

## EXECUTIVE SUMMARY

### I. INTRODUCTION

- The proposed development is known as the **PROPOSED HYDROCARBON STORAGE AND DISTRIBUTION TERMINAL AT TANJUNG BIN, JOHOR.**
- The proposed terminal is located within the new Tanjung Bin Petrochemical and Maritime Industries Development and occupies a total land area of 50 ha or 5,380,000 sq ft. The immediate requirement is to develop approximately 60% or 30 ha of the site for the storage and handling of fuel oil, distillates and gasoline in a Terminal with a capacity of at least 750,000 m<sup>3</sup>.
- The primary purpose of the terminal is to import fuel oil, distillates and gasolines into storage, provide added value services such as product blending and then re-export via sea-going tankers, barges and road tankers.

### II. PROJECT INITIATOR / CONSULTANT

- The Project is being initiated by ATT Tanjung Bin Sdn Bhd, a subsidiary of Vitol Tank Terminals International (VTTI).
- The environmental consultant commissioned to undertake the present EIA study is Environment Asia Sdn Bhd.
- The analytical laboratory engaged to carry out analysis of water quality, ambient air quality and noise levels is Chemical Laboratory (Malaysia) Sdn Bhd, a Skim Akreditasi Makmal Malaysia (SAMM) accredited laboratory.
- The objectives of the EIA study are to identify the potential adverse and beneficial impacts of the project activities on the environment and recommend mitigating measures to minimise the identified impacts to acceptable levels.

### III. STATEMENT OF NEED

- The proposed Project is the first within the Petrochemical and Maritime Industrial Park at Tanjung Bin and could possibly play an important role in being a catalyst for future growth and investment by related industries. The basic infrastructure of the terminal will require an injection of RM975 million by the project proponent. In addition, the completion of the petrochemical and maritime development by Seaport Worldwide is expected to attract a further RM10 billion in direct investment to the local economy and create about 10,000 jobs.
- The proposed project development is also in line with the aims outlined in the Local Plan 2002-2015 for the District of Pontian in the state of Johor which lists Tanjung Bin as being designated as the Industrial Center for Petrochemical and Maritime Development.
- In line with this vision, the proposed terminal facility based on Vitol's world-class operating standards will provide safe and efficient petroleum import, storage and distribution facilities with the highest regard to protecting the surrounding environment.
- The proposed Project will help ensure a stable supply and distribution of petroleum products to Vitol's trade partners in the region and contribute to the overall economic growth of the area.

#### **IV. LEGAL REQUIREMENTS**

- An Environmental Impact Assessment (EIA) is required under Section 34A of the Environmental Quality Act, 1974.
- The proposed Project is listed as a prescribed activity under Activity 12(e) - (Petroleum: Construction of product depots for the storage of petrol, gas or diesel which are located within 3km of any commercial, industrial or residential areas and which have a combined storage capacity of 60,000 barrels or more) in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987.

#### **V. PROJECT DESCRIPTION**

- The proposed site is located on part of Lot PTD1851 of the Petrochemical and Maritime Industrial Park at Tanjung Bin, Johor.
- The proposed terminal is about 50 hectares in area and, at the moment, is still a mangrove swamp pending the clearing and filling by Seaport Worldwide Sdn Bhd, the developer of the Petrochemical and Maritime Industrial Park.
- The facility will be constructed in accordance with Best Industry Practice to give a minimum design life of 40 years. The petroleum products that will be handled by the proposed terminal are fuel oil, gas oil, jet fuel, gasoline and MTBE (methyl tertiary butyl ether) which is a gasoline additive.
- The proposed terminal is expected to employ 40-45 staff and will be operational 24 hours a day on a 7 days work schedule.
- The proposed overall work schedule for the Project is 36 months commencing from October 2008 to October 2011. However, the actual construction period is expected to involve only 31 months commencing in July 2009 to October 2011.

#### **VI. PROJECT OPTIONS**

- In order to select the optimal choice of development, factors such as the Project's compatibility with surrounding landuse, relevance to national and local government strategy, policy for the area and the state, social economic values and the impacts to the natural environment have been taken into consideration.
- The Project site is on the western shoreline of Sg. Pulai and opposite the Port of Tanjung Pelepas. The accessibility provided by the river allows for the construction of jetties required for the pipeline transfer of petroleum products. The Project is also located at a strategic position straddling the Straits of Malacca and Singapore, an important and busy sea route between the Indian Ocean and the Pacific, providing it with an advantage to compete in the marine and offshore trading markets.
- The "No Project" option will leave the current site vacant and bring about a loss of potential economic returns to the Government.
- Alternative options such as the Pasir Gudang port area, Port Klang/Westport/Southport area and Singapore have also been considered and deemed not viable.
- Another operational option deliberated was the use of a single point mooring which was found not practical due to the variety of raw materials and products for transfer.
- The realignment of the jetty to be located closer to the shoreline was also not feasible as this would require more extensive dredging work as well as frequent maintenance work which would have a potentially more long term impact on the water quality and marine resources.

**VII. EXISTING ENVIRONMENT**

No.	Environmental Component	Description
<b>1.</b>	<b>Physical Environment</b>	
a.	Topography	<ul style="list-style-type: none"> <li>▪ The Project site is presently a flat low lying swamp and is regularly inundated during the high tides.</li> <li>▪ The site will be filled and platform levels brought up to +5m CD by the industrial park developer, Seaport Worldwide Sdn Bhd.</li> </ul>
b.	Hydrology & Streamflow	<ul style="list-style-type: none"> <li>▪ There are no water intake points located downstream of the Project Site. The existing drainage system near to the site comprises two rivers, i.e., Sg. Chengkeh Besar and Sg. Dinar.</li> <li>▪ Surface runoff flows into either of these two rivers before discharging into Sg. Pulai.</li> <li>▪ The water levels along Sg. Chengkeh Besar and Sg. Dinar are greatly influenced by the tides.</li> </ul>
c.	Geological Terrain	<ul style="list-style-type: none"> <li>▪ The geological profile of the Project consists of clay and silt (marine) deposits of the Quaternary geological period.</li> <li>▪ Structural geological features such as folding, foliation of faulting is not found at the site.</li> </ul>
d.	Soil	<ul style="list-style-type: none"> <li>▪ The soil within the Project site comprises the Keranji soil series.</li> </ul>
e.	Climate	<ul style="list-style-type: none"> <li>▪ The Project area has an equatorial climate with high relative humidity and uniform temperature throughout the year.</li> </ul>
f.	Landuse	<ul style="list-style-type: none"> <li>▪ The Project site is located on a vacant industrial lot within the designated Tanjung Bin Petrochemical and Maritime Industrial Park.</li> <li>▪ Directly adjacent and around the site, the landuse consist of vacant industrial lots while development outside of the Industrial Park that are already constructed or in the process of construction are the Asian Petroleum Hub, Tanjung Bin Power Station and the Port of Tanjung Pelepas.</li> <li>▪ The nearest waterway to the site is Sungai Pulai, located at the eastern boundary of the Project site while to the north is Sg Chengkeh Besar and to the south is Sg Dinar.</li> <li>▪ The closest sensitive receptor to the site is the nearby residential area of Kg. Sg. Chengkeh, located approximately 1.4 km away from the site boundary.</li> </ul>
g.	Water Quality	<ul style="list-style-type: none"> <li>▪ Water samples were collected from a total of six locations from three rivers, Sg. Chengkeh Besar, Sg. Dinar and Sg. Pulai; three samples from stations upstream of the Project site and the other three samples downstream of the Project site.</li> <li>▪ Water quality monitoring results for the rivers adjacent to the site indicated them to be listed as slightly polluted as the Water Quality Index (WQI) levels for all six stations fell under Class III of the WQI.</li> </ul>

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No.	Environmental Component	Description
<b>1. Physical Environment</b>		
h.	Air Quality	<ul style="list-style-type: none"> <li>▪ The air quality sampling was conducted at two locations, at the western boundary of the Project site (A1) and at the closest sensitive receptor (A2), the residential area of Kg. Sg. Chengkeh Besar.</li> <li>▪ Based on the results, the ambient air quality had low levels of the gaseous pollutants (TSP, NO<sub>2</sub>, and SO<sub>2</sub>) monitored and well within the acceptable levels (Recommended Malaysian Air Quality Guidelines).</li> </ul>
i.	Noise Levels	<ul style="list-style-type: none"> <li>▪ Noise levels measurement was conducted at the same two air quality monitoring locations.</li> <li>▪ The existing noise levels at both locations for daytime and night time were low and within the Planning Guidelines for Environmental Noise Limits and Control by DOE under Schedule 1 (Designated Industrial Zones).</li> </ul>
<b>2. Marine Biological System</b>		
a.	Fish	<ul style="list-style-type: none"> <li>▪ The fish species in the nearby rivers are common species.</li> </ul>
b.	Plankton and Macroalgae	<ul style="list-style-type: none"> <li>▪ There are no rare species of plankton at Sg. Pulai.</li> </ul>
c.	Seagrass and Seahorse	<ul style="list-style-type: none"> <li>▪ An extensive colony of seagrass is at the Merambong-Tanjung Adang beds.</li> <li>▪ The seagrasses at the Tg. Adang Laut / Darat and at the Merambong shoals are dominated by <i>Enhalus acoroides</i> and <i>Halophila ovalis</i> species.</li> <li>▪ These seagrass beds are known to be the habitat for the seahorse <i>Hippocampus kuda</i> as well as dugongs.</li> </ul>
d.	Benthos	<ul style="list-style-type: none"> <li>▪ The macrobenthic fauna at Tg. Bin was fairly diversified as typical of mangrove and mudflat areas.</li> </ul>
<b>3. Existing Socio Economic System</b>		
a.	Socio-economy	<ul style="list-style-type: none"> <li>▪ Population of Pontian District estimated to be 142,697 which accounts for about 5.2% of the total population of the State of Johor.</li> <li>▪ The ethnic groups residing in the District of Pontian are Malay (64.7%), Chinese (30.0%) and Indian (0.9%).</li> <li>▪ The population in the District of Pontian has a high proportion of young population.</li> <li>▪ A socio-economic survey was conducted at three locations within the zone of influence (nearest settlement area) at Kg. Sg. Boh, Kg. Sg. Chengkeh and Kg. Sg. Dinar.</li> <li>▪ About 62.5% of those interviewed were agreeable towards the proposed Project and while about 37.5% of the respondents disagreed.</li> </ul>

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No.	Environmental Component	Description
<b>3.</b>	<b>Existing Socio Economic System</b>	
a.	Socio-economy	<ul style="list-style-type: none"> <li>▪ The non-fishermen, who were not directly affected by the Project development, were generally agreeable whilst the proportion of the fishermen who agreed and disagreed were nearly equal.</li> <li>▪ Their main concern was that the proposed Project will 'affect the fishing area', 'make fishing activities more difficult' and 'surrounding area will be crowded and busy with boats'. They were also worried that they will not be able to carry out their normal fishing work once the Project is completed due to the increase in the number of boats and tugboats plying the area.</li> </ul>
b.	Infrastructure and Utilities	<ul style="list-style-type: none"> <li>▪ Syarikat Air Johor Holdings Sdn Bhd (SAJ) supplies water to the entire District of Pontian.</li> <li>▪ The electricity supply is provided by Tenaga Nasional Berhad (TNB) via the national grid system.</li> <li>▪ Waste collection and disposal services are provided by Southern Waste Management Sdn Bhd. The nearest landfill site is located at Kg. Air Putih, Jalan Sawah, Pekan Nanas.</li> </ul>
<b>4.</b>	<b>Nearby Areas of Concern</b>	
a.	Fisheries/Aquaculture	<ul style="list-style-type: none"> <li>▪ The nearest cage culture is located 6.5km upstream of Sg Pulai, north of the project site.</li> <li>▪ The cage culture in Sg. Pulai occupies an area of about 0.31 ac and involves the culture of fish such as <i>Lates calcarifer</i>, <i>Lutjanus argentimaculatus</i> and <i>Epinephelus fuscoguttatus</i>.</li> </ul>
b.	Mangrove areas	<ul style="list-style-type: none"> <li>▪ The RAMSAR site is located 2.8km to the north of the project site.</li> </ul>
c.	Seagrasses	<ul style="list-style-type: none"> <li>▪ The main seagrass beds are at Tanjong Adang Laut Shoal (3.8km away), Tanjong Kupang Shoal (6.4km away), Tanjong Adang Darat Shoal (7.8km away) and the Marambong shoal (8.7km away).</li> <li>▪ Five isolated small patches of seagrass beds are also reported at the upper part of the Sg. Pulai. The nearest is about 2.3km to the north of the project site.</li> </ul>

#### VIII. IMPACTS IDENTIFICATION AND EVALUATION

Potential Impacts	Description
<b>Pre-Construction Phase</b>	
No impacts are expected during the preconstruction phase	<ul style="list-style-type: none"> <li>▪ Flora and fauna survey, engineering design and topographic surveys.</li> </ul>

Potential Impacts	Description
<b>Construction Phase</b>	
Soil Erosion and Sedimentation during earthworks	<ul style="list-style-type: none"> <li>▪ As no earthworks will be carried out at the site, the amount of soil erosion is not anticipated to be significantly different from the existing condition.</li> <li>▪ The estimated average rate of soil erosion for the Project site under the existing condition and at the construction stage is similar at 12.192 tonnes/ha/yr. The calculated erosion risk at the Project site is considered as average category.</li> <li>▪ The average rate of soil erosion during the operation phase will be reduced to 0.012 tonnes/ha/year after construction of the project is completed.</li> </ul>
Drainage and Flooding	<ul style="list-style-type: none"> <li>▪ The developer of the Petrochemical and Maritime Industrial Park has prepared the proposed Project site, hence the drainage system and land condition will not be altered. Therefore, flooding is unlikely to occur at the site as a result of the construction work.</li> </ul>
Water Pollution	<ul style="list-style-type: none"> <li>▪ Pilling work, dredging and disposal of spoil for the construction of jetties may increase the TSS and turbidity levels of the Sg. Pulai and the Strait of Johor.</li> <li>▪ Spillage / leakage of waste oils, fuels, and lubricants may contaminate the receiving stream.</li> <li>▪ Indiscriminate disposal of solid wastes and construction debris into the open drains will affect the flow and capacity of the drains.</li> <li>▪ Improper maintenance of sanitation facilities at the site may contribute to sewage pollution of the drainage channel and Sg. Pulai.</li> <li>▪ Based on the QUAL2K modeling, there will not be any high increase in TSS concentration at the seagrass beds (2.3km away) and the aquaculture area (6.5 km away). Hence, the water quality at these areas will not be affected as the discharge from the silt trap will be within the permissible limit.</li> </ul>
- Hydraulic study	<ul style="list-style-type: none"> <li>▪ The hydraulic modelling during dredging showed that the maximum spread of the sediment plume at a concentration of 25 –50 mg/l does not exceed 1km southwards. Most of the sediment will be directed into Sg Chengkeh Besar and trapped within the river basin as a result of the prevailing direction of the flood and ebb tide. Therefore, the seagrass beds and the cage cultures will not be affected. With the usage of silt curtains, the sediment plume will be confined to within the dredging area.</li> </ul>
- Oil spill	<ul style="list-style-type: none"> <li>▪ NE monsoon wind and current conditions - oil trajectories travel to the south and close to the Malaysia-Singapore border.</li> <li>▪ SW monsoon wind and current conditions – oil trajectories travel toward Tg. Piai and west along the Johor shoreline without crossing the international border. Inside Sg. Pulai, the oil moves west affecting the mangrove areas at the west.</li> <li>▪ Pure tide – oil trajectories travel in a south-western direction but with a higher dispersion tendency.</li> <li>▪ Oil slick of 0.1mm will reach the boundary of the Ramsar mangroves areas after 1hr 35min but will not exceed 1mm during the worst case scenario oil spill.</li> </ul>

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Potential Impacts	Description
<b>Construction Phase</b>	
Air Pollution	<ul style="list-style-type: none"> <li>▪ Exhaust fumes from vehicles and machinery could contribute to ambient air quality degradation but are expected to be dispersed due to the 'open' condition.</li> <li>▪ The predominant wind direction was from the north (wind rose data from 1975-2006). There are no sensitive receptors located downwind of the prevailing wind direction to the south of the site.</li> <li>▪ The potential sensitive receptors are located towards the west of the Project site and approximately 1.4 km away from the site and will not be affected.</li> </ul>
Noise Pollution	<ul style="list-style-type: none"> <li>▪ Sources of noise pollution are expected to be from heavy vehicles and machinery operating within the site.</li> <li>▪ The cumulative predicted noise levels at the nearest residential area, Kg. Sg. Chengkeh, located approximately 1.4 km from the site is 62.9 dB(A) (worst case scenario when piling works is carried out) for both daytime and night time periods. The cumulative noise level at Kg. Sg. Chengkeh without piling works is 56.9 dB(A) during daytime and 53.2 dB(A) during night time.</li> <li>▪ The noise generated from construction works is not expected to cause any impact on the adjacent areas as the Project is located within a designated industrial area that will also be undergoing development.</li> <li>▪ All noise impacts are expected to be short-term and the disturbance will cease upon completion of the construction phase.</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>▪ The number of heavy vehicle movement in and out of Project site (for transportation of construction material and equipment) is expected to be not more than 10 vehicles per day. The addition is not expected to cause any congestion to the existing traffic condition.</li> <li>▪ There will be an increase in coastal activity in the movement of barges and piling boats. The constant and frequent movement of barges at the coastal area will require delineated areas for restricted public access to prevent the potential accidents with small fishing boats.</li> </ul>
Land Use and Zoning	<ul style="list-style-type: none"> <li>▪ The Project site is located within the Tanjung Bin Petrochemical and Maritime Industrial Park which is designated for the development of various petroleum related heavy industries.</li> <li>▪ The Project development is consistent with the land use zoning of the area for petrochemical and maritime industries. The nearest residential area is located about 1.4 km from the proposed site boundary.</li> </ul>
Ecological Impacts	<ul style="list-style-type: none"> <li>▪ Apart from increased suspended sediment, dredging and piling work for the piers of the jetties will directly affect the benthos within the work area but only a small area is involved.</li> <li>▪ The construction activity would not physically affect the fishes but could adversely affect the catches of the inshore artisanal fishermen by restricting access to these areas for reasons of safety and security.</li> </ul>

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Potential Impacts	Description
<b>Construction Phase</b>	
Socio-economic Impacts	<ul style="list-style-type: none"> <li>▪ The proposed Project is expected to generate both positive and negative socio-economic impacts.</li> <li>▪ Aesthetics – Negligible as site is a filled and level industrial lot and construction work will temporarily result in materials and debris to be placed within the Project site.</li> <li>▪ Fishermen – Construction works for the jetties may hinder movement of the fishermen boats especially when the shoreline area is cordoned off during dredging works.</li> <li>▪ Health and Safety - Improper housekeeping and waste management at the work areas would provide breeding ground for pest that will result in health problems to the workers.</li> <li>▪ Employment Opportunities – The generation of employment and business opportunities for the local population as well as local suppliers and contractors is expected.</li> </ul>
Solid and Scheduled Waste	<ul style="list-style-type: none"> <li>▪ Solid wastes expected include construction debris as well as domestic waste.</li> <li>▪ Scheduled wastes generated may pollute the drainage channel, Sg. Chengkeh Besar, Sg. Dinar and Sg. Pulai if proper disposal procedures are not implemented.</li> <li>▪ Any indiscriminate disposal of construction and solid wastes will also lead to deterioration in the overall environmental quality.</li> </ul>
Project Abandonment	<ul style="list-style-type: none"> <li>▪ Impacts arising will depend on the state of progress that had been achieved prior to work stoppage. Little potential environmental impact with the proper disposal of construction / demolition debris to the approved Municipal dumpsite.</li> </ul>
<b>Operation Phase</b>	
Drainage and Flooding	<ul style="list-style-type: none"> <li>▪ No impacts expected as the stormwater will be discharged into Sg. Pulai via the underground drainage system.</li> <li>▪ Flooding is unlikely as the drainage system of the future industrial estate has been designed to accommodate any change in run-off and high tide.</li> </ul>
Water Pollution	<ul style="list-style-type: none"> <li>▪ The potential impact could be from the surface runoff from the tank farm area, waste oil drum storage pavement, tank truck loading bays, pump station pavement, storage pavement and maintenance workshop area.</li> <li>▪ The other potential source of water pollution maybe due to leakage from the pipe system during the transportation of the liquid product into ships or barges.</li> </ul>
Air Pollution	<ul style="list-style-type: none"> <li>▪ There are no air emissions from the operation of the terminal to pose any hazard to the closest sensitive receptor at 1.4 km away.</li> </ul>

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Potential Impacts	Description
<b>Operation Phase</b>	
Noise Pollution	<ul style="list-style-type: none"> <li>▪ The major potential source of noise from the terminal is expected to arise from the major equipment used during the operational phase.</li> <li>▪ The noise generated from the terminal is expected to increase the cumulative noise level at the sensitive receptor slightly from 56.1 to 56.3 dB(A) during daytime and 51.1 to 51.7 dB(A) during night time.</li> <li>▪ Any noise generated by the vehicular traffic would have decreased to approximately 17.8 dB(A) at a distance of 1.4km. Hence, the predicted generated noise level will not cause any change to the ambient noise level at Kg. Sg. Chengkeh for both the daytime and night time periods.</li> </ul>
Traffic Generation	<ul style="list-style-type: none"> <li>▪ Land traffic volume will average out to approximately 2 trucks per hour assuming the trucks operate the entire day and 4 trucks per hour assuming the trucks only operate during daytime (12 hours).</li> <li>▪ Additional traffic generated will result in an increase in the traffic movement using the existing road.</li> <li>▪ However, the overall impact is not expected to be significant as the roads are designed to accommodate the overall higher traffic volume for the entire Petrochemical and Maritime Industrial center.</li> <li>▪ Increase in marine traffic will necessitate enhanced control and coordination of vessel movement. The constant and frequent movement of barges at the coastal area will require delineated areas for restricted public access.</li> </ul>
Socio-economics	<ul style="list-style-type: none"> <li>▪ The proposed terminal is expected to create more job opportunities and other related employment opportunities for the local population.</li> <li>▪ Some migrants and non-locals workforce may continue to remain in the vicinity of the Project site for reemployment and other purposes and thus, may impose excessive demand on the existing public facilities and services meant for the locals.</li> </ul>
Solid Waste and Scheduled Waste	<ul style="list-style-type: none"> <li>▪ Domestic and office wastes are expected from the daily activities at the terminal.</li> <li>▪ Scheduled wastes expected from the proposed Project are spent lubricating oil (SW 305), spent hydraulic oil (SW 306), oily residue from the oil interceptor (SW 307) and spent rags/cloth contaminated with oil (SW 410).</li> <li>▪ Improper storage and handling of the scheduled waste will cause ground and water pollution.</li> </ul>

## **IX. RISK ASSESSMENT**

- The QRA was prepared to address the risks present during the operational phase of the proposed terminal including its import and export jetties.
- Hazardous materials are confined to flammable liquids handled on-site such as fuel oil, distillates and gasoline. The main potential hazard incident involving the handling and storage of flammable liquids was determined to be fire event due to the following failure incidents:
  - Storage tank failure;
  - Pipeline failure;
  - Loading arm failure; and
  - Loading hose failure.
- The results of this QRA study show that the proposed terminal will not impose unacceptable risk levels to any adjoining development. Specifically,
  1. *At the terminal, the individual risk contour at  $1 \times 10^{-6}$  fatalities/person per year extends approximately 90m from the northern terminal boundary. However, it does not encroach into any sensitive land use (i.e. residential).*
  2. *The  $10 \times 10^{-6}$  or  $1 \times 10^{-5}$  fatalities/person per year individual risk contour is entirely contained within the terminal boundaries / jetty area and certainly does not affect neighboring land use.*
- Hence, the Project site is suitably located to satisfy the individual risk criteria proposed in the EIA Guidelines for Risk Assessment, 2004.

## **X. PROPOSED MITIGATION MEASURES**

- Mitigation measures recommended for the above impacts are summarized in Table A.

Table A : Summary of Potential Impacts and the Recommended Mitigation Measures

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
<b>I. PHYSICAL ENVIRONMENT</b>			
Soil Erosion Control	<b><u>Construction Phase</u></b> Soil improvement works and construction activities.	<ul style="list-style-type: none"> <li>▪ Temporary perimeter drains and one silt trap has been proposed for the Project to contain silt runoff from the Project.</li> <li>▪ Regular inspection of the silt trap and temporary drains is required.</li> <li>▪ A wash trough should be installed at the exit of the Project site to ensure wheels of all vehicles leaving the site are clean. Wastewater from the wash trough should be directed into the silt trap.</li> <li>▪ Construction activities should take into account the hydrological and climatic conditions of the area, particularly the rainfall pattern.</li> <li>▪ Open areas of the project site where construction is not carried out should be protected.</li> <li>▪ Protection of exposed areas should be carried out as soon as it is deemed possible, to minimise erosion.</li> <li>▪ Landscaping of open areas that are not hard paved should be carried out upon completion of the construction works.</li> </ul>	None.
	<b><u>Operational Phase</u></b>	<ul style="list-style-type: none"> <li>▪ No mitigation measures required as the site will be paved and landscaped.</li> </ul>	None.

Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (con't)

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
Water Pollution	<b><u>Construction Phase</u></b> Soil improvement works, onshore and offshore construction works.	<p><u>Onshore works</u></p> <ul style="list-style-type: none"> <li>▪ Adequate temporary toilet facilities shall be provided according to the JPP and Ministry of Health (MOH) specifications.</li> <li>▪ Effluent from the site will comply with Standard A of the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979.</li> <li>▪ Adequate attention should be given to the storage and handling of petroleum products. Storage and handling of scheduled waste is to be carried out according to the Environmental Quality (Scheduled Wastes) Regulations, 2005. Used oil and grease should be stored properly at a designated location as far as possible from waterways prior to disposal by licensed contractors.</li> <li>▪ All construction and solid waste should be collected for final disposal at an approved municipal dumpsite.</li> </ul> <p><u>Offshore works</u></p> <ul style="list-style-type: none"> <li>▪ A silt curtain is proposed to be used during dredging work. The type of silt curtain proposed is a floating screen from the top surface of the water to the seabed around the outer perimeter of the dredger. This method will not restrict the movement of access of boat plying Sg. Pulai as oppose to the placement of a permanent silt curtain around the dredging area. The silt curtain will be firmly anchored to the seabed during the dredging work to prevent the release of suspended sediment from the bottom.</li> <li>▪ The silt curtain and associated equipment should be inspected regularly to ensure that they are functioning properly.</li> </ul>	Temporary during construction phase.

**Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (con't)**

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
Water Pollution	<u>Operational Phase</u>	<ul style="list-style-type: none"> <li>▪ Two drainage systems will be constructed for the proposed Project, one to cater for surface runoff and the other for water originating from work areas that are handling and storing petroleum products.</li> <li>▪ The storage terminal area will be designed and built with full primary and secondary containment facilities.</li> <li>▪ The storage tanks are to be designed and constructed to the latest API 650 standards and fitted with all necessary connections, instrument and control devices to enable safe and efficient operation meeting environmental and fire fighting requirements in force in Malaysia.</li> <li>▪ The tanks are to be located within bunded areas and capable of holding 110% of the single largest inventory within a particular group of tanks and be designed to be impervious.</li> <li>▪ Bentomat Claymax Geosynthetic Clay Liners will be used for lining of all the bunds in the terminal.</li> <li>▪ Any oily water generated from the work areas will be routed through an enclosed recovery system to a settling tank where the water/oil mix will be allowed to settle and separate.</li> <li>▪ All wastewater runoff leaving the terminal has to comply with Standard A of the Environmental Quality (Sewage &amp; Effluent) Regulations, 1979.</li> <li>▪ Pipes for transporting liquid should be inspected and maintained regularly.</li> <li>▪ An Oil Spill Contingency Plan will be developed by VTTI to handle any oil spills.</li> </ul>	Water pollution if oil water recovery system fails.

Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (con't)

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
Air Pollution	<b><u>Construction Phase</u></b> Soil improvement works and construction activities.	<ul style="list-style-type: none"> <li>▪ The following preventive measures should be applied during the construction phase:               <ul style="list-style-type: none"> <li>• All construction vehicles should be maintained in good condition.</li> <li>• Vehicles transporting construction materials or debris should be properly covered. The on-site road network must be in a good servicing condition.</li> <li>• Driving speeds of vehicles within the construction site should be limited to 30 km/hr.</li> <li>• All fuel burning equipment should comply with the DOE requirements and temporary generators should apply for necessary approvals from DOE.</li> <li>• All vehicles/machinery used for the construction activities should be checked and maintained regularly.</li> <li>• Wetting of the site should be carried out as and when needed.</li> <li>• A wash trough or tyre washing facility should be provided at the exit point of the Project site.</li> </ul> </li> </ul>	None.
	<b><u>Operational Phase</u></b> Stack and vehicle emissions	<ul style="list-style-type: none"> <li>▪ Emissions from the stack will have to comply with the Standard C requirement of the Environmental Quality (Clean Air) Regulations, 1996.</li> <li>▪ All vehicles shall be checked and maintained regularly to ensure they comply with the Environmental Quality (Control of Emissions from Diesel Engines) Regulations, 1996 and/or Environmental Quality (Control of Emissions from Petrol Engines) Regulations, 1996.</li> </ul>	None

Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (con't)

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
Noise Pollution	<p><b><u>Construction Phase</u></b> Noise construction work and heavy vehicles/machinery</p>	<ul style="list-style-type: none"> <li>▪ All construction workers who are involved with extensive noise emission activities should be equipped with hearing protective devices such as ear-muffs. In addition to this, warning signs should be installed at high-level noise areas to alert workers of the noise danger.</li> <li>▪ Routine maintenance of equipment must be carried out to ensure they are in good working condition and well maintained.</li> </ul>	None.
	<p><b><u>Operational Phase</u></b> Operation of major equipment</p>	<ul style="list-style-type: none"> <li>▪ All equipment will be designed to meet the required noise limits.</li> <li>▪ Place equipment that produces high noise levels in separate rooms installed with noise proofing.</li> <li>▪ Routine maintenance of equipment to ensure they are properly installed.</li> <li>▪ Personal protecting equipment such as ear-muff shall be utilized to protect workers exposed to high noise levels.</li> </ul>	None.



Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (*con't*)

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
Traffic	<u>Operational Phase</u>	<u>Land Traffic</u> <ul style="list-style-type: none"> <li>▪ Incorporation of an effective traffic management scheme into the overall developmental framework of the proposed Project is recommended.</li> <li>▪ Safety enhancement features such as road signs, traffic lights and street lamps should be properly installed.</li> </ul> <u>Marine Traffic</u> <ul style="list-style-type: none"> <li>▪ All ships will be controlled by port pilots and be tugboat assisted during berthing operation and upon entering the port area.</li> <li>▪ Close liaison with Marine Department and relevant authorities is required to avoid the possible occurrence of any mishaps</li> </ul>	None.
			None.
Ecological Aspects	<u>Construction Phase</u>	<ul style="list-style-type: none"> <li>▪ Any remnant vegetation should be removed for proper disposal and the burning of cut vegetation is strictly prohibited to avoid deterioration of the air quality.</li> <li>▪ Any hard landscaping works to commence as soon as possible.</li> </ul>	None.
	<u>Operational Phase</u>	<ul style="list-style-type: none"> <li>▪ No mitigation measures required.</li> </ul>	None

Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (*con't*)

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
<b>II. SOCIO-ECONOMIC CONSIDERATIONS</b>			
Socio Economic Considerations	<b><u>Construction Phase</u></b> Employment of construction workers, occupational safety aspect, and health	<ul style="list-style-type: none"> <li>▪ Active dissemination of information to the locals to increase the level of awareness of the proposed Project and to assist in an acceptance of temporary inconveniences is recommended.</li> <li>▪ A short-term strategy developed and implemented by Seaport Worldwide is the payment of compensation to fishermen affected by the project. The other long-term strategy is the development of an agro-based project to allow the fishermen to participate as shareholders to obtain a sufficiently lucrative monthly income.</li> <li>▪ Preference for the employment of workers should be given to locals of or the nearby residents.</li> <li>▪ Temporary sanitary facilities should be provided for workers in accordance with the requirement of Jabatan Perkhidmatan Pembentungan (JPP). Adequate rubbish bins for domestic and general waste must be provided with a schedule for disposal.</li> <li>▪ Clear signboards and night-light indicating and highlighting danger areas should be put up. Adequate first aid facilities should be made available on site.</li> <li>▪ If a base camp is necessary and constructed, and so the following measures should be observed: <ul style="list-style-type: none"> <li>• Debris and abandoned materials that may attract insects and snakes to the construction site must always be cleared. Fogging should be carried out occasionally if the insect problem persists.</li> <li>• All building materials (used/unused) need to be properly kept so as to prevent the area from becoming breeding grounds for mosquitoes and rodents.</li> <li>• Remaining food and wrappers must be disposed in covered containers to keep stray animals such as dogs, cats and crows away from the construction site.</li> </ul> </li> <li>▪ Work areas should be kept clean at all times and garbage / solid wastes are to be disposed into the waste bins at a designated location prior to disposal off-site by licensed contractors.</li> </ul>	None

Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (*con't*)

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
Socio Economic Considerations	<u>Operational Phase</u>	<ul style="list-style-type: none"> <li>▪ All unused building materials should be cleared to prevent the area from becoming breeding grounds for mosquitoes and rodents.</li> <li>▪ Workers, whether foreign or non-locals, whose work have terminated need to be vacated from the Project site so as to prevent them from staying in the locality and creating social problems to the locals.</li> </ul>	None
Solid Waste	<u>Construction Phase</u>	<ul style="list-style-type: none"> <li>▪ Solid wastes generated from the construction site shall be collected at an on-site designated area prior to disposal.</li> <li>▪ No open burning of solid wastes shall be carried out at any time.</li> <li>▪ Solid wastes from the Project site must be regularly removed and disposed by licensed contractors.</li> <li>▪ Regular de-sludging of the portable and/or septic toilets from the site camp should be carried out</li> </ul>	None
	<u>Operational Phase</u>	<ul style="list-style-type: none"> <li>▪ Solid wastes (non-scheduled) generated, shall be disposed off at the dedicated dumpsite approved by the authorities. Open burning of solid waste is strictly prohibited.</li> </ul>	None

Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (con't)

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
<b>III. BEST MANAGEMENT PRACTICES</b>			
Dredging Works	<b><u>Construction Phase</u></b> Dredging and transport of dredged material to dumpsite	<ul style="list-style-type: none"> <li>▪ Hopper and tug boats to be inspected regularly to ensure no leakage occur.</li> <li>▪ Extreme care should be taken in the loading and transport of dredged material into the disposal barges to ensure no spills occur.</li> <li>▪ A Vessel Tracking System should be used to monitor the movement and dumping activities of the hopper barges. The hopper barges should only use predetermined routes of travel to the disposal site.</li> <li>▪ The dredging area should be marked with lighted buoys and the dredger should be adequately lighted.</li> <li>▪ Oil, grease or other waste material from minor ship repair works should be kept in suitable containers and brought back to the shore. Any discharge of oily wastes into the sea is strictly prohibited.</li> <li>▪ Oil spills onboard should be physically contained, recovered and stored in a tank for proper disposal according to the Environmental Quality (Scheduled Waste) Regulations, 2005.</li> <li>▪ All boats and vessels used for dredging and transporting dredged material to report their movements to Jabatan Laut and should be equipped with the automatic identification system. All marine safety measures should meet the requirements set by the Jabatan Laut.</li> <li>▪ All vessels to be properly maintained and brightly lit at night when moored to prevent accidents.</li> <li>▪ The vessels should not obstruct marine traffic and must be docked at designated non-obstructive safe places.</li> <li>▪ Any installation of buoys at the dredged site must obtain the approval of the Jabatan Laut.</li> <li>▪ The scheduling of disposal works should take into consideration bad weather conditions to prevent additional dispersion of spoil at the dumping ground site.</li> </ul>	None

Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (con't)

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
Risk and Emergency Response	<u>Operational Phase</u> Accidents/ Emergencies/ On-site spills	<ul style="list-style-type: none"> <li>▪ The Emergency Response Plan (ERP) will be drawn up which outlines procedures to be adopted when any pollution occurs.</li> <li>▪ The ERP will provide for procedures to be followed and outlines responsibilities and actions to be taken by designated personnel to bring the emergency under control using available resources while waiting for external assistance to arrive.</li> <li>▪ In the case of on-site spills, leaks and accidental releases, containment and clean up procedures will be carried out in accordance to the seriousness of the spills. The mitigation measures include:               <ul style="list-style-type: none"> <li>• The use of absorbent materials, booms, and chemical dispersant spray.</li> <li>• Blocking drains with raw material to prevent oil from flowing into the river.</li> <li>• For large oil spills, a large boom will be required to contain the spills prior to the oil being cleaned up.</li> </ul> </li> <li>▪ In case of any accidents and emergencies, the Emergency Response Plan (ERP) shall be followed in order to minimize the impacts on human lives and the surrounding environment.</li> <li>▪ The fire fighting and Emergency Shut Down (ESD) systems as per described in essential part of the emergency response procedure. The ERP is to ensure proper and efficient actions are being taken in the event of an emergency happening.</li> <li>▪ In addition, an Oil Spill Contingency Plan will be developed by VTTI in conjunction with, and under the umbrella of the Port Authority's Port wide Plan, in order to conform to the Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation) Regulations and / or specific Malaysian legislation.</li> <li>▪ The developed plan is intended to assist VTTI in dealing with any accidental discharge of oil and normally follows a tier approach in line with a world-wide accepted convention.</li> </ul>	None

Table A : Summary of Potential Impacts and the Recommended Mitigation Measures (*con't*)

Potential Impact	Project Activity and Sources of Pollution	Proposed Mitigation Measures	Residual Impact
<b>IV. SITE ABANDONMENT AND DECOMMISSIONING</b>			
Abandonment of Project	<u>Construction Phase</u> Abandonment	<ul style="list-style-type: none"> <li>▪ Project proponent must endeavor to vacant the Project site in an environmentally responsible manner and prepare a Project Abandonment Plan.</li> <li>▪ The site should be left in the best shape possible in terms of the environment and free of any unexpected hazards to the public.</li> </ul>	None
	<u>Operational Phase</u> Abandonment	<ul style="list-style-type: none"> <li>▪ In the event of abandonment during the operational phase:               <ul style="list-style-type: none"> <li>• All relevant authorities will have to be informed by the Project Proponent</li> <li>• The Project site will be fenced up and all building sealed off for security reasons. Warning signs have to be installed to prevent unauthorized entry.</li> <li>• Removal and proper disposal of all types of wastes on-site.</li> <li>• Dismantling and removal of all equipment that may cause injury.</li> <li>• Implementation of the relevant rehabilitation plan, if an adverse environmental condition has been created.</li> <li>• The area should be checked for damaged live wires that could pose a threat to anyone who trespassed into the area.</li> </ul> </li> </ul>	None
Decommissioning	Decommissioning	<ul style="list-style-type: none"> <li>▪ For decommissioning, all relevant authorities need to be informed, the site should be fenced up with warning signs installed, the completed buildings be sealed off, any on-site waste be removed and all equipment dismantled and removed. The site should be rehabilitated if any adverse environmental condition had been created.</li> </ul>	None

## XI. ENVIRONMENTAL MANAGEMENT PLAN

- An Environmental Management Plan (EMP) and a monitoring and auditing program should be prepared to guide the project proponent in managing the environmental impacts during project implementation. This will also ensure that all EIA approval conditions are complied with, and that all regulatory environmental emission/discharge criteria and standards are being met.

### *Proposed Monitoring Programme during Construction and Operation Phases*

Monitoring Components	Location	Frequency	Parameters	Compliance Levels	Reporting Requirements
<b>CONSTRUCTION PHASE</b>					
Water Quality	<ul style="list-style-type: none"> <li>Sg. Pulai, upstream of the Project Site (CW1)</li> <li>Sg. Pulai, downstream of the Project Site (CW2)</li> </ul>	<ul style="list-style-type: none"> <li>Fortnightly</li> </ul>	pH DO COD BOD TSS O&G NH <sub>3</sub> -N E.coli	5 – 9 3 – 5 mg/l 50 mg/l 6 mg/l 150 mg/l - 0.9 mg/l - National Water Quality Standards (NWQS) Class III	Quarterly to DOE Johor
	<ul style="list-style-type: none"> <li>Outlet of silt trap discharge (CW3)</li> </ul>		TSS O&G	50 mg/l (DOE Conditions of Approval) ND (Not Detected) Standard A of the Environmental Quality (Sewage and Industrial Effluents) Regulations, 1979	
Air Quality	<ul style="list-style-type: none"> <li>Western boundary of the Project site (CA1)</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly</li> </ul>	TSP (24 hours monitoring)	260 µg/m <sup>3</sup> (Recommended Malaysian Air Quality Guidelines)	Quarterly to DOE Johor
Noise Quality	<ul style="list-style-type: none"> <li>Western boundary of the Project site (CN1)</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly</li> </ul>	L <sub>eq</sub> (8 hours monitoring)	70 dB(A) (Recommended DOE Guidelines for Environmental Noise Limits)	Quarterly to DOE Johor
Environmental Audits	<ul style="list-style-type: none"> <li>Project site</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly</li> </ul>	-	DOE's conditions of EIA approval, existing legislation & regulations	Once a year to DOE Johor

**Proposed Monitoring Programme during Construction and Operation Phases (cont'd)**

Monitoring Components	Location	Frequency	Parameters	Compliance Levels	Reporting Requirements
<b>OPERATION PHASE</b>					
Water Quality	▪ Outlet of oil trap (OW1)	▪ Monthly	O&G	ND (Not Detected) Standard A of the Environmental Quality (Sewage and Industrial Effluents) Regulations, 1979	Quarterly to DOE Johor
Air Quality	▪ Outlet of chimney (OA1)	▪ Half yearly	Dust Content	0.4gm/Nm <sup>3</sup> (Environmental Quality (Clean Air) Regulations, 1978)	Half yearly to DOE Johor
Environmental Audits	▪ Project site	▪ Yearly	-	DOE's conditions of EIA approval, existing legislation & regulations	Once a year to DOE Johor

**XII. RESIDUAL IMPACTS**

- The identified residual impacts (noise levels, air quality, traffic and accidents) are expected to be insignificant.
- The proposed Project is expected to have a positive residual impact on social and economic aspect, as it will act as a catalyst for the development and establishment of the Petrochemical and Maritime Industries Complex.

**XIII. CONCLUSIONS**

- The proposed Project is expected to generate some potential environmental impacts but can be minimized through compliance of effective mitigation measures. Ultimately, this proposed Project is beneficial as upon completion, it will be able to provide long term beneficial impacts to the region.