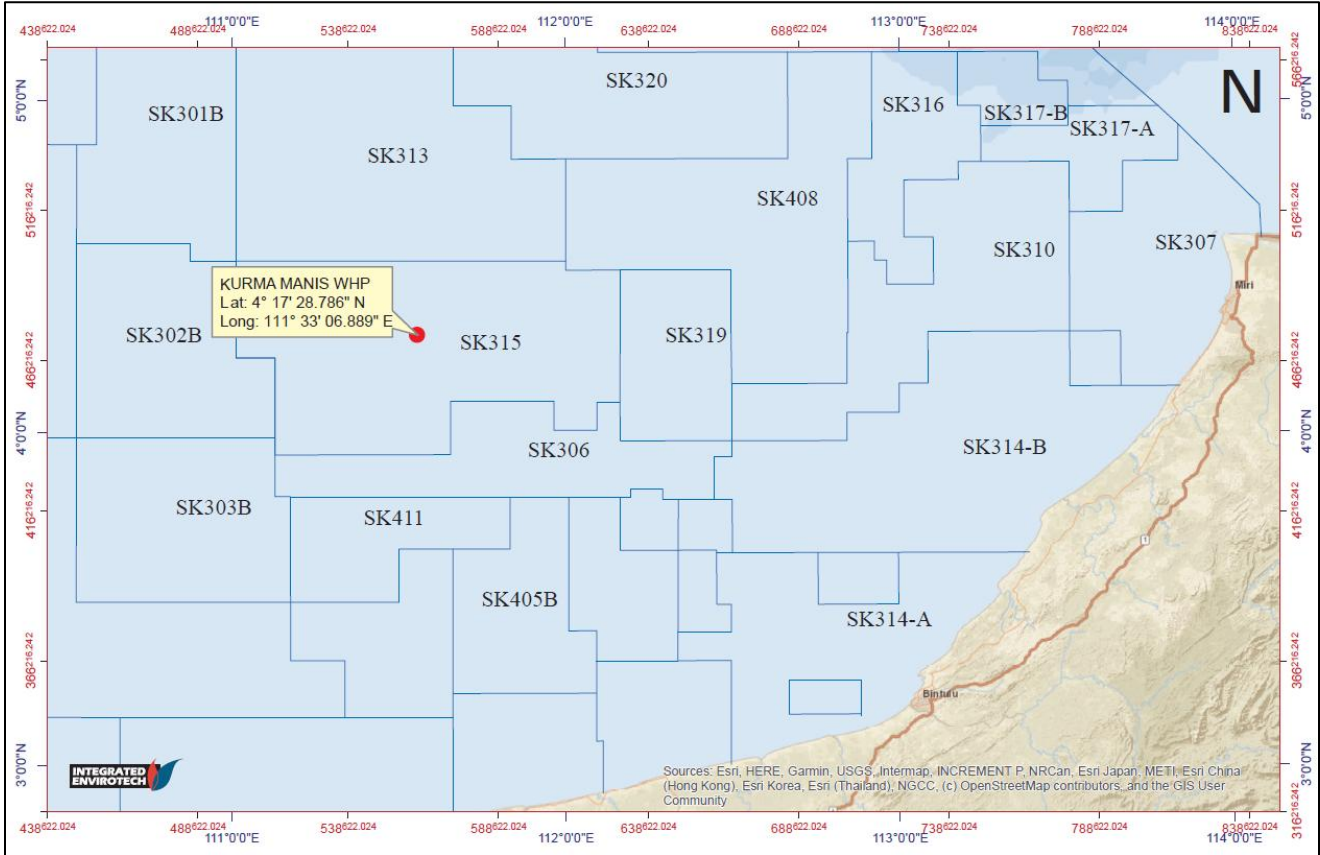


# ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PROJECT PROPONENT:  
VESTIGO PETROLEUM SDN. BHD.



## ENVIRONMENTAL IMPACT ASSESSMENT FOR KURMA MANIS FIELD DEVELOPMENT PROJECT, OFFSHORE SARAWAK (VOLUME 1 – MAIN REPORT)



## ENVIRONMENTAL IMPACT ASSESSMENT FOR KURMA MANIS FIELD DEVELOPMENT PROJECT, OFFSHORE SARAWAK

Project Proponent:



VESTIGO PETROLEUM SDN. BHD. (VPSB)

Main Contractor:



BUREAU  
VERITAS

BUREAU VERITAS (MALAYSIA) SDN. BHD.

Qualified Person:



INTEGRATED ENVIROTECH SDN. BHD. (IESB)

### Project Overview

- VPSB intends to develop the Kurma Manis Field located within Block SK315. The field lies approximately 200 km offshore from Bintulu, Sarawak, at water depths ranging from 70 to 80 m.
- The proposed development is intended to unlock the gas potential of Kurma Manis Field and sustain gas supply to the existing Kumang Hub through a tie-back arrangement, thereby supporting continued gas production within the Kumang Cluster.
- The development of Kurma Manis Field is designed for 10-year operational life with an expected production capacity of approximately 40 MMscfd.
- The First Gas Delivery is targeted for September 2026, following the completion of drilling, installation and commissioning activities.

### Legislative Requirement

- Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 2015
- First Schedule: Item 9: Petroleum
  - (a)[ii]): Development of gas field
  - (b)[i]): Construction of 30 kilometres or more in length of offshore pipelines.

### Statement of Need

- The need for the Kurma Manis Field Development Project arises from the following key considerations:
  - Resource monetization: To unlock and commercialize the gas reserves in Block SK315 efficiently and economically.
  - Production sustainability: To contribute to the continuity of gas production within the Kumang Cluster over the project lifecycle.
  - Infrastructure integration: To connect the proposed field development with existing production and processing facilities within the Kumang Cluster.

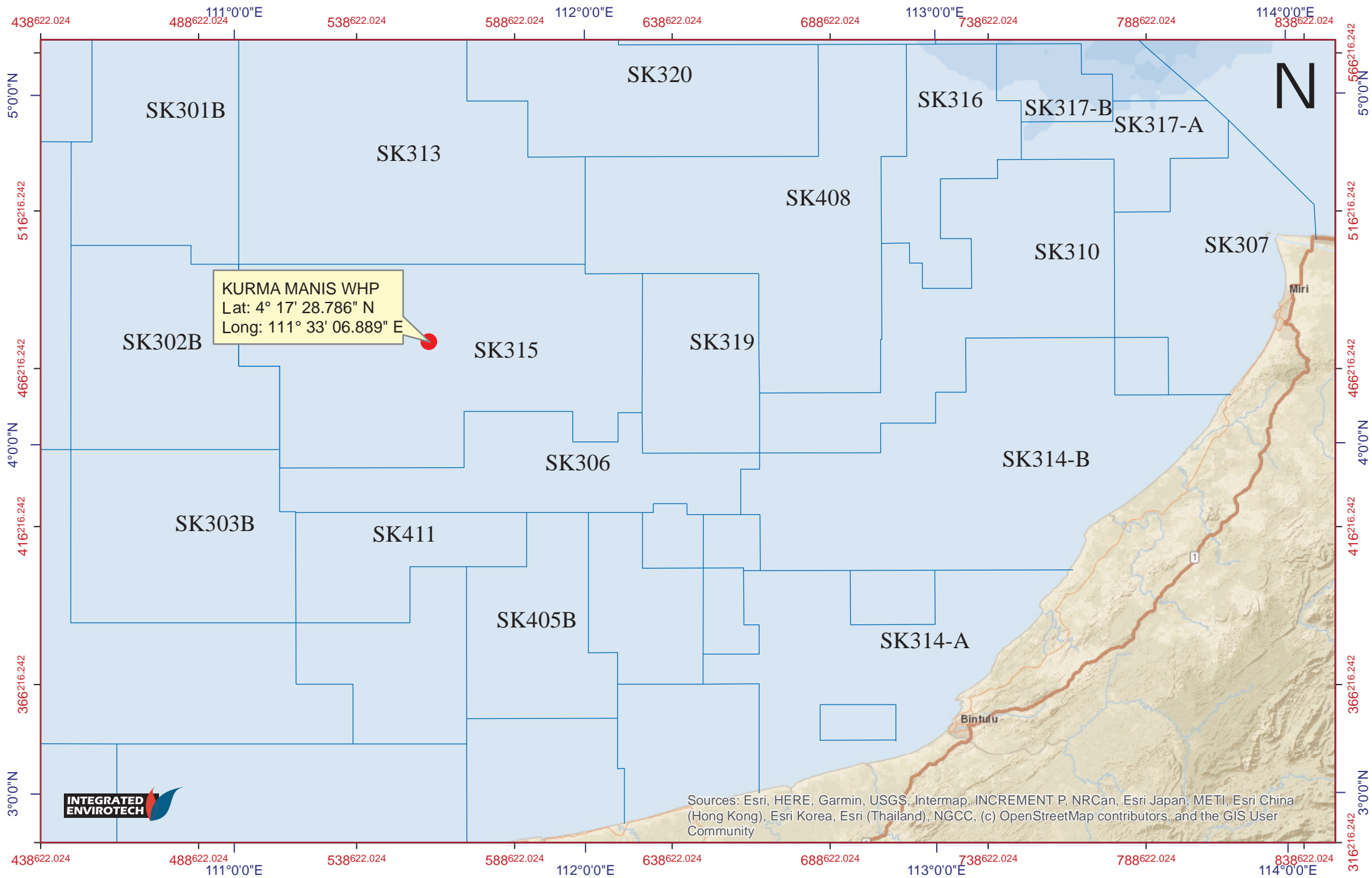


Figure ES-1: Location of the Project Site

# Project Description

## Development Concept

- The development concept for Kurma Manis Field consists of installation of new facilities / utilities (greenfield) and modification of existing facilities / utilities (brownfield) to enable gas production and evacuation within the Kumang Cluster.
- The Project involves the installation of 1 new Wellhead Platform (WHP) with 3 gas production wells and 3 future provision slots. A 12-inch diameter subsea pipeline of approximately 32 km will be installed and tied back to the existing Kumang East Platform (KUJT-A). Produced gas will be commingled at KUJT-A prior to being transported to the Kumang Hub (KAKG-A) for processing and export.
- No gas processing will be carried out at the Kurma Manis Field.

New Facility / Utility	Existing Facility
<p><b><u>Kurma Manis Field</u></b></p> <ul style="list-style-type: none"> <li>• Installation of:               <ul style="list-style-type: none"> <li>○ 1 new WHP named as Kurma Manis WHP with 6 slots, comprising of 3 gas production wells and 3 provision slots.</li> <li>○ 1 new 32 km of 12-inch rigid pipeline from Kurma Manis WHP to Kumang East WHP (KUJT-A).</li> <li>○ Vertical pig launcher.</li> <li>○ Solar Panel &amp; Wind Turbine (Main Power) and Diesel Engine Generator.</li> </ul> </li> </ul>	<p><b><u>Modification at Kumang East WHP (KUJT-A)</u></b></p> <ul style="list-style-type: none"> <li>• Installation of new riser and receiver at existing KUJT-A cellar deck.</li> <li>• Tie-in works to the existing KUJT-A.</li> </ul>

## Coordinates of Kurma Manis WHP and KUJT-A

Location	Timbalai 1984 / UTM Zone 49N			
	Geographical Coordinates		Grid Coordinates	
	Latitude (N)	Longitude (E)	Northing (m)	Easting (m)
<b>New Facility</b>				
<b>Kurma Manis WHP</b>	04°17'28.786"	111°33'06.889"	474 316.37	561 236.03
<b>Existing Facility</b>				
<b>Kumang East WHP (KUJT-A)</b>	04°26'17.821"	111°47'42.623"	490 671.56	587 831.75

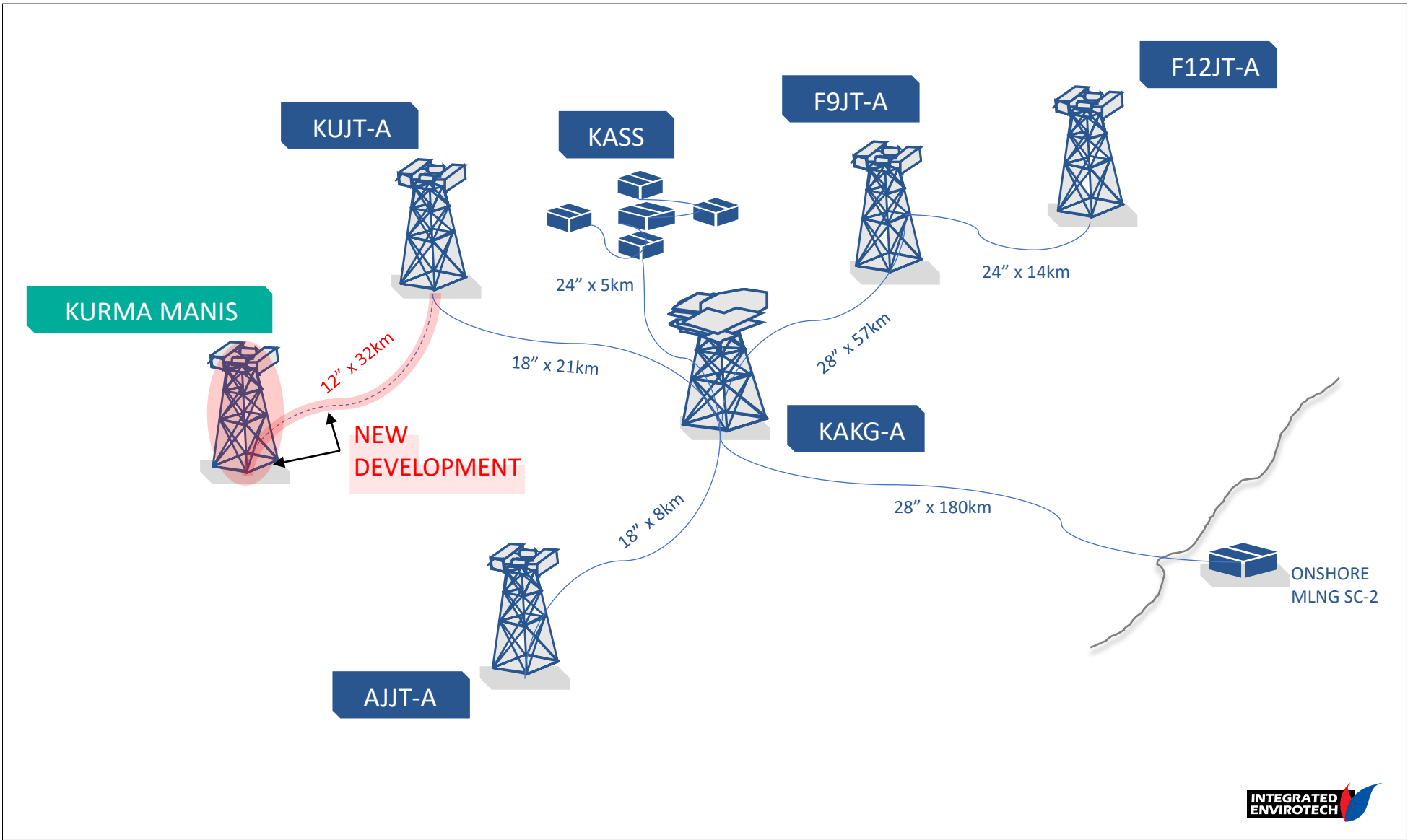
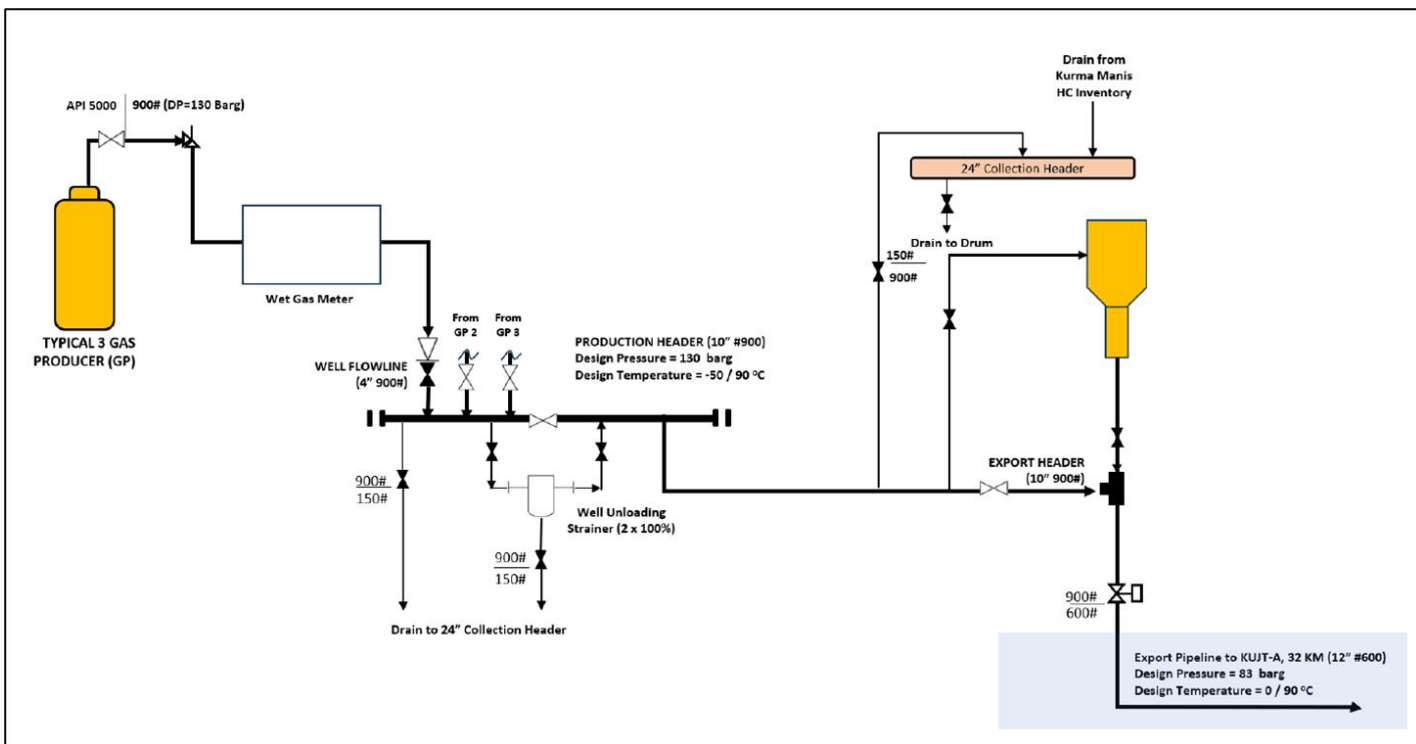


Figure ES-2: Development Concept of Surface Facilities

## Process Description

- The process flow for the Kurma Manis Field Development involves the production of raw gas at the Kurma Manis WHP and export of the gas via a subsea pipeline to the KUJT-A.
- Production from 3 gas production wells will be routed through individual wellhead flowlines and controlled at the wellhead prior to entering the production header.
- Wet gas metering will be provided at the WHP for production monitoring purposes.
- No hydrocarbon separation, dehydration or treatment facilities will be installed at the Kurma Manis WHP.
- During well start-up or well unloading activities, temporary well unloading strainers will be provided. Any drained fluids generated during these activities will be routed to the closed drain system.
- The combined gas stream from the production header will be routed to the export header and subsequently evacuated from the Kurma Manis WHP via a new 32 km, 12-inch pipeline to KUJT-A.
- The exported gas will be integrated into the existing Kumang production system at KUJT-A and routed via existing infrastructure for further processing and export.

Figure ES-3: Process Flow Diagram for Kurma Manis WHP



# Project Activities

## 1) Onshore Fabrication

- Fabrication of wellhead platform, pipelines, riser, deck extension, jacket and topsides as well as associated structural, mechanical, electrical and piping components will be done at an onshore fabrication yard and will be transported to the offshore site for subsequent installation activities.

## 2) Offshore Installation

- Installation of Kurma Manis WHP involves offshore transportation & installation of platform substructure & topsides. The substructure will be positioned on the seabed and secured using piling systems, followed by installation of the topsides using a heavy lift vessel.
- Export pipeline installation involves installation of a 12" diameter subsea pipeline connecting the Kurma Manis WHP to the existing KUJT-A, using a dedicated pipelay vessel & supported by marine support vessels. The works include pipelay along the defined pipeline route, pipeline approach and tie-in at Kurma Manis WHP and KUJT-A, as well as associated offshore testing and pre-commissioning activities.

## 3) Hook-up, Testing & Commissioning

- Hook-up & commissioning at Kurma Manis WHP comprise final equipment connections & system testing to ensure readiness for drilling and production, with no hydrocarbon processing or treatment facilities commissioned.
- Hook-up & commissioning of export pipeline include final tie-in at Kurma Manis WHP & KUJT-A, pre-commissioning & hydrotesting to ensure the pipeline is fit for service, followed by dewatering and inerting activities.
- Upon completion, the pipeline will be ready to transport full well stream gas from the WHP to KUJT-A.

## 4) Drilling

- Drilling campaign generally comprise the following key activities:
  - Mobilization of the jack-up rig & associated support vessels to the drilling location
  - Positioning & jacking-up of the rig at the drilling site
  - drilling of surface, Intermediate & production hole sections
  - Installation & cementing of casing strings
  - Well completion & testing activities
  - Demobilization of the rig upon completion of drilling works.

## 5) Operation & Maintenance

- Operation & maintenance phase involves routine production & export of gas from the unmanned Kurma Manis WHP to KUJT-A, with remote monitoring and control from KAKG-A.
- No separation, dehydration, treatment or compression will be carried out at the Kurma Manis WHP.
- Routine maintenance & inspections will be conducted bi-weekly to ensure safe operation of Kurma Manis WHP, wells & associated facilities.

## 6) Decommissioning & Abandonment

- All facilities will be decommissioned in compliance with DOE Environmental Guidelines for Decommissioning of Oil and Gas Facilities in Malaysia, 2019.

## Physical Environment

### Bathymetry, Seabed Morphology, Sediment Type and Seabed Features

- **Proposed Kurma Manis WHP:**
  - Water depth: ~78.8 m.
  - Seabed morphology: Flat and smooth.
  - Seabed sediment: Very soft clay.
  - Seabed features: Seabed depression, pockmark cluster, isolated pockmark, drilling borehole marks and seabed scar.

### Oceanography

- **Sea current:** In the South China Sea (SCS), surface current patterns are largely controlled by the regional monsoon system.
- **Tide levels:** Tide levels in the South China Sea (SCS) are primarily co-oscillating tides originating from tidal waves propagating from the Pacific Ocean, mainly through the Bashi Channel and the Taiwan Strait.
- **Waves:** Wave conditions in the South China Sea are predominantly governed by regional monsoonal wind systems.

### Meteorology

#### Meteorological conditions in Bintulu for Year 2015 - 2024

- Rainfall: 54.2 mm to 795.4 mm
- Evaporation: 2.9 mm to 4.3 mm
- Temperature: 25.3°C to 28.1°C
- Relative humidity: 82.4% to 95.9%

#### Wind data recorded at Bintulu MMD station from Year 2020 - 2024

- Wind speed & direction: Wind rose pattern indicates that the prevailing winds from 2020 to 2024 were predominantly from the east, southeast and northwest. Mean wind speeds were generally low, ranging from 1.4 m/s to 2.9 m/s.

## Environmental Baseline Survey

### Seawater Quality

- **No. of station monitored:** 12 stations (top, middle and bottom layers)
- **Parameters measured:** Temperature, pH, salinity, conductivity, dissolved oxygen, turbidity, total suspended solid, oil and grease, total organic carbon, ammoniacal nitrogen, total nitrogen, nitrate nitrogen, total phosphate, barium, arsenic, cadmium, chromium, copper, cobalt, iron, lead, mercury, nickel, vanadium, zinc, total hydrocarbon, total petroleum hydrocarbon (C5-C6, C6-C9, C10-C14, C15-C28, C29-C36)
- All parameters monitored were within the stipulated limits as per the Class 3 of Malaysian Marine Water Quality Standards (MMWQS).

### Seabed Sediment Quality

- **No. of station monitored:** 12 stations
- **Parameters measured:** Redox potential, particle size distribution, arsenic, barium, cadmium, chromium, copper, cobalt, iron, lead, mercury, nickel, vanadium, zinc, oil & grease, total organic carbon, total hydrocarbon, total petroleum hydrocarbon (C5-C6, C6-C9, C10-C14, C15-C28, C29-C36)
- All parameters monitored were within the standard limits suggested by US NOAA SQiRTs except for barium (exceeded both TEL and AET), lead (exceeded TEL), nickel (exceeded TEL) and zinc (exceeded TEL).

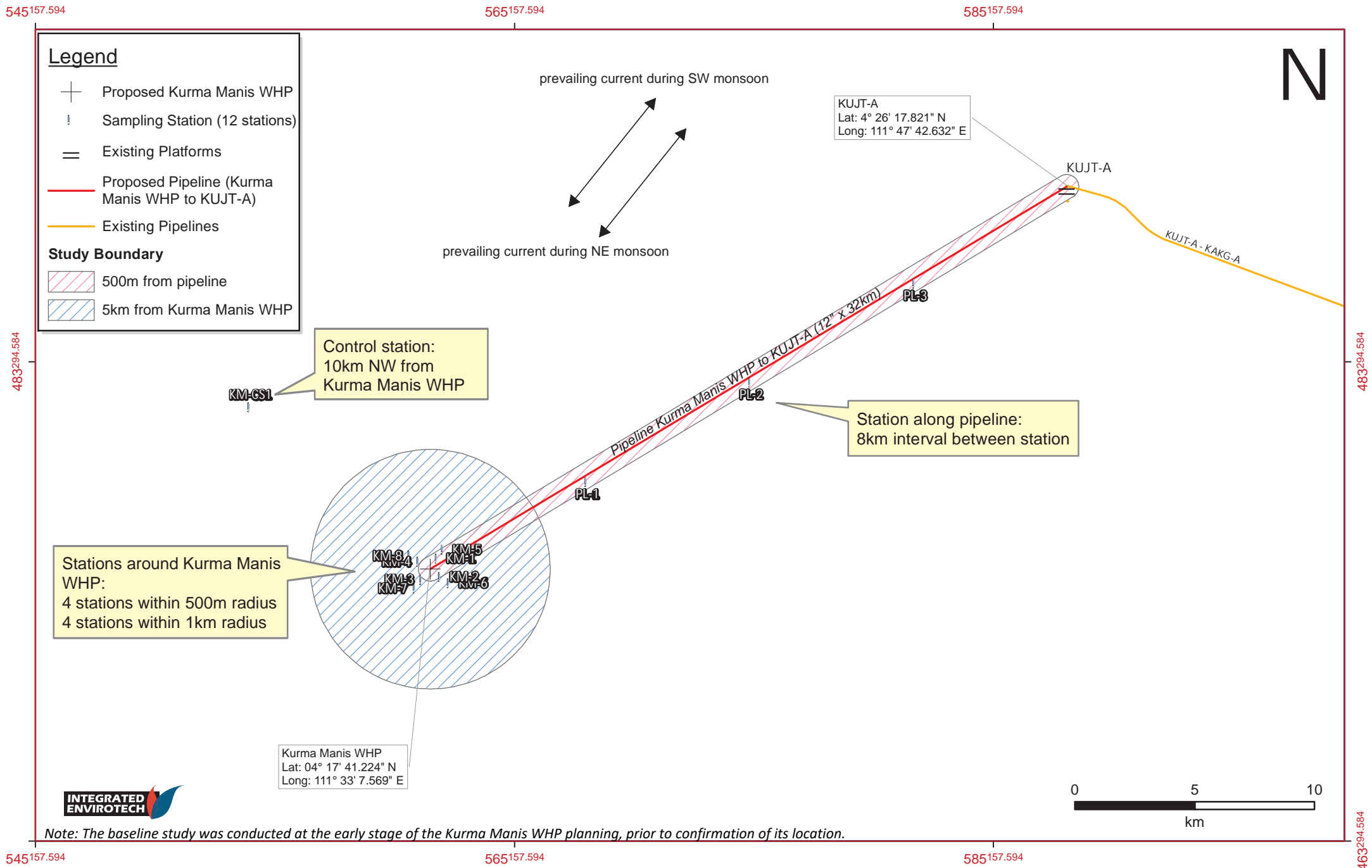


Figure ES-4: Seawater and Seabed Sediment Sampling Stations for Kurma Manis Field

# Existing Environment

## Marine Biology

- **Parameters measured:** chlorophyll-a, phytoplankton, zooplankton and macrobenthos.
- Chlorophyll-a concentrations: <0.001 mg/m<sup>3</sup> for top, middle and bottom layers of water column.

Parameter	Phytoplankton	Zooplankton	Macrobenthos
No. of Species	39	32	77
Total Densities	24.69 units/L to 91.47 units/L	0.33 units/L to 3.33 units/L	105.56 units/m <sup>2</sup> to 223.33 units/m <sup>2</sup>
Diversity Index	1.563 – 2.287	1.480 – 2.628	2.258 – 2.816
Evenness Index	0.541 – 0.740	0.534 – 0.837	0.777 – 0.921

- There were no sightings of marine mammals and marine reptiles around the Kurma Manis Field during the offshore survey conducted between 9<sup>th</sup> and 25<sup>th</sup> November 2025.

## Human Environment

## Landuse

- Sarawak is the largest state in Malaysia covering an area of approximately 124,170.8 km<sup>2</sup> bordering Kalimantan in the south and Brunei in the northeast.
- Within Sarawak, Bintulu Division is one of the larger administrative divisions, covering an area of approximately 12,166.2 km<sup>2</sup>.
- The division comprises 2 administrative districts, namely Bintulu and Tatau and 1 sub-district, namely Sebauh.
- Bintulu District is one of the major industrial and economic centres in Sarawak, characterized by a combination of urban development, heavy industry, rural settlements and extensive forested areas.
- The existing land-use pattern reflects its strategic role as an energy, petrochemical and port hub, while still supporting traditional livelihoods and natural ecosystems.

## Population & Demography

- The population of Sarawak increased from 2,517,500 in 2024 to 2,529,800 in 2025, reflecting an annual growth rate of approximately 0.5%.
- Bintulu District recorded an estimated population of approximately 189,000 persons in 2024, which increased marginally to about 190,100 persons in 2025.

Citizenship	2024	2025 <sup>P</sup>
Citizens	167,900	169,200
Non-Citizens	21,100	20,900

Ethnic Group of Citizens	2024	2025 <sup>P</sup>
Bumiputera	79.2	79.2
Malay	15.2	15.2
Other Bumiputera	64.0	64.0
Chinese	20.3	20.2
Indians	0.2	0.2
Others	0.3	0.4

# Evaluation of Impacts & Mitigation Measures



## Non-Scheduled & Scheduled Waste

### Fabrication Phase

- Improper handling of industrial wastes
  - Public Health
  - Personnel Safety

### Env. Risk

Low

### Mitigation Measures

- Segregate waste by type.
- Provide suitable container for solid wastes.
- Dispose of wastes only at approved facilities.

### Fabrication Phase

- Scheduled wastes generated from the fabrication activities at fabrication yard
  - Inappropriate disposal may pollute the environment

### Env. Risk

Moderate

### Mitigation Measures

- Minimize waste at the source and recycle where possible.
- Dispose of wastes only at DOE approved sites.
- Develop a Waste Management Plan.

### Installation Phase

- Disposal of food waste from the work barges
  - Increase in organic matter content in seawater column
  - Provide nutrient for fish

### Env. Risk

Beneficial

### Mitigation Measures

- Macerate food waste from barges and vessels before disposal into the sea.
- Conduct regular maintenance on the macerator.
- If the macerator is not functioning, cut the food waste into small pieces before disposal into the sea.

### Installation Phase

- Industrial wastes generated from the activities on the work barges and vessels
  - Inappropriate disposal may potentially foul/contaminate the marine environment

### Env. Risk

Low

### Mitigation Measures

- Segregate waste by type.
- Provide suitable container for solid wastes.
- Dispose of wastes only at approved facilities.

### Installation Phase

- Scheduled wastes generated from the activities on the work barges
  - Inappropriate disposal may pollute the marine environment

### Env. Risk

Low

### Mitigation Measures

- Minimize waste at the source and recycle where possible.
- Dispose of wastes only at DOE approved sites.
- Develop a Waste Management Plan

# Evaluation of Impacts & Mitigation Measures



## Non-Scheduled & Scheduled Waste

### Drilling Phase

- Disposal of food waste from the support vessels and drilling rig
  - Increase in organic matter content in seawater column
  - Provide nutrient for fish

### Env. Risk

Beneficial

### Mitigation Measures

- Macerate food waste from barges and vessels before disposal into the sea.
- Conduct regular maintenance on the macerator.
- If the macerator is not functioning, cut the food waste into small pieces before disposal into the sea.

### Drilling Phase

- Industrial wastes generated from the activities on the work barges and rig
  - Inappropriate disposal may potentially foul/contaminate the marine environment

### Env. Risk

Low

### Mitigation Measures

- Segregate waste by type.
- Provide suitable container for solid wastes.
- Dispose of wastes only at approved facilities.

### Drilling Phase

- Scheduled wastes generated from the activities during drilling phase
  - Inappropriate disposal may pollute the marine environment

### Env. Risk

Low

### Mitigation Measures

- Minimize waste at the source and recycle where possible.
- Dispose of wastes only at DOE approved sites.
- Develop a Waste Management Plan

### Operation & Maintenance Phase

- Non-scheduled wastes generated from the activities during the operational phase
  - Inappropriate disposal may potentially foul/contaminate the marine environment

### Env. Risk

Low

### Mitigation Measures

- Segregate waste by type.
- Provide suitable container for solid wastes.
- Dispose of wastes only at approved facilities.

### Operation & Maintenance Phase

- Scheduled wastes generated from the maintenance and operational activities at Kurma Manis WHP
  - Inappropriate disposal may pollute the marine environment

### Env. Risk

Low

### Mitigation Measures

- Minimize waste at the source and recycle where possible.
- Dispose of wastes only at DOE approved sites.
- Develop a Waste Management Plan

# Evaluation of Impacts & Mitigation Measures



## Aqueous Effluent

### Installation Phase

- Discharge of sewage from work barges and vessels
  - Increase in inorganic matter content in seawater column
  - Harmful to marine organisms

### Env. Risk

Low

### Mitigation Measures

- Work barges and vessels shall comply with MARPOL 73/78 Annex IV – Regulations for the Prevention of Pollution by Sewage from Ships;
- Prevent direct discharge of untreated sewage and sullage from work barges and vessels into waterways; and
- Conduct regular preventive maintenance on the sewage treatment system to ensure its effectiveness.

### Installation Phase

- Discharge of oily water from work barges and vessels
  - Marine water (pollution)
  - Harmful to marine organisms

### Env. Risk

Low

### Mitigation Measures

- Avoid direct release of oily water from work barges and vessels into waterways.
- Keep the Oil Record Book readily available on work barges and vessels.
- Take immediate action to stop the release of oil into the environment and minimize its environmental impact.

### Hook-up, Testing & Commissioning Phase

- Discharge of sewage from work barges and vessels
  - Increase in organic matter content in seawater column

### Env. Risk

Low

### Mitigation Measures

- Work barges and vessels shall comply with MARPOL 73/78 Annex IV – Regulations for the Prevention of Pollution by Sewage from Ships;
- Prevent direct discharge of untreated sewage and sullage from work barges and vessels into waterways; and
- Conduct regular preventive maintenance on the sewage treatment system to ensure its effectiveness.

### Hook-up, Testing & Commissioning Phase

- Pipeline Integrity Testing
  - Biocide may kill small marine organisms

### Env. Risk

Low

### Mitigation Measures

- Minimized the quantity of chemicals used.
- Store leftover chemicals properly for safe disposal.
- Discharge hydrotest water at a rate that promotes rapid dispersion;

# Evaluation of Impacts & Mitigation Measures



## Aqueous Effluent

### Drilling Phase

- Discharge of sewage from drilling rig and support vessels
  - Increase in organic matter content in seawater column

### Env. Risk

Low

### Mitigation Measures

- Support vessels shall comply with MARPOL 73/78 Annex IV – Regulations for the Prevention of Pollution by Sewage from Ships;
- Prevent direct discharge of untreated sewage and sullage from drilling rig and support vessels into waterways; and
- Conduct regular preventive maintenance on the sewage treatment system to ensure its effectiveness.

### Drilling Phase

- Discharge of oily water from support vessels and drilling rig
  - Marine water pollution
  - Harmful to marine organisms

### Env. Risk

Low

### Mitigation Measures

- Avoid direct release of oily water from support vessels and drilling rig into waterways.
- Keep the Oil Record Book readily available on support vessels.
- Take immediate action to stop the release of oil into the environment and minimize its environmental impact.

### Operation & Maintenance Phase

- Discharge of non-hazardous effluent at Kurma Manis WHP
  - Marine water pollution

### Env. Risk

Low

### Mitigation Measures

- Maintain segregation of hazardous and non-hazardous drains to prevent cross-contamination.
- Conduct routine housekeeping on deck areas to minimize oil, grease and debris accumulation prior to wash-down;
- Conduct regular inspection and maintenance of open drain systems to prevent blockages and uncontrolled discharges.

### Operation & Maintenance Phase

- Discharge of oily water from support vessels
  - Marine water pollution
  - Harmful to marine organisms

### Env. Risk

Low

### Mitigation Measures

- Prevent direct discharge of oily water from support vessels into waterways
- Suspend operations as soon as practicable if continuation may cause or is likely to cause hydrocarbon spills into the environment.
- Take immediate action to stop oil releases and minimize environmental impacts.

# Evaluation of Impacts & Mitigation Measures



## Air Emissions

<p><b>Offshore Installation Phase</b></p> <ul style="list-style-type: none"> <li>Power generation for vessel/boat                             <ul style="list-style-type: none"> <li>➤ Global warming</li> <li>➤ Acid rain</li> </ul> </li> </ul>	<p><b>Env. Risk</b></p> <p>Low</p>	<p><b>Mitigation Measures</b></p> <ul style="list-style-type: none"> <li>Optimize the installation schedule to reduce air emissions from the installation vessels.</li> <li>Optimise supply and support operations/logistics to minimize operational time.</li> <li>Maintain all engines and fuel burning equipment to achieve efficient performance.</li> </ul>
<p><b>Hook-up, Testing &amp; Commissioning Phase</b></p> <ul style="list-style-type: none"> <li>Power generation for vessel/boat                             <ul style="list-style-type: none"> <li>➤ Global warming</li> <li>➤ Acid rain</li> </ul> </li> </ul>	<p><b>Env. Risk</b></p> <p>Low</p>	<p><b>Mitigation Measures</b></p> <ul style="list-style-type: none"> <li>Vessels shall comply with MARPOL 73/78 Annex VI – Regulations for the Prevention of Air Pollution from Ships.</li> <li>Maintain all engines and fuel burning equipment to achieve efficient performance.</li> </ul>
<p><b>Drilling Phase</b></p> <ul style="list-style-type: none"> <li>Well testing                             <ul style="list-style-type: none"> <li>➤ Global warming</li> <li>➤ Acid rain</li> </ul> </li> </ul>	<p><b>Env. Risk</b></p> <p>Low</p>	<p><b>Mitigation Measures</b></p> <ul style="list-style-type: none"> <li>Control hydrocarbon releases during well testing.</li> </ul>
<p><b>Drilling Phase</b></p> <ul style="list-style-type: none"> <li>Power generation for support vessel and drilling rig                             <ul style="list-style-type: none"> <li>➤ Global warming</li> <li>➤ Acid rain</li> </ul> </li> </ul>	<p><b>Env. Risk</b></p> <p>Low</p>	<p><b>Mitigation Measures</b></p> <ul style="list-style-type: none"> <li>Rig and other supporting vessels are contracted from third parties. VPSB to incorporate all the clauses into the contract with the following requirements:                             <ul style="list-style-type: none"> <li>○ Conform to MARPOL 73/78 Annex VI – Regulations for the Prevention of Air Pollution from Ships;</li> <li>○ Regularly maintain the engines to achieve high combustion efficiency; and</li> <li>○ Use low-sulphur diesel fuel</li> </ul> </li> </ul>
<p><b>Operation &amp; Maintenance Phase</b></p> <ul style="list-style-type: none"> <li>Exhaust emissions from power generators and support vessels at Kurma Manis WHP                             <ul style="list-style-type: none"> <li>➤ Global warming</li> <li>➤ Acid rain</li> </ul> </li> </ul>	<p><b>Env. Risk</b></p> <p>Low</p>	<p><b>Mitigation Measures</b></p> <ul style="list-style-type: none"> <li>Take precautionary steps to minimize GHG emissions from major engines on board vessels or other emission sources.</li> <li>Optimise the installation schedule to reduce air emissions from the installation vessels.</li> <li>Optimise supply and support operations/logistics to minimize operational time.</li> </ul>

# Evaluation of Impacts & Mitigation Measures



## Seabed Disturbance

### Installation Phase

- Deployment of anchors, installation of submerged structures and pipelines
  - Disturb the macrobenthos community

### Env. Risk

Moderate

### Mitigation Measures

- Plan the installation carefully to minimize the duration and disturbance to the biological community within the Kurma Manis Field area.
- Pre-determined the location of anchor deployment to minimize the seabed disturbance.
- Retrieve all material or debris from the seabed prior to exiting the site.

### Drilling Phase

- Deployment of anchors
  - Disturb the macrobenthos community

### Env. Risk

Moderate

### Mitigation Measures

- Avoid soft ground areas that are prone to anchor dragging.
- Adhere to the approved anchor pattern and anchor handling procedure.
- Follow rig positioning procedure.



## Noise

### Installation Phase

- Piling and platform, vessels and equipment noises during installation activity
  - Interference to human and fish sensory systems

### Env. Risk

Low

### Mitigation Measures

- Use appropriate PPE (i.e. hearing protection devices).
- Conduct regular inspection and maintenance of all equipment.
- Install signage to indicate high-noise areas.



## Drilling Cuttings/ Used Drilling Mud

### Drilling Phase

- Disposal of drill cutting and drilling mud
  - Disturbance to the macrobenthos community

### Env. Risk

Moderate

### Mitigation Measures

- Use only water-based mud (WBM) or fluids and low-toxicity synthetic oil-based mud (SOBM) or fluids for drilling.
- Send excess cement to shore for disposal.
- Follow Standard Operating Procedure (SOP) for cement handling.

# Evaluation of Impacts & Mitigation Measures



## Interaction with Merchant Shipping & Other Users

Installation Phase	Env. Risk	Mitigation Measures
<ul style="list-style-type: none"> <li>Transportation of structures and equipment                             <ul style="list-style-type: none"> <li>➤ Interference with fishing and marine navigation activities</li> </ul> </li> </ul>	<div style="border: 1px solid #f4a460; padding: 5px; text-align: center;">Low</div>	<ul style="list-style-type: none"> <li>Avoid mobilization and transportation activities during adverse weather.</li> <li>Plan the work programme to optimize mobilization and transportation time.</li> <li>Deploy standby boat to warn fishing vessels from encroaching into the 500 m exclusion zone.</li> </ul>
Drilling Phase	Env. Risk	Mitigation Measures
<ul style="list-style-type: none"> <li>Towing and positioning the rig at the drilling site (Kurma Manis platform)                             <ul style="list-style-type: none"> <li>➤ Interference with fishing and marine navigation activities</li> </ul> </li> </ul>	<div style="border: 1px solid #4db6ac; padding: 5px; text-align: center;">Low</div>	<ul style="list-style-type: none"> <li>VPSB to notify local authority (e.g. Custom, Marine and Fisheries Department) prior to mobilization to ensure safe navigation and coordination with maritime traffic;</li> <li>VPSB to maintain communication with Malaysian Maritime Enforcement Agency (MMEA) for any emergency related to facilities security; and</li> <li>VPSB to comply with relevant requirements from government agencies such as Marine Department, Department of Lands and Surveys, Department of Ports and Harbours, Malaysian Maritime Enforcement Agency and etc.</li> </ul>
Operation & Maintenance Phase	Env. Risk	Mitigation Measures
<ul style="list-style-type: none"> <li>Presence of the new and existing physical structures (Kurma Manis WHP)                             <ul style="list-style-type: none"> <li>➤ Interference with navigation</li> </ul> </li> </ul>	<div style="border: 1px solid #c8e6c9; padding: 5px; text-align: center;">Low</div>	<ul style="list-style-type: none"> <li>Equip the facilities with safety devices such as navigation lights and platform lighting.</li> <li>Engage the radio operator with the facility standby vessel to chase away any foreign vessel approaching offshore facilities.</li> <li>VPSB to maintain communication with Malaysian Maritime Enforcement Agency (MMEA) for any emergency related to facilities security.</li> </ul>
Operation & Maintenance Phase	Env. Risk	Mitigation Measures
<ul style="list-style-type: none"> <li>Presence of the new and existing physical structures (Kurma Manis WHP)                             <ul style="list-style-type: none"> <li>➤ Interference with fishing activities</li> </ul> </li> </ul>	<div style="border: 1px solid #c8e6c9; padding: 5px; text-align: center;">Low</div>	<ul style="list-style-type: none"> <li>VPSB shall inform the relevant agencies (Fisheries and Marine Departments) of the location of the new structure to prevent fishermen from entering the exclusion zone.</li> </ul>

# Evaluation of Impacts & Mitigation Measures



## Abnormal Event

### Installation Phase

- Transportation of structures and equipment
  - Fatalities
  - Public health and safety
  - Harmful to fish and marine organisms

### Env. Risk

High

### Mitigation Measures

- Project activities shall be informed to Marine Authorities for issuance of Notice to Mariners to ensure navigational safety.
- Plan work execution during optimal weather conditions.
- Develop an Oil Spill Contingency Plan (OSCP).

### Drilling Phase

- Diesel and chemical spill/ leak from supply vessels, oil rig and storage tank
  - Marine pollution
  - Harmful to marine life

### Env. Risk

Moderate

### Mitigation Measures

- Implement bunkering procedures to prevent and control the occurrence of spills.
- Develop an Emergency Response Plan.
- Develop an Oil Spill Contingency and Response Plan.

### Drilling Phase

- Vessel collision
  - Fatalities
  - Public health and safety
  - Harmful to fish and marine organisms

### Env. Risk

High

### Mitigation Measures

- Equip vessels with radio, radar and GPS.
- Maintain close communication with external assistance and standby vessels.
- Reduce towing speed and adjust the length of tow wire.

### Drilling Phase

- Well blowout
  - Marine pollution
  - Harmful to fish and marine organisms
  - Disrupt the fishing activities and reduce the fish caught
  - Disrupt the navigation activities
  - Public Health and Safety
  - Fatalities

### Env. Risk

High

### Mitigation Measures

- Isolate the wellbore from the surface by activating the blowout preventers (BOP) and closing in the well.
- Use sufficient mud density to provides hydrostatic pressure in the wellbore greater than the formation/reservoir pressure.
- Use only certified BOPs

# Evaluation of Impacts & Mitigation Measures



## Abnormal Event

Operation & Maintenance Phase	Env. Risk	Mitigation Measures
<ul style="list-style-type: none"> <li>Diesel and chemical spill/ leak at Kurma Manis WHP                             <ul style="list-style-type: none"> <li>➤ Marine pollution</li> <li>➤ Harmful to marine life</li> </ul> </li> </ul>	Low	<ul style="list-style-type: none"> <li>Suspend operations as soon as practicable if continued activities pose a risk of hydrocarbon spillage into the environment.</li> <li>Take immediate action to stop the release of oil or chemicals and minimize environmental impacts.</li> <li>Develop an Emergency Response Plan.</li> </ul>
<ul style="list-style-type: none"> <li>Vessel collision                             <ul style="list-style-type: none"> <li>➤ Fatalities</li> <li>➤ Public Health and Safety</li> <li>➤ Harmful to fish and marine organisms</li> </ul> </li> </ul>	Low	<ul style="list-style-type: none"> <li>Establish a 500 m exclusion zone around the Kurma Manis Field facilities;</li> <li>Conduct an oil spill risk assessment prior to commencement of operations;</li> <li>Maintain and review an Oil Spill Contingency Plan (OSCP).</li> </ul>



## Ecological Effects

Operation & Maintenance Phase	Env. Risk	Mitigation Measures
<ul style="list-style-type: none"> <li>Presence of the new physical structure                             <ul style="list-style-type: none"> <li>➤ Localized increase in biodiversity</li> </ul> </li> </ul>	Beneficial	<ul style="list-style-type: none"> <li>The presence of new structures and pipelines provides shelters and creates new ecosystems for marine organisms in the area. Therefore, the Project is considered beneficial for marine ecology, and no mitigation measures are proposed for ecological impacts.</li> </ul>



## Abandonment / Decommissioning

Abandonment/ Decommissioning	Mitigation Measures
<ul style="list-style-type: none"> <li>All Project assets, including wells and associated offshore infrastructure that have reached the end of their useful life, shall be decommissioned and either dismantled and removed or abandoned in accordance with applicable regulatory requirements and approved decommissioning standards.</li> </ul>	<ul style="list-style-type: none"> <li>VPSB will consult the relevant authorities on the decommissioning requirements at least six (6) months prior to the decommissioning plan; and</li> <li>VPSB will ensure the abandoned structures will not pose danger to the user of the surrounding area.</li> </ul>

## Proposed Environmental Monitoring Plan for Kurma Manis Field Throughout All Project Phases

No.	Environmental Components	Parameter to be Monitored	Compliance / Standards	Monitoring Location	Frequency
1	Seawater Quality	<ul style="list-style-type: none"> <li>• Temperature, pH, Salinity, Conductivity, Dissolved Oxygen and Turbidity (in-situ measurement)</li> <li>• Total Suspended Solid</li> <li>• Total Organic Carbon</li> <li>• Nutrients (Ammoniacal Nitrogen, Total Nitrogen, Nitrate Nitrogen and Total Phosphate)</li> <li>• Metals (Barium, Arsenic, Cadmium, Chromium, Copper, Cobalt, Iron, Lead, Mercury, Nickel, Vanadium and Zinc)</li> <li>• Hydrocarbons (Oil and Grease, Total Hydrocarbon and Total Petroleum Hydrocarbon)</li> </ul>	<ul style="list-style-type: none"> <li>• Malaysian Marine Water Quality Standards (MMWQS) – Class 3</li> <li>• Baseline study</li> </ul>	<ul style="list-style-type: none"> <li>• 12 monitoring stations (refer to <b>Figure ES-5</b>)</li> </ul>	<ul style="list-style-type: none"> <li>• Once every five (5) years</li> </ul>
2	Seabed Sediment Quality	<ul style="list-style-type: none"> <li>• Redox Potential (in-situ measurement)</li> <li>• Particle Size Distribution</li> <li>• Metals (Arsenic, Barium, Cadmium, Chromium, Copper, Cobalt, Iron, Lead, Mercury, Nickel, Vanadium and Zinc)</li> <li>• Total Organic Carbon</li> <li>• Hydrocarbons (Oil and Grease, Total Hydrocarbon and Total Petroleum Hydrocarbon)</li> </ul>	<ul style="list-style-type: none"> <li>• National Oceanic and Atmospheric Administration (NOAA SQuIRTS)</li> <li>• Baseline study</li> </ul>		
3	Biological System	<ul style="list-style-type: none"> <li>• Chlorophyll-a</li> <li>• Phytoplankton</li> <li>• Zooplankton</li> <li>• Macrobenthos</li> </ul>	<ul style="list-style-type: none"> <li>• Baseline study</li> </ul>		

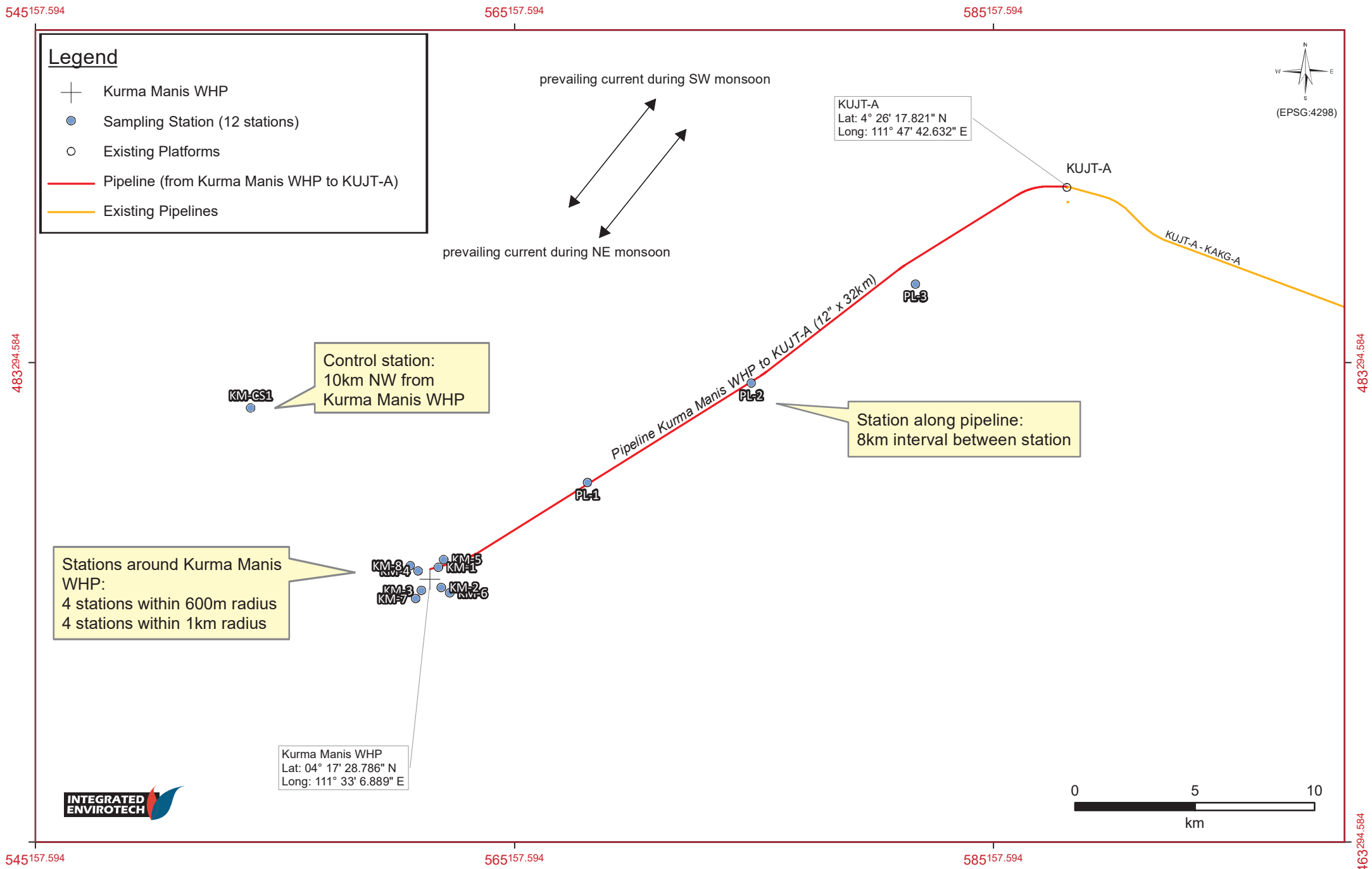


Figure ES-5: Proposed Seawater and Seabed Sediment Sampling Stations for Kurma Manis Field Throughout All Project Phases