



Oil and Gas Exploration Drilling Corentyne Petroleum Prospecting License (PPL)

Petroleum Exploration Drilling within the Northern Portion of the Corentyne PPL Offshore Guyana

Application for Operation Permit

Wei-1

Project Summary (3rd Revision – with EPA Comments addressed)

March 2022

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1 Cover Page

Title:

Wei-1 Petroleum Exploration Drilling within the Northern Portion of the Corentyne PPL Offshore
Guyana

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Introduction

CGX Resources Inc. (“CRI” or the Company), a wholly owned subsidiary of CGX Energy Inc. (“CGX”) proposes to drill an oil and gas exploration well in the Northern portion of its Corentyne Petroleum Prospecting License, PPL (the Project). The Project targets large Campanian and Santonian prospects in structural/stratigraphic traps. Based on exploration and assessment activities in the Corentyne Block, including a 3D seismic survey, CRI believes the reservoirs potentially contain an economic accumulation of hydrocarbons.

The prospect is named Wei, after the tallest and hottest mountain close to the villages of Paramakatoi and Kurububaru in the Pakaraimas. Wei mountain has commanding visibility over all the surrounding terrain, so it was used as a sentinel post by the Patamona people to guard against attacks. This is the second prospect after Kawa, currently being drilled (September-December 2021), that has been identified in the Northern Corentyne area for exploration drilling. The proposed exploration well is named Wei-1.

The components and activities of the Project are:

- Exploration drilling, including well design and rig;
- Onshore support, including shore bases;
- Marine and aviation support vessels and equipment;
- Decommissioning (End of operations); and
- Nearby appraisal wells if Wei-1 proves successful.

The process of drilling Wei-1 will be similar to the oil and gas exploration drilling programs conducted offshore Guyana and worldwide. The Project will involve onshore facilities and marine and aviation services to support drilling and decommissioning the well.

The summary of the project is required for Application for Environmental Authorization for the project in keeping with section 11(1) of the Environmental Protection Act Cap 20:05 and Regulation 17 of the Environmental Protection (Authorizations) Regulations. The summary is prepared following guidelines provided by the Environmental Protection Agency (EPA) in its November 23rd, 2021, correspondence.

2 Description of the Project:

2.1 Physical Location

The site of the proposed Wei-1 well is approximately 200km from Georgetown in a North Easterly direction in the Atlantic Ocean. A map locating Wei-1 in the Atlantic Ocean within the Corentyne Block is shown in **Figure 2-1**. The coordinates of Wei-1 are provided in **Table 2-1**. The site of Kawa-1, the oil and gas exploration well currently being drilled by CRI in Northern Corentyne (September-December 2021) is also shown in the figure.

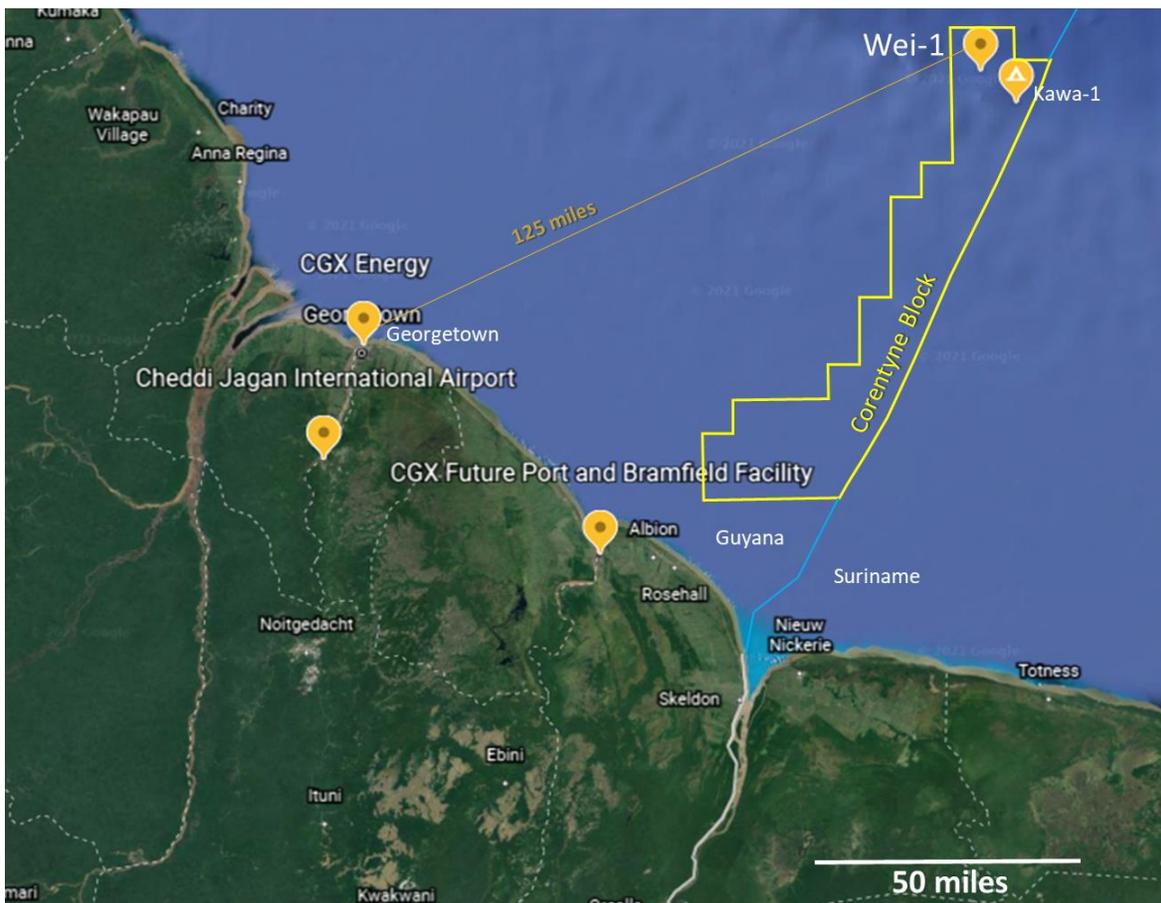


Figure 2-1. Location of the proposed oil and gas exploration well (Wei-1).

Table 2-1. Coordinates of proposed Wei-1 well.

(UTM 21N)	X	554307
	Y	834595
	Latitude	7.550128° (7° 33' 0.4608'')
	Longitude	-56.507723° (-56° 30' 27.803'')

The area is bordered by the Stabroek and Kanuku PPLs on the North and West, respectively and Suriname on the East. The location of the proposed area in the Corentyne block is shown in the activity map in **Figure 2-2**. The map also indicates the prospectivity of the region including the northern portion of the Corentyne block and recent Apache discoveries in Block 58 offshore Suriname to the east and Exxon discoveries in Stabroek block to the north.

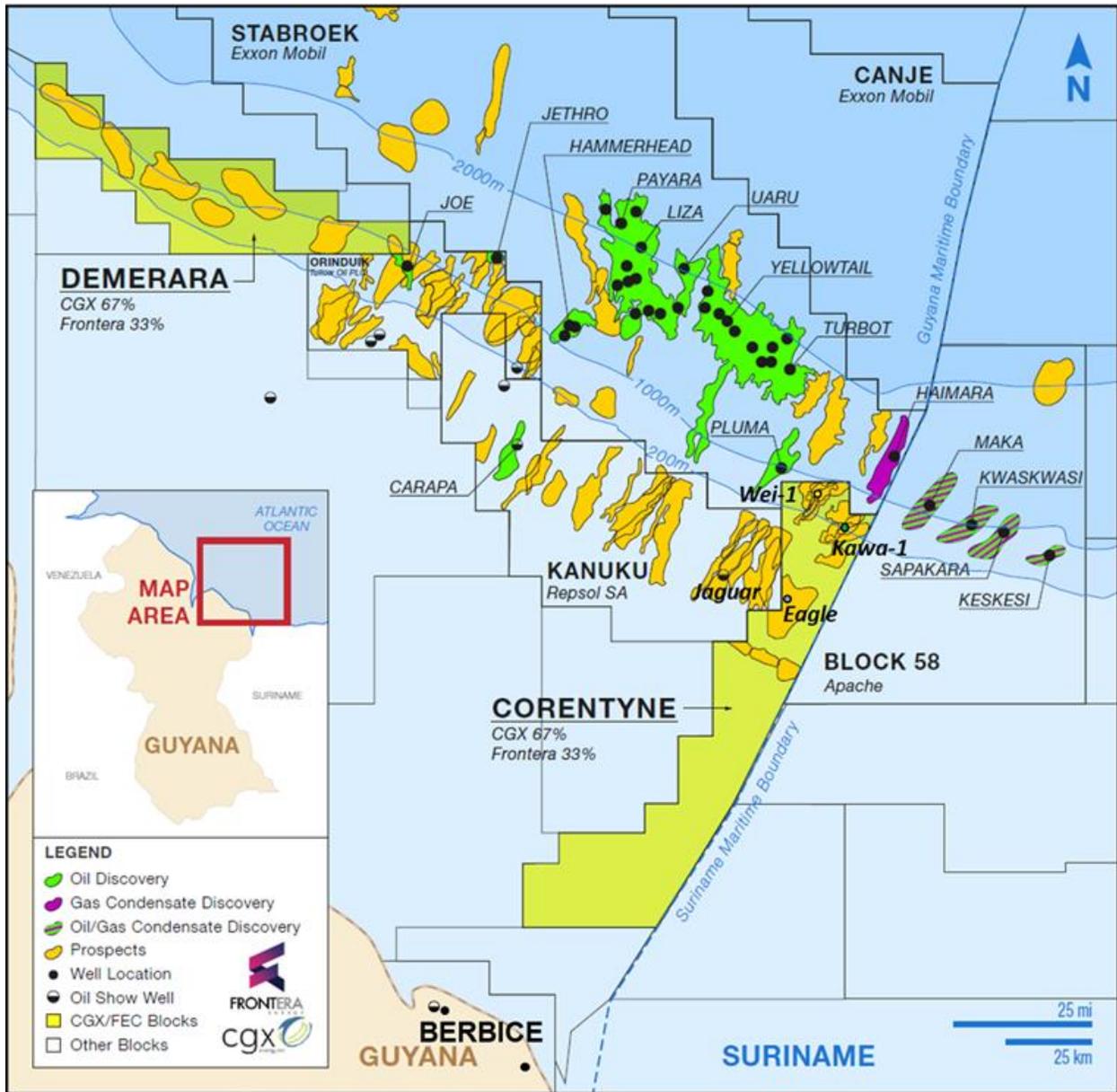


Figure 2-2. Map locating Wei-1 in the Northern portion of the Corentyne block.

2.2 Alternatives

There are no impactful alternatives to the Project. The drilling location was selected by the location of resources to be uncovered. Land Area for the project is confined within a 5km × 5km area within the Corentyne PPL in the Atlantic Ocean (see map in **Figure 2-3**).

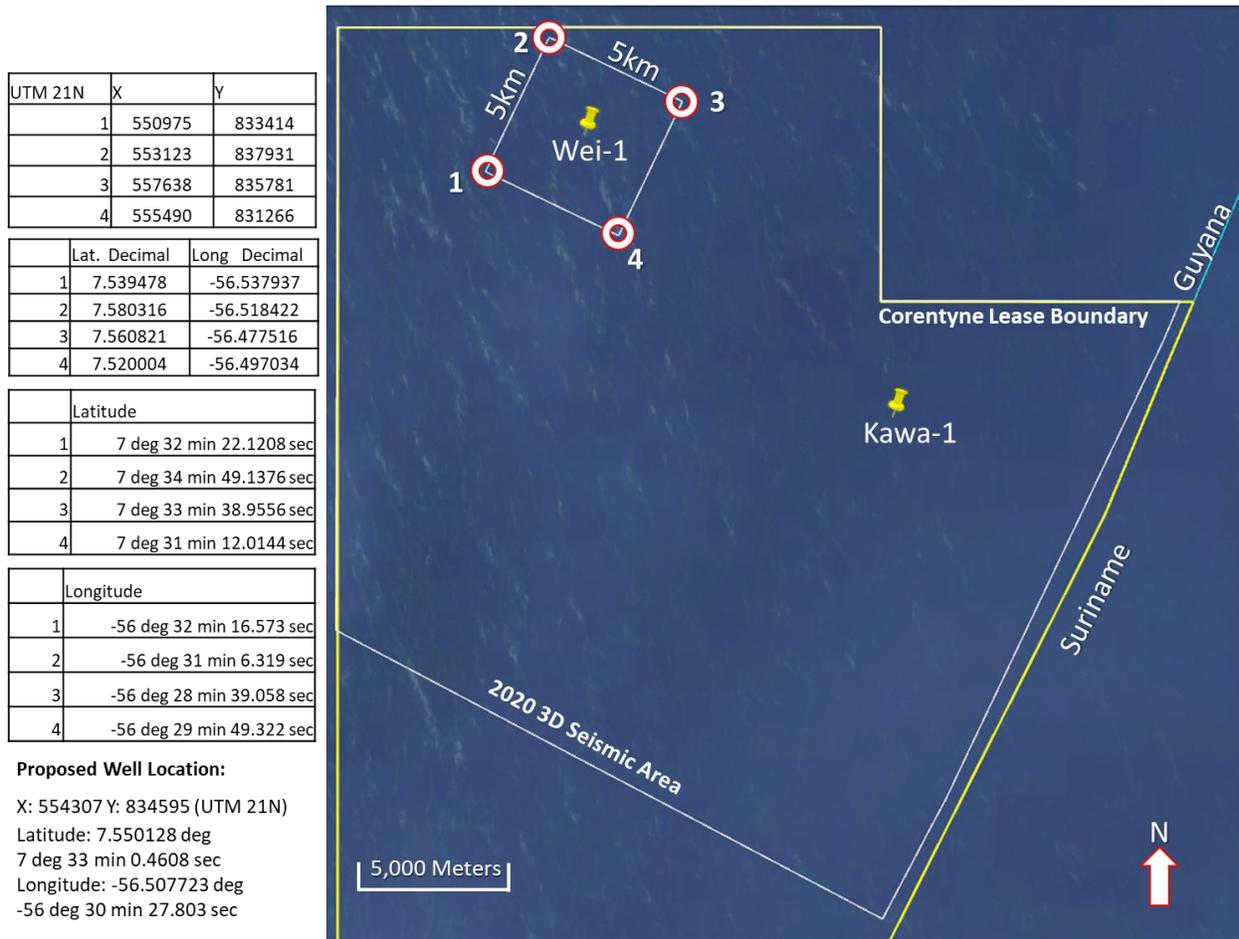


Figure 2-3. 5km × 5km area well location in the Corentyne block.

There are no consequential alternatives for the drill center and for the equipment within the area. The nature of the seafloor and the water surface do not vary appreciably across the area; thus, no environmental or social adverse impacts or benefits would be achieved by the modification of the location. The positive and negative impacts assessed would be similar within the optimal area.

A no-go alternative would keep the existing physical and biological conditions of the environment unchanged.

2.3 Existing baseline

Guyana’s marine ecosystems are part of the North Brazil Large Marine Ecosystem (NBLME). The project area is 200km from Georgetown in the Atlantic Ocean. The only land use activity which has been known in the area relates to infrequent presence of large fishing vessels.

2.3.1 Ecosystems, protected areas and wildlife

There are no sensitive ecosystems or protected areas at the site of the Project. There is no particular natural seabed, oceanographic or topographic features that would attract any threatened marine and coastal species to the proximity of the drilling location. The Project is not likely to affect the movement of any of these species through the area. The drilling operations do not involve any processes that may threaten the breeding, feeding or migration of any of the listed threatened species as indicated in the International Union for Conservation of Nature (IUCN) red list and those included in Appendix I, II, and III of the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora to which Guyana acceded in 1977. IUCN is the world’s most comprehensive information source on the global conservation status of animal, fungi and plant species. The IUCN Red List divides species into nine categories: Not Evaluated, Data Deficient, Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct.

Guyana passed “The Wildlife Conservation and Management Act 2016” to “provide for the protection, conservation, management, sustainable use, internal and external trade of Guyana’s wildlife”. The Act repealed the Wild Birds Protection Act and revoked the Species Protection Regulations 1999. It also revoked the Wildlife Management and Conservation Regulations 2013 made under the Environmental Protection Act but maintaining them in conformity until replaced by regulations made under the Act. The Act applies to all wildlife species including those listed in the 1st, 2nd and 3rd Schedules which list all species included in Appendix I, II, and III of CITES, respectively. The Act established the “Guyana Wildlife Conservation and Management Commission” to enforce the provisions of the Act and designated the Commission as the CITES Management Authority.

WWF indicates that of the species known to occur in Guyana, 4.5% of mammals, 0.4% of birds, 3% of amphibians, 3.3% of reptiles, and 0.3% of freshwater fishes are threatened (Critically Endangered (CR), Endangered (EN) or Vulnerable (VU)) or Near Threatened (NT)) (WWF_Guianas 2012). The following list (**Table 2-2**) includes some of the animals in Guyana rated as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU).

Table 2-2. Some of the animals in Guyana rated as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU).

Classification		Animals
CR	<ul style="list-style-type: none"> Critically Endangered 	<ul style="list-style-type: none"> Daggernose Shark (<i>Isogomphodon oxyrinchus</i>); Caribbean Electric Ray (<i>Narcine bancroftii</i>); Large-tooth Sawfish (<i>Pristis pristis</i>), and Hawksbill Sea Turtle (<i>Eretmochelys imbricata</i>) Leatherback turtle (<i>Dermochelys coriacea</i>)
EN	Endangered	<ul style="list-style-type: none"> Green Sea Turtle (<i>Chelonia mydas</i>), Nassau Grouper (<i>Epinephelus striatus</i>), Scalloped Hammerhead (<i>Sphyrna lewini</i>), Squat-headed Hammerhead Shark (<i>Sphyrna mokarran</i>), Atlantic Bluefin Tuna (<i>Thunnus thynnus</i>), Sei Whale (<i>Balaenoptera borealis</i>), Blue Whale (<i>Balaenoptera musculus</i>), and Fin Whale (<i>Balaenoptera physalus</i>). Olive Ridley Turtle (<i>Lepidochelys olivacea</i>)
VU	Vulnerable	<ul style="list-style-type: none"> Amazonian Manatee (<i>Trichechus inunguis</i>). American Manatee (<i>Trichechus manatus</i>). Boto (Amazon River Dolphin) (<i>Inia geoffrensis</i>). Forest Tortoise (<i>Geochelone denticulate</i>)

The Critically Endangered marine species known to occur in Guyana include: the Daggernose Shark (*Isogomphodon oxyrinchus*); the Caribbean Electric Ray (*Narcine bancroftii*); the Large-tooth Sawfish (*Pristis pristis*), and the Hawksbill Sea Turtle (*Eretmochelys imbricata*). The IUCN Red List of Endangered marine species known to occur in Guyana include: The Green Sea Turtle (*Chelonia mydas*), the Nassau Grouper (*Epinephelus striatus*), the Scalloped Hammerhead (*Sphyrna lewini*), the Squat-headed Hammerhead Shark (*Sphyrna mokarran*), the Atlantic Bluefin Tuna (*Thunnus thynnus*), the Sei Whale (*Balaenoptera borealis*), the Blue Whale (*Balaenoptera musculus*), and the Fin Whale (*Balaenoptera physalus*). Guyana has no listed Critically

Endangered or Endangered freshwater vertebrates. The remaining include sea turtles, marine mammals, and crustaceans.

Most of the threatened species that could be impacted by the Project are fish. They include highly migratory species such as tunas and sharks, benthic-pelagic species including certain groupers, and demersal species including species of skates and rays.

Although turtles may occur in the area during their oceanic migrations, the Project is not likely to affect any populations of these species. There is no suitable habitat for turtle nesting for hundreds of kilometers.

2.3.2 Atmospheric Environment

2.3.2.1 Climate/ Meteorology

Guyana enjoys a wet tropical climate with warm temperatures and abundant rainfall without the extremes of hot or cold. Its weather is affected by the migration patterns of the Inter-Tropical Convergence Zone (ITCZ), a massive system of weather located over the Atlantic Ocean, as well as by easterly and tropical waves moving west across the Atlantic from Africa. Guyana is not susceptible to hurricanes as it lies outside (south) of the hurricane belt in the Caribbean.

2.3.2.1.1 Rainfall Zones in Guyana

There are two main rainfall zones in Guyana:

i) the northern coastal area sub-zone

This zone is moderated by maritime influences and two seasonal rainfall peaks. This zone generally experiences heavy rainfall between mid-April and the ending of July, with a major peak rainfall in June. This is referred to as the primary wet season. A second wet season is observed between mid-November and the ending of January with peak rainfall in December. The periods in between are often referred to as primary (long) dry season (August-October) and second (short) dry season (February-March).

ii) the continental sub-zone of the Rupununi Savannahs

This southern subzone in the southwest (Region 9 and parts of Region 6) experiences one wet season from April to September and one dry season from October to March.

2.3.2.1.2 Climate and Weather Conditions

Climate and weather conditions are monitored by the Hydrometeorological Service of Guyana through its network of weather monitoring stations across the country. Annual average rainfall totals range between 1,778mm and 2,800mm. The average daily temperature is 25.9°C, and while the annual variation in daily average temperature is only about 2°C, the average diurnal variation is about 6°C. Warmest months are September and October, and coldest are January and February (Rama Rao, Alves et al. 2012).

Because of Guyana’s proximity to the equator there is little variation in the hours of daylight. In comparison to its CARICOM neighbors, the number of sunshine hours is not very high because of high cloud cover. The lowest number of sunshine hours (5-6 hours) coincide with the very wet rainy season in May-June, and the highest (8 hours) to the August-October dry season.

The mean historical monthly temperature and rainfall for Guyana during the period 1901-2015 is shown in the chart below (**Figure 2-4**).

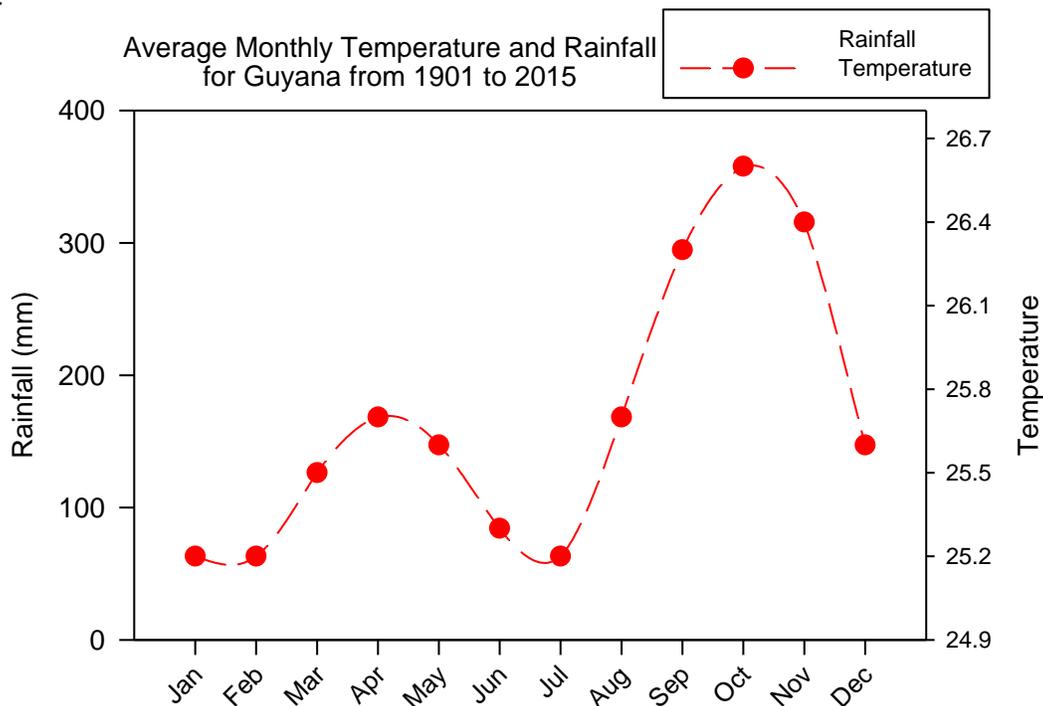


Figure 2-4. Mean historical monthly temperature and rainfall for Guyana (1901-2015).

(Source: The World Bank Group ([WBG 2019](#))).

2.3.3 Oceanography

2.3.3.1 Seawater Temperature and Salinity

In general, because of the discharges of the Orinoco and Amazon Rivers as well as Essequibo, Demerara and Berbice rivers, Guyana’s coastal marine waters receive heavy loads of fresh water reducing the salinity of the nearshore area (can be as low as 35 to 36.5 parts per thousand (ppt)) compared to deeper water (FAO, 2012). Surface and bottom sea temperatures at the location of the well are expected to be similar to what was found in similar area Offshore Guyana (FUGRO 2016) i.e., an average of about 28°C, and 11°C, respectively. Salinity is expected to range between 37.1ppt to 36.6ppt near the surface.

2.3.3.2 Wind Patterns

Guyana’s coastal zone is affected by the Northern Hemisphere’s trade winds and westerlies (NOAA 2008). The trade winds influence produces a strongly dominant northeast wind offshore Guyana. The average wind force in the area is approximately 14 knots and the wind direction is typically East-Northeast. **Figure 2-5** shows the wind force and wind direction for the region.

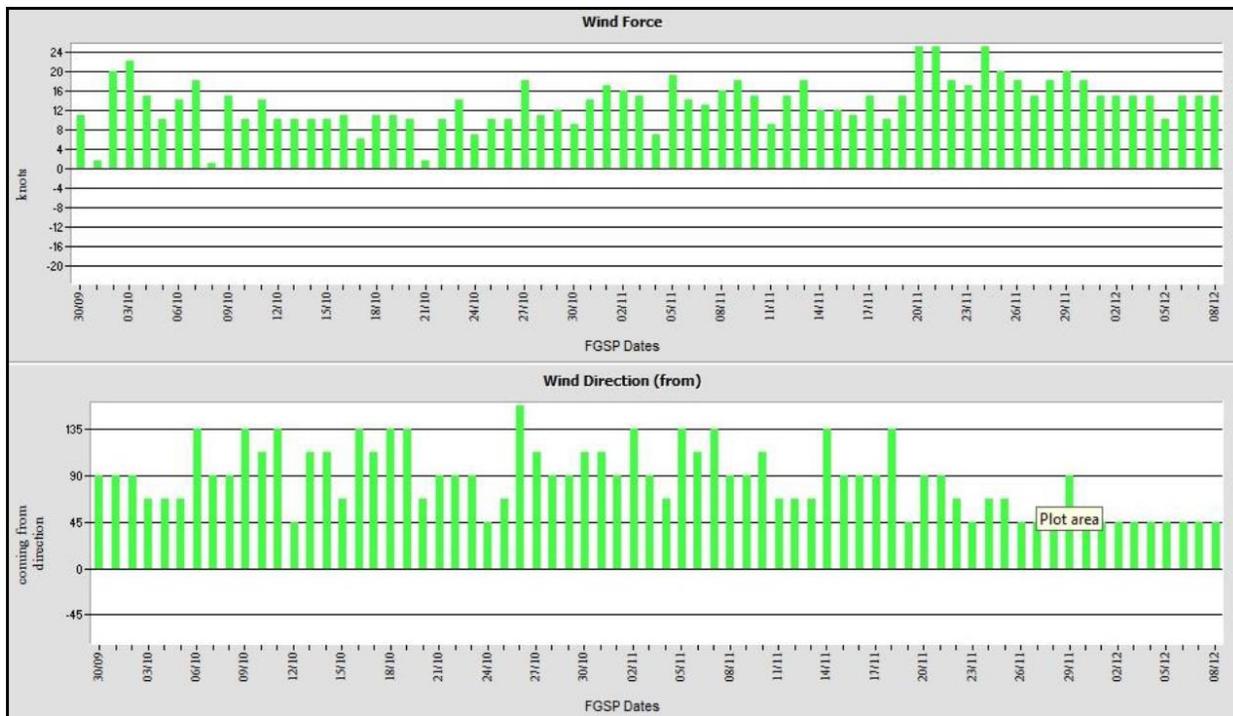


Figure 3 Wind force

Figure 2-5. Wind force and wind direction for the region.

Wind speed maps for the Caribbean can be found in a report prepared by PJ Vickery and D, Wadhwa (Vickery and Wadhwa 2012) for the Pan American Health Organization. Forecast maps for pressure, wind, wave, ocean currents, sea surface temperature and rain for the region are readily available online. The wind, waves and weather can be accessed in-time (WindFinder last accessed Jan 2018). The rig and support vessels involved in the Project will be designed to handle winds much higher than what is typically recorded.

2.3.3.3 Currents

The strongest flow in the Caribbean is found across the southern third of the sea and belongs to the Caribbean Current (Gordon 1967, Kinder 1983). In this area, the highest surface velocities can reach 70cm/s along the coasts of Venezuela and the Netherland Antilles (Fratantoni 2001).

The surface current in the Guyana marine waters is known as the Guiana Current. The Guiana Current derives from and is fed by the North Brazil Current. It is a major source of water flowing northwest toward the southeastern Caribbean Sea. North of the Equator, the North Atlantic Current and the Amazon and Orinoco rivers contribute to the Guiana Current. During spring tide, the current can extend and cover Guyana’s entire continental shelf. **Figure 2-6** shows the Guiana current as represented by the Mariano Global Surface Velocity Analysis (MGSVA).

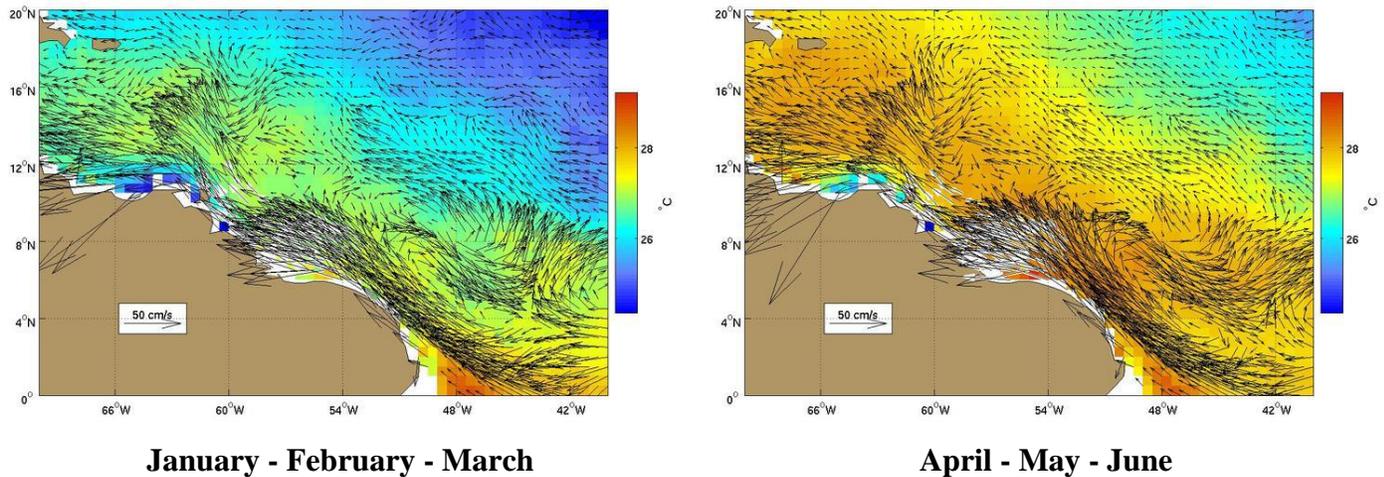


Figure 2-6. The Guiana current as represented by the Mariano Global Surface Velocity Analysis (MGSVA) (a) January-March; (b) April-June.

Source: University of Miami, CIMAS.

There are significant seasonal variation in the strength of the Guiana Current and the extent of its influence offshore, maximum speeds generally occur in April-May, while minimum speeds occur in September (Gyory, Mariano et al. 2013). The Guiana Current’s highest velocities tend to occur along the edge of the continental shelf. CRI has operated offshore with these currents before and is well prepared with the ability to model supply vessel and rig requirements as well as handling unplanned events.

2.3.3.4 Sea and Swell

Eight (08) to 10-foot consistent swells occur in the Guyana-Suriname Basin. The waves are in general from the east and the most persistent swell will arrive from the east with typical swell height averaging 1.5m (5ft) but can be as high as 3.5m (11.5ft).

The swell height and swell direction for the region (FGSP dates) is shown in **Figure 2-7**.

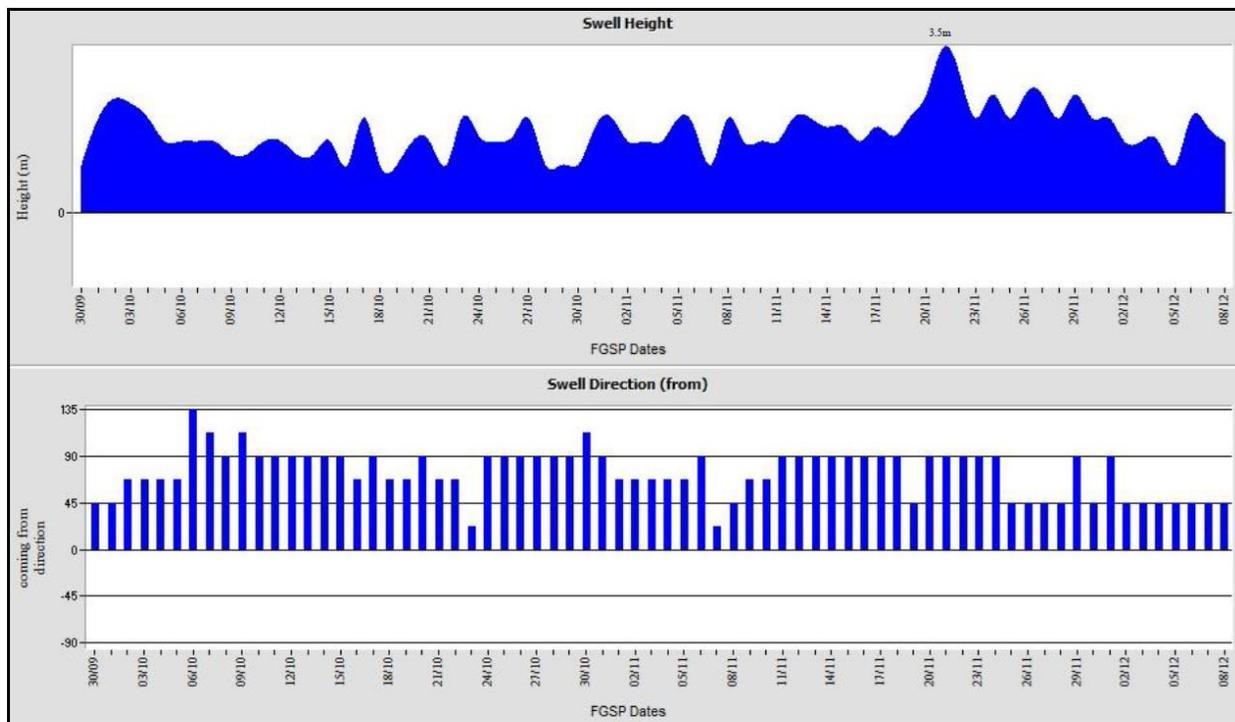


Figure 4 Swell height

Figure 2-7. Swell height and swell direction versus Forecast GSP dates.
 (GSP: Max 5s peak gust reported at the last hourly 10-min measurement segment).

2.3.4 General geology of the area

The Guyana-Suriname Basin is a passive margin basin with formations that range in age from the Jurassic to recent. Overall, the continental shelf has a smooth seafloor and gently dipping platform without significant regional or large-scale morphological features. The available seismic data of the Basin clearly indicate a variety of plays in both the clastic rocks (turbidites and channels) and carbonates (shelf edge and shelf).

The Guyana-Suriname Basin is a passive margin basin with formations that range in age from the Jurassic to recent. Overall, the continental shelf has a smooth seafloor and gently dipping platform without significant regional or large-scale morphological features. The Basin exhibits excellent seismic signature of a variety of plays in both the clastic rocks (turbidites and channels) and carbonates (shelf edge and shelf). Geology of the Guyana basin stratigraphic column is provided in **Figure 2-8**. The main geologic formations of the Guyana basin from youngest to oldest (surface to basement) are listed in **Table 2-3**.

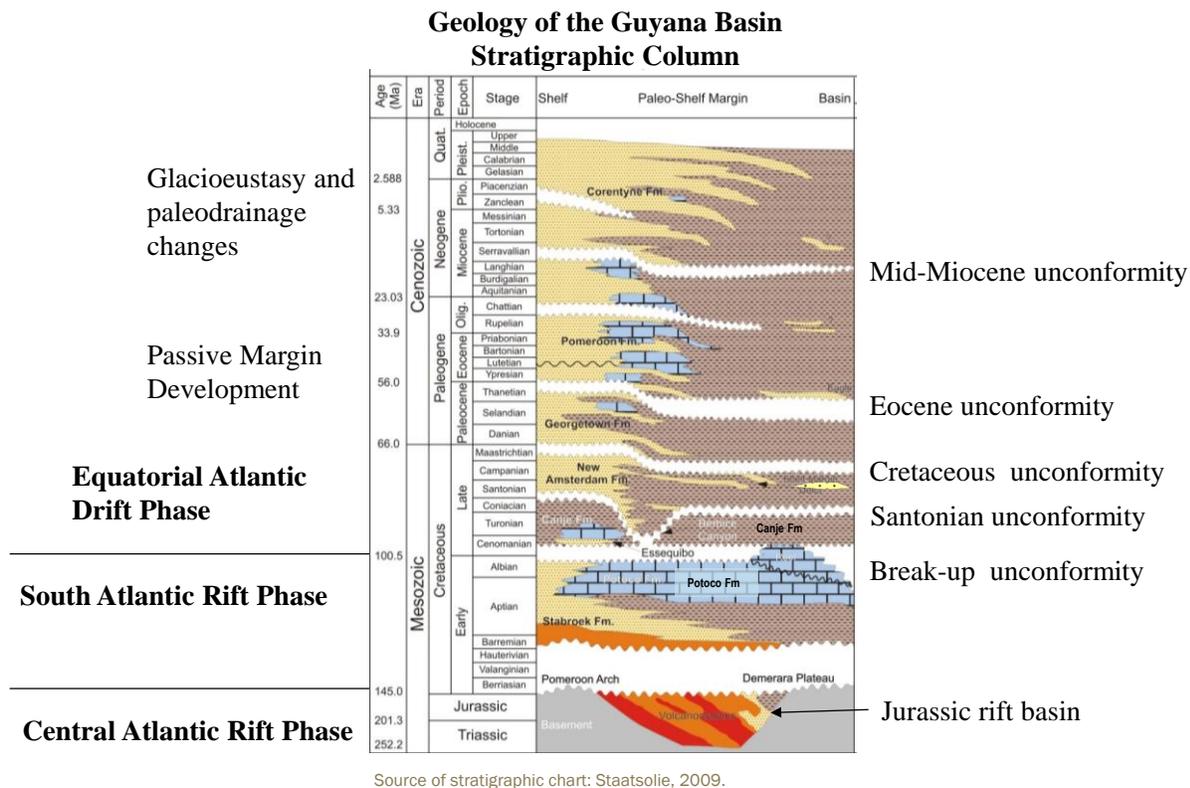


Figure 2-8. Geology of the Guyana basin stratigraphic column.

Table 2-3. Major Geologic Formations of the Guyana Basin.

Formation	Age	Composition
Corentyne	Pleistocene-Pliocene	Sand and shale
Pomeroon	Miocene-Eocene	Carbonate sand and shale
Georgetown	Maastrichtian	Sand, shale, and carbonate
New Amsterdam	Maastrichtian to Lower Tertiary	Sand and shale
Canje Shale formation	Cenomanian to Turonian	Organic shale, source rock
Potoco Formation	Aptian	Carbonates
Stabroek Formation	Cretaceous–Barremian	Basal shales and sands of continental origin
Precambrian Basement	Proterozoic-Hadean	Metamorphic rock

2.3.5 Bathymetry of the area comprising ‘Wei-1’

The water depth in the Corentyne PPL ranges between 0 and 1,100m with the shelf break lying at depth from 90m to 100m. A bathymetry map of the General area is provided in **Figure 2-9**. The water depth at the proposed well area, based on a recently acquired 3D seismic Bathymetry interpretation (November 2019), is 1,935 feet (590 meters).

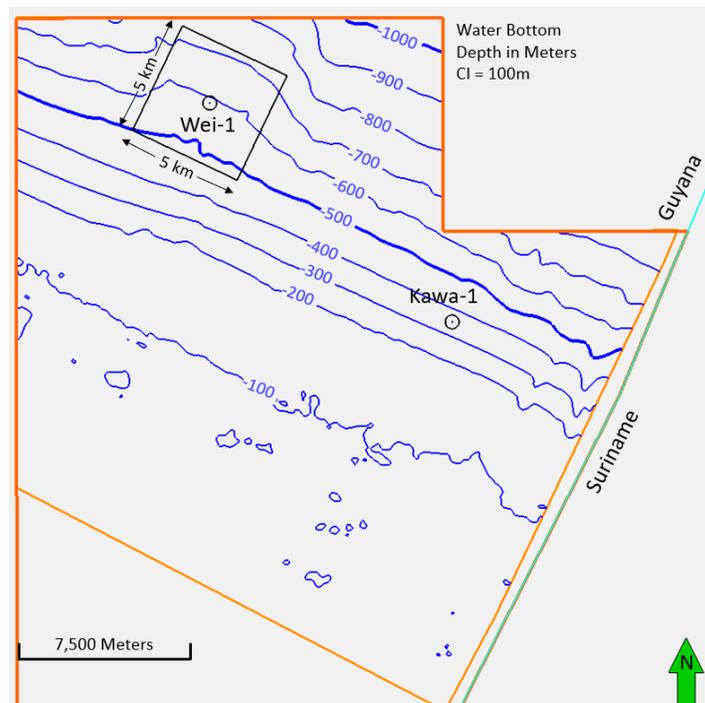


Figure 2-9. Bathymetry map of the Corentyne area where the 5km-by-5km enclosing Wei-1 well is located.

2.4 Layout of the project

The Wei-1 well will be drilled as a vertical well utilizing a semi-submersible rig. A provisional casing program outlining the design and construction of the subsurface well is provided in **Section 3.2** below.

CRI has secured an option to use semi-submersible rig Maersk *Discoverer*, a mobile offshore drilling unit (MODU) from Maersk Drilling. Maersk *Discoverer* is shown in **Figure 2-10**.



Figure 2-10. Maersk Discoverer by Maersk Drilling rig that would be utilized to drill Wei-1.

Maersk Discoverer was selected because of its potential to drill effectively and safely Wei-1. The rig is designed to sustain extreme environmental conditions and is certified for offshore operations. It is fully equipped to handle all the drilling operations effectively and safely. Its blowout preventer (BOP) and well control systems exceed all well control requirements.

A seabed survey will be conducted at the start of operations and prior to the MODU moving off location. Maersk *Discoverer* will be dynamically position by thrusters available for station

keeping. A general overview of the Project area while exploration drilling operations are underway is displayed in **Figure 2-11**.

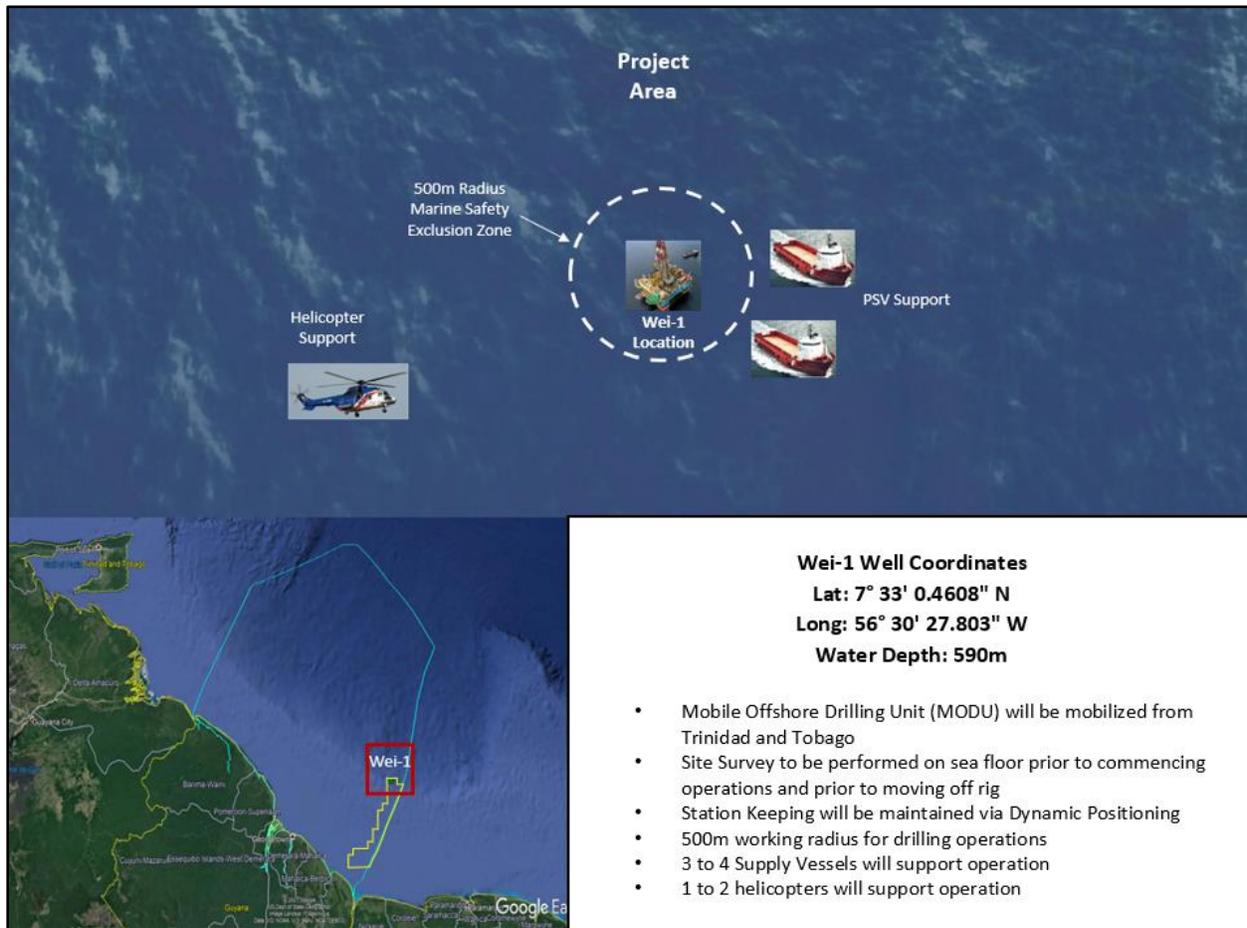


Figure 2-11. Wei-1 Project Area during Drilling Operations.

2.4.1 Marine Safety

Authorizations for in-water activities will be obtained from the Guyana Maritime Administration Department (MARAD). A Marine Safety Exclusion Zone with a 500-m radius around the rig will be established for the duration of the drilling and decommissioning operations in accordance with industry standards and practices. MARAD will be advised of the location of the rig and establishment of the Marine Safety Exclusion Zone. MARAD which is responsible for safety at sea will issue notices to mariners for all marine vessels including the supply and support vessels so that mariners are aware of these activities.

3 Project design

3.1 Design\construction

3.1.1 The Mobile Offshore Drilling Unit (MODU)

The Maersk *Discoverer* MODU will be kept in place over the well location with thrusters via dynamic positioning. The MODU will be self-contained to maintain crew and support the operation. Facilities would include living quarters, power generator, and telecommunications. Maersk *Discoverer* External view is shown in **Figure 3-1**. Maersk *Discoverer*'s schematic showing its discharge points is shown in **Figure 3-2**.

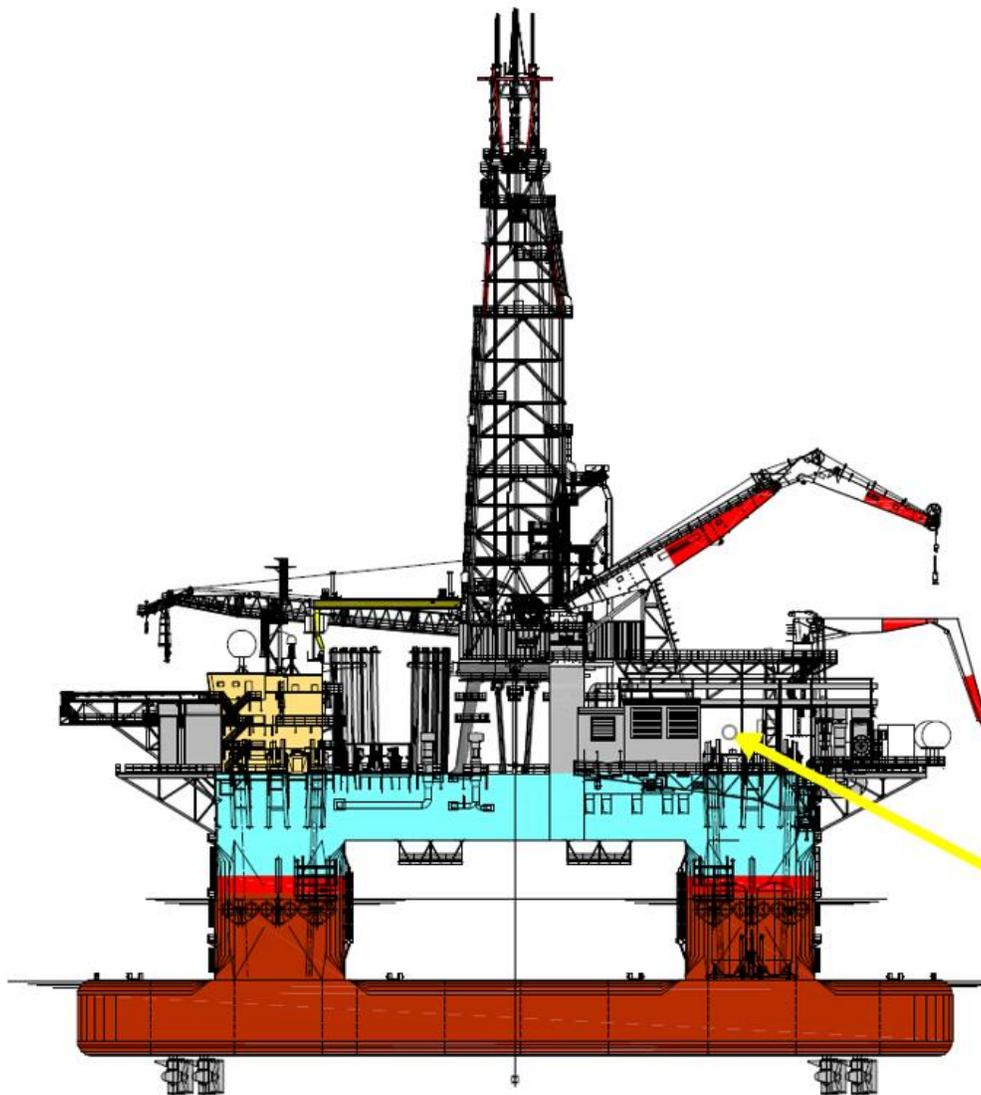


Figure 3-1. MD External view.

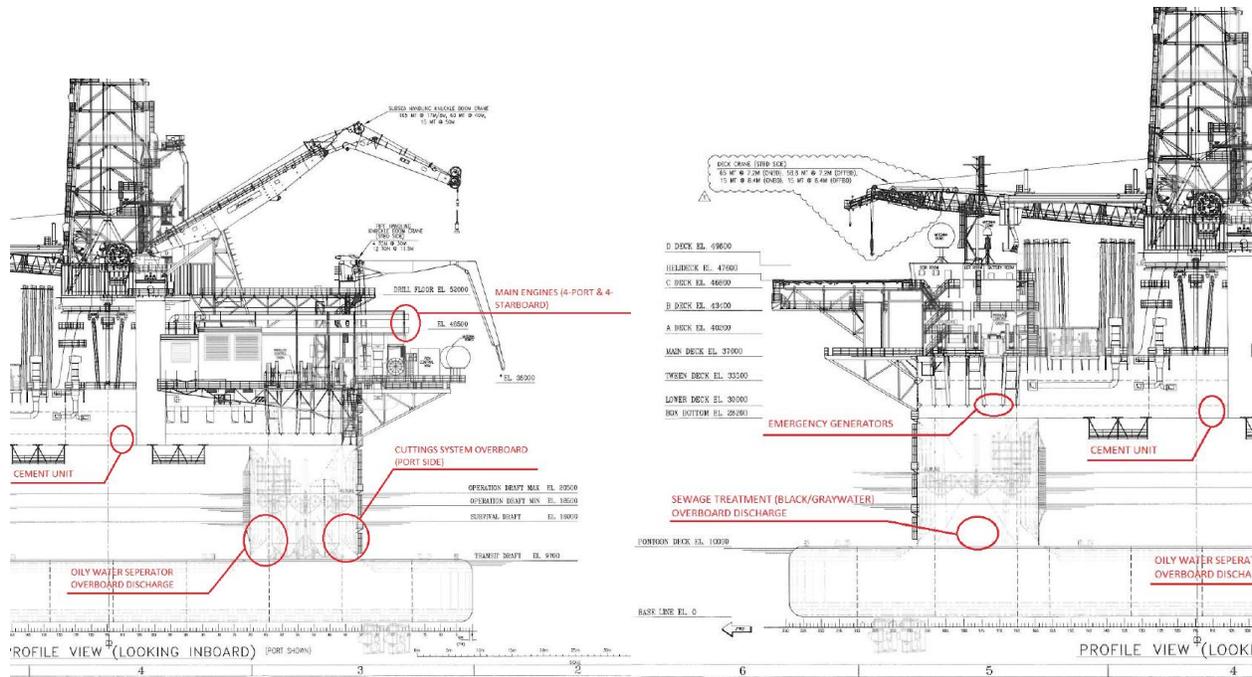


Figure 3-2. Maersk *Discoverer* Primary Effluent Discharge points.

3.1.1.1 "Realtime" compliance monitoring

Maersk *Discoverer* has the necessary interface and will be capable of supporting remote access by the EPA to provide "Realtime" compliance monitoring.

3.1.2 Onshore facilities and marine/aviation support

The Project will involve onshore facilities and marine/aviation services in Guyana to support the exploration drilling and decommissioning activities. Laydown areas, pipe yards, warehouses, fuel supply, heliport, and waste management facilities are planned to be part of the support. CRI will consider Trinidad & Tobago for back-up service activities if not available in Guyana.

Daily activities and operations to be performed at the shorebases will generally include:

- Storage of pipe, equipment, and spares;
- Loading and unloading cargo from trucks and marine vessels;
- Use of cranes and other lifting equipment;
- Bulk storage of chemicals, fuels, and industrial consumables;

- Potential operation of a cement and drilling fluids and mud plant to support offshore drilling operations; and
- Secure handling and storage of wastes pending final recycling, treatment, or disposal.

Four Operational Areas are designated to support the Exploration Drilling Activities:

- (1) CRI's Logistics Yard and Storage Facility at Lot 5 Bramfield, Region 6, on the Eastern Bank of the Berbice River - referred to as the Bramfield Facility.
- (2) Shorebase and port services in Georgetown: CRI is in discussion with G-Port for mooring and shorebase services.
- (3) Helicopter support will be based at Eugene F. Correia International Airport (Ogle Airport);
- (4) Waste Management Facilities to be contracted by CRI.

Port Georgetown is on the North coast of Guyana along the East Bank of the Demerara River. The port is currently run by MARAD. Port Georgetown piers are independently operated, either by private owners or public corporations. CRI is in discussion with G-Port Inc. for standard offshore Rig support logistics, PSV mooring and other Shore base services in Georgetown. CRI is in discussion with Tiger Rentals Guyana for non-hazardous and hazardous waste management disposal services and PSV mud tank cleaning services at the GYSBI Inc. location at Houston, Guyana. Both G-Port and GYSBI are equipped to provide adequate the services to support Project operations as long as potential vendors for drilling mud can supply CRI and other oil and gas operators.

3.1.2.1 The Bramfield Logistics Yard and Storage Facility

The Bramfield Facility is fully functional and expected to be used for the storage and staging of tubular goods and equipment. It is situated in 15.6 acres of freehold land purchased by CRI from the state-owned GuySuCo. The Bramfield Facility is 5-km from New Amsterdam and is accessible by the Corentyne Highway.

3.1.2.2 Guyana Shore Base Inc. (GYSBI)

GYSBI is a Guyanese company supporting the oil and gas offshore operations in Guyana. GYSBI operates from Houston, East Bank Demerara, provides specialized shore base management and integrated logistics services for operators in Guyana’s oil and gas sector. GYSBI facilities include pipe and inventory management, construction, waste management, climate-controlled warehousing, water treatment, fuel storage and delivery, dry cement storage and liquid drilling mud delivery. The facility provides all the support services including emergency response services.

3.1.2.3 Port Georgetown – G-Port Facility

CRI is in discussion with G-Port for mooring and shore base services. G-Port is in Port Georgetown at the mouth of the Demerara River and is complete with secure 24-hour operations, 6.5m Low Tide Depth and 140m wharf with 3,000 lb./ft² Load Capacity. It has covered, secure warehouse space, and a mud and cement facility. It is fully equipped to handle CRI needs for drilling Wei-1.

3.1.2.4 Support vessels and helicopter support

Three to five drilling support vessels (boats) will be utilized during the drilling of Wei-1. The support vessels will conduct supply services from the wharf to the well site. Based on previous experience, it is estimated that the supply vessels will be transiting on average three times per week between the wharf and the well location.

Helicopter support will be based at Eugene F. Correia International Airport (Ogle Airport) in Georgetown. An average of six (06) round-trip helicopter flights per week is expected to support the Project’s activities.

3.2 Drilling and Well Design

A detailed well program and design consistent with industry practices and protective of the environment are planned for Wei-1 to ensure safe and successful drilling.

3.2.1 Pre-Drill Workflow

In preparation for drilling, CRI has conducted “Geohazards Assessment” (which includes the seabed and shallow section below the mudline) and “Pore-Pressure/Geo-Mechanical Modeling”. These studies drive the basis of well design and are used to select casing points and drilling fluid program design. An independent third-party Geomechanical Modeling Workflow process is described by a process flow diagram in **Figure 3-3**.

The goal of these studies includes the following:

- Provide estimates of the pore pressure and fracture gradients, including a range of possible outcomes;
- Develop reliable effective mud weight predictions for drilling the well;
- Provide operational recommendations to mitigate geomechanical risks.

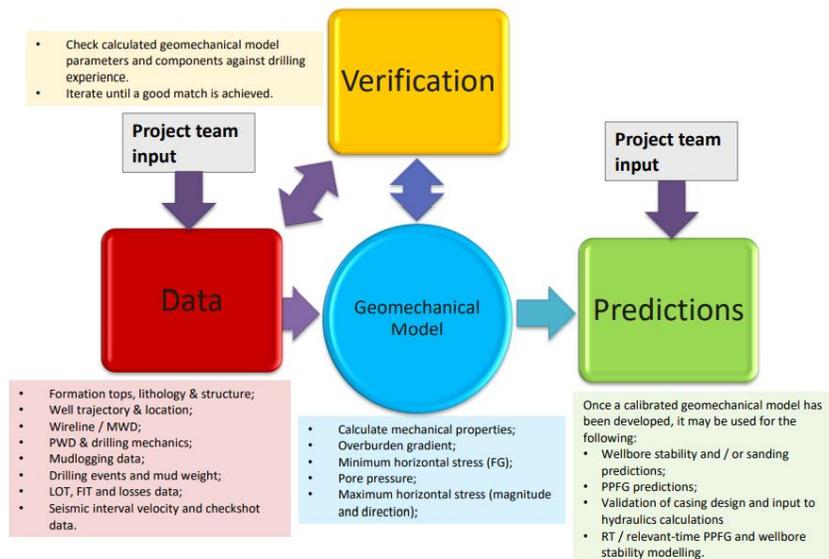


Figure 3-3. Geomechanical Modeling Workflow.

3.2.2 Well Design

Once the borehole is started for a well, casing is inserted into the borehole and cemented in place (to keep the well from collapsing and to seal the casing to the formation). Various sized casings will be progressively set as the well is drilled deeper. The size and strength of the wellhead and

casings to be used in the design of the well considers the peak reservoir temperature and pressure conditions that may be encountered during drilling. After each casing is installed, pressure and integrity testing will be performed according to standard industry practices.

A well program and design are planned for Wei-1. The drilling operations are expected to be conducted 24 hours per day for up to 85 days. In the event hydrocarbons are encountered, the drilling program may be extended for additional resource assessment by logging. The provisional Casing Program for Wei-1 including casing types and sizes, setting depths, drilling fluid types, and discharge locations for the drilling program is shown in **Table 3-1**.

Table 3-1. Planned Casing Program for Wei-1.

Formation Tops MD/TVD (ft-RKB)	Water Depth		MD/TVD (ft-RKB)	Hole Size (in)	Casing				Fluids PPFG Temperature				
	1,935 ft 2,045 ft-RKB				(in)	(ppf)	Grade	Conn	Fluid Type	MW ppg	PP ppg	FG ppg	BHST (°F)
			2,323	Jetted 36	36	727 553	X-65 X-95	XLW XLW	WBDF	SW 8.5	8.2	8.8	49
			5,450	26	22	277 224	X-80 X-80	XLW XLW	WBDF	DHMMW 10.5	8.8	12.3	95
			10,600	18 ½ x 21	18	117	P-110	Hunting SLF	NADF	DHMMW 11.7	11.3	14.7	170
Miocene – 11,452 Eocene – 13,050			17,450	16 ½	14 x 13 ¾	113 88.2	Q-125 IC Q-125	TSH 523 Vam 21	NADF	DHMMW 12.5	12.0	15.9	267
Campanian Horizon 15 – 18,351 Horizon 20 – 19,135			21,200	12 ¼	9%	53.5	P-110	Vam SLIJ-II	NADF	DHMMW 14.5	14.1	17.0	340
Santonian Horizon 24 – 20,918 Horizon 26 – 21,537			22,400	8 ½	Open Hole	-	-	-	NADF	DHMMW 15.2	14.7	17.3	358

3.3 Potential Appraisal Wells

Nearby appraisal wells will be drilled if Wei-1 proves successful. The appraisal wells design will be very similar to that of Wei-1. However, no program has been formulated as yet. The potential impacts on the environment and socioeconomics from the appraisal wells operations and any oil and gas drilling operations in the area would be similar to those from Wei-1.

3.4 Best Available Technology (BAT) analysis

The selected drilling contractor will employ best available technologies for ballast water management, mud and cuttings management, and reductions in air emissions.

3.5 "Realtime" Compliance Monitoring

CRI will work with the EPA to provide remote access to the EPA for compliance monitoring on the exploration drilling rig. CRI will work with the EPA in determining necessary communications technology which may be required to facilitate remote inspections.

3.6 Project Size

3.6.1 Project duration and capital investment

3.6.1.1 Project Schedule

The drilling of Wei-1 is planned to be executed in the period May 2022 to August 2022. The Project will consist in two stages (1) Drilling and (2) Decommissioning/Plugging and Abandonment (P&A). These operations will involve offshore and onshore support activities. The operations are expected to be conducted 24 hours per day for the estimated days. In the event hydrocarbons are encountered, the drilling program may be extended. The Project will involve shore base facilities and marine/aviation services to support the drilling activities.

3.6.1.2 Factors that May Influence the Project Schedule

While no sidetracks are planned for Wei-1, a sidetrack remain within the realm of possibility in the event drilling operational challenges are encountered prior to reaching the geologic objective. A sidetrack would add an estimated 20-30 days to the operation.

Appraisal wells may follow should Wei-1 prove successful. If so, the Appraisal Wells will be similarly drilled and would take up to 85 days each.

3.6.1.3 Costs of the Drilling Operations

The expected AFE (authority for expenditure) for drilling Wei-1 is approximately \$93,000,000. The detail of the cost for drilling Wei-1 will be provided if required.

3.6.2 Project Workforce

The Company currently employs 21 full time local Guyanese personnel in Berbice and another 18 members in Georgetown. Approximately 225 persons offshore (on rig and OSVs) and 25 persons at the shore base (storage area and wharf) will be working during the Exploration Drilling operations. The employment will peak at the drilling stage. Other personnel for activities such as waste management will be contracted. The preliminary workforce estimates will be refined following execution of contracts for the rig, support vessels and shore base support facilities.

3.6.3 Rates of production

The petroleum exploration drilling activity entails moving a drilling rig into position, then spudding and drilling of the exploration well. The well will be evaluated for hydrocarbons, but no production is expected at this stage. The Well - Petroleum Exploration Drilling will provide the company with logging results which will be interpreted.

3.6.4 Transportation route

The support vessels will conduct supply services from the wharf to the well site. Based on previous experience, it is estimated that the supply vessels will be transiting on average three times per week

between the wharf and the well location. An average of six (06) round-trip helicopter flights per week is expected to support the Project’s activities.

The coordinates of the Operational Areas are provided in **Table 3-2**. A coastal map of Guyana indicating the location of Wei-1 relative to the Bramfield Facility and Georgetown and the Guyana coast is shown in **Figure 3-4**.

Table 3-2. Coordinates of the Operational Areas - Coordinates for CRI Operation Locations.

Location	Latitude	Longitude	Distance to Well
1) Georgetown Port	6°, 48', 16" N	58°, 9', 19" W	200km
2) Bramfield Storage Facility	6°, 13', 03" N	57°, 31', 36" W	177km
3) Ogle Heli-Airport	6°, 48', 26" N	58°, 06', 21" W	198km

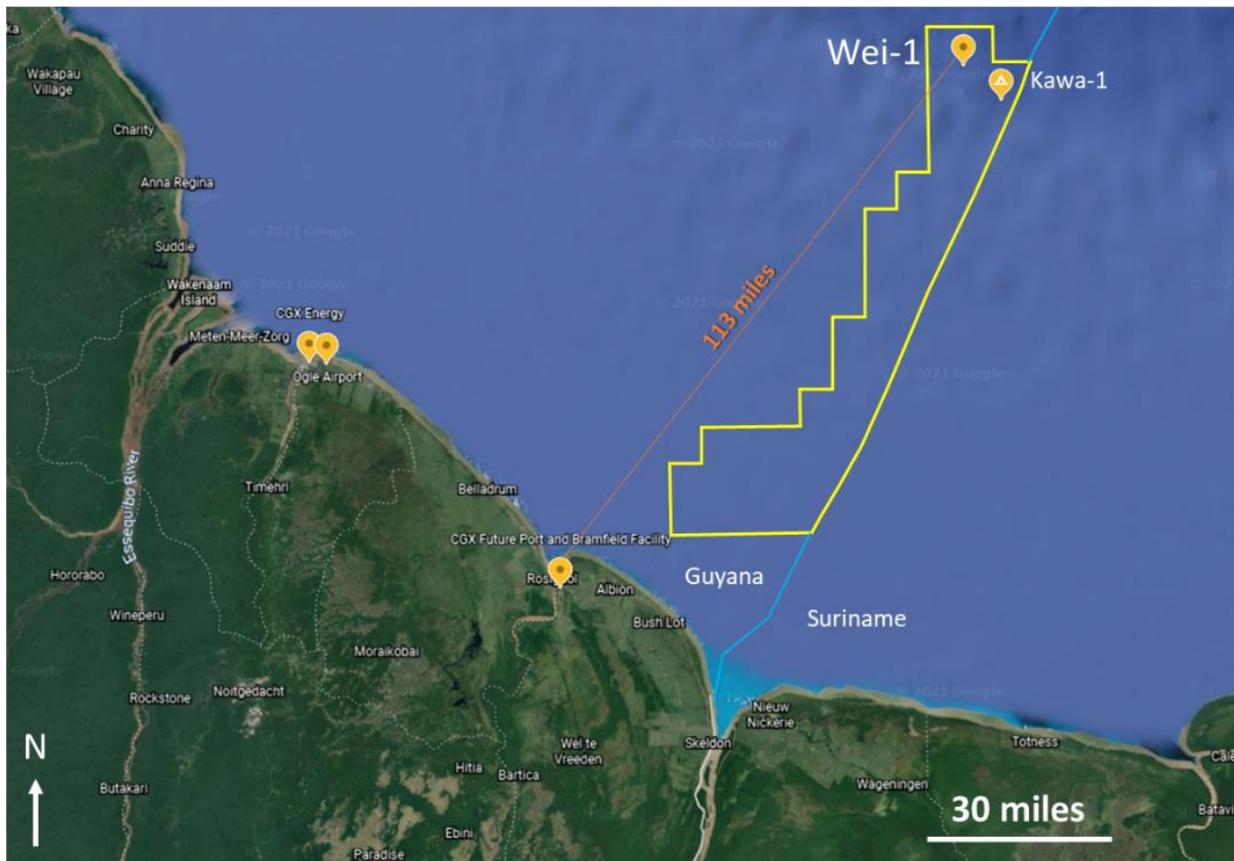


Figure 3-4. Coastal map of Guyana indicating Wei-1 relative to the coast of Guyana.

3.7 Volume of expected pollutants

3.7.1 Emissions

The Project will include several sources of atmospheric emissions as well as sound and vibrations and light emissions. Noise, light, and hull fouling are disturbances that may eventually impact seabirds and marine fauna. **Table 3-3.** below lists the emissions generated by the activities associated with the Project with short description of these emissions.

Table 3-3. Atmospheric emissions generated by the activities associated with the Project.

Emission	Description
Atmospheric emissions	Toxic emissions such as GHG (Green House Gases), NO _x (Nitrogenous Oxides), SO _x (Sulfurous Oxides) and ODS (Ozone Depleting Substances) would be generated by the Project. Atmospheric emissions are anticipated from three main categories: <ol style="list-style-type: none"> 1) Combustion Emissions: generated from combustion of liquid fuel or natural gas during aviation and marine support and operation of the drilling rig and unlikely unplanned gas flaring; 2) Fuel transfer operations; and 3) Fugitive Emissions: leakage through process equipment components (e.g., valves, flanges), and potential unplanned CFC releases from the HVAC and refrigeration systems.
Sound and vibrations	Sound and vibrations are physical disturbance to marine fauna. These emissions originate from the rig with the relatively constant noise source of drilling, the supply vessels and support aircraft.
Light emissions	Emissions due to generation of light from the rig have the potential to impact on seabird populations.

3.7.1.1 Atmospheric Emissions

The atmospheric emissions arise from the photochemical oxidation of gases such as nitrogen oxides (NO_x), sulphur oxides (SO_x) and volatile organic compounds (VOC)s which have potential to form particulate matter (PM) and ground-level ozone leading to smog formation. VOCs also include Greenhouse Gases (GHS) that could impact Global Climate Change.

The atmospheric emissions expected to be generated by the activities associated with the Project arise from three main categories:

- (i) Combustion of fossil-based fuel during installation and operation of the rig, incomplete incineration of waste and unplanned flaring of gas;
- (ii) Transport and support activities of the Project such as vessel loading for fuel transfer; and
- (iii) Leakage through process equipment and chlorofluorocarbon releases from cooling and vacuum equipment.

3.7.1.2 Air Quality Emissions Modeling Survey (AQEMS)

The impact of air pollutant Emissions will be assessed using the third-party services company, Trinity Consulting. CRI will work in conjunction with the drilling contractor and boat contractors to gather the information needed by Trinity Consultants to assess all air emissions point sources related to the drilling operation. Trinity Consultants will perform Air Quality Emissions Modelling (AQEM) in accordance with World Health Organization (WHO) guidance. The typical AQEM approach would include three main components: (1) identifying specific point sources, such as the power-generating units and diesel engines on rig and engine exhaust sources such as marine support vessels and helicopters and (2) calculating their associated air emissions based on engine loads, fuel types and run times and (3) utilizing WHO accepted industry modelling processes that incorporates weather forecasting to predict the resulting AQEM maximum concentrations. An Air Quality Emissions Modeling Survey report will be provided to the EPA upon request.

During the period of drilling operations, CRI considers the air pollutant emission points sources to originate from three non-road mobile sources: the mobile offshore drilling unit (MODU), Crew Helicopters, and the Production Supply Vessels (PSV). The MODU is conducting the drilling operations approximately 168km offshore. Helicopters will travel between Georgetown, Guyana and the MODU, conducting an estimated 9 round trip flights per week. The three PSV's will travel between Georgetown, Guyana and Chaguaramas Trinidad, and the MODU, conducting an estimated 16 round trips per week. For all these sources, engine combustion emissions will be the only significant air pollutant emission sources. CRI will use the fuel consumption of each non-road mobile source to calculate the monthly and end of well emissions of particulate matter (PM), Oxides of Nitrogen (NOx) and sulfur dioxide (SO₂) to ensure they remain within WHO AQEMS guidelines.

Table 3-4 below summarizes the most critical air dispersion modeling results for the proposed Wei-1 drilling operation. The air emissions from the helicopter twin engine Jet A-1 fueled and the four drilling rig diesel engines have a negligible impact on the Guyanese shoreline.

Table 3-4. Emissions Summary.

Source	Maximum 1-hour NOX (ug/m ³)	Maximum 1-hour SOX (ug/m ³)	Maximum 24-hour PM _{2.5} (ug/m ³)	Maximum 24-hour PM ₁₀ (ug/m ³)
MODU	1.87	1.61	0.05	0.05
Helicopter	0.00	0.00	0.00	0.00
PSV	182.43	30.78	0.18	0.18
TOTAL	184.3	32.39	0.23	0.23
WHO Standard	200	500 (10-minute average)	25 (24-hour average)	50 (24-hour average)

Such emissions contribute to increases in the ambient air concentrations of certain pollutants. Depending on the magnitude and extent of the increases relative to the location, the increases may have the potential to contribute to health impacts in onshore receptors. The receptors of these impacts in Guyana would be the onshore population. Air quality for Project workers will be addressed through standard occupational exposure guidelines.

Particulate matter (PM_{2.5}, PM₁₀) and other pollutants (VOC_x, CO, CO₂) are considered in the Wei-1 AQEMS study. The total emissions expected during an up to 100-day drilling period are summarized in **Table 3-5**. Details on the emission calculation methodology are provided in the Modeling Methodology and Input Data of the AQEMS report.

Table 3-5. Total Air Pollutant Emissions During 100-Day Project Duration.

Photochemical Pollutants	Atmospheric Emissions (ton)
• Nitrogen oxides (NO _x) e.g., NO ₂ , NO ₃ , N ₂ O	268.6
• Sulfur Oxides (SO _x) e.g., SO ₂	24.5
• Particulate Matter (PM) e.g., PM ₁₀ , PM _{2.5}	7.4
• Volatile Organic Compounds (VOCs)	11.3
• Carbon Monoxide (CO)	41.9
• Carbon dioxide (CO ₂)	28015.6

3.7.1.3 Flared Hydrocarbons

There is no intention to flare hydrocarbons unless encountered during drilling. The potential environmental effects of flared hydrocarbons are localized effect on air quality and global contribution to greenhouse gases.

3.7.1.4 Ozone Depleting Substances (ODS)

The ozone depleting substances (ODS)s – HFC R407c, HFC 134a and HCFC R22 - are used in AC systems and freeze rooms. These are closed systems and do not vent to the atmosphere. For maintenance, a vacuum pump is used to recover the gas into the circuit. In the event of an emergency a small volume of halon which is an ODS present on helicopters, would be released. Generally, ODS would have localized effect on air quality.

3.7.1.5 Power generation

The rig uses 43m³ per day of diesel. The supply/support vessels will each use 10m³ per day. The potential environmental effects of power generation include localized effect on air quality and global contribution to greenhouse gases.

3.7.2 Sound and Vibrations

The noise caused by drilling, support and supply vessels has the potential to disturb seabirds, cetaceans, turtles, and fish. The noise levels from the rig are loudest during the short time required for its positioning. The relatively constant noise source of drilling is less likely to traumatize fauna than erratic sources. The supply vessels which would also emit noise would be under low propulsion power when near the rig. Noise is also caused by support aircraft with potential disturbance to roosting seabirds and marine fauna. The expected noise levels are below those of GNBS Guidelines for noise emissions into the environment for offshore operations.

Vibrations and their impacts are anticipated to be insignificant.

The Project would not be expected to result in significant airborne sound impacts or ground-borne vibration impacts on onshore communities and receptors (the well site is 200km offshore). The workers onboard the rig, and other Project-associated vessels would be the only airborne sound receptors. CRI will utilize industry standard engineering and administrative controls for sound

mitigation and provide appropriate hearing protection PPE for workers as needed. Although the expected noise levels are below those of GNBS Guidelines for noise emissions into the environment, CRI will monitor sound levels.

3.7.3 Light from the Rig

The Light from the rig may cause disturbance to cetaceans, turtles, seabirds, and fish. Lighting may result in a short-term abundance of certain species attracted by the light. Lighting on the rig will be directed, where practicable, to operational areas rather than at the sea surface or skyward as an embedded control. Drilling will last in the order of up to 85 days and this period will not cause irreversible fauna behavior.

3.8 Activities associated with all development stages

The project is an oil and gas exploration drilling. The exploration drilling operation will provide the company with valuable information for the assessment of the potential for oil production. Although no production is expected at this stage, the exploration drilling may result in a find which would lead to the development of the oil and gas field and a production stage. This stage will be the subject of a separate Operation Permit application.

3.9 Use of Natural Resources

No raw materials would be used on the site, but the rig and offshore support vessels will consume the following materials:

- Food – 5,625kg per month (225 PoB)
- Fuel (low sulfur diesel)- 2,435m³ per month
- Water based drilling fluid (WBDF): 10,000bbl
- Non-Aqueous drilling Fluid (NADF): 6,000bbl
- Cement (bulk): 275m³

Tubulars and a wellhead will be used for the drilling operations.

3.10 Utility services

The Maersk *Discoverer* is self-contained to maintain crew and support the operation. Facilities would include living quarters, power generator, and telecommunications. The rig will use Membrane processes for potable water access during the drilling of the exploration well. Brine disposal streams are a byproduct of these processes.

3.11 Waste production

3.11.1.1 Materials and Drilling Chemicals

The project will, require the use of various equipment (e.g., drilling rig, pipes), as well as some chemicals used to facilitate well drilling, water/waste treatment, and other purposes. **Table 3-6** below provides the chemicals that will be used for the drilling and construction of Wei-1.

Table 3-6. Project-related Chemicals.

Discharges	Composition
Water-Based Drilling Fluid (WBDF)	<ul style="list-style-type: none"> • Water, seawater, or inorganic salts • Barite; Clays • Water-soluble biopolymers and modified biopolymers • Thinners; Shale Inhibitors; Calcium Carbonate • Lost circulation material • Caustic Soda; Soda Ash
Non-aqueous drilling fluid (NADF) retained on cuttings	<ul style="list-style-type: none"> • Base Oil (IOGP Group III) • Barite • Calcium chloride brine • Organophilic clay • Emulsifier; Wetting Agent • Viscosity modifiers; Fluid loss modifiers • Lime; Calcium Carbonate
Cement	<ul style="list-style-type: none"> • Cement class “G” • Extender; Accelerator • Defoamer; Retarder • Surfactant; Dye
Potable Water Processing Brines	<ul style="list-style-type: none"> • Concentrated water solution of common salt (sodium chloride)
BOP Testing Fluids	Typical composition: <ul style="list-style-type: none"> • ~97 % water • ~3 % biocide/lubrication/corrosion protection chemicals

All chemicals will be stored in appropriate storage containers according to their Safety Data Sheets (SDS) and following industry standard safety protocols using appropriate containment and drainage controls. Unused or used and recovered chemicals will be re-used, recycled, or disposed of in accordance with applicable regulations and best practices.

3.11.1.2 Discharges

The Project will have several planned discharges to water related to the operations and maintenance of the drilling rig. Potential discharges include:

- Drilling Fluids (Seawater, WBDF, NADF);
- Drill cuttings generated while using WBDF and Drill cuttings generated while using NADF;
- Reject (brine) water;
- Excess cement;
- Blowout Preventer testing fluids;
- Ballast water; Cooling water; and Fire water;
- Deck drainage;
- Sanitary waste; Domestic waste; and Food waste.

Note that all discharges will be accounted for.

The drilling rig and supply vessels will be equipped to comply with the water pollution control standards required by the International Maritime Organization (IMO) International Convention for the Prevention of Pollution by Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78).

The rig will provide wastewater treatment for sanitary wastes (black water/sewage) and food preparation wastes in accordance with MARPOL requirements. These wastes will be managed in compliance with MARPOL 73/78 requirements.

The operational discharges will be treated as required and released only if they meet the requirements of the Water Quality Regulations 2000. Recovered or unused chemicals will be re-used, recycled, or disposed in compliance with applicable regulations.

The overall potential environmental effects of marine waste discharges are:

- Increased turbidity in the water column.
- Localized smothering of benthic fauna from drill cuttings.
- Toxic effects of hydrocarbons and chemicals on marine animal and plant life, or changes in habitat characteristics.
- Physical coating or asphyxiation, or disruption of physiological or behavioral processes in marine animal and plant life by hydrocarbons.
- Localized increases in environmental nutrient loading.
- Localized reduction in water quality, including reduced dissolved oxygen and an increase in water temperature and salinity.

3.11.1.3 Anticipated Waste Volumes

A waste Profile sheet for each of the 36 required waste streams will be provided to the EPA and will be certified with CGX HSE Manager signature. The required volumes of the chemicals (**Section 3.11.1.1**) and the planned discharges will be provided to the EPA in a Waste and Discharges Information Worksheet document based on the estimates which will be received from preliminary assessments of the Project (**Section 3.11.1.2**).

3.11.2 Waste and Waste Management

The Project's rig and supply vessels will generate a variety of solid wastes including hazardous and non-hazardous wastes. The general garbage (domestic and industrial solid wastes consisting of plastic, glass, paper, and scrap metal) is considered non-hazardous and solid and liquid wastes consisting of used oil, paint waste, oil-contaminated cement, and unused chemicals are considered hazardous waste.

The solid waste-management methods are:

- Recycling through reinjection in operations of used oil, water containing oil;
- Recycling of Glass, paper, plastic, scrap metal, wood non-hazardous solids;
- Onshore treatment e.g., incineration, bioremediation;
- Onshore Non-hazardous Landfill Ash from incineration and general trash.

The general garbage as well as the hazardous waste will be collected and segregated on the rig/vessel before proper disposal onshore to avoid disturbance to marine resources and adverse effects on water quality. Solid waste generated offshore will be reduced, recycled, treated, and disposed offshore where practicable, with the remainder directed for onshore treatment, recycling, reuse, or disposal. CRI will utilize a regional supplier operating an existing onshore waste treatment/incineration facility at a local shorebase. All Project's waste streams will be managed in accordance with the Company's Waste Management Plan (WMP). The Company will employ a licensed local waste management facility with existing infrastructure for treatment, incineration, and safe disposal of solid wastes.

3.11.2.1 "Cradle to Grave" Waste Analysis

A "Cradle to Grave Waste Analysis" is being prepared for the Project. A "Cradle to Grave Waste Analysis" will be provided specific to the Wei-1 well and aligns with the operational procedures set out in the CRI waste management plan. CRI understands that in the cradle-to-grave approach, waste generators are responsible for all hazardous waste they create from the moment it is generated to the ultimate disposal of that waste. Components of the cradle to grave analysis will include waste profile Generation, Transportation, Treatment, Storage, and Disposal process stream diagrams, associated volumes, related Safety Data Sheets (SDS), and other applicable waste profile details. CRI however acknowledges the challenges facing the country regarding waste management and commits to delivering the most practical solutions with the most up to date available technologies.

CRI adopts practical and feasible 'waste hierarchy' model for prioritising waste management practices for its waste management. The "waste hierarchy" offers a preferential order of waste handling options that aims to reduce environmental impacts by prioritizing prevention/reduction, recovery, reuse, and recycling over landfill.

The waste policy is in place to encourage prevention and reduction in waste generation and conformance with the waste hierarchy of recycling, treating and managed disposal of residues. CRI is committed to ensure *minimization* of the amount or hazardous nature of waste entering the

waste streams. Recovery, recycling and reuse are the preferred options whereas final disposal in landfill is the least desirable option.

The "Cradle to Grave" Waste Analysis is specific to Wei-1 and will be provided to the EPA upon request. The "Cradle to Grave" Waste Analysis document will include:

- a) CRI's "Cradle to Grave" Waste Analysis
- b) Waste Profiles 001 to 036 for Wei-1 well
 - i) Waste stream Table of Content
 - ii) Basal Convention waste categorization #
 - iii) Waste stream Instructions
 - iv) Waste stream Profile Numbers & Estimated volumes for Wei-1 well.

Available drilling mud options in the region may lead to less impactful mud/cuttings discharges and more practical Production Support Vessels tank cleaning options. Tucker Energy Services Ltd out of Trinidad and Tobago is a specialized mud services company in the region, that can supply the quantity and quality of NABF mud needed for the project at a Free on Board (FOB) cost comparable with other companies based in Georgetown. The cost-benefit analysis on the mud services options will be provided in Appendix 5 of the Wei-1 "Cradle to Grave" Waste Analysis document.

3.11.2.2 Waste Management Plan (WMP)

As part of CRI's commitments to achieve high environmental standards, CRI has developed a Waste Management Plan (WMP) covering its offshore drilling activities. The WMP ensures management and disposal of waste is done in accordance with standard industry practice and comply with all applicable regulations. The CRI WMP standardized document apply to all CGX's offshore wells in the Corentyne PPL and the Demerara PPL. The plan outlines how CRI implements its HSE policy with respect to the management of waste. It sets the objectives, defines the strategy, assigns the responsibilities and outlines monitoring and control systems.

Those activities that are specific to the Project are not included in the CRI's WMP standardized document and are covered in documents provided as appendices to the standardized WMP.

The overall WMP is applicable to the management of wastes generated in the performance of the Projects including, drilling, installation, commissioning, production operations, and decommissioning.

The overall Waste Management Plan has been developed to ensure effective management of generated wastes and compliance with all legal and regulatory requirements. The selected rig will operate in compliance with all six Annexes of MARPOL 73/78 (The International Convention for the Prevention of Pollution from Ships).

3.11.3 System integration, Waste reduction, recycling

CGX has integrated the waste management plans of the drilling contractor and PSV. Waste reduction, recycling will be achieved according to the Waste facility services proposal quoted by Tiger Rentals Guyana (TRG). CRI will ensure that it reviews and approves all chemicals that may be used as drilling mud additives. Where hazardous chemicals are required, the volumes of those chemicals shall be maintained at a minimum for the well phase / hole section.

To assist with EPA agency capacity, CRI records all waste generation manifests and disposal certificates in the EPA Remote Inspection database each month. For example, Kawa-1, the oil and gas exploration well that CRI is currently drilling (September – December 2021) has 80 Waste manifests and four certificates of disposal uploaded.

3.11.4 Waste facility infrastructure

CRI is planning to utilize a regional supplier who is operating an existing waste management facility at a local shore base in Georgetown, Guyana. CRI is in discussion with G-Port for the management of the waste generated by the Project. Tiger Rentals Guyana (TRG) is the potential waste management company which would handle Wei-1 waste management. The TRG waste management facility at the GYSBI shore base provides all the support services including emergency response services to support the waste management initiative. The IBC or Totes required from TRG to ship the waste to shore are readily available and tracked by GPS tags. In Guyana, the Haags Bosch Landfill has been permitted by the Guyana EPA and is managed by the Ministry of Communities.

CRI may consider alternative Guyanese or regional waste management services according to Project needs. If additional landfills become available in Guyana, those appropriately engineered landfills will be assessed and reviewed for use. The details regarding waste management facilities will be provided to the EPA when contracts are finalized.

3.12 Duration of the project

The drilling operations are expected to be conducted 24 hours per day during up to 85 days to be executed in the period May 2022 to August 2022. In the event hydrocarbons are encountered, the drilling program may be extended. The Project will involve shore base facilities and marine/aviation services to support the drilling activities.

3.13 Decommissioning plan

The drilling operations are to be conducted 24 hours per day for up to 85 days. In the event hydrocarbons are encountered, the drilling program may be extended. On completion of the evaluation program, the well will be permanently abandoned with the wellhead left in place, meeting all requirements for permanent plugging and abandonment (P&A) but with the possibility of future re-entry. A Decommissioning/ P&A Plan in compliance with the laws and regulations in effect and with industry standards is prepared for Wei-1. A notice of intent for P&A of the well will be presented to the GGMC and EPA for approval before decommissioning.

The waste streams associated with decommissioning activities, including hazardous and non-hazardous wastes, will be managed and disposed in accordance with standard industry practice and applicable regulations. Methods may include separation and incineration offshore, or transport to onshore waste management facilities for disposal in accordance with standard industry practice and applicable regulations.

The Final Decommissioning Plan will describe how to permanently plug and abandon the well with the possibility of future re-entry. A seabed video survey will be conducted seven days before the end of operations. At the end of operations, the rig will be removed from the location and transit to a new location.

4 Potential impacts of the project

CGX has identified and assessed the environmental issues and risks associated with the activity. The environmental and social impacts of the activities related to the drilling and decommissioning of Wei-1 may result from planned activities as well as potential unplanned events. The Project's routine operations and activities which could interact and potentially impact on existing environmental or socioeconomic resources (the receptors) are identified for the project on the basis that the Project will utilize existing Georgetown shore base and the Bramfield storage facility.

The offshore routine activities potentially have adverse impacts on air quality and disturbance of marine resources, such as those on the sea bottom (marine sediments and benthos), marine water quality, and biological resources such as seabirds, fish, mammals, and turtles, and eventually marine navigation. The routine activities at the shore base (Georgetown port) and Bramfield Facility will likely include short term impacts on air quality and traffic. The subsistence and commercial marine fisheries in coastal Regions of Guyana will potentially have increased exposure to the Project socioeconomic impacts.

The potential non-routine (unplanned) events such as an oil spill could have impacts on marine waters and coastal areas beyond the immediate area of operations and extend to the coast of Guyana, and other neighbouring countries and territories if a large oil spill were to occur. An oil spill from a well blowout could impact the coastal Regions more than the other regions because of their subsistence and commercial marine fisheries (e.g., potential impacts on fish and marine transport) and increased exposure to Project socioeconomic impacts. The extent and fate of an oil spill from a well control event during the Project was obtained using an oil spill trajectory modeling specific to the characteristics of the Project. The areas that could be impacted by an oil spill are mapped and described in detail in an environmental sensitivity mapping report.

The resources which can be significantly impacted by the Project are classified into physical, biological, and socioeconomic resources. The list of the resources that were identified as having the potential to be impacted by the Project is provided in **Table 4-1**.

Table 4-1. Resources which can potentially be significantly impacted by the Project.

Resources Category	Potential Resources to be impacted
Physical Resources	• Air Quality and Climate
	• Sound
	• Submarine topography/bathymetry - Marine Sediments
	• Marine Water Quality
Biological Resources	• Protected Areas and Special Status Species
	• Coastal Habitats; Coastal Wildlife and Shorebirds
	• Seabirds
	• Marine Mammals; Marine Turtles; Marine Fish and Marine Benthos
	• Ecosystems
Socioeconomic Resources	• Economic Conditions; Employment and Livelihoods
	• Community Health & Wellbeing
	• Social Infrastructure and Services
	• Marine Use and Transportation
	• Cultural Heritage
	• Land Use
	• Indigenous Peoples

4.1 Project Area of influence

The direct and Indirect Areas of Influence (AOI) are identified with their environmental and socioeconomic resources which may be impacted.

4.1.1 Direct AOI

The direct AOI is shown in **Figure 4-1**. The AOI within which the Project is expected to have direct impacts includes:

- the project drilling area (i.e., the Wei-1 subsea well);
- the marine transit corridors between Wei-1 and shorebase in Guyana;
- the port and City of Georgetown;
- the Bramfield facility and the town of New Amsterdam;
- the portion of the highway between the Bramfield Facility and port of Georgetown.

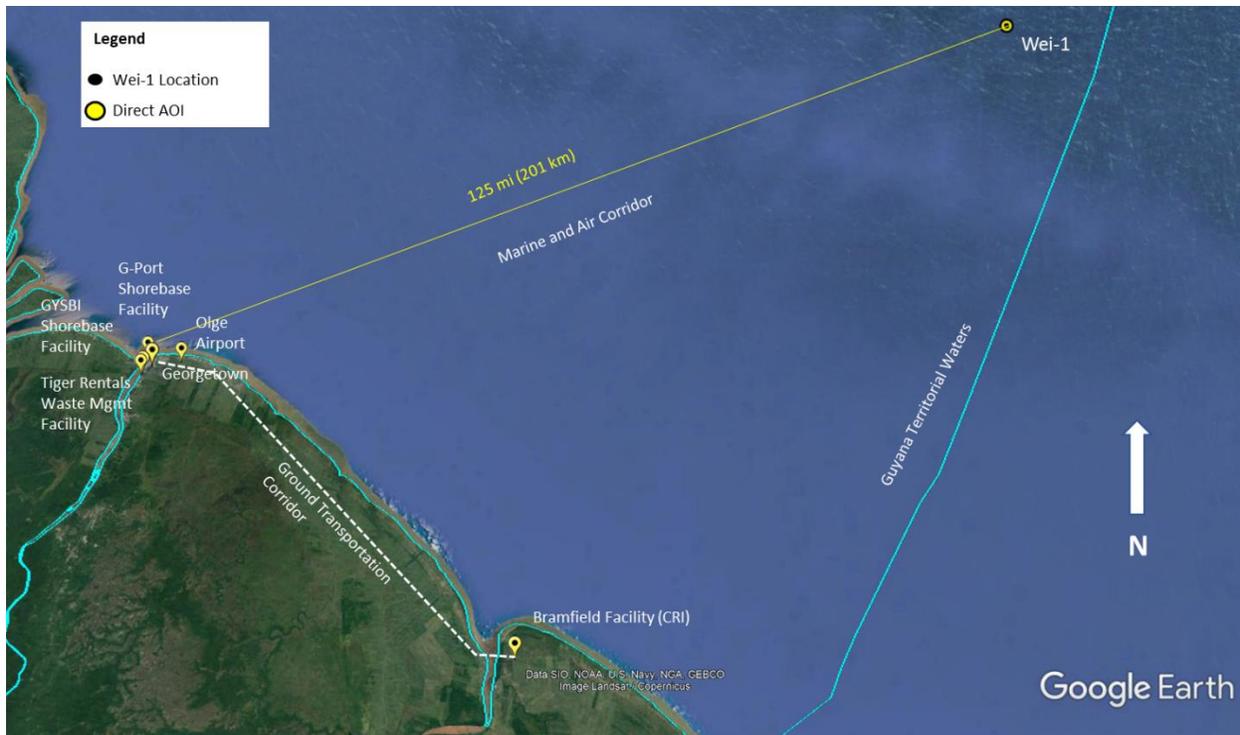


Figure 4-1. Direct Area of Influence.

4.1.2 Indirect AOI

The Indirect AOI is shown in **Figure 4-2**. The AOI, within which the Project is expected to have indirect impacts includes:

- coastal areas and marine waters within the territorial boundary of Guyana that could potentially be impacted by an unplanned event; and
- coastal Regions who could be impacted by the Project than the other regions because of their subsistence and commercial marine fisheries (e.g., potential impacts on fish and marine transport) and increased exposure to Project socioeconomic impacts.

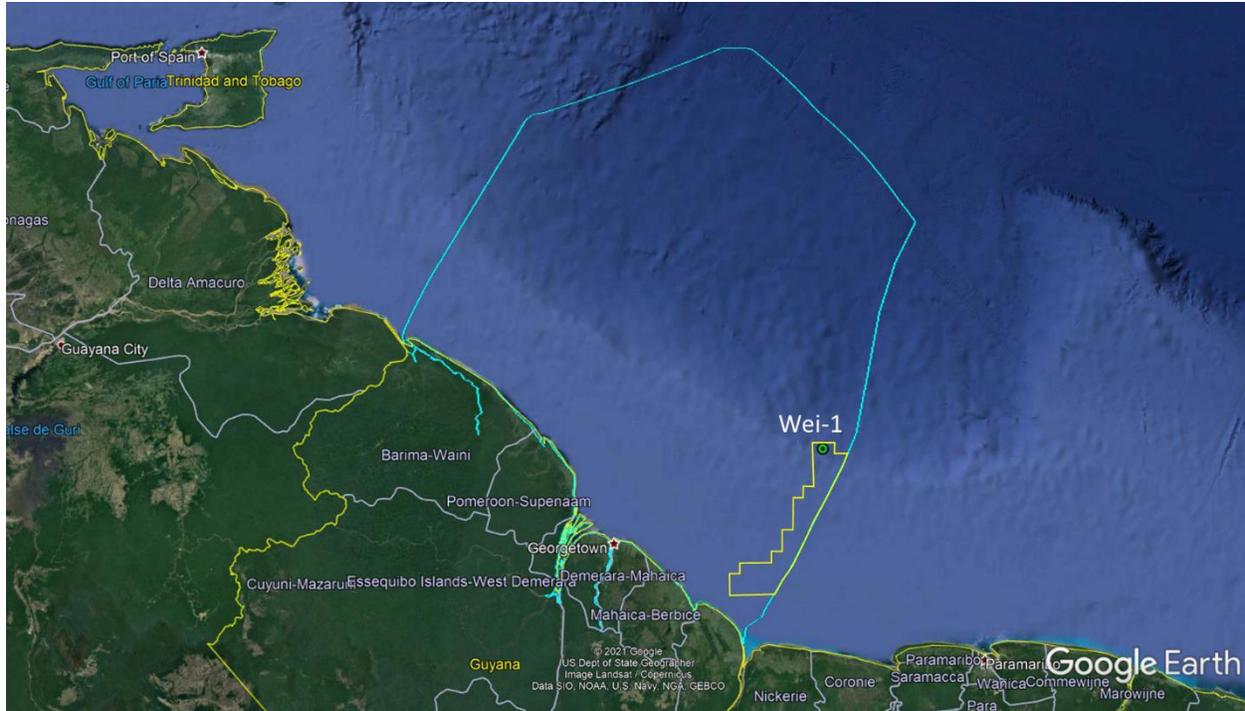


Figure 4-2. Indirect Area of Influence.

4.1.2.1 Geographical area of concern for cumulative impacts

A cumulative impact assessment will take into consideration incremental effects of the Project, when combined with other past, present, and reasonably foreseeable future projects in the AOI, on all resources affected by the Project. The geographical area of concern for the cumulative impacts analysis is consistent with the Project AOI.

4.2 Trans frontier nature of the impacts

The modeling of worst case well blowout, the oil spill model projected that there is 5 to 10 % chance of shoreline oiling in Guyana, and it would take 5 to 15 days for oil to reach shore. In this case and although with very low probability, the model predicted the oil spill may impact surface waters beyond Guyana waters and could reach the shorelines of immediate neighboring countries. without accounting for any preventative response measures, the oil spill may impact surface waters beyond Guyana waters and the shorelines of immediate neighboring countries.

4.3 Magnitude and complexity of the impacts - Impacts Assessment

A range of quantitative and qualitative information sources were used to evaluate Risk factors.

4.3.1 Methodology

The environmental and social impacts of the activities related to the drilling of an exploration well may result from planned activities (routine activities) as well as potential unplanned events. An “impact” is defined as any alteration of existing conditions, adverse or beneficial, caused directly or indirectly by the Project as defined Under the provisions of the EP Act (Cap. 20:05).

The Company’s environmental impact assessment approach is based on its experience drilling in the Corentyne block and the knowledge and understanding of risks and impacts inherent to operating in the Guyana Basin. It is also based on experience gained and shared by the oil and gas companies which are actively operating in blocks contiguous to the Project area.

Information on potential impacts, including potential cumulative effects generated from the activities required to develop the Project in Guyana, will be obtained by CRI from various sources including scientific research and literature, consultation with stakeholders and environmental impact assessments of other similar projects in the region and worldwide.

4.3.2 The Process

CRI’s risk assessment approach is targeted at providing information on all hazards and accidents (source) that might occur during the Project. The assessment methodology implemented by CRI is articulated as follows:

1. Identification of the sources of impacts and the potential impacts themselves.
2. Scoping and Terms of Reference
3. Assessing existing conditions
4. Description of Project
5. Stakeholder engagement
6. Assessment of Impacts and Identification of Mitigation.
7. Proposition of Mitigation Measures to address impacts and Management and Monitoring;
8. Disclosure and Reporting.

CRI ensures that all potential hazards are identified for the Project area and the areas that might be impacted. A resource/receptor may be physical, biological, or socioeconomic. The process is initiated at the very early stages of the Project during the design phase. The adverse impacts on the environment, labor, community, health and safety, and assets as well as the repercussion on the reputation of stakeholders and company are predicted and assessed. The stakeholders' concerns and suggestions are compiled in a report on the Company's outreach.

CRI will conduct and document planned inspections to ensure the early discovery of hazards and identify unsafe practices or procedures before the start of the Project and during operations. The intent of the inspections is to look for hazards, spills, or unsafe operations so they can be corrected.

Standard impact assessment process of rating potential impacts as provided by the EPA will be used to provide CRI with:

- a basis for prioritization of impacts to be managed;
- a method of assessing the effectiveness of proposed management measures; and
- a scale which assesses effectiveness of proposed management measures.

4.3.3 Rating Risk from Planned Activities

A range of quantitative and qualitative information sources will be used to evaluate Risk factors. Impact Significance Rating Matrix (shown in **Table 4-2** below) will be used to designate the overall significance of potentially adverse impacts. Potential adverse impacts will be rated according to the magnitude of the potential impact, and the sensitivity/ vulnerability/ importance of a given receptor.

The environment sensitivity/ vulnerability/ importance is factored in to properly evaluate and quantify to the extent possible the severity and consequences of the impacts. Mitigation measures, safeguards and recommendations which are susceptible to avoid, remedy or reduce these impacts to as low as reasonably practicable (ALARP) will be proposed.

4.3.3.1 Criteria for Rating Impacts

The severity of an impact is rated according to:

- 1) the magnitude of the potential impact; and
- 2) the sensitivity/vulnerability/importance of a given impact or receptor.

4.3.3.2 Magnitude of an Impact

Magnitude describes the degree of change the resource or receptor that the impact is likely to yield. The impact characteristics that determine Magnitude are:

- Extent;
- Duration;
- Scale;
- Frequency;
- Reversibility; and
- Likelihood (for unplanned events only)

Considering the magnitude of impact characteristics, the magnitude of each impact will be assigned one of the following ratings:

1. Positive;
2. Negligible;
3. Low;
4. Medium; or
5. Large.

4.3.3.3 Sensitivity/ Vulnerability/ Importance of Receptors

The Sensitivity / Vulnerability / Importance of a receiving resource is defined according to factors specific to the receiving resource and categorized as:

- Low;
- Medium; or
- High.

4.3.3.4 Determining Impact Significance

Once magnitude of impact and sensitivity/vulnerability/importance of receptor have been characterized, the significance can be assigned for each impact. The severity of the consequences of an event is ranked in increasing order from 1 to 4 and defined as:

1. Negligible,
2. Minor,
3. Moderate, and
4. Major.

Table 4-2 presents the Evaluation of Impact Significance Matrix which determine the significance of the negative impacts taking into consideration the magnitude of the impact and the sensitivity of the receptor.

Table 4-2. Evaluation of Impact Significance Matrix taking into consideration the magnitude of the impact and the sensitivity/ vulnerability/ importance of the receptor.

		Sensitivity/vulnerability/importance of the receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

The changes to the environment that may be within the range of normal natural variation are regarded as essentially having no impact and are characterized as *Negligible*. *Major* changes are those deemed to have national and international ramifications. *Moderate* changes are those that would have local ramifications, respectively. The duration of the cleanup of the consequences of an incident if it were to occur is factored into the description of the severity of the impact. Also, the number of breaches of statutory or prescribed limits or number of complaints is factored into the evaluation of the severity of the impact.

4.3.4 Rating Risk from Planned Activities

Non-routine/unplanned events related to the Project (e.g., oil spills, traffic accidents or other events with a less-than-certain chance of occurrence) do not lend themselves readily to the analysis described above for planned activities. Rather than assigning Significance Ratings as done for potential impacts from planned activities, Risk Ratings are assigned for potential risks from unplanned events. Assessing risk considers:

- The potential consequence/severity of the event, if it were to occur;
- The likelihood of the unplanned event occurring.

The likelihood of an unplanned event reflects the probability of occurrence of the event. *Likelihood* is defined related to the frequency at which a hazard/accident event is observed in the oil and gas industry (*Frequency*). Three levels of likelihood corresponding to three categories of occurrence frequency are recognized: Unlikely (I), Possible (II), and Likely (III). The 3 *Frequencies* corresponding to the 3 levels of *Likelihood* are: Rarely (A), At least once (B), Several times (C), respectively. The Frequency/ Likelihood correspondence is shown in **Table 4-3**.

Table 4-3. Ranking of likelihood of potential hazard/accident events and corresponding occurrence frequency as observed in the oil and gas industry sector.

	Increasing Ranking			
Frequency*	Not reported (0)	Rarely reported (A)	At least once (B)	Several times (C)
Likelihood	Non-credible	Unlikely (I)	Possible (II)	Likely (III)

The events with practically Non-credible Occurrence (value “0”) are not considered in the analysis. An Unlikely event is a Rarely reported event and has a small likelihood to occur. A Possible event has a reasonable chance to occur at some time during normal operating conditions. A Likely event is expected to occur during the life of the Project.

The potential of a hazard/accident (Risk) occurring is categorized as:

- Low;
- Medium; or
- High.

The Zero risk of incidence is excluded from the analysis. The Risk is defined by the potential of its occurrence as defined above and the severity of its consequences. The Risk Table (**Table 4-4**) is used based on event consequence and likelihood to assess the significance of impacts associated with unplanned events.

Table 4-4. Evaluation of Risk Matrix.

		Potential of a hazard/accident (Risk) Occurring		
		Low	Medium	High
Likelihood	Unlikely	Negligible	Minor	Moderate
	Possible	Minor	Moderate	Major
	Likely	Moderate	Major	Major

4.4 Impact of the Project’s Planned Activities

The activities of the Project will not disturb any natural onshore habitats as it is at over 200km off the coast of Guyana. The support activities may result in a minor increase in traffic congestion near the shore base and storage facility, and a Road Safety Management Procedure should mitigate those impacts.

The only resources with the potential to incur any significant adverse impacts from the planned Project activities would be air quality and marine resources, including marine sediments, water quality, and biological resources. The marine discharges stream forecast for Wei-1 are relatively small and their impact will be negligible. The impact of the routine activities on these resources are summarized and discussed briefly below in **Table 4-5**.

Table 4-5. Impact of the routine activities on air quality and marine resources.

Resource	Source of Impact	Nature of Impact	Mitigation measures / Comments
Air Quality	<ul style="list-style-type: none"> • Power generators and diesel engines on the rig • Support vessels and helicopters 	<ul style="list-style-type: none"> ○ Contribute to increases in the ambient air concentrations of certain pollutants. 	<ul style="list-style-type: none"> • Pollutants <1% of the WHO guideline. • GHG emissions will be insignificant. • No gas flaring is expected.

Resource	Source of Impact	Nature of Impact	Mitigation measures / Comments
Marine Water Quality	<ul style="list-style-type: none"> • Drilling fluids and cuttings discharges 	<ul style="list-style-type: none"> ○ Localized impact on water quality. 	<ul style="list-style-type: none"> • Drilling at a controlled rate. If mud is used for the top hole, it will normally be WBDF - innocuous. • NADF drill cuttings are recovered and treated onboard the rig to meet permissible discharge requirements prior to discharge to the sea. • NADF is not discharged
	<ul style="list-style-type: none"> • Domestic and Sanitary Wastewater discharges 	<ul style="list-style-type: none"> ○ The quality of the marine water in the area surrounding the well. 	<ul style="list-style-type: none"> • This discharge would comprise contaminants such as nutrients, chlorine, and bacteria. • Will be treated according to internationally recognized standards prior to discharge.
	<ul style="list-style-type: none"> • Potable water processing brine discharge 	<ul style="list-style-type: none"> ○ This discharge meets the applicable standards without treatment. 	<ul style="list-style-type: none"> • This discharge would comprise contaminants such as biocides, chlorine, oxygen scavengers, and scale inhibitors.
Marine Sediments and Benthos	<ul style="list-style-type: none"> • Accumulation of drill cuttings discharge on the seafloor, primarily around the well location 	<ul style="list-style-type: none"> ○ Smothering of marine benthos around the well. ○ No significant impact on sediment quality. 	<ul style="list-style-type: none"> • NADF drill cuttings will be treated onboard the rig to meet discharge requirements prior to discharge to the sea.
Marine Biological Resources	<ul style="list-style-type: none"> • Light from rig 	<ul style="list-style-type: none"> ○ Light could attract seabirds and interfere with their migration. 	<ul style="list-style-type: none"> • The lighting will be dimmed to minimize its attraction potential.
	<ul style="list-style-type: none"> • Sound from rig machinery and the sound from vessels 	<ul style="list-style-type: none"> ○ May cause Marine mammals' injury in the 10 m diameter area of the source. ○ Marine turtles are less sensitive to sound. 	<ul style="list-style-type: none"> • Sound will be below 150 dB (GNBS Guidelines); • Project workers will be on the lookout.
	<ul style="list-style-type: none"> • Deterioration of water quality due to discharges 	<ul style="list-style-type: none"> ○ May impact Marine fish. 	<ul style="list-style-type: none"> • The discharges will be localized in a very small area around the well. Fish are known to avoid these areas.

4.5 Impact of the Project’s Unplanned Events

Four types of unplanned events are identified: hydrocarbon spill, vessel collision, onshore vehicular accidents, and rig accidents. Unplanned events are considered unlikely to occur because of the extensive preventative measures employed by CRI. The embedded controls put in place (e.g., training of vessel operators to recognize and avoid marine mammals and marine turtles; adherence to international and local marine navigation procedures; adherence to Road Safety Management Procedure) will lower the likelihood of occurrence of such events and reduce the extent of their impact were they to occur.

4.5.1 Marine Vessel Strikes

Marine vessel strikes would be the most significant potential Project-related impact on marine mammals and turtles. Marine vessel strikes are not anticipated to result in any significant impact to marine mammals and turtles because of the relatively very small numbers of vessel trips compared to existing vessel activity in Guyana waters and vessel crews will be on the lookout for marine mammals and turtles to minimize the potential for vessel strikes.

4.5.2 Vessel Collisions and Vehicular Accidents

Considering high risk areas and the speeds, *vessel collisions and vehicular accidents* are expected to be rare. They are considered to have small, temporary, and localized impacts.

4.5.3 Oil Spills

CRI has identified several spill scenarios involving different types of hydrocarbons (e.g., crude oil, marine diesel, fuel oil, lubricating oil, drilling fluid). The magnitude of the impact would depend on the volume and duration of the release. The spills may occur at the shore base, on vessels, in the Berbice River estuary from supply vessel or in the Atlantic Ocean from the well, rig or supply vessel. The largest oil spill would result from a loss of well control incident at the seafloor releasing oil. The *Likelihood* of a large oil spill occurring is expected to be highly unlikely. CRI has meticulously planned a well control program focused on blowout prevention, safety and risk management systems and using trained experienced personnel.

4.5.4 The Resources Most at Risk in Case of a Well Blowout

The resources most at risk would include Shell Beach Protected Area, coastal habitats (especially mangroves and marshes) and coastal wildlife (especially birds and furbearers), as well as coastal communities and Indigenous Peoples dependent on impacted ecosystem services. The combination of the low probability of an oil spill reaching the shoreline and the time available to allow for spill response, results in the risk to these resources being considered Minor. The marine resources most at-risk are water quality, seabirds, marine mammals, and marine turtles. Because light oil which degrades quickly is expected in the area, and given that its impacts are reversible, the risk is being considered moderate to water quality, marine mammals, and marine turtles and minor to seabirds because seabirds are primarily transient in the area. The potential impacts of an Oil Spill on these resources are briefly described in **Table 4-6**.

Table 4-6. Potential impact to coastal and marine resources by an oil spill and risk rating.

Resource	Potential Impact	Rating
Coastal Resources		
Protected Areas	Shell Beach Protected Area could be impacted if oil were to reach the Guyana shoreline.	Minor
Coastal Habitats and Wildlife	Mangroves and wetlands are common habitats along the Guyana coastline (and support many species) and are considered sensitive to oil contamination.	Minor
Coastal Communities and Indigenous Peoples	Rural coastal communities, and especially Indigenous communities, who rely on ecosystem provisioning goods, including genetic resources, food and fiber, and fresh water, and ecosystem cultural services including spiritual enrichment, recreation, and aesthetic experience.	Minor
Marine Resources		
Marine Water Quality	Dissolution of some spilled oil into the water column.	Moderate
Marine Mammals	Ingestion and respiratory irritation from inhalation of vapors at the water surface; Potential for fouling of baleen whale plates.	Moderate
Marine Turtles	Dermal irritation from contact with oil;	Moderate

Resource	Potential Impact	Rating
	Ingestion, and respiratory irritation from inhalation of vapors at the water surface.	
Seabirds	Seabirds are typically among the species most impacted by an oil spill because they spend significant time on the water surface and may come in contact with the spilled oil.	Minor

4.6 Duration, frequency and reversibility of the impacts

4.6.1 Degree of Irreversible Damage

The onshore areas of Guyana will not be irreversibly damaged by any activity of the planned Project. The drilling of the well disturbance to the seafloor will be localized around the well. The activity would result in a very minor disturbance to sediment and benthic habitat. The subsea equipment which may be proposed to be left in place upon decommissioning is not a concern as this equipment can eventually be used for colonization of the impacted area. Even in the unlikely event of an oil spill, little irreversible damage would be expected in the long run. However, it could take decades for the severely impacted resources to fully recover from a large and extensive release.

4.7 Cumulative impacts

Cumulative impacts assessment considered interaction between potential impacts from the Project and impacts on all resources affected by the Project in the AOI of other (non-Project) planned activities. Nonplanned events are not considered in the cumulative impact assessment.

The activities immediately surrounding the project include Exxon’s Liza Field and its planned expansion of its development activities in the Stabroek block and Apache’s operations in Block 58 in offshore Suriname. The closest that these activities could be expected to approach the Project would be more than 20km (12 miles) which is well beyond the geographical range of the Project’s impacts. There would therefore be no opportunity for cumulative effects between the Project and activities in other blocks, so interactions between the Project and other operator’s activities are not considered further in the analysis.

Wei-1 Well operation will add to the existing Marine Vessel traffic in Guyana’s Exclusive Economic Zone (EEZ). The likelihood of vessel collision is *Unlikely* (**Table 4-3**). The USA Bureau of Safety and Environmental Enforcement (BSEE) incident report database reports annual collisions are low of 6 to a high of 24 between 2007 and 2020, with hundreds of MVs in operation. Guyana oil & gas exploration PSV fleet is newer, and less than 20% of PSVs in operation for the Gulf of Mexico.

Greatly reduced probability of collision is achieved using an automated collision avoidance aid that permits rapid assessment of the situation and the determination of a safe, efficient maneuver.

Avoiding Marine vessel collision with other MV’s starts with the Maersk requirements for vessels alongside the Rig. To meet those requirements for collision avoidance, Wei-1 contracts for the Production Support Vessels (PSV) include the following key specifications:

1. PSV’s need to approach the stern to the Rig and hold their position with their Azimuthal drives (Z-drives) while backloading or off-loading cargo.
2. All PSV’s must hold stations utilizing 50% of their Z-drives thruster power or less. If unable to do so, backloading or off-loading operations must be canceled.
3. CRI provides the Rig and PSVs with daily weather, wave, and loop current five-day forecasts (Vento Marine and Eddy Watch) with specific no-go wave height, visibility, and loop current speeds.
4. The Rig and PSVs are equipped with Automatic Identification System (AIS) transponders that provide real-time satellite positioning information between vessels through various service providers such as MarineTraffic.com
5. PSVs are equipped with X-Band and IR cameras for oil spill response that provides nighttime visibility.

Based on the AIS tracking, the z-Drive capabilities, the coordination of weather, wave and loop current information, and the use of newer PSVs than in the GoM, the likelihood of the three possible scenarios of allision or collision is provided in **Table 4-7**.

Table 4-7. Likelihood of the possible scenarios of allision or collision with Wei-1 PSVs.

Scenario	Likelihood
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1.	Allision or collision with other MVs on the route between Rig and Georgetown	Unlikely
2.	Allision or collision with other MVs on the route between Rig and Trinidad	Unlikely
3.	Allision or Collision during Standby, Off-loading, or Backloading at the Rig	Unlikely

Note: Allision is an important term in maritime law used to refer to situations in which one vessel runs into another or into an object that is not in motion. Collision refers to situations in which two vessels are running against each other.

During the Kawa-1 drilling campaign, CRI has conducted weekly Marine Traffic surveys and random MV surveys from August through January. There were no fishing vessels equipped with AIS on any of those surveys within 10 nautical miles of the rig or any PSV travel routes. CRI will submit the Fishing Vessel Survey information to the EPA in the Kawa-1 end of well report.

The likelihood of marine animals being affected as a result of the combined activities of all existing projects would increase. Regarding marine mammals, CRI requires the Master of the Vessel to report monthly of all Marine Mammals observed during the transit of the PSV from the shorebase to rig and return route. There was a total of eight marine mammals sighted by the different PSV’s. No Particularly Sensitive Sea Areas (PSSA) Marine Mammal was identified in the Guyana EEZ on the Production Support Vessels (PSV) travel routes to the rig.

The area is not an offshore breeding grounds and therefore not a high-risk area for marine mammal collisions.

CRI pays special attention to the research posted by the Society of Marine Mammalogy and International Conventions related to the US NOAA Marine Mammal Protection Act, specifically the species and populations considered the most vulnerable to human activities at greatest risk of extinction or in greatest conflict with people (Schoeman RP and al., 2020)¹.

CRI acknowledges that studies are underway by NOAA to assess the risk of chronic noise from commercial ships on large whale acoustic habitats off the coast of California that may have useful

¹ Schoeman Renée P., Patterson-Abrolat Claire, Plön Stephanie, 2020, A Global Review of Vessel Collisions with Marine Animals, *Frontiers in Marine Science*, V7, DOI=10.3389/fmars.2020.00292, URL=https://www.frontiersin.org/article/10.3389/fmars.2020.00292.

information to apply to its Wei-1 project. NOAA currently recommends that ships operate in a manner that reduces noise in PSSA, such as operating at reduced speed or using alternate shipping routes.

CRI Geographical Response Plan was used to identify potential sea turtle and marine mammal impacts. Likelihood for impact on marine mammals and turtles for PSV routes based on the available information, for Wie-1 is provided in **Table 4-8**.

Table 4-8. Likelihood for impact on marine mammals and turtles for PSV routes.

	Route	Marine vessel collision scenarios	Likelihood
1.	To and from Georgetown	whales & dolphins	Non-Credible
		turtles	Non-Credible
2.	To and from Trinidad	whales & dolphins	Unlikely
		turtles	Unlikely

Overall, the Wei-1 campaign will have even a lesser impact as it has reduced the number of PSV from four to three compared to Kawa-1, which had zero incidents due to PSVs. This smaller number of PSVs reduces the cumulative impacts. Note that all the companies contracting on Kawa-1 have used their option and stayed on for Wei-1.

Because future exploration or production activities within the Corentyne block would not co-occur at the same place and time as Project, there would be no increase in the significance of cumulative impacts on these resources. Cumulative impacts of future activities have therefore not been considered but would be included as appropriate in future assessments for these possible activities.

The Government of Guyana is currently considering repairs to the heavily used Demerara Harbor Bridge. These could take just under one year, but it is currently unclear when the repair project will proceed. The bridge is located several kilometers upriver from the shore base that CRI may use to support the Project. If repair of the bridge moves forward, there is a chance it might occur contemporaneously with the proposed Project.

Overall, the Project will not contribute cumulative adverse impacts as it is a small size, simple typical oil and gas exploration project and is remote from any other activity which would impact the same receptors. Thus, potential cumulative impacts are considered to be negligible.

5 Management and mitigation measures

5.1 Factors Considered in the plan to mitigate the risks

The factors considered in the plans to mitigate the risks are:

- The nature of the activity;
- The nature of the surrounding environment;
- Legislative requirements; and
- Industry standards.

5.1.1 Embedded control measures and procedures

The Company has adopted best practice and internationally recognized effective control measures for the drilling of its exploration wells. The embedded control measures are implemented to mitigate the impact particularly on:

- Air quality, Water quality;
- Marine mammals, Marine turtles, fish, benthos, and seabirds;
- Marine sediment.

In order to prevent oil spills, such as during refueling and transfer operations, control measures are implemented to also mitigate the impact on:

- Protected area, sensitive species, coastal habitats, coastal wildlife, and shorebirds;
- Ecology and ecosystems;
- Marine use and transportation safety.

Specific control measures are established for each identified activity/risk.

The environmental information which documents the quality of the environment within the Project surrounding areas and the general area were gathered from most up to date information and literature available to ensure that:

- The necessary controls are in place to minimize environmental and socioeconomic impacts;
- Effective mitigation measures are implemented to complete the Project without compromising the natural environment.

5.1.1.1 General Control Measures for Wei-1 Drilling Operations

The Company’s drilling programs incorporate three key well control elements to provide an industry ‘best practice’ approach to well control. These are:

- 1) Thorough assessment of the geology and formation pressures prevalent in the area,
- 2) Design of the drilling fluid program, and
- 3) Well control procedures used by the drilling contractor.

The general control measures, although codified, are common-sense control measures. The General Control Measures for the Drilling of Wei-1 are listed in **Table 5-1**.

Table 5-1. General Control Measures for drilling Wei-1.

	General Control Measures
1.	• Follow best practices, industry standards, strict adherence to operational protocols
2.	• Maintenance of offshore equipment marine vessels, and helicopters
3.	• Regular inspection and servicing of shorebase construction equipment
4.	• Shut down of combustion source equipment when not in use.
5.	• Proper use of secondary containment for bulk fuel storage, drilling fluids, and hazardous materials.
6.	• Regular inspection of pipes, storage tanks, hydrocarbons/chemicals storage and transfer
7.	• Treat sewage in compliance with regulations (MARPOL 73/78).
8.	• Regular audits of operations offshore and shorebase.
9.	• Bilge water controls to <15 ppm; per MARPOL.
10.	• Best practices for offshore and onshore treatment of wastes
11.	• Vetting of waste-management operators and facilities
12.	• Navigation instructions and best practices to maintain vessel speed and course control
13.	• Health screening of Project workers, establishment of a health, wellness, and sanitation protocol
14.	• Screen around rig
15.	• Proper lighting on major vessels and on rig rather than at the sea surface or skyward
16.	• Effective OSCP for oil spill response during drilling operations

Firstly, a Safety, Health, Security and Environment (SHHE) program is established to mitigate against risk of injury/illness to workers. The Company will utilize the SHHE to take care of the occupational and community health, safety, and wellbeing of workers.

The drilling rig and supply vessels involved in the Project will be equipped to comply with the international water pollution control standards (MARPOL 73/78). Other general common-sense control measures such as maintenance of all equipment, marine vessels, and helicopters in good working order and operation in accordance with the manufacturer's specifications, regular inspection and service of shorebase equipment, pipes, storage tanks and effectual use of equipment are implemented to reduce related risks to ALARP. The utilization of secondary containments for bulk fuel storage, drilling fluids, and hazardous materials, where practical, and utilization of oil/water separators to limit oil in water content in bilge water as per MARPOL requirement.

All international and local navigation standards, best ship-keeping and navigation practices will be strictly observed for optimal marine transportation safety.

The treatment of sewage will be done according to MARPOL 73/78 standards. The Company will ensure the safe transfer to appropriate onshore facilities of wastes that cannot be reused, treated, or discharged/disposed on the Rig for management. The Company will be vetting the contractors which would receive the Project's wastes prior to hiring and will address in time any on the job Waste Management deficiency.

5.1.1.2 Categories of embedded control measures including Spill Prevention Embedded control measures

The key measure to avoid loss of well control is an appropriate well design. The planned preventative maintenance and the surveillance and monitoring of the operations are crucial measures in mitigating the risk of oil spills. All CRI and CRI contractors' activities will be examined to help prevent or mitigate the effects of an environmental release. The Company will stress the importance of preventing spills of hydrocarbons and chemicals and creating awareness through in-house training programs.

The Company will implement rigorous controls to all drilling activities particularly the processes where the possibility of a discharge of a hydrocarbon or other harmful substance into the environment is possible.

The embedded control measures listed by category are shown in **Table 5-2** below.

Table 5-2. Categories of embedded control measures.

Category	Embedded Control Measures
Spill Prevention	
General Spill Prevention	<ul style="list-style-type: none"> • A survey of all hydrocarbon and hazardous material containment areas shall be conducted prior to the commencement of drilling. Each possible source of failure will be examined and assessed for: <ul style="list-style-type: none"> • Risk of release • Bonding requirements • Other forms of control (drip trays, bonding, procedural or planned maintenance system).
	<ul style="list-style-type: none"> • Drip trays will be used for stationary areas where leaks occur (engines, generators, fill points etc.) • For areas where this is not practical, absorbent pads will be used to keep leaking oil to a minimum.
	<ul style="list-style-type: none"> • The preventative maintenance program established and practiced at the rig will be strictly abided by.
	<ul style="list-style-type: none"> • Perform required inspections and testing of all equipment prior to installation.
	<ul style="list-style-type: none"> • Regularly audit field operations on the rig and shorebases to ensure application of designed safeguards.
	<ul style="list-style-type: none"> • Install an Emergency Shutdown System in all facilities to initiate automatic shutdown actions to restore safe conditions on the Drilling rig following a significant release of contaminants offshore.
	<ul style="list-style-type: none"> • Establishment of a 500 m exclusion zone around the rig.
Spill Response equipment	<ul style="list-style-type: none"> • Maintain emergency spill response equipment on site for response to potential spills.
	<ul style="list-style-type: none"> • Ensure that spill response and containment equipment, are routinely inspected, maintained, and operationally exercised and tested, and are deployed or available as necessary for response.

Category	Embedded Control Measures
Well Control	
Drilling materials and	<ul style="list-style-type: none"> • Treatment of drill cuttings and solids control prior to discharge.

Category	Embedded Control Measures
Well Control	
treatment	<ul style="list-style-type: none"> Utilize overbalanced drilling fluids to control wells while drilling.
	<ul style="list-style-type: none"> Continuous monitoring for abnormal reservoir pressure parameters during drilling.
	<ul style="list-style-type: none"> Well Test flaring gas and condensate storage tanks in the event of an influx of hydrocarbons during drilling.
	<ul style="list-style-type: none"> Utilize and regularly test certified Blowout Prevention (BOP) equipment and other spill prevention equipment.
Training and Guidelines	<ul style="list-style-type: none"> Project operation and well control training and certification of rig and onboard personnel
	<ul style="list-style-type: none"> Establishment of guidelines particularly for well operations

Category	Embedded Control Measures
Refueling	
Refueling and Transfer operations	<ul style="list-style-type: none"> The vessel’s Master or First Officer oversees refueling and transfer operations,
	<ul style="list-style-type: none"> Conduct refueling only during periods of calm weather and preferably in daylight hours,
	<ul style="list-style-type: none"> Fit Refueling transfer hoses with dry break couplings,
	<ul style="list-style-type: none"> Utilize A liquid hydrocarbon checklist before every bulk transfer,
	<ul style="list-style-type: none"> Chemical transport, handling, storage, use, and disposal practices comply with corresponding Safety Data Sheets (SDS).
Use of Certified Equipment and protocols	<ul style="list-style-type: none"> Use of dry-break connections on liquid hydrocarbon bulk transfer hoses
	<ul style="list-style-type: none"> Use of a liquid hydrocarbon checklist before every bulk transfer
	<ul style="list-style-type: none"> Use of certified BOP equipment
	<ul style="list-style-type: none"> Use of overbalanced drilling fluids
	<ul style="list-style-type: none"> Use of Dynamic Positioning (DP) system.

Category	Embedded Control Measures
Dynamic Positioning System	
Maintenance of the Dynamic Positioning System	<ul style="list-style-type: none"> Station keeping and maintenance of DP system
	<ul style="list-style-type: none"> Personnel training
	<ul style="list-style-type: none"> Trials and acceptance criteria for sea
	<ul style="list-style-type: none"> Consistent DP trials
	<ul style="list-style-type: none"> System check-up and analysis of failure mode and effects
	<ul style="list-style-type: none"> Failure consequence analysis.

Category	Embedded Control Measures
Inspections and testing of:	
	<ul style="list-style-type: none"> • All equipment prior to deployment/installation
	<ul style="list-style-type: none"> • Certified BOP equipment and other spill prevention equipment
	<ul style="list-style-type: none"> • Periodical test and change of liquid hydrocarbon transfer hoses
	<ul style="list-style-type: none"> • Regular audit of Project Operations.

5.2 Environmental and Socioeconomic Management Plans

Comprehensive Management Plans including mitigation measures are proposed for the identified adverse impacts of the Project. These management and mitigation plans were prepared considering the most current and proven technology and in compliance with the applicable laws and regulations. The Management Plans and Procedures are:

- Environmental Management Plan developed to manage and mitigate the impacts identified in the assessment of risks, including:
 - Air Quality Management Procedures
 - Water Quality Management Procedures
 - Waste Management Plan
 - Radiation Protection Plan
 - Drilling Mud Sampling Plan
 - Seabed Survey Plan (pre-spud and post decommissioning video surveys)
- Socioeconomic Management Plan including:
 - Stakeholder Engagement Plan
 - Transportation and Road Safety Management
- Environmental and Socioeconomic Monitoring Plan
- Emergency Preparedness and Response Plan including:
 - H₂S Contingency Plan
 - Oil Spill Response Plan, including
 - Oil Spill Trajectory Modeling,
 - Coastal Sensitivity Mapping,
 - Response Procedures;
- Preliminary End of Operations and Decommissioning Plan.

5.3 Preparedness, Emergency Planning and Response

5.3.1 Emergency Response Plan (ERP)

The CRI Emergency Response Plan (ERP - Response procedures) is a Tier II document providing good industry practices used to address potential unplanned events related to drilling operations Offshore Guyana. CRI's ERP will be provided to the EPA as a separate document.

5.3.2 Oil Spill Contingency Planning

CRI is fully prepared for spill response in case of a large subsea release of crude oil from a well control event at Wei-1 as it would likely impact the physical and biological marine environment as well as fishermen, coastal Guyanese, and Indigenous communities reliant on ecosystem services for sustenance and their livelihood.

CRI has its own oil spill response resources and will contract any other required resources. CRI has joined Oil Spill Response Ltd. (OSRL), the largest international industry-funded cooperative which exists to respond to oil spills, prior to starting the drilling operations. CRI will ensure offsite equipment is mobilized for a timely response. CRI commits to regular oil spill response drills, simulations, and exercises and to involve appropriate Guyanese authorities and stakeholders in these activities.

CRI has developed a detailed Oil Spill Contingency Plan (OSCP) to ensure an adequate and effective response to any unlikely oil spill event from minor to major. The OSCP is guided by the International Maritime Organization (IMO) Manual on Assessment of Oil Spill Risk and Preparedness and aligns with Guyana's National Oil Spill Contingency Plan (NOSCP-Draft). In fact, CRI has been an active participant in the several workshops spearheaded by the Civil Defense Commission (CDC) to establish Guyana's first NOSCP and contributed to its elaboration. The 3-tier response categorization and Incident Command System (ICS), internationally recognized as best practices, are adopted and constitute the OSCP backbone. The chain of command and roles and responsibilities during a response to an oil spill event are clearly articulated.

The OSCP describes how the Company would mobilize both its own resources and those of its oil spill response contractors. The OSCP also details the communication and notification protocols, including notifying as required the government of Guyana and the agencies that might be involved.

As part of preparedness, CRI has conducted an environmental sensitivity mapping to identify and characterize the resources with the potential to be exposed to oil if oil were to reach the Guyana shoreline. CRI will conduct oil spill trajectory modeling to evaluate the fate of an oil spill from a well control event under different metocean conditions.

5.3.3 Rig Participation

The Rig's drilling contractor will participate in the preparedness and emergency planning and response with the following Rig Site Specific documents including a Site-Specific Assessment (SSA) document, a Rig Emergency Response Plan (ERP): and a Rig Severe Weather Plan (SWP).

5.3.4 Supply Vessels Participation

All supply vessels will be required to carry Oil spill dispersant equipment on board, as per international standards. This equipment will be reviewed prior to commencement of the drilling campaign and inspected monthly according to EPA requirements.

5.3.5 Emergency Evacuation

Although Emergency rig evacuation is a rare event in the offshore oil and gas sector, the rig operator is required to have effective evacuation criteria in place. Most evacuations occur because of bad weather but are normally routine because today's meteorological forecasts are very accurate. The risk is even lower as the region is not prone to hurricanes. Rig evacuation due to infectious diseases such as Covid-19 has occurred in the region but the possibility of occurrence on Wei-1 is greatly reduced due to recent vaccine and testing requirements. More common situations are those where fires or explosions cause an unexpected or sudden need for evacuation.

5.3.6 Comment on Emergency Preparedness and OSCP group of documents.

1. Emergency Preparedness and Response Plan (EPRP - combined CRI-Maersk) covers the CRI onshore resources and coordination of responses needed to support a schedule of planned drills and exercises in a forward-looking plan (Pre-Spud through the end of well). Embedded within that schedule are:

- a. Testing of Medivac Emergency Response Plan (MERP – Bristow Search and Rescue);
 - b. Primary and secondary communication with PSVs;
 - c. OSCP – Pre-Spud Demonstration Exercise (TRG & WWC) and monthly notification drills. (Coordination with one of four monthly Maersk Station Bill exercises);
 - d. MD H2S Evacuation Plan (first station bill drill closest to Spud).
2. OSRP is comprised of two Annexes as per IOGP 512, and Well Control Contingency Plan
- a. Annex 1 – oils spill resources:
 - i. Well Control Contingency Plan (Wild Well Control);
 - ii. Well Control Logistics Plan (WWC);
 - iii. Well Control – Kill Well;
 - iv. Well Control Bridging document (Maersk-CRI);
 - v. OSRL Membership (operator) and Access to Global Dispersant Stockpile;
 - vi. OSRL Equipment for hire (1) – deployed on PSV’s.
 - b. Annex 2 – Tactical shoreline plans:
 - i. OSRL Equipment for hire (2) – held at Georgetown in shipping containers.

5.4 Training

CRI recognizes that a successful project will in large part be attributed to proper knowledge transfer and training of field-based personnel. Through its Health Safety and Environment (HSE) Bridging document process, CRI ensures that Rig specific training and operating procedures are in place with the drilling contractor and third-party service providers. The Rig-specific training will include but not be limited to well monitoring and well control, drilling mud and cuttings discharges, non-hazardous and hazardous waste generation, air emissions, and effluent discharge monitoring.

CRI will award service contracts considering preparedness and training in-place for personnel and equipment. Prior to spud, Drill Well on Paper (DWOP) sessions will be held with rig contractor and service companies. During these sessions, well specific information, and procedures will be communicated to personnel involved in the exploration drilling program.

CRI will operate in compliance with industry standards. Drillers and Drilling Supervisors will be required to have valid Well Control Licenses which requires attendance of Well Control school every two years. Training is vital for rig workers. CRI will ensure that they are educated in safety procedures and specific equipment to help prevent accidents and to facilitate safe emergency departure from the rig, and sea survival. Helicopter survival training will be a requirement for those traveling to the rig. CRI will ensure that a full evacuation drill has been carried out.

5.5 Potential Impacts and Management of Unplanned Events

The key measure to avoid loss of well control is an appropriate well design. The planned preventative maintenance and the surveillance and monitoring of the operations are crucial measures in mitigating the risk of oil spills.

All CRI and CRI contractors' activities will be examined to help prevent or mitigate the effects of an environmental release. The Company will stress the importance of preventing spills of hydrocarbons and chemicals and creating awareness through in-house training programs.

CRI's approach is focused on spill prevention using safety and risk management systems, management of change procedures, global standards and trained experienced personnel. Measures to avoid any loss of well control include proper preparation for wells (well design, well control equipment inspection and testing), automatic detection of any excess pressure 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.

5.5.1 Oil, Fuel and Chemical Spills

If the multiple layers of control fail, there is the potential for release of hydrocarbons including crude oil, marine diesel, fuel oil, lubricating oil and drilling fluid (NADF). The hydrocarbon releases would occur at the Georgetown Guyana shorebase, into the Demerara River or other estuarine waters from supply vessels and into the Atlantic Ocean from the supply vessels and rig or well. The threats from Oil Spills from blown out wells are known and can be very damaging to the environment. However, the number and size of such accidental spills have decreased

significantly thanks to tremendous improvement in the technologies for drilling for oil in deep water. A series of Technical Information Papers detailing information on a wide range of marine pollution topics based on the most recent technological advances is provided by International Tanker Owners Pollution Federation Ltd (ITOPF).

5.5.2 Contingency Planning and Response

As part of the contingency planning, an Oil Spill Contingency Plan (OSCP), oil spill trajectory modeling and environmental sensitivity mapping were procured for Wei-1. The rig has also an ERP contained within the *Rig Safety Case*.

The documents are designed to serve as a high-level and overarching plan into which respective, functional, tactical-level operational plans can be bridged to ensure that emergency response and incident management is consistent across all activities.

The information contained within these documents is for planning and preparedness purposes to demonstrate the potential response capability available to respond to predetermined emergencies. The plans are not intended to limit the discretion of company employees and/or contractors to select a sequence of actions they deem necessary to maximize the effectiveness of a response to an incident, consistent with life safety, security, and environmental considerations.

The plans do not supersede and subordinate applicable, project or site-specific plans. If a conflict exists, it should be reported to the plan administrator.

Provisions of the plans will be introduced in the environmental training process undertaken by all CRI employees and contractors.

5.5.3 Oil Spill Contingency Plan (OSCP)

In addition to the established spill prevention controls, CRI has developed an Oil Spill Contingency Plan (OSCP) detailing actions to be taken in the event of a chemical or oil spill offshore. CRI's OSCP will be provided to the EPA upon request.

CRI's OSCP framework is guided by (1) IOGP/IPICA Report 519 - Contingency planning (Annex 1), (2) Tactical Response Planning (Annex 2) for oil spills on water, (3) the Joint

IMO/IPIECA/OGP Guidance on sensitivity mapping for oil spill response (2012), (4) the International Maritime Organization (IMO) Manual on Assessment of Oil Spill Risk and Preparedness. CRI's OSCP mirrors Guyana's Draft National OSCP (NOSCP-Draft), requirements of the International Convention on Oil Pollution Preparedness, Response and Cooperation of 1990 (OPCR 1990) and the Regional Association of oil and natural gas companies in Latin America and the Caribbean (ARPEL) National Oil Spill Contingency Plan.

CRI has adopted the internationally recognized Incident Command System (ICS) outlined by IPIECA (IPIECA-IOPG Good Practice Guide, 2015) as a basis for CRI's cascading response planning and management. The chain of command and roles and responsibilities during a response to an oil spill event are clearly articulated.

CRI's Oil Spill Response Plan (OSRP) is supported by an Oil Spill Trajectory Modeling and an Environmental Sensitivity Mapping (ESM) including Guyana coastal mapping which identifies and characterizes the resources that could potentially be impacted (receptors) in case of a major oil spill.

5.5.3.1 Oil Spill Categorization

CRI adopts the (OPRC 1990) Tier categorization for clear demarcation of spill severity and response. The geographical distinction of the response capability, which is built around the potential severity of the incident and the period in which resources are needed on scene, is at the core of the tiered model. The resources are categorized according to whether that capability is held locally (Tier I), regionally (Tier II) or internationally (Tier III).

- **Tier I:** the spill is small, the source of spill is under control, and the response would be managed by CRI and its contractors using local resources.
- **Tier II:** the spill is moderate, the source can be rapidly brought under control, local response equipment is immediately available. If needed, the response would be managed in coordination with national or regional sourced resources; and
- **Tier III:** the spill is large, the source of the spill is not under control, and response would be managed in coordination with regional and internationally sourced resources.

The OSCP ensure a clear demarcation of spill severity, according to the size of the spill, using a clearly defined Tier 1, Tier 2, and Tier 3 approach and describes the way local, regional and international oil spill response resources are mobilized.

The OSCP identifies the different release responses and entities that would take part in a response depending on the magnitude and complexity of the spill.

Of note is that CRI is member of Oil Spill Response Limited (OSRL), the largest international industry-funded cooperative which exists to respond to oil spills. CRI will have the full support of OSRL.

5.5.4 Environmental Sensitivity Mapping

One key element to CRI's oil spill contingency planning and response is identifying and characterizing the resources with the potential to be exposed to oil if oil were to reach the Guyana shoreline. CRI has commissioned an Environmental Sensitivity Mapping (ESM) of its offshore blocks including the sensitive coastal and offshore environmental and socio-economic resources which can be potentially exposed and affected by a well blowout. The ESM report will be provided to the EPA upon request.

The Environmental Sensitivity Mapping (ESM) is a compilation of information from three main categories ([NOAA 2002](#)):

1. Shoreline: type description, biological productivity and sensitivity, exposure to wave and tidal energy, natural persistence of oil, and ease of clean-up;
2. Biological Resources: including Fauna and Flora and Habitats which are potentially at risk from oil spills (used by oil-sensitive species or are themselves sensitive to oil spills, such as submersed aquatic vegetation.); and
3. Human-Use Resources: specific areas that have added sensitivity and value because of their use. Coastal and/or Amerindians Communities (e.g., location and socioeconomic characteristics), coast-dependent commercial and artisanal activities (e.g., fishing, foraging), other industrial activities, and infrastructure (e.g., water intake facilities).

The ESM highlights and maps the biological resources such as coastal, marine, aquatic, wetland, and riparian species and habitats. The ESM considers the sensitivity of the habitat and the sensitivity of the species that use or rely on the habitat. Emphasis is on the locations and areas of the highest concentrations of species that are vulnerable and sensitive to oil spills and disturbance related to response activities. The species that are of upmost importance are those threatened, endangered, or rare; and species that are of commercial/recreational importance.

The OSCP describes the coastal sensitivity mapping process and actual components in the OSCP tactical plan, considered for oil spill preparedness and response, include protection of sensitive areas, shoreline cleanup, wildlife care, etc. The ESM information contained in the OSCP will enable prioritizing the mobilization of emergency response resources (manpower and equipment) and to establish protection priorities.

5.5.5 Oil Spill Trajectory Modeling

Oil spill models are used to simulate oil transport, predict trajectory and fate of spilled oil, assess the risk of oiling beaches, mangroves, or wetlands and determine the geographic area for response. The models simulate spill events using the best available characterization of the wind and hydrodynamic (marine currents) forces that drive oil transport. It models the changes the oil undergoes as it interacts with water, air, and land (oil fate). The models quantify the potential consequences from a spill, which can then be used to guide response planning and prioritize response asset deployment. In case of an actual oil spill, the real-time spill conditions (e.g., oil type, quantity, trajectory, etc.) are quickly assessed and information about actual resources at risk reconfirmed to adapt to the actual spill conditions.

The oil spill trajectory modelling for Wei-1 will be completed by both The Response Group (TRG) and Oil Spill Response Limited (OSRL) on behalf of CRI for the Guyana-Suriname Basin. The results of the modeling will be produced using deterministic and Stochastic techniques without accounting for any preventative response measures (e.g., aerial, vessel or sub-sea dispersant application, offshore containment and recovery, source control operations). Using the two types of modelling approaches allows for both historical and probabilistic data to be used for preparedness planning and risk assessment for three scenarios: (1) Fastest oil Ashore Guyana, (2)

Worst Case Discharge Guyana and (3) Fastest Oil Suriname. Stochastic results are an excellent tool for assessing risk as they predict the fate of an oil spill under different metocean conditions. The outputs will illustrate the waters and shorelines that are most at risk from oiling. The modeling will be used to predict possible impact an oil spill from a major blowout at the Wei-1 site may have on surface waters and the shorelines.

The oil spill trajectory modeling done in support of the Wei-1 Project follows an industry-standard approach and using publicly available Metocean database and software tools such as OILMAP.

The stochastic modeling has been produced using stochastic techniques under various wind and current conditions. Stochastic method is an excellent tool for assessing risk as they predict the fate of an oil spill under different metocean conditions. This type of modeling is generally used for preparedness planning and risk assessment. Stochastic results are an excellent tool for assessing risk as they predict the fate of an oil spill under different metocean conditions. The outputs illustrate the waters and shorelines that are most at risk from oiling.

Five years of hydrodynamic data were used as model inputs. Wind and current data were downloaded from 2014 through 2019 for the Wei-1 well site. This data was obtained from Hybrid Coordinate Ocean Model (HYCOM) and was averaged together using a series of proprietary python scripts. For this, the focus was on the second quarter of each year (April 1st through June 28th) of each of the five years incorporated.

The results of the oil spill trajectory modeling for Wei-1 were produced without accounting for any preventative response measures (e.g., aerial, vessel or sub-sea dispersant application, offshore containment and recovery, source control operations). Both scenarios have the spill heading in a generally northwest direction toward Trinidad and Tobago. Based on the data collected and averaged, the Suriname shoreline is not expected to be impacted. The full Oil Spill Trajectory Modeling Report for Wei-1 will be provided to the EPA upon request.

The deterministic oil spill trajectory modeling for Wei-1 will support the tactical implementation of the OSCP for the Guyana-Suriname Basin area, deploying oil spill containment and clean-up resources at the sensitive areas most likely impacted during different times throughout a potential event.

The trajectory and fate model provides input to the OSRP process by determining spill pathways and quantifying potential spill consequences. Determining the consequences from a spill typically has two components: the likelihood that a spill will contaminate a given part of the environment and what will be its ecological and socioeconomic consequences. Effective implementation of the OSRP would reduce this risk by reducing the probability that oil would reach the shoreline even in case of a major marine oil spill. The effective application of the OSRP in fact lowers the consequence/ severity rating of impacts of oil spills.

5.6 Summary of Potential Impacts and Management

A summary of the potential impacts, sources of potential impacts, and management related to these resources is provided in **Table 5-3** below.

Table 5-3. Summary of resources and corresponding sources of potential impacts, resulting potential impacts, and management approach.

Resource	Sources of Potential Impacts	Potential Impacts	Management Approach
Physical Resources			
Air Quality	<ul style="list-style-type: none"> Power generation and other combustion sources Fugitive emissions Helicopter and aviation emissions Waste incineration Non-routine, temporary flaring 	<ul style="list-style-type: none"> Potential Localized alteration of ambient air quality in the vicinity of the well by the Project’s air emissions. 	<ul style="list-style-type: none"> Monitoring at the drilling site of pollutants including particulate matter (PM_{2.5}; PM₁₀), carbon monoxide (CO), sulphur dioxide (SO₂), hydrogen sulphide (H₂S), nitrogen dioxide (NO₂), and volatile organic compounds (VOC).
Sound	<ul style="list-style-type: none"> Equipment/machinery operating onboard the rig 	<ul style="list-style-type: none"> Auditory impacts on the Project workers. 	<ul style="list-style-type: none"> Managing occupational-related risks through appropriate PPE.
Sediments	<ul style="list-style-type: none"> Drilling of the well 	<ul style="list-style-type: none"> Localized disturbance of marine sediments in the Project area Impact on sediment quality from discharges of NABF on drill cuttings. 	<ul style="list-style-type: none"> Treatment of NADF cuttings and recovery of drilling fluid; Discharge only when permissible levels of NADF; Monitoring of accumulation of drill cuttings and the distribution of residual NABF on drill cuttings.
Marine Water Quality	<ul style="list-style-type: none"> Drilling of the exploration well (cuttings with NADF discharge) Wastewater discharges 	<ul style="list-style-type: none"> Localized impacts to marine water quality in the vicinity of the well. 	<ul style="list-style-type: none"> Evaluation of total suspended solids concentrations resulting from drill cuttings discharges.
	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 	<ul style="list-style-type: none"> Impact to marine water quality in the impact area 	<ul style="list-style-type: none"> Estimation of concentrations of dissolved hydrocarbons that might result from different oil spill scenarios.

Resource	Sources of Potential Impacts	Potential Impacts	Management Approach
Biological Resources			
Coastal Habitats	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 	<ul style="list-style-type: none"> Impacts on beaches, mangroves, and wetland habitats. 	<ul style="list-style-type: none"> oil spill trajectory modeling was used to simulate the trajectory of an oil spill and assess the risk of oiling beaches, mangroves, or wetlands.

Resource	Sources of Potential Impacts	Potential Impacts	Management Approach
Biological Resources			
			<ul style="list-style-type: none"> Note: the routine planned operations of the Project are not expected to impact beaches, mangroves, or wetlands.
Protected Areas and Special Status Species	<ul style="list-style-type: none"> Underwater sound generated by the drilling activities Lighting on rig Wastewater discharges Drilling of the exploration well (cuttings discharge) Vessel movements 	<ul style="list-style-type: none"> Underwater sound, light, and changes in marine water quality may impact some special status species (e.g., endangered, or listed species) close to the well. 	<ul style="list-style-type: none"> Review of the scientific literature for information on the impacts of planned offshore activities on special status species; Evaluation of the mixing zone around the rig and impacts on marine water quality from routine operational discharges; Note: impacts to Protected Areas are not expected during routine operations.
	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 	<ul style="list-style-type: none"> Protected Areas Special status species, including marine turtles, fish, and marine mammals. 	<ul style="list-style-type: none"> Oil spill trajectory modeling was used to simulate the trajectory of oil spill and assess the risk of oiling impacting any designated Protected Areas.
Coastal Wildlife and Shorebirds	<ul style="list-style-type: none"> Non-routine, unplanned event (e.g., spill or release) 	<ul style="list-style-type: none"> Impacts on coastal wildlife and shorebirds. 	<ul style="list-style-type: none"> Oil spill trajectory modeling was used to simulate the trajectory of an oil spill and assess the risk of impacting coastal wildlife and shorebirds. Note: The routine planned operations and activities of the Project are not expected to impact coastal wildlife or shorebirds.
Seabirds	<ul style="list-style-type: none"> Lighting on rig Non-routine, temporary flaring Waste incineration 	<ul style="list-style-type: none"> Lighting may disorient seabirds in the vicinity of the well. 	<ul style="list-style-type: none"> The scientific literature was reviewed for information on the impacts of lighting from planned offshore activities on seabirds.
	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 	<ul style="list-style-type: none"> Impacts on seabirds. 	<ul style="list-style-type: none"> Oil spill trajectory modeling was used to assess potential spill-related impacts on seabirds.

Resource	Sources of Potential Impacts	Potential Impacts	Management Approach
Biological Resources			
Marine Mammals	<ul style="list-style-type: none"> Underwater sound generated by the drilling operations 	<ul style="list-style-type: none"> Some marine mammals in a localized manner because of underwater sound and ship strikes. 	<ul style="list-style-type: none"> The scientific literature was reviewed for information on the impacts of planned offshore activities on marine mammals, turtles, and fish; Likelihood of vessel strikes was assessed based on Project vessel transits and expected marine mammal and turtle presence; The mixing zone around the rig and impacts on marine water quality from routine operational discharges was evaluated.
Marine Turtles	<ul style="list-style-type: none"> Ship strikes Lighting on rig Wastewater discharges 	<ul style="list-style-type: none"> some marine turtles in a localized manner because of underwater sound, ship strikes, and light. 	
Marine Fish	<ul style="list-style-type: none"> Drilling of exploration well (cuttings and fluid discharge) Cooling water discharges Changes in food availability 	<ul style="list-style-type: none"> The Project could potentially impact some marine fish because of underwater sound, light, and changes in marine water quality close to the well. 	
	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 	<ul style="list-style-type: none"> Impact on marine mammals, marine turtles, and marine fish. 	<ul style="list-style-type: none"> Oil spill trajectory modeling was used to simulate the trajectory of an oil spill and assess the risk of impacting marine mammals, turtles, and marine fish.
Marine Benthos	<ul style="list-style-type: none"> Drilling of exploration well (cuttings discharge and deposition) 	<ul style="list-style-type: none"> Disturbance of some benthic habitat and organisms in a localized manner in the vicinity of the well. 	<ul style="list-style-type: none"> The magnitude of the disturbance from accumulation of cuttings discharged on the seafloor evaluated based on data from similar projects.
Ecosystems	<ul style="list-style-type: none"> Rig installation-related disturbances to seafloor Underwater sound generated by the drilling operations Lighting on rig Wastewater discharges Waste incineration 	<ul style="list-style-type: none"> Indirect impacts on ecological functions, particularly if special status species or trophic relationships are disturbed. 	<ul style="list-style-type: none"> The scientific literature was reviewed to determine the ecological relationships between major marine taxonomic groups.
	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 		<ul style="list-style-type: none"> Oil spill trajectory modeling was used to simulate the trajectory of an oil spill and assess potential spill-related impacts on marine organisms.

Resource	Sources of Potential Impacts	Potential Impacts	Management Approach
Socioeconomic Resources			
Economic Conditions	<ul style="list-style-type: none"> Local/regional procurement of select materials, goods, and services Limited local employment 	<ul style="list-style-type: none"> Positive impact on the economy; Potential shorter-term increases in the cost of living. 	<ul style="list-style-type: none"> Identification of key economic drivers in the national and local economies, particularly industrial sectors that are important to coastal communities; Determination of likely project-related impacts
	<ul style="list-style-type: none"> non-routine, unplanned events. (oil spill) 	<ul style="list-style-type: none"> Potential adverse impacts to income from agriculture and fisheries. 	
Employment and Livelihoods	<ul style="list-style-type: none"> Local employment 	<ul style="list-style-type: none"> Build capacity and increase demand for skilled labour. 	Assessment of: <ul style="list-style-type: none"> Types of labour requirements; Coastal agriculture, aquaculture, and offshore/coastal fishing activities; Potential for adverse impacts to fishing activities considering the locations and durations of the Project; Potential occupational hazards to the Project workforce.
	<ul style="list-style-type: none"> Marine safety exclusion zones Project-related marine traffic 	<ul style="list-style-type: none"> Limited adverse impacts to fishing activities because of marine safety exclusion zones or marine traffic. 	
	<ul style="list-style-type: none"> Drilling and support vessel operations 	<ul style="list-style-type: none"> Occupational health and safety for the Project workforce. 	
	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 	<ul style="list-style-type: none"> Impacts to fishing activities as a result of an oil spill. 	
Community Health and Wellbeing	<ul style="list-style-type: none"> Pressure on wages from increased competition for skilled labour Social interaction between the Project workers and residents Increased traffic at the shore base locations Noise and light near shore by the Project marine and aviation operations 	<ul style="list-style-type: none"> Most Project activities will be offshore at the well location and would have no direct impacts on communities in Guyana; Community health and wellbeing due to near shore noise and light and onshore traffic, and social interaction. 	<ul style="list-style-type: none"> Assessment of Potential risks to safety and health of local communities posed by shore base operations; Characterization of existing road, marine, and air traffic safety conditions.
	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 	<ul style="list-style-type: none"> Community health and wellbeing. 	

Resource	Sources of Potential Impacts	Potential Impacts	Management Approach
Socioeconomic Resources			
Marine Use and Transportation	<ul style="list-style-type: none"> Marine vessel operations 	<ul style="list-style-type: none"> Increase of marine-related traffic, which could potentially contribute to marine vessel congestion in port areas. 	<ul style="list-style-type: none"> Characterization of the communities dependent on marine transportation for livelihoods (e.g., speedboat operators and fishers); Characterization of existing marine vessel and safety conditions in the Project Area.
Social Infrastructure and Services	<ul style="list-style-type: none"> Requirements for selected infrastructure and services 	<ul style="list-style-type: none"> Could potentially compete with other existing businesses and consumers. 	<ul style="list-style-type: none"> Assessment of existing demand on public infrastructure, transportation networks, vehicular traffic, and public services; and Determination of the impact that any additional demand on these resources in terms of access and safety would have on impacted communities.
	<ul style="list-style-type: none"> Use of public infrastructure and services (roads, medical and emergency response, accommodation, and utilities) 	<ul style="list-style-type: none"> Use could overburden existing capacity and supply. 	
	<ul style="list-style-type: none"> Shore base operations (New Amsterdam) Ground transportation operations 	<ul style="list-style-type: none"> Increase in vehicular traffic in certain areas which could potentially contribute to vehicular congestion. 	
Cultural Heritage	<ul style="list-style-type: none"> Drilling of the well 	<ul style="list-style-type: none"> Adverse impact to cultural heritage through disturbance of potential archaeological or historical sites. 	<ul style="list-style-type: none"> Mapping of seabed objects in the well area.
	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 	<ul style="list-style-type: none"> Impact to cultural heritage in the Project Impact Area as a result of an oil spill. 	<ul style="list-style-type: none"> Assessment of the potential to contact terrestrial archaeological sites with oil spill trajectory modeling simulated oil spill trajectory.
Land Use	<ul style="list-style-type: none"> Shore base operations (pipe yards, warehouses, bulk fuel storage) Onshore waste recycling, treatment, and disposal facilities 	<ul style="list-style-type: none"> No new Project-dedicated land disturbance is planned; 	<ul style="list-style-type: none"> Potential for land use changes in the area surrounding the onshore facilities which will support the Project was reviewed and assessed.

Resource	Sources of Potential Impacts	Potential Impacts	Management Approach
Socioeconomic Resources			
Local communities, including Indigenous Peoples	<ul style="list-style-type: none"> Project-related impacts on natural resources. 	<ul style="list-style-type: none"> Project-related impacts on natural resources could lead to short term impacts on the services and/or values derived from natural resources and ecosystems used by local communities; The Project is not expected to directly cause any changes to population and demographics in local communities including indigenous communities. 	<ul style="list-style-type: none"> Socioeconomic conditions in communities, including indigenous communities and their reliance on natural resources characterized; The specific dependencies of communities, including indigenous communities on resources that could be impacted by the Project were identified; Sensitivity mapping was used to map coastal communities, including indigenous communities that rely on resources that could be impacted by the Project.
	<ul style="list-style-type: none"> Non-routine, unplanned event (oil spill) 	<ul style="list-style-type: none"> Impact to local communities including indigenous peoples as a result of an oil spill. 	<ul style="list-style-type: none"> Oil spill trajectory modeling was used to simulate the trajectory of an oil spill and to assess the potential for oil to contact lands and natural resources of coastal communities.

6 Public consultations

The Company has a robust public consultation program and is particularly keen in engaging with all stakeholders and the general public about its oil and gas exploration activities. The Company has engaged in several meetings with the Government of Guyana, its agencies and commissions, and with regional officials. It has reached out to professional and business associations, domestic non-governmental organizations, and various religious and ethnic organizations who have or showed interest in its projects. The Company has also engaged various international organizations, several universities and research institutes and the media.

The Company has held various workshops with the government and others regarding oil and gas exploration and development. It has participated in government led workshops such the Civil Defense Commission (CDC) led draft of the National Oil Spill Contingency Plan (NOSCP) where CRI was an active and constructive contributor.

The Company has initiated several public scoping meetings in different Regions of Guyana to inform the public about its Projects and to understand stakeholders' concerns so this feedback could be incorporated into the environmental assessment and management of impacts.

7 Assumptions, Uncertainties and Gaps in Knowledge

The major uncertainties for the project lie within two primary areas:

- 1) Pore Pressure Fracture Gradient predictions
- 2) the Geologic Model

These uncertainties will be managed through interpretation of real-time LWD data and paleo analysis. Any significant deviation from planned due to these uncertainties will be mitigated through deployment of contingencies incorporated in the overall plan. The deployment of contingencies will result in an impact to time and cost of the project.

8 Non-Technical Explanation of The Project

CGX Resources Inc. (“CRI”), a wholly owned subsidiary of CGX Energy Inc. (“CGX”) proposes to drill an oil and gas exploration well in the Northern portion of its Corentyne block (the Project). The Project targets large Campanian and Santonian prospects in structural/stratigraphic traps. Based on exploration and assessment activities in the Corentyne Block, including a 3D seismic survey, CRI believes the reservoirs potentially contain an economic accumulation of hydrocarbons.

The prospect is named Wei, after the tallest and hottest mountain close to the villages of Paramakatoi and Kurububaru in the Pakaraimas. Wei mountain has commanding visibility over all the surrounding terrain, so it was used as a sentinel post by the Patamona people to guard against attacks. This is the second prospect after Kawa, currently being drilled (September-December 2021), that has been identified in the Northern Corentyne area for exploration drilling. The proposed exploration well is named Wei-1.

The components and activities of the Project are:

- Exploration drilling, including design of the well and drilling rig;
- Onshore support, including shorebase;
- Marine and aviation support vessels and equipment;
- Decommissioning (End of operations); and
- Nearby appraisal wells if Wei-1 proves successful.

The process of drilling Wei-1 will be similar to the oil and gas exploration drilling programs conducted offshore Guyana and worldwide. The Project will involve onshore facilities and marine and aviation services to support drilling and decommissioning the well.

The company has implemented embedded controls into the Project design and established Environmental Management Strategies (EMS) for the drilling campaign based on the assessment of the identified potential environmental hazardous routine and unplanned events and their environmental impacts. The company has also devised a robust HSE management system for implementing the EMS which will ensure that recommended management measures are implemented as planned and effective. Emergency Preparedness and Response Plans, such as an Emergency response plan and procedures and Oil Spill Response Plan, are also established to ensure adequate resources are in place for potential unplanned events.

With the adoption of such controls and plans, the Project is expected to pose only negligible risks to the environmental and socioeconomic resources of Guyana.

The exploration drilling operation will provide the company with valuable information for the assessment of the potential for oil production. Although no production is expected at this stage, the exploration drilling may result in a find which would lead to a production stage.