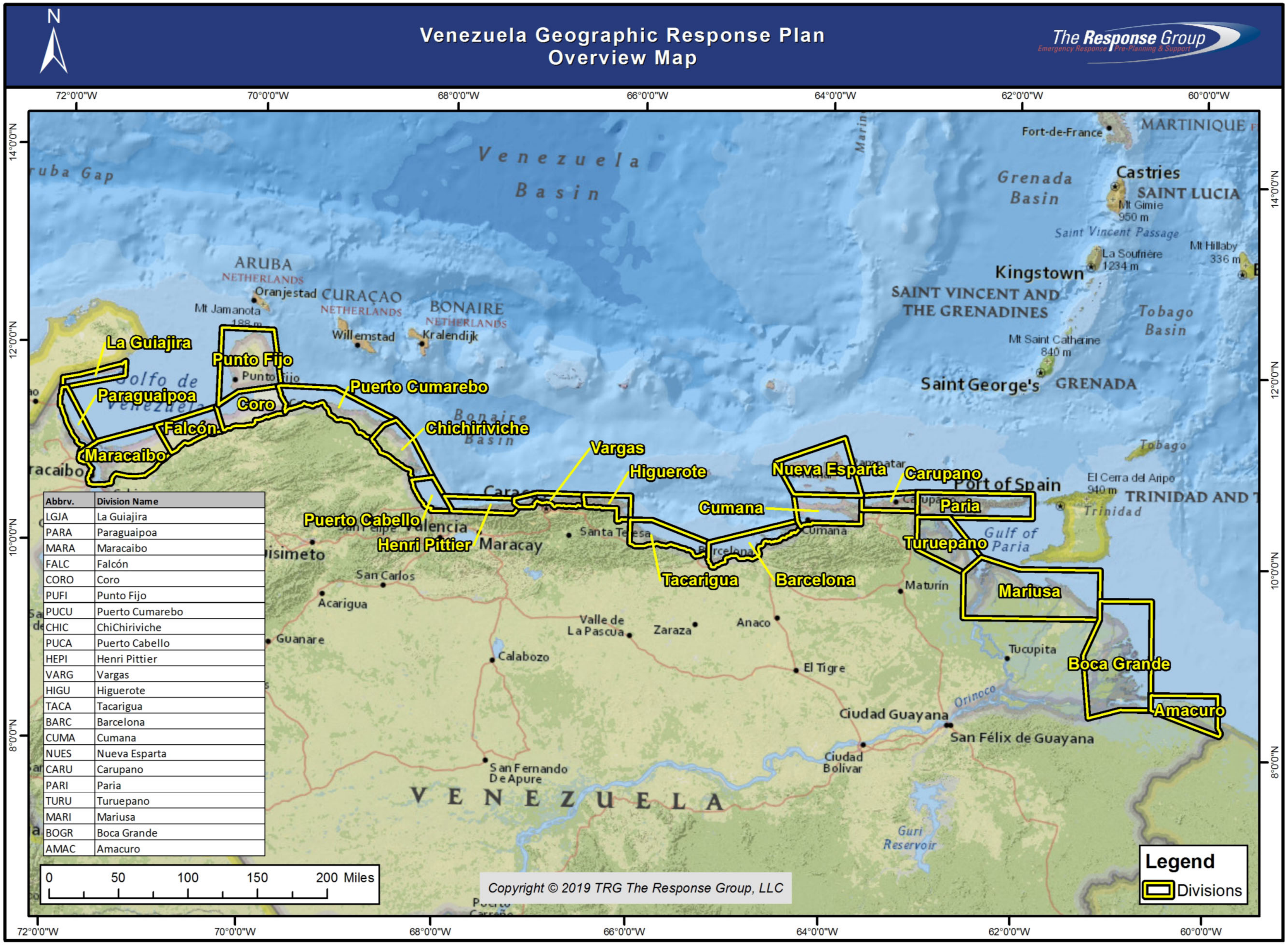
Resources Required

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				

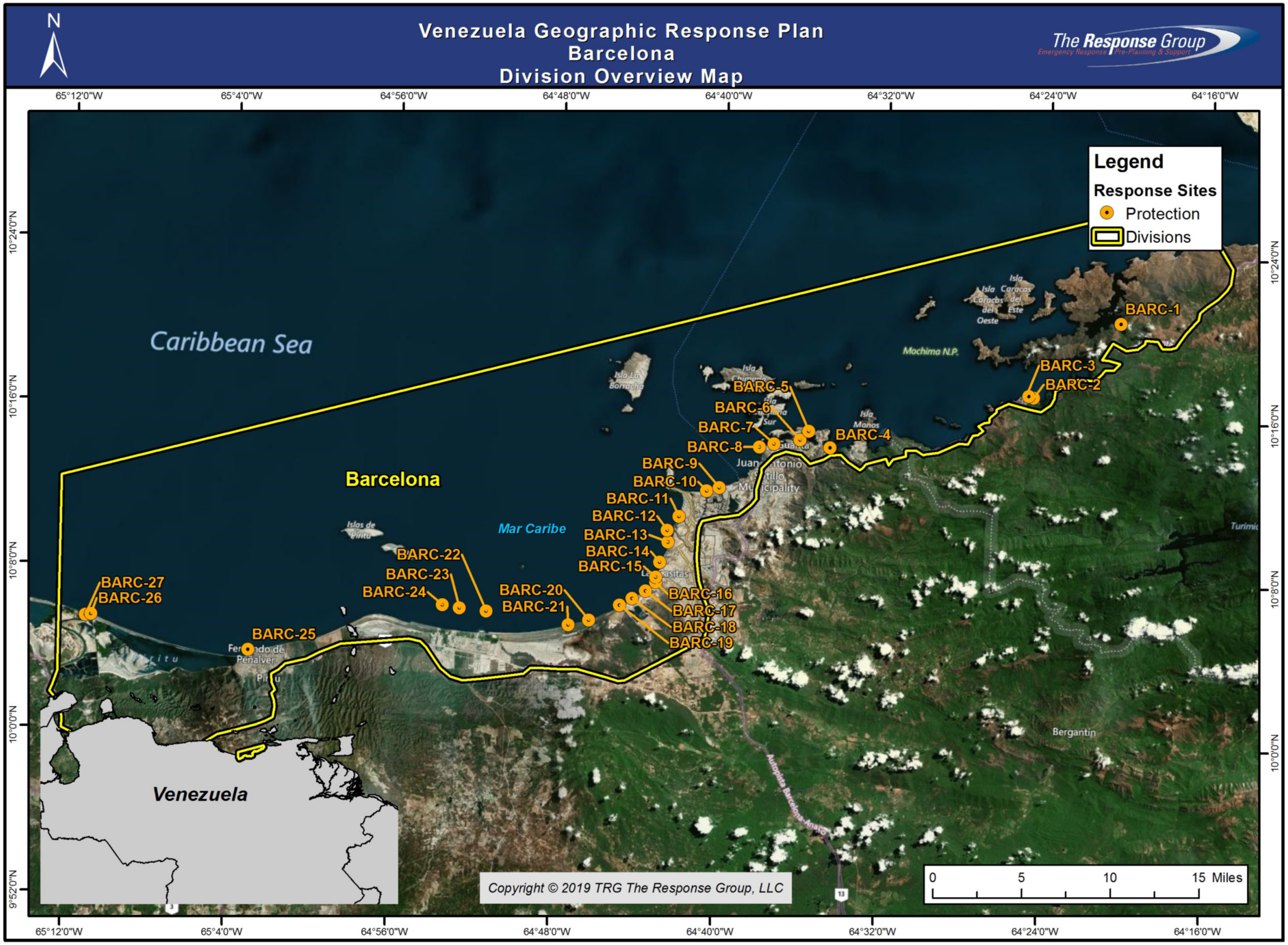
The Response Group

PGPT-4

D.3 Example Venezuela Geographical Response Plan Information


Venezuela Geographic Response Plan
Overview Map
The Response Group
Abbrv. Division Name
LGJA La Guijaira
PARA Paraguaipoa
MARA Maracaibo
FALC Falcón
CORO Coro
PUFI Punto Fijo
PUCU Puerto Cumarebo
CHIC ChiChiriviche
PUCA Puerto Cabello
HEPI Henri Pittier
VARG Vargas
HIGU Higuerote
TACA Tacarigua
BARC Barcelona
CUMA Cumana
NUES Nueva Esparta
CARU Carupano
PARI Paria
TURU Turuepano
MARI Mariusa
BOGR Boca Grande
AMAC Amacuro
La Guiajira
Punto Fijo
Paraguaipoa
Coro
Puerto Cumarebo
Falcón
Maracaibo
Chichiriviche
Vargas
Higuerote
Nueva Esparta
Carupano
Cumana
Paria
Puerto Cabello
Henri Pittier
Turuepano
Tacarigua
Barcelona
Mariusa
Boca Grande
Amacuro
Venezuela Basin
ARUBA
CURAÇAO
BONAIRE
SAINT LUCIA
SAINT VINCENT AND THE GRENADINES
GRENADA
TRINIDAD AND T
V E N E Z U E L A
0 50 100 150 200 Miles
Copyright © 2019 TRG The Response Group, LLC
Legend
Divisions


Venezuela Geographic Response Plan
Barcelona Division: BARC-3
Protection Site - Strategy Map
N
The Response Group
Lat: 10° 17' 12.066" N
Long: 64° 24' 51.305" W
Boom
Resources | Qty | Qty UoM | Size | Size UOM
Hard Boom | 400 | ft | 18" | Inch
Shore Seal Boom | 200 | ft | 22" | Inch
Mar Caribe
BARC-3
200
200
200
Legend
Response Sites
Protection
Boom
Hard Boom
Shore Seal Boom
0 100 200 300 Feet
Copyright © 2019 TRG The Response Group, LLC
bing
64°24'57"W
64°24'54"W
64°24'51"W
64°24'48"W
64°24'45"W
10°17'15"N
10°17'12"N
10°17'9"N


Venezuela Geographic Response Plan
Barcelona
Division Overview Map
N
The Response Group
Legend
Response Sites
Protection
Divisions
Caribbean Sea
Barcelona
Mar Caribe
Venezuela
BARC-1
BARC-2
BARC-3
BARC-4
BARC-5
BARC-6
BARC-7
BARC-8
BARC-9
BARC-10
BARC-11
BARC-12
BARC-13
BARC-14
BARC-15
BARC-16
BARC-17
BARC-18
BARC-19
BARC-20
BARC-21
BARC-22
BARC-23
BARC-24
BARC-25
BARC-26
BARC-27
Mochima N.P.
Bergantin
0 5 10 15 Miles
Copyright © 2019 TRG The Response Group, LLC

GRP Area Maintenance				GRP Area: BARC-3
Resources Required				
Area Of Operation	*Resource Kind*	*Description*	*Quantity*	*Size*
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)

Assignments

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.

Location of Work

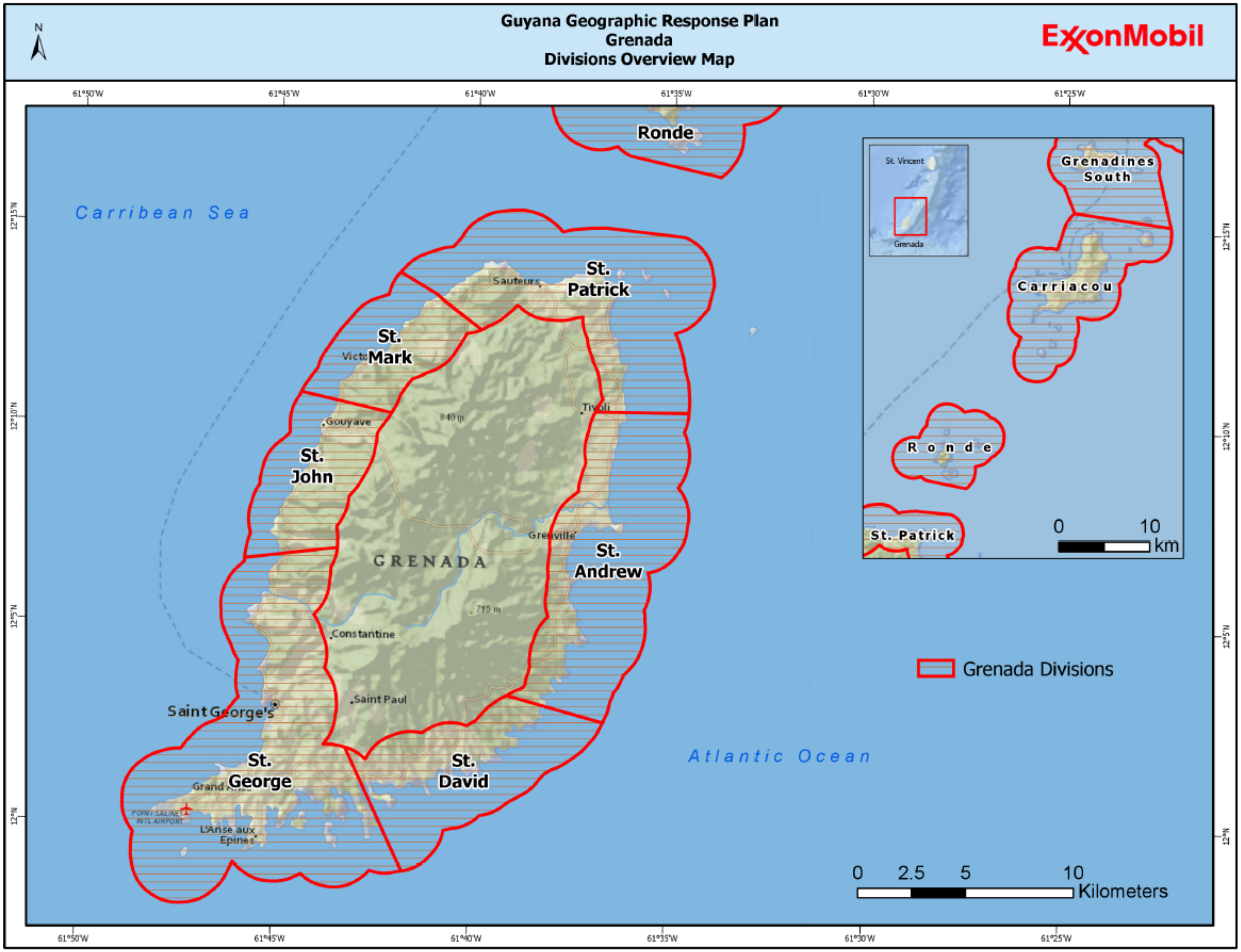
Latitude: 10° 17' 12.066" N
Longitude: 64° 24' 51.305" W

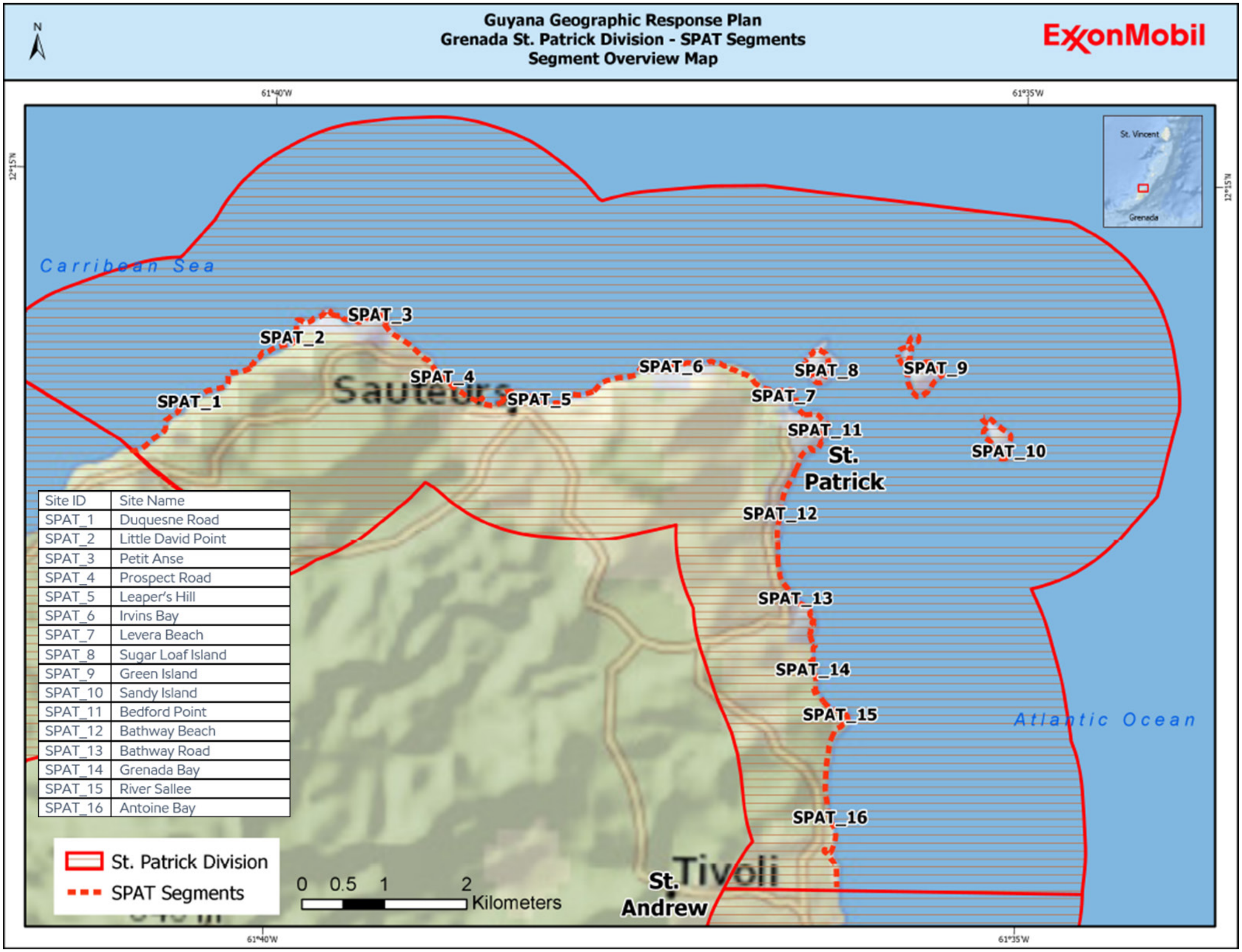
Special Site-Specific Safety Considerations

Wear PFD when working near water. Ensure JSA is completed prior to work initiation.

GRP Area Maintenance			
INCIDENT ACTION PLAN SOFTWARE™	Printed 6/4/2019 20:16	Page 1 of 2	© TRG

D.4 Example Grenada Geographical Strategic Response Maps


Guyana Geographic Response Plan
Grenada
Divisions Overview Map
ExxonMobil
N
Carribean Sea
Atlantic Ocean
Ronde
St. Patrick
St. Mark
St. John
St. Andrew
St. George
St. David
GRENADA
Sauteurs
Gouyave
Tivoli
Grenville
Constantine
Saint Paul
Saint George's
L'Anse aux Epines
840 m
715 m
St. Vincent
Grenada
Grenadines South
Carriacou
R o n d e
St. Patrick
0 10 km
Grenada Divisions
0 2.5 5 10 Kilometers
61°50'W
61°45'W
61°40'W
61°35'W
61°30'W
61°25'W
12°15'N
12°10'N
12°5'N
12°N


Guyana Geographic Response Plan
Grenada St. Patrick Division - SPAT Segments
Segment Overview Map
ExxonMobil
N
61°40'W
61°35'W
12°15'N
St. Vincent
Grenada
Carribean Sea
Atlantic Ocean
SPAT_1
SPAT_2
SPAT_3
SPAT_4
SPAT_5
SPAT_6
SPAT_7
SPAT_8
SPAT_9
SPAT_10
SPAT_11
SPAT_12
SPAT_13
SPAT_14
SPAT_15
SPAT_16
Sauteurs
St. Patrick
St. Andrew
Tivoli
Site ID | Site Name
SPAT_1 | Duquesne Road
SPAT_2 | Little David Point
SPAT_3 | Petit Anse
SPAT_4 | Prospect Road
SPAT_5 | Leaper's Hill
SPAT_6 | Irvins Bay
SPAT_7 | Levera Beach
SPAT_8 | Sugar Loaf Island
SPAT_9 | Green Island
SPAT_10 | Sandy Island
SPAT_11 | Bedford Point
SPAT_12 | Bathway Beach
SPAT_13 | Bathway Road
SPAT_14 | Grenada Bay
SPAT_15 | River Sallee
SPAT_16 | Antoine Bay
St. Patrick Division
SPAT Segments
0 0.5 1 2
Kilometers

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	Response Information	Site Contact Info
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	**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	**Organization:** N/A **Phone:** N/A **Cellular Service:** Yes

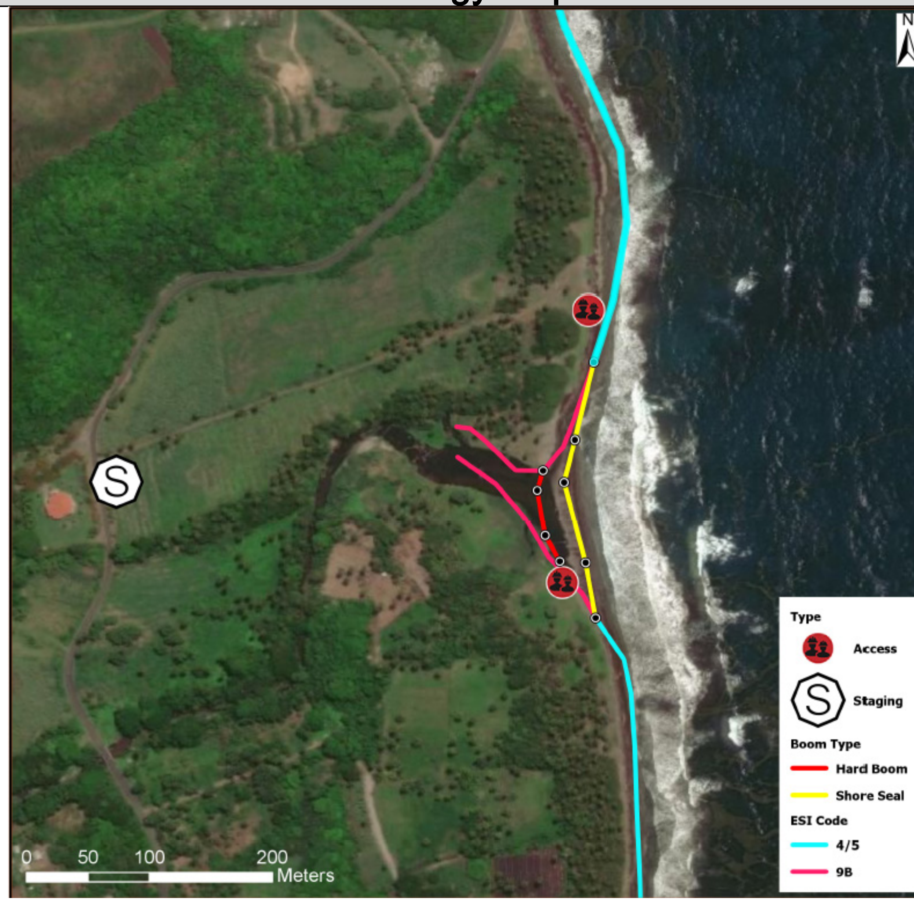
Site Description	Considerations
Access Location Description: This protection site is located south of Bathway Beach at 12.1767, -61.6038 **Hazards:** Slips, trips, falls, water hazards and currents **Obstructions/Limitations:** Debris along shoreline	**Associated Sensitivities:** This segment is located 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

Grenada Geographic Response Plan	St Patrick Division	Protection Site SPAT-16a

Site Pictures

Figure 1 South view on River Antoine, north of protection site SPAT-16a

Strategy Map



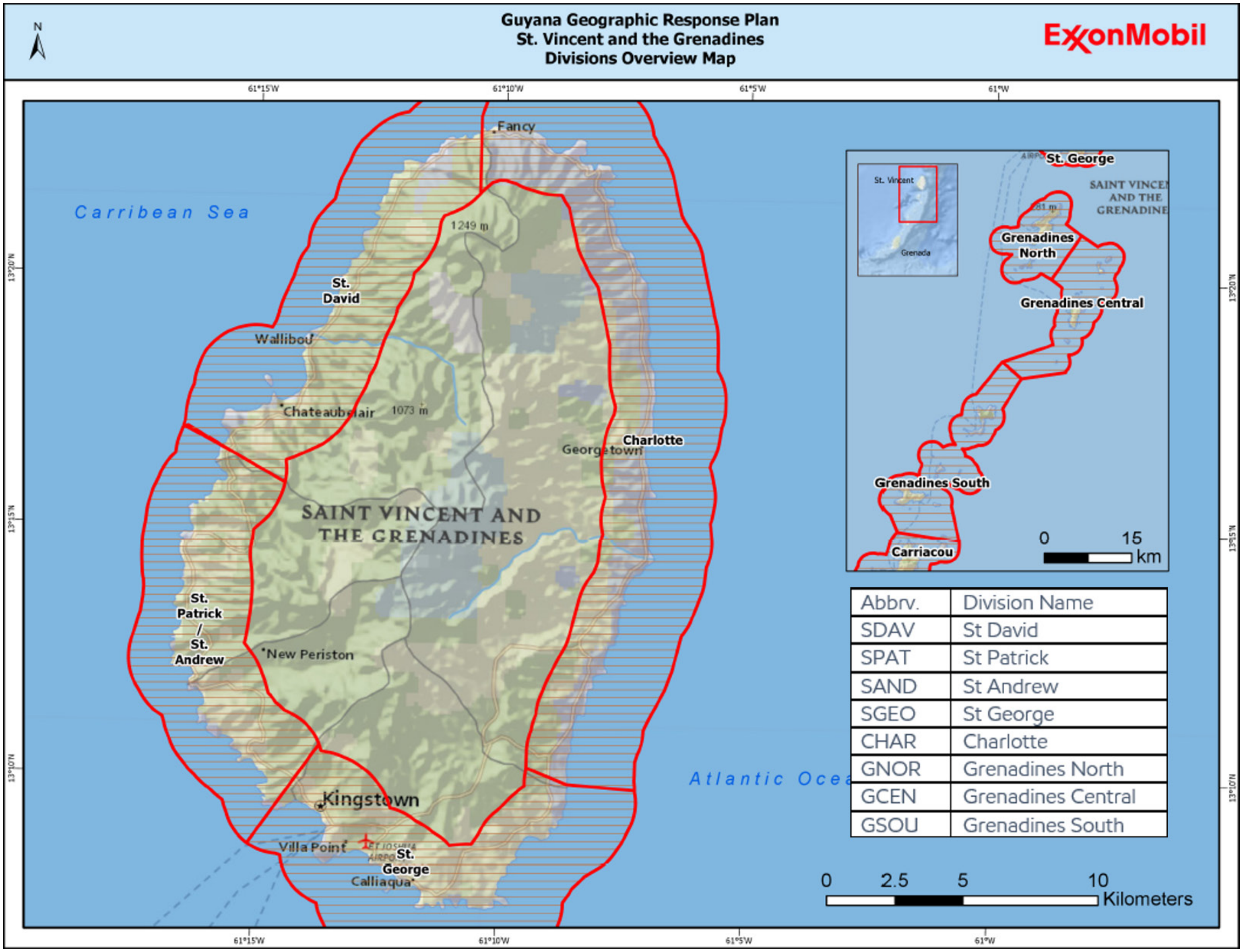
Assignments

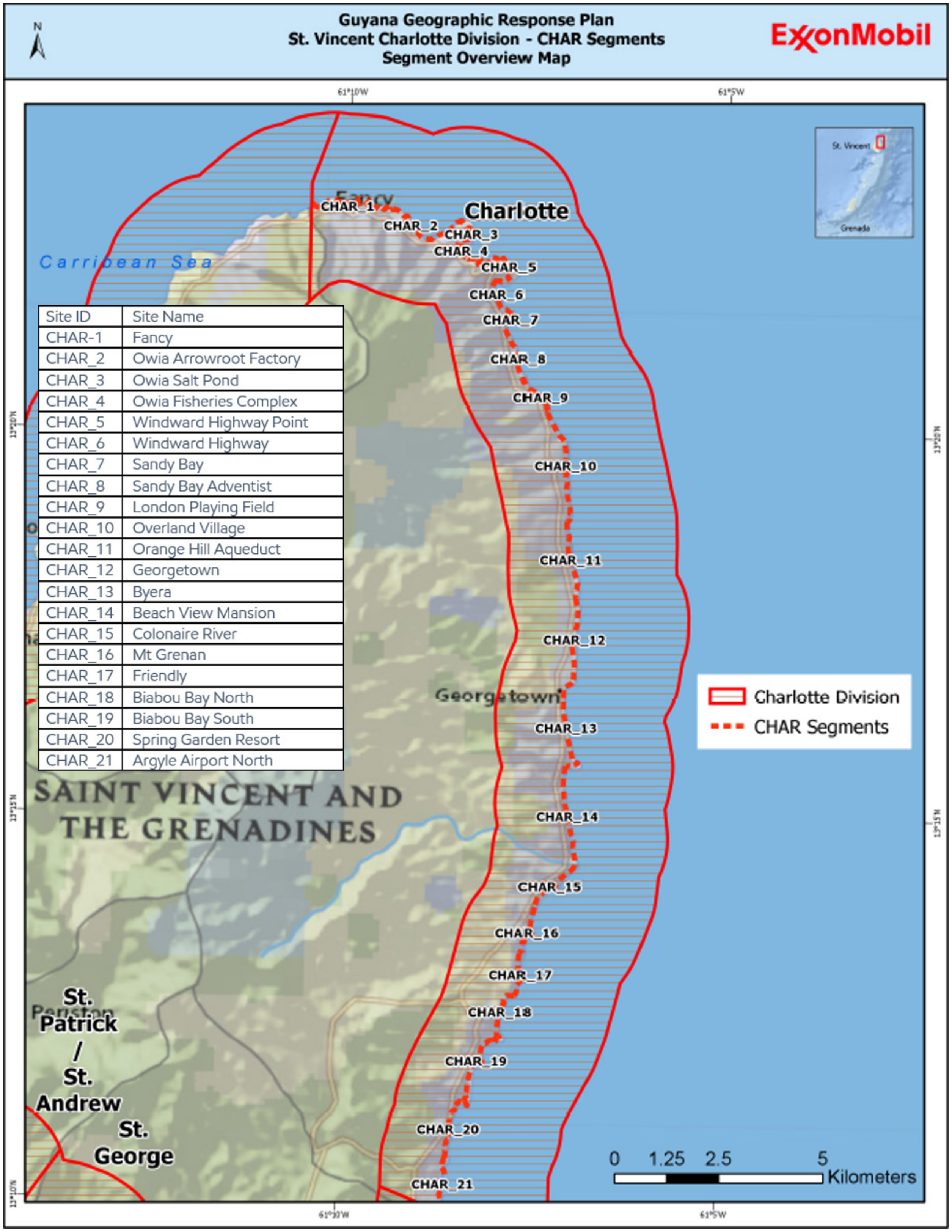
1. Staging area to be established adjacent to Rivers Restaurant at 12.1763, -61.6071
2. Deploy 100 meter section of hard boom at mouth of water way at location 12.1767, -61.6038 to prevent oil from reaching inland
3. Deploy 250 meter section of shore seal boom along beach to protect waterway at location 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				

D.5 Example St. Vincent and the Grenadines Geographical Strategic Response Maps


Guyana Geographic Response Plan
St. Vincent and the Grenadines
Divisions Overview Map
ExxonMobil
N
Carribean Sea
Atlantic Ocea
SAINT VINCENT AND THE GRENADINES
Fancy
1249 m
St. David
Wallibou
Chateaubelair
1073 m
Charlotte
Georgetown
St. Patrick / St. Andrew
New Periston
Kingstown
Villa Point
St. George
Calliaqua
St. Vincent
Grenada
St. George
SAINT VINCENT AND THE GRENADINES
Grenadines North
Grenadines Central
Grenadines South
Carriacou
0 15 km
0 2.5 5 10 Kilometers
Abbrv. | Division Name
SDAV | St David
SPAT | St Patrick
SAND | St Andrew
SGEO | St George
CHAR | Charlotte
GNOR | Grenadines North
GCEN | Grenadines Central
GSOU | Grenadines South



Site ID	Site Name
CHAR-1	Fancy
CHAR_2	Owia Arrowroot Factory
CHAR_3	Owia Salt Pond
CHAR_4	Owia Fisheries Complex
CHAR_5	Windward Highway Point
CHAR_6	Windward Highway
CHAR_7	Sandy Bay
CHAR_8	Sandy Bay Adventist
CHAR_9	London Playing Field
CHAR_10	Overland Village
CHAR_11	Orange Hill Aqueduct
CHAR_12	Georgetown
CHAR_13	Byera
CHAR_14	Beach View Mansion
CHAR_15	Colonaire River
CHAR_16	Mt Grenan
CHAR_17	Friendly
CHAR_18	Biabou Bay North
CHAR_19	Biabou Bay South
CHAR_20	Spring Garden Resort
CHAR_21	Argyle Airport North

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

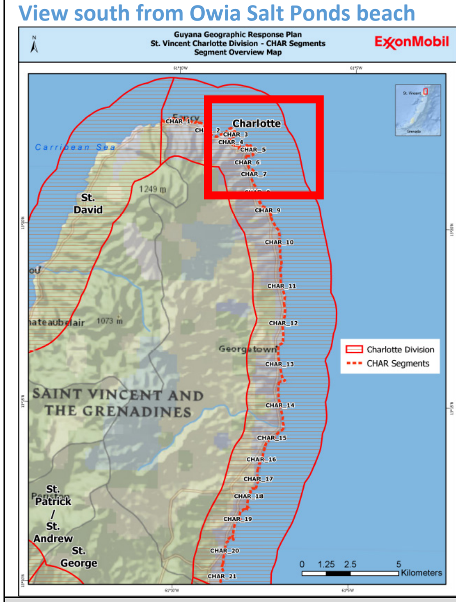
Waterway Information	Response Information	Site Contact Info
Type: Open access ocean w/tidal inlets **Waterway name:** Caribbean Sea **Avg Speed:** Tidal **Waterway Width:** N/A **Tidally Influenced:** Yes **Shoreline Type:** Exposed Rocky Cliffs 1C **Bank Slope:** Medium **Bank Height:** 3 meters	**Deployment 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)	**Organization:** OWIA Salt Pond Recreational Site **Phone:**+1 (784) 530-7890 **Cellular Service:** Yes

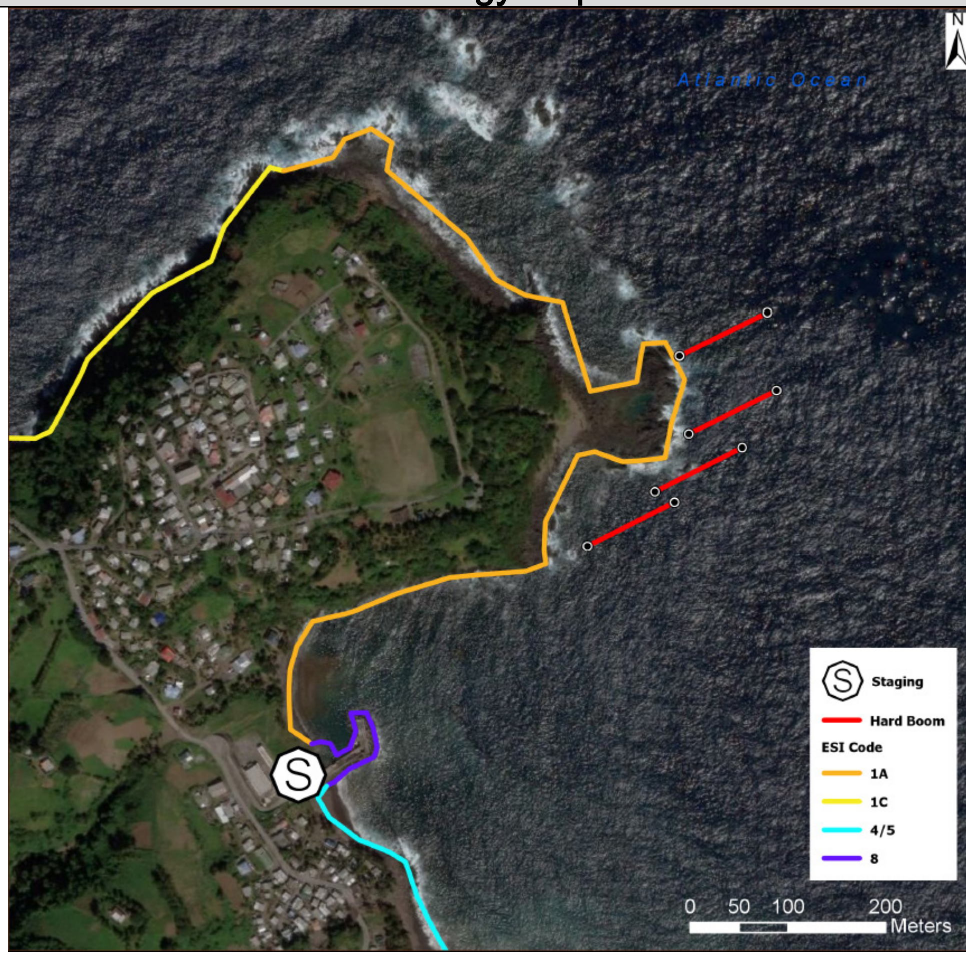
Site Description	Considerations
Access Location Description: This protection site is located adjacent to the Owia Salt Pond at 13.3756, -61.1394 **Hazards:** Slips, trips, falls, water hazards and currents **Obstructions/Limitations:** High energy wave action along coastline. Restricted access to Coastline at Owia Salt Pond	**Associated Sensitivities:** Owia Salt Pond Recreational Site **Strategy Considerations:** Deflection boom to be installed offshore to protect the Owia Salt Pond

St Vincent t & Grenadines Geographic Response Plan	Charlotte Division	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				

APPENDIX E WILDLIFE RESPONSE PLAN

Prepared for

Esso Exploration and Production Guyana Limited (EEPGL)

ExxonMobil Biomedical Sciences, Inc.

Updated July 2019

E.1 Introduction

E.1.1 Objective

Prevention of oil spills remains the top priority for EEPGL. In the unlikely event of a spill, it is important to be prepared to minimize the duration and impact of any release. For a subsea well release, capping and containment measures are available to serve this purpose. Beyond those 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. A critical aspect of protecting wildlife once oil is released is to minimize the formation of floating slicks and when formed to prevent such slicks from coming ashore driven by wind/currents. As this is not always possible, more detailed wildlife response planning is necessary.

This Wildlife Response Plan is supplemental to the EEPGL Oil Spill Response Plan (OSRP) and is intended to serve as general guidance for wildlife deterrence (hazing), capture, and rehabilitation during an oil spill response. The principal objectives of Wildlife Operations during a spill 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 immediately contact and request 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 E2. Initial wildlife response guidance is provided in Attachment E-7: of this plan.

E.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 size of the spill, chemistry of the petroleum product spilled, meteorological and oceanographic conditions, time of year, and the location of the spill. Species feeding in intertidal and near-shore areas are often vulnerable to oiling. 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.

E.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 E-1, E-2, E-3, and E-4 of this plan describe some of the habitats, birds, and marine reptile and mammal species that are at risk of oiling from EEPGL operations. In these appendices, information is provided for key sensitive periods (nesting, molting, migration, breeding, rearing).

E.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.

E.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 oil spills from EEPGL operations can be provided on a regional and/or international basis as needed. See Section 2.2 of the Oil Spill Response Plan for a description of the geographic extent of an EEPGL response.

E.2 Incident Command System and Tiered Response

This section provides a general overview of the Incident Command Structure (ICS) and a tiered approach used for oil spill response, with emphasis on wildlife response activities. The ICS designed to provide a framework for a consistent, efficient, and effective means to train, activate, and implement EEPGL's response resources. The ICS also facilitates interaction with Contractors, Subcontractors, Guyana government agencies, and non-government organizations that could become involved during a spill response. Table E1 shows the sections and key activities of the ICS.

Table E1: Key ICS Sections and Activities

ICS Function	Activities
Command Staff	Overall Oil Spill Response Management Management Liaison Government Liaison Community Liaison Media/Public Affairs Liaison Legal Support Safety and Health Oversight
Operations Section	Oil Spill Source Control Site Safety and Security Surveillance Dispersant Application *In-Situ* Burning Offshore/Near-shore Containment and Recovery On Land Containment and Recovery Shoreline, River, and Resource Protection Pre-Impact Debris Removal Shoreline Treatment and Cleanup Bioremediation Waste Management Wildlife Deterrence, Capture, and Rehabilitation
Planning Section	Site Characterization and Analysis Documentation Spill Tracking and Surveillance Sensitive Areas Identification and Characterization Environmental Monitoring Incident Action Plan Coordination Oil Spill Sampling Oil Spill Response Technical Support Dispersant / *In-Situ* Burning Support Waste Management Support Demobilization
Finance and Logistics Sections	Transportation (Air, Water, Land) Housing Catering Telecommunications Customs Clearance Security Field Operations Support Personnel Resourcing Material Distribution

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. See Attachment E-7: for initial response activities of the Wildlife Branch.

The tiered response system provides preparedness for the full range of scenarios that may be imaginable, from an incident of lesser wildlife significance (a few animals threatened or affected) to a more significant incident (e.g., thousands of animals, a mix of species groups, large stretches of complicated shorelines).

In a tiered response, assets are mobilized locally or from further afield according to the size and complexity of the incident and the availability of appropriate resources. In a Tier I response, assets are mobilized within hours of notification of the incident; and can be sourced from pre-identified stocks located at the Project shorebase(s) to deal with an incident in its early stage of development. If a more complicated scenario begins to unfold (Tier II or III), EEPGL would activate additional resources such as the ExxonMobil RRT and/or OSRL to mitigate the impacts of the spill.

E.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 E2.

This Wildlife Plan 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 and can be operational in approximately 4-5 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;
  - 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 Soccoro Center for Wildlife Conservation (Trinidad);
  - Pointe-a-Pierre Wildfowl Trust (Trinidad);
  - Tobago Society for Prevention of Cruelty to Animals (Tobago).

Table E2: 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
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 that will be 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 that each person receives will depend on the task that 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 that have received additional training may perform tasks such as administering fluids to dehydrated animals, take blood samples from animals, and wash oiled animals.

E.4 Training and Health and Safety

Worker health and safety are a priority during oiled wildlife response operations. The following is a summary list of safety precautions that need to be considered in the development of the Wildlife Health 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 that 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;
- 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.

E.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 cleaning of wildlife after receiving the required training, orientations, and deployment of Personal Protective Equipment (PPE).

E.4.2 Personal Protective Equipment

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 also 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.

E.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.

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 that 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.

E.4.4 Zoonosis

Wildlife may carry diseases that are transmissible to people. Diseases that are 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 that has been 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.

E.5 Wildlife Deterrence (Hazing)

E.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 E1. 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.

No attempt should be made to haze oiled wildlife. Depending on the extent of oiling, wildlife that is 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.

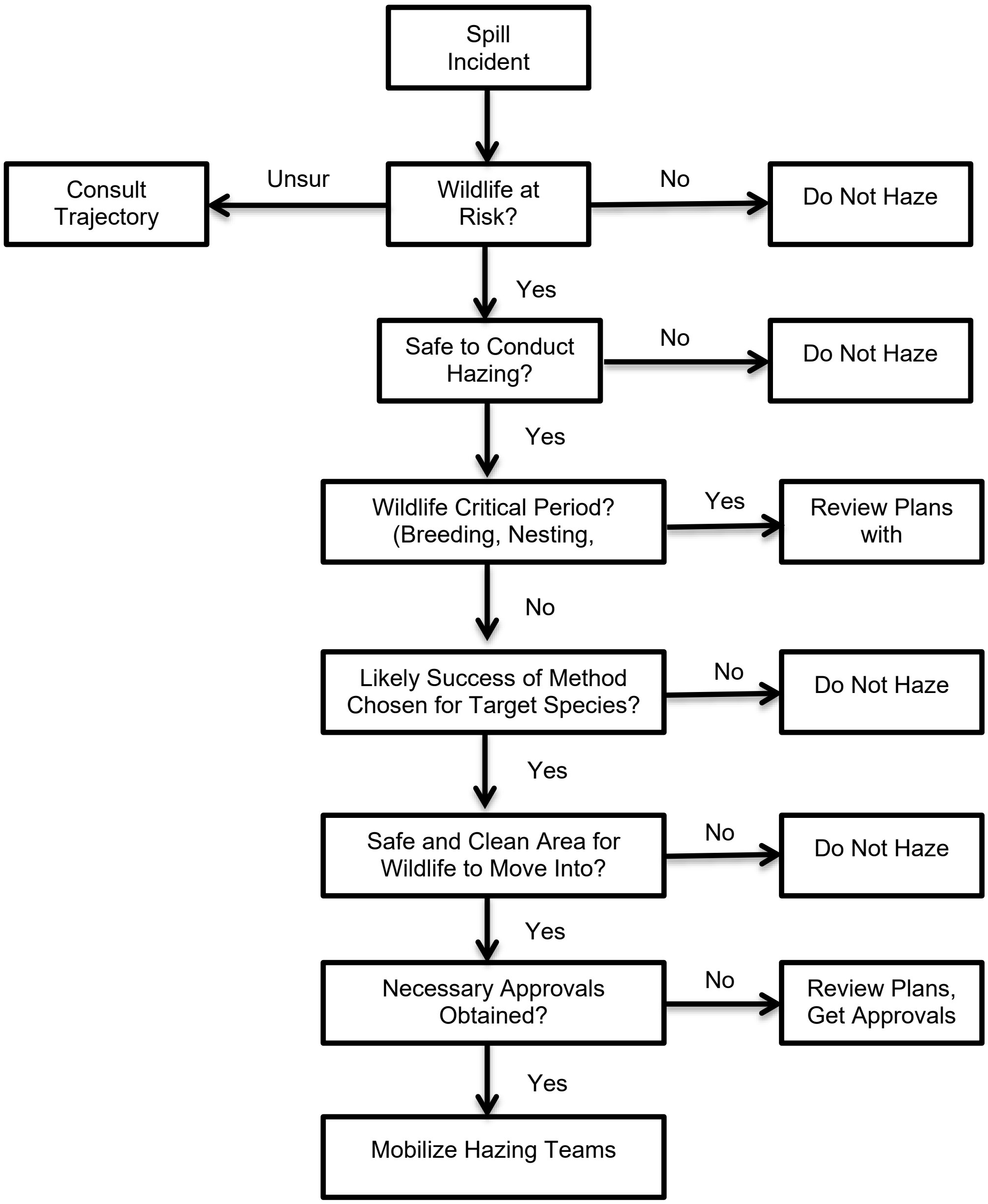


Figure E1: Hazing Decision Tree

E.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 situations. The effects of sound emitting devices on humans, in terms or irritation and noise, especially at night, will influence whether or not some hazing methods will be acceptable.

E.5.2.1 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.

E.5.2.2 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.

E.5.2.3 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.

E.5.2.4 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.

E.5.2.5 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).

E.5.2.6 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.

E.5.2.7 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.

E.5.2.8 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.

E.5.2.9 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.

E.5.2.10 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.

E.6 Capture and Transport of Oiled Wildlife

E.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 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, that are 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.

E.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 also 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 also 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.

E.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 vapors. Temperature should be maintained at an adequate level to prevent hypothermia or overheating.

E.7 Stabilization, Rehabilitation, and Husbandry

E.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.

E.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.

E.7.3 Rehabilitation

A suitable facility must have a large open space that can easily be reconfigured 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).

Each wildlife rehabilitation facility must have a Site Safety Plan in place prior to start-up. The Site Safety Plan must include checklists for measures to avoid physical, chemical, and biological hazards, safe animal handling procedures, and other emergency procedures and contact numbers.

E.7.3.1 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).

E.7.3.2 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).

E.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);
- 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.

E.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:

E.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.

Attachment E-1: Habitats

Additional information on habitats in Guyana is included in the Liza Phase 1, Liza Phase 2, and Payara Development Project 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.

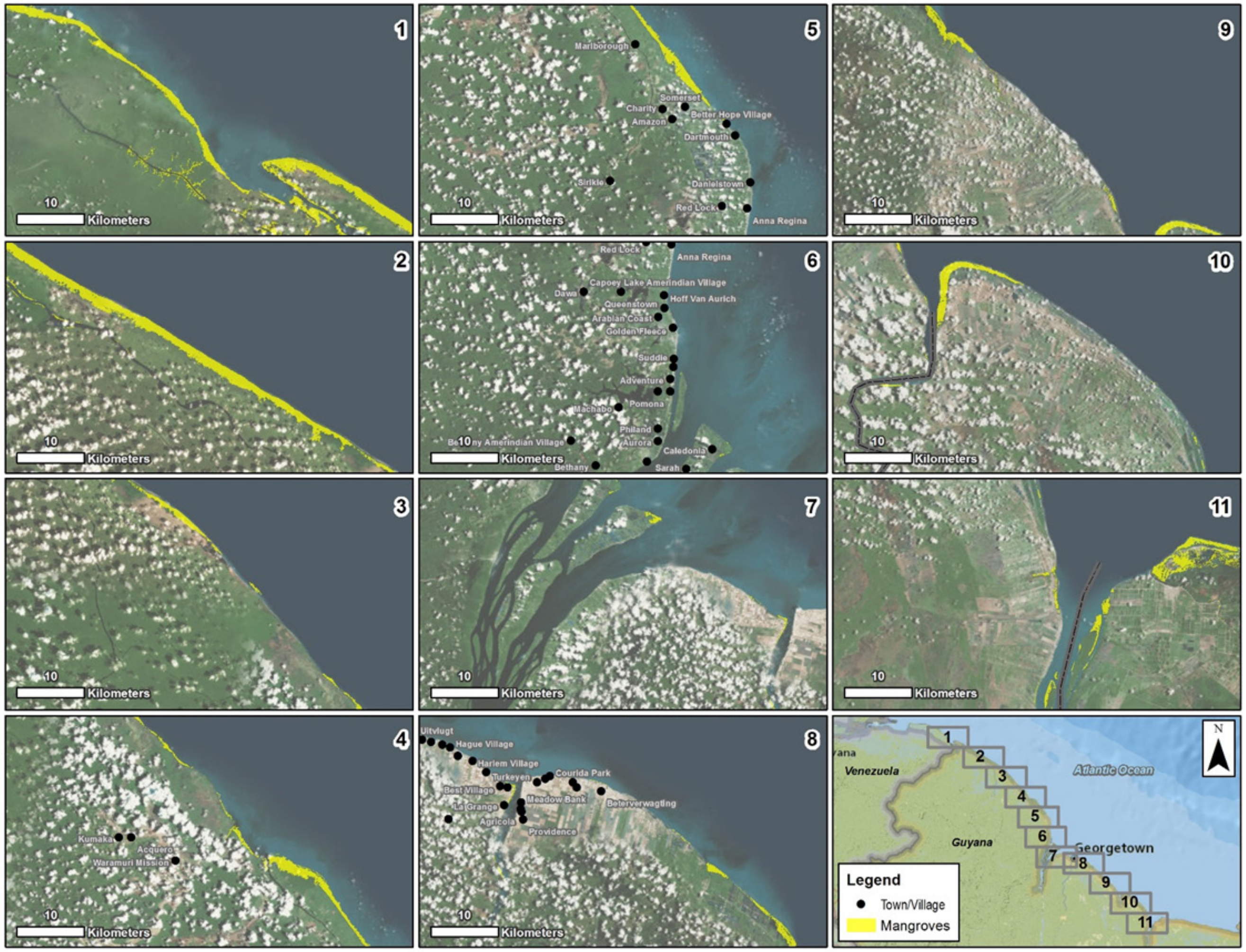


Figure E-1-1: Guyana's Coastal Mangrove Distribution

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 E-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 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).

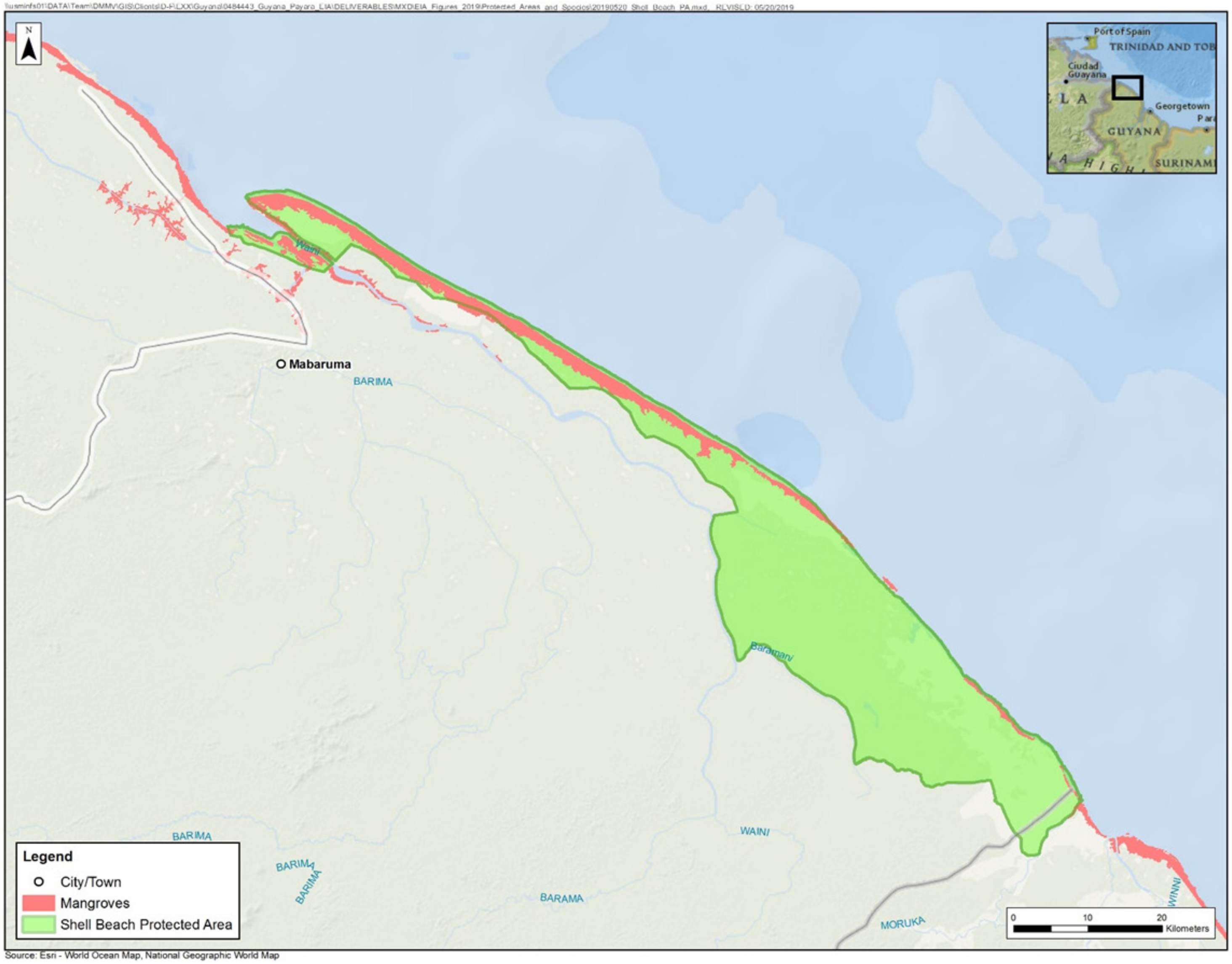


Figure E-1-2: Shell Beach Protected Area

Attachment E-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 that are 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 E-2-1).

Table E-2-1: Seabird Species Known to Occur in Guyana

Common Name	Scientific Name
Great Shearwater [a, b]	*Ardenna gravis*
Cory's Shearwater [a]	*Calonectris borealis*
Barolo Shearwater [c]	*Puffinus baroli*
Audubon's Shearwater [a, b]	*Puffinus lherminieri*
Wilson's Storm-Petrel [a, b]	*Oceanites oceanicus*
Leach's Storm-Petrel [a, b]	*Oceanodrama leucorhoa*
Brown Pelican [a, b]	*Pelecanus occidentalis*
Brown Booby [a, b, c]	*Sula leucogaster*
Masked Booby [c]	*Sula dactylatra*
Red-footed Booby [c]	*Sula sula*
Magnificent Frigatebird [a, b, c]	*Fregata magnificens*
White-tailed Tropicbird [c]	*Phaethon lepturus*
Parasitic Jaeger [b, c, d]	*Stercorarius parasiticus*
Pomarine Jaeger [a, b, c]	*Stercorarius pomarinus*
Great Skua [a, b]	*Stercorarius skua*
Lesser Black-backed Gull [c, d]	*Larus fuscus*
Laughing Gull [a, b, c]	*Leucophaeus atricilla*
Brown Noddy [a, c]	*Anous stolidus*
Black Tern [b, c, d]	*Chlidonias niger*
Gull-billed Tern [a, c]	*Gelochelidon nilotica*
Bridled Tern [c]	*Onychoprion anaethetus*
Sooty Tern [a]	*Onychoprion fuscatus*

Common Name	Scientific Name
Black Skimmer [a, c]	*Rynchops niger*
Roseate Tern [a, c]	*Sterna dougalli*
Common Tern [a, b, c]	*Sterna hirundo*
Royal Tern [a, b, c]	*Thalasseus maximus*
Arctic Tern [c]	*Sterna paradisaea*
Sandwich Tern [c, d]	*Thalasseus sandvicensis*
Bridled Tern[e]	*Onychoprion anaethetus*
Manx Shearwater[e]	*Puffinus puffinus*
Red-billed Tropicbird[e]	*Phaethon aethereus*
Bulwer's Petrel[e]	*Bulweria bulwerii*
Band-rumped Storm Petrel[e]	*Oceanodroma castro*
Long-tailed Jaeger[e]	*Stercorarius longicaudus*
Great Black-backed Gull[e]	*Larus marinus*

[a] Braun et al. 2007
[b] BirdLife International 2019a
[c] eBird 2019a
[d] Sight record only (Braun et al. 2007)
[e] 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.

EEPGL 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, based on the results of the EEPGL-commissioned coastal bird surveys conducted from 2017 through 2019 as well as other available data from historical or ongoing surveys, and local bird specialists' knowledge (Figure E-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.

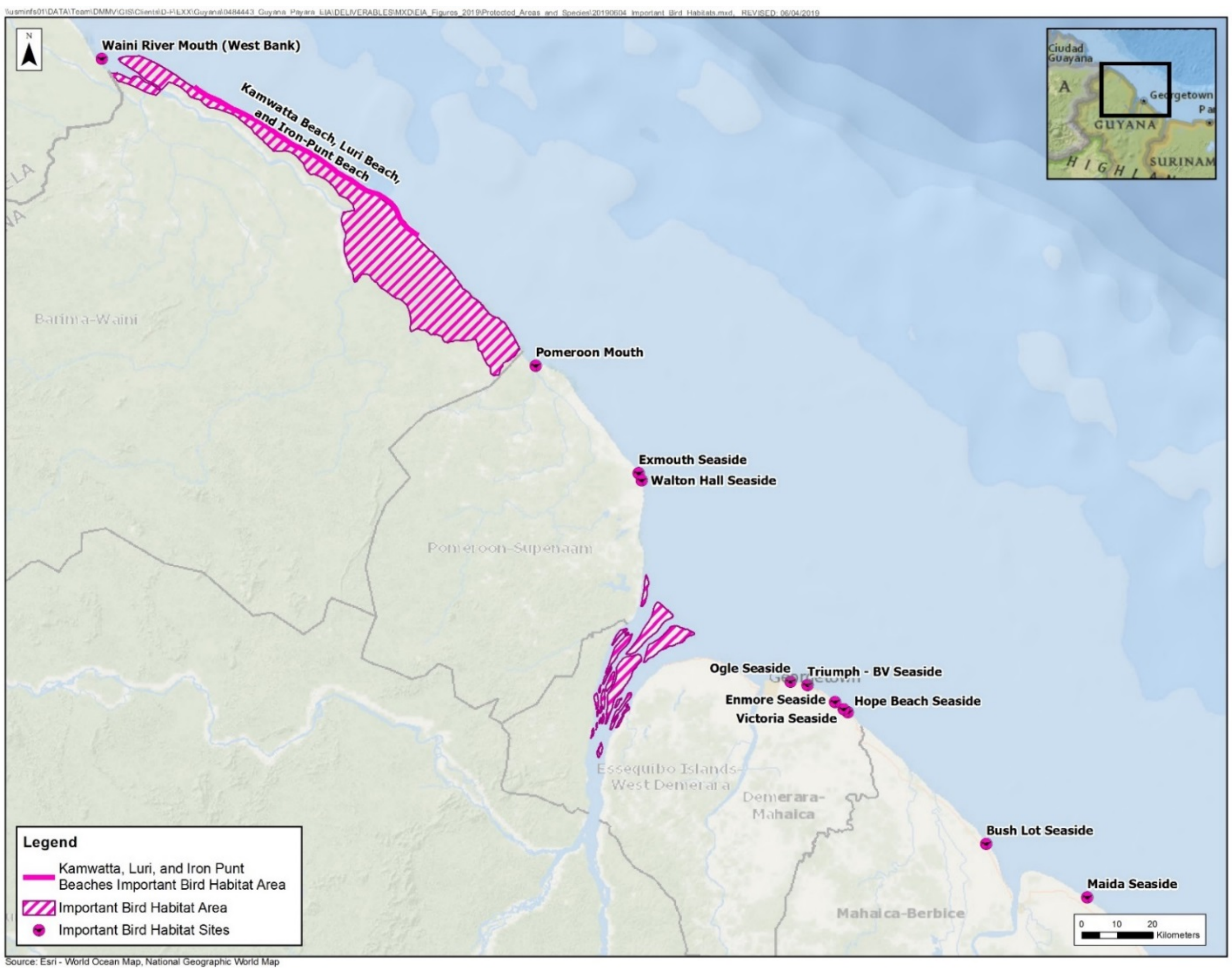


Figure E-2-1: Locations of Important Bird Habitats - Regions 1 -6

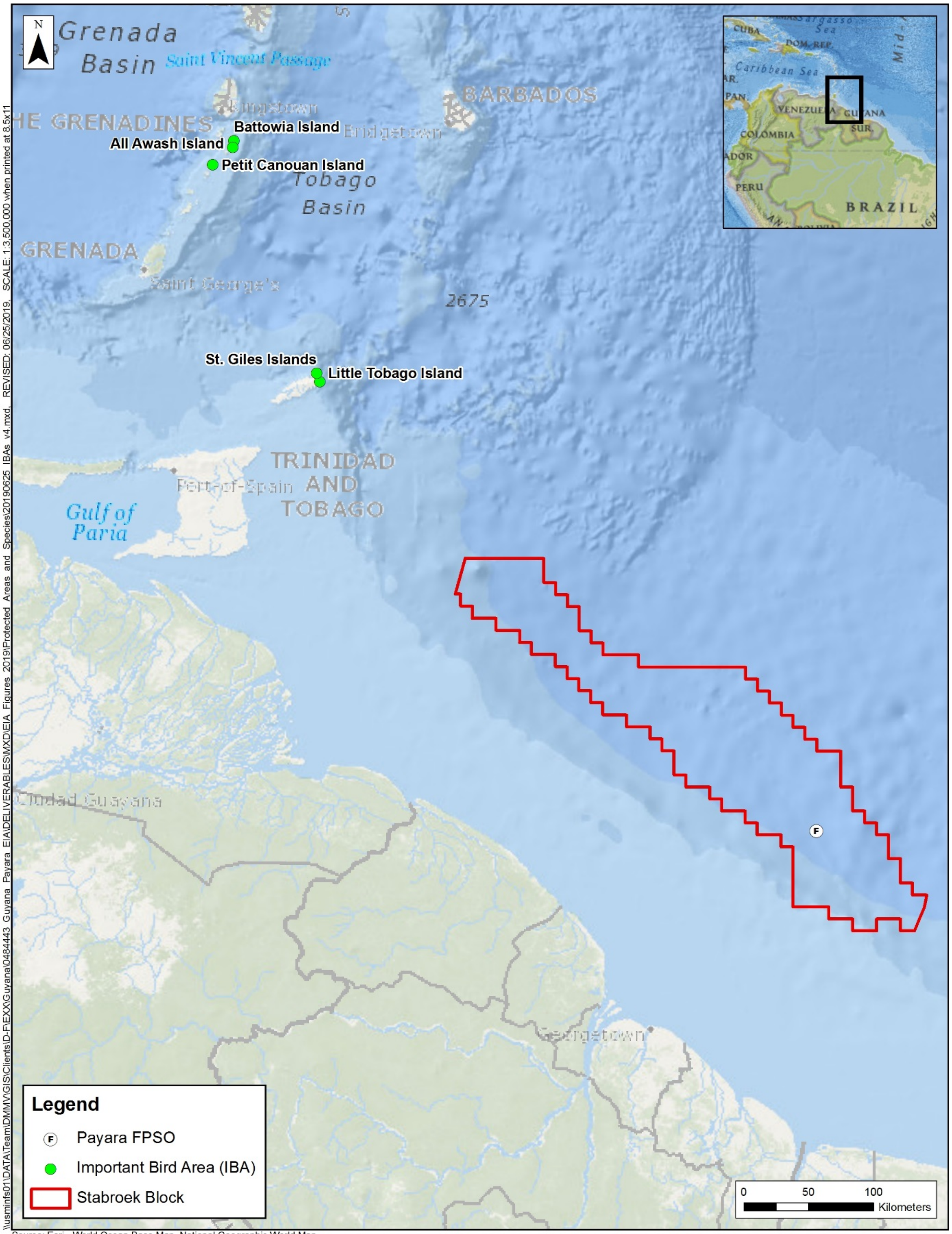
Important Bird Areas—Offshore Sites (outside of the Stabroek Area of Operation)

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 E-2-2 summarizes information on the five IBAs and Figure E-2-2 depicts the location of these IBAs relative to the Stabroek Block.

Table E-2-2: Marine IBAs with Importance to Seabirds that Transit the Stabroek Block

Important Bird Area Name	Country	IBA Attributes [a]
Little Tobago Island	Trinidad and Tobago	This IBA supports globally important breeding populations of Red-billed Tropicbird (*Phaethon aethereus*) and Laughing Gull (*Leucophaeus atricilla*), and regionally important breeding populations of Audubon's Shearwater (*Puffinus lherminieri*), Brown Booby (*Sula leucogaster*), Red-footed Booby (*Sula sula*), and Bridled Tern (*Onychoprion anaethetus*). 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 (*Fregata magnificens*), Masked Booby (*Sula dactylatra*), and Red-footed Booby. Other seabird species including Brown Booby and Brown Noddy (*Anous stolidus*) 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 (*Sterna dougalli*) (~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 (*Onychoprion fuscatus*), Brown Booby, Laughing Gull, Magnificent Frigatebird, Roseate Tern, Royal Tern (*Sterna maxima*), and Brown Noddy.

[a] Sources: BirdLife International 2019a, 2019b



Source: Esri - World Ocean Base Map, National Geographic World Map

Figure E-2-2: IBAs with Importance to Seabirds Relative to Stabroek Block

Attachment E-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 E-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 truncates)*, 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 an individual 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.

Table E-3-1: Marine Mammals with Ranges that include Guyana's Coastal and Offshore Marine Territorial Waters

Common Name	Scientific Name
Sei whale	*Balaenoptera borealis* (EN)
Bryde's whale *	*Balaenoptera brydei*
Blue whale	*Balaenoptera musculus* (EN)
Fin whale	*Balaenoptera physalu* (EN)
Short beaked common dolphin *	*Delphinus delphis* (LC)
Long-beaked common dolphin *	*Delphinus capensis*
Minke whale	*Balaenoptera acutorostrata* (LC)
North Atlantic right whale	*Eubalaena glacialis* (EN)
Pygmy killer whale *	*Feresa attenuate*
Short-finned pilot whale *	*Globicephala macrorhynchus*
Rissos dolphin *	*Grampus griseus* (LC)
Boto	*Inia geoffrensis*
Pygmy sperm whale	*Kogia breviceps*
Dwarf sperm whale	*Kogia simus*
Frasers dolphin *	*Lagenodelphis hosei* (LC)
Humpback whale	*Megaptera novaeangliae* (LC)
Blainvilles beaked whale	*Mesoplodon densirostris*
Gervais beaked whale	*Mesoplodon europaeus*
Trues beaked whale	*Mesoplodon mirus*
Melon-headed whale *	*Peponocephala electra* (LC)
Sperm whale *	*Physeter macrocephalus* (VU)
False killer whale	*Pseudorca crassidens*
Tucuxi	*Sotalia fluviatilis*
Pantropical spotted dolphin *	*Stenella attenuate* (LC)
Clymene dolphin *	*Stenella clymene*
Striped dolphin	*Stenella coeruleoalba* (LC)
Rough-toothed dolphin *	*Steno bredanensis* (LC)
Spinner dolphin *	*Stenella longirostris*
Atlantic spotted dolphin *	*Stenella frontalis*
West Indian manatee	*Trichechus manatus*
Common bottlenose dolphin *	*Tursiops truncatus*

EN = Endangered; LC = Least Concerned; VU = Vulnerable
Note: species marked with an asterisk (*) were confirmed sighted during EEPGL activities 2015-2019.

Attachment E-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 E-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 E-4-1: Marine Reptiles with Ranges that include Waters Offshore Guyana

Common Name	Scientific Name	Primary Nesting Location in Guyana
Green turtle	*Chelonia mydas*	Shell Beach
Leatherback turtle	*Dermochelys coriacea*	Shell Beach
Hawksbill turtle	*Eretmochelys imbricata*	Almond Beach
Olive Ridley turtle	*Lepidochelys olivacea*	Shell Beach
Loggerhead turtle	*Caretta caretta*	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 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.

Attachment E-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 E-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 E-5-1: Fish Species Observed in the Stabroek Block and between the Stabroek Block and the Guyana Shore during EEPGL -Commissioned PSO Activities Since 2015

Common Name	*Scientific Name*	IUCN Status [a]
Atlantic bonito	*Sarda sarda*	LC
Atlantic flying fish	*Chellopogon melanurus*	LC
Atlantic tripletail	*Lobotes surinamensis*	LC
bar jack	*Caranx ruber*	LC
blackfin tuna	*Thunnus atlanticus*	LC
blackwing flying fish	*Hirundichthys rondeletii*	LC
blue marlin	*Makaira nigricans*	VU
clearwing flying fish	*Cypselurus comatus*	LC
Eelpout	*Lycodonus sp.*	—
four-wing flying fish	*Hirundichthys affinis*	LC
jack crevalle	*Caranx hippos*	LC
king mackerel	*Scomberomorus cavalla*	LC
largehead hairtail	*Trichiurus lepturus*	LC
little tunny	*Euthynnus alletteratus*	LC
dolphinfish/mahi-mahi	*Coryphaena hippurus*	LC
manta ray	*Mobula sp.*	—
margined flying fish	*Cheilopogon cyanopterus*	LC
ocean sunfish	*Mola mola*	VU
planehead filefish	*Stephanolepis hispidus*	LC
Porcupinefish	*Diodon hystrix*	LC
rainbow runner	*Elagatis bipinnulata*	LC
sailfish	*Istiophrous albicans*	LC
skipjack tuna	*Katsuwonus pelamis*	LC
smalleye smoothhound	*Mustelus higmani*	LC
southern red snapper	*Lutjanus purpureus*	—
swordfish	*Xiphiaa gladius*	LC
unidentified grenadiers	*Macrouridae*	—
unidentified skates and rays	*Rajiformes*	—
tiger shark	*Galeocerdo cuvier*	NT
tripodfish	*Bathypterois sp.*	DD-LC
yellowfin tuna	*Thunnus albacares*	NT

DD-LC = Data Deficient-Least Concern; LC = Lease Concern; NT = Near Threatened; VU = Vulnerable
[a] 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 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.

Attachment E-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 E-6-1 summarizes the characteristics of these fisheries.

Table E-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 E-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.

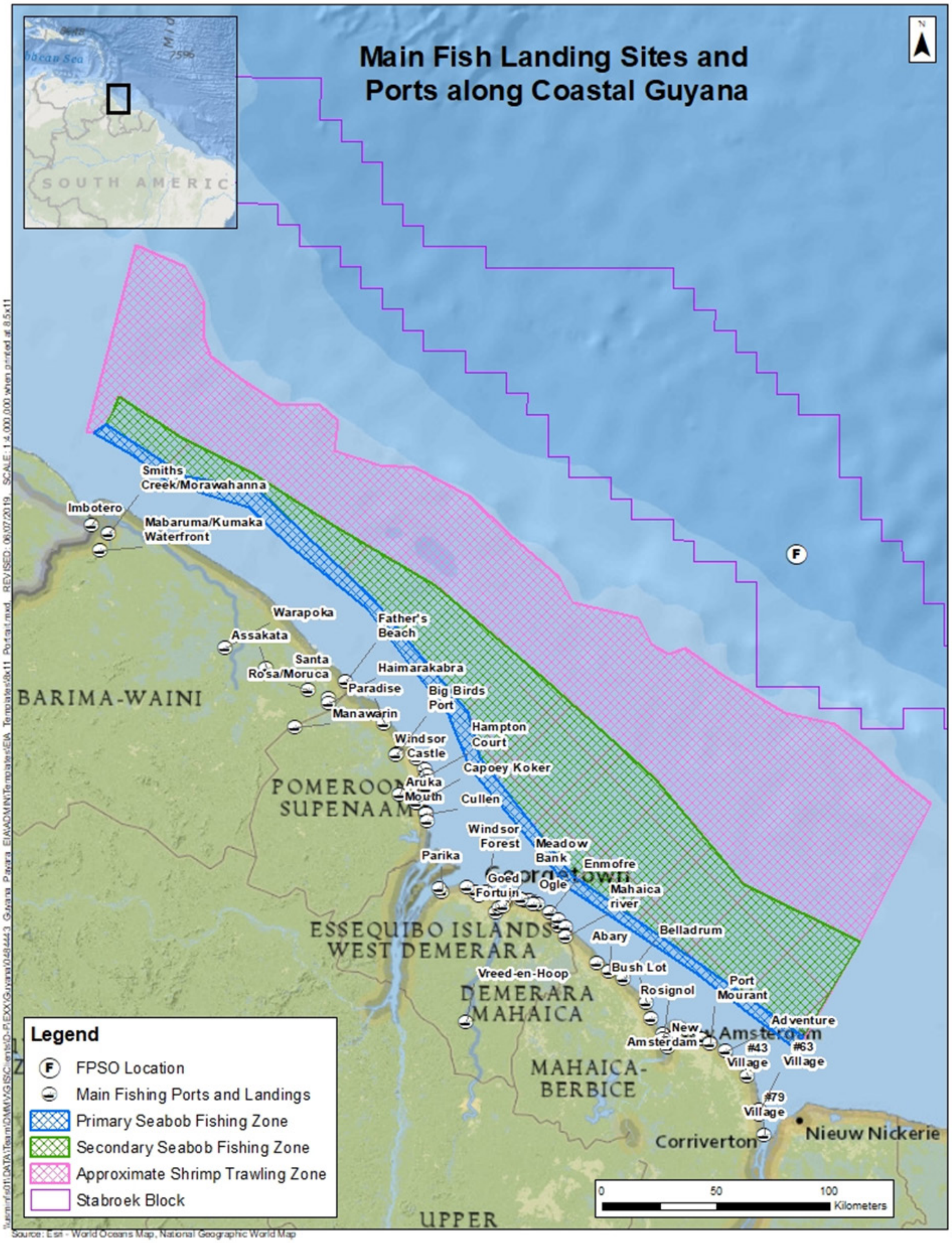


Figure E-6-1: Fishing Zones , Ports , and Landing Sites

Attachment E-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;

    - 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.

APPENDIX F SUMMARY OF SPILL PREVENTION, MITIGATION MEASURES AND EMBEDDED CONTROLS

The following table is aligned with the Payara Development Project Environmental Impact Assessment (EIA) and 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.

#	Embedded Control / Spill Prevention Measure
1	Engineering design and operations will be carried out according to applicable Guyana statutory requirements, applicable international design codes and standards, as well as the EEPGL Operations Integrity Management System (OIMS) and the EEPGL Safety, Security, Health, and Environment (SSHE) policies. EEPGL and its contractors will have structured management systems to verify the ongoing application of all necessary codes, standards, procedures, and SSHE management systems.
2	The planned development drilling program and its cuttings management approach is consistent with industry practices, considered protective of the environment, and has been the basis for the exploration wells.
3	The size and strength of the casings to be used in the design of the development wells takes into account the peak reservoir temperature and pressure conditions that may be encountered during drilling and during production operations when the wells are flowing reservoir fluids. After each casing string cement job is completed, pressure testing will be performed to confirm integrity according to standard industry practices.
4	A drilling riser will be deployed to connect the conductor casing and the drill ship, and the blowout preventer (BOP) will be installed. Marine drilling risers with buoyant joints and tension will be used to connect the wells via the BOP to the drill ship. BOPs will be periodically tested during the well construction process.
5	The production tubing includes the subsurface safety valve (SSSV), which is designed to mitigate the uncontrolled release of fluids from the reservoir during the production process. The production tubing also protects the production casing from corrosion and deposition of by-products, such as sand, paraffins, and asphaltenes.
6	Based on wellbore stability analysis and experience gained from exploration drilling, NADF will be required to maintain borehole stability while drilling all well sections below the conductor casing.
7	The Subsea, Umbilicals, Risers, Flowlines (SURF) system will be designed to withstand the full shut in pressure from the production wells, and the gas/water injection components will be designed to withstand the highest required injection pressures. Overpressure protection will be provided on the FPSO, in accordance with industry standards, to protect the subsea systems.
8	The production drill centers will be connected to the FPSO with round-trip piggable production flowlines. Pigging is performed to aid and assist in the maintenance, operations, cleaning, and inspection of flowlines.

#	Embedded Control / Spill Prevention Measure
9	Each subsea development well is capped by a subsea tree, which include several isolation valves and a choke valve to control production and water and gas injection.
10	The FPSO will be configured with back-up power, in the event primary power is lost.
11	The subsea trees and manifolds will be monitored and controlled through the subsea control system on the FPSO via an umbilical. Subsea control system will accommodate typical monitoring requirements such as pressure and temperature measurement.
12	Key FPSO design features include the following: FPSO will be designed to remain moored for at least 20 years without dry-docking and will include facilities to support in-water hull/structural surveys and repair and maintenance. FPSO will be designed to operate in extreme (100-year return period) environmental conditions (associated wind, waves, and current).
13	A flare system will be provided for the collection and safe disposition of produced hydrocarbon gases resulting from unplanned, non-routine relief and blowdown events. Relief events occur to prevent overpressure scenarios in the process equipment. Blowdown events occur to depressure the facilities in a controlled manner as a result of emergency shutdown events.
14	The required power for the FPSO will be generated by three systems as follows: The main power generation system will be gas turbine driven generator sets with spares available in the case of unplanned downtime. All generator sets will be dual fuel (diesel, produced gas) capable to allow for restoring power to the facility (i.e., black start). The essential services power generation system will be a diesel driven generator set. Essential services include systems required for facility restart and for flow assurance hydrate mitigation activities after an unplanned shutdown. The vessel emergency power generator set will be diesel driven and will provide power to both the hull and topsides emergency systems (e.g., safety systems including emergency lighting, telecommunication). Additionally, for back-up power during emergency situations, the uninterruptible power supply (UPS) system will be provided to power equipment such as the Integrated Control and Safety System (ICSS) and subsea controls, among others.
15	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).
16	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.
17	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.

#	Embedded Control / Spill Prevention Measure
18	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.
19	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.
20	Production, water injection, and gas injection flowlines and risers will be cleaned and tested to verify and ensure integrity after installation, and then staged on the seafloor until arrival of the FPSO. Manifolds, manifold foundation piles, jumpers, Subsea Distribution Units, and flying leads at the drill centers will be integrity tested and verified following installation. The connected, integrated FPSO and SURF production systems will be tested and commissioned, including testing and de-watering / displacing flowlines and umbilicals with commissioning fluids, and testing SURF control and shutdown systems.
21	Throughout production operations where the FPSO is owned/operated by a contractor, EEPGL's personnel will perform oversight and monitoring of the FPSO contractor to ensure that management systems pertinent to safety, the environment, and operations integrity are properly implemented. To accomplish this, EEPGL plans to utilize an onboard representative (OBR) supported by operational and technical specialists to monitor, and direct as necessary, operation of the FPSO and SURF facilities.
22	Internal corrosion of the subsea facilities shall be managed by a combination of material selection and injection of inhibitor. Components in the production path upstream of the flowlines will be fabricated from corrosion-resistant alloys suitable for the intended service. The carbon steel flowlines and risers will be protected by the injection of corrosion inhibitor at the subsea production manifold headers.
23	For decommissioning phase (subject to plan approval by GoG), all risers, pipelines, umbilicals, subsea equipment, and topside equipment will be safely and properly isolated, de-energized, and cleaned to remove hydrocarbons and other hazardous materials to a suitable level prior to being taken out of service. Wells will be permanently plugged and abandoned (P&A) by restoring suitable cap rock to prevent escape of hydrocarbons to the environment. P&A barriers will be installed in the wellbore, of adequate length to contain reservoir fluids and deep enough to resist being bypassed by fracturing.
24	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.

#	Embedded Control / Spill Prevention Measure
25	With respect to prevention of spills of hydrocarbons and chemicals during the drilling stage: Change liquid hydrocarbon transfer hoses periodically; Utilize dry-break connections on liquid hydrocarbon bulk transfer hoses; Utilize a liquid hydrocarbon checklist before bulk transfers; Perform required inspections and testing of equipment prior to deployment/installation; Utilize certified Blowout Prevention (BOP) equipment; Regularly test certified BOP equipment and other spill prevention equipment; Utilize overbalanced drilling fluids to control wells while drilling; Perform operational training certification (including well control training) for drill ship supervisors and engineers; Regularly audit field operations on the drill ships, FPSO, and shorebase(s) to ensure application of designed safeguards; and Controls for mitigating a failure of the dynamic positioning system on the drill ships and maintain station keeping, which include: ○ Use of a Class 3 Dynamic Positioning (DP) system, which includes numerous redundancies; ○ Rigorous personnel qualifications and training; ○ Seatrials and acceptance criteria; ○ Continuous DP proving trials; ○ System Failure Mode and Effects Analysis; ○ Continuous DP failure consequence analysis; and ○ Establishment of well-specific operations guidelines.
26	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.
27	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.
28	Utilize support tugs to aid tankers in maintaining station during approach/departure from FPSO and during offloading operations.
29	Utilize a hawser with a quick release mechanism to moor the FPSO to the tanker at a safe separation distance during offloading operations.
30	FPSO offloading to tankers will occur within an environmental operating limit that is established to ensure safe operations. In the event that adverse weather occurs during offloading operations that is beyond the environmental operating limit, the tanker will cease the offloading operations, and may disconnect and safely maneuver away from the FPSO as appropriate.
31	Utilize a marine bonded, double-carcass floating hose system certified by Class or other certifying agency that complies with the recommendations of Oil Companies International Marine Forum (OCIMF) Guide to Manufacturing and Purchasing Hoses for Offshore Moorings (GMPHOM) 2009 Edition or later.
32	Utilize breakaway couplers on offloading hose that would stop the flow of oil from FPSO during an emergency disconnect scenario.
33	Utilize a load monitoring system in the FPSO control room to support FPSO offloading.

#	Embedded Control / Spill Prevention Measure
34	Use leak detection controls during FPSO offloading (e.g., for breach of floating hose, instrumentation/procedures to perform volumetric checks).
35	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.
36	Regularly inspect and service shorebase cranes and construction equipment to mitigate the potential for spills and reduce air emissions to the extent reasonably practicable.
37	Utilize secondary containment for bulk fuel storage, drilling fluids, and hazardous materials, where practicable.
38	Regularly check pipes, storage tanks, and other equipment associated with storage or transfer of hydrocarbons/chemicals for leaks.
39	Perform regular audits of field operations on the drill ships, FPSO, and shorebases to ensure application of designed safeguards.
40	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.
41	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.
42	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.
43	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.
44	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.
45	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).

#	Embedded Control / Spill Prevention Measure
46	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.
47	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.
48	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.
49	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.
50	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.
51	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.

#	Embedded Control / Spill Prevention Measure
52	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: Environmental—protected areas, mangroves, shoreline types, seagrass beds, coral reefs, important coastal fish habitats, important coastal bird habitats, and other sensitive habitats; and 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. This information enables EEPGL to prioritize the mobilization of emergency response resources (manpower and equipment) to those areas most sensitive to a spill.
53	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 automatic BOPs, personnel training and proficiency drills for well control, and the use of drilling fluids to control pressures within the well.
54	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.
55	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.

#	Embedded Control / Spill Prevention Measure
56	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.
57	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.
58	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.
59	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.
60	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.
61	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.
62	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.

#	Embedded Control / Spill Prevention Measure
63	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: Establishing operations and communication protocols between different command posts. 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. Identifying places of refuge in the impacted region where vessels experiencing mechanical issues could go for repairs and assistance. 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. Assigning or accepting financial liability and establishing a claims process during a response to a transboundary event. Informing local communities regarding response planning.
64	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.
65	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.
66	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.
67	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.
68	Promptly remove damaged Project vessels (associated with any vessel incidents) to minimize impacts on marine use, transportation, and safety.
69	Implement the OSRP in the unlikely event of an oil spill, including: Conducting air quality monitoring during emergency response; Require use of appropriate PPE by response workers; Implementing a Wildlife Oil Response Program, as needed; and Implement a claims process for damage caused by an oil spill, as needed.

#	Embedded Control / Spill Prevention Measure
70	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.
71	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.
72	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.
73	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.
74	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.
75	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.
76	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.

#	Embedded Control / Spill Prevention Measure
77	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.
78	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 aerially applied dispersants, which can be quickly deployed and treat large surface areas rapidly and efficiently.
79	The safety of responders also needs to be considered in the evaluation of response strategies. Response tactics depend upon a variety of environmental conditions: • 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 primary response tool for oil further from the source where mechanical recovery/in situ burn operations are less effective; • Utilize aerial dispersant application during calm seas on emulsified oil; and • 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 cleanup may be potentially needed for some scenarios, in which case, sensitive shorelines will receive prioritization for protective booming.
80	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: • Verify oil spill scale and location; • Monitor effectiveness of applied response strategies; • Visually quantify spill volume; • Direct operations—dispersant application, containment and recovery, shoreline assessment, in situ burning; and • Monitor wildlife.
81	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.
82	For Tier II or Tier III incidents, EEPGL will scale up to a full surveillance plan using helicopters, fixed wing aircraft and satellite imagery.

#	Embedded Control / Spill Prevention Measure
83	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.
84	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.
85	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.
86	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.
87	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.
88	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.
89	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 well blowout, dispersant is injected subsea at the wellhead location on the seafloor using specialized equipment and remote operated vehicles (ROVs).
90	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 reguire 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 Appendix C.
91	EEPGL will source VOOs to provide platforms for the containment and recovery systems.
92	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.
93	EEPGL may use in situ burning for large-scale Tier III incidents. OSRL will provide the resources required.

#	Embedded Control / Spill Prevention Measure
94	EEPGL will manage hazardous waste resulting from clean-up activities and ensure appropriate disposal.
95	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.
96	If a Tier III well control incident 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.
97	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: • Survey & debris clearance equipment; • Intervention equipment; • Dispersant hardware application system*; and • CSSs and auxiliary equipment.
98	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.
99	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.
100	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.
101	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.
102	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.
103	EEPGL has access to the GDS, which is an additional 5,000 cubic meters (m^3) of dispersant located across the OSRL bases and in France.
104	EEPGL has access to the Boots & Coots 15 PSI Subsea Well Capping Stack located in Houston, TX, USA.

#	Embedded Control / Spill Prevention Measure
105	EEPGL also has access to the OSRL SWIS, Oceaneering, Wild Well Control, and Trendsetter Engineering for subsea well response. SWIS holds and maintains four CSSs and two SIRTS globally: • 15k PSI Subsea Well Capping Stack—Norway and Brazil; • 10k PSI Subsea Well Capping Stack—South Africa and Singapore; • SIRT—Norway and Brazil.
106	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.
107	EEPGL ERT and IMT members, which includes the RRT, will receive oil spill response training listed in the OSRP based on their response position.
108	ERT and IMT members will receive appropriate Incident Command System (ICS) Training listed in OSRP based on their roles and responsibilities.
109	EEPGL will conduct oil spill response exercises to test incident response personnel function and responsibilities, in line with OSRP.
110	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.

APPENDIX G OIL SPILL SCENARIOS AND NET ENVIRONMENTAL BENEFIT ANALYSIS FOR SELECTI ON OF RESPONSE TECHNOLOGIES

This Net Environmental Benefit Analysis (NEBA) was performed for the Payara Development Project. It is a representative analysis for a Floating Production, Storage, and Offloading (FPSO) Development Project, and results would be consistent for the Liza Phase 1 and Liza Phase 2 Development Projects, and for exploration activities in Guyana.

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.

G.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.

G.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 WCD 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 (Most Credible WCD)
- 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 Most Credible WCD (20,000 bbl per day) 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 (NAVGEM). 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.

G.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 at its disposal for use in 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 the Liza Phase 1 and Liza Phase 2 oil spill response analyses. 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 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.

Table G-1: Equipment Used during Modeled O il 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

G.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^2])
- 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)

G.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 G-2.

Table G-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

In preparing information for this NEBA, a number of potential oil spill scenarios (Table G-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.

Table G-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 (Most Credible WCD)	Monitor and Observe	600,000	30 Days
13b	Jun-Nov	Well Control Loss (Most Credible WCD)	Burning, Dispersants, and Mechanical Recovery	100,000	5 Days
13c	Dec-May	Well Control Loss (Most Credible WCD)	Monitor and Observe	600,000	30 Days
13d	Dec-May	Well Control Loss (Most Credible WCD)	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 well blowout, 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.

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.

G.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 G-4 to Table G-7. The timing of the initiation of those responses is presented in Table G-8. The oil spill equipment and techniques utilized for the NEBA analysis are consistent with the equipment and techniques discussed in Sections 5 through 8 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 G-4: Mechanical Re covery 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^3 (6,604.3 gal) per vessel system unloaded

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^3 = cubic meter; VOO = vessel of opportunity

Table G-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 G-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
Daylight operations only

Surface Dispersant Application
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) 20:1

Table G-7: Aerial Dispersant Application Parameters and Limitations

Aerial Dispersant Application
Boeing 727—2 identical aircraft [a], 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 20:1
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
[a] 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 G-8: Timing of Response Activities

	Day	1	2	3	4	5	6	7	9	10	12	14	21
Well debris cleanup					x								
Supply vessels [1]		x											
Aircraft 1- Boeing 727			x										
Aircraft 2-Boeing 727					x								
Aircraft 3—C-130				x									
Vessel with Spray Arms							x						
Burn Boat 1							x						
Burn Boat 2							x						
Burn Boat 3								x					
Burn Boat 4								x					

	Day	1	2	3	4	5	6	7	9	10	12	14	21
Capping Stack [2]							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).

G.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.

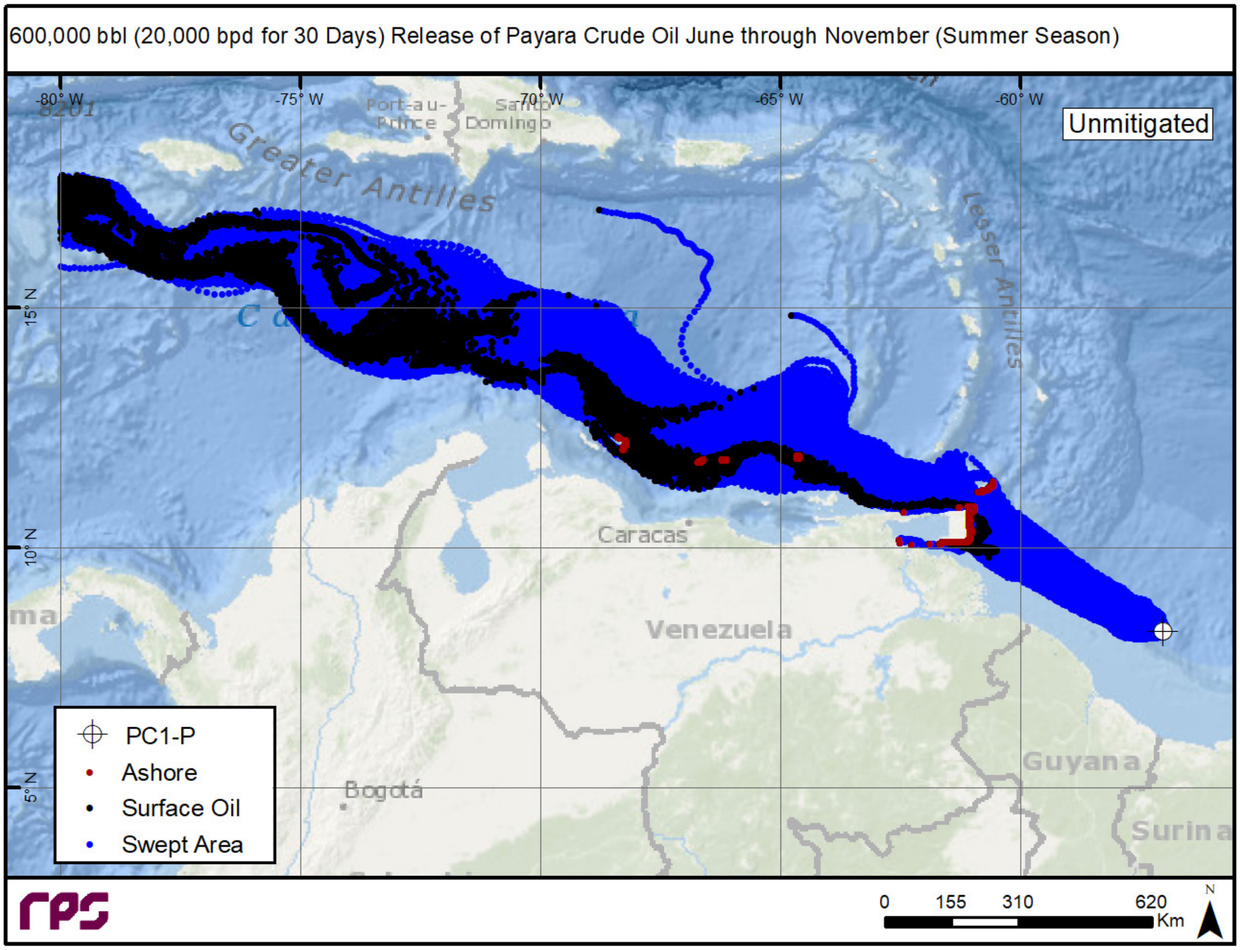


Figure G-1: Payara Unmitigated Wellhead 600,000 bbl (20,000 bpd) Crude Release (Most Credible WCD)—Summer Season. Areas colored dark blue show the sea surface area swept by oil. Red indicates where oil has stranded on the shoreline. Areas colored black show the presence of oil on the sea surface.

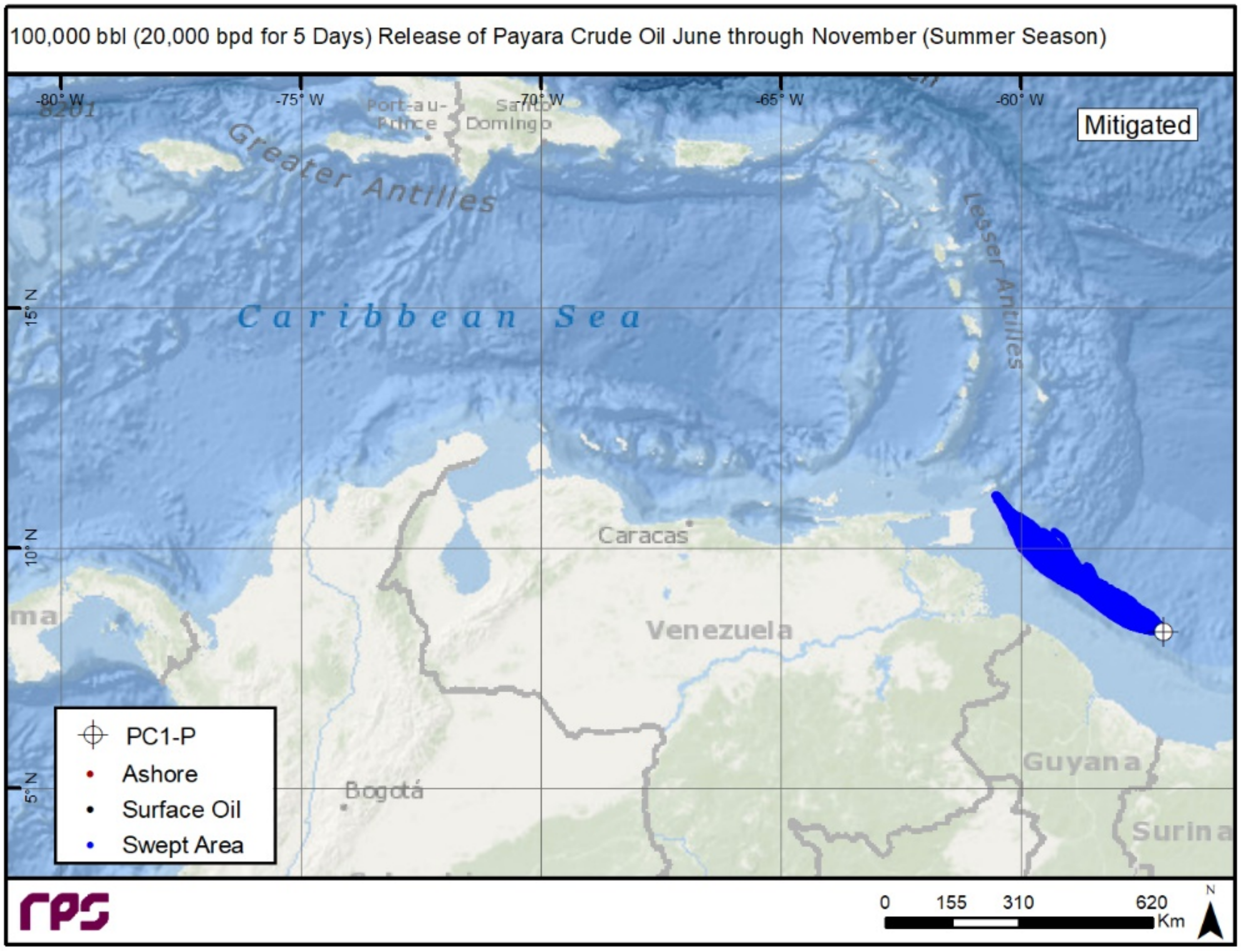


Figure G-2: Payara Mitigated Wellhead 100,000 bbl (20,000 bpd) Crude Release (Most Credible WCD)—Summer Season. Areas colored dark blue show the sea surface area swept by oil. There is no shoreline oiling and no surface oil remains.

Table G-9: Comparison of Key Model Output Parameters for the Payara 20K BOPD (Most Credible WCD) Jun-Nov Summer Season Release for Mitigated (Full Response) and Unmitigated (Monitor and Observe)

	Monitor and Observe 600,000 bbl	Full Response [a] 100,000 bbl
Shoreline area oiled (km^2)	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

[a] Full Response includes installation of a capping stack on Day 5.

600,000 bbl (20,000 bpd for 30 Days) Release of Payara Crude Oil December through May (Winter Season)

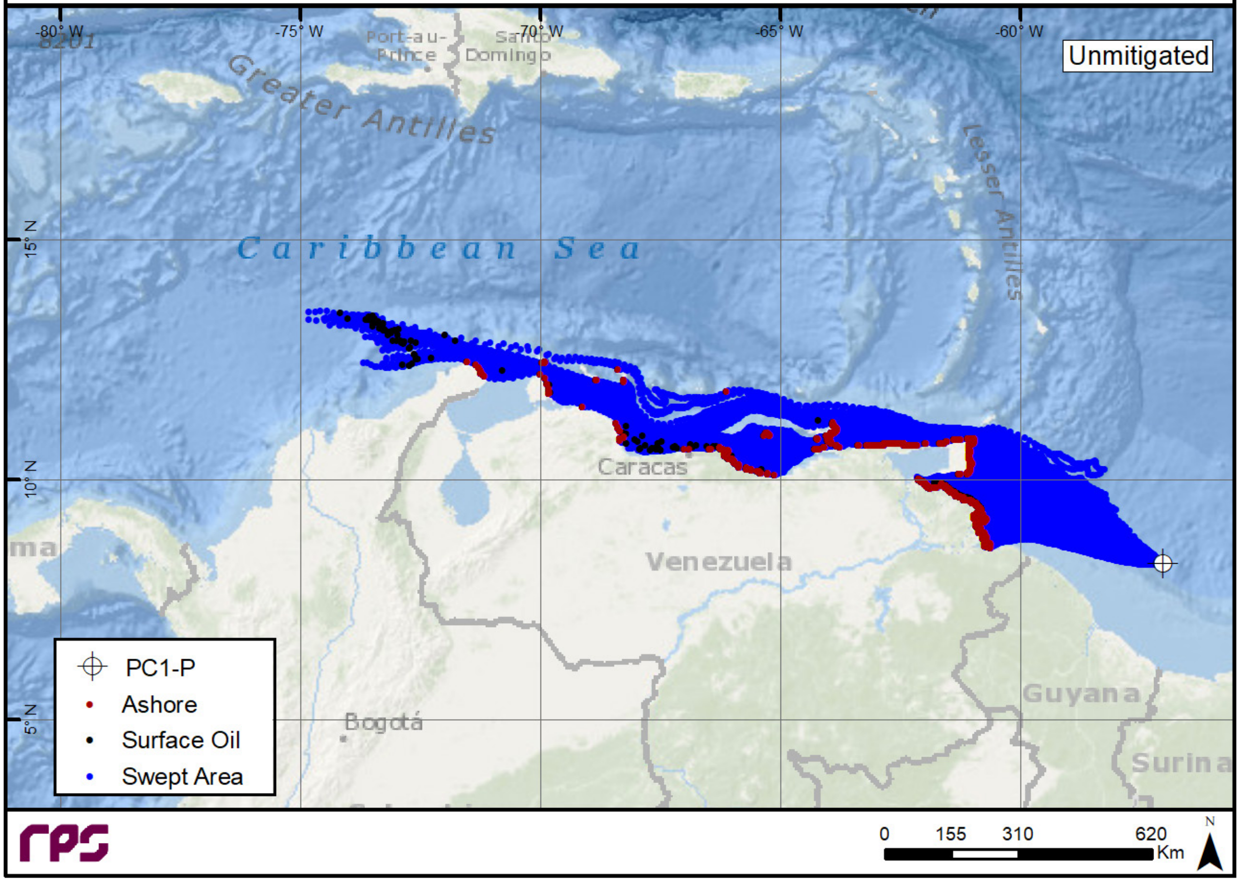


Figure G-3: Payara Wellhead 600,000 bbl (20,000 bpd) Unmitigated Crude Release (Most Credible WCD)—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Red indicates where oil has stranded on the shoreline. Areas colored black show the presence of oil on the sea surface.

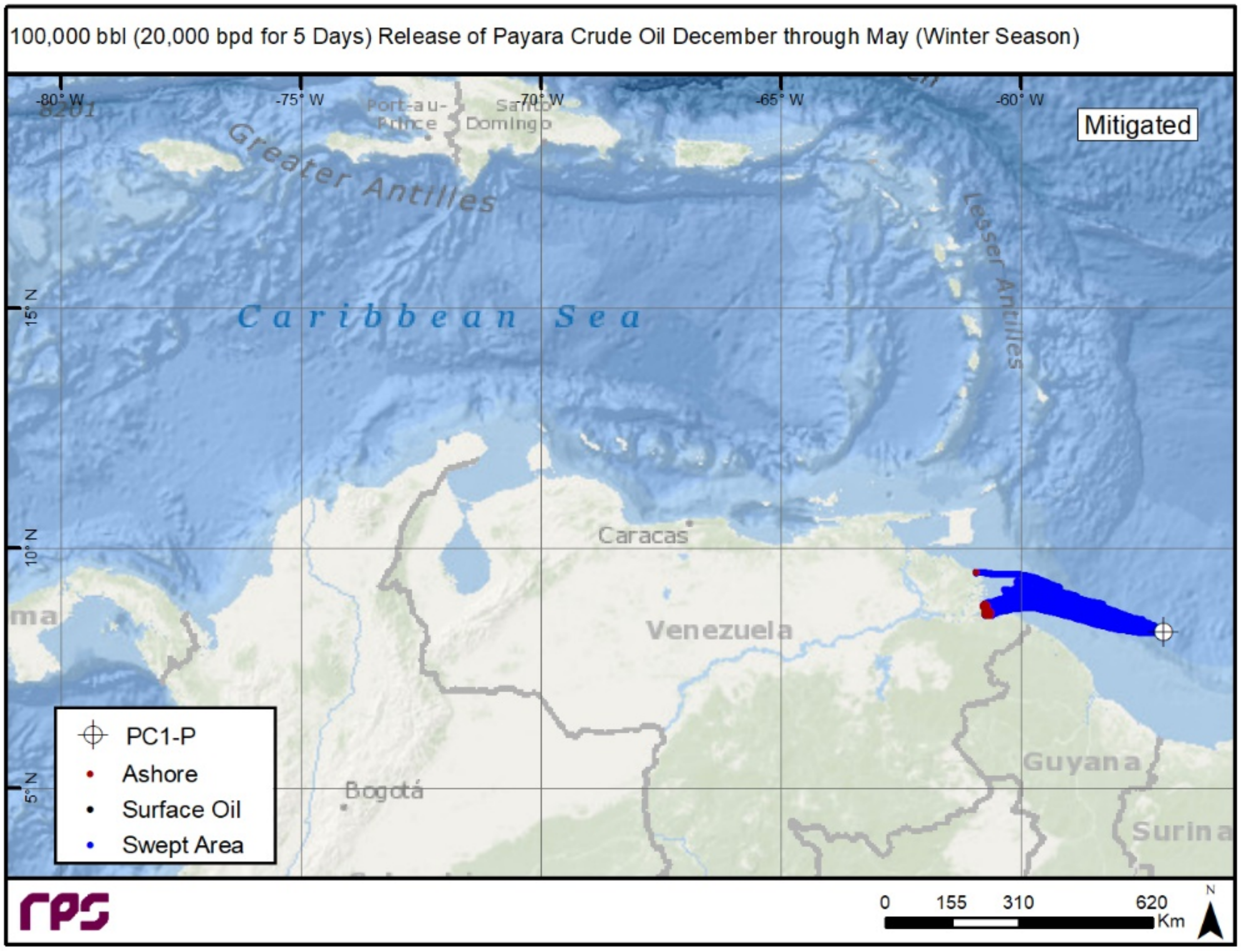


Figure G-4: Payara Mitigated Wellhead (100,000 bbl) 20,000 bpd Crude Release (Most Credible WCD)—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Shoreline oiling is shown in red; no surface oil remained.

Table G-10: Comparison of Key Model Output Parameters for the Payara 20K BOPD (Most Credible WCD) Dec-May Winter Season Release for Mitigated (Full Response) and Unmitigated (Monitor and Observe)

	Monitor and Observe 600,000 bbl	Full Response [a] 100,000 bbl
Shoreline area oiled (km^2)	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

[a] Full Response includes installation of a capping stack on Day 5.

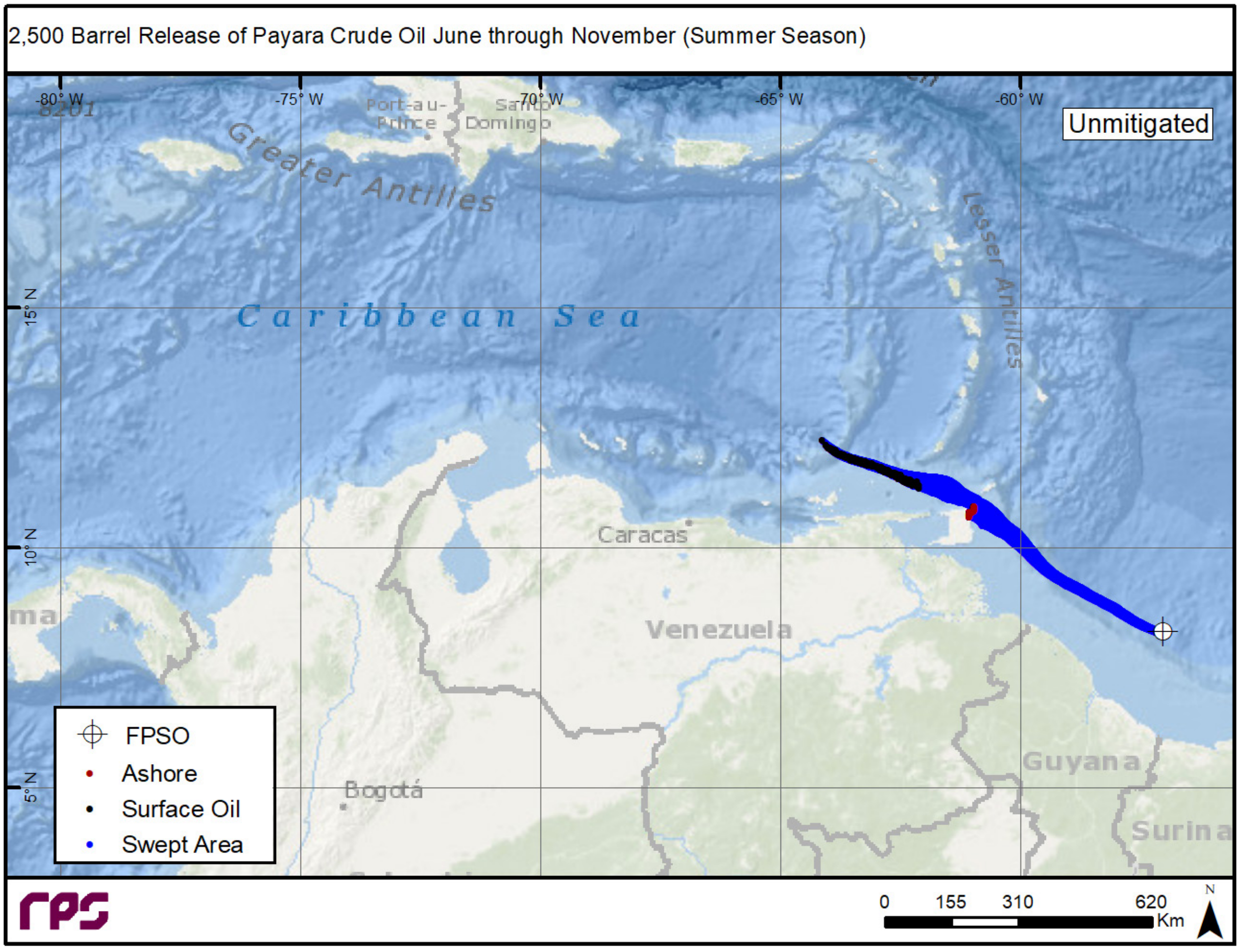


Figure G-5: Payara FPSO Unmitigated 2,500 bbl Payara Crude Release—Summer Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

Mitigated 2,500 Barrel Release of Payara Crude Oil June through November (Summer Season)

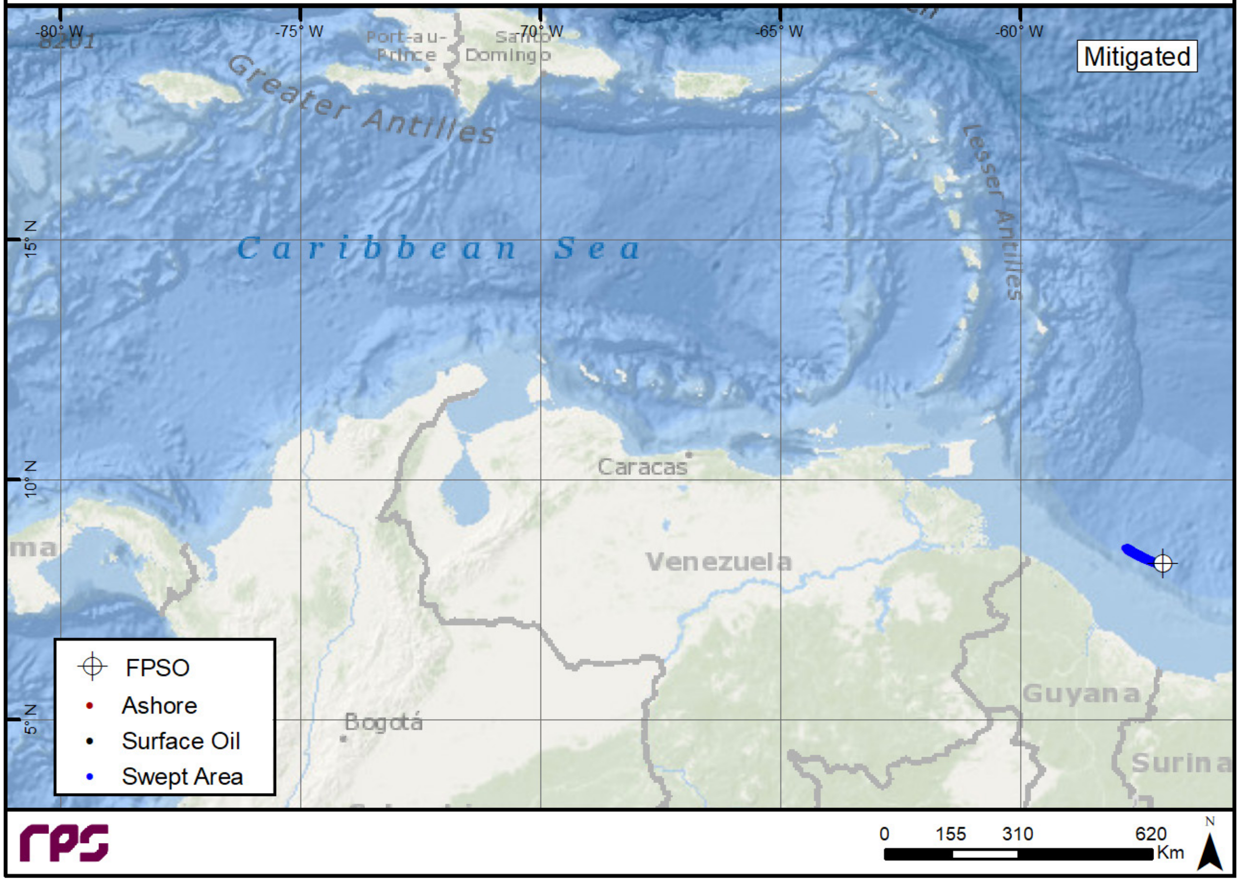


Figure G-6: Payara FPSO Mitigated 2,500 bbl Crude Release—Summer Season. Areas colored dark blue show the sea surface area swept by oil. No shoreline oiling occurred and no surface oil remained.

Table G-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^2)	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

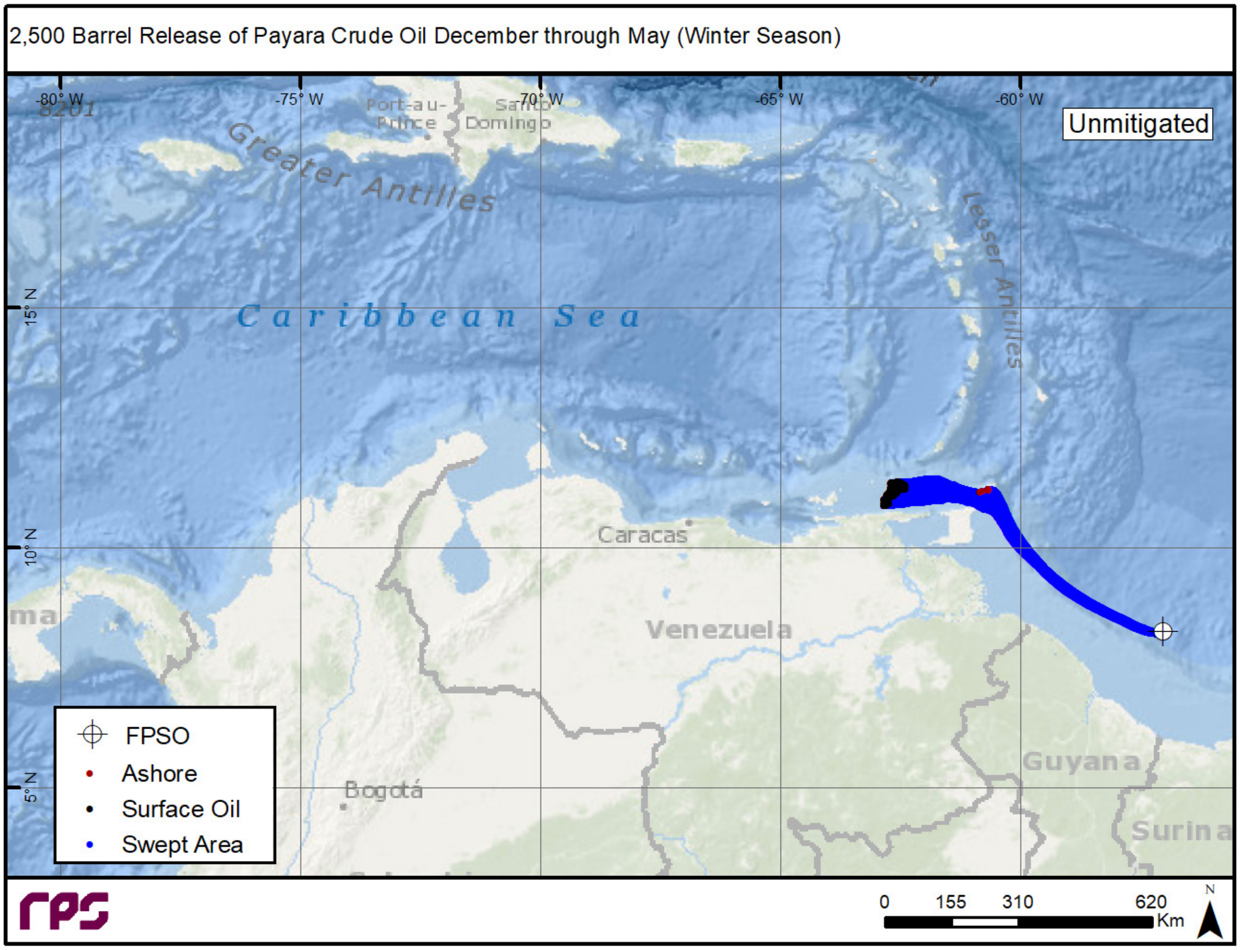


Figure G-7: Payara FPSO 2,500 bbl Unmitigated Crude Release—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

Mitigated 2,500 Barrel Release of Payara Crude Oil December through May (Winter Season)

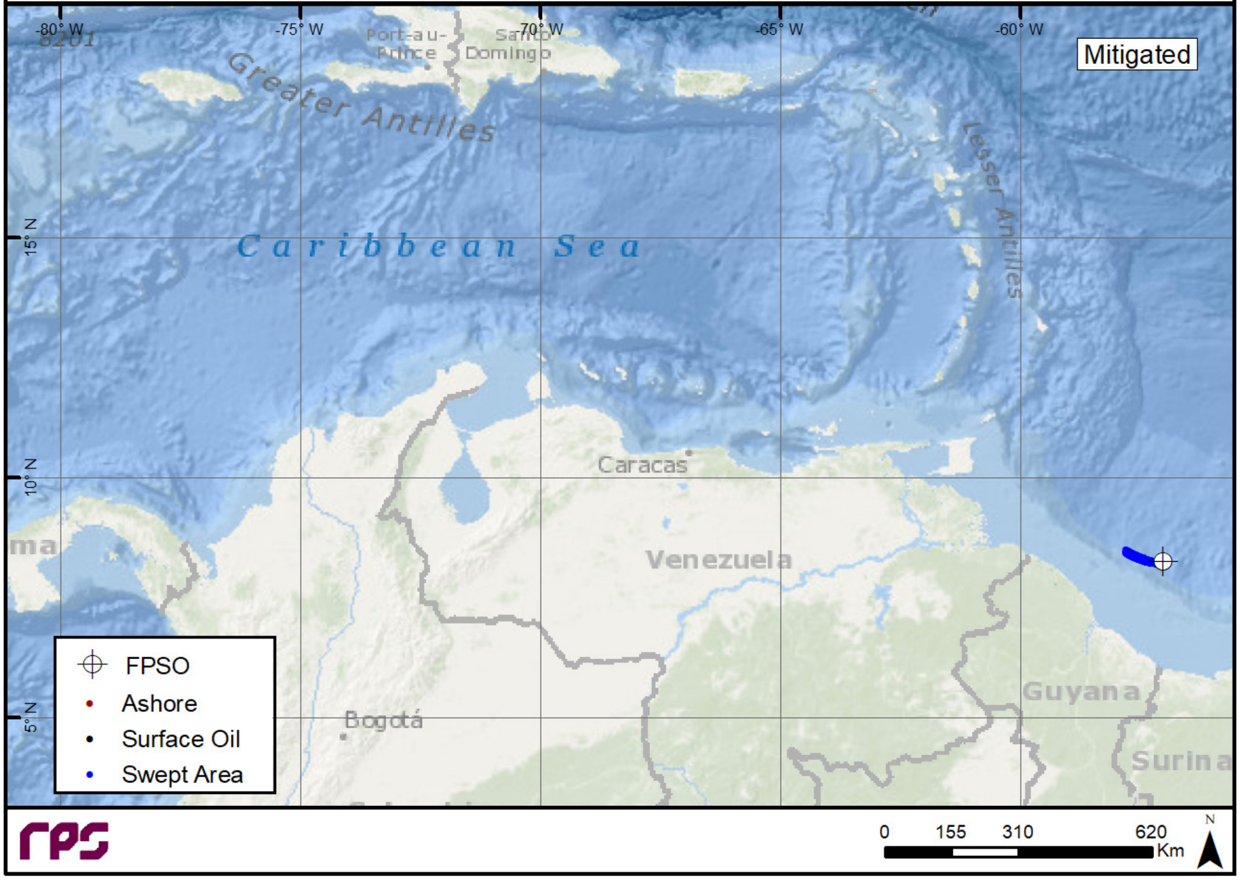


Figure G-8: Payara FPSO 2,500 bbl Mitigated Crude Release—Winter Season. Areas colored dark blue show the sea surface area swept by oil. No shoreline oiling occurred and no surface oil remained.

Table G-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 (m2)	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

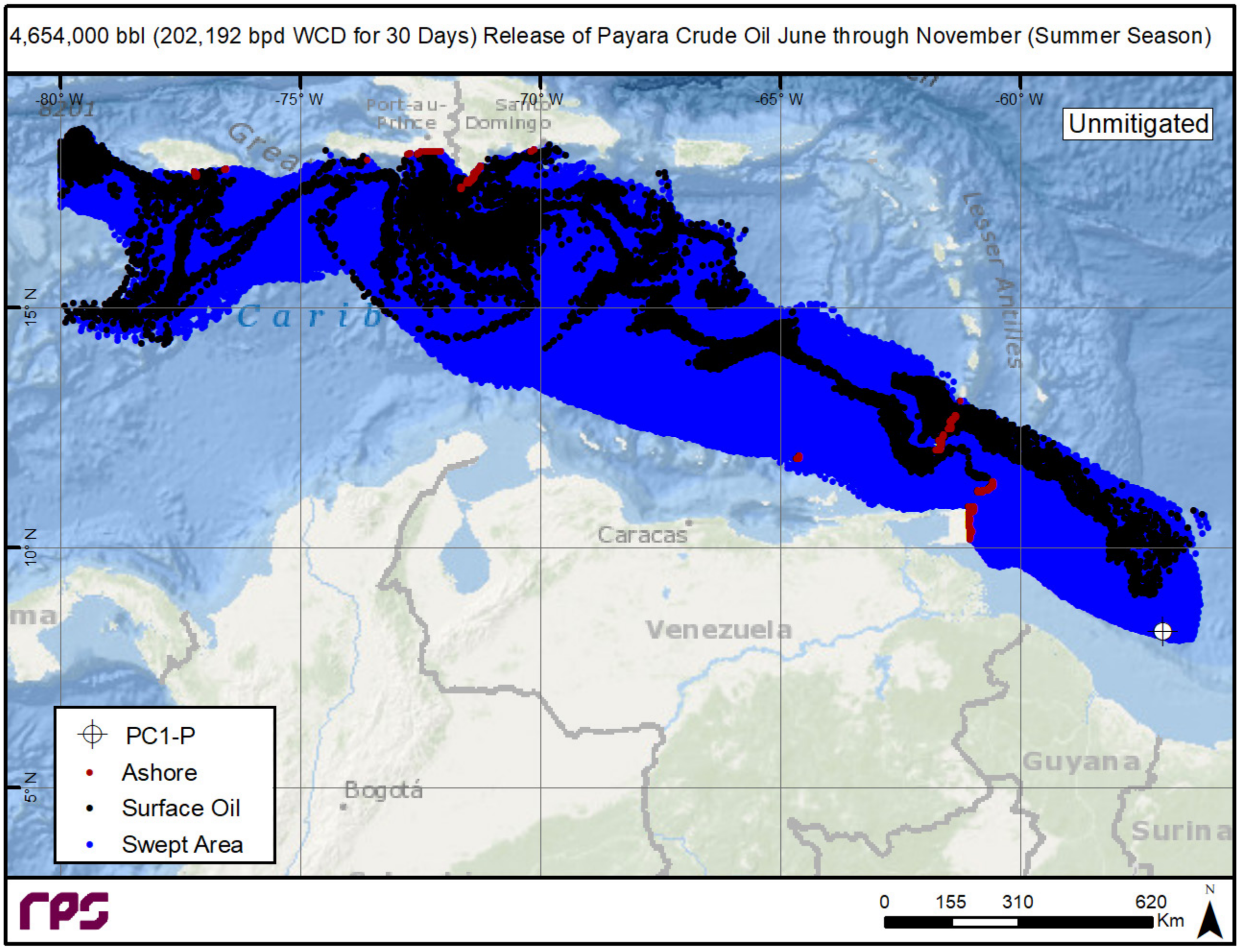


Figure G-9: Unmitigated Payara Wellhead 202,192 bbl Crude Release (Maximum WCD)—Summer Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

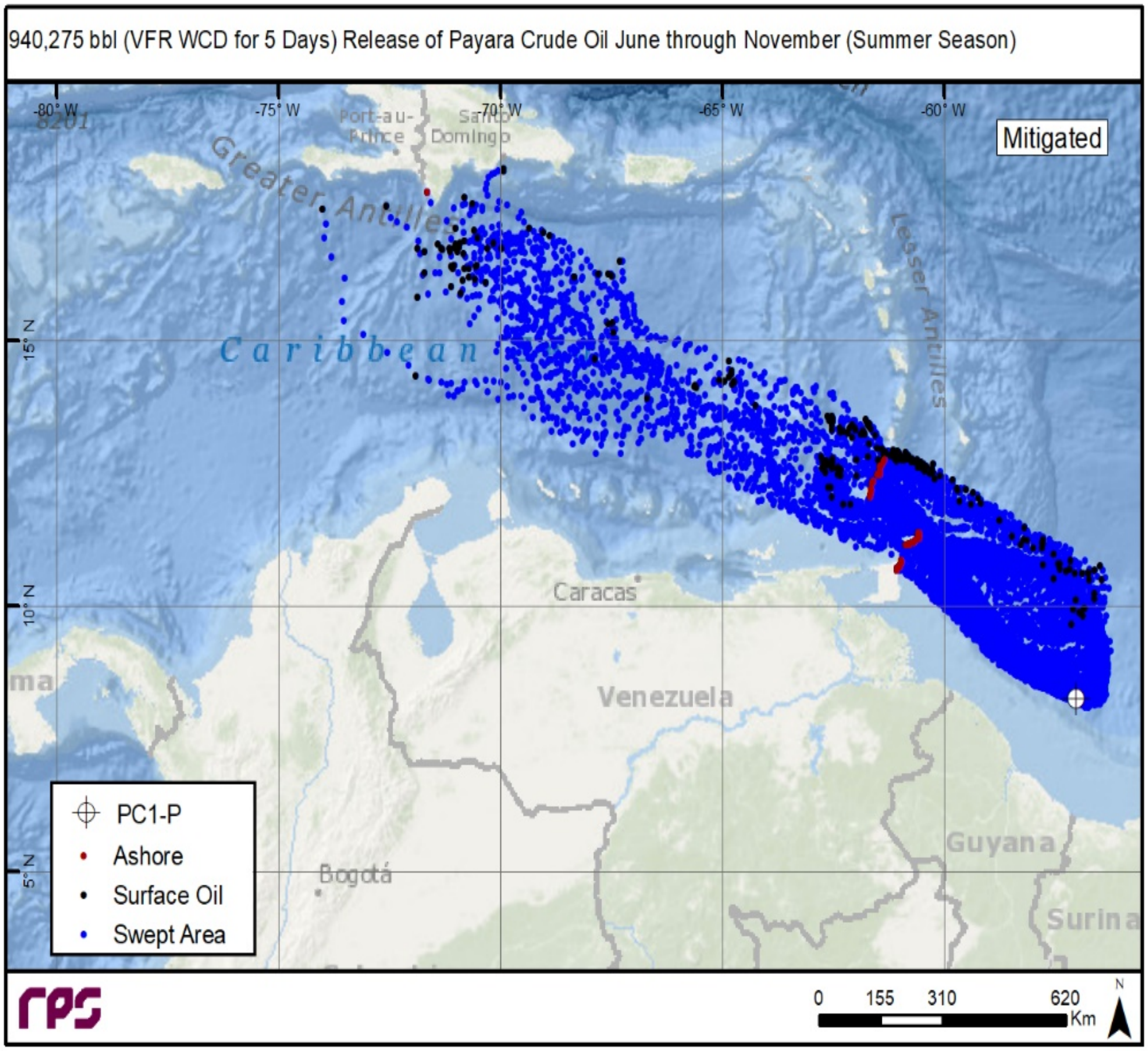


Figure G-10: Mitigated Payara Wellhead (940,275 bbl) 202,192 bbl per day Crude Release (Maximum WCD)—Summer Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

Table G-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 [a] (940,275 bbl)
Shoreline area oiled (km^2)	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

[a] Full Response includes installation of a capping stack on Day 5.

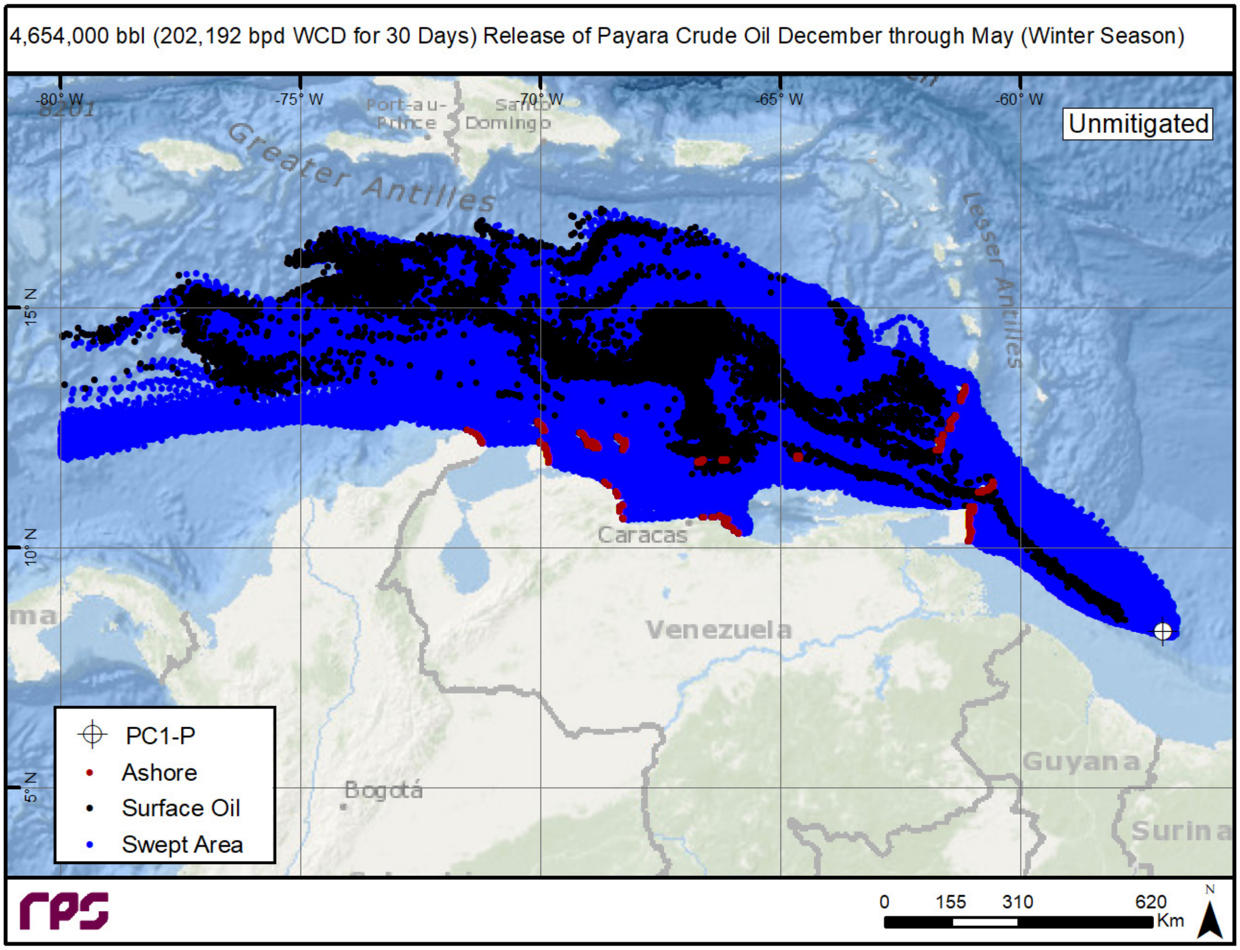


Figure G-11: Unmitigated Payara Wellhead 202,192 bbl per day Crude Release (Maximum WCD)—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

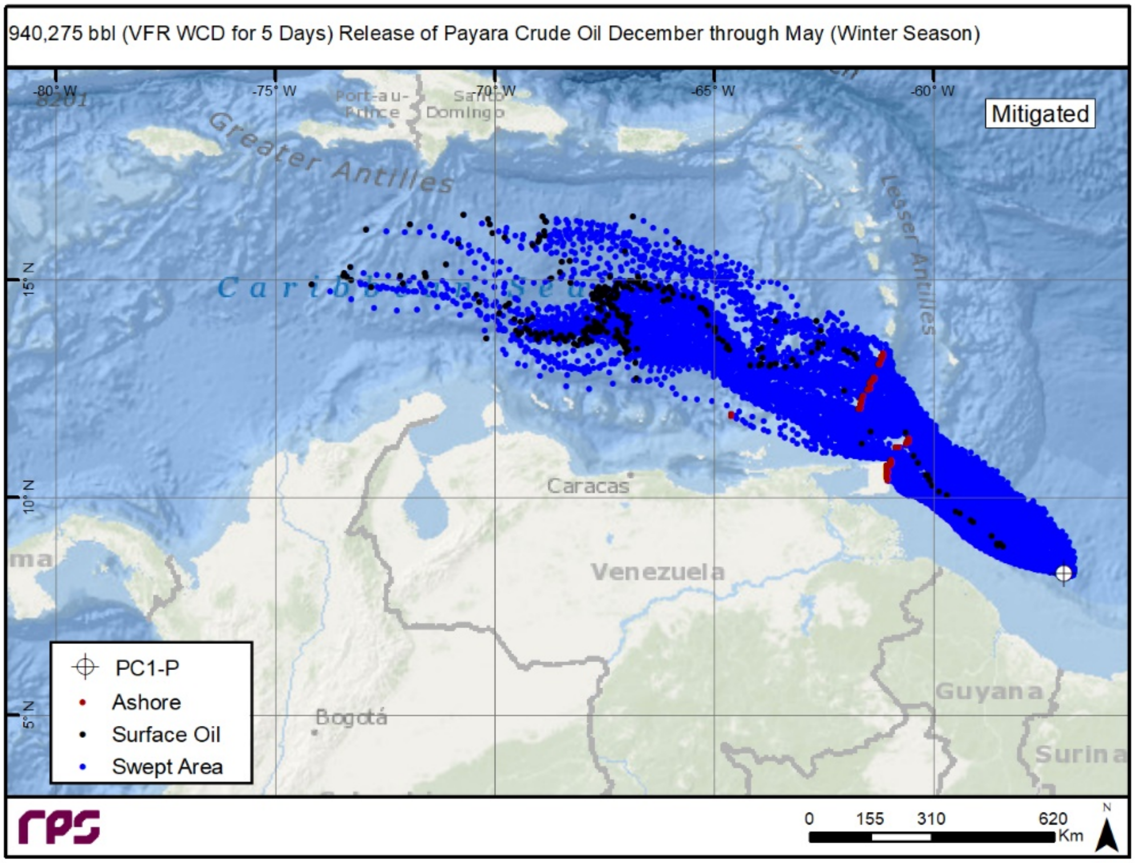


Figure G-12: Mitigated Payara Wellhead (940,275 bbl) 202,192 bbl per day Crude Release (Maximum WCD)—Winter Season. Areas colored dark blue show the sea surface area swept by oil. Red shows areas of shoreline oiling and black represents remaining surface oil.

Table G-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 [a] (940,275 bbl)
Shoreline area oiled (km^2)	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

[a] Full Response includes installation of a capping stack on Day 5.

G.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.

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 G-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 G-14 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 concurrent utilization of the full suite of oil spill techniques, rather than on independent NEBA analyses of each individual oil spill response technique. Figure G-15 represents the shoreline affected by an oil spill that has been mitigated with dispersants in order to avoid shoreline impact.

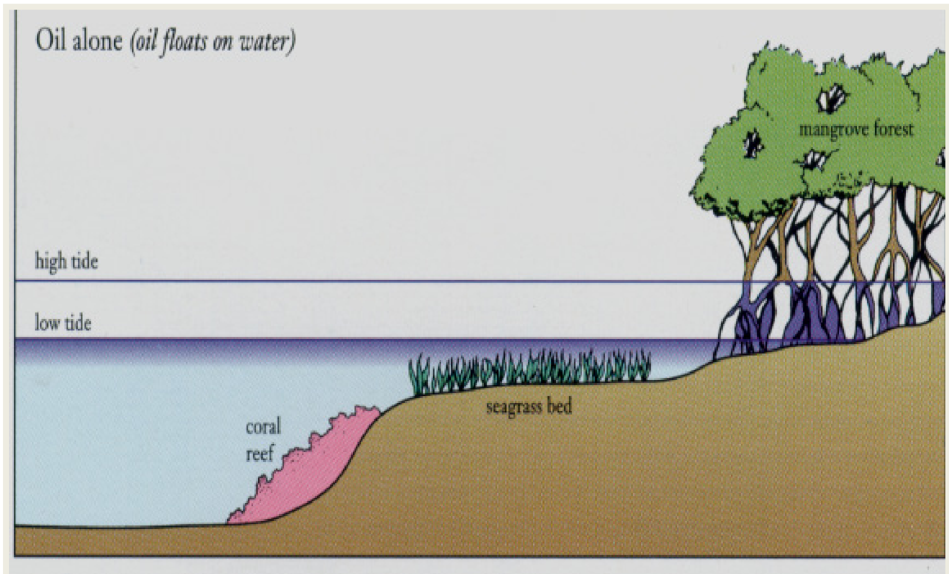


Figure G-13: Intertidal Zone between Low and High Tide at Risk from Floating Oil

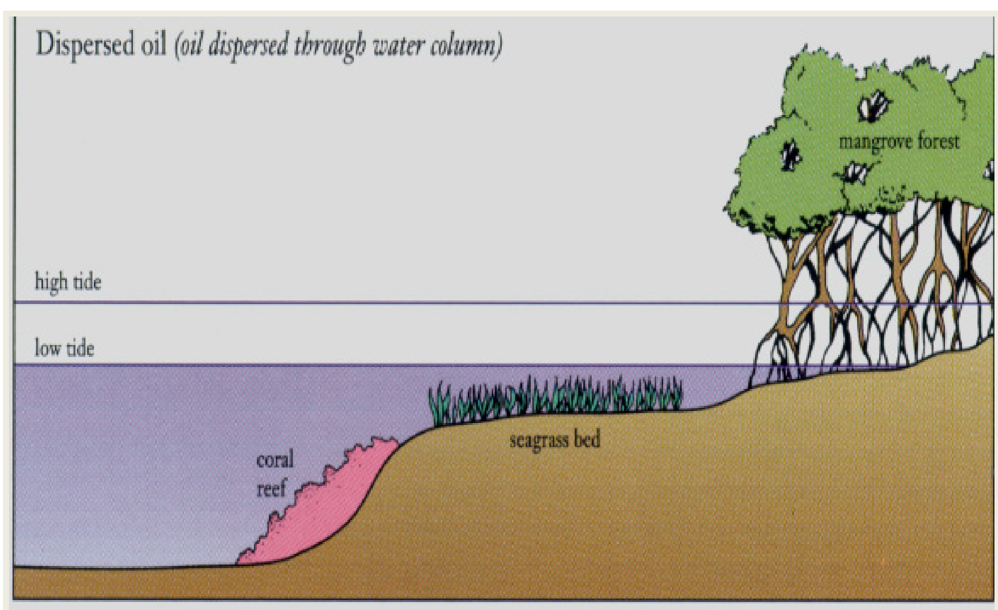


Figure G-14: Shallow Sub-Tidal Zone at Risk from Dispersed Oil

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.

G.9 References

Berek, Eugene P., Fei Chen, and Guangqiang Yang. 2015. Guyana Consolidated Metocean Criteria: Version 0.0. URC.2015.041.

APPENDIX H GUYANA WELLS EMERGENCY RESPONSE LOGISTICS MOBILIZATION PLAN

ExxonMobil

Guyana Wells Emergency Response Logistics Mobilization Plan

Prepared:	DocuSigned by: Johnny Lonsdale 5F24AC844E67438... Mark Temple / Johnny Lonsdale EEPGL Logistics Superintendent	February 18, 2020 Date
Endorsed:	DocuSigned by: Jonathan Regina D619463FE49848E... Jonathan Regina EEPGL Logistics Manager	February 19, 2020 Date
Endorsed:	DocuSigned by: MURTALA SILVA F5CE173188D847A... Brad Edlington EEPGL Safety & Risk Manager	February 20, 2020 Date
Endorsed:	DocuSigned by: Ryan Turton 32D5EC7F46054A0... Ryan Turton Guyana Wells Execution Manager	February 20, 2020 Date
Approved:	DocuSigned by: 884CC4C75FE843C... Mike Ryan EEPGL Production Manager	February 20, 2020 Date

Guyana Wells Emergency Response Logistics Mobilization Plan

Subsea Well Intervention System (SWIS)

SIRT & Capping Stack – Logistics Mobilization Plan

Esso Exploration & Production Guyana Limited

February 2020

INTRODUCTION

The purpose of this document is to outline the mobilization of pre-identified source control equipment to support a well control incident in order to facilitate the mobilization in a timely and cost effective manner.

In the event of a high consequence Tier II / III emergency response incident, specialized equipment will need to be mobilized from various global locations and Emergency Response contractors. ExxonMobil subscribes yearly to incident response consortiums and therefore maintains worldwide access to source control equipment.

The Wells Team has identified the strategic subscriptions for Oil Spill Response Limited (OSRL), Boots & Coots (B&C) and Wild Well Control. Details on each subscription are below:

OSRL

- Annual membership to enable equipment access

B&C

- Annual membership to enable equipment access

Wild Well Control

- Annual membership to enable equipment access

This work is to be coordinated by the Guyana Wells Team and personnel assigned otherwise to support this effort and along with EEPGL staff. Equipment and materials needed for this operation may come into airports at Georgetown Guyana and/or Port of Spain Trinidad. Seaports may be used in Georgetown and in Trinidad as well. This work is to be coordinated by Logistics with assistance from Wells and involves the movement of subsea well intervention equipment not routinely handled by Production Logistics. This document outlines logistics procedures and contacts to charter marine vessels capable of moving 140MT+ equipment and or chartering of Antonov type aircraft for multiple shipments of airfreight and dispersant.

Roles and Responsibilities

It is the Wells Team's responsibility to 1) evaluate worst case discharge scenario(s), 2) identify and locate the high-priority response equipment and 3) engage vendors in Response Time Modeling. It is then the Logistics Team's responsibility to arrange the transportation, and customs clearance as necessary, of the selected high-priority response equipment including by land, air or sea to the incident location.

The following Roles and Responsibilities are associated with the mobilization of equipment:

Task	*EM Logistics*	*OSRL*	*B&C*
1. Equipment storage and maintenance		X Tanager, Norway	X Houston, USA
2. Mobilization to export site (airport/quay)		X	X
3. Provide packing lists, pro-forma, invoices, Safety Data Sheets, customs paperwork		X	X
4. Arrange customs export from storage locations		X	X
5. Charter marine vessel and/or aircraft and mobilize ancillary 3rd parties	X		
6. Lift, load and secure equipment at loadout locations		X	X
7. Mobilize equipment to incident country	X		
8. Importation/ customs clearance of equipment	X		
9. Deployment to in-country site location	X		

This Mobilization Plan Details:

- Equipment included in Emergency Response contractor subscriptions
- Contact information for Emergency Response contractors and suppliers
- Roles and Responsibilities associated with the mobilization of source control equipment from its storage location to the incident country – see chart below for specific job roles

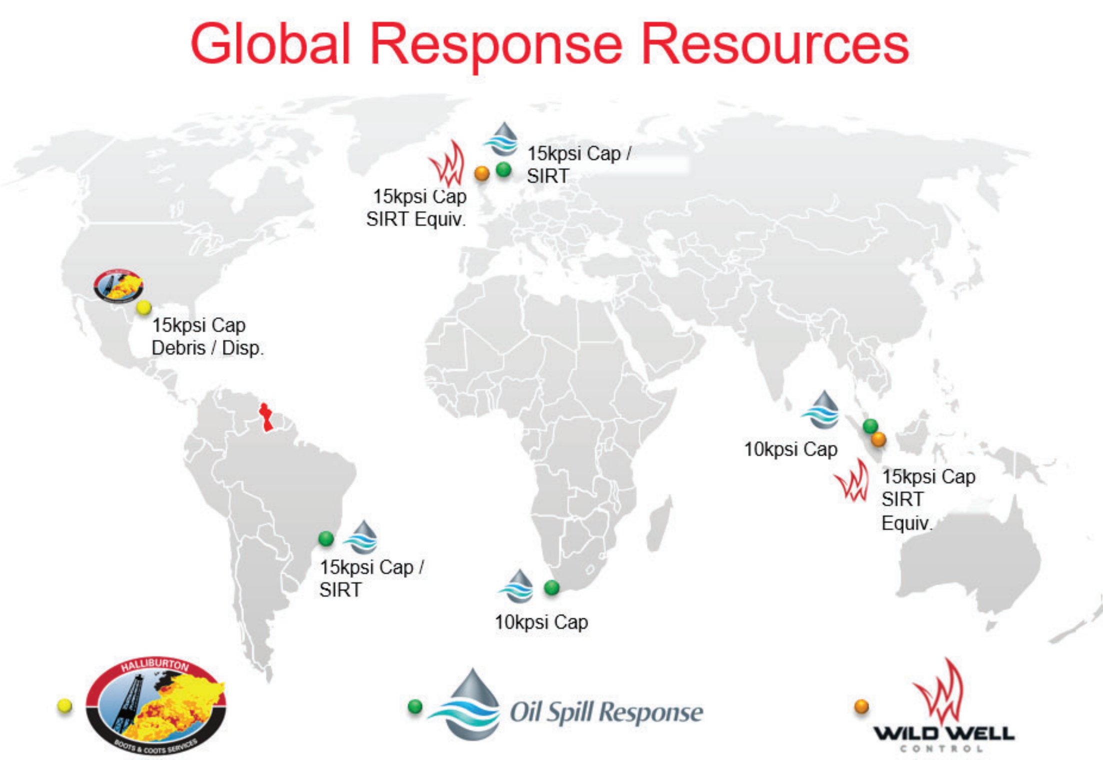
It is the affiliate's responsibility to communicate the situation to all appropriate in-country authorities per their own guidelines to the GGMC, EPA, Department of Energy, MARAD, etc. Contacts with authorities in customs and immigration will need to be made to ensure speedy processing and clearance of equipment, materials, and personnel movements. A full list of equipment, materials and personnel needing to move with appropriate schedules will be required and is listed below.

External P&GA manager for EEPGL is Deedra Moe, who can be reached at deedra.jp.moe@exxonmobil.com or + (592) 620-0332

In-Country Logistics Manager is Jon Regina who can be reached at jonathan.regina@exxonmobil.com
Guyana Local + (592) 277-3535 (Guyana) or Guyana Cell: + (592) 620-0337

Source Control Equipment Technical Specs + Packing Lists

The following source control equipment is what is available through ExxonMobil's contracted emergency response subscriptions by vendor.



OSRL Capping Stack System (CSS)

The OSRL CSSs is designed and maintained by Trendsetter Engineering. The locations of the OSRL CSSs are noted below as well as the technical specifications:

Capping Stack System (CSS): there are two (2) key mobilization strategies for the CSS

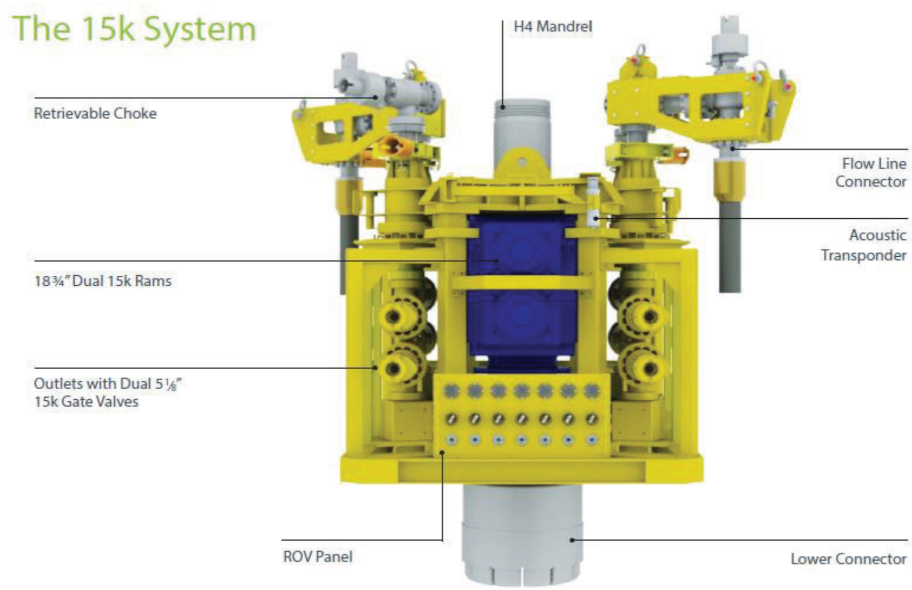
1. **Air** – OSRL will breakdown and containerize the CSS then transport by road to an airport designated by EM

2. **Sea** – OSRL will transport the assembled CSS from the OSRL storage facility to the quayside. EM Logistics is responsible to collect the assembled CSS from the designated quayside and arrange shipment.

The Capping Stack System is operated by Trendsetter. These are packed for sea shipment and stored in Norway and Brazil as this is believed the most efficient means of mobilizing them in many cases versus disassembly to fly and then reassemble for deployment in the field. The 15k capping stacks are too large to move in any of the aircraft cited above fully assembled.

Primary Option	Backup Option
OSRL Norway RIsavika, Havnering 235 4098 Tanager, Norway Contact: 47-952-84-299/ 47-918-06-074	OSRL Brazil Avenida Rio de Janeiro, 780, Portão 24, MultiRIO Caju, Porto do Rio de Janeiro, Brazil, 20931-675 Contact: Vicente Allevato: vicenteallevato@oilspillresponse.com +55 24 99928 4890 Sergio Afonso: sergioafonso@oilspillresponse.com +55 24 99852 6045

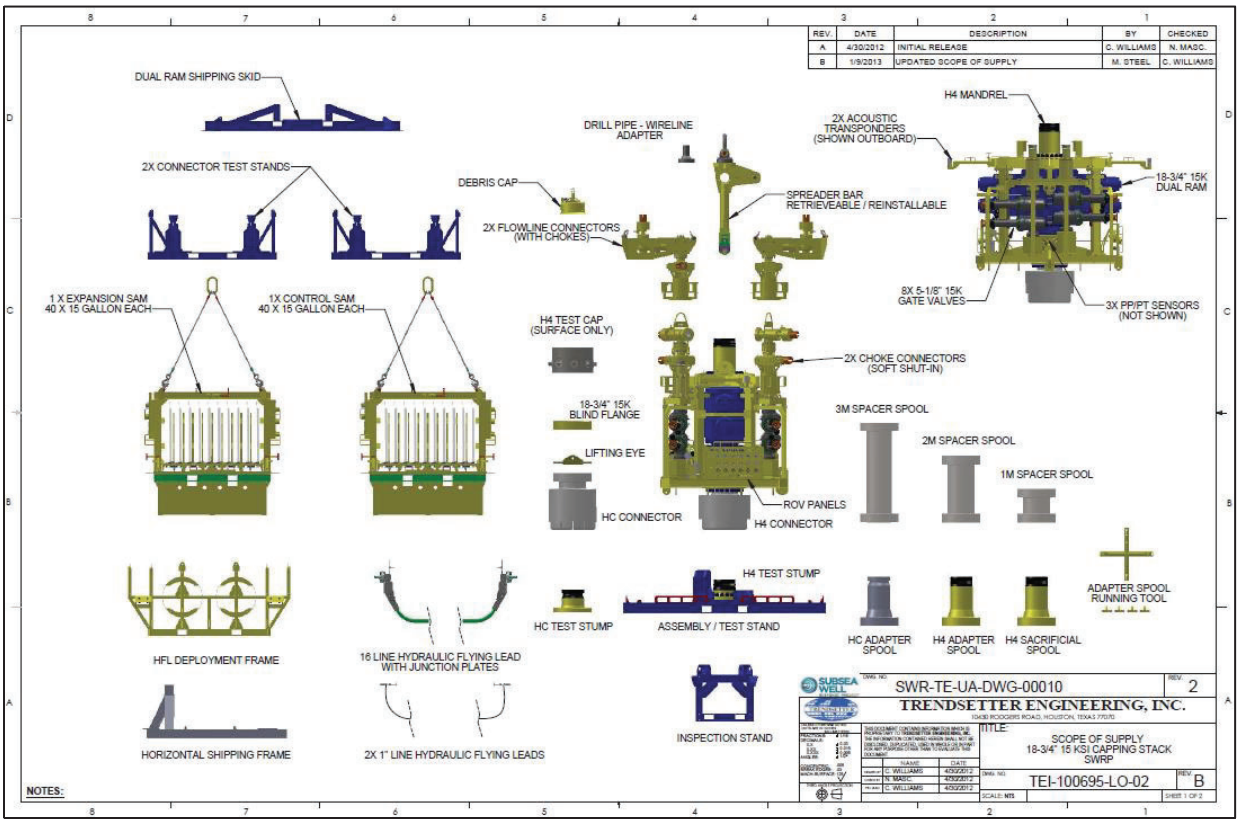
OSRL CSS Technical Specifications

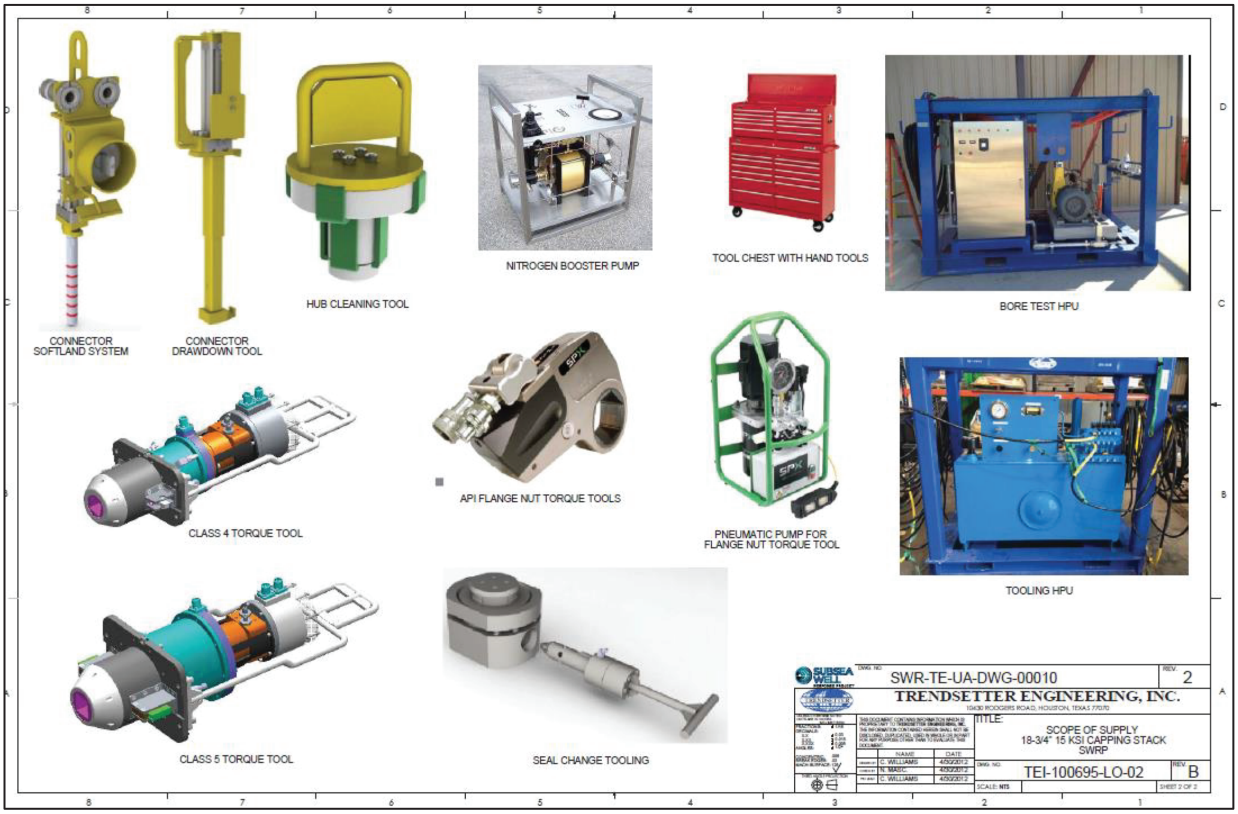


Location	Norway, Brazil,
Max Rated Water Depth (fsw)	10,000 fsw / 3,000 m
Rated Working Pressure (psi)	15,000
Dry Weight with Wellhead Connector (MT)	
Center Bore Size (inches)	18 3/4
Wellhead Connector Type(s)	HC, H4H4
Sealing Method	Two (2) 18 ¾'' Blind Rams
Actuator	Two (2) 14''
Outlets and Chokes	Four (4) 5 1/18'' outlets, Two (2) chokes
Maximum Discharge Rating (bpd)	100,000

Maximum Gas Oil Ratio (scf/stb)	2000
Temperature Rating (degrees F)	-2C to 150C

The scope of supply for both of the CSSs is pictured below:





Below is the packing list for the primary stack option, out of Norway, and further details can be found on OSRL's Electronic Data Management Site (EDMS):

https://oilspillresponse.sharepoint.com/dms/SitePages/Electronic-Document-Management-System.aspx

The 15k CSS is packaged in the Following Manner for Sea Shipment: this information should be shared with the Freight Forwarder and Clarksons marine vessel broker and included in the ERP.

Item	Packed Weight	Dimensions
Capping Stack (15 ksi)	146247 Kg	6.13 m x 5.96 m x 9.97 m
Container-1 Open Top	13596 Kg	6.10 m x 2.44 m x 2.60 m
Container-2 Open Top	13717 Kg	6.10 m x 2.44 m x 2.60 m
Container-3 (Tooling)	6716 Kg	6.10 m x 2.44 m x 2.60 m
SS Accumulator Module Master	17824 Kg	4.10 m x 2.37 m x 2.87 m
SS Accumulator Module Slave	16348 Kg	4.10 m x 2.37 m x 2.87 m
Hydraulic Flying Lead Rack	3892 Kg	4.88 m x 1.83 m x 2.38 m
Bore Test Hydraulic Power Unit	4304 Kg	3.05 m x 2.05 m x 2.22 m
Inspection Test Stand	3121 Kg	1.73 m x 1.73 m x 1.70 m
Tooling Hydraulic Power Unit	1031 Kg	2.08 m x 0.92 m x 1.65 m

Total Weight **227 MT** **Configured for Sea Shipment**

Addresses and Contacts for the CSS:

Norway	Brazil
OSRL (Norway)	OSRL (Brazil)
Risavika, Havnering 235	Avenida Rio de Janeiro
4098 Tananger, Norway	780, Portão 24, MultiRIO Caju,
Phones: 47-952-84-299	Porto do Rio de Janeiro, Brazil, 20931-675
47-918-06-074	55 24 99928 4890
Use Risavika Port, Tanager	55 24 99852 6045

In the event the 15k capping stack has to be flown by air from Norway and Brazil and not shipped by sea the packaging is as follows below and the logistics more complicated:

Item	Packed Weight	Dimensions
Container-1 Open Top (HC Connector)	18453 Kg	6.10 m x 2.44 m x 2.60 m
Container-2 Open Top (Spools)	18335 Kg	6.10 m x 2.44 m x 2.60 m
Container-3 Open Top (Flowline Conn.)	10088 Kg	6.10 m x 2.44 m x 2.60 m
Container-4-HD Open Top (Stack Parts)	20039 Kg	6.10 m x 2.44 m x 1.30 m
Container-5 Open Top (Test Cap, etc.)	17931 Kg	6.10 m x 2.44 m x 2.60 m
Container-6 Open Top (Valves, Funnel)	18105 Kg	6.10 m x 2.44 m x 2.60 m
Container-7 Open Top (Mandrels)	17104 Kg	6.10 m x 2.44 m x 2.60 m
Container-8 Open Top (Spacer Spools)	15806 Kg	6.10 m x 2.44 m x 2.60 m
Container-9 Open Top (Stack Parts)	9510 Kg	6.10 m x 2.44 m x 1.30 m
Container-10 Open Top (Stack Parts)	8072 Kg	6.10 m x 2.44 m x 1.30 m
Container-11 (Tooling)	7170 Kg	6.10 m x 2.44 m x 2.60 m
Skid 1 Choke Connector	6922 Kg	3.90 m x 2.14 m x 2.77 m
Skid 2 Flowline Assembly	5351 Kg	3.90 m x 2.14 m x 1.72 m
Skid 3 SS Accumulator Module Master	17824 Kg	4.10 m x 2.37 m x 2.87 m
Skid 4 SS Accumulator Module Slave	16348 Kg	4.10 m x 2.37 m x 2.87 m
Skid 5 Assembly Test Stand w/HC Stump	12525 Kg	6.13 m x 2.22 m x 1.37 m
Skid 6 Assembly Test Stand Parts	8779 Kg	6.13 m x 2.04 m x 1.08 m
Skid 7 Lower Frame w/Inj. Panel	5195 Kg	3.86 m x 2.35 m x 1.62 m
Skid 8 Lower Frame w/SSWH Panel	5666 Kg	3.86 m x 2.35 m x 1.66 m
Skid 9 Horizontal Shipping Frame	3634 Kg	4.36 m x 3.44 m x 1.62 m

Skid 10 BOP	29491 Kg	6.10 m x 2.29 m x 2.49 m
Skid 11 Hydraulic Flying Lead Rack	3892 Kg	4.88 m x 1.83 m x 2.38 m
Skid 12 Bore Test Hydraulic Power Unit	4304 Kg	3.05 m x 2.05 m x 2.22 m
Skid 13 Inspection Test Stand	3121 Kg	1.73 m x 1.73 m x 1.70 m
Skid 14 Tooling Hydraulic Power Unit	1031 Kg	2.08 m x 0.92 m x 1.65 m
Skid 15 Spreader bar	4694 Kg	3.66 m x 3.10 m x 1.43 m
Total Weight	**290 MT**	**Configured for Air Shipment**

Based on the above weights, 4 x Antonov AN-124 aircraft are recommended to mobilize the SIRT. Based on the size of the aircraft, they should be flown into Piarco Airport in Trinidad & Tobago and transferred to one of the EEPGL chartered supply vessels a spot hire Active Heave Compensated Crane (AHCC) vessel or Deep Water Drill Ship moved there depending on the specific circumstances.

The airport must have this following equipment available to offload the aircraft and transfer for it to trucks to the shorebase (should take no longer than 24 hours if properly planned to get it on the appropriate vessel):

- 13 x 40-ft Long bed Trucks and Tractor Heads
- 2 x 20 MT and 2 x 30 MT Cranes (or Acceptable Mix), 15 and 55 kip Forklifts
- Associated Lifting Gear, Slings, Shackles, Tie-downs, Crews
- Aircraft Landing & Road Permits worked in advance by Freight Forwarder

The back-up CSS would be the one located in Brazil and moved in a similar manner using similar aircraft, trucking and supporting gear and personnel. Along with the primary CSS mobilization of some additional CSS tool spare parts should be considered as this is often done in real situations.

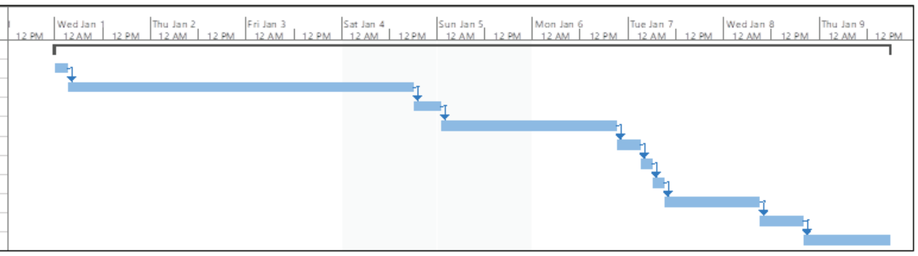
The Logistics for Loading and Shipping the CSS out of Norway / Brazil is as Follows:

The Estimated Timeline for Mobilization of the CSS by Sea is: ~3-4 weeks

• Notification, Paperwork, Charter Vessel, Load	3 Days
• Sail from Norway / Brazil to well-site	18 Days
Total	**21 Days + 3 Days Cont. = 24 days**

The Estimated Timeline for Mobilization of the CSS by Air is: ~1- 2 weeks

ID	Task Name	Duration
13	**OSRL AFCS**	**8.75 days**
14	Activation of Response	3 hrs
15	Capping Stack Equipment Mobilized	87 hrs
16	Load Equipment onto Aircraft	7 hrs
17	Flight time to POS	44 hrs
18	Unload Equipment from Aircraft	6 hrs
19	CS Transport to Port (SPOE)	3 hrs
20	CS Unloaded at Port (SPOE)	3 hrs
21	Capping Stack Function Test	24 hrs
22	CS Transferred and Secured to Vessel	11 hrs
23	CS Transported to WellSite	22 hrs



The air freight schedule assumes minimal issues disassembling and reassembling the CSS.

It is possible that a vessel used to mobilize the CCS from Norway and Brazil by sea may be different from the deployment vessel offshore.

CSS Stack Re-Assembly if Sent by Air: if the CSS is sent by airfreight, the following resources are needed to rebuild it upon arrival:

- Work Area of ~500 m2 adjacent to deployment vessel and with suitable hard standing
- Crane to rebuild and Lift Stack
- Generator to Power HPU (3 Phase, 400v, 60 Hz)
- Nitrogen to Charge SAMS (900 m3, 64 Cylinder, 4500 psi Rack)
- Shell Tellus 22 Hydraulic Oil (100 gallons)
- Empty IBCs (2)
- Pelagic 100 (750 Gallons)
- Yellow Paint (Carboguard 890 Yellow Paint Multi-Purpose Epoxy (Color Code #6666)
- Scaffolding for Man Access to the CSS
- Cherry Picker for Man-Lifts
- 25 MT Forklift
- 50 MT Forklift
- Spill Kit
- Spill/Oil Specific First Aid Kit
- Air Compressor (350 cfm @ 150 psi)
- Base Electrical Supply
- Spare Parts for Spare HPUs
- Lifting Slings & Shackles (Will Be Defined before Need)

CSS Deployment Vessel: the following marine vessel support is needed to deploy the CSS at the well control site. Recommend using Sea/Response subscription service with assistance from Upstream Logistics or reputable marine vessel charter service like Clarksons (contact details are provided below).

- Vessel with Active Heave Compensated Crane (AHCC) w/ Safe Working Load (SWL) and wire capacity for Installation at the required water depth (~148 MT heaviest load + wire weight)
- DP 2/3 Class
- Capacity for 2 x Work Class Remote Operated Vehicles (ROVs)
- Deployment Moonpool Advantageous – if no Moonpool available, ROV Launch and Recovery Systems (LARS, etc.) must be capable of launching ROV in desired weather condition. All identified vessels for this scope of work (SOW) should be capable of deploying ROVs and capping stack in 95% non-exceedance (nx).
- Base Dimensions = 5.9 m x 6.1 m x Height
- Total CSS Weight including test stand (148 MT) - a 250+ MT crane is needed due to wire weight and varying weather conditions (crane will be de-rated based on boom angle / length and weather criteria)

Sea/Response - Vessel Tracking Software Database and Features:
Subscription-based software application that delivers real-time emergency response vessel data to the offshore industry for intelligent vessel sourcing and incident response management.

- Addresses critical gap to rapidly identify response vessels (AIS tracking)
- Develop and maintain tailored vessel lists for enhanced tracking
- Trendsetter transitioning vessel software to Clarksons Marine Vessel Brokers
- This new version of the Sea/Response software will also include the identification and selection of PSVs, tankers, and oil spill response vessels.

Sea/Response is a source control planning tool that ExxonMobil (EM) users can access to expedite the selection of suitable vessels to perform capping stack missions. OSRL recommends using a capping vessel with a 250T crane that is suitable for subsea emergency operations. The attachment is a representative sample of capping vessels that have cranes suitable for deploying the CSS system based in Norway. For depths in excess of 2000m, and depending on the type of wire used by the vessel, some operators have recommended using vessels with cranes capable of lifting loads in excess of 400T.

EM users of Sea/Response will be able to identify potential capping stack vessels near the OSRL base to expedite a response. For detailed information on vessel specs and availability, EM users can contact Clarksons marine brokers to verify vessel specifications, configuration, capabilities, and consumables and to procure the vessel for the capping stack mission. For source control support and response, EM users can contact Trendsetter to augment source control teams and to facilitate source control mission planning.

Marine Vessel Issues to Consider for Mobilization of CSS:

- Does the vessel identified to collect the Capping Stack and SIRT components have suitable on board cranes capable of safely reaching and lifting equipment from the quayside?
- What are their lifting radii and SWL?
- Does the vessel identified have suitable deck load capacity?
- Does the vessel identified have suitable space to carry the components and accommodate the CSS?
- Is the vessel identified to collect the equipment capable of deploying it at the incident location?
- Will the equipment require transferring from the vessel of collection to the vessel of deployment?
- What is the crane capacity and maximum unit shipping weight if ship to ship or ship to shore transfer is required?

Name	Type	Owner	Built	Crane	Crane Size	ROV Class 1
Olympic Challenger	CONS	Olympic Shipping	2008	Yes	250	Work
Seven Pacific	CONS	Subsea 7	2010	Yes	250	Work
Normand Clipper	CONS	Solstad Offshore	2001	Yes	250	Work
Normand Seven	CONS	Solstad Offshore	2007	Yes	250	Work
Skandi Neptune	CONS	DOF Management	2001	Yes	250	Work
Olympic Zeus	CONS	Olympic Shipping	2009	Yes	250	Work
Seven Falcon	CONS	Subsea 7	2010	Yes	250	Observation
Skandi Skansen	CONS	DOF Management	2011	Yes	250	Work
Olympic Ares	CONS	Olympic Shipping	2013	Yes	250	Work
Grand Canyon	CONS	Volstad Maritime	2012	Yes	250	Work
Havila Phoenix	CONS	Havila Shipping	2009	Yes	250	Work

Siem Barracuda	CONS	Siem Offshore	2013	Yes	250	Work
Seven Mar	CONS	Subsea 7	2001	Yes	300	Work
Seven Oceans	CONS	Subsea 7	2007	Yes	350	Work
Aker Wayfarer	CONS	Ocean Yield	2010	Yes	400	Work
Akofs Seafarer	CONS	AKOFS Offshore	2010	Yes	400	Work
Normand Vision	CONS	Solstad Offshore	2014	Yes	400	Work
Skandi Acergy	CONS	DOF Management	2008	Yes	400	Work
Viking Neptun	CONS	Eidesvik Offshore	2015	Yes	400	Work
Deep Arctic	CONS	Technip Offshore UK	2009	Yes	400	Work

Clarksons – Sea/Response Contacts: for marine vessel charter arrangements and contracting

Source control and Sea/Response support			
Trendsetter Engineering	Brett Morry	(832)-279-3210	b.morry@trendsetterengineering.com
Trendsetter Engineering	Emergency Response Contact	(US): +1-713-955-9029	response@trendsetterengineering.com
Marine Vessel Procurement and Sea/Response Support			
Clarksons	Paul Love	+44 1224 256666 (work) +44 1224 256600 (24x7)	Paul.love@clarksons.com
Clarksons	Michael Braid	(713)-459-8646 (mobile) (713)-235-7400 (24x7) (713)-235-7469 (24x7)	Michael.braid@clarksons.com
Clarksons	Tyler Boje	(713)-634-9088 (mobile) (713)-235-7400 (24x7) (713)-235-7469 (24x7)	Tyler.boje@clarksons.com

Exploration Wells Campaigns: Tomas Kasa is the coordinator for vessel contracting for exploration drilling and can be reached at +592 623 2013and tomas.kasa@exxonmobil.com.

- **Marine Vessel Contracting Agreement**: Once a suitable vessel required for CSS mobilization and export to incident location has been identified, arrange for the Procurement department to issue a Purchase Order or contract agreement directly with Clarksons.

Upstream Logistics (UL) Regional Advisors for Support:

		Group	Contact Info
• Jon Regina	jonathan.regina@exxonmobil.com	Guyana Logistics Mgr	+592-620-0337

- Tom Wojahn thomas.p.wojahn@exxonmobil.com UOG Upstream Logistics 832-624-1360
- Len Coughlan len.w.coughlan@exxonmobil.com UOG Upstream Logistics 346-337-7419
- Dave Berry william.d.berry@exxonmobil.com UOG Upstream Logistics 281-744-1076

OSRL Subsea Intervention Response Toolkit (SIRT)

The SIRT equipment requires no disassembly or reconfiguration prior to mobilization. The SIRT equipment comes with the appropriate lifting shackles, slings and the latest inspection certificates.

The SIRT is broken into three (3) categories of mission specific equipment noted below, and further details can be found on OSRL's Electronic Data Management Site (EDMS):

https://oilspillresponse.sharepoint.com/dms/SitePages/Electronic-Document-Management-System.aspx

SIRT Debris Clearance and Site Survey Kit Packing List

The Debris Clearance and Site Survey Set includes various tools for removing debris to allow access for dispersant applications and work on BOPs, etc., as well as site survey tools including 2D/ 3D sonar.

Item Name	Length (mm)	Width (mm)	Height (mm)	Volume (cbm)	Weight (kg)	Value (USD)
Container 1	2991	2439	2591	18.90	4,140.80	1,273,872.49
Container 2	2991	2439	2591	18.90	3,276.44	521,671.08
Container 3	6058	2439	2591	38.28	9,309.42	598,533.24
Container 4	6058	2439	2591	38.28	8,855.86	410,148.68
Container 5	6058	2439	2591	38.28	7,763.19	513,288.02
Basket 1	3200	2510	2040	-	3,843.70	162,091.00
Basket 2	3200	2510	2040	-	3,843.70	162,091.00

SIRT Subsea Dispersant System Packing List

The Subsea Dispersant System allows for subsea application of oil dispersant at the wellhead to enhance the degradation of oil and create safer surface working conditions for response personnel.

Item Name	Length (mm)	Width (mm)	Height (mm)	Volume (cbm)	Weight (kg)	Value (USD)
Container 6	6058	2439	2591	38.28	9,377.96	1,004,510.30
Hydraulic Flying Lead 1	5480	2200	2772	-	4,050.00	267,757.57
Hydraulic Flying Lead 2	5480	2200	2772	-	4,050.00	267,757.57
Hydraulic Flying Lead 3	5480	2200	2772	-	4,050.00	267,757.57
Hydraulic Flying Lead 4	5480	2200	2772	-	4,050.00	267,757.57

SIRT BOP Emergency Intervention System Packing List						
The BOP Emergency Intervention System is to be used in the unlikely event that the rig fails to close off the BOPs.						
Item Name	**Length (mm)**	**Width (mm)**	**Height (mm)**	**Volume (cbm)**	**Weight (kg)**	**Value (USD)**
Container 7	6058	2439	2591	38.28	9,411.68	520,383.05
Container 8	6058	2439	2591	38.28	9,883.17	514,572.34
Subsea Accumulator Module Master	1880	1480	3340	-	8,160.00	492,860.72
Subsea Accumulator Module Slave 1	1880	1480	3340	-	11,220.00	492,860.72
Subsea Accumulator Module Slave 2	1880	1480	3340	-	11,220.00	492,860.72
Subsea Accumulator Module Slave 3	1880	1480	3340	-	11,220.00	492,860.72
Spreader Bar	3000	1900	500	-	810.00	89,545.12

The locations of the OSRL SIRTs for Guyana are:

Primary Option	Backup Option
Address: OSRL Norway RIsavika, Havnering 235 4098 Tanager, Norway Primary Contact Duty Manager Southampton + 44 23 8033 1551 Local Contact: Base Manager 47-952-84-299 Airports: Stavanger Sola (SVG) Oslo (OSL)	Address: Oceaneering Brazil Base Operacional de Macae Rua Lady Esteves da Conceicao, 1020 Novo Cavileiros, Macae CEP 27933-420 Contact: 55 (22) 2757-9550/9551 55 (22) 99213-0937 (After Hours) Airports: Rio de Janeiro Galeao (GIG) Cabo Frio (CFB)

The Estimated Timeline for Mobilization of the SIRT: ~6-8 days

Task Name	Duration
OSRL SIRT	**6.29 days**
Activation of Response	3 hrs
SIRT Equipment Mobilized	30 hrs
Load SIRT onto Aircraft	6 hrs
Flight time to POS	44 hrs
Unload SIRT from Aircraft	7 hrs
SIRT Transported to Port (SPOE)	3 hrs
SIRT Transferred and Secured to Vessel	12 hrs
Deploy and Install SIRT	24 hrs
Transit to Wellsite	22 hrs

Shipping the SIRT system by air from Brazil is expected to take up to several days longer due to complex customs clearance and exporting issues..

Note: the SIRT in Norway can be flown out of Stavanger (SVG) Sola Airport or Oslo (OSL) Airport. The SIRT in Brazil can be flown out of Cabo Frio (CFB) Airport or Galeao (GIG) Int'l Airport. All offshore containers with the SIRTs are certified with the appropriate lifting shackles and slings with the latest inspection certificates available from OSRL. This applies to the CSS Package's as well.

All of the items on the SIRT and Capping Stack are loadable into a combination of Boeing 747-F, Ilyushin IL-76 or Antonov AN-124 aircraft to be confirmed with the freight forwarder. If a 747-F is used it must be factory built with a nose loading door and not a converted passenger aircraft to cargo aircraft. If a 747-F is used a Main Deck Loader (MDL) may be available for this aircraft type. In Brazil, this is at Macae; a AN-124 or IL-76 aircraft would be needed out of Galeao in Rio de Janeiro. Aircraft of 747-F cannot be used out of Sola Airport in Stavanger as this airport can only accommodate aircraft with onboard cranes. Oslo may be needed in this situation.

Based on the above weights, 1 x Antonov AN-124 and 1 x IL-76 each of aircraft are recommended to Mobilize the SIRT Based on the size of the aircraft, they should be flown in for transfer to one of the EEPGL chartered supply vessels or a spot hire vessel depending on the specific circumstances. Airport must have the following available to offload the aircraft and transferred to trucks to the shorebase. Depending on the circumstances, this should take no longer than 6-8 hours if properly planned to get it on the appropriate vessel:

- 4 x 40-ft Long bed Trucks and Tractor Heads
- 2 x 20MT Cranes (or Acceptable Mix), 15 and 55 kip Forklift
- Associated Lifting Gear, Slings, Shackles, Tie downs, Crews
- Aircraft Landing & Road Permits worked in advance by freight forwarder under contract

Since 2 x aircraft are needed, the AN-124 can be flown with a lesser load out of Stavanger and avoid trucking to Oslo. Fully loaded AN-124 cannot be flown in and out of Stavanger and must go to Oslo. The back-up SIRT would be the one located in Brazil and moved in a similar manner using similar aircraft, trucking and supporting gear and personnel.

The following equipment is needed to be provided by EEPGL from other third parties to work with the SIRT equipment and it is assumed flown into (if not there already) to meet up and sail with the SIRT equipment:

The following is a list of equipment is to be provided by EM and third parties in order to use the SIRT equipment offshore:

- *2x Work Class ROVs - rated to 3000 m & 96 lpm @ 3000 psi w/toolings, w/100 kg carrying capacity, RS-485 or RSD-232 communications, and 110v or 230v & 24v power*
- *Support vessel capable of 28,000 kg lifts with 3,600-25,000 kg or higher rated deployment crane (or up to full capping stack weight of 150 MT)*
- *20-40 gallons of Tellus 22 mineral oil or similar*
- *Downline to operate debris clearance/grappler tools to 3000 m (self plus 18,000 kg lift)*
- *2 inch Coil Tubing Unit - rated to 3000 m, 110-220 lpm dispersant injection w/box interface (requires Grayloc connector to fit either a 1-1/2-in AMMT-S box or 2-3/8-in PAC DSI box on the Coiled Tubing Termination Head-to be sent with both)*
- *Pump for dispersant injection w/CTU*
- *Corexit EC9500A dispersant*
- *Locator beacons for Coil Tubing Termination Head & SS Dispersant Manifold plus spares*
- *Nitrogen for precharge of the 6 x 100 gallons SS bottles (600 gallons @ 7500 psi) (It may be best to precharge the unit before loading it on a vessel)*
- *Stack Magic to charge the SS accumulator of 400 gallons*
- *2 x tool baskets (1.8 m x 2.2 m x 0.5 m or larger)*
- *17H High Flow Receptacle at SS BOP*
- *Deck space for 2 x 10-ft, 6 x 20-ft containers, 4 x 20-ft deployment racks, 4 x 5 m x 5m SS accumulators*

OSRL Global Dispersant Stockpile

Approved for use in Guyana is the dispersant, Corexit EC9500A. 21 cubic meters are spread across our PSV and Tug Fleet and an additional 45 cubic meters stored at Georgetown Guyana at the GYSBI Shorebase.

Note: The OSR Plan contains pre-authorization for Corexit, but requires specific approval on the day we wish to use.

Corexit on the Vessels: 5,580 gallons
Breakdown Per Vessel is as follows:

Esso Guyana Dispersant Totes

Tote number	Quantity (gallons)	Date transferred	Container test date	Vessel
504316	250	8/14/2018	18-May	Sanibel Island
504317	330	8/14/2018	18-May	Cat Island
504318	330	8/14/2018	18-May	Robert Adams
505321	330	8/14/2018	18-May	Clarence Triche
504322	250	8/14/2018	18-May	Paradise Island
504323	330	8/14/2018	18-May	Eland
504324	250	8/14/2018	18-May	Horn Island
504326	250	8/14/2018	18-May	Oryx
504327	250	8/14/2018	18-May	Guyana Hero
504330	330	8/14/2018	18-May	Sanibel Island
504292	250	8/14/2018	18-May	Russell Adams
504294	330	8/14/2018	18-May	Jack Edwards
509207	350	12/15/2019	19-Feb	Amazon
512418	350	12/16/2019	19-Aug	Liberty 308
512304	350	12/16/2019	19-Jul	Seaways 20
512410	350	1/2/2020	19-Aug	Gary Rook
512396	350	12/20/2019	19-Aug	O'Rourke Tide
512306	350	12/21/2019	19-Aug	Springbok

Dispersant Applicator Nozzles

Vessel Name	Dispersant Nozzle
CAT ISLAND	√
HORN ISLAND	√
ELAND	√
PARADISE ISLAND	√
SANIBEL ISLAND	√
ORYX	√
CLARENCE TRICHE	√
JACK EDWARDS	√
ROBERT ADAMS	√
SPRINGBOK	√
GARY ROOK	√
RUSSELL ADAMS	√
AMAZON	√
GUYANA HERO	√
O'ROURKE TIDE	√
LIBERTY 308	√
SEAWAYS 20	√
2 in Warehouse	

GYSBI Shore Base in 20' Sea Containers
34 Tote Tanks w/ 350Gal Per Tote (11,900 Gallons)

The remaining 535 cubic meters (406 totes) stored in Houston. Stock Pile getting ready to ship late Feb/early March 2020 for mobilization to Guyana for storage in EEPGL Operations Warehouse at GYSBI.

OSRL Global Dispersant Stockpile: a stock of 5000 m3 of dispersant is available at various sites around the world to provide ~30 days of response use during an incident. RussellThorn@oilspillresponse.com is the main contact for OSRL UK Dispersant Stockpile (44-7765-243882 Southampton, UK).

The current volume of available dispersant is:

• 500 m3 (3145 Bbl.) Dasic Slickgone NS	OSRL Base in Southampton, UK
• 500 m3 Finasol OSR 52	OSRL Base in Southampton, UK
• 350 m3 (2200 Bbl.) Dasic Slickgone NS	OSRL Base in Singapore
• 350 m3 Finasol OSR 52	OSRL Base in Singapore
• 1500 m3 (9435 Bbl.) Finasol OSR 52	Supplier Warehouse, Vatry, France

• 800 m3 (5030 Bbl.) Finasol OSR 52	OSRL Base Saldanha, South Africa
• 500 m3 Corexit EC9500A	Sites in Sunrise, Florida, USA
• 500 m3 Corexit EC9500A	Sites in Rio de Janeiro, Brazil

Note: 100% of the dispersant stockpile can be mobilized for a single event anywhere needed by an OSRL member company. It is packaged in 1m3 IBC containers (1.2 m x 1 m, 1.1 m). The main airports in Capetown, Vatry, Miami and Rio can accept all wide body 747, IL-76, and AN-124 aircraft.

For aircraft an AN-124 can handle about 90 IBCs, IL-76 38-40 IBCs and 747-F about 42-80 IBCs each.
Some 747-F can only carry the lesser amount when operated by some airlines. Hence, to move 500m3 (3 days of supply subsea) it would take 6 x AN-124 aircraft at a total cost of ~$6.5 M USD to move by air, arriving at the well site in ~2 weeks. Wider mobilizations are likely to be needed.
Initial mobilization of dispersant is expected from the OSRL Base in Southampton, UK and trucked 1-2 hours to Heathrow airport. Dispersant cargo can be loaded on to chartered Antonov AN-124 aircraft. Large aircraft can also fly in and out of East Midlands or Doncaster in Central England.

The EEPGL affiliate is responsible per the base OSRL to mobilize any dispersant needed. OSRL claims ~48 hours are needed to mobilize dispersant from Southampton to the incident location from notice of need to arrival. It may be up to 14 days to get 500 m3 to the well by air from Europe.

OSRL Containment Toolkit

The OSRL Containment Toolkit is deployed in the event a well shut-in is not possible in order to enable the flow of well hydrocarbons from the capping stack to an offloading tanker. It is usable with a wide range of Mobile Offshore Drilling Units (MODUs) and is designed to supplement standard industry well test equipment.

How it works: from the capping stack, hydrocarbons are directed through the Flowline End Termination (FLET) via a flexible jumper then via a flexible flowline to a flow spool assembly and a standard well testing riser to the MODU. Hydrate prevention chemicals can be supplied via coil tubing to a Chemical Distribution Assembly (CDA) and then to the FLET.

The CT is rated to 3,000 m, 130 degrees Celsius, up to 500ppmV H2S and contains the following items, pictured below:

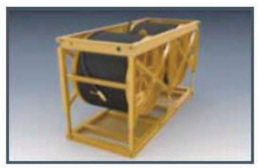
Flowline end termination (FLET)
Subsea hardware installed at the end of flexible flow lines to enable ROV operated functions, venting functionality and pressure control.
Size: 6.2m x 2.5m x 3m
Weight = 32 tonnes

Flow spool with subsea test tree latch
Assembly that connects the flexible flowline to a standard well testing riser and interfaces with standard wellhead foundation and MODU BOP equipment.
Size: 4.3m x 3.7m x 3.8m,
Weight = 43.5 tonnes

Diverless subsea connectors
Standard ROV operated subsea hardware used to connect flexible flowlines to a capping stack, FLET, flow spool assembly and burst disk trees.
Size: 1.6m x 1.2m x 1.9m
Weight = 3.3 tonnes

Coiled tubing termination head (CTTH)
A hydrate inhibitor distribution hardware suspended from the coiled tubing to de-couple the dynamic section of the coiled tubing riser from the static CDA.
Size: 1.5m x 1.1m x 1.8m
Weight = 3 tonnes

Chemical distribution assembly (CDA)
Hardware for distribution of hydrate inhibitor to the FLET and/or to the capping stack.
Size: 2.5m x 2m x 2.3m
Weight = 6 tonnes



Deployment reels for flying leads
The 1" and 2" flying leads are coiled on deployment reels for safe subsea installation of flying leads between the CTTH, CDA, capping stack and the FLET, for hydrate inhibitor supply to the cap or FLET(s).
Size: 6.2m x 2.4m x 2.6m
Weight = 12 tonnes

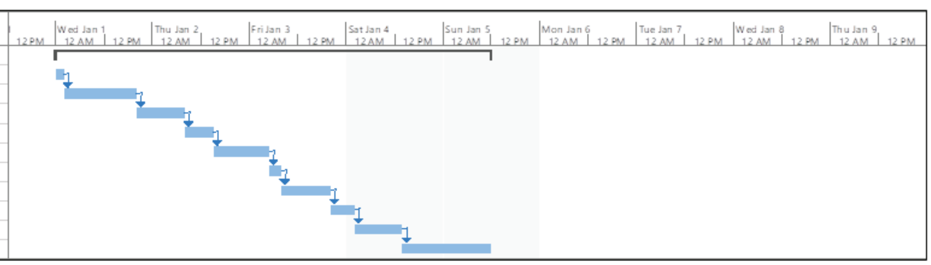
Hose end valves (HEV)
End valves on the marine offloading hoses for safe coupling to the offloading tanker.
Size = 1.5m x 1.8m x 1.1m
Weight = 2.5 tonnes

Flexible jumpers / flowlines
Connect pipe between the capping stack, FLET and the flow-spool assembly.
Inner diameter = 6"
Lengths = 250m, 850m, 1200m

B&C Global Rapid Intervention Package (GRIP) w/ RapidCap Capping Stack

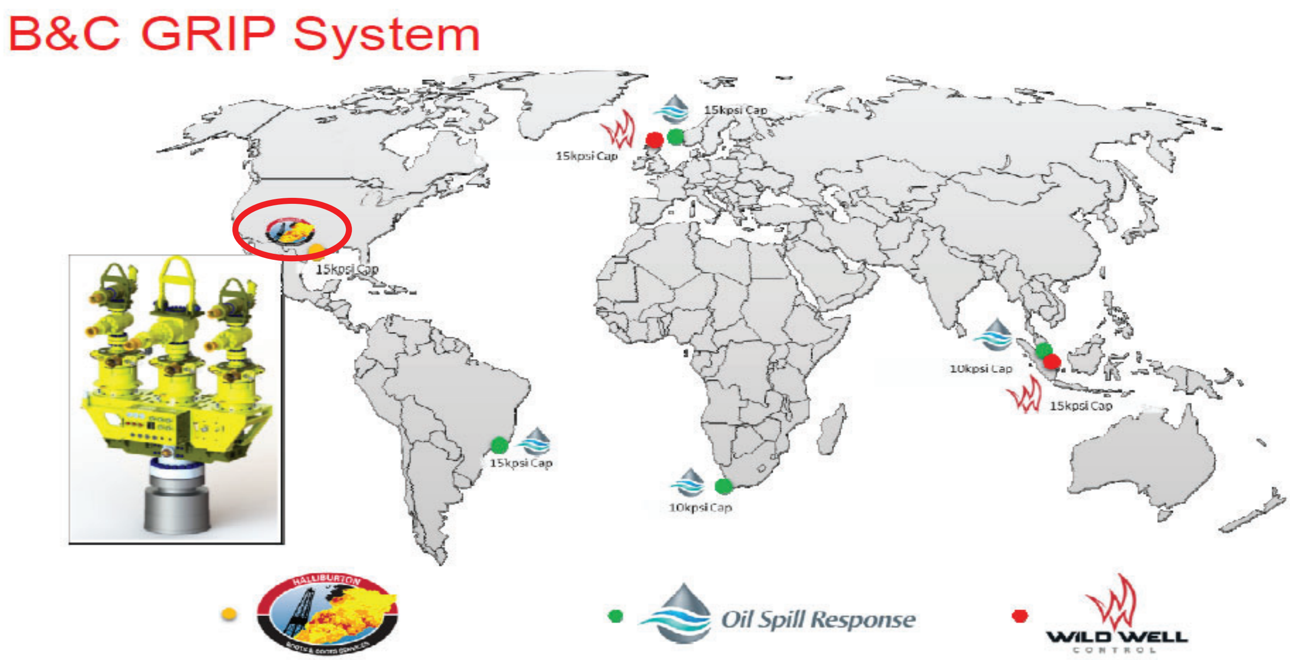
Boots and Coots storage location is in Houston with a 5-6 days CSS response time to the field by air.

ID	Task Name	Duration
36	**B&C GRIP Capping Stack**	**4.5 days**
37	Activation of Response	2 hrs
38	Aircraft sourcing and transit	18 hrs
39	Load out GRIP onto Aircraft	12 hrs
40	Flight time and customs clearance	7 hrs
41	Unload GRIP from Aircraft	14 hrs
42	GRIP Transported to Port	3 hrs
43	Reassemble GRIP CS	12 hrs
44	CS Pre-deployment test	6 hrs
45	Load CS to Vessel and Seafasten	12 hrs
46	Transit to Wellsite	22 hrs



System is 747-flyable and would need to go to Trinidad and then be transported to the well location by supply vessel from the Chagterms facility currently being used for operations.

Boots & Coots Equipment Storage Location



The GRIP is an air-mobile equipment package and includes the RapidCap Capping Stack.

GRIP RapidCap Capping Stack Specifications	
	
Location	Houston
Max Rated Water Depth (fsw)	12,000
Rated Working Pressure (psi)	15,000
Dry Weight with Wellhead Connector (MT)	40
Center Bore Size (inches)	7 1/16
Wellhead Connector Type(s)	15K DX 18 ¾’’ Bore, H4 Profile, 27’’ mandrel connector
Sealing Method	Two (2) 7 1/16’’ gate valves
Outlets and Chokes	Four (4) 5 1/8’’ gate valves, Two (2) 5 1/8’’ chokes
Maximum Discharge Rating (bpd)	330,000
Maximum Gas Oil Ratio (scf/stb)	684
H2S Content	Unlimited
CO2 Content	<30 ppm
Temperature Rating (degrees F)	350

The modular design of the GRIP components enables mobilization with a single Boeing 747-800F or Antonov 124 aircraft and/or on six (6) flatbed trucks.

The suggested loads from B&C are in the following tables, starting with the overall load weights and including the four (5) Load Lists: Capping Stack, Debris Removal, Subsea Dispersant Kit, BOP Intervention Kit and Job Box.

Lashing is responsibility of the truck driver and materials should include load rated chain, ratchet style binders and 4'' soft web ratchet straps.

Overall Load Weights	
Flatbed Truck Load	**Total Cargo Weight (lbs)**
1	16,500
2	20,837
3	43,600
4	52,254
5	58,301
6	10,000
Combined Load Weight	201,492 (101 tons)

B&C Job Box Load List							
Truck #	**Item Name**	**Length (in)**	**Width (in)**	**Height (in)**	**Skid Type**	**Weigh t (lbs)**	**Value (USD)**
6	Job Box – Response Kit	96	96	118	Container	10,000	

B&C RapidCap Capping Stack Load List

NOTE: The overall width of the diverter section may render this as a **permit required load.**

Truck #	Item Name	Length (in)	Width (in)	Height (in)	Skid Type	Weight (lbs)	Value (USD)
4	Capping Stack – Diverter	156	126	116	Pallet	52,254	
2	H4 Connector w/ Test Stand	96	96	100	Skid	35,715	
5	TC7/5 Conns w/ stand	173	84	117	Skid	22,586	
5	TC7/8 Conn w/ stand	173	84	113	Skid	16,628	

B&C Debris Removal Load List

This package includes Model 2500 Genesis GXP Subsea Hydraulic Shears (with jaws capable of opening 46 inches reaching 21’ 9’’ and a depth of 48’’) as well as a Super Grinder.

Truck #	Item Name	Length (in)	Width (in)	Height (in)	Skid Type	Weight (lbs)	Value (USD)
3	GENESIS Shears	216	107	60	Pallet	32,000	
1	Cylinder for shears	134	34	45	Crate	11,200	
2	Rigging for shears	79	79	35	Crate	2,365	
2	Super Grinder	45	32	18	Case	140	

B&C Subsea Dispersant Kit Load List

This kit includes two (2) 500’ 1’’ hydraulic flying lines, a Hydraulic Flying Lead (HFL) deployment frame, a Coil Tubing Termination Head (CTTH) and remotely operated vehicle wands.

Truck #	Item Name	Length (in)	Width (in)	Height (in)	Skid Type	Weight (lbs)	Value (USD)
2	Coil Tubing Termination Head	36	33	53	Crate	808	
3	Hydraulic Flying Leads Deployment Frame w/ Hose and Wands	184	96	99.5	Skid	11,600	
1	Hydraulic Flying Lead Frame Mudmat	184	96	40	Skid	5,300	

B&C BOP Intervention Kit Load List

This kit includes a subsea Hydraulic Power Unit (HPU) with 50 gpm c/w API RP 17W ROV hot stabs.

Truck #	Item Name	Length (in)	Width (in)	Height (in)	Skid Type	Weight (lbs)	Value (USD)
3	BOP Intervention Skid	81	61	27	Skid	1600	

Boots & Coots Grip RapidCap Capping Stack System			
Name	**Position**	**Phone**	**Email**
Gary Barbee	Director	(713) 851-6947	Gary.Barbee@halliburton.com
Guy Fox	Senior Product Manager	(281) 536-0848	guy.fox@halliburton.com
Leo Portillo	Operations Manager	(281) 814-0667	LeonardoJ.Portillo@halliburton.com
Andy Cuthbert	Global Engineering & Technology Manager	(832) 652-6057	Andy.Cuthbert@Halliburton.com
Mike Patton	Well Control Specialist	(281) 217-5010	mpatton@boots-coots.com
	24/7 On-Duty Call Center	(281) 931 8884	

MAJOR COMPONENTS OF LOGISTICS PLAN

Section	Description	Components
Equipment Status/Mobilization Preparation	In this section we identify the pre-established arrangement that have been made to help ease the mobilization of the capping stack and ancillary equipment	• Modular Packaging of the equipment • Aircraft Details and Specifics • Load Plans per aircraft • Manifests for loads
Origin Responsibilities	The responsible parties are: Wild Well, Client, Equipment Specialists and Third Party Service Providers.	• Mobilization initiation • Authorization to Charter Aircraft • Origin equipment Movement, i.e. loading and trucking services • Airport Operations • Export Operations / Documentation Control **For Sea Freight Deployment:** • Deployment Vessel Chartering • Quayside Activities • Equipment Stack up Activities • Vessel Loading • Sea Fastening
Destination Responsibilities	The responsibilities of each of the involved parties at the incident locations nearest port of operation as defined by the client. This will define the handover of responsibilities.	• Customs Importation • Airport operations • Final Delivery to Quayside, trucking from Airport • Quayside Facility and Operations • Stack up of equipment • Sea Fastening and Vessel loading

Airport & Aircraft Information – POS Airport – Piarco

1. Piarco Port of Spain Trinidad: 10,500-ft runway can be accessed 24 hours and accepts up to a Boeing 777 Antonov AN-124, Ilyushin IL-76 and Boeing 747 Aircraft. Can move up to 75mt load from there on roads up to 10-ft wide and 12-ft high without special permit. Larger loads requiring onwards movement by road may require special permits and approvals from the utility companies and gov't road authorities (Ramps can assist here) 48hrs notice is necessary to have the runway prepared and ensure there are no other aircraft within radius of landing. Proper PPE is required.

2. Space to park and work cargo for large Charter Aircraft - the South Terminal of the airport serves cargo flights, general aviation and helicopter flights. It has fourteen parking positions. Once the work area is requested within 48hrs, it will be allocated for use.

3. Container loaders, also known as cargo loaders or "K loaders", are used for the loading and unloading of containers and pallets into and out of aircraft. The loader has two platforms which raise and descend independently. The containers or palettes on the loader are moved with the help of built-in rollers or wheels. The heaviest piece as shown is 29tonnes and the max capacity of the K loaders varies up to 50 tonnes.

4. Maximum Lift Capacity of Forklift Used For Offloading Cargo - 25ton Forklift will be utilized

5. Containers must be fitted with Fork pockets (receivers) in the base as shown in the picture:

6. EEPGL contracted logistics supplier will be contracted to offload the aircraft who will either perform the work directly or arrange the services of a sub-contracted provider.

7. With prior notice (48hrs) the Airport Authority and customs officials can have the aircraft operate at any time 24/7.

Secondary Airport name and location: there is no back-up airport capable of landing a heavy lift cargo aircraft of large size (Boeing 747, Antonov An-124 etc.) in Trinidad/Tobago or Guyana.

Cheddi Jagan, Georgetown, Guyana: 7500-ft runway; can be 24 hours, Accepts up to Boeing 767 Loaded to 80 MT, Airbus 320 & AN-12 and IL76 aircraft are also feasible. Local road loads up to 50 MT are allowable. Cranes are available to 50 MT.

Aircraft Capacities	**Cargo Door**	**Width**
• Boeing 747-F	112 MT	(Requires Nose Door)
• Ilyushin IL-76	46 MT	
• Antonov AN-124	120 MT	36 m x 6.4 m x 4.4 m (Onboard Crane)

Volga Dnper Unique Air Cargo - a British firm, manages one of the world's largest fleet of 17 x AN-124 aircraft and may be one of the most-fit for purpose suppliers for these aircraft, especially for mobilizations out of the UK, Europe or Norway (44-0-1279-682-100). Walid Bouazra / Jonathan Morris / Mike Witterick of ExxonMobil Procurement are the lead contacts for chartering of aircraft. Email contacts are: walid.bouazra@exxonmobil.com / jonathan.morris@exxonmobil.com / mike.witterick@exxonmobil.com and can be reached at +592 620 0318 / +1 832 452 2698 / +1 281 900 2899.

Volga Dnepr Unique Air Cargo
Contact: Robert Williams / Email: robert@cvolga-dnepr.us
Phone: 832-585-8611 / Mobil: 713-240-9646
MSA #A2541085 Agreement Exp. 01/15/2021

Alternative aircraft providers and solutions may also be available through contacting Freight Forwarders or a specialist Air Charter broker:

Air Charter Services
Contact: Dustin Roades
Director - ACS Texas
Tel 24 Hour: +1 281 552 8382
Mob: +1 713 409 3407
Email: dustin@usa-aircharter.com

Port Information

1. **Georgetown, Guyana (John Fernandes)**: new 150m wharf with 8-9m draft at high tide and 6.4m at low tide. Rated to 200MT on wharf. Several bridge load capacities between the airport and port are unknown and questionable.

2. **Georgetown, Guyana (GYSBI):** new 195m wharf with 8-9m draft at high tide and 6.5m at low tide. Rated to 4.5MT sq/m on wharf. A new Heavy Lift Dock is in the planning stage and will have 7.5MT sq/m once completed. Several bridge load capacities between the airport and port are unknown and questionable.

   - Passes and safety orientation must be issued to personnel planning to enter or work at the port facility. These passes can be obtained in advance. Proper PPE is required.

- Quayside maximum load limit
  - 4.5MT sq/m

- Length of Quayside
  - 190m / 640ft of Berth

- Number of Berths
  - Two (2) Berths

- Maximum Crane Capacity at this port
  Kobelco CKE-1800: / Max = 68.0te @10m radius / Min = 12te @ 38.6m radius
  Kobelco CK-1600: / Max = 60.8te @9m radius (based on structural over stability) / Min = 10.2te @ 34.8m radius (based on structural over stability)

- Minimum Draft at the Port Quayside Dock at Low Tide
  6.5 Meters Chart Datum

- Fuel Available & Hours of Operations
  - Fuel is available via SOL Fuel Terminal Just Up river from GYSBI Dock
- Laydown Area for Staging Shipment – If yes, how much space is available?
  - Laydown Space can be made available for this type of an event – 10 Acre Yard Complex
- Typical advance time to book a berth in terms of traffic at port.
- No Advance Required – ExxonMobil controls the berth

3. **Port of Spain - Chaguaramas, Trinidad (Primary)**: Shorter wharfs to 200-300m and at 10.5m draft as well. Wharf load capacity is to 350MT. They are restricted in use to shore cranes rated to 250MT. This facility can handle the SIRT and CSS system here as verified by RAMPS. EEPGL Logistics maintains an office and presence at Chaguaramas under a support contract with Chagterms, the facility operator. There are shore cranes in Trinidad rated to 750MT.

- Any access or egress restrictions into and out of the port
  - No restrictions to get into the port. Proper PPE is required
- Quayside maximum load limit
  - 10 tonnes per sq. ft.
- Length of Quayside
  - Main Dock - 270 Metres / 900 Feet
  - South Dock – 120 Metres / 400 Feet
- Number of Berths
  - 3 Berths
- Maximum Crane Capacity that can be hired locally to work at this port
  - Upon request of the size of Crane, Chag Terms can accommodate the 750T Crane
- Max Draft at the Port Quayside Dock at High Tide
  - 10.5 Meters / 34.50 Feet
- Minimum Draft at the Port Quayside Dock at Low Tide
  - Tidal range from 0.7 Metres of 2.3 Feet
- Fuel Available & Hours of Operations
  - Fuel stations are ready on the dock and fuel can be obtain 24/7 with sufficient notice to the Port of quantity and date (48 hrs).
- Laydown Area for Staging Shipment
  - Storage yard holds up to 200,000 sq. feet. Available will be approximately 20,000 Square foot (1,858 sq. meters)
- Berth bookings should be done 48-72hrs in advance. Vessel traffic and congestion fluctuates.

4. **Port of Spain and Port Point Lisas, Trinidad (secondary)**: 300-500m wharfs and 12.8 m draft. Rated for loads to 350MT. Provisions can be made for heavier loads. Typical loads to 100MT are handled on a tandem lift with shore cranes. Loads up to 500MT can be lifted with ship cranes. There are shore cranes on the island rated to 650MT.

- Access Passes and safety orientation must be issued to personnel planning to enter or work at the port facility. These passes can be obtained in advance. Proper PPE is required

- Quayside maximum load limit
    - Awaiting information from the port but don't expect any issues due to weights of cargo listed above

- Length of Quayside
    - 650m of Berth

- Number of Berths
    - Eight (8) Berths

- Maximum Crane Capacity that can be hired locally to work at this port
    - MC Linkbelt Mobile Harbour Crane 1 x 99.5T (under hook beam @ 22 ft.)
    - Demag Mobile Harbour Crane 1 x 100T @ Radius 16.4 ft.
    - FMC Linkbelt Mobile Harbour Crane 2 x 27.8T @ Radius 12 ft.

- Max Draft at the Port Quayside Dock at High Tide:
    - The Grier Channel is approximately 8km in length, with a dredged depth of 12m CD. The width of the Channel is 122m. There are 20 Aids to Navigation Buoys marking the Channel. Each pair of buoys is spaced approximately 800m apart. The Channel opens up into a Turning Basin approximately 550m in diameter. The depths alongside the marginal wharf vary from -9.75m at Berths 1-5 and Berth 8, and a depth of -12m for Berths 6-7. The elevation of the top of the wharf is approximately +3.0m

- Minimum Draft at the Port Quayside Dock at Low Tide
    - Mean Higher High Water = 1.1m
    - Mean Lower Low Water = 0.4m
    - Chart Datum = 0m

- Fuel Available & Hours of Operations
    - Fuel is available via Trucks. A request must be made 72hrs in advance to the fuel company and quantity of Fuel must be confirmed. With the approval of the port, these will be brought in by tanker trucks. Each Truck contains a capacity of approximately 20,000 litres

- Laydown Area for Staging Shipment – If yes, how much space is available?
    - 2.19 hectare (Approx. 236,000 sq. ft.) of covered storage for Bulk Cargo

- Typical advance time to book a berth in terms of traffic at port.
    - Due to congestion at this port, 4 Days' notice will be sufficient to have a berth available.

Port Lisas (alternate):

- Any access or egress restrictions into and out of the port
  - A list of names and id's must be submitted 24 hrs in advance of persons entering the port to have access granted with no delay on the day of arrival. Proper PPE is required

- Quayside maximum load limit
  - Awaiting information from the port but don't expect any issues due to weights of cargo listed above

- Length of Quayside
  - 400M long, 15 meters in width.

- Number of Berths
  - 1 Berth

- Maximum Crane Capacity that can be hired locally to work at this port
  - Upon request, a service provider can mobilize any size crane. No limitations

- Max Draft at the Port Quayside Dock at High Tide
  - 11 Metres

- Minimum Draft at the Port Quayside Dock at Low Tide
  - 10.5 Meters

- Fuel Available & Hours of Operations
  - Fuel is available via Trucks. A request must be made 72hrs in advance to the fuel company and quantity of Fuel must be confirmed. With the approval of the port, these will be brought in by tanker trucks. Each Truck contains a capacity of approximately 20,000 litres

- Laydown Area for Staging Shipment – If yes, how much space is available?
  - 150,000 Square feet available at the key side, 40,000 square feet available for covered warehouse storage and 120,000 metres available on site

- Typical advance time to book a berth in terms of traffic at port
  - Traffic is minimum, berthing notice of 48 hrs.

Loads up to 75MT and no more than 10ft wide and 15ft high can be moved on roads without special permits in Trinidad. Travel through Trinidad involves double import and exporting from Brazil and Norway into Guyana.

Trinidad Road Information:

- Maximum Weight limit for cargo load
    - No restrictions based on weight of cargo listed in the equipment packages above.

- Maximum Height of the Cargo going down the roadway before escorts and electrical linesman are required
    - Maximum travelling height will be 15ft. Highest load from cargo listed above is 2.87M (9.4 feet).

- Maximum dimension (Height, Width) that does not require a permit
    - 15ft height. The width must not exceed the width of the trailer which is 8ft. Widest load from cargo listed above is 3.44M (11.3 ft). Permit would be required.

- Threshold For Special Permits for Road Transport of cargo
    - Once the cargo exceeds 15ft in height or 8ft in width, you will require road permits

- Largest Cargo Dimension that can be moved between Airport and Port of Spain Port, Port Lisas and or Chagterms
    - Once the cargo exceeds 15ft in height and 8ft in width, you will require road permits. The Road size from End to End is 20ft heading into Chaguaramas

- Bridge Limitations (Weight & Size) between POS Piarco and Port of Spain Port, Port Lisas and or Chagterms?
    - No weight restrictions based on cargo listed above

- Time Frame for requesting Police Escorts if required
    - All services must be requested 2 days in advance

Logistics Service Providers (LSP): the EEPGL Freight Forwarder under contract is Ramps Logistics Ltd. EEPGL. The LSP is to participate in table-top exercise on a frequent basis to identify gaps, lessons learned and provide updated plans as needed as well as develop their own internal documented plans where required. This step is crucial to a successful planning and mobilization campaign in the event of an incident. The EEPGL supply chain function is managed by Procurement, who own the contract (with effect December 2018) with RAMPS/Blue Water Shipping (BWS) for supply chain, freight and customs support. Key contacts for engagement of RAMPS/BWS and international freight services are:

Area Procurement Manager – Guyana
Tara Clinton
Office:+1-832-624-6143
Cell: +592-608-7245
tara.m.clinton@exxonmobil.com

Inbound Freight Manager - Guyana
Walid Bouazra
Inbound Logistics Supervisor
Procurement Supply Chain
Office: (420) 296 577 126
Cell: (592) 608 7218
Email: walid.bouazra@exxonmobil.com

Logistics Service Provider -Freight Forwarding / Import and Export Procedures.

- Process to Import equipment and materials for forward movement to Guyana both on Vessels and Aircraft
  - The importation will be done via a transhipment document. This means the cargo will not be liable to any duty and taxes. The cargo will be transported from the port of entry to another port of entry/exit under customs supervision
- Any Bonds required
  - Ramps has a transhipment bond which will be able to accommodate this movement
- Information required to process Import and Export
  - AWB/Bill of lading, CARICOM Invoice, Commercial Invoice, Packing List. Cargo clause on the AWB/BL must clearly state cargo in transit to Guyana
- Timing to Prepare Documentation
  - Upon receipt of the above, documents processing time will be up to 24 hrs. to have all approvals
- Trucking Operations – Availability of Trucks, Trailers, SPMT's, Winch Trailers w/ Adjustable Bed Height
  - All the above are available on request of services

Ramps Logistics Limited		
Name	**Tel/Mobile Contact**	**Email**
Shaun Rampersad	+18686202525	shaun.rampersad@rampslogistics.com
Rudy Rampersad	+18686782382	rudy.rampersad@rampslogistics.com
Gagen Ramkissoon	+18687404651	gagen.ramkissoon@rampslogistics.com
Richard DeNobrega	+15926003454	richard.denobrega@rampslogistics.com

- 24/7 Emergency Contact Names, Job Title, Cell Phone, Email for Emergency Response Coordination with Ramps

Esso Exploration & Production Guyana Limited – Wells Execution Manager (Guyana)

Ryan Turton + (592) 227-3644 (Guyana)
Guyana Cell: + (592) 620-0344
US Cell: +1 (832) 418-4423
ryan.turton@exxonmobil.com

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Jim Hagg
Drilling Operations Superintendent (Guyana)

Office: + (713)431-8286 (Guyana)
Guyana Cell: +592 600-1498
US Cell: +1 (716) 790-9011
Skype: +1(709)273-1550
James.r.hagg@exxonmobil.com

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jay.akers@exxonmobil.com

David Sutton Guyana Office: +5926200350
US iPhone: 1-709-273-1533
Email:david.sutton@esso.ca

Esso Exploration & Production Guyana Limited – Logistics Manager (Guyana)

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Guyana Local + (592) 277-3535 (Guyana)
Guyana Cell: + (592) 620-0337
jonathan.regina@exxonmobil.com

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Johnny Lonsdale
Guyana Cell: + 592-620-0339
Email: johnny.e.lonsdale@exxonmobil.com

Esso Exploration & Production Guyana Limited–Operations Logistics Supervisors –Trinidad

Alvaro Zambrano
Trinidad Cell: + 1-868-283-0182
Email: alvaro.zambrano@exxonmobil.com

David Stevens
Trinidad Cell: + 1-868-283-0182
Email: david.stevens1@exxonmobil.com

OSRL - Oil Spill Response Limited		
Oceaneering Brazil	+ 55 (22) 2757-9550 / 55 (22) 99213 0937	SIRT Brazil
Oceaneering AS	+ 47 90 64 447	SIRT Norway
Oil Spill Response Ltd (Brazil)	+ 55 24 3421 5480 / 55 24 99852 6045	CSS Brazil
Oil Spill Response Ltc (Norway)	+ 47 952 84 299	CSS Norway

Logistics Support Firms

RAMPS Logistics is contracted to EEPGL for logistical support in both Trinidad and Guyana and can be contacted through Shaun Rampersad at 1-868-620-2525 or shaun.rampersad@ramplslogistics.com for the Trinidad side and Richard DeNobrega at 1-592-600-3454 or richard.denobrega@rampslogistics.com within Guyana. Ramps have a formal tri-party agreement with Blue Water Shipping (BWS) which provides additional international capacity for freight movement. The have a formal logistics ERP to support this effort as well. The actual in-Trinidad logistics are likely variable depending on the exact circumstances / event and RAMPS is expected to be able to advise the best logistics plan real time in a real situation there. It may vary somewhat from what is included in this advance document.

For movements concerning Brazil, RAMPS is recommended to work with the following firm by the ExxonMobil affiliate in Brazil (via Marcio Bastos-Logistics Manager-1-713-767-9726 or marcio.bastos@exxonmobil.com):

Agility Brazil (AGILITY DO BRASIL LOGISTICA INTERNACIONAL S.A)
Contact Person: Tania Vilches (Manager)
Email Address: TVilches@agility.com
Contact: +55 11 304 00134

For movements concerning Norway ORSL SIRT System, RAMPS is recommended to work with the following company:
Agility Norway (Agility AS).
Contact Person: Stefan Boberg (General Manager)
Email Address: SBoberg@agility.com
Contact: +47 66813431

For movements of Boots & Coots GRIP RapidCap System, RAMPS is recommended to work with the following:
ExxonMobil UOG Upstream Logistics
Len Coughlan – Ph: +1-346-335-0000 or
len.w.coughlan@exxonmobil.com

Note: No Subsea Incident Response Toolkits (SIRT) or Capping Stack Systems (CSS) equipment can be planned to be pulled from the US GOM stocks. Also, at least one CSS is required to stay in Brazil based on the agreement made to base some OSRL gear there.

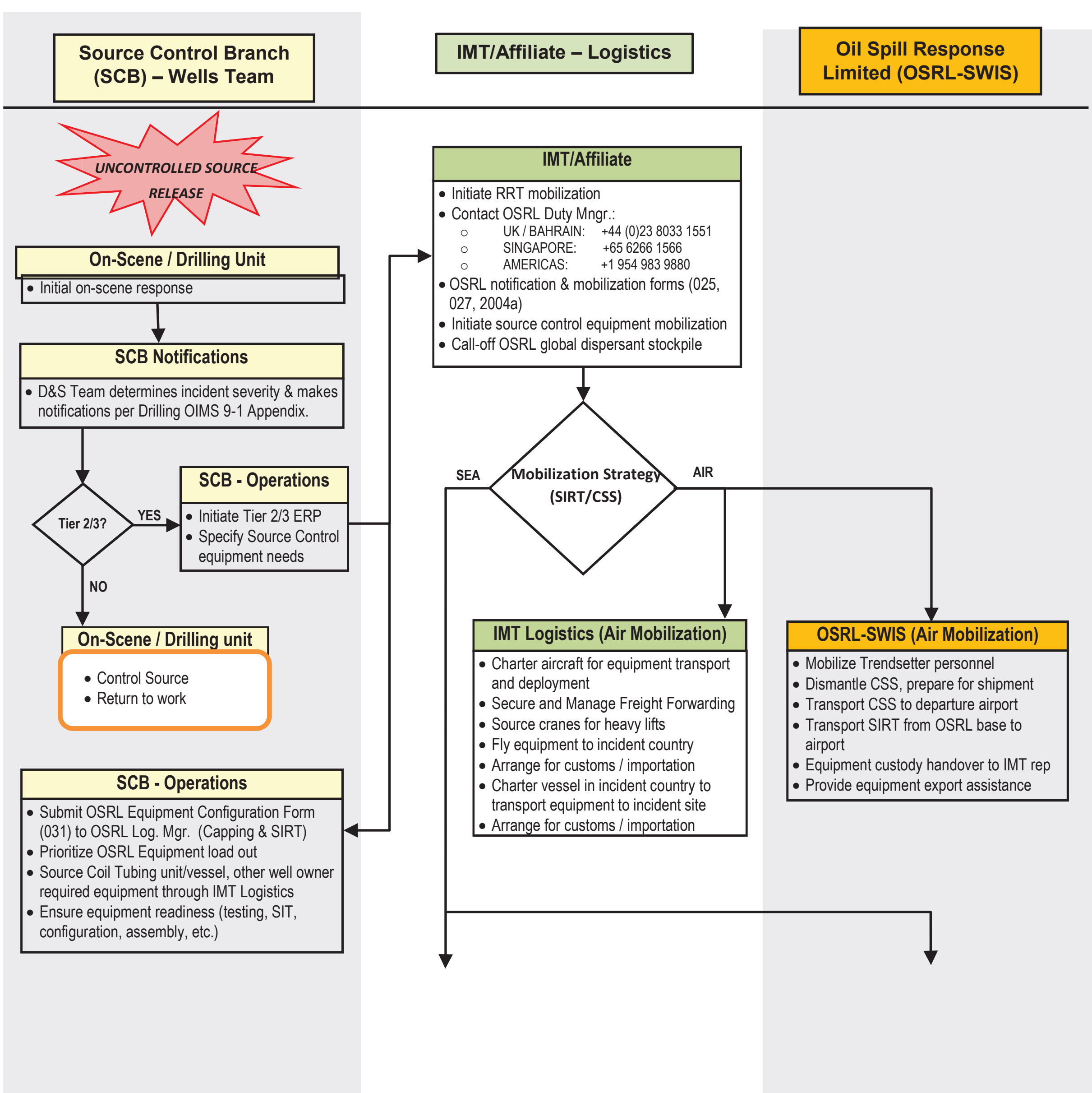
Note: No SIRT or CSS equipment can be pulled from the MWCC Gulf of Mexico stocks as this equipment is reserved for the U.S. GOM and all logistics mobilization of equipment is arranged by MWCC. Also, at least one (1) CSS is required to stay in Brazil based on the agreement made to base OSRL equipment there. Norway is the first option if the 15k CSS is required.

If your local Logistics Service Provider (LSP) is unable to provide the required freight forwarding expertise, a list of approved LSP's with EM Master Agreements is provided below.

LSP with EM Agreements	LSP Contact Name	LSP Contact Number	LSP E-mail	LSP Contract Number
Agility	Elizabeth Santos	(713) 927-4002	elsantos@agility.com	A2156774
BDP International	Hector Gonzalez	(832) 710-5713	hector.gonzalez@bdpint.com	A2189789
Bertling	Michael Kaemerow	(281) 774-2300	michael.kaemerow@bertling.com	A2510299
Blue Water Shipping	Brent A. Patterson	(832) 477-3275	brpa@bws.dk	A2473269
Deugro	Jeff Grogan	(281) 443 3001	jeff.grogan@deugro.com	A2376684
Fagioli	Edoardo Ascione	(281) 997-3434	e.ascione@fagioli.com	A2531247
Garner	Sean Pullins	(832) 297 4019	sean.pulins@garnercorp.com	A2464386
Geodis Wilson	George Abreu	(281) 973-0034	george.abreu@geodis.com	A2276527
JAS	Phillip Cutruzzula	(832) 995-8769	phillip.cutruzzula@jas.com	A2435819
Kuehne+Nagel	Adi Chowdhury	(281) 235 4056	adi.chowdhury@kuehne-nagel.com	A2348883
Lynden	Adam Murray	(907) 227-0494	Adam@lynden.co	A2172737
Mammoet	Akira Koga	+55 (11) 4440 0310	akira.koga@mammoet.com	A2493416
Panalpina	Andreas Schneider	(832 661 4346	andreasschneider@panalpina.com	A2357646
PRL	Ron Hyde	(907) 223-1242	ron.hyde@pacrimlog.com	A2465881
Sarens Group	Bev Bentley	011 44 (0) 7808 920393	bev.bentley@sarens.co.uk	A2357790
UTC	Marco Poisler	(646) 235-0384	M.Poisler@utcoverseas.com	A2384058
Volga Dnepr	Robert Williams	(832) 585-8611	robert@volga-dnepr.us	A2541085

Figure 1. List of Logistics Service Providers (LSP) with ExxonMobil Master Agreements

OSRL-SWIS Equipment Mobilization Process



SCB - Operations
- Deploy & operate equipment with Trendsetter specialists

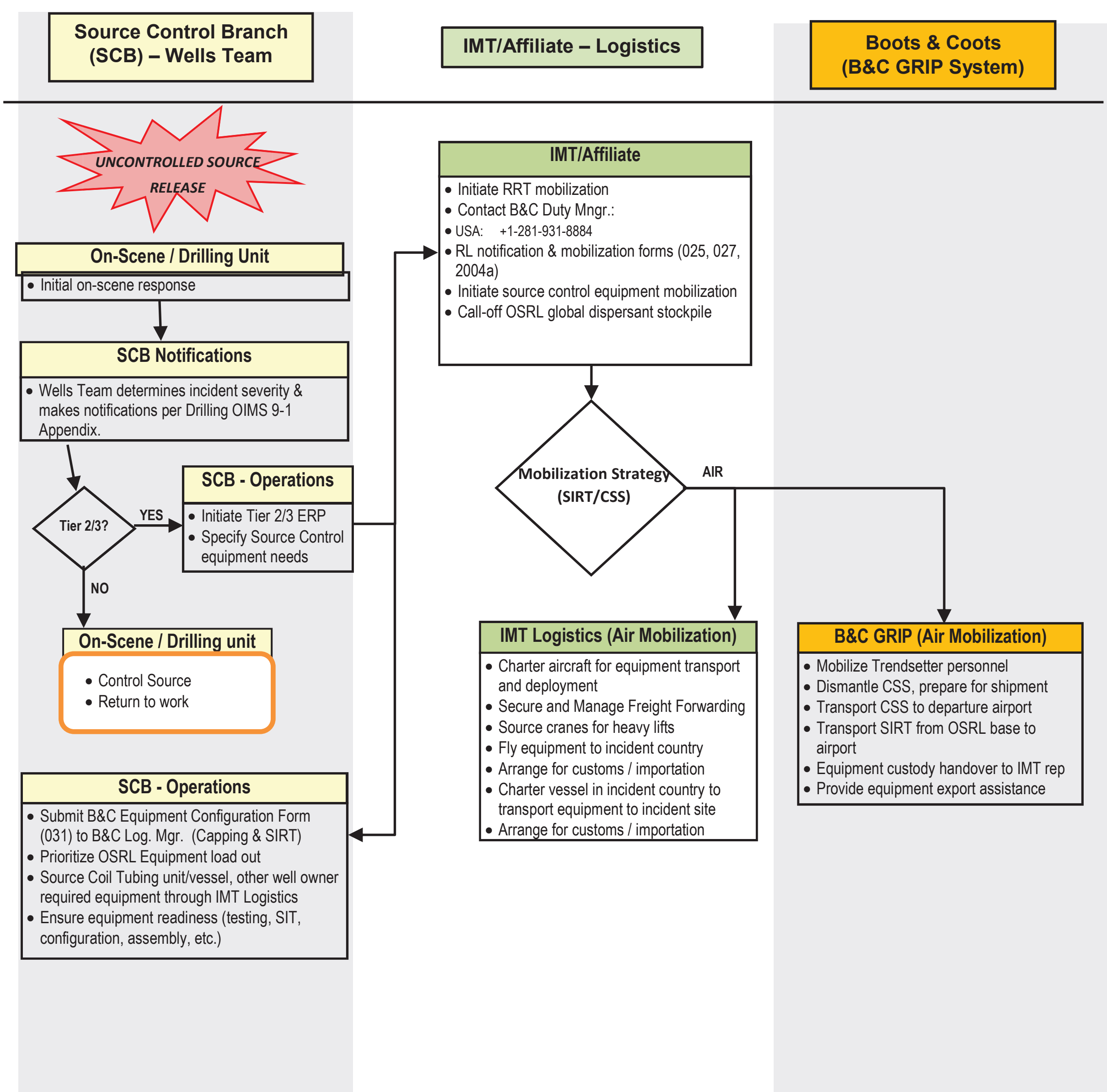
IMT Logistics (Sea Mobilization)
- Charter vessels for equipment transport and deployment
- Secure and Manage Freight Forwarding
- Source cranes for heavy lift
- Sail equipment to incident country/site
- Arrange for customs / importation

OSRL-SWIS (Sea Mobilization)
- Mobilize Trendsetter personnel
- Transport CSS to quay
- Transport SIRT from OSRL base to OSRL-SWIS quay
- Equipment custody handover to IMT rep
- Provide equipment export assistance

Legend

SIRT – Subsea Incident Response Toolkit
CSS – Capping stack System
IMT – Incident Management Team
RRT – Regional Response Team
OSRL – Oil Spill Response Limited - SWIS

Boots & Coots Equipment Mobilization Process



SCB - Operations
• Deploy & operate equipment with Trendsetter specialists

Legend		
	SIRT – Subsea Incident Response Toolkit **CSS** – Capping stack System **IMT** – Incident Management Team **RRT** – Regional Response Team	**OSRL –** Oil Spill Response Limited - SWIS