

# FIRST SCHEDULE



## ENVIRONMENTAL IMPACT ASSESSMENT

FOR THE PROPOSED OFFSHORE PIPELINE FROM BNCPP-B (BLOCK SK307) TO PROPOSED MIRI ONSHORE RECEIVING FACILITIES (ORF) ON PART OF LOT 102, BLOCK 1 MIRI CONCESSION LAND DISTRICT, MIRI, SARAWAK

## FINAL REPORT

Prepared by



Prepared for



# EXECUTIVE SUMMARY

## ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED OFFSHORE PIPELINE FROM BNCPP-B (BLOCK SK307) TO PROPOSED MIRI ONSHORE RECEIVING FACILITIES (ORF) ON PART OF LOT 102, BLOCK 1 MIRI CONCESSION LAND DISTRICT, MIRI, SARAWAK

Project Proponent



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Qualified Person



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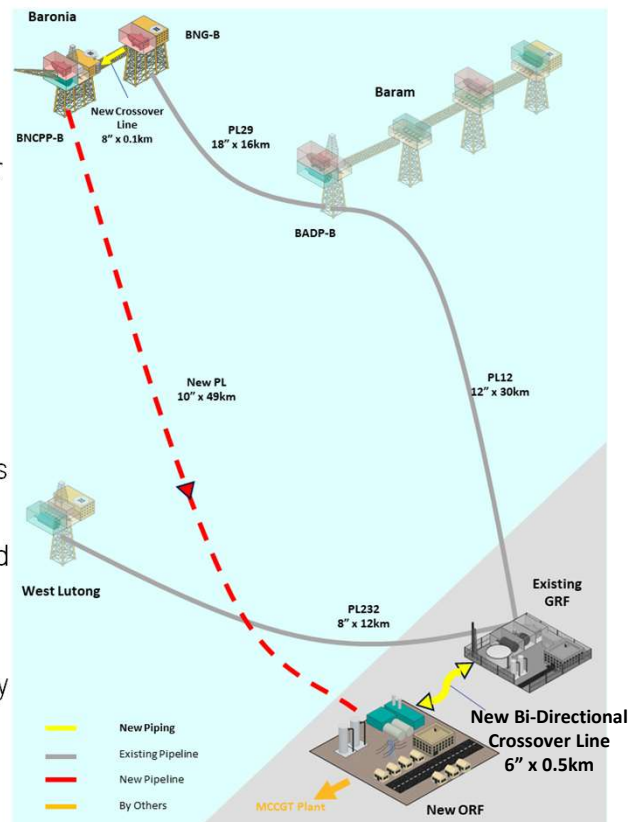
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### Introduction

- The Project Proponent intends to develop a new Miri Onshore Receiving Facility (MORF), a 10" x 49 km long offshore pipeline from BNCPP-B to MORF and a new flare stack.
- The project is required to meet the 70 MMscfd gas demand for PETROS's Miri Combined Cycle Gas Turbine power plant
- The MORF and new flare stack will be located in MCOT.
- The MORF and pipeline are designed for 88 MMscfd, and the flare stack for 130 MMscfd.
- The incoming gas stream has been pre-processed and dehydrated upstream at BNCPP-B, containing only trace liquids. MORF will remove the liquid via a slug catcher and gas scrubber to meet delivery specification.
- The gas will then be sent to MCOT and Miri CCGT, while liquid will be sent to MCOT.
- A crossover connection to the existing GRF will support Miri CCGT Cold Commissioning (Jan–Apr 2027) until MORF is fully commissioned in May 2027.



## Legislative Requirements

Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 2015:

### Activity 9. PETROLEUM:

- (a) Construction of 30 kilometres or more in length of –
  - (iii) Off-shore pipelines and on-shore pipelines
- (c) Construction of –
  - (ii) gas separation, processing, handling and storage facilities

## Statement of Need

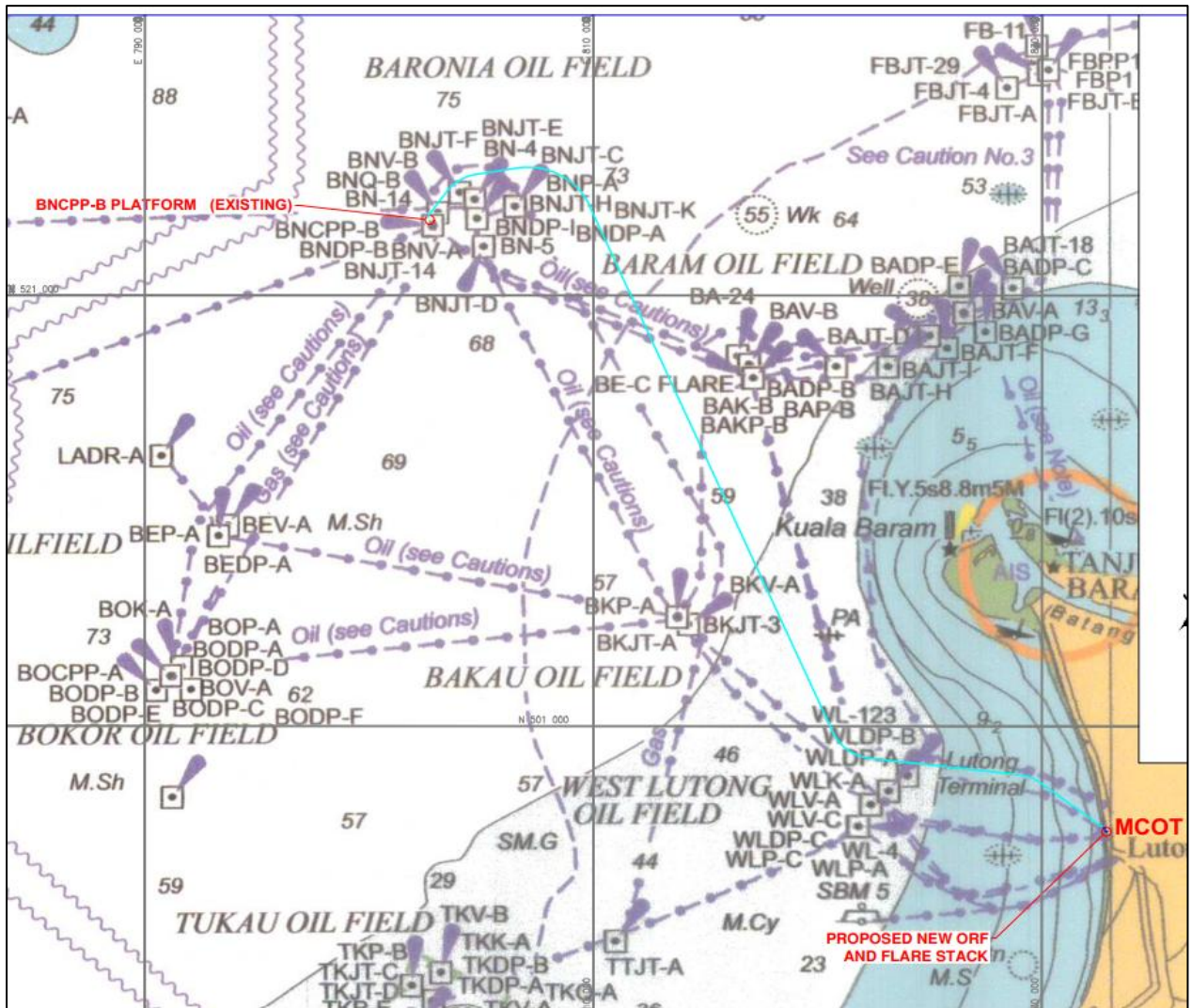


The project aims to meet the increased 70 MMscfd gas demand for the planned Miri CCGT under the Sarawak Gas Roadmap.



The Project is expected to create employment and stimulate economic development in Miri and the surrounding regions.

## Project Location (Offshore)



### Existing BNCPP-B Platform

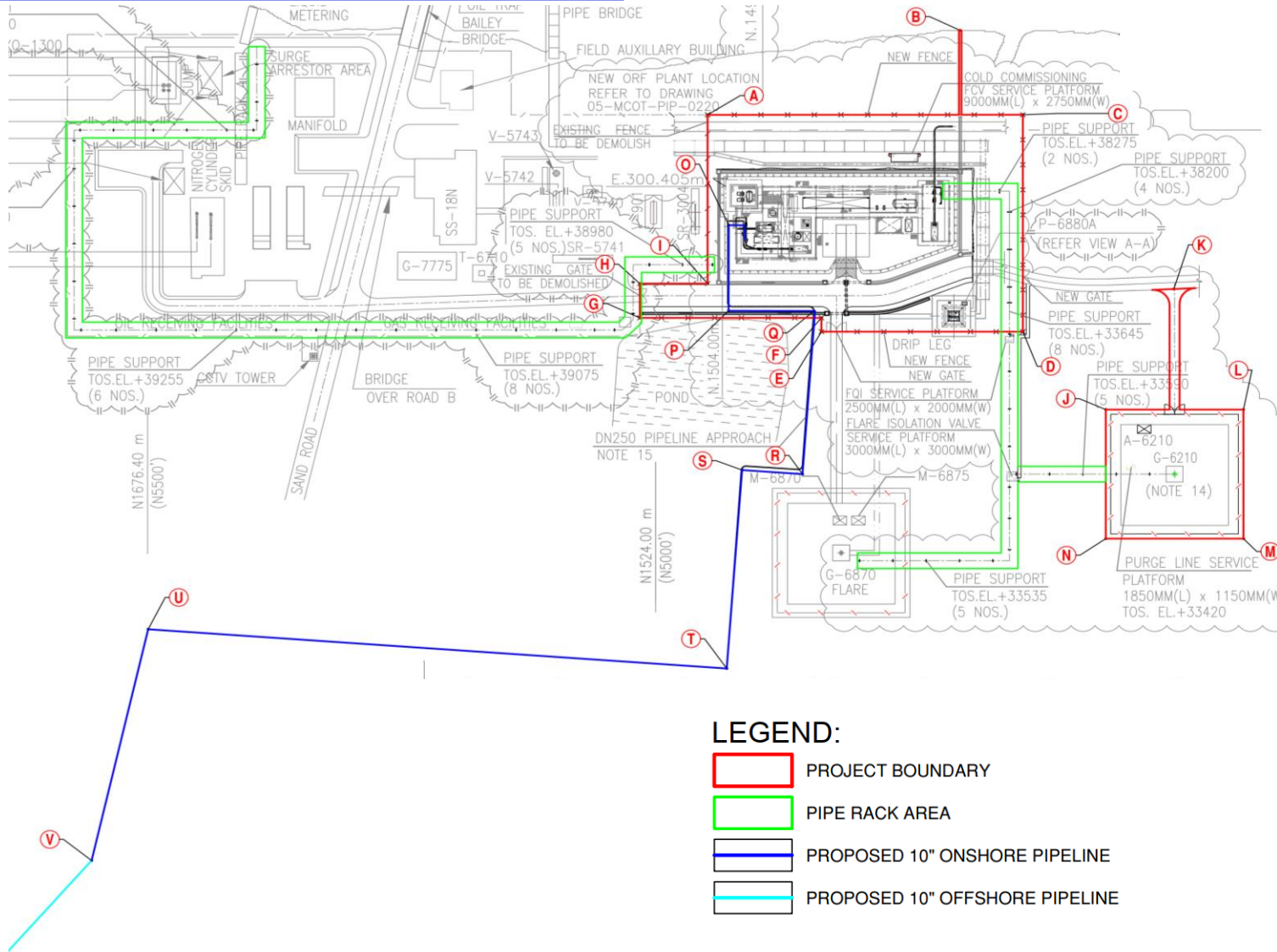
- Located in offshore Block SK307, is part of Baronia hub.
- The platform is not located within any national park.

### Proposed Gas Pipeline

- 10" x 49 km long gas pipeline.
- Of the total 49 km pipeline length, the onshore section extending from the Landfall Point (LFP) to the MORF comprises 450 m.
- The offshore pipeline is located within the Tiger Prawn Refugia Area.



# Project Coordinates



POINTS	LONGITUDE	LATITUDE
A	114° 00' 00.33"	04° 28' 56.44"
B	114° 00' 01.37"	04° 28' 54.04"
C	114° 00' 00.54"	04° 28' 53.38"
D	113° 59' 58.29"	04° 28' 53.22"
E	113° 59' 58.16"	04° 28' 55.18"
F	113° 59' 58.30"	04° 28' 55.19"
G	113° 59' 58.18"	04° 28' 56.96"
H	113° 59' 58.54"	04° 28' 56.98"
I	113° 59' 58.58"	04° 28' 56.32"
J	113° 59' 57.54"	04° 28' 52.36"
K	113° 59' 58.83"	04° 28' 51.78"

POINTS	LONGITUDE	LATITUDE
L	113° 59' 57.63"	04° 28' 51.02"
M	113° 59' 56.30"	04° 28' 50.93"
N	113° 59' 56.21"	04° 28' 52.27"
O	113° 59' 59.20"	04° 28' 56.16"
P	113° 59' 58.31"	04° 28' 56.10"
Q	113° 59' 58.37"	04° 28' 55.27"
R	113° 59' 56.67"	04° 28' 55.27"
S	113° 59' 56.68"	04° 28' 55.86"
T	113° 59' 54.61"	04° 28' 55.86"
U	113° 59' 54.64"	04° 29' 01.52"
V	113° 59' 52.21"	04° 29' 01.91"

## Project Description

- MORF will receive dehydrated natural gas from BNCP-B as the primary supply source and from BNG-B as a backup (via a jumper line), through a 10-inch, 49 km pipeline.
- Gas arriving at MORF's Baronia Gas Receiver, then to Slug Catcher for gas-liquid separation. The gas will pass through Gas Scrubber before metering to the receivers, MCCGT and MCOT. Separated condensate will be channeled to the condensate header in MCOT.
- Platform will be provided for the installation of launcher to MCCGT. The launcher and pipeline installation will be carried out by other parties.
- MORF will also be connected to the new flare stack for emergency relief. Knockout drum and other flare associated support equipment and facilities will also be in place.
- Modification and rerouting work at existing MCOT facilities will be carried out to provide process and utility support to MORF.

### Project Component



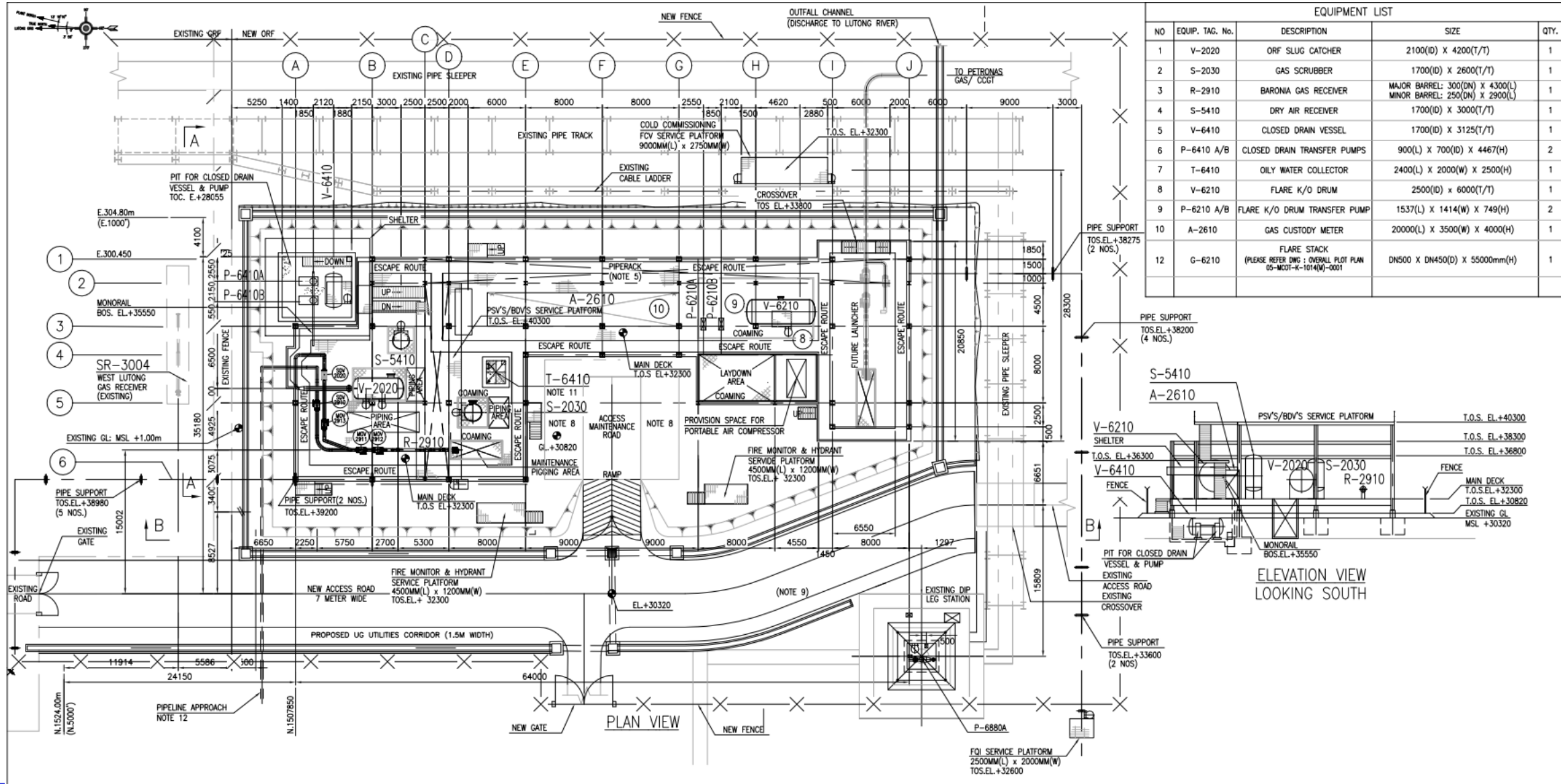
#### Offshore Components

- 10" x 49 km pipeline from BNCP-B to Landfall Point
- Brownfield Modifications
  - Brownfield modification at BNCP-B
    - 1 x new Gas launcher for 10" x 49 km from BNCP-B to new ORF
    - 1 x tie-in for new 8" from BNCP-B (C-2210 gas outlet) to MORF export header (TP-008 & 009)
    - 1 x tie-in 8" line from BNG-B Downstream GDU to MORF export header
    - Modifications to existing compressor signal control
    - 1 x operational meter at new pipeline inlet
    - 1 x operational meter at the new supply header from BNG-B
    - 1 x tie-in for flare connection to the existing flare header for the blowdown (from new gas launcher) (TP-022)
    - 1 x tie-in for closed drain system (from new gas launcher) (TP-021)
    - 1 x tie-in for chemical injection system (Corrosion inhibitor) (TO-016 & 017)
    - 1 x tie-in for chemical injection system (Methanol) (TP-018 & 019)
  - Brownfield modification at BNG-B
    - 1 x tie-in for 14" line from BNG-B Downstream GDU to BNCP-B
- Utilities
  - Corrosion Inhibitor Injection System
  - Methanol Injection System
  - Instrument Air (IA) System
  - Blowdown Valve (BDV-2951)

#### Onshore Components

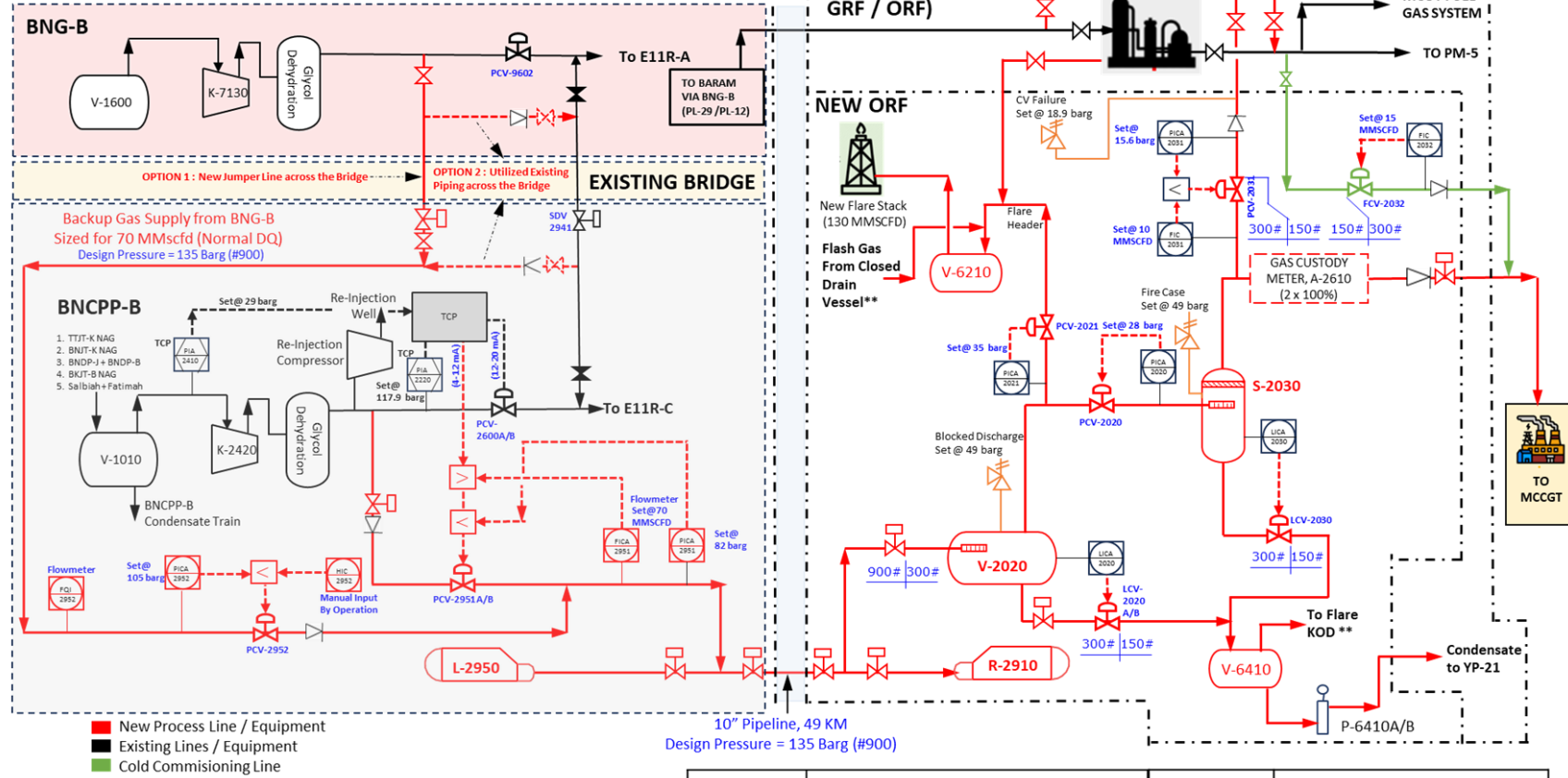
- 10" x 450 m (out of the 49 km ) pipeline from Landfall Point (LFP) to MORF
- Gas piping to the new flare stack
- Gas piping from MORF to MCOT
- Condensate piping to Condensate Header in MCOT
- MORF
  - Baronia Gas Receiver
  - Gas Slug Catcher
  - Gas Scrubber
  - Onshore Metering
- Platform for launcher to Miri CCGT
- New flare stack and associated flare support equipment
- Utilities
  - Relief and blowdown system
  - Closed drain system
  - Open drain system
  - Oily water collection system
  - Instrument air system
  - Flare system
  - Power system
- Modification at MCOT
  - ORF Tie ins
  - West Lutong / Baram Bypass and MORF Jumper Line
  - Facilities Improvement Projects (FIP) Scope
  - Cold Commissioning Scope

# Equipment Layout Plan - MORF



# Process Description – Process Flow Diagram

## BNCPP-B - MORF OVERALL PROCESS SCHEMATIC



Tag No.	Equipment	Tag No.	Equipment
V-1600	BNG-B Slugcatcher	R-2910	MORF Gas Receiver
K-7130	BNG-B Reinjection Compressor	V-2020	MORF Slug Catcher
V-1010	BNCPP-B Slug Catcher	S-2030	MORF Gas Scrubber
K-2420	BNCPP-B Reinjection Compressor	V-6210	MORF Flare KO Drum
L-2950	BNCPP-B Gas Launcher	V-6410	MORF Closed Drain Vessel

## Project Activities

### Pre-Construction Offshore

Fabrication of modification and pipeline components.

### Onshore

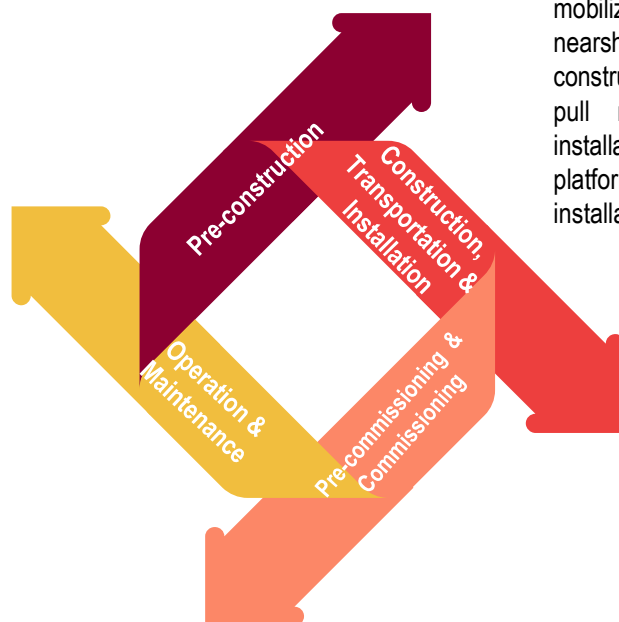
Includes boundary survey, topographical survey, soil investigation, EIA, stakeholder engagement to gather information for Project design as well as engagement with other interfacing construction parties.

### Construction, Transportation & Installation Offshore

Include transportation of pipes and modification components from fabrication yard to BNCPP-B. Brownfield modification at BNCPP-B and BNG-B, pipelaying activities, installation of concrete mattress at pipeline crossing.

### Onshore

Include temporary facilities set up at Lot 616, mobilization of equipment and machineries, nearshore temporary cofferdam construction, pipeline installation by beach pull method, site clearing, earthwork, installation of sediment and erosion control, platform formation and equipment and piping installation.



### Operation and Maintenance Offshore

Controlled and monitored from Baronia CCR. Routine visit to replenish consumables and maintenance works

### Onshore

Controlled and monitored from MCOT CCR.

### Pre-commissioning & Commissioning Offshore

Hydrotest will be carried out at fabrication yard. Commissioning then introduces hydrocarbons gradually after system readiness checks, ensuring safe pressurisation and stable operation.

### Onshore

Hydrotest will be carried out using about 75m<sup>3</sup> treated freshwater, The pipeline contains dry air. Nitrogen gas is then inserted into the pipeline as an inert buffer immediately prior to natural gas filling.

## Project Implementation Schedule

No.	Activity	Start	Finish
1.	<b>Engineering</b> - Front End Engineering Design (FEED) and Detailed Engineering Design (DED)	Sep '25	May '26
2.	<b>Procurement Long Lead Item (LLI)</b> - LLI Pipelines & Others	Apr '26	Dec '26
3.	<b>Engineering, Procurement, Construction and Commissioning (ePCC) Onshore @ MCOT</b>		
	- Site Preparation	Jan '26	Mar '26
	- Piling Works → ORF	Apr '26	Jun '26
	→ Flare	Jul '26	Jul '26
	- Concrete Foundation, Infrastructure, Steel Structure Installation, Equipment Installation and Commissioning	Aug '26	Apr '27
4.	<b>Transportation and Installation</b>		
	- Install. Eng.	Mar '26	Apr '26
	- Procurement Bulk Item	May '26	Aug '26
	- Shore Approach & Beach Pull	Sep '26	Dec '26
	- Pipeline & Riser Installation	Jan '27	Feb '27
	- Pipeline Precommissioning	Mar '27	Apr '27
5.	<b>Hook-up and Commissioning (HUC)</b>		
	- Procurement Bulk Item	May '26	Sep '26
	- Onshore Prefabrication	Oct '26	Nov '26
	- Brownfield Modifications	Dec '26	Mar '27
	<b>Ready for Start-Up (RFSU)</b>		
	- Cold Commissioning	Jan '27	
	- Hot Commissioning & Commercial	May '27	

## Existing Physical Environment (Offshore)

### Bathymetry



- Water depth ranged from 14.3 m at KP 42.326 to 78.5 m MSL at KP0.591 along the proposed pipeline route.
- The seabed features found within the survey corridor of the proposed pipeline route are 10 existing platforms, 33 existing pipeline and cable, 85 sonar contacts, 263 magnetic signals, 134 pipeline support, 4 sets of jack-up footprints, 1 pockmark cluster, 19 isolated pockmarks.
- Some high reflective seabed, anchor scars and trawl scars were observed too.

### Soil



- Overall, the subsurface soil generally comprises very soft to soft olive, greenish to dark gray lean to fat clay, occasionally sandy, consistently containing traces of shell fragments, extending to depths of approximately 1.1 m to 2.6 m.

### Metocean



- The maximum wave height and 1\* D(water depth) current velocity for the 100-year event are 10 m and 1.66 m/s respectively.
- Ambient air, sea surface and seabed temperature are 21-40°C, 22-35.7 °C and 17- 30 °C respectively.
- Rainfall intensity is 125 mm/hr based on 20-year return period.

### Tide



- Tidal regime is a mixed diurnal / semidiurnal type..
- The three nearest tidal stations are Miri, Kuala Baram and Miri Port Tidal Stations.
- The Highest Astronomical Tide (HAT) Level ranged from 2.1 m to 2.3 m for the three stations.

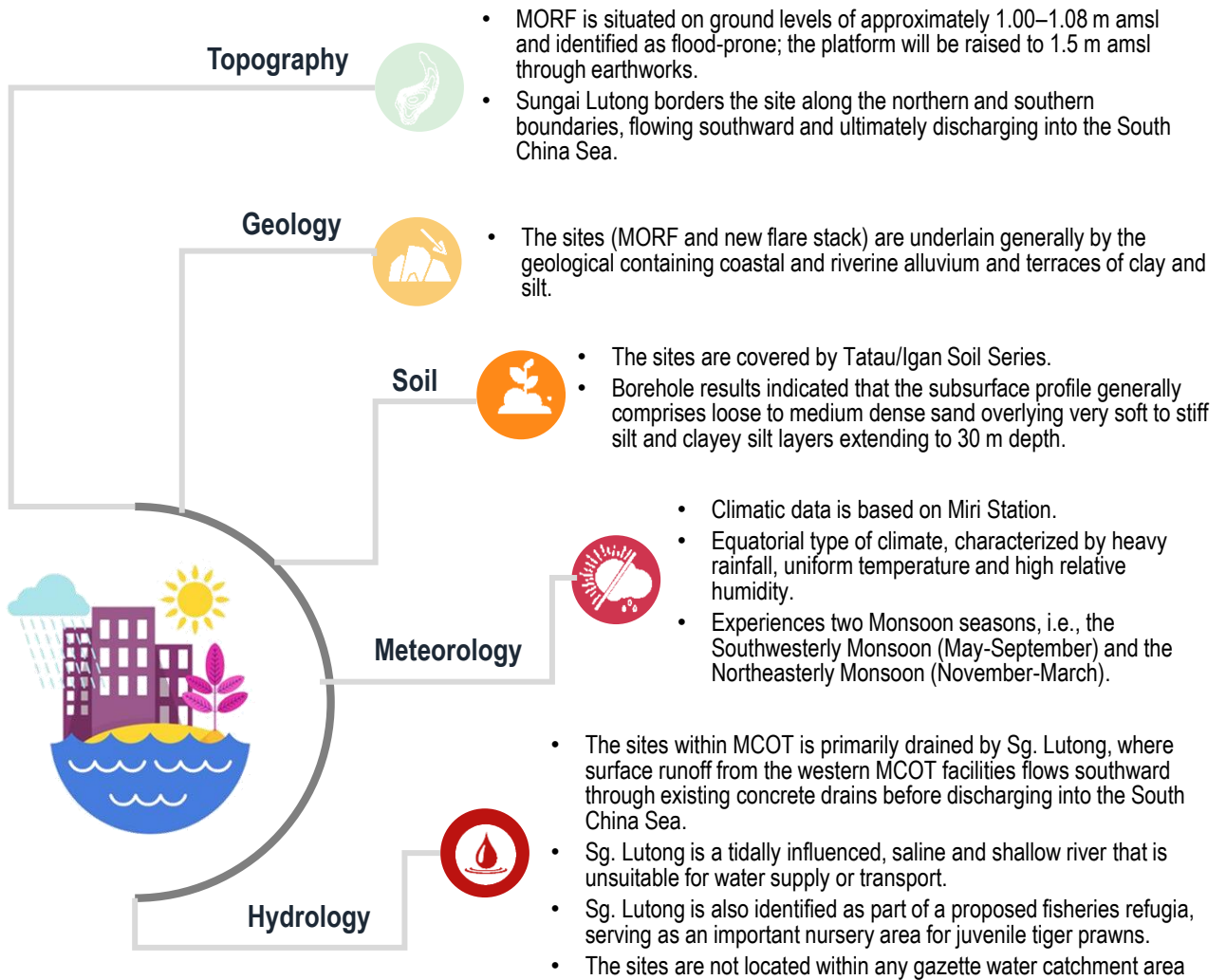


Baseline Sampling Point	Description
<b>Marine Water, Sediment, Macrobenthos and Planktons (Zooplankton and Phytoplankton)</b>	
ORF-1	1000 m radius from BNCPP-B
ORF-2	1000 m radius from BNCPP-B
ORF-3	1000 m radius from BNCPP-B
ORF-4	1000 m radius from BNCPP-B
ORF-5	500 m away from the proposed pipeline
ORF-6	500 m away from the proposed pipeline
ORF-CP1	Control point, approximately 5km south of BNCPP-B
ORF-CP2	Control point, approximately 5km north of BNCPP-B
NS1	Approximately 500m from shoreline
NS2	Approximately 500m from shoreline
NS3	Approximately 500m from shoreline

Baseline data for 600 m radius of the BNCPP-B is referred to the latest EMR for Baronia.

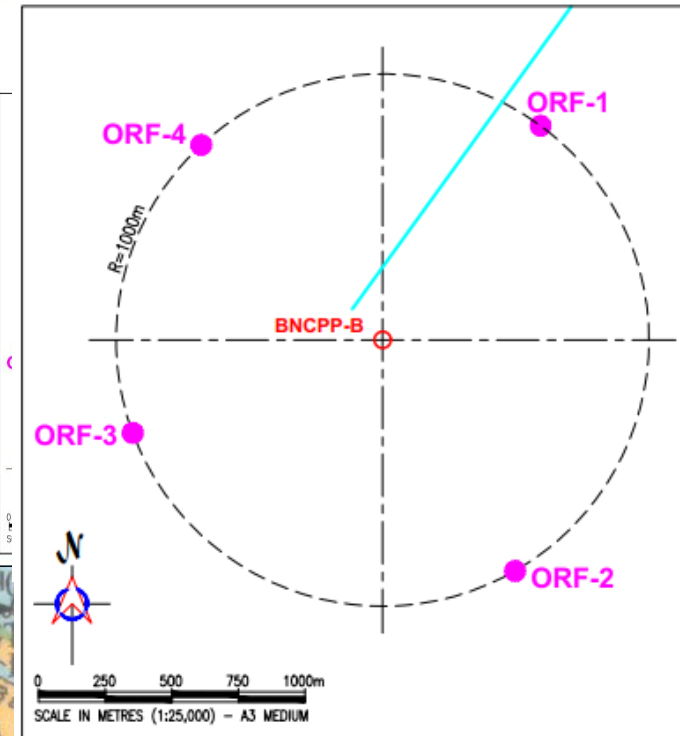
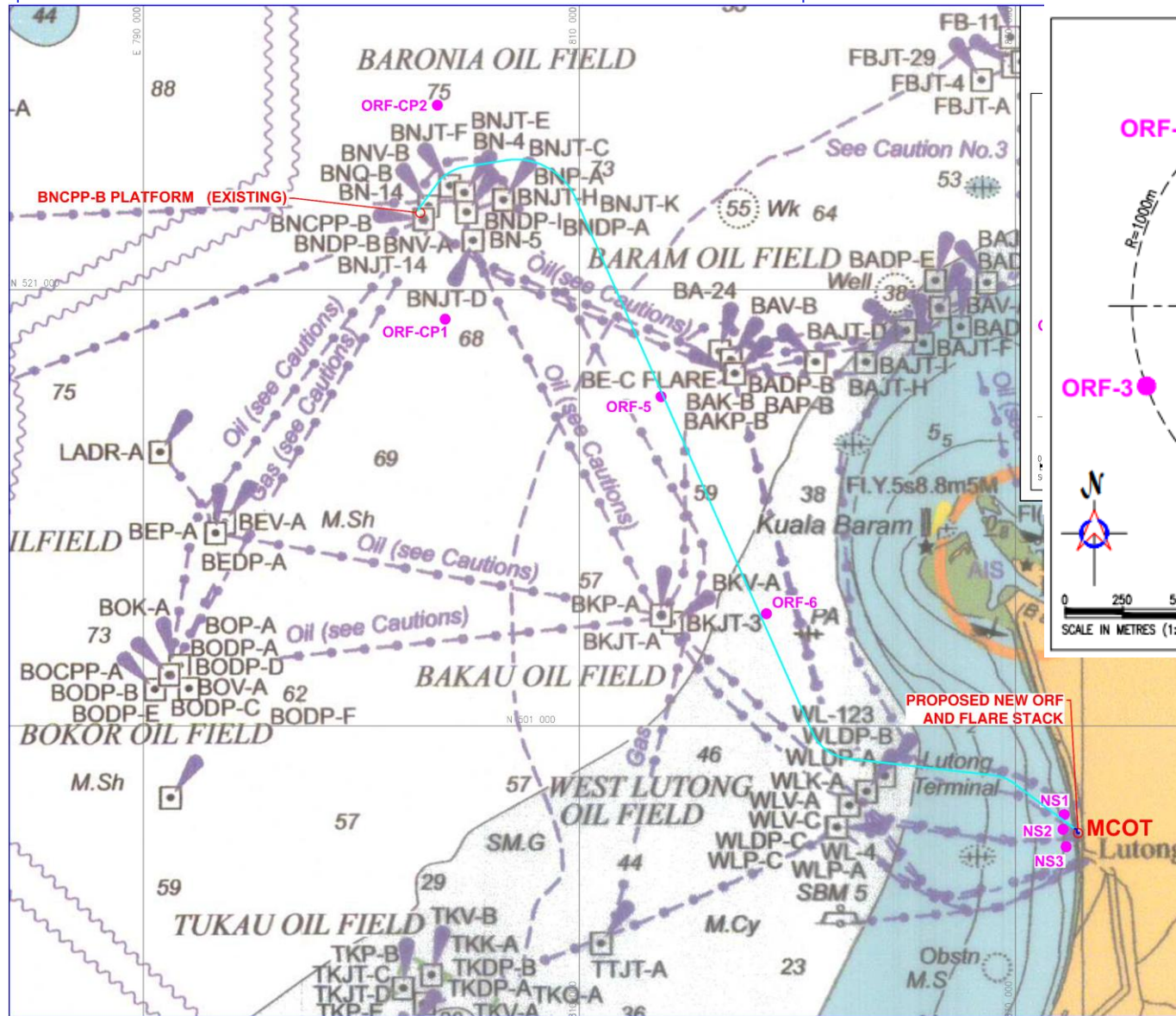
- **Sampling Date:** 27<sup>th</sup> October until 14<sup>th</sup> November 2025





## Existing Physical Environment ( Onshore )



Baseline Sampling Points		Description and Justification
<b>Surface Water (High Tide and Low Tide)</b>		
W1	Upstream of Sg. Lutong	
W2	Midstream of Sg. Lutong	
W3	Downstream of Sg. Lutong	
<b>Groundwater and Soil</b>		
GW1/S1	Downgradient of Project site	
GW2/S2	Upgradient of Project site	
<b>Ambient Air and Noise</b>		
A1/N1	Within GRF boundary, located about 7m north of Project site	
A2/N2	Kg. Senadin Jaya, located about 592 m northeast of the Project site	
A3/N3	SK. Senadin, located about 1.39 km northeast of the Project site	
A4/N4	Residential house at Jalan Geranit, located about 990 m west of the Project site	
A5/N5	SK. Lutong, located about 1.47 km southeast of the Project site	

# Environmental Baseline Sampling (Offshore)



- LEGEND:**
-  BNCPP-B
  -  PROPOSED 10" PIPELINE
  -  SAMPLING POINTS (ORF-1 TO ORF-6, NS1 TO NS3)
  -  CONTROL POINT (ORF-CP1 & ORF-CP2)

**Note:**  
Existing monitoring results will be used to represent the existing marine water and sediment quality for 600m radius of the BNCPP-B platform

# Baseline Sampling Locations (Onshore)



## LEGEND:

- PROJECT SITE
- PROPOSED 10" OFFSHORE PIPELINE
- PROPOSED 10" ONSHORE PIPELINE
- WATER SAMPLING POINTS (W1 TO W3)
- GROUND WATER SAMPLING LOCATIONS (GW1 - GW2)
- AIR AND NOISE SAMPLING LOCATIONS (A1/N1 - A5/N5)
- SOIL SAMPLING LOCATIONS (S1 - S2)

## Environmental Baseline Sampling (Offshore and Nearshore)

### Marine Water Sampling

- All parameters for the samples complied with Class 3 of the MMWQS, except for Nitrate in ORF-1.



### Sediment Sampling

- All parameters analysed for all sampling locations were reported to be well below the NOAA ERL limits, except for Cadmium. The cadmium levels at all sampling station were reported at 1.4-2.2 mg/kg, which is higher than the ERL limit of 1.2 mg/kg but well below the ERM limit at 9.6 mg/kg.



### Macrobenthos Sampling

- The macrobenthos community shows moderate diversity (4–9 taxa) and is strongly dominated by Polychaeta, which makes up 56% of the assemblage.
- Macrobenthos distribution is shaped by food availability and environmental factors such as monsoon conditions, tides, light, temperature, salinity and seawater depth, and the EBS results provide essential baseline data for future comparison.



### Plankton Sampling (Zooplankton and Phytoplankton)

- Phytoplankton showed 14–31 taxa with moderate diversity and varying evenness, and the community was strongly dominated by Diatoms (≈83%).
- Zooplankton density peaked at NS1 (85,946 units/L), with communities moderately diverse and dominated by Arthropoda (79%), while other taxa were present in smaller proportions, and the results provide essential baseline data for future comparison.



## Environmental Baseline Sampling (Onshore)

### Surface Water Sampling



- River water samples were collected at Sg. Lutong during high tide and low tide.
- As Sg. Lutong is tidal influenced and salinity tested for all samples were above 10 ppt, hence the result were compared with Class 3 of MMWQS.
- All parameters complied with Class III of MMWQS except for Phosphate at W1 and Thermotolerant (Faecal) Coliform count for all sampling stations.

### Groundwater Sampling



- All parameters complied with the Site Screening Levels (SSLs) in the Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land.
- All parameters except for conductivity, total dissolved solid, total suspended solid, chloride, sulphate, iron, manganese, total hardness and chemical oxygen demand have exceeded the National Groundwater Quality Standards for Industrial Use.

### Soil Sampling



- Soil samples were collected at two (2) locations.
- All parameters were within the limits of Site Screening Levels (SSLs) in the Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land – Industrial Soil.

### Ambient Air Sampling



- Ambient air was sampled at five (5) locations.
- All sampling points parameters are within MAAQS limit.

### Ambient Noise Level



- Baseline ambient noise was undertaken at five (5) locations.
- All parameters except N2 (daytime) and N3 (both daytime and night time) were within the stipulated limits under Schedule 1 of the Guidelines for Environmental Noise and Control.

# Existing Land Uses at MORF and New Flare Stack



## Existing Sensitive Receptors within 5km Radius of Project Site

Sensitive Receptors	Land Use Type	Approx. Distance	Direction
Sribima Maritime Training Centre (SMTTC)	Training Centre	300 m	North
Surau Darul Ikhlas	Religious	500 m	Northeast
Tabika Kampung Senadin	Institution	500 m	East
Kampung Senadin Jaya	Settlement	600 m	Northeast
Kampung Sealine	Settlement	700 m	Northeast
Regent Park	Settlement	700 m	East
Kampung Sealine Atas	Settlement	1.1 km	Northeast
Kampung Kuala Baram Batu Satu	Settlement	1.2 km	North
Kampung Merikan	Settlement	1.2 km	Southeast
Pasar Ikan Batu 1	Commercial	1.3 km	North
Riverview Park	Settlement	1.4 km	North
SK Senadin	Institution	1.4 km	Northeast
SMK Pujut	Institution	1.6 km	Northeast
SJK (C) Chung Hua Lutong	Institution	1.6 km	Southeast
SK Lutong	Institution	1.6 km	Southeast
Taman Million	Settlement	1.8 km	Southeast
Greenville	Settlement	2.0 km	East
Taman Ruby	Settlement	2.1 km	Southeast
Taman Indah	Settlement	2.2 km	East
Kampung Pangkalan Lutong	Settlement	2.3 km	Southeast
Borneo Safety Training Services Sdn. Bhd. (SBTS)	Institution	2.4 km	Northeast
SMK Lutong	Institution	2.4 km	South
Klinik Kesihatan Tudan	Hospital	2.7 km	East
Bayshore Villa	Settlement	2.9 km	South
SK Tudan, Miri	Institution	3.1 km	East
Taman Harmoni	Settlement	3.2 km	Northeast
Taman Bayshore	Settlement	3.2 km	South
Desa Senadin	Settlement	3.3 km	Northeast
Kampung Tudan	Settlement	3.3 km	East
Knewton Global School	Institution	3.4 km	Northeast
Tudan Methodist Church	Religious	3.4 km	Northeast
Curtin University Sarawak	Institution	3.8 km	Northeast
Azman Islamic Center	Institution	4.1 km	Northeast
Taman Permai	Settlement	4.2 km	Northeast
Piasau Nature Reserve	Nature Reserve	4.3 km	South
Desa Indah 2	Settlement	4.6 km	Southeast
Permy Jaya	Settlement	4.9 km	Southeast

*Note: The approximate distance is from the nearest Project boundary.*



## Potential Impacts and Recommended Mitigation Measures (Offshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p><b>Transportation</b></p> <p><u>Impact on Marine Water Quality</u></p> <ul style="list-style-type: none"> <li>• Sewage</li> <li>• Food waste</li> <li>• Ballast water</li> <li>• Bilge water</li> <li>• Deck drainage water</li> </ul> <p>These discharge or improper disposal may degrade marine water quality.</p>	Low	<ul style="list-style-type: none"> <li>• Implement a comprehensive Waste Management Plan for all offshore and onshore activities.</li> <li>• Ensure all contractor vessels comply with PETRONAS policy, MARPOL and national regulations.</li> <li>• Conduct mandatory training on waste, sewage, oily water, and spill management.</li> <li>• Maintain clean work areas and proper chemical/oil storage to prevent overboard loss.</li> <li>• Anchor only at designated locations to minimise seabed disturbance.</li> <li>• No sewage discharge within 12 nm unless treated; otherwise offload to licensed facilities.</li> <li>• Treat oily bilge water to &lt;15 ppm or store for onshore disposal; no discharge in Refugia Area.</li> <li>• Prohibit all garbage discharge; segregate and offload waste to licensed facilities.</li> <li>• Store and dispose all hazardous/scheduled wastes onshore per DOE regulations.</li> <li>• Discharge food waste only when macerated and &gt;12 nm from shore, outside Refugia Area.</li> <li>• Equip vessels with spill kits and trained personnel for rapid response.</li> <li>• Conduct periodic environmental audits and ensure pipeline installation complies with PETRONAS separation and emergency response requirements.</li> </ul>	<p>Section 7.3.1.1.1.1, Page C7-10 to C7-11</p> <p>Section 8.2.1.1.1, Page C8-2 to C8-5</p>
<p><u>Impacts on Marine Traffic</u></p> <ul style="list-style-type: none"> <li>• Increase in marine traffic at the area during transportation of substructures etc.. may expose marine traffic hazards to other marine users.</li> </ul>	Low	<ul style="list-style-type: none"> <li>• Follow all marine navigation and communication requirements in the approved Marine Risk Assessment (MRA).</li> <li>• Register and mark the new pipeline on Admiralty Charts and notify relevant marine authorities.</li> <li>• Coordinate with DOF and authorities to issue notices on restricted zones and activity schedules.</li> <li>• Implement vessel safety measure, which include no-go zones, weather restrictions, trained crew, and well-maintained navigation equipment—to minimise collision and spill risks.</li> <li>• Ensure all project vessels comply with maritime laws, hold valid certificates, carry spill-response equipment, and use approved navigational charts.</li> </ul>	<p>Section 7.3.1.1.1.2, Page C7-22</p> <p>Section 8.2.1.1.2, Page C8-5 to C8-7</p>



## Potential Impacts and Recommended Mitigation Measures (Offshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p><b>Transportation</b></p> <p><u>Impact on the Fishing Community</u></p> <ul style="list-style-type: none"> <li>• Movement and presence of vessel pose risk of collision with other fishing vessels.</li> <li>• Indiscriminate waste disposal/discharge may reduce fish abundance and lead to temporary decline in fish catch.</li> </ul>	Low	<ul style="list-style-type: none"> <li>• Mitigation Measures for Impacts on Marine Traffic are applicable.</li> </ul>	<p>Section 7.3.1.1.1.3 , Page C7-11 to C7-12</p> <p>Section 8.2.1.1.2, Page C8-5 to C8-7</p>
<p><u>Impacts on Ambient Air Quality</u></p> <ul style="list-style-type: none"> <li>• Exhaust emission generated by vessel operations may degrade ambient air quality..</li> </ul>	Low	<ul style="list-style-type: none"> <li>• Perform regular maintenance of combustion and mechanical equipment to minimise air emissions.</li> <li>• Prohibit vessel refrigeration systems that use ozone-depleting substances (ODS).</li> </ul>	<p>Section 7.3.1.1.1.4 , Page C7-12</p> <p>Section 8.2.1.1.3 Page C8-7</p>



## Potential Impacts and Recommended Mitigation Measures (Offshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Construction and Installation</b></p> <p><u>Impacts on Marine Water Quality</u></p> <ul style="list-style-type: none"> <li>Wastewater discharge from support, supply and installation vessel</li> <li>Resuspension of sediment during installation of pipeline</li> <li>Uncontrolled disposal of solid and scheduled waste may degrade marine water quality.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Mitigation Measures for Impacts on Marine Water Quality during Transportation are applicable.</li> <li>At nearshore, fuel skids (if any) should be placed at the fuel oil storage areas to prevent oil seepage to the shoreline and nearby waterbody.</li> <li>Maintain spill kits, drip trays, and absorbent booms at nearshore.</li> <li>Carry out visual inspection of cofferdam sealing regularly to prevent slurry or “dirty water” leaking into the marine water</li> </ul>	<p>Section 7.3.1.2.1, Page C7-12 to C7-23</p> <p>Section 8.2.1.2.1, Page C8-7 to C8-8</p>
<p><u>Impacts on Seabed Sediment</u></p> <ul style="list-style-type: none"> <li>Installation of pipeline, anchor chain movement will disturb the seabed.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Optimise the installation schedule to shorten the duration of seabed disturbance and enable quicker re-establishment of marine communities.</li> <li>Determine optimal placement during the design stage to reduce long term seabed occupation and impacts on benthic habitats.</li> <li>Deploy anchors only at designated, pre-surveyed locations to reduce the likelihood of anchor dragging and the associated smothering of benthic organisms.</li> <li>Strategically plan the placement of concrete mattresses during the design phase to minimise seabed footprint and associated environmental impacts.</li> </ul>	<p>Section 7.3.1.2.2, Page C7-24</p> <p>Section 8.2.1.2.2, Page C8-8 to C8-9</p>



## Potential Impacts and Recommended Mitigation Measures (Offshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Construction and Installation</b></p> <p><u>Impacts on Marine Ecology</u></p> <ul style="list-style-type: none"> <li>Trenching activities and vessel operation may disturb seabed. Short-term sediment resuspension and localized change to habitat conditions during active construction works..</li> </ul>	Low	<ul style="list-style-type: none"> <li>Mitigation Measures for Impacts on Marine Water Quality are applicable.</li> <li>Use pre-determined anchoring points and pipeline routes to minimise seabed disturbance.</li> <li>Follow controlled anchor-handling procedures to avoid dragging.</li> <li>Optimise pipe-laying duration to shorten disturbance and support faster benthic recovery.</li> <li>Pre-define cofferdam locations and clearly demarcate work zones.</li> <li>Use vibro-hammer sheet piles for cofferdam installation to reduce marine noise and impact.</li> <li>Apply strict sediment controls, including controlled excavation rates and immediate backfilling.</li> <li>Install the cofferdam in stages to limit turbidity.</li> <li>Reinstatement and backfilling must occur immediately after pipeline installation.</li> </ul>	<p>Section 7.3.1.2.3, Page C7-24 to C7-26</p> <p>Section 8.2.1.2.3, Page C8-9 to C8-10</p>
<p><u>Impacts on Waste Generation</u></p> <ul style="list-style-type: none"> <li>Non-hazardous wastes</li> <li>Hazardous / scheduled wastes</li> <li>Sewage</li> <li>Solid wastes</li> </ul> <p>Improper waste management will cause marine water pollution.</p>	Low	<ul style="list-style-type: none"> <li>Mitigation Measures for waste management in Impacts on Marine Water Quality are applicable.</li> </ul>	<p>Section 7.3.1.2.4, Page C7-26</p> <p>Section 8.2.1.2.4, Page C8-10 to C8-11</p>



## Potential Impacts and Recommended Mitigation Measures (Offshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p><b>Construction and Installation</b></p> <p><u>Impacts on Underwater Noise</u></p> <ul style="list-style-type: none"> <li>Installation of pipeline may cause underwater noise. This may lead to behavioral changes and could have psychological impact on the marine fauna.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Use dynamically positioned (DP) vessels where practicable to reduce anchor-related disturbance.</li> <li>Ensure vessels and equipment are properly maintained to minimise unnecessary noise.</li> <li>Implement a soft-start / ramp-up procedure for marine equipment to allow marine fauna to move away from the work area.</li> <li>Limit offshore construction activities to the minimum practicable duration at any given location.</li> <li>Maintain a controlled vessel speed when transiting through the work area.</li> <li>Schedule offshore works, where practicable, to avoid sensitive breeding or migration periods.</li> </ul>	<p>Section 7.3.1.2.5, Page C7-26 to C7-27</p> <p>Section 8.2.1.2.5, Page C8-12</p>
<p><u>Impacts on Security</u></p> <ul style="list-style-type: none"> <li>The supply and support vessels could attract unauthorized access or create opportunities for interference with operations, or theft.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Mitigation Measures on Impacts on Marine Traffic are applicable.</li> <li>Coordinate with the Royal Malaysian Navy and Malaysian Maritime Enforcement Agency (MMEA) for patrol support where required.</li> <li>Enforce strict identification procedures.</li> <li>Emergency Response Plan (ERP) to be developed and implemented. Ensure the ERP is clearly communicated to Project and contractors' workers prior commencement of work.</li> </ul>	<p>Section 7.3.1.2.6, Page C7-27 to C7-28</p> <p>Section 8.2.1.2.6, Page C8-12</p>



## Potential Impacts and Recommended Mitigation Measures (Offshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p><b>Construction and Installation</b></p> <p><u>Impacts on Marine Traffic</u></p> <ul style="list-style-type: none"> <li>During installation stage, the offshore vessels occupy defined work areas, creating temporary exclusion zones and may affect other marine users in the immediate vicinity.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Mitigation Measures for Impacts on Marine Traffic for Transportation is applicable.</li> <li>Communicate details of offshore works, including installation timelines and exclusion zones, via Notices to Mariners, marine radio broadcasts, and other standard maritime communication channels.</li> <li>Maintain a continuous lookout on the vessel bridge during pipeline installation activities to monitor nearby marine traffic and potential navigation hazards.</li> <li>Install buoys near the temporary cofferdam as navigational marker to alert other marine users.</li> <li>Temporary cofferdam shall be dismantled at the end of nearshore pipelaying activities. All wastes shall be managed accordingly onshore and disposed of at approved facilities. No disposal of waste into the sea is permitted.</li> <li>Any complaints should be immediately investigated, and necessary action should be taken. Grievance mechanisms shall be made available to all stakeholders (e.g. fishermen association, PETROS, DID and Sarawak Energy Berhad etc.). The stakeholders shall be notified regarding the grievance mechanisms.</li> <li>.</li> </ul>	<p>Section 7.3.1.2.7, Page C7-28</p> <p>Section 8.2.1.2.7, Page C8-13</p>
<p><u>Impacts on the Fishing Community</u></p> <ul style="list-style-type: none"> <li>Presence of vessels during installation may temporarily affect local fishing communities by restricting access to traditional fishing grounds and altering normal fishing patterns in the vicinity of the Project area</li> </ul>	Low	<ul style="list-style-type: none"> <li>Mitigation measures for Impacts on Marine Traffic are applicable.</li> </ul>	<p>Section 7.3.1.2.8, Page C7-28 to C7-29</p> <p>Section 8.2.1.2.8, Page C8-13</p>



## Potential Impacts and Recommended Mitigation Measures (Offshore)

	Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
Construction and Installation	<p><u>Impacts on Health and Safety</u></p> <ul style="list-style-type: none"> <li>Physical hazards, including trips, slips, and falls.</li> <li>Injuries may also result from being struck by or caught between materials and equipment during lifting, handling, or installation works</li> <li>Chemical hazards</li> <li>Noise Exposure</li> </ul>	Low	<ul style="list-style-type: none"> <li>Comply with all applicable Malaysian health, safety, and labour legislation.</li> <li>Prepare and obtain approval for Site-Specific Procedures and Emergency Response Plans prior to project commencement.</li> <li>Ensure all personnel undergo medical fitness examinations by PETRONAS Approved Medical Examiners before deployment.</li> <li>Require offshore personnel to complete TBOSIET and relevant role-specific safety training, with periodic refresher courses.</li> <li>Maintain updated training matrices and certification records for all personnel.</li> <li>Provide and maintain appropriate personal protective equipment (PPE), including fall protection for work above 2 meters.</li> <li>Install adequate safety and warning signage at all required locations.</li> <li>Conduct daily toolbox meetings and ensure coordination of construction activities.</li> <li>Report and record all accidents, near misses, and unsafe conditions to prevent recurrence; ensure adequate first aid and medical support.</li> <li>Ensure all foreign workers are medically screened (FOMEMA) and obtain DOSH approvals (PTI &amp; PTO) prior to site works.</li> </ul>	<p>Section 7.3.1.2.9, Page C7-29</p> <p>Section 8.4.3, Page C6-28 to C8-29</p>
	<p><u>Impacts on Air Quality</u></p> <ul style="list-style-type: none"> <li>Exhaust emission from vessel operation</li> </ul>	Low	<ul style="list-style-type: none"> <li>Regular engine servicing and tuning to maintain high combustion efficiency and reduce emissions.</li> <li>Comply with MARPOL Annex V1 fuel quality standard.</li> </ul>	<p>Section 7.3.1.2.10, Page C7-29 to C7-30</p> <p>Section 8.3.1.2.8, Page C8-13</p>



## Potential Impacts and Recommended Mitigation Measures (Offshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Operation and Maintenance</b></p> <p><u>Impacts on Waste Generation</u></p> <ul style="list-style-type: none"> <li>Waste will be much lower volume compared to construction and installation stage.</li> <li>Non-hazardous waste</li> <li>Hazardous / scheduled waste</li> </ul>	Low	<ul style="list-style-type: none"> <li>Mitigation Measures on Impacts from Waste Generation for Construction and Installation are applicable.</li> </ul>	<p>Section 7.3.1.3.1, Page C7-30</p> <p>Section 8.2.2.1.1, Page C8-14</p>
<p><u>Impacts on Marine Water Quality</u></p> <ul style="list-style-type: none"> <li>Discharge from routine vessel operation or minor maintenance works.</li> <li>These discharges are temporary, limited in volume and not expected to cause significant deterioration of marine water quality.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Mitigation Measures for Impacts on Marine Water Quality during Transportation are applicable.</li> <li>Inspect pipeline integrity, especially on the connection points regularly.</li> <li>Monitor the pressure drop across the gas pipeline. If abnormal pressure drop is detected, actions should be taken immediately to find the cause.</li> <li>Proper engineering aspects should be considered when designing the pipeline to prevent pipeline leakage/rupture.</li> <li>Emergency Response Plan should be in place in case of unplanned incident.</li> <li>In case of rupture/leakage at the pipeline, the emergency shutdown valve will quickly shut down process operation and isolate incoming and outgoing flows.</li> <li>Recovery of the rupture point will be investigated and remediation plan to be in place immediately either via temporary or permanent solution.</li> </ul>	<p>Section 7.3.1.3.2, Page C7-30.</p> <p>Section 8.2.2.1.2, Page C8-14</p>



## Potential Impacts and Recommended Mitigation Measures (Offshore)

	Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
Operation and Maintenance	<p><u>Impacts on Health and Safety</u></p> <ul style="list-style-type: none"> <li>The maintenance work on the offshore platform may require personnel to work at heights or handle heavy equipment, exposing them to falls, mechanical injuries, and slips/trips.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Comply with all applicable Malaysian health, safety, and labour legislation.</li> <li>Prepare and obtain approval for Site-Specific Procedures and Emergency Response Plans prior to project commencement.</li> <li>Ensure all personnel undergo medical fitness examinations by PETRONAS Approved Medical Examiners before deployment.</li> <li>Require offshore personnel to complete TBOSIET and relevant role-specific safety training, with periodic refresher courses.</li> <li>Maintain updated training matrices and certification records for all personnel.</li> <li>Provide and maintain appropriate personal protective equipment (PPE), including fall protection for work above 2 meters.</li> <li>Install adequate safety and warning signage at all required locations.</li> <li>Conduct daily toolbox meetings and ensure coordination of construction activities.</li> <li>Report and record all accidents, near misses, and unsafe conditions to prevent recurrence; ensure adequate first aid and medical support.</li> <li>Ensure all foreign workers are medically screened (FOMEMA) and obtain DOSH approvals (PTI &amp; PTO) prior to site works.</li> </ul>	<p>Section 7.3.1.3.3, Page C7-30 to C7-31</p> <p>Section 8.4.3, Page C8-28 to C8-29</p>



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts		Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<b>Transportation</b>	<u>Impacts on Air Quality</u> <ul style="list-style-type: none"> <li>Emission from vehicles and machineries</li> </ul>	Low	<ul style="list-style-type: none"> <li>Conduct regular servicing of construction vehicle engines.</li> <li>Ensure all transported loads are securely covered with tarpaulin.</li> </ul>	Section 7.3.2.1.1.1, Page C7-31 to C7-32 Section 8.3.1.1.1, Page C8-15
	<u>Impacts on Land Traffic</u> <ul style="list-style-type: none"> <li>Temporary increase in traffic volume on public road may cause congestion, delays and reduce road safety for other road users.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Coordinate closely with PETROS, DID and Sarawak Energy on construction schedules.</li> <li>Install warning signage along the shoreline access road before transporting materials.</li> <li>Ensure vehicles are not overloaded and have proper tire specifications.</li> <li>Maintain roadworthy condition for all heavy vehicles.</li> <li>Enforce road safety rules for all workers and drivers.</li> <li>Cover and secure transported materials to prevent falling objects.</li> <li>Remove any dropped material from road surfaces immediately.</li> <li>Conduct regular vehicle maintenance using approved parts.</li> <li>Ensure all contractors comply with RTD safety regulations.</li> <li>Avoid peak-hour traffic where possible.</li> <li>Use designated routes and maintain safe driving practices near shared access areas.</li> </ul>	Section 7.3.2.1.1.2, Page C7-32 Section 8.3.1.1.2, Page C8-15 to C8-16



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Transportation</b></p> <p><u>Impacts on Surface Water Quality</u></p> <ul style="list-style-type: none"> <li>• Improper material handling causing fuel leaks, accidental spillages</li> <li>• Spilled transported load may enter nearby waterway via runoff especially during rainfall events</li> <li>• These may degrade water quality.</li> </ul>	<p>Low</p>	<ul style="list-style-type: none"> <li>• Cover all transported loads with tarpaulin to prevent spills on public roads</li> <li>• .Ensure spill kits are available to manage any oil or fuel spills during transport and refuelling.</li> </ul>	<p>Section 7.3.2.1.1.3 , Page C7-32</p> <p>Section 8.3.1.1.3, Page C8-16</p>



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Construction and Installation</b></p> <p>Impacts on Surface Water Quality</p> <ul style="list-style-type: none"> <li>• Soil erosion and sedimentation</li> <li>• Sewage discharge</li> <li>• Accidental spills and leak</li> </ul> <p>Which may lead to degradation of water quality.</p>	Low	<ul style="list-style-type: none"> <li>• Limit work within designated ROW, MORF and flare stack areas.</li> <li>• Perform excavation only during dry weather.</li> <li>• Install wash troughs, sediment traps and drains before work starts.</li> <li>• Direct runoff to sediment traps via temporary drainage.</li> <li>• Damp exposed soil during dry, windy conditions.</li> <li>• Maintain and clear temporary earth drains regularly.</li> <li>• Install and maintain sediment traps and temporary earth drain as required.</li> <li>• Provide sufficient portable toilets with collection tanks; no direct sewage discharge to waterways.</li> <li>• Perform regular maintenance and desludging of collection tanks of portable toilets.</li> <li>• Store fuel in bunded, sealed areas with drip containment and weather protection.</li> <li>• Store used oil in designated areas with proper inventory records and dispose per Environmental Quality (Scheduled Waste) Regulations 2005.</li> <li>• Conduct routine inspections and maintain strict procedures to prevent leaks and spills.</li> <li>• Equip sites with spill kits and maintain machinery regularly to prevent oil leaks.</li> </ul>	<p>Section 7.3.2.1.2.1, Page C7-33 to C7-37</p> <p>Section 8.3.1.2.1, Page C8-16 to C8-19</p>
<p>Impacts on Riverine Ecology</p> <ul style="list-style-type: none"> <li>• Sediment-laden runoff</li> <li>• Accidental spillage of chemicals and fuel</li> </ul> <p>May indirectly affect benthic habitat.</p>	Low	<ul style="list-style-type: none"> <li>• Limit clearing activities within the Project area only. Riparian vegetation outside of the Project area shall remain untouched.</li> <li>• Ensure the sediment runoff from the Project site is channelled to the Sediment Trap prior discharging into the Sg. Lutong, to minimize impacts on the turbidity and sedimentation in the river, indirectly affecting the aquatic habitat.</li> <li>• No fishing or harvesting of aquatic life is permitted. Ensure all personnel are aware of this requirement and adhere to it consistently.</li> <li>• Ensure fuel, oil and chemical spills are properly contained and away from the waterway. Spill kits must be readily available at the construction site.</li> </ul>	<p>Section 7.3.1.2.2., Page C7-37</p> <p>Section 8.3.1.2.2, Page C8-19</p>



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Construction and Installation</b></p> <p><u>Impacts on Air Quality</u></p> <ul style="list-style-type: none"> <li>Dust generation from site activities</li> <li>Emission from construction vehicles and equipment</li> </ul> <p>May deteriorate air quality.</p>	Low	<ul style="list-style-type: none"> <li>Prohibit open burning of solid waste and all solid waste generated from the site is to be disposed of to a proper sanitary landfill.</li> <li>Minimize the size of material stockpiles and the periods of their existence</li> <li>Switch off idling engines.</li> <li>Use low-sulfur diesel where available.</li> <li>Maintain fuel-burning equipment to avoid dark smoke.</li> <li>Enforce 30 km/h speed limit to minimise dust.</li> <li>Unpaved area if not further developed, shall be planted with grass or covered with crusher run.</li> </ul>	Section 7.3.2.1.2.3, Page C7-37 to C7-38 Section 8.3.1.2.3, Page C8-18.
<p><u>Impacts on Noise Quality</u></p> <ul style="list-style-type: none"> <li>Construction machineries</li> <li>Piling activities</li> </ul> <p>May cause nuisance to nearby sensitive receptors.</p>	Medium	<ul style="list-style-type: none"> <li>Use low-noise equipment where feasible.</li> <li>Install temporary noise barriers around high-noise equipment.</li> <li>Position noisy machinery away from sensitive receptors.</li> <li>Conduct high-noise work only during daytime hours.</li> <li>Avoid concurrent operation of multiple noisy equipment.</li> <li>Monitor noise levels and maintain a complaint response system.</li> </ul>	Section 7.3.2.1.2.4, Page C7-38 to C7-42 Section 8.3.1.2.3, Page C8-19 to C8-20



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<b>Construction and Installation</b> <u>Impacts from Waste Generation</u> <ul style="list-style-type: none"> <li>• Non-hazardous waste</li> <li>• Hazardous / Scheduled waste</li> <li>• Sewage</li> <li>• Construction wastes</li> </ul>	Low	<ul style="list-style-type: none"> <li>• Implement a waste management plan with designated storage areas, scheduled collection, inspections, and disposal only at approved landfills.</li> <li>• Reduce solid waste generation through efficient material planning and promoting 3R practices (Reduce, Reuse, Recycle).</li> <li>• Ensure proper scheduled waste handling and storage, including separation of incompatible wastes and compliance with Environmental Quality (Scheduled Wastes) Regulations , 2005.</li> <li>• Provide adequate facilities and equipment such as clearly marked disposal sites, sufficient waste bins, spill kits, and proper spill containment and disposal procedures.</li> <li>• Educate workers to minimize waste and strictly prohibit open burning on site</li> </ul>	Section 7.3.2.1.5, Page C7-42 to C7-43  Section 8.3.1.2.5, Page C8-21
<u>Impacts on Land Traffic</u> <ul style="list-style-type: none"> <li>• Additional land traffic may cause minor congestion along internal roads and access points.</li> </ul>	Low	<ul style="list-style-type: none"> <li>• Mitigation Measures for Impacts on Land Traffic during Transportation are applicable.</li> </ul>	Section 7.3.2.1.2.6 , Page C7-43 to C7-44  Section 8.3.1.2.6, Page C8-22



## Potential Impacts and Recommended Mitigation Measures (Onshore)

	Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
Construction and Installation	<u>Impacts on Health and Safety</u> <ul style="list-style-type: none"> <li>Physical hazard such as slips, trips and falls.</li> <li>Chemical hazard</li> <li>Biological hazard such as crocodile at Sg. Lutong</li> </ul>	Medium	<ul style="list-style-type: none"> <li>Comply with all applicable Malaysian health, safety, and labour legislation.</li> <li>Prepare and obtain approval for Site-Specific Procedures and Emergency Response Plans prior to project commencement.</li> <li>Ensure all personnel undergo medical fitness examinations by PETRONAS Approved Medical Examiners before deployment.</li> <li>Maintain updated training matrices and certification records for all personnel.</li> <li>Provide and maintain appropriate personal protective equipment (PPE), including fall protection for work above 2 meters.</li> <li>Conduct onshore construction during daytime (7am–7pm); notify relevant authorities for night work and implement required safety measures.</li> <li>Install adequate safety and warning signage at all required locations.</li> <li>Conduct daily toolbox meetings and ensure coordination of construction activities.</li> <li>Report and record all accidents, near misses, and unsafe conditions to prevent recurrence; ensure adequate first aid and medical support.</li> <li>Install biological hazard warning signage near the riverbank.</li> <li>Avoid unnecessary access to the riverbank.</li> <li>Prohibit swimming and fishing in the river.</li> </ul>	Section 7.3.2.1.2.7 , Page C7-44 Section 8.4.3, Page C8-28 to C8-29
	<u>Impacts on Security</u> <ul style="list-style-type: none"> <li>unauthorized access, theft, or vandalism prior to the establishment of perimeter fencing and controlled entry points.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Install hoarding around the MORF and Flare Stack site to prevent unauthorized entry.</li> <li>Establish another security check point at the MCOT access point near the shoreline.</li> <li>Comply with MCOT entry requirement when access from either MCOT entrance or access road near the shoreline.</li> </ul>	Section 7.3.2.1.2.8 , Page C7-44 to C7-45 Section 8.3.1.2.7, Page C8-22



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p><b>Pre-commissioning and Commissioning</b></p> <p><u>Impacts on Surface Water Quality</u></p> <ul style="list-style-type: none"> <li>Discharge of hydrotest water without controlled may affect downstream waterway.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Hydrotest will be using clean freshwater without any chemical additives.</li> <li>Spent hydrotest will be released in a regulated manner.</li> </ul>	<p>Section 7.3.2.1.3.1 , Page C7-45</p> <p>Section 8.3..2, Page C8-22</p>
<p><u>Impacts on Health and Safety</u></p> <ul style="list-style-type: none"> <li>Working with pressurised fluids and gases, which may result in personnel injury in the event of sudden release.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Comply with all applicable Malaysian health, safety, and labour legislation.</li> <li>Prepare and obtain approval for Site-Specific Procedures and Emergency Response Plans prior to project commencement.</li> <li>Ensure all personnel undergo medical fitness examinations by PETRONAS Approved Medical Examiners before deployment.</li> <li>Require offshore personnel to complete TBOSIET and relevant role-specific safety training, with periodic refresher courses.</li> <li>Maintain updated training matrices and certification records for all personnel.</li> <li>Provide and maintain appropriate personal protective equipment (PPE), including fall protection for work above 2 meters.</li> <li>Conduct onshore construction during daytime (7am–7pm); notify relevant authorities for night work and implement required safety measures.</li> <li>Install adequate safety and warning signage at all required locations.</li> <li>Conduct daily toolbox meetings and ensure coordination of construction activities.</li> <li>Report and record all accidents, near misses, and unsafe conditions to prevent recurrence; ensure adequate first aid and medical support.</li> <li>Implement vector and pest control measures, ensure proper housekeeping, and arrange scheduled waste disposal with local authorities.</li> <li>Ensure all foreign workers are medically screened (FOMEMA) and obtain DOSH approvals (PTI &amp; PTO) prior to site works.</li> </ul>	<p>Section 7.3.2.1.3.2 , Page C7-45 to C7-46</p> <p>Section 8.4.3, Page C8-28 to C8-29</p>



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts		Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<b>Operation and Maintenance</b>	<u>Impacts on Surface Water Quality</u> <ul style="list-style-type: none"> <li>Minor spill of lubricants, hydraulic fluid and cleaning chemicals during equipment maintenance.</li> <li>Oily water collector to contain oily discharge.</li> <li>Existing MCOT personnel will involve in operation and maintenance of MORF. No additional sewage and domestic wastewater to be generated.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Ensure all oily water is contained in the oily water collector. The oily water discharge shall be disposed of as scheduled wastes or treated at MCOT's Effluent Treatment Plant (ETP) before discharge.</li> <li>All scheduled wastes shall be handled, stored and disposed of in accordance with the Environmental Quality (Scheduled Wastes) Regulations, 2005. The Project Proponent shall refer to the Guidelines for Packaging, Labelling and Storage of Scheduled Wastes in Malaysia.</li> <li>Use of secondary containment, such as spill or drip trays, to contain spills and leaks during maintenance activities.</li> <li>Guidelines and procedures should be established for immediate clean-up actions following any spillages of oil, fuel or chemicals.</li> <li>Ensure all personnel are trained to manage and handle spills.</li> </ul>	Section 7.3.2.1.4.1, Page C7-46  Section 8.3.3.1.1, Page C8-23
	<u>Impacts on Riverine Ecology</u> <ul style="list-style-type: none"> <li>Accidental release of hydrocarbon or oily water discharge may affect water quality then riverine habitats.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Mitigation Measures for Impacts on Surface Water Quality are applicable. .</li> </ul>	Section 7.3.2.1.4.2, Page C7-46 to C7-47  Section 8.3.3.1.2, Page C8-23



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p><b>Operation and Maintenance</b></p> <p><u>Impacts on Groundwater Quality</u></p> <ul style="list-style-type: none"> <li>Contamination could occur through seepage of hydrocarbons or chemicals into the soil, with potential migration along the groundwater flow direction.</li> <li>Routine operations do not involve direct discharge to groundwater.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Mitigation Measures for Impacts on Surface Water Quality during operation are applicable.</li> <li>No oily water shall be discharged to the ground. All oily water shall be contained in the oily water collector, after which it will be vacuumed out and disposed of as scheduled waste or treated at the MCOT Effluent Treatment Plant (ETP).</li> <li>Monitor groundwater quality to detect any changes during operation.</li> </ul>	<p>Section 7.3.2.1.4.3, Page C7-47</p> <p>Section 8.3.3.1.3, Page C8-23 to C8-24</p>
<p><u>Impacts on Air Quality</u></p> <ul style="list-style-type: none"> <li>Emergency flaring will only be carried out to relief pressure from the system.</li> <li>Based on air dispersion modelling outcome and impact assessment, the impact is assessed as low.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Flaring will only be undertaken when operationally necessary, such as during emergency depressurization, start-ups, or emergency events.</li> <li>All flaring activities shall be optimised to minimise duration and volume, while ensuring complete combustion to reduce greenhouse gas (GHG) and pollutant emissions.</li> <li>Maintain a flaring log documenting event duration, cause, and estimated emissions for regulatory reporting.</li> <li>Ensure the closed drainage system is in place for all hydrocarbon systems to prevent vapour releases during fluid handling, maintenance, or drainage operations.</li> <li>Maintain detailed maintenance logs for audit and compliance verification.</li> <li>The volumes of gas vented for all venting and/or blowdown events should be recorded (taken from actual flow measurement devices or estimated) and reported.</li> <li>Carry out routine inspection of instrument, equipment, and flare system.</li> <li>Regularly testing and upgrade pipeline (if needed) to prevent leaks..</li> </ul>	<p>Section 7.3.2.1.4.4, Page C7-47 to C7-66</p> <p>Section 8.3.3.1.5, Page C8-25</p>



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts		Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<b>Operation and Maintenance</b>	<u>Impacts on Noise Quality</u> <ul style="list-style-type: none"> <li>Major noise equipment</li> <li>Noise from flare stack during emergency gas flaring events.</li> <li>Impact assessment indicates that under normal operating conditions, there is no anticipated increase in noise levels attributable to the proposed Project at any of the surrounding sensitive receptors</li> </ul>	Low	<ul style="list-style-type: none"> <li>Install acoustic enclosures, silencers, or lagging for major noise-generating equipment (e.g. compressors, pumps).</li> <li>Design plant layout to maximise distance and shielding between noise sources and site boundaries.</li> <li>Ensure flare systems are designed to minimise noise during emergency flaring.</li> <li>Implement a preventive maintenance programme to ensure equipment operates within design noise levels.</li> </ul>	Section 7.3.2.1.4.5, Page C7-66 to C7-71  Section 8.3.3.1.5, Page C8-25
	<u>Impacts on Health and Safety</u> <ul style="list-style-type: none"> <li>Physical hazards</li> <li>Chemical hazards</li> </ul>	Low	<ul style="list-style-type: none"> <li>Comply with all applicable Malaysian health, safety, and labour legislation.</li> <li>Prepare and obtain approval for Site-Specific Procedures and Emergency Response Plans prior to project commencement.</li> <li>Ensure all personnel undergo medical fitness examinations by PETRONAS Approved Medical Examiners before deployment.</li> <li>Maintain updated training matrices and certification records for all personnel.</li> <li>Provide and maintain appropriate personal protective equipment (PPE), including fall protection for work above 2 meters.</li> <li>Install adequate safety and warning signage at all required locations.</li> <li>Conduct daily toolbox meetings and ensure coordination of construction activities.</li> <li>Report and record all accidents, near misses, and unsafe conditions to prevent recurrence; ensure adequate first aid and medical support.</li> </ul>	Section 7.3.2.1.4.8, Page C7-89  Section 8.4.3, Page C8-28 to C8-29



## Potential Impacts and Recommended Mitigation Measures (Onshore)

Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<p><b>Operation and Maintenance</b></p> <p><u>Quantitative Risk Assessment</u></p> <ul style="list-style-type: none"> <li>The QRA evaluates potential accident scenarios, their likelihood and consequences, and the resulting risk levels against DOE criteria..</li> <li>The project's individual risk contours meet DOE criteria, remain confined to industrial areas, and even conservative worst-case scenarios show no impact to sensitive receptors, indicating overall low risk..</li> </ul>	Low	<ul style="list-style-type: none"> <li>Emergency Response Plan (ERP) shall be prepared to address all potential scenarios (small leak, medium leak, catastrophic for pressure vessel and pipeline) in relation to those identified in the QRA.</li> <li>Design changes during the subsequent engineering phases post EIA should be analysed to determine the severity of the potential hazards (via safety studies i.e. hazard identification and HAZOP) due to the proposed changes. The revised risk levels shall be in line with the governing risk criteria adopted by DOE.</li> <li>The proposed plant management has to ensure the implementation of an effective health and safety management system which governs a safe operating condition for the proposed facility. This will help minimise the risk posed by the plant's operation to be maintained within the acceptable limits.</li> </ul>	<p>Section 7.3.2.1.4.6 , Page C7-72 to C7-88</p> <p>Section 8.3.3.1.6, Page C8-25</p>
<p><u>Impacts from Waste Generation</u></p> <ul style="list-style-type: none"> <li>Non-hazardous / scheduled waste that are much lower volume than during construction and installation phase.</li> </ul>	Low	<ul style="list-style-type: none"> <li>Establish scheduled waste management plan to ensure that scheduled wastes are managed and handled in accordance with the Environmental Quality (Scheduled Wastes) Regulations, 2005. The Project Proponent shall refer to the Guidelines for Packaging, Labelling and Storage of Scheduled Wastes in Malaysia.</li> <li>All scheduled wastes, including the accidental oily contaminated water should be labelled and stored in durable containers, which are able to prevent spillage or leakage of the scheduled wastes into the environment.</li> <li>The transportation of scheduled waste shall only be carried out by DOE licensed transporter, and the waste is to be delivered to DOE licensed treatment facility.</li> <li>Domestic wastes shall be disposed of at the designated waste collection point to be collected by council approved waste collector.</li> </ul>	<p>Section 7.3.2.1.4.7 , Page C7-89</p> <p>Section 8.3.3.1.7, Page C8-25 to C8-26.</p>



## Potential Impacts and Recommended Mitigation Measures (Onshore)

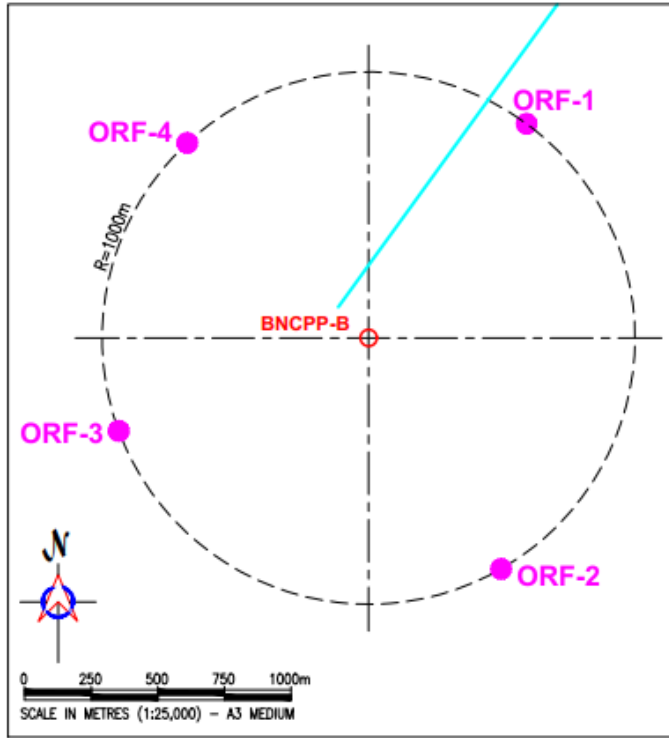
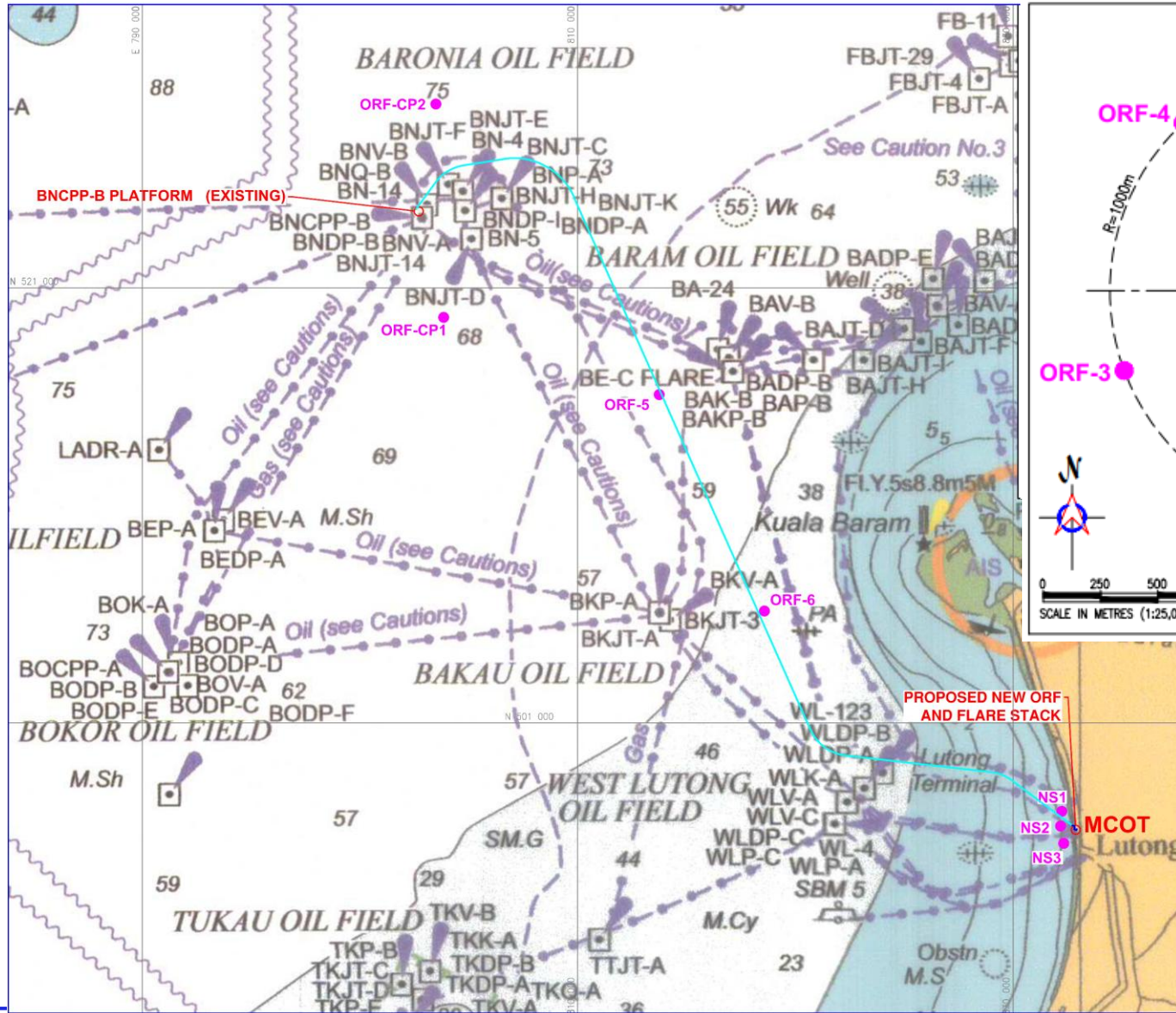
Significant Potential Impacts		Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<b>Health Impact Assessment</b>	<ul style="list-style-type: none"> <li>Hazard identified include ambient air, river water, marine water and noise hazards.</li> <li>The project is expected to have minimal health impacts with proper controls, with communicable disease risk among workers requiring ongoing surveillance and prevention.</li> </ul>	Low	<ul style="list-style-type: none"> <li>All workers underwent FOMEMA pre-employment medical exams to detect infectious diseases, with referrals and treatment provided before deployment.</li> <li>Workers were encouraged or required to receive key vaccinations (e.g., hepatitis B, COVID-19), with records maintained and monitored.</li> <li>Regular site inspections and vector control (fogging, larviciding, removing stagnant water) were carried out to reduce risks of malaria, JE, filariasis, dengue and leptospirosis through proper waste and sanitation management.</li> <li>Workers and nearby receptors received targeted health education on hygiene, safe food handling, protective equipment use, and early recognition of symptoms for vector-borne diseases, STIs, tuberculosis and leprosy.</li> </ul>	<p>Section 7.4, Page C7-90 to C7-113</p> <p>Section 8.4.1, Page C8-26</p>
<b>Socio-Economic Impact</b>	<ul style="list-style-type: none"> <li>Employment and spin-off business</li> <li>Migrant Labour</li> </ul>		<ul style="list-style-type: none"> <li>The Project management must embark on a practice of giving priority of employment to qualified locals.</li> <li>If employment of foreign labours is unavoidable, it must be through proper agents with proper documentation in compliance with the Immigration and Labour rules and regulations of Sarawak Ordinance. Movement of these workers must be monitored. A repatriation programme shall be instituted at the end of the contract to ensure smooth and legal departure of the foreign labours. A clause of this requirement must be stated in the contract document between the Project Proponent and their contractors and sub-contractors.</li> <li>Effective dissemination of information and establishment of a 'grievance mechanism' to take care of suggestions and complaints from the community.</li> </ul>	<p>Section 8.4.2, Page C8-27 to C8-28</p>







## Potential Impacts and Recommended Mitigation Measures

	Significant Potential Impacts	Magnitude of Significant Potential Impacts	Pollution Prevention and Mitigation Measures (P2M2)	Ref. Page to EIA Report
<b>Accidental/ Emergency Events</b>	<p><u>Impacts due to Pipeline Rupture and Leakage</u></p> <ul style="list-style-type: none"> <li>Accidental hydrocarbon or gas release may cause localised environmental and safety impacts.</li> </ul> <p><u>Impacts due to Hydrocarbon Spill (Vessel Collision)</u></p> <ul style="list-style-type: none"> <li>Increased marine traffic may lead to vessel collision and accidental fuel spill.</li> </ul>	Medium	<ul style="list-style-type: none"> <li>All equipment installed or used in operations shall be designed, manufactured, and certified to meet international industry standards, as well as PETRONAS Technical Standards and engineering specifications.</li> <li>Safety features such as leak detection systems, pressure relief devices, and automatic shut-off valves shall be incorporated where applicable.</li> <li>Maintain detailed inspection and maintenance records for audit and compliance purposes.</li> <li>Develop and implement a site-specific Oil Spill Contingency Plan (OSCP) for the Project operation, fully aligned with the National Oil Spill Contingency Plan (NOSCP).</li> <li>Implement internal and external corrosion protection, including corrosion inhibitors, coatings, and cathodic protection, with regular performance monitoring.</li> <li>Conduct routine integrity inspections at high-risk areas and through scheduled methods such as intelligent pigging and visual/ultrasonic testing.</li> <li>Install and operate continuous monitoring systems to detect abnormal pressure, flow, or temperature changes along the pipeline.</li> <li>Record all inspection, monitoring, and maintenance data in the Pipeline Integrity Management System (PIMS).</li> </ul>	<p>Section 7.5, Page C7-113 to C7-114</p> <p>Section 8.5, pg. C8-30 to C8-32</p>
<b>Decommissioning and Abandonment</b>	<p><u>Impacts during Construction</u></p> <ul style="list-style-type: none"> <li>Habitat for pests and disease vectors.</li> </ul> <p><u>Impacts during Operation</u></p> <ul style="list-style-type: none"> <li>Decommissioning of facilities and pipeline removal</li> <li>Waste management</li> </ul>	-	<ul style="list-style-type: none"> <li>An abandonment plan (during construction) or decommissioning plan (during operation) shall be submitted to DOE at least three (3) months prior to Project abandonment/ decommissioning.</li> <li>The Project Proponent shall refer to EIA Guidelines for Petroleum Industries (DOE, 2018) and Environmental Guideline for Decommissioning of Oil and Gas Facilities in Malaysia (DOE, 2019) in preparation of the abandonment/ decommissioning plan.</li> <li>Environmental Site Assessment (ESA) Report which shall include post abandonment's environmental monitoring, BMP inspections and waste inventories is to be submitted to DOE post project abandonment stage for onshore components</li> </ul>	<p>Section 7.3.2.1.5, Page C7-89 to C7-90</p> <p>Section 8.6, Page C8-33</p>

# Proposed Monitoring (Offshore)



### LEGEND:

-  BNCPP-B
-  PROPOSED 10" PIPELINE
-  MONITORING POINTS (ORF-1 TO ORF-6, NS1 TO NS3)
-  CONTROL POINT (ORF-CP1 & ORF-CP2)

**Note:**  
Existing monitoring results will be used to represent the existing marine water and sediment quality for 600m radius of the BNCPP-B platform

# Proposed Monitoring during Construction (Onshore)



## LEGEND:

- PROJECT SITE
- PROPOSED 10" OFFSHORE PIPELINE
- PROPOSED 10" ONSHORE PIPELINE
- PROPOSED WATER MONITORING POINTS (W1 TO W3)
- PROPOSED AIR AND NOISE MONITORING LOCATIONS (A1/N1 - A5/N5)



# Proposed Monitoring during Operation (Onshore)



## LEGEND:

- PROJECT SITE
- PROPOSED 10" OFFSHORE PIPELINE
- PROPOSED 10" ONSHORE PIPELINE
- PROPOSED WATER MONITORING POINTS (W1 TO W3)
- PROPOSED GROUND WATER MONITORING POINTS (GW1 TO GW2)
- PROPOSED AIR AND NOISE MONITORING LOCATIONS (A1/N1 - A5/N5)



## Proposed Monitoring Program during Construction and Operation Stages (Offshore and Nearshore)

No. of Stations	Parameters	Frequency	Compliance
11	Temperature (in-situ), pH (in-situ), Dissolved Oxygen (in-situ), Salinity (in-situ) Total Suspended Solid, Unionised ammonia (as NH <sub>3</sub> ), Nitrate (as NO <sub>3</sub> ), Phosphate (as PO <sub>4</sub> ), Cadmium, Chromium, Hexavalent (Cr <sup>6+</sup> ), Copper, Lead, Zinc, Mercury (Total), Arsenic (III), Aluminium, Cyanide (CN <sup>-</sup> ), Tributyltin, Phenol, Oil & Grease, Faecal coliform, Polycyclic Aromatic Hydrocarbon (PAH), Total hydrocarbon, Turbidity, Barium (Ba), Iron (Fe), Nickel (Ni), Vanadium (V), Cobalt, Total Organic Carbon, chlorophyll-a	Bi-annually	Class I of the Malaysian Marine Water Quality Standards (MMWQS)
3	Turbidity	Monthly monitoring during trenching activities	Class I of the Malaysian Marine Water Quality Standards (MMWQS)
11	Particle Size Distribution (Gravel, Sand, Silt, Clay), Mercury (Hg), Aluminum (Al), Copper (Cu), Cadmium (Cd), Chromium (Cr), Arsenic (III), Lead (Pb), Zinc (Zn), Oil & Grease, Total Organic Carbon, Total Hydrocarbon, Total Petroleum Hydrocarbon (TPH), Polycyclic Aromatic Hydrocarbon (PAH), Oxidation Redox Potential (ORP, in-situ)	Bi-annually	NOAA Sediment Quality Guideline's ERL and ERM
11	.Phytoplankton, zooplankton, macrobenthos <ul style="list-style-type: none"> <li>• No. of taxa</li> <li>• Density (no. of ind/m<sup>2</sup> or per m<sup>3</sup>)</li> <li>• Diversity indices (Shannon Weaver Index, Margalef Index &amp; Evenness Index)</li> </ul>	Bi-annually	-

## Proposed Monitoring Program during Construction Stage (Onshore)

	No. of Sample	Parameters	Frequency	Compliance
Final discharge point of sediment trap	6	TSS, turbidity	Monthly	TSS <150 mg/L Turbidity <250 NTU
Surface water quality (high tide and low tide)	6	Temperature (in-situ), pH (in-situ), Dissolved Oxygen (in situ), Turbidity, Salinity, Total Suspended Solids, Unionised Ammonia (as NH <sub>3</sub> ), Nitrate (as NO <sub>3</sub> ), Phosphate (as PO <sub>4</sub> ), Cadmium (Cd), Chromium, Hexavalent (Cr <sup>6+</sup> ), Mercury (Hg), Copper (Cu), Lead (Pb), Zinc (Zn), Barium (Ba), Iron (Fe), Nickel (Ni), Vanadium (V), Cobalt (Co), Aluminium (Al), Cyanide (CN), Oil and Grease, Total Hydrocarbon, Polycyclic Aromatic Hydrocarbon, Total Organic Carbon, Faecal Coliform, E.coli	Monthly	Class III of MMWQS
Ambient air quality	5	PM10 (24 hrs), PM2.5 (24 hrs), Sulphur dioxide (SO <sub>2</sub> ), Nitrogen oxides (NO <sub>2</sub> ), CO, Ozone, Total Petroleum Hydrocarbon (TPH), BTEX, Hydrogen Sulfide (H <sub>2</sub> S)	Monthly	MAAQS 2013
Ambient noise level	5	Leq, L10, L90, Lmax, Lmin	Monthly	Schedules 1 & 6 of the Guidelines for Environmental Noise Limits & Control, 2019

## Proposed Monitoring Program during Operation Stage (Onshore)

No. of Sample	Parameters	Frequency	Compliance	
Surface water quality (high tide and low tide)	6	Temperature (in-situ), pH (in-situ), Dissolved Oxygen (in situ), Turbidity, Salinity, Total Suspended Solids, Unionised Ammonia (as NH <sub>3</sub> ), Nitrate (as NO <sub>3</sub> ), Phosphate (as PO <sub>4</sub> ), Cadmium (Cd), Chromium, Hexavalent (Cr <sup>6+</sup> ), Mercury (Hg), Copper (Cu), Lead (Pb), Zinc (Zn), Barium (Ba), Iron (Fe), Nickel (Ni), Vanadium (V), Cobalt (Co), Aluminium (Al), Cyanide (CN), Oil and Grease, Total Hydrocarbon, Polycyclic Aromatic Hydrocarbon, Total Organic Carbon, Faecal Coliform, E.coli	Monthly	Class III of MMWQS
Ambient air quality	5	PM10 (24 hrs), PM2.5 (24 hrs), Sulphur dioxide (SO <sub>2</sub> ), Nitrogen oxides (NO <sub>2</sub> ), CO, Ozone, Total Petroleum Hydrocarbon (TPH), BTEX, Hydrogen Sulfide (H <sub>2</sub> S)	Monthly	MAAQS 2013
Ambient noise level	5	Leq, L10, L90, Lmax, Lmin	Monthly	Schedules 1 & 6 of the Guidelines for Environmental Noise Limits & Control, 2019
Groundwater	2	pH (in-situ), Dissolved Oxygen (in-situ), Temperature (in-situ), LNAPL/DNAPL Detection (in situ), Alkalinity, Conductivity, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Oil and Grease, Chemical Oxygen Demand (COD), Total Organic Carbon (TOC), Total Petroleum Hydrocarbon, Volatile Organic Compounds, BTEX, Chlorinated Hydrocarbon, Polycyclic Aromatic Hydrocarbon (PAH), Chloride, Sulphate (SO <sub>4</sub> ), Mercury (Hg), Cadmium (Cd), Lead (Pb), Chromium, Hexavalent (Cr <sup>6+</sup> ), Copper (Cu), Nickel (Ni), Zinc (Zn), Arsenic (As), Selenium, Silver (Ag), Silica (SiO <sub>2</sub> ), Iron (Fe), Manganese (Mn), Hardness, Cyanide (CN <sup>-</sup> ), E.coli	Annually	Groundwater Quality Standards- for Industrial Use  Contaminated Land Management and Control Guidelines No.1: Malaysian Recommended Site Screening Levels for Contaminated Land – SSL (Tap Water)

### Study Findings

The proposed Project will not result in any significant impacts if appropriate mitigating measures are implemented followed by environmental management plan, environmental monitoring and environmental auditing.