PROJECT SUMMARY
WHIPTAIL DEVELOPMENT PROJECT
STABROEK LICENCE AREA, OFFSHORE GUYANA

Esso Exploration and Production Guyana Limited

Prepared by: Michael B. Persaud

Environmental, Regulatory, and Socioeconomic Manager

Address: 99 New Market Street North Cumminsburg, Georgetown, Guyana

December 2022

Contents

List of Tables

List of Figures

1. INTRODUCTION

Esso Exploration and Production Guyana Limited (EEPGL) is the designated Operator of the Stabroek Block under a Petroleum Agreement signed by EEPGL and its co-venturers, Hess Guyana Exploration Limited and CNOOC Petroleum Guyana Limited, with the Government of the Cooperative Republic of Guyana. The Petroleum Agreement covers approximately 26,806 km^2 and was executed together with a Petroleum Prospecting Licence for the Stabroek Block. Pursuant to the Petroleum Agreement, EEPGL has previously planned and obtained approval from the Government of Guyana for four development projects in the Stabroek Block – Liza Phase 1, Liza Phase 2, Payara, and Yellowtail. A fifth development project, Uaru, is currently pending approval. These development projects are collectively referred to as the Stabroek Projects. The subject of this current application for Environmental Authorization is the Whiptail Development Project, which will be the sixth deepwater petroleum development project in Guyana, if approved. The Whiptail Development Project (referred to in this document as Whiptail or the Project) will develop the Whiptail, Pinktail and Tilapia fields, and potentially additional resources, if determined to be feasible and economically viable. The Project will be designed to add up to 275,000 barrels of oil a day to existing daily production volumes in Guyana with the associated additional revenues to the Government of Guyana, while continuing a steady expansion of opportunities for Guyanese to participate in the petroleum industry.

Like the other Stabroek Projects, the Project will involve drilling of production and injection wells, installation, commissioning, and operations of Subsea Umbilicals, Risers, and Flowlines (SURF), and a Floating Production, Storage, and Offloading vessel (FPSO) for handling and offloading of produced hydrocarbons. The Project will utilize marine support vessels as well as onshore infrastructure, including but not limited to shorebases, warehouses, storage, and pipe yards, fabrication facilities, fuel supply facilities, and waste management facilities in Guyana. Such infrastructure will be used to support the drilling, installation, production, and decommissioning operations of the Whiptail Project.

EEPGL is committed to conducting business in a manner that is compatible with the environmental and economic needs of the communities in which it operates and that protects the safety, security, and health of its employees, those involved with its operations, its customers, and the public.

The Project will be designed to demonstrate a strong commitment to environmental performance. EEPGL strives to excel in environmental performance through emissions controls, technology selection, and process optimisations. EEPGL plans to incorporate the lessons learned from commissioning and operation of previous Stabroek Projects into future projects.

EEPGL strives to operate in a manner that minimizes environmental impacts to air, water, land, and social infrastructure, to the extent practicable, and strives to protect the health of people and animals. EEPGL continues to apply the learnings from starting up and operating Liza Phase 1 and Liza Phase 2, and will benefit from the experiences of starting up Payara and Yellowtail

developments. EEPGL has undertaken additional studies to obtain a more comprehensive understanding of potential impacts of effluent discharges to water, the feasibility of alternative handling of produced water, cradle to grave waste management in Guyana, emergency response capabilities, and environmental monitoring and verification, among others. The learnings from current operations and environmental studies will enhance the design and implementation of the Whiptail Project, increasing environmental performance and economic value.

The Whiptail Project will contribute positively, directly and indirectly, to economic growth in Guyana, including increased national revenues, local procurement of select goods and services, increased direct and indirect local employment opportunities which drive associated beneficial "multiplier" impacts throughout the local economy.

2. DESCRIPTION OF THE PROJECT

EEPGL is progressing plans for the Whiptail Project, located within Stabroek Block on Guyana's Continental Shelf. Whiptail will be located in the southeastern portion of the Stabroek Block, approximately 183 km from Georgetown and amid previous Stabroek Projects (see Figure 1). Current plans include drilling via drillships to produce oil from approximately 40 - 65 production and injection wells. Production is expected to begin between 4Q27 and 2Q28 with an expected field life of at least twenty years.

The production facilities to be installed include subsea equipment attached to the seafloor as well as processing equipment on the ocean's surface known as a Floating, Production, Storage, and Offloading (FPSO) vessel (see Figure 10). The subsea equipment will be installed in approximately 1,600 – 2,000 m of water depth (see Figure 2). The main components of the subsea kit include the following: production tree, production manifold, flowlines, risers, and umbilicals. The subsea umbilicals, risers, and flowlines are commonly referred to as SURF. The oil, gas, and water flows from the well into the production tree. The fluids are then gathered into the manifold which then connects to the flowlines before the risers take the fluids up to the FPSO for processing. The umbilical lines support production by providing real time control of the subsea installation from the surface by delivering fluids to facilitate the flow of hydrocarbons.

The FPSO is an industrial floating complex that continuously separates oil from produced water and associated gas for onboard storage, and later transfer to third party tankers. The anticipated production rate for the FPSO ranges between approximately 220,000 barrels and 275,000 barrels of oil per day. The vessel will be capable of storing approximately two million barrels of oil. Third-party oil tankers will be scheduled to offload the oil from the FPSO, making the oil available for export to the international market. The FPSO will also process, dehydrate, compress, and reinject associated gas produced from the reservoir.

As the Whiptail, Pinktail and Tilapia reservoir pressures deplete over time, gas reinjection will help maintain reservoir pressure and allow for optimum production of hydrocarbons to continue over time. In addition, some of the gas will be used as fuel on the FPSO.

The Project has been designed for no routine flaring of associated gas, instead using the gas for fuel, or reinjecting it into reservoirs to improve oil recovery, except for de minimis volumes of gas from processing equipment, which cannot feasibly be captured by vapor recovery. This design is consistent with ExxonMobil's plans to align with the World Bank's initiative to eliminate routine flaring of associated gas by 2030. However, it is important to recognize that some flaring is necessary or inevitable to maintain safe and reliable oil and gas operations. Such flaring will for example include well testing, background operational and safety flaring, planned maintenance activities, and intermittent unplanned events associated with process upsets or temporary infrastructure (equipment) malfunction. These gas streams are not the focus of the World Bank's Zero Routine Flaring (ZRF) by 2030 Initiative, which concentrates on other types of flaring[i].

The FPSO design will treat produced water before discharging overboard, consistent with good international industry practices (GIIP). In addition, the FPSO will use treated seawater for cooling and injection into the reservoir for additional pressure maintenance. The cooling water will be discharged overboard, consistent with GIIP.

In addition to the processing equipment, the vessel will also have living quarters and associated utilities to support operations personnel on the FPSO.

Table 1: Whiptail Key Technical Parameters

Oil Rate, kBD (thousand barrels per day)	220 – 275 (34,977 – 43,721 m^3/day)
Gas Production Rate MscfD (million standard cubic feet per day)	400 – 620
Produced Water Rate kBD (thousand barrels per day)	150 - 295 (23,848 – 46,901 m^3/day)

[i] The World Bank Group. (n.d.). *Zero Routine Flaring by 2030 (ZRF) Initiative*. Retrieved from www.worldbank.org: https://www.worldbank.org/en/programs/zero-routine-flaring-by-2030/qna (About the ZRF Initiative: Does the "Zero Routine Flaring 2030" Initiative focus on certain types of flaring?): *"The [ZRF 2030] Initiative pertains to routine flaring, defined as flaring that occurs during the normal production of oil, and in the absence of sufficient facilities to utilize the gas on-site, dispatch it to a market, or re-inject it. The typical example this initiative addresses is long-term continuous flaring for gas disposal where a gas market or injection capacity does not exist. The Initiative does not include non-routine flaring events. These can include: exploration and appraisal; initial well flow-back; well servicing; process upset; safety or emergency situations; equipment or gas handling infrastructure malfunction; or-de-pressurizing equipment for maintenance. The initiative also excludes purge and pilot flaring necessary for safe flare operation, combustion of hazardous or polluting emissions, such as volatile organic compounds and hydrogen sulphide. Some flare gas sources (e.g., glycol treatment facilities, produced water treatment facilities) are so small and at such low pressure that it is environmentally more beneficial to utilize resources to reduce other flaring sources and other types of emissions."*

The major components of the proposed Whiptail Development Project are highlighted in Table 2.

Table 2: Major Components of the Whiptail Development Project

Major Component	
Surface Production Facility	A single Floating Production, Storage, and Offloading (FPSO) vessel
Distance from Shore	FPSO is approx. 183 km from Georgetown
FPSO Mooring System	FPSO uses a spread mooring system with mooring lines connected to suction piles embedded in seafloor
FPSO Oil Storage Capacity	Approx. 2 million barrels
Offloading Frequency by Export Tankers	Approximately every 3-6 days during peak production
Subsea Production Facility Design	Subsea production trees and gas/water injection trees clustered around subsea manifolds
Wells	Approx. 40 – 65 wells
Drillships	Each development well will use multiple dynamically-positioned drillships
Onshore Support including Shorebase	Onshore infrastructure includes shorebases, pipe yards, fabrication facilities, fuel supply facilities, and waste management facilities; potential sharing among developments
Logistics Support	Marine vessels and helicopters throughout all stages; potential sharing among developments

While much of the installation and production operations activity will be offshore, the Project will utilize onshore infrastructure, including, but not limited to, shorebases, warehouses, storage and pipe yards, fabrication facilities, fuel supply facilities, and waste management facilities in Guyana. Such infrastructure will be used to support drilling, installation, production, and decommissioning operations. Additional logistical support may be provided by others outside of Guyana, as determined by the Project. Helicopters required for crew changes are planned to be operated out

of the Eugene F. Correia International Airport as is currently being done for exploration drilling and for the Stabroek Projects. In some cases, crew transfers may occur by marine vessel.

The Project will generate hazardous and non-hazardous wastes and effluent discharges, as well as sanitary discharges, throughout its lifetime.

Waste and effluents generated offshore will be avoided, reduced, recycled, and treated offshore where practicable, with the remainder directed for onshore treatment, recycling, reuse, or disposal. All waste streams for the Project will be managed in accordance with EEPGL's Comprehensive Waste Management Plan (CWMP), approved by the EPA. The CWMP covers the storage, handling, treatment, and disposal requirements of EEPGL's wastes for the various offshore and onshore operations. The CWMP defines the waste management philosophy, responsibilities for waste management, waste management methodology and controls for various waste types and classifications, and inspection, monitoring, auditing, and reporting of waste management activities.

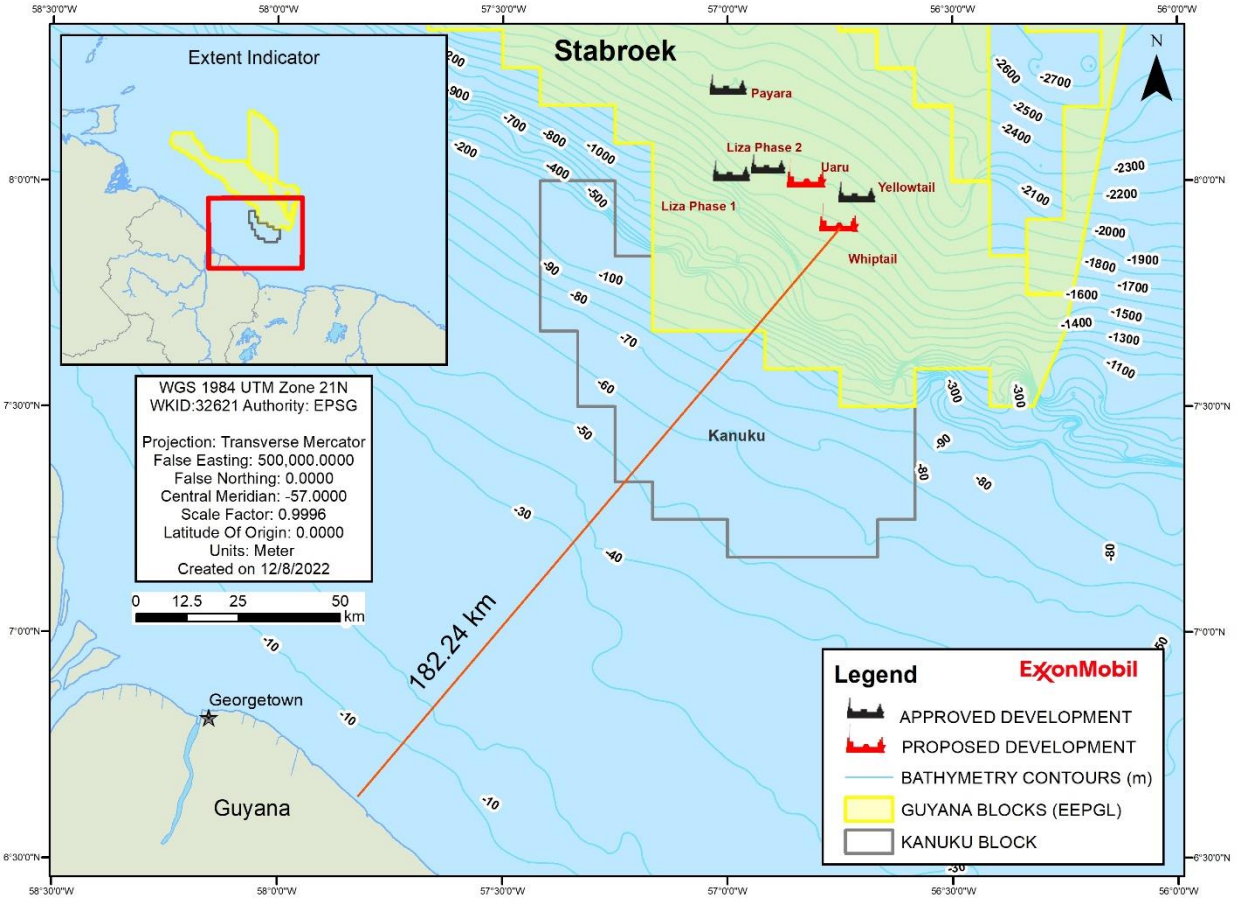
The CWMP provides both EEPGL and the EPA with an efficient way to understand and reference waste management practices for all EEPGL waste management activities. It is an evergreen document intended to accommodate all projects in Guyana associated with EEPGL's exploration and appraisal drilling, development drilling, installation and hook-up, commissioning and start-up, office construction, onshore and offshore pipeline, production operations, and related activities; and as Projects are planned or come on stream, the CWMP will be updated to address them.

3. SITE, DESIGN, AND SIZE OF PROJECT

3.1. SITE

The proposed location of the Whiptail FPSO is within the Stabroek Block, approximately 183 km from Georgetown, Guyana is shown on Figure 1.

Figure 1: Location of the Whiptail FPSO within the Stabroek Block



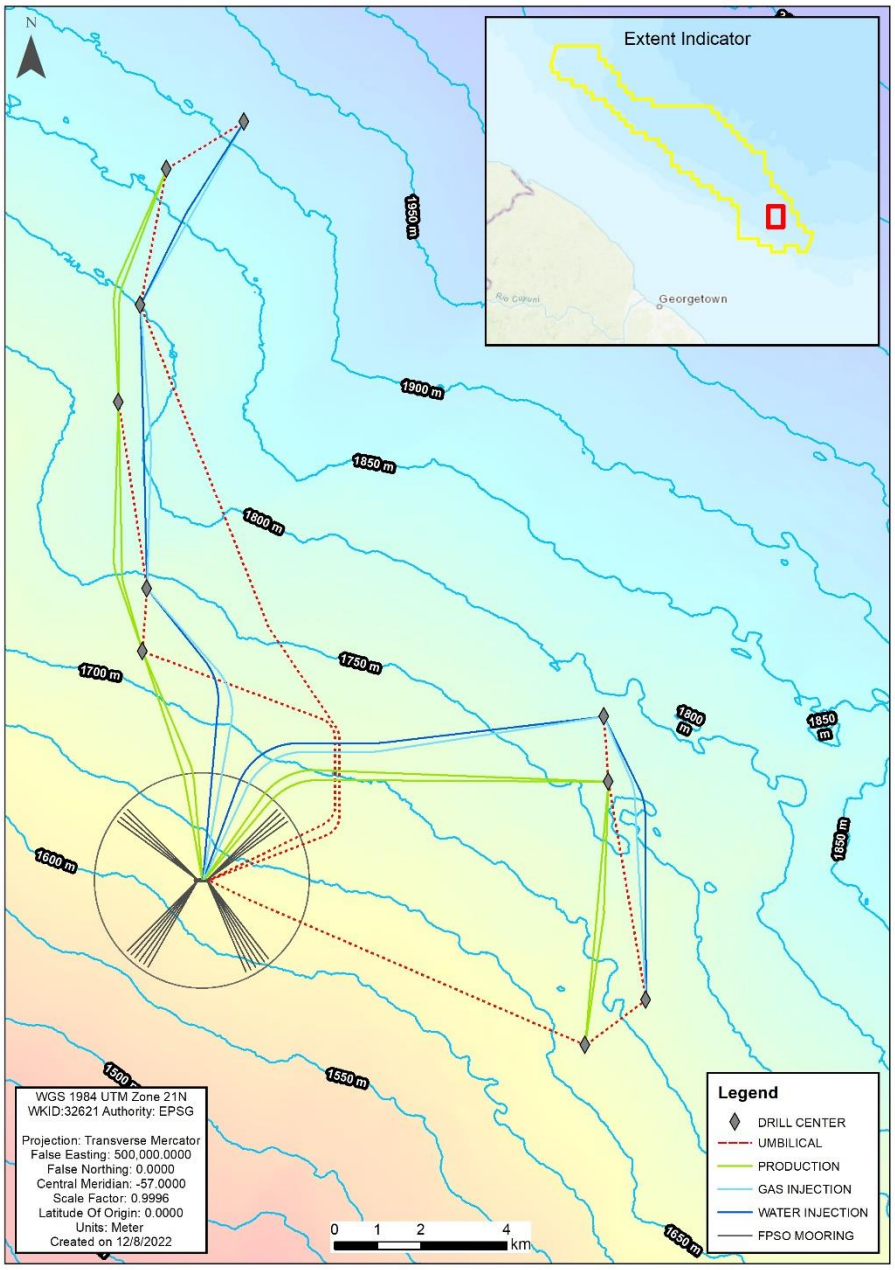
The development plan for the Project will use an FPSO and subsea umbilicals, risers, and flowlines (SURF) production system similar to those of Liza Phase 1, Liza Phase 2, Payara, Yellowtail, and proposed Uaru development projects. Although similar in overall Project design, the Whiptail Development Project will be a stand-alone project.

The FPSO and subsea production system is a proven approach for deepwater oil developments in Guyana and will leverage both operator and industry-proven technologies, consistent with GIIP.

The FPSO for the Whiptail Development Project will be located approximately 22 km and 29 km from the operational Liza Destiny and Liza Unity FPSOs respectively, 43 km from Payara development, 8 km from the Yellowtail development and approximately 13 km from the proposed Uaru development (see Figure 1).

Figure 2 illustrates the preliminary conceptual area layout of the production system and the preliminary bathymetry, as the Whiptail Development Project is in the preliminary design phase.

Figure 2: Preliminary Area Layout for Whiptail Development



NOTE: Quantities and locations in figure subject to change

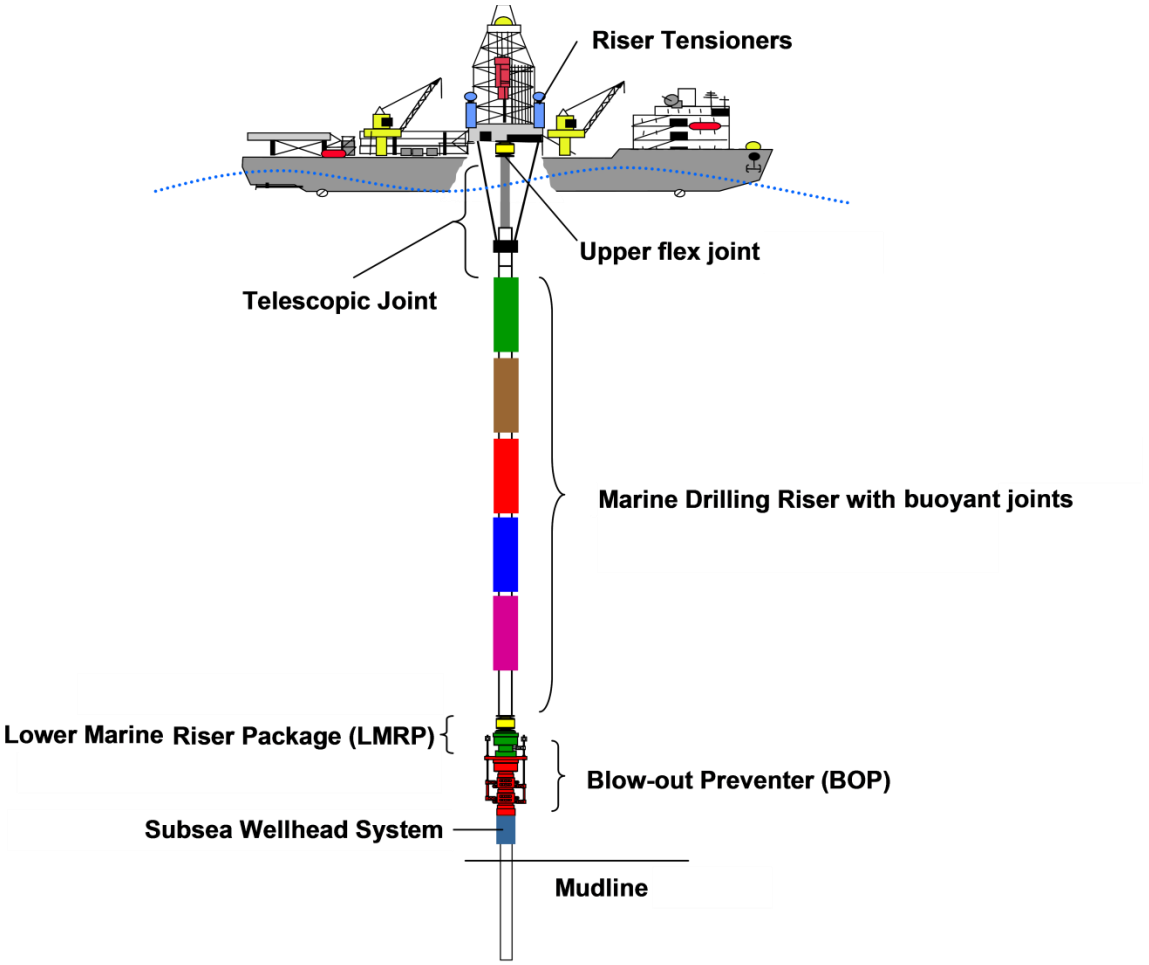
3.2. DESIGN AND SIZE OF PROJECT

3.2.1. Drilling

Based on the water depths in the Whiptail Development area, multiple dynamically-positioned drillships, as shown on Figure 3, will be used to drill the wells and typical subsea drilling system is shown on Figure 4. The process of drilling the wells for Whiptail will be similar to the process followed during exploration/appraisal well campaigns as well as the Liza Phase 1, Liza Phase 2, Payara, and Yellowtail drilling programs. After drilling to total depth, the wells will be completed, and the subsea production equipment will be installed.

Figure 3: Example of Drillship

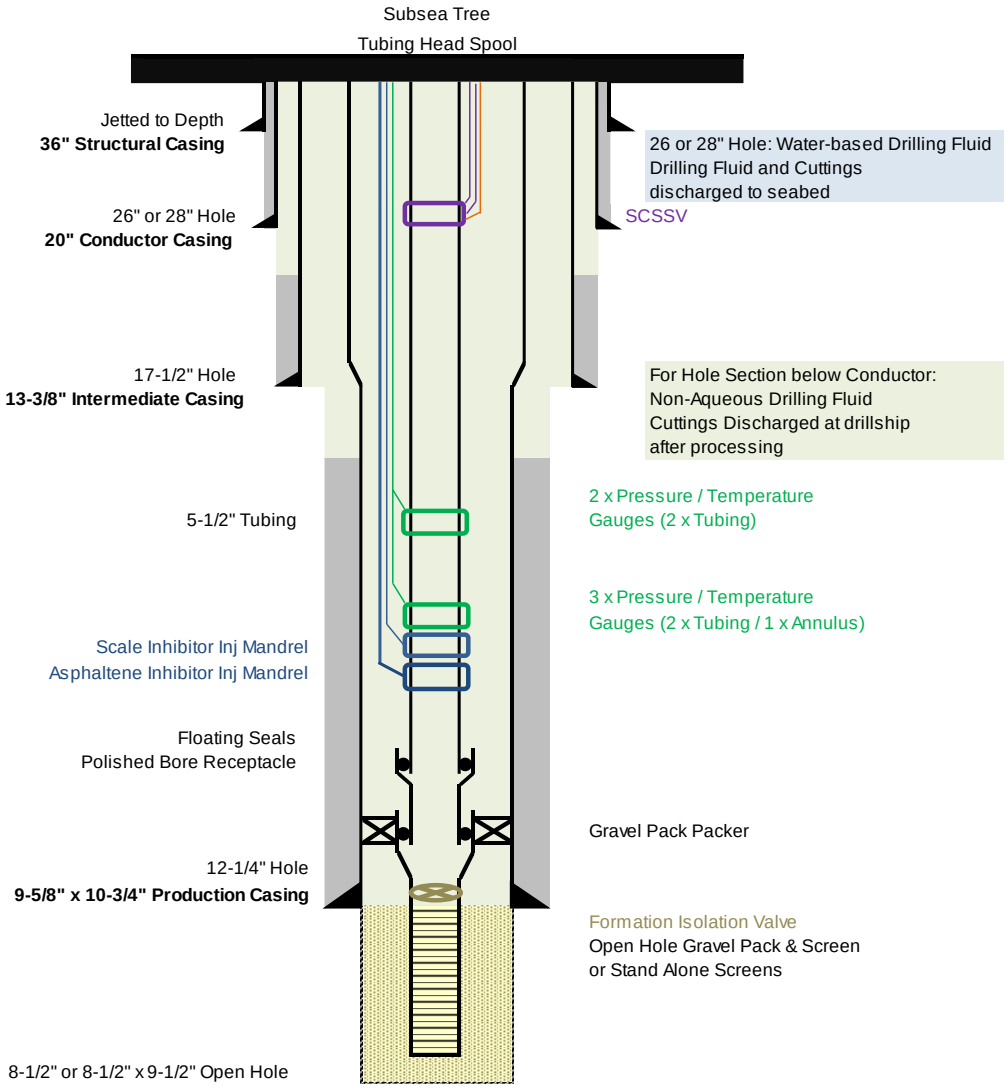
Figure 4: Typical Subsea Drilling System



The following information describes development wells for the purposes of the Project.

Once the borehole is started for a well, pipe (also known as 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 are progressively set as the well is drilled deeper. After each casing (for the conductor casing and deeper casings) is installed, pressure and integrity testing is performed according to standard industry practices. A provisional well program and design for the Whiptail development-drilling program, including preliminary casing types and sizes, setting depths, drilling fluid types, and discharge locations, is shown on Figure 5.

Figure 5: Provisional Casing Program for Development Drilling



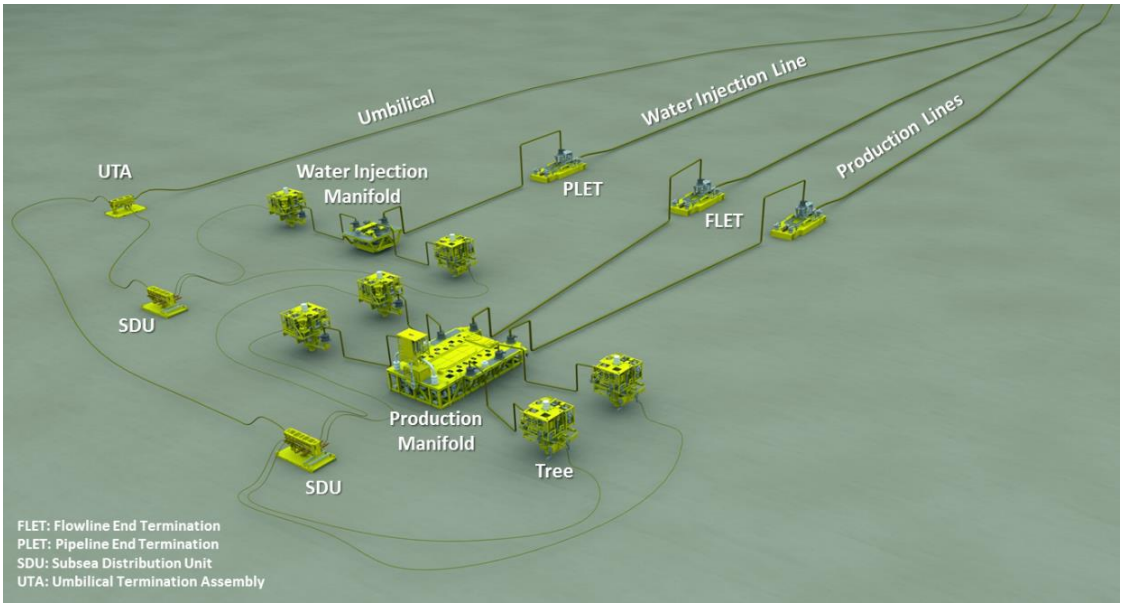
SCSSV = surface-controlled subsurface safety valve

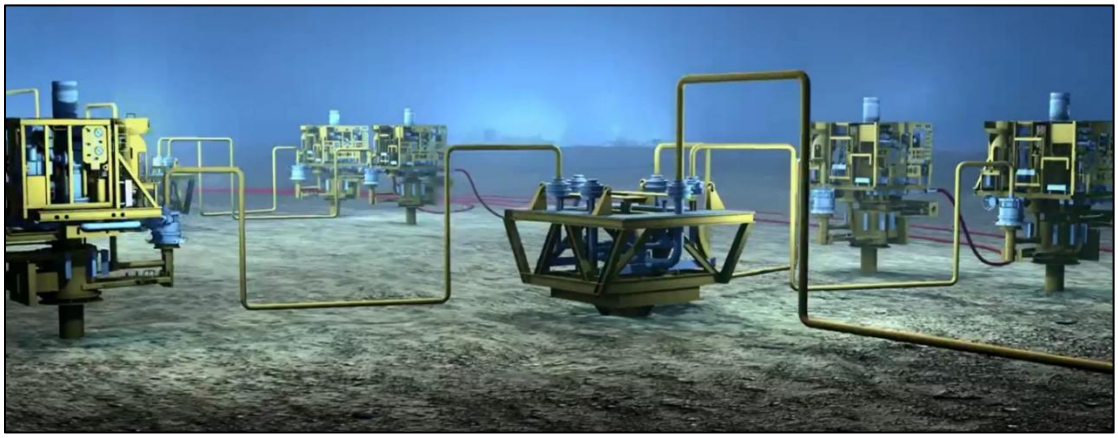
During the drilling process, drillships will require various materials, instruments, and devices to connect the drill bit to the drillship. Various size casings will be set as the well is drilled deeper. The drilling process will also require circulating drilling fluid to remove cuttings and control formation pressures and cement to support the casing and to isolate reservoir formations. Completion equipment and completion fluids will also be required. The raw materials above are in addition to the basic supplies required to operate the production equipment and support vessels such as fuel, food for the crews, fresh water, and industrial consumables.

3.2.2. SURF

The proposed SURF facilities for the Whiptail Development Project are composed of subsea production and injection wells clustered around subsea manifolds. Approximately 40 - 65 wells could be drilled consisting of a combination of producers and injectors (i.e., for the injection of sea water and reinjection of associated gas to maintain reservoir pressure). Produced well stream fluids, which include associated gas, will be transported through subsea flowlines to the FPSO at the surface. The risers and umbilicals will connect the equipment on the sea floor to the FPSO. The subsea system will be monitored and controlled using a control system connected to the FPSO through a control umbilical, which also supplies chemicals to the subsea facilities. The hydraulic fluid for operating the subsea control system will be water-based. Figure 6 represents an example of subsea facilities on the sea floor.

Figure 6: Example Subsea Facilities (SURF)





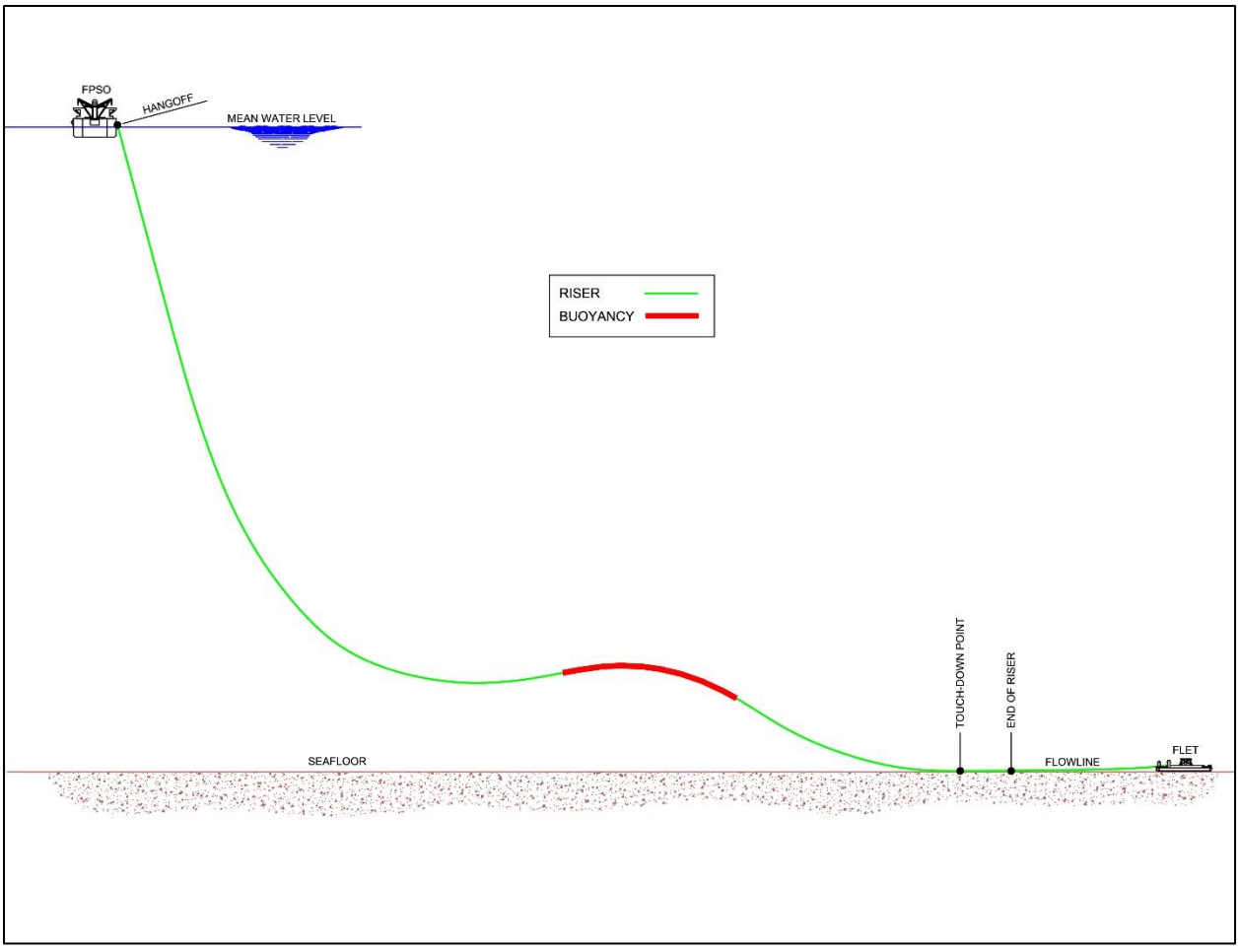
Below is the description of SURF components:

- **Risers and Flowlines**

The Project will incorporate production (oil, gas, and water), sea water injection, and gas injection flowlines and risers, as shown on Figure 6. Flowline and umbilical lengths will range from approximately 1 to 16 kilometers (approximately 1 to 10 miles), excluding risers, in water depths of approximately 1,600 – 2,000 meters (5,249 - 6,561 feet). The current design lengths are based on preliminary shallow hazard surveys and current field layout, and may be adjusted slightly during detailed design.

The steel risers transition from the seabed to the FPSO in a “lazy wave” configuration as shown on Figure 7.

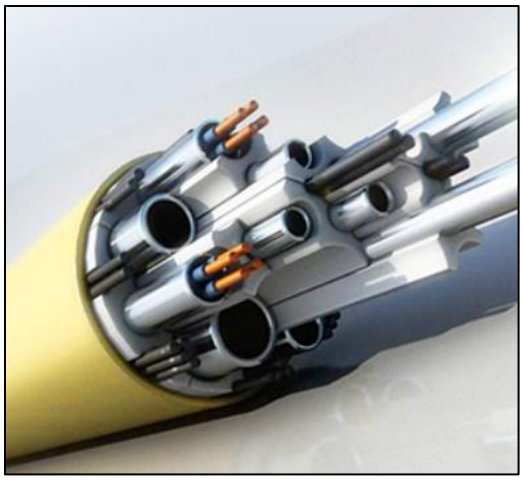
Figure 7: Representative Steel Lazy Wave Riser



- **Umbilicals**

Umbilicals will be designed as an integrated bundle of tubes and cables to serve multiple functions (see Figure 8). Two to four (2 - 4) dynamic umbilicals connected to the FPSO will service the entire Project. The remaining drill center components, composed of the subsea trees, manifolds, flying leads, and jumpers, will be connected via 6 - 10 in-field/static umbilicals.

Figure 8: Representative Dynamic Umbilical



- **Manifolds**

Manifolds are gathering points or central connections made up of valves, hubs, piping, sensors, and control modules. Manifolds (see Figure 9) include a protective structural framework that rests on a foundation on the seabed where multiple trees, jumpers, and flowlines gather to consolidate flows before they are transported either to the surface as part of production or back downhole as part of injection into the reservoir.

Figure 9: Representative Subsea Manifold

- **Gas-Lift System**

The FPSO riser support system will be designed to accommodate a riser that may be utilized for gas-lift capability. The gas-lift system is not required for initial start-up and may be installed at some future time during the Whiptail service life based on the production characteristics of the field. This system will include gas-lift flowlines with connections to the production manifold Flowline End Terminations (FLETs).

3.2.3. FPSO

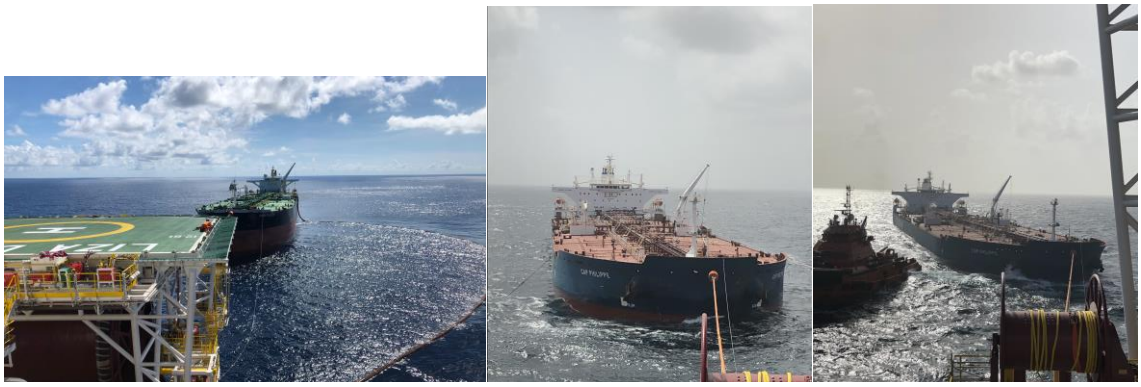
The proposed FPSO will be a newly built floating facility with double side and single bottom protection, with approximate dimensions of 333 m long by 60 m wide by 33 m deep, and will be moored on location, approximately 183 km offshore, some 29 km southeast of the Liza Unity FPSO (shown in Figure 10).

The FPSO will have a peak production capacity of approximately 220,000 barrels to 275,000 barrels of oil per day. The FPSO will have an oil storage capacity of approximately 2 million barrels in the cargo tanks within its hull. Its mooring system will be designed to keep the FPSO stationary continuously for the duration of the Project (at least 20 years). Produced oil will be stored in the FPSO tanks prior to export to market via conventional tankers owned/operated by third parties. At peak production during Whiptail operations, the FPSO may offload oil to conventional tankers approximately every 3 - 6 days by either direct tandem offloading, or via a Dynamically Positioned Offloading Tug (DPOT) . The conventional tanker will be held in position with the assistance of stationkeeping tug(s) to maintain a safe separation distance from the FPSO. Figure 11 shows an example of FPSO offloading configuration.

Figure 10: Liza Unity FPSO

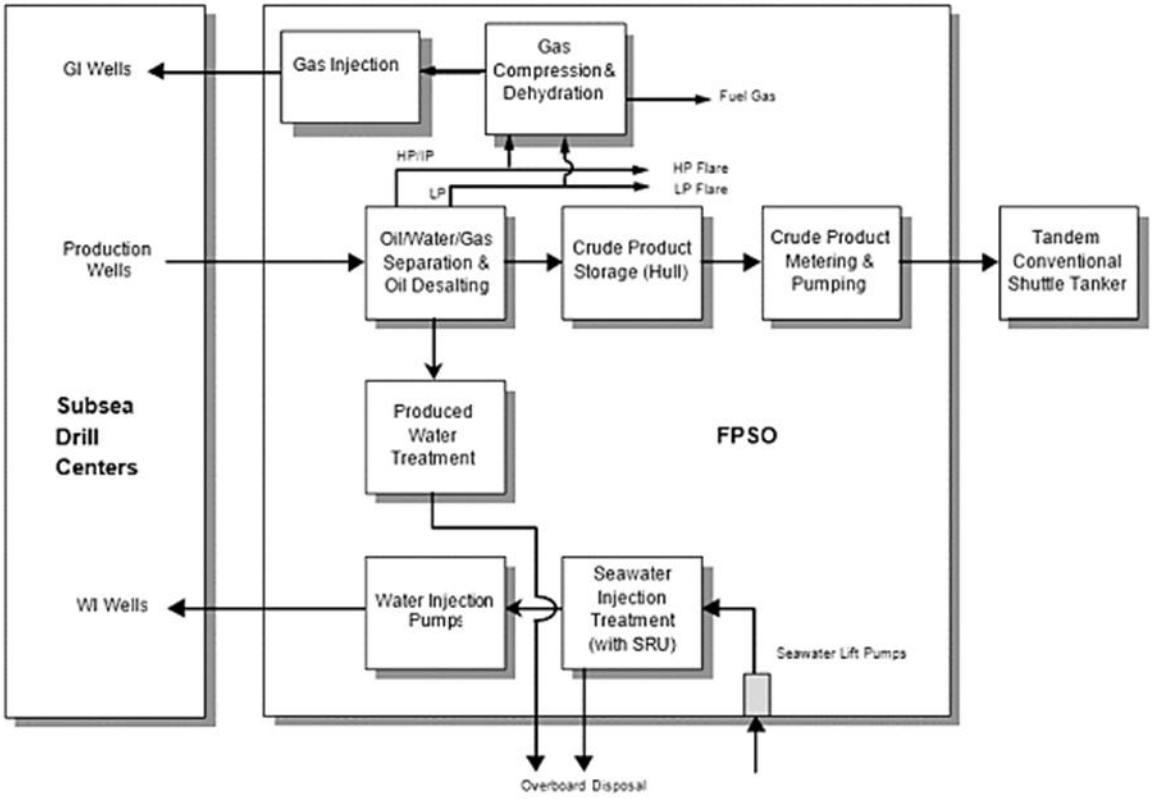
Figure 11: Typical FPSO Offloading Configuration

Figure 12: Liza Phase 1 Development Project FPSO Destiny Offloading



Operating processes during production will include flowing the reservoir hydrocarbons from the wells to the FPSO, where further processing, storage, and management occurs, prior to offloading the oil to conventional tankers (see Figure 12). General maintenance of the production equipment will also be required. The production facilities will require the use of industry standard chemicals and additives to process oil and prevent corrosion, scale, and hydrate formation. The preliminary chemical requirements and estimated quantities will be defined as part of the ongoing facility design work and will be addressed in more detail during environmental authorisation.

Figure 13: FPSO Block Flow Diagram



GI = gas [re]injection; HP = high pressure; IP = intermediate pressure; LP = low pressure; SRU = sulfate removal unit; WI = water injection

Examples of FPSO tank arrangements and FPSO topside layout are shown on Figure 14 and Figure 15, respectively.

Example of FPSO Overall Equipment Layout is shown in Appendix 1.

Figure 14: Example of Whiptail FPSO Tank Arrangements

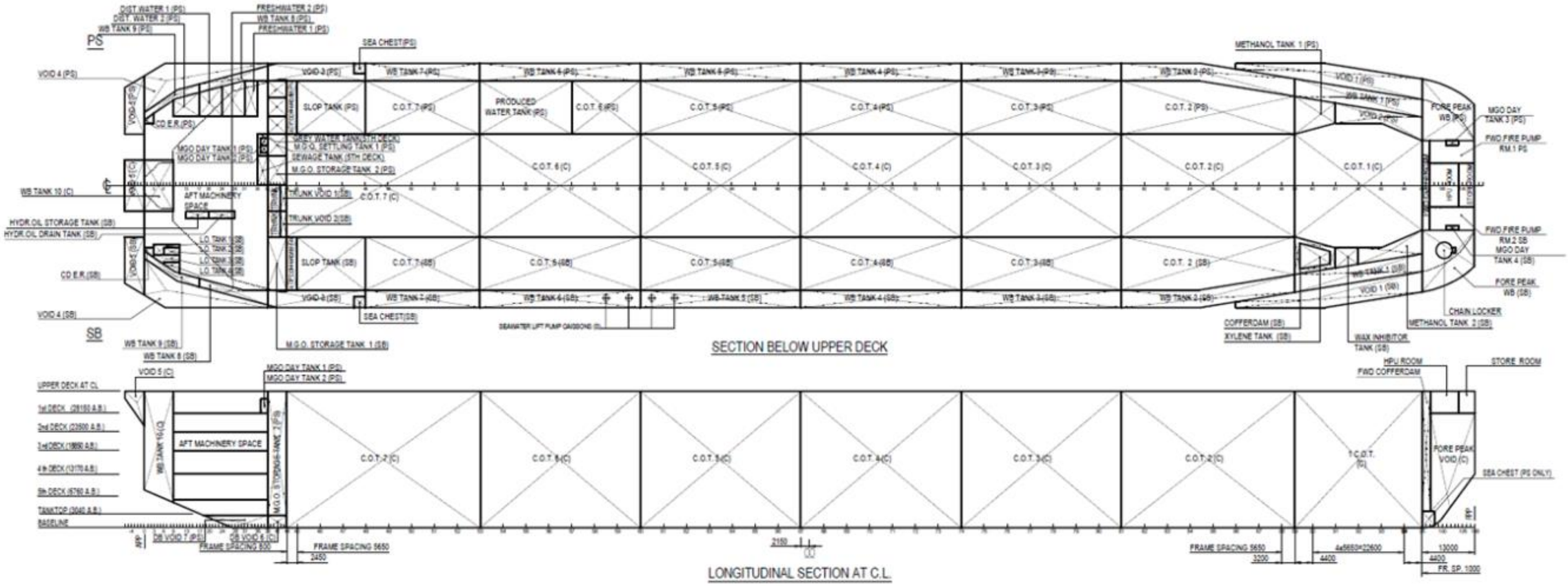
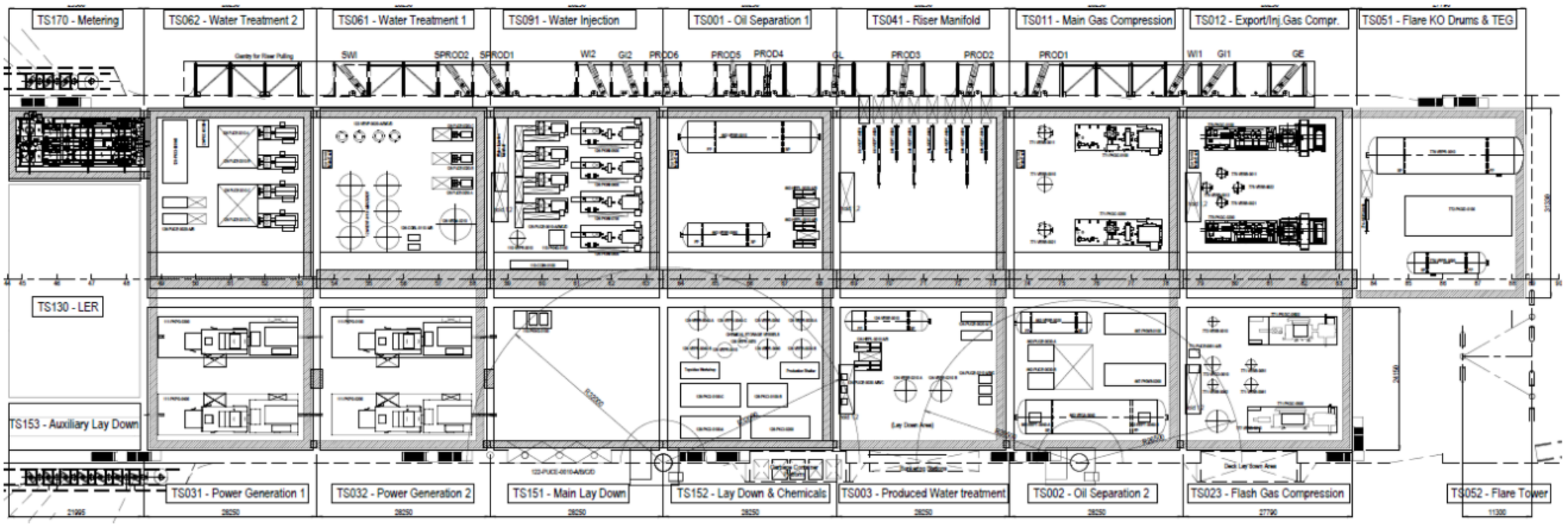


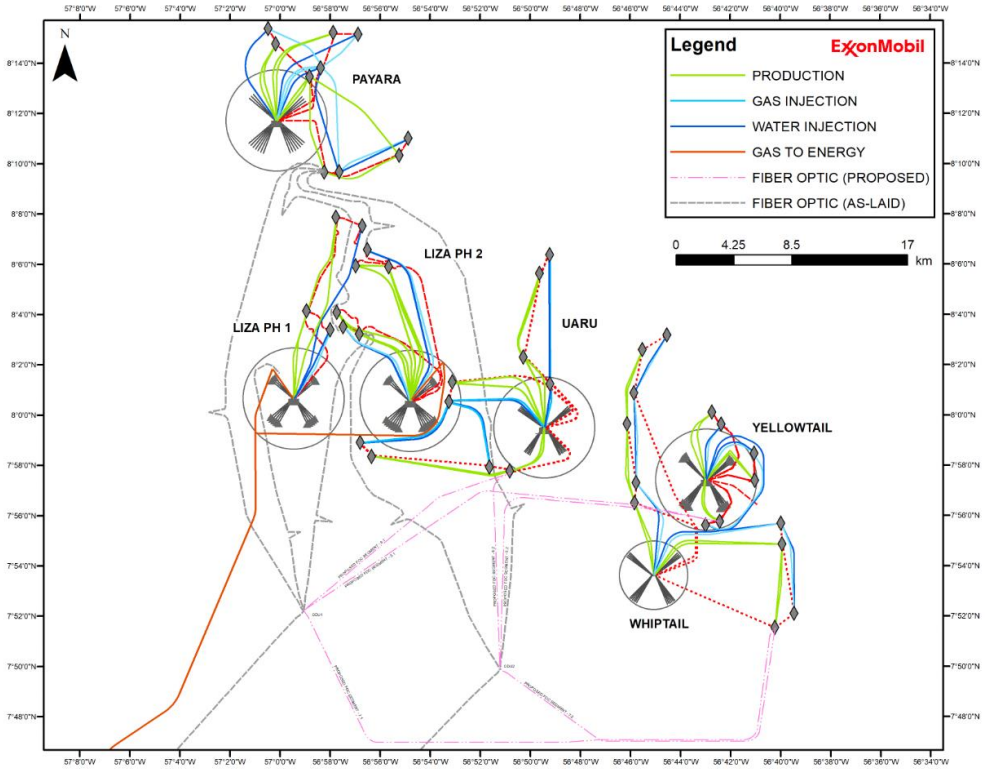
Figure 15: Example of Whiptail FPSO Topside Layout



3.2.4. Communication Systems

Telecommunications equipment will be installed on the FPSO to enable safe operation of the facilities in normal and emergency conditions. This equipment will allow communication with the offices, shorebases, support vessels, helicopters, and tankers, as well as communication within the FPSO. EEPGL has previously installed the Fibre Optic Cable Project, which provides the fibre optic communication infrastructure from the Stabroek Block to shore, enabling high-speed, low-latency communications and data transfer between EEPGL's FPSOs and shore. The Fibre Optic Cable Project included installation of two optical distribution units (ODUs), two main fibre optic trunk lines to shore, and fibre optic cables routed from the Liza Destiny, Liza Unity, Payara Prosperity, and Yellowtail ONE GUYANA FPSOs to the ODUs. EEPGL plans to connect this Project's FPSO into the existing fibre optic infrastructure back to shore, as shown in Figure 16, which will consist of two fibre optic cables connected from a Whiptail subsea drill centre back to the existing two ODUs. From the subsea drill centre, the fibre optic cable will connect to the FPSO via one of the dynamic umbilicals, which will contain fibre strands.

Figure 16: Fibre Optic Cable Layout



3.2.5. Workforces

The Project is in the initial stages of planning and design, and detailed estimates of workforce requirements have not yet been developed. Preliminary workforce estimates are provided below. These estimates will be refined following selection and contracting for the drillships, FPSO, SURF installation vessels, and support vessels. The following workforce levels in Table 3 are preliminary projections for the offshore components during each stage of the Project; some stages may occur concurrently.

Table 3: Preliminary Workforce Levels

Well Drilling	Approximately 600 persons at peak utilizing two to three drill ships (approx. 200 persons per drillship). Estimate is dependent upon final drillships and support vessels selected.
FPSO and SURF Mobilization/ Installation/Hookup	Approximately 600 persons at peak. Estimate is dependent upon final construction/installation and support vessels selected.
Production Operations, including FPSO and support vessels	Approximately 160 - 180 persons at peak
Decommissioning	Approximately 160 persons at peak.

In addition to the offshore components, there will be a comparatively smaller number of personnel providing shorebase and logistical support onshore, in addition to personnel already engaged in supporting other EEPGL projects. The onshore staff will be expected to ramp up gradually through the mobilization and installation stage, and return to the same level or slightly higher after the end of Whiptail installation and drilling campaigns. The onshore workforce is expected to increase again briefly during decommissioning. Logistical support may be shared among the Liza Phases 1 and 2, Payara, Yellowtail and the proposed Uaru Development Projects.

3.2.6. Decommissioning

A decommissioning program for Whiptail will be submitted for approval by the government, in accordance with the Petroleum Agreement. The final decommissioning strategy is expected to include a comparative assessment, which is designed to evaluate the potential safety, environmental, technical, and economic impacts and associated mitigation measures in order to finalize the decommissioning program.

Subject to future comparative assessment, the expectation is that the SURF components will be detached from the FPSO and abandoned-in-place on the sea floor, consistent with GIIP at the time of decommissioning. The FPSO is expected to be towed away, and the FPSO

mooring system will be disconnected and remain intact on the sea floor, consistent with standard industry practice.

4. POSSIBLE IMPACTS ON ENVIRONMENT

The potential impacts from the Project could be related to the following physical, biological, and socioeconomic (inclusive of community health) values:

- Air quality and climate
- Sound
- Marine geology and sediments
- Marine water quality
- Coastal habitats
- Coastal wildlife
- Protected areas and special status species
- Seabirds
- Marine mammals
- Riverine mammals
- Marine turtles
- Marine fish
- Marine benthos
- Ecological balance and ecosystems
- Cultural heritage
- Community health and wellbeing
- Employment and livelihoods
- Marine use and transportation
- Social infrastructure and services
- Land use
- Ecosystem services
- Indigenous people and traditional use of resources and land
- Economy/economic conditions
- Waste management infrastructure capacity
- Cumulative impacts

The potential impacts, which are expected to be similar to those identified in the Stabroek Development Environmental Impact Assessments (EIAs), could be directly and/or indirectly generated by Whiptail during drilling and installation, hook-up and commissioning, production, and/or decommissioning operations, and such impacts could be adverse or positive in nature. The potential for cumulative impacts exist where impacts from Whiptail overlap with those of other Stabroek Projects (or other existing or planned future activities) in space or time. As such, a robust cumulative impact assessment will be performed as part of the Whiptail assessment of impacts. Additional information on potential impacts is included in Appendix 2.

Should an EIA be required by the Guyana Environmental Protection Agency (EPA) as part of the environmental authorisation process, an EPA-approved EIA Consultant will scope, study, and assess potential impacts from the Whiptail Development Project in an EIA per the laws of Guyana, in particular the Environmental Protection Act 1996. Through an EIA, EEPGL and those qualified independent environmental consultants chosen and approved to conduct the EIA will identify mitigation measures and monitoring programs to address any identified adverse impacts of significance. Potential mitigation measures to minimize or eliminate potential impacts are included in Appendix 3.

Appendix 4 provides a summary of the predicted residual impact significance ratings (taking into consideration proposed mitigation measures) for impacts on each of the resources that may potentially result from the planned Project activities in each Project stage (i.e., development well drilling/Subsea, Umbilicals, Risers, and Flowlines/FPSO installation, production, and decommissioning operations). For each resource, the table shows the highest residual impact significance rating among the potential impacts relevant to each Project stage. For each resource, the table also summarizes the highest residual risk rating for potential risks to resources from unplanned events (e.g., oil spill, vessel strike) and the priority rating for potential cumulative impacts on each resource, as determined by the cumulative impact assessment.

5. NON-TECHNICAL EXPLANATION OF PROPOSED PROJECT

EEPGL is proposing a project to develop an oil production facility in the offshore waters of Guyana. The Whiptail Development Project (Whiptail or the Project) will be located in the southeastern portion of the Stabroek Block, approximately 183 km from Georgetown (see Figure 1).

Oil production from the Project is expected to last approximately 20 to 30 years.

EEPGL will drill approximately 40 – 65 wells offshore to support extraction of the oil from below the sea floor. Each well will be drilled using a drillship (see Figure 3).

EEPGL will install some of the oil production facilities on the sea floor at approximately 1,600 – 2,000 m water depth. These subsea facilities include various types of pipes and hardware. The subsea facilities allow the oil from the wells to be gathered and moved to the surface of the ocean for further processing (see Figure 6).

EEPGL will install other oil production facilities on a vessel which floats on the surface of the ocean. The vessel is called a Floating Production, Storage, and Offloading vessel (FPSO). The FPSO will be moored on location in approximately 1,700 m of water depth and will remain on location throughout the production stage (see Figure 10). Oil production facilities on the FPSO will further process the oil extracted from below the sea floor.

The FPSO will have the peak capacity to produce up to approximately 220,000 barrels to 275,000 barrels of oil per day. These estimates are preliminary and are subject to change.

Processed oil will be stored in cargo tanks inside the FPSO hull which have the capacity to hold approximately 2 million barrels of oil. During peak production, approximately every 3 - 6 days, the oil will be pumped from the FPSO to a conventional oil tanker, which is owned/operated by third parties. The tanker will then export the oil to buyers. Figure 11 shows a typical FPSO Offloading Configuration and Figure 12 shows an example of an FPSO and a tanker while oil is being offloaded.

EEPGL will utilize onshore support facilities to support drilling the wells, installing the offshore production facilities, and operating the offshore production facilities. This will include but is not limited to shorebases, warehouses, storage and pipe yards, fabrication facilities, fuel supply facilities, and waste management facilities in Guyana. Helicopters and supply boats will also be needed to support the Project.

At peak, EEPGL will be supported by approximately 1,200 offshore personnel during the well-drilling and oil production installation stages. This number will decrease to less than 200 personnel

during the production phase. A smaller number of personnel will be utilized at the onshore support facilities.

At the end of the life of the Project (at least 20 years), EEPGL will decommission the offshore production facilities in accordance with the abandonment plan approved by the government.

Whiptail Key Design Details

- Oil Production Rates:
  - Whiptail Development Project production rate will be approximately 220,000 barrels to 275,000 barrels of oil per day.

- FPSO Oil Storage Volume:
  - Whiptail Project storage volume will be approximately 2 million barrels of oil.

- Number of Wells:
  - Whiptail Development Project will have approximately 40 to 65 wells.

- Oil Offloading Frequency:
  - Oil will be offloaded from the Whiptail FPSO approximately every 3 - 6 days during peak production.

The Project activities may have the following impacts on People, Wildlife, and the Environment:

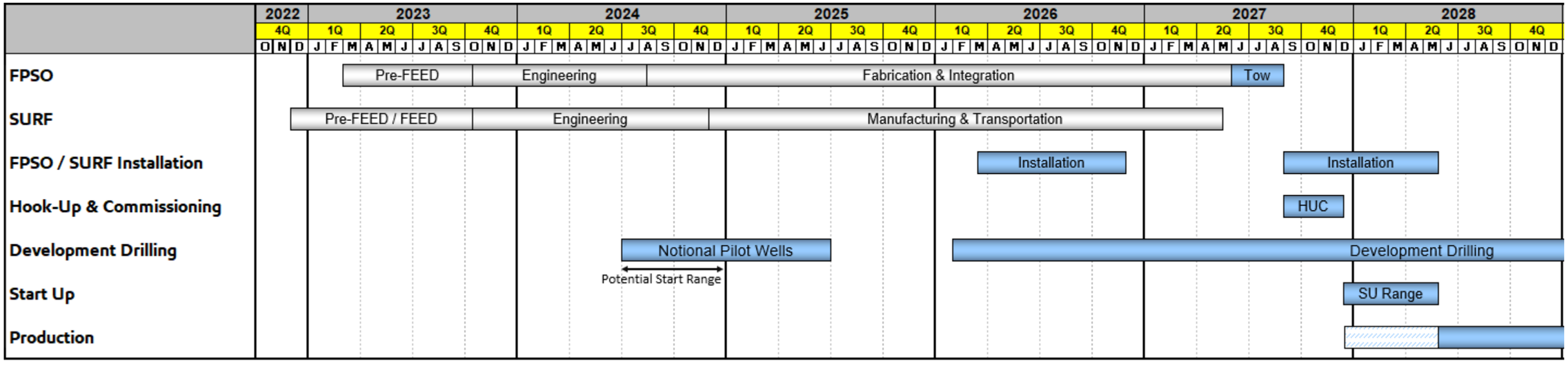
- Changes in quality of air and increases in greenhouse gas emissions
- Changes in noise and light levels
- Disturbance of seabed
- Changes in quality of ocean water
- Impacts to whales, dolphins, sea turtles, fish, marine birds, and marine protected species
- Impacts to coastal wildlife and/or coastal habitat
- Changes in food sources for fish and wildlife
- Increase in number of available local jobs
- Increase in government revenue
- Increase in foreign workers
- Increased demand for local goods and services
- Increased demand for local accommodations
- Increased road and vessel traffic and use of local shorebases
- Restriction on fishing around drillships (temporary) and FPSO
- In the unlikely event of an oil spill, impacts to the environment (e.g., marine waters, coastline, protected areas), indigenous communities, and livelihoods of farmers and fishermen
- Cumulative impacts

6. DURATION OF PROJECT

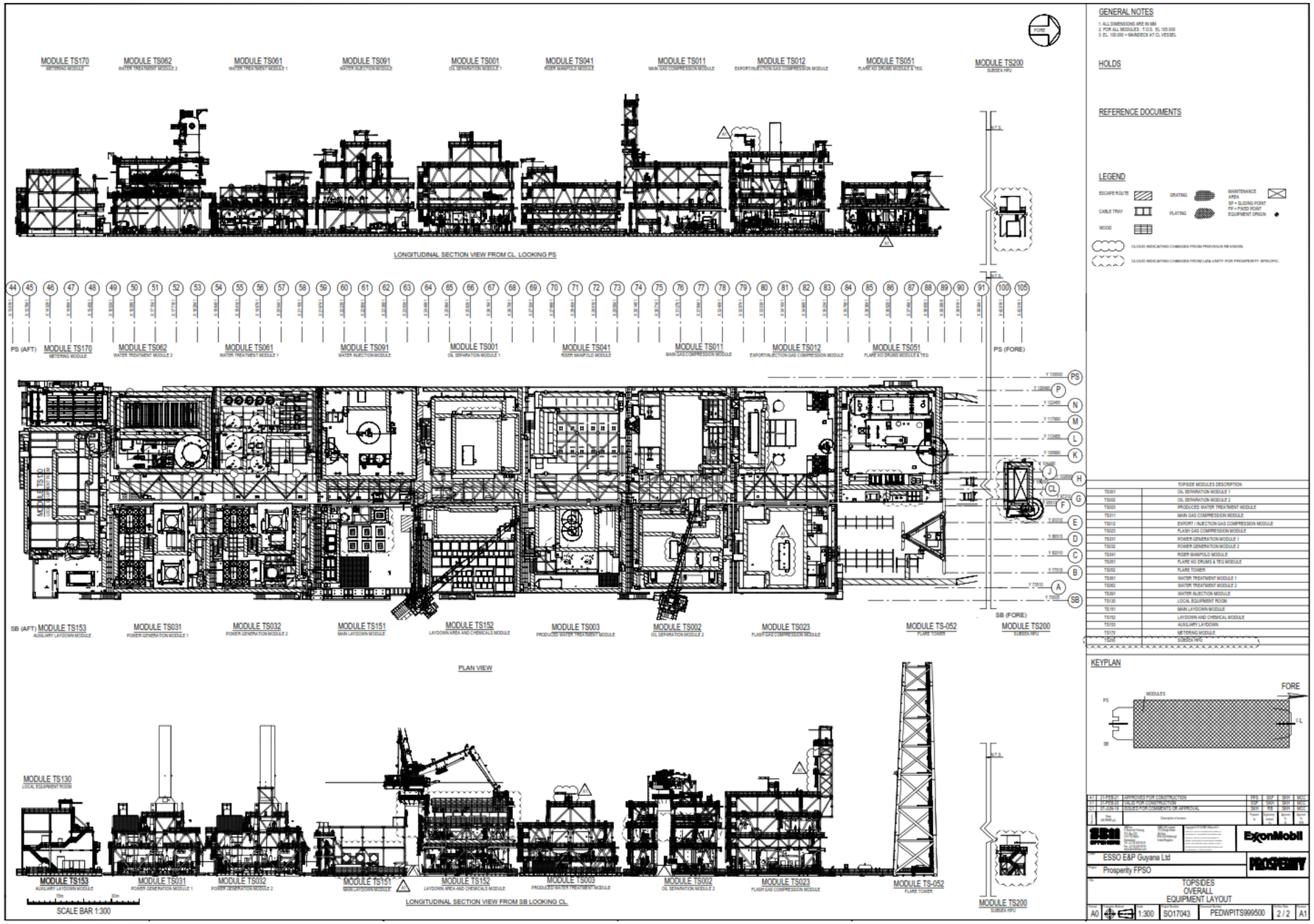
The lifecycle for the Project will include engineering, construction, installation, commissioning, start-up, operations and maintenance, and decommissioning. The engineering phase will include conceptual design, Front-End Engineering and Design (FEED), and detailed engineering. The construction phase will include procurement, fabrication and construction, followed by offshore installation, hook-up and commissioning, and start-up. Operations and maintenance will follow commissioning and start-up and will be the longest phase of the Project, with a duration of at least 20 years. Subject to applicable regulatory approvals and Project sanction, start-up of the facilities is expected to occur between 4Q27 and 2Q28.

Figure 17 provides a preliminary schedule with major scheduling milestones for the engineering, construction, installation, and commissioning of the SURF and FPSO scopes, as well as other (drilling, start-up) scopes for the Whiptail Development Project; however, this schedule is still being refined and is subject to change.

Figure 17: Preliminary Project Schedule



APPENDIX 1: EXAMPLE OF FPSO OVERALL EQUIPMENT LAYOUT



APPENDIX 2: POTENTIAL IMPACTS OF THE WHIPTAIL DEVELOPMENT

Resource or Receptor	Potential Impact	Primary Sources of Potential Impacts	How Potential Impacts Could Impact Human Life and Environment
Physical Resources			
Air Quality and Climate	Air emissions resulting from the Project have the potential to affect ambient air quality in the Project area on a localized basis and to contribute to greenhouse gas (GHG) emissions.	• Emissions from construction equipment and back-up diesel-fired power generation • Emissions from operational point sources • Non-routine, temporary flaring • Pilot flare and other de minimis background flaring • Plant emissions • Fugitive emissions from construction or operations • Non-routine, unplanned events	Localized, increased concentrations of criteria pollutants, in ambient air could contribute to health concerns in exposed humans and wildlife. Combustion of hydrocarbons from Project activities could contribute to GHG emissions.
Marine Geology and Sediments	The Project has the potential to affect marine geology and sediments along in the Project Development area.	• Drilling of development wells • Installation of FPSO and SURF components	Disturbance of the seabed during offshore drilling and installation activities has the potential to affect benthic habitat and cause death/injury of benthic fauna.
Marine Water Quality	The development could have localized impacts to marine water quality in the Project development area from discharge of drill cuttings and from routine operational and hydrotesting discharges. The development could potentially impact marine water quality in the Project area of interest (AOI) as a result of non-routine, unplanned events (e.g., spill or release).	• Drilling of development wells (cuttings and fluid discharge) • Cooling water discharges • Sulfate removal and potable water processing brines • Installation of FPSO and SURF components • Wastewater discharges • Produced water discharges • Hydrotesting discharges • Ballast water discharges • Non-routine, unplanned event (e.g., spill or release)	Increased total suspended solids concentrations, chemical concentrations, or temperature in water column has a potential to affect marine water quality and marine habitat quality and affect wildlife.
Biological Resources			
Coastal Habitats	The development is not expected to impact beaches, mangroves, or wetlands in the Project AOI during routine, planned operations and activities. The development could potentially impact beaches, mangroves, and wetland habitats in Project AOI as a result of non-routine, unplanned events (e.g., spill or release).	• Non-routine, unplanned event (e.g., spill or release)	An unplanned event could potentially impact beaches, mangroves, and wetlands as wildlife habitat, or could result in declines in fisheries productivity, and/or affect other ecosystem services.
Coastal Wildlife	The development is not expected to impact coastal wildlife during routine, planned operations and activities in the Project AOI. The development could impact coastal wildlife in the Project AOI as a result of non-routine, unplanned events (e.g., spill or release).	• Non-routine, unplanned event (e.g., spill or release)	An unplanned event could potentially impact coastal wildlife including chronic sub-lethal effects such as decreased vigor or reproductive impacts from direct exposure or ingestion of contaminated prey items.

Resource or Receptor	Potential Impact	Primary Sources of Potential Impacts	How Potential Impacts Could Impact Human Life and Environment
Protected Areas and Special Status Species	The Project is not expected to impact Protected Areas. The development could potentially impact some special status species (e.g., endangered or listed species) within the Project area.	• Underwater sound generated by marine component operations and activities (e.g., Offshore pile driving operations, Installation of FPSO and SURF components,Vertical Seismic Profiling) • Lighting on offshore facilities (e.g., FPSO, drillships) • Seawater intake by FPSO • Wastewater discharges • Drilling of development wells (cuttings and fluid discharge) • Cooling water discharges • Produced water discharges • Hydrotesting discharges • Ballast water discharges • Vessel movements • Non-routine, unplanned event (e.g., spill or release)	Reduction in wildlife habitat quality and disturbance, injury, or mortality of wildlife. Potential declines in local abundance of some species within the Project area caused by decreased water quality and entrainment of early life stages of special status fish species, auditory impacts on noise-sensitive species, injury/death from vessel collisions, and habitat degradation and loss.
Seabirds	The Project has the potential to affect seabirds within the Project area.	• Lighting on offshore facilities (e.g., FPSO, drillships) • Non-routine, temporary flaring • Non-routine, unplanned event (e.g., spill or release) • Indirect effects on prey availability due to changes in distribution of fish in vicinity of FPSO	Possible direct mortality and injury of seabirds related to attraction to offshore light sources and possible direct mortality and injury related to vessel (ship or air) strikes may occur.
Marine Mammals	The Project has the potential to affect marine mammals within the Project area.	• Underwater sound generated by marine component operations and activities (e.g., Offshore pile driving operations, Installation of FPSO and SURF components,Vertical Seismic Profiling) • Changes in forage availability • Lighting on offshore facilities (e.g., FPSO, drillships) • Seawater intake by FPSO • Wastewater discharges • Drilling of development wells (cuttings and fluid discharge) • Cooling water discharges • Produced water discharges • Hydrotesting discharges • Ballast water discharges • Non-routine, unplanned event (e.g., spill or release, vessel strikes)	Potential auditory injury to or disturbance of marine organisms from Project-related noise could occur. Potential injury/mortality of marine mammals or marine turtles from collisions with Project-related vessel traffic may occur. Minor potential impacts from decreased water quality on all taxa could occur from changes in water quality in the AOI. Entrainment of early life stages of fish, and potential trophic effects associated with concentration of prey species around artificial lights could occur. Non-routine/unplanned events (e.g., spill or release) could potentially cause a range of effects from acute and/or chronic sub-lethal toxic effects to mortality throughout the indirect AOI depending on the magnitude of the event.
Marine Turtles	The Project has the potential to affect some marine turtles within the Project area.		
Marine Fish	The Project has the potential to affect some marine fish in the Project area.		

Resource or Receptor	Potential Impact	Primary Sources of Potential Impacts	How Potential Impacts Could Impact Human Life and Environment
Riverine Mammals	The development is not expected to impact riverine mammals in the Project AOI as a result of routine, planned activities. The Project could potentially impact riverine mammals in the Project AOI as a result of non-routine, unplanned events (i.e., diesel fuel release, vessel strikes).	• Non-routine, unplanned event (e.g., diesel fuel release, vessel strike)	Potential disturbance of riverine mammals from Project-related vessel movements near shorebases could occur. Potential injury/mortality of riverine mammals from collisions with Project-related vessel traffic may occur.

Resource or Receptor	Potential Impact	Primary Sources of Potential Impacts	How Potential Impacts Could Impact Human Life and Environment
Marine Benthos	The Project has the potential to affect some benthic habitat and organisms within the Project area.	• Drilling of development wells (cuttings discharge and deposition) • Installation of FPSO (mooring structures) and SURF components • Non-routine, unplanned event (e.g., spill or release)	Disturbance of benthic habitat in the Project area and potential smothering of benthos within footprint of SURF and sediment deposition zones.
Ecological Balance and Ecosystems	The Project has the potential to affect localized changes in marine and riverine nutrient cycles, gene flow, and biodiversity.	• Indirect impacts on the base of the marine foodweb (phytoplankton) due to localized changes in water quality • Indirect physiochemical barriers to migration, breeding, or dispersal/colonization occur due to localized changes in water quality, acoustic impacts, or general human activity • Introduction of invasive species • Non-routine, unplanned event (e.g., spill or release)	Ecological impacts to marine resources could potentially have ramifications for commercial and/or subsistence fisheries.
Socioeconomic Resources			
Cultural Heritage	The Project has the potential to impact cultural heritage through localized disturbance of archaeological or historical sites related to Project development.	• Drilling of development wells • Installation of FPSO and SURF components • Non-routine, unplanned event (e.g., spill or release)	Disturbance of the seabed could potentially affect submerged archaeological resources (e.g., shipwrecks).
Community Health and Wellbeing	Most Project activities will be located offshore in the Project area and will have no direct impacts on communities in Guyana. Introduction of limited levels of foreign specialized labor could potentially have community health and wellbeing impacts. The development could potentially impact community health and wellbeing in the Project AOI due to onshore traffic, social interaction, or as a result of non-routine, unplanned events (e.g., spill or release).	• Increased traffic as a result of Project activities at the Guyana shorebase locations • Social interaction between Project workers and residents • Pressure on wages from introduction of foreign workers and increased competition for skilled labor • Noise and light near shore by Project marine and aviation operations • Non-routine, unplanned event (e.g., spill or release)	Increased demand for limited emergency and health services in Guyana, and a slight increased risk of communicable disease transmission could potentially result from Project activities and influence community health and wellbeing.

Resource or Receptor	Potential Impact	Primary Sources of Potential Impacts	How Potential Impacts Could Impact Human Life and Environment

Employment and Livelihoods	The development is expected to build capacity in the local labor force, increase demand for skilled labor, and increase demand for service industries (beneficial impact). There is also the potential for limited adverse impacts to fishing activities.	• Local employment for:
		  ○ Drillships
		  ○ Installation vessels
		  ○ FPSO operations
		  ○ Marine support and supply vessels
		  ○ Aviation operations
		  ○ SURF Component fabrication
		  ○ Other related service industries
		• Marine safety exclusion zones
		• Project-related marine traffic
		• Drilling; FPSO/SURF installation, hookup and commissioning; and FPSO and support vessel operations (aspects relating to occupational health and safety for Project workforce)
		• Non-routine, unplanned event (e.g., spill or release)
			Direct and indirect employment for the Project will enhance livelihoods and family incomes, but could result in some competition with other businesses for skilled workers. Marine safety exclusion zones for the FPSO, drillship, and major installation vessels, and Project-related vessel traffic could potentially interfere with fishing activities in certain areas.

Marine Use and Transportation	The development may result in increased marine-related traffic, which could potentially contribute to marine vessel congestion in nearshore or port areas.	• Marine vessel operations • Non-routine, unplanned event	Increased vessel traffic could result in localized potential congestion near shorebase and marine safety exclusion zones around the FPSO, drillship, and major installation vessels will restrict access by unauthorised vessels.
Social Infrastructure and Services	The development will use public infrastructure and services and thus could potentially compete with other existing businesses and consumers across a range of services (e.g., roads, accommodation, and utilities). The development may result in increased vehicular traffic in Georgetown, which could potentially contribute to vehicular congestion in certain areas.	• Project demand requirements for selected infrastructure and services which could overburden existing capacity and supply • Shorebase operations • Ground transportation operations	Increased demand for public infrastructure, services, and housing by the Project workforce could influence the availability of these services; and increased Project-related traffic could result in localized traffic congestion.
Land Use	No new Project-dedicated land disturbance is planned. There is the potential that third-party onshore facilities may elect to expand or impact adjacent land as a result of supporting Project-related needs; however, these impacts are outside the scope of the Project.	• Shorebase operations • Pipe yards • Warehouses • Fabrication facilities • Bulk fuel storage and transfers • Onshore recycling of materials, waste treatment, and disposal facilities	Potential development or expansion of shorebases by third-parties could affect nearby properties. Some Project solid wastes will be treated/disposed at permitted third-party facilities onshore.
Ecosystem Services	The development will not have measurable impacts on ecosystem services during its planned, routine activities. The development could potentially impact ecosystem services in the coastal areas of Guyana as a result of non-routine, unplanned events (e.g., spill or release).	• Operational effluent discharges • Non-routine, unplanned event (e.g., spill or release)	If resources affected by the Project provide ecosystem services, this could result in indirect effects to these services. As an example, such effects to resources could potentially affect provisioning services particularly for communities that rely on fishing, hunting, and harvesting activities for subsistence and livelihoods. In addition, coastal flood protection services offered by mangrove forests could be affected. Cultural services could also be affected for some communities that make use of the seashore in traditional and/or religious ceremonies.

Resource or Receptor	Potential Impact	Primary Sources of Potential Impacts	How Potential Impacts Could Impact Human Life and Environment
Indigenous People and Traditional Use of Resources and Land	The Project is not expected to directly cause any changes to population and demographics in indigenous communities. The development could potentially impact indigenous peoples in the Project AOI as a result of non-routine, unplanned events (e.g., spill or release).	• Non-routine, unplanned event (e.g., spill or release)	If resources affected by the Project are used by indigenous peoples, this could result in indirect effects to these individuals or populations.
Economy/ Economic Conditions	The development is generally anticipated to have a positive impact on the economy of Guyana, as a result of government revenue sharing, as well as employment and local procurement opportunities. Potential adverse impacts may include potential shorter-term increases in the cost of living as a result of increased demand for specific goods and services. Potential adverse impacts on income from agriculture and fisheries could also occur as a result of non-routine, unplanned events (i.e., oil spill or release) and also occur as a result of presence of Project working spreads during installation and drilling.	• Government revenue sharing • Local purchases of select materials, goods and services • Limited local employment (direct and indirect) • Increased spending on select materials, goods and services (indirect multiplier impacts for local/regional population)	Positive economic impacts throughout the country, which could potentially affect all segments of the population. Positive effects related to local purchasing and employment could potentially affect all segments of the population.
Waste Management Infrastructure Capacity	The Project could potentially stress the capacity to manage wastes in Guyana.	• Project-generated wastes requiring off-site treatment, storage, or disposal	If the capacity in Guyana to properly treat, store, or dispose of waste is overburdened by Project demands, this could affect the ability to properly accommodate treatment, storage, or disposal needs by other parties.

APPENDIX 3: POTENTIAL EMBEDDED CONTROLS AND MITIGATIONS

A 3.1 Development Well Drilling and Subsea, Umbilicals, Risers, and Flowlines (SURF)/FPSO Installation and Commissioning

Embedded Controls	Resources/Receptors Benefited
Use water-based drilling fluids to the extent reasonably practicable (upper sections of the wells). For well sections requiring NADF, use only low-toxicity IOGP III base fluid.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, seabirds, marine benthos
When NADF is used, use a solids control and cuttings dryer system to treat drill cuttings such that end-of-well maximum weighted mass ratio averaged over all well sections drilled using NADF does not exceed 6.9 percent wet weight base fluid retained on cuttings.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, seabirds, marine benthos
Install a BOP system that can be closed rapidly in the event of an uncontrolled influx of formation fluids and that allows the well to be circulated to safety by venting the gas at surface and routing oil so that it may be contained.	Marine geology and sediments, marine water quality, coastal habitats, marine mammals, marine turtles, marine fish, seabirds, marine benthos
Test BOP equipment at installation, after disconnection or repair of any pressure containment seal, and at regular intervals (at least every 21 days or as operations allow).	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, seabirds, marine benthos
Install subsea BOP systems consisting of one annular preventer, two shear ram preventers – one of which must be sealing, and two pipe ram preventers, and equip them with choke and kill lines and failsafe choke and kill close valves.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Utilize a BOP that is able to close on the maximum outside diameter drill pipe string used for the drilling operations and that contains a safety system to secure the well in the event of a loss of control signal and hydraulic supply from the surface to the BOP. At a minimum, subsea BOP systems should allow closure of one set of pipe rams and blind-shearing type rams by ROV intervention if required.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Visually check and take appropriate measures to mitigate occurrence of free oil resulting from discharge of NADF drill cuttings.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, seabirds, marine benthos
Employ trained Marine Mammal Observers (MMOs) during the conduct of seismic-related activities.	Marine mammals, marine turtles
Conduct a continuous observation of a mitigation zone (500 metres [1,640 feet] around the sound source) to verify whether it is clear of marine mammals and marine turtles before commencing sound producing seismic	Marine mammals, marine turtles

Embedded Controls	Resources/Receptors Benefited
operations. Do not conduct sound-producing seismic operations (including soft starts) if marine mammals or turtles are sighted within the mitigation zone during the 30 minutes prior to commencing sound-producing operations in water depths less than 200 metres (656 feet), or 60 minutes prior to commencing sound-producing operations in water depths greater than 200 metres (656 feet).	
Where reasonably practicable, equip sound-making devices or equipment with silencers or mufflers that are enclosed, and/or use soft-start procedures (e.g., for vertical seismic profiling, etc.) to reduce sound to levels that do not cause material harm or injury to marine species.	Marine mammals, marine fish, marine turtles
Adhere to the Joint Nature Conservation Committee guidelines (JNCC 2017) during the conduct of seismic-related activities.	Marine mammals, marine turtles
If well testing[2] is performed, implement the following measures: • Flow only the minimum volume of hydrocarbons required for the test and reduce the test duration to the extent practical. • Use an efficient test-flare burner head equipped with an appropriate combustion enhancement system to minimize incomplete combustion, black smoke, and hydrocarbon fallout3 to the sea. • Provide adequate gas sensors that are appropriately located during testing operations, so that all sources of gas can be detected. • Monitor pipes and joints on a daily basis for leakages and fugitive emissions. Burn all collected gaseous streams in high-efficiency flares and implement and maintain a leak detection and repair program. • Keep the well test to the minimum practical time, in keeping with a pre-approved schedule with the EPA. Notify the EPA immediately in case of any deviation/variation to the well test • Provide sufficient compressed air to the oil burner for efficient flaring assignment.	Air quality, climate, and climate change
To prevent non-routine, unplanned events during the drilling stage: • Change liquid hydrocarbon transfer hoses periodically;	Marine geology and sediments, marine water quality, protected areas and special status species, coastal habitats, coastal wildlife,

[2] While well testing is not planned for the Project, there is the potential it could be needed, in which case EEPGL will implement the measures in Table 2.14-1.

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

Embedded Controls	Resources/Receptors Benefited
• Use dry-break connections on liquid hydrocarbon bulk transfer hoses; • Perform required inspections and testing of all equipment prior to deployment/installation; • Use overbalanced drilling fluids to control wells while drilling; • Perform operational training certification (including well-control training) for drill ship supervisors and engineers; • Use controls for mitigating a failure of the Dynamic Positioning (DP) system on the drill ships and maintaining station-keeping, which include: - Use of a Class 3 DP system, which includes numerous redundancies; - Rigorous personnel qualifications and training; - Sea trials and acceptance criteria; - Continuous DP proving trials; - System Failure Mode and Effects Analysis; - Continuous DP failure consequence analysis; and - Establishment of well-specific operations guidelines.	marine mammals, marine turtles, marine fish, marine benthos, ecological balance, and ecosystems
Prior to and post-drilling, a Remotely Operated Vehicle (ROV) will take pictures of the area immediately surrounding the well location to monitor for marine water quality impacts.	Marine geology and sediments, marine water quality, protected areas and special status species, marine mammals, marine turtles, marine fish, marine benthos, ecological balance, and ecosystems
Maintain marine safety exclusion zones to be issued through MARAD with a 500-metre (approximately 1,640-foot) radius around drill ships and major installation vessels, to prevent unauthorised vessels from entering areas with an elevated risk of collision.	Marine use and transportation
For all vessel effluent discharges (e.g., storage displacement water, ballast water, bilge water, and deck drainage) comply with IMO and MARPOL 73/78 requirements.	Marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds, ecological balance, and ecosystems
Prepare contingency plans for well operations that include identification of provisions for well capping in the event of uncontrolled blowout (providing indication of the tools, equipment, and intervention time required) and identification of spill recovery measures.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Use leak detection systems for equipment, treatment, and storage facilities (fuel, chemical, etc.) on drill ships in accordance with international offshore petroleum industry standards.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds

Use leak detection controls during installation and operation of SURF equipment (e.g., pigging and pressure testing of lines, periodic remotely operated vehicle surveys of subsea trees, manifolds, flowlines, and risers).	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds

A3.2 Production

Potential Embedded Controls	Resources/Receptors Benefited
Use aero-derivative turbines instead of industrial turbines on the FPSO.	Air quality and climate
Evaluate installed spares or similar measures on compressors, such that when one compressor trips, system capacity is available, reducing non-routine flaring frequency and volume/duration.	Air quality and climate
Install waste heat recovery units (WHRUs) on turbine generators to reduce the demand of more power generation or fired heaters, thus decreasing fuel gas consumption.	Air quality and climate
Use a heat integration to recover heat from the process, instead of using a fired heater.	Air quality and climate
Use large, high-voltage motors, which are more efficient than industry-standard machines.	Air quality and climate
Implement an FPSO topsides leak detection and repair program to reduce fugitive emissions.	Air quality and climate
Develop a flaring minimization plan to document the design measures and operational practices that minimize flaring during Project FPSO operations. The Flare Minimization program/Flare Management Protocol will be developed closer to start-up.	Air quality and climate
Instead of continuous flaring of gas produced during crude oil production, re-inject associated gas that is not used as fuel gas on the FPSO—excluding *de minimis* sources not captured by the VRU—into the reservoir, to avoid routine flaring of associated gas.	Air quality and climate
Install Volatile Organic Compound (VOC) recovery on the FPSO cargo tanks, which results in a reduction in FPSO cargo tank emissions	Air quality, climate, and climate change
Install vapor recovery for low-flow process streams from produced water and triethylene glycol regeneration, resulting in a reduction in emissions to the atmosphere.	Air quality, climate, and climate change
Optimize gas turbine maintenance to ensure that gas turbines are not overhauled more often than needed, and also to ensure overhauls are completed at the right time, in alignment with other FPSO maintenance activities to reduce the need to flare.	Air quality, climate, and climate change

Potential Embedded Controls	Resources/Receptors Benefited
Record volumes of hydrocarbons flared and make available to the EPA upon request.	Air quality, climate, and climate change
Use highly efficient combustion equipment that utilizes recovery heat systems as part of the heat and power production.	Air quality, climate, and climate change
With respect to non-routine flaring of associated gas, the following measures will be implemented: • Properly inspect, maintain, monitor, certify, and function-test flare equipment prior to and throughout operations. • Design and build combustion equipment to appropriate engineering codes and standards. • Use flare tip of a non-pollutant type, with low NOx emissions, and a burning efficiency high enough to support low hydrocarbon emissions to the atmosphere. • Minimise risk of pilot blowout by ensuring sufficient exit velocity and provision of wind guards; • Use a reliable pilot ignition system. • Install high-reliability instrument pressure protection systems, as appropriate, to reduce overpressure events and avoid or reduce flaring situations. • Minimise liquid carryover and entrainment in the gas flare stream, with a suitable liquid separation system, with sufficient holding capacity for liquids that may accumulate, and which is designed in accordance with GIIP (World Bank 2015). • Equip liquid separation system (e.g., knockout drum) with high-level facility shutdown or high-level alarms and empty as needed to increase flare combustion efficiency. • Implement source gas reduction measures (i.e., gas re-injection into reservoir) to the extent possible to avoid or reduce flaring from FPSO. • Minimise flaring from purges and pilots without compromising safety through measures such as installation of purge gas reduction devices, VRUs, inert purge gas, and soft seat-valve technology where appropriate, and installation of pilot flares, and • Minimise flame lift off and/or flame lick.	Air quality and climate
Employ reasonable efforts and execute a maintenance program to minimize equipment breakdowns and plant upsets that could result in flaring, and make provisions for	Air quality and climate

Potential Embedded Controls	Resources/Receptors Benefited
equipment sparing and plant turn-down protocols where practical.	
Implement inspection, maintenance, and surveillance programs to identify and prevent unplanned emissions to atmosphere onboard the FPSO.	Air quality and climate
Limit flaring during commission and start-up to three months (i.e., 92 cumulative days).	Air quality, climate, and climate change
Notify the EPA within 24 hours of all process upset events or unplanned maintenance occurrences which result in a flaring event on the FPSO lasting more than 12 hours.	Air quality and climate
Avoid routine venting (excludes tank flashing emissions, standing/ working/breathing losses, secondary sealing) except during safety and emergency conditions.	Air quality and climate
Adopt measures as far as practicable, in accordance with the Global Gas Flaring and Venting Reduction Partnership, when considering venting and flaring options under emergency or upset conditions.	Air quality and climate
Treat produced water onboard the FPSO to an acceptable specification prior to discharging. Limit oil content of discharged produced water to 42 milligrams per liter (mg/L) on a daily basis or 29 mg/L on a monthly average. If oil content of produced water is observed to exceed these limits, route it to an appropriate storage tank on the FPSO until the treatment system is restored and the discharge meets the noted specification.	Marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds, ecological balance and ecosystems
Design cooling water discharges from FPSO to avoid increases in ambient water temperature of more than 3˚C (5.4°F) at 100 meters (approximately 328 feet) from discharge point.	Marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds, ecological balance and ecosystems
Install temperature probes on effluent locations to allow for real-time remote and on-site monitoring of water temperature before discharge including data trending in control system and PI.	Marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds, ecological balance, and ecosystems
Evaluate available alternatives for antifouling chemical dosing to prevent marine fouling of offshore facility cooling water systems. Where practical, optimize seawater intake depth to reduce the need for use of chemicals.	Marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds, ecological balance and ecosystems

Potential Embedded Controls	Resources/Receptors Benefited
Treat black sewage using Ultraviolet (UV) method, and measure discharges from FPSO weekly to verify it is below 100 thermotolerant coliforms/100 mL. Hypochlorite will be used as a backup treatment method; measure residual chlorine concentration of black sewage discharges from the FPSO weekly to verify it is below 0.5 mg/L in accordance with MARPOL 73/78 regulations	Marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds, ecological balance and ecosystems
Perform daily visual inspections on the FPSO of discharge points to verify that there are no floating solids or discoloration of the surrounding waters	Marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds, ecological balance and ecosystems
Maintain marine safety exclusion zones to be issued through the Maritime Administration Department with a 2-nautical-mile (approximately 12,150-foot) radius around FPSO during offloading operations, to prevent unauthorized vessels from entering areas with an elevated risk of collision.	Marine use and transportation, marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Employ dedicated Mooring Master to supervise offloading activities, according to the conditions of the sea. The conditions and characteristics of the export tankers will be assessed by the Mooring Master and reported to the Offshore Field Manager prior to commencing offloading operations. Use only properly registered and well-maintained double-hull vessels.	Marine use and transportation, marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Use support tugs to aid tankers in maintaining station during approach/departure from FPSO and during offloading operations.	Marine use and transportation, marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Use a hawser with a quick release mechanism to keep the tanker at a safe separation distance to the FPSO during offloading operations.	Marine use and transportation, marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Establish operating conditions for FPSO offloading to tankers to support safe operations. In the event that adverse weather occurs during offloading operations that is beyond the environmental operating limit, the tanker will cease offloading operations, and may disconnect and safely manoeuvre away from the FPSO as appropriate.	Marine use and transportation, marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Use a certified marine-bonded, double-carcass floating hose system that complies with the recommendations of Oil Companies International Marine Forum Guide to Manufacturing and Purchasing Hoses for Offshore Moorings 2009 Edition (OCIMF 2009) or later.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds

Potential Embedded Controls	Resources/Receptors Benefited
Use marine breakaway coupler (MBC) on offloading hose that will stop the flow of oil from FPSO during an overpressure or emergency disconnect scenario.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Use the FPSO onboard metocean-monitoring system to support FPSO offloading.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Use leak detection system during FPSO offloading (e.g., for breach of floating hose, instrumentation/procedures to perform volumetric checks).	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Inspect and maintain onboard equipment (engines, compressors, generators, sewage treatment plant, and oil-water separators) in accordance with manufacturers' guidelines, in order to maximize efficiency and minimize malfunctions, and unnecessary discharges into the environment.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Use a liquid hydrocarbon checklist before every bulk transfer.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Use a load-monitoring system in the FPSO control room to support FPSO offloading.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Utilize procedures for loading, storage, processing, and offloading operations, either for consumables (i.e., fuel, drilling fluids, and additives) or for liquid products, to minimize spill risks. Inspect pumps, hoses, and valves on a monthly basis, and perform maintenance as needed.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Install an Emergency Shutdown System on the FPSO to initiate automatic shutdown actions to bring the offshore facility to a safe condition and which should be activated in case of any significant non-routine event.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Abide with IMO (2004) guidelines including the International Convention for the Control and Management of Ship's Ballast Water and Sediments, with the exception of Regulation D-2 (Ballast Water Performance Standard) while the FPSO is on station, and abide with the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78).	Ecological balance and ecosystems
Adopt risk assessment processes (e.g., hazard and operability study, hazard identifications study, etc.) to assess risks associated with process upset and loss-of-containment events which could impact the environment.	Marine use and transportation, marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds

A3.3 General Measures

Potential Embedded Controls	Resources/Receptors Benefited
Regularly maintain equipment, marine vessels, vehicles, and helicopters and operate them in accordance with manufacturers' specifications and at their optimal levels to minimize atmospheric emissions and sound levels to the extent reasonably practicable.	Air quality and climate, sound, marine water quality, marine mammals, marine turtles, riverine mammals
Equip Project vessels with radar systems and communication mechanisms to communicate with third-party mariners.	Marine use and transportation
Shut down (or throttle down) sources of combustion equipment in intermittent use where reasonably practicable in order to reduce air emissions.	Air quality and climate
Implement engineering controls, administrative controls, and training to protect offshore workforce from high noise levels in the offshore work environment.	Sound, Project workforce
Implement chemical selection processes and principles that exhibit recognized industry safety, health, and environmental standards. Use low-hazard substances. The chemical selection process is aligned with applicable Guyanese laws and regulations and includes; • Review of Safety Data Sheets; • Evaluation of alternate chemicals; • Consideration of hazard properties, while balancing operational effectiveness and meeting performance criteria, including: - Using the minimum effective dose of required chemicals; and - Minimum safety risk relative to flammability and volatility • Risk evaluation of residual chemical releases into the environment	Air quality and climate, marine water quality, marine geology and sediments, marine mammals, marine turtles, riverine mammals, marine fish, marine benthos, seabirds
Use secondary containment for storage of bulk fuel, drilling fluids, and hazardous materials, where reasonably practicable.	Marine water quality
Regularly (e.g., monthly) check pipes, storage tanks, and other equipment associated with storage or transfer of hydrocarbons/chemicals for leaks.	Marine water quality
For effluent released from the onboard sewage treatment plant, comply with aquatic discharge standards in accordance with MARPOL 73/78 regulations.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Treat food waste in accordance with MARPOL 73/78 (e.g., food comminuted to 25-millimeter-diameter particle size or less) prior to discharge.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds

Potential Embedded Controls	Resources/Receptors Benefited
Confirm there is no visible oil sheen from commissioning-related discharges (i.e., flowlines/risers commissioning fluids, including hydrotesting waters) or FPSO cooling water discharge.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Treat bilge water in accordance with MARPOL 73/78 to comply with an oil in water content of less than 15 parts per million, as applicable. Perform oil-in-water content (automatic) monitoring of bilge water to verify compliance with 15 parts per million MARPOL 73/78 limit and record in Oil Record Book.	Marine geology and sediments, marine water quality, marine mammals, marine turtles, marine fish, marine benthos, seabirds
Provide awareness training to Project-dedicated marine personnel to recognize signs of marine mammals and riverine mammals at the sea surface. Provide standing instruction to Project-dedicated vessel masters to avoid marine mammals, riverine mammals, and marine turtles while underway and reduce speed or deviate from course, when possible, to reduce probability of collisions.	Marine mammals, marine turtles, riverine mammals
Provide standing instruction to Project-dedicated vessel masters to avoid any identified rafting seabirds when transiting to and from Project Development Area.	Seabirds
Provide standing instructions to Project-dedicated vessel masters to reduce their speed within 300 meters of observed marine mammals and marine turtles, and to not approach the animals closer than 100 meters.	Marine turtles, marine mammals
Observe standard international and local navigation procedures in and around the Georgetown Harbour and Demerara River, as well as best ship-keeping and navigation practices while at sea.	Marine use and transportation
Where reasonably practicable, direct lighting on FPSO and major Project vessels to required operational areas rather than at the sea surface or skyward. Adhere to maritime safety regulations/standards for lighting on vessels.	Seabirds, marine turtles
Provide screening for seawater intakes to avoid entrainment and impingement of marine flora and fauna.	Marine fish
Provide health screening procedures to Project workers to reduce risks of transmitting communicable diseases.	Community health and wellbeing
Employ Guyanese citizens having the appropriate qualifications and experience where reasonably practicable.	Socioeconomic conditions, employment and livelihoods
Partner with select local institutions and agencies to support workforce development programs and proactively message Project-related employment opportunities.	Socioeconomic conditions, employment and livelihoods
Procure Project goods and services locally when available on a timely basis and when they meet minimum standards and are commercially competitive.	Socioeconomic conditions, employment and livelihoods

Potential Embedded Controls	Resources/Receptors Benefited
Monitor percentage of Project Workforce made up of Guyanese nationals on a half yearly basis in accordance with the Local Content Act 2021 and the Petroleum Agreement.	Socioeconomic conditions, employment and livelihoods
Monitor percentage of Project goods and services expenditures procured locally on a half yearly basis in accordance with the Local Content Act 2021 and the Petroleum Agreement.	Socioeconomic conditions, employment and livelihoods
Develop and implement a Stakeholder Engagement Plan.	Community health and wellbeing
Implement a transparent, accessible, and consistent Community Grievance Mechanism (CGM) early on, prior to onset of Project activities.	Community health and wellbeing
Monitor grievances received and resolved by the CGM; adjust CGM and other management measures, as appropriate.	Community health and wellbeing
Implement a community safety program for potentially impacted schools and neighborhoods to increase awareness and minimize potential for community impacts due to vehicle incidents.	Social infrastructure and services, community health and wellbeing
Implement a Road Safety Management Procedure to mitigate increased risk of vehicular accidents associated with Project-related ground transportation activities. The Road Safety Management Procedure includes the following components: • Definition of typical, primary travel routes for ground transportation in Georgetown area. • Development of an onshore logistics/journey management plan to reduce potential conflicts with local road traffic when transporting goods to/from onshore support facilities. • Definition of required driver training for Project-dedicated drivers, including (but not limited to) defensive driving, loading/unloading procedures, and safe transport of passengers, as applicable. • Designation and enforcement of speed limits through speed governors, global positioning system, or other monitoring systems for Project-dedicated vehicles. • Avoidance of deliveries during typical peak-traffic hours as well as scheduled openings of the Demerara Harbour Bridge, to the extent reasonably practicable. • Monitoring and management of driver fatigue. • Definition of vehicle inspection and maintenance protocols that include all applicable safety equipment for Project-dedicated vehicles, and • Community outreach to communicate information relating to major delivery events or periods.	Social infrastructure and services, community health and wellbeing

Potential Embedded Controls	Resources/Receptors Benefited
Coordinate with relevant aviation authorities and stakeholders to understand peak Project-related utilization rates.	Social infrastructure and services
Use an established Safety, Security, Health, and Environment program to which all Project workers and contractors will be required to adhere to mitigate against risk of occupational hazards. Train workers and contractors on implementation of these principles and are required to adhere to them in the daily execution of their duties.	Occupational health and safety
Maintain an Oil Spill Response Plan (OSRP) to effectively respond to an oil spill, including maintaining the equipment and other resources specified in the OSRP. Conduct periodic inspections, training, and drills including monthly inspection of oil spill response equipment, quarterly test runs of oil spill response equipment, annual preventive maintenance program execution, and annual exercise and deployment of oil spill response equipment to test readiness and response capability.	All resources and receptors potentially impacted by an oil spill
Waste streams will be managed in accordance with the provisions of systems and procedures outlined in the EEPGL Comprehensive Waste Management Plan (CWMP).	Waste management infrastructure capacity

APPENDIX 4: SUMMARY OF RESIDUAL IMPACT SIGNIFICANCE RATINGS, RESIDUAL RISK RATINGS, AND CUMULATIVE IMPACT PRIORITY RATINGS

Resource	Highest Residual Impact Significance Rating (Planned Project Activities)			Highest Residual Risk Rating (Unplanned Events)	Cumulative Impact Priority Rating
	Drilling and Installation	Production	Decommissioning		
Air Quality, Climate, and Climate Change	Negligible	Moderate	Negligible	Minor	Low (Air Quality) Medium (Climate)
Sound [a]	None	None	None	None	NA
Marine Geology and Sediments	Negligible	None	None	Moderate	NA
Marine Water Quality	Minor	Negligible	Negligible	Moderate	Low
Protected Areas	None	None	None	Moderate	NA
Special Status Species: [b]					
• Terrestrial species and coastal marine fish	Negligible	Negligible	Negligible	Minor	Low
• Critically Endangered and Endangered Offshore Marine Fish	Moderate	Negligible	Negligible	Minor	Low
• Vulnerable offshore marine fish	Minor	Negligible	Negligible	Minor	Low
• Near threatened seabirds and endangered Black-capped Petrel (*Pterodroma hasitata*)	Negligible	Minor [d]	Negligible	Minor	Low
• Vulnerable Leach's Storm-Petrel (*Oceanodroma leucorhoa*)	Negligible	Minor [d]	Negligible	Moderate [e]	Low
Coastal Habitats	None	None	None	Moderate	NA
Coastal Wildlife	None	None	None	Minor	NA
Seabirds [c]	Negligible	Minor	Negligible	Minor	NA
Marine Mammals	Minor	Minor	Negligible	Moderate	Medium
Riverine Mammals	Minor	Minor	Minor	Minor	Low
Marine Turtles	Negligible	Negligible	Negligible	Moderate	Low
Marine Fish [f]	Minor	Negligible	Negligible	Minor	Low
Marine Benthos	Negligible	Positive	Positive	Minor	NA
Ecological Balance and Ecosystems	Minor	Minor	Minor	Minor	Low
Socioeconomic Conditions [g]	Minor	Minor	Minor	Minor	Low
Employment and Livelihoods [h]	Minor	Minor	Minor	Minor	Low
Community Health and Wellbeing	Minor	Minor	Minor	Minor to Moderate	Low
Marine Use and Transportation:					
• Commercial cargo	Negligible	Negligible	Negligible	Minor	Low
• Commercial fishing	Minor	Minor	Minor	Minor	Low

Resource	Highest Residual Impact Significance Rating (Planned Project Activities)			Highest Residual Risk Rating (Unplanned Events)	Cumulative Impact Priority Rating
	Drilling and Installation	Production	Decommissioning		
• Subsistence fishing	Minor	Minor	Minor	Minor	Low
Social Infrastructure and Services:					
• Lodging	Minor	Negligible	Negligible	Minor	Low
• Housing and utilities	Minor	Negligible	Negligible	Minor	Low
• Ground transportation	Minor	Minor	Minor	Minor	Low
• Air transportation	Negligible	Negligible	Negligible	Minor	Low
Waste Management Infrastructure Capacity	Minor	Minor	Minor	Minor	Medium
Cultural Heritage	Negligible	None	None	Minor	NA
Land Use	Negligible	Negligible	Negligible	Minor	NA
Ecosystem Services	None	None	None	Minor	NA
Indigenous Peoples	None	None	None	Minor	NA

NA = not applicable (not assessed in cumulative impact assessment); scoped out as potentially eligible

[a] Potential underwater sound-related impacts on marine mammals, marine turtles, and marine fish are assessed in the resource-specific sections for those resources.

[b] Includes only seabirds and marine fish. Excludes listed marine turtles, listed marine mammals, and listed riverine mammals, which are covered in the Marine Turtles, Marine Mammals, and Riverine Mammals resource categories, respectively.

[c] Excludes listed seabirds, which are covered in the Special Status Species resource category.

[d] Based on the 20-year presence of the FPSO (as a lighted attractant), the potential impact significance to special status marine birds during the production stage is considered Minor.

[e] The residual risk rating for Leach's Storm-Petrel is considered Moderate based on the results of marine bird surveys in 2017, 2018, and 2019, which documented the importance of the offshore zone as a migratory corridor for this special status marine bird.

[f] Excludes listed marine fish, which are covered in the Special Status Species resource category.

[g] Reflects the highest residual impact significance rating for impacts to lower income subpopulation, although other impacts will be beneficial and therefore Positive.

[h] Reflects the highest residual impact significance rating for impacts to fisherfolk, although other impacts will be beneficial and therefore Positive.