

# Non-Technical Summary – Sub-Project 7

Design and Development of Marine Infrastructure for the Liquid Bulk Berths in the Port of Duqm (stage 1) including Optional Dredging

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## ACRONYMS

ALARP	As Low As Reasonably Possible
BAT	Best Available Technique
BAT BREF	Best Available Technique Reference
CEMP	Construction Environment Management Plan
CSD	Cutter Suction Dredger
CSR	Corporate Social Responsibility
DGEA	Directorate General of Environmental Affairs
DLBB	Duqm Liquid Bulk Berth Project
DRPIC	Duqm Refinery and Petrochemical Industries Company L.L.C
EIPPCB	European Integrated Pollution Prevention and Control Bureau
EPC	Engineering, Procurement and Construction
ESIA	Environment and Social Impact Assessment
ESMP's	Environmental and Social Management Plan
ESO	Environment Society of Oman
FEED	Front End Engineering Design
GHG	Green House Gases
GM	Grievance Mechanism
IP7	Infrastructure Package
IUCN	International Union for Conservation of Nature
LBW	Lee Breakwater
MD	Ministerial Decision
MECA	Ministry of Environment and Climate Affairs
MMO	Marine Mammal Observer
NAAQS	National Ambient Air Quality Standards
NTS	Nontechnical Summary
O3	Ozone
PDC	Port of Duqm Company
PDD	Partnership and Development Department
RD	Royal Decree
ROP	Royal Oman Police
SEZ	Special Economic Zone
SEZAD	Special Economic Zone Authority Duqm
SEZD	Special Economic Zone Duqm
SLR	Sea Level Rise
STP	Sewage Treatment Plant
UAR	Umm ar Raduma
USEPA	United States Environment Protection Agency

# 1 INTRODUCTION

With a land area of 2,000 km<sup>2</sup> and 70 km of coastline along the Arabian Sea, the Duqm Special Economic Zone (SEZ) is the largest in the Middle East and North Africa region and ranks among the largest in the world. The Duqm SEZ is a model of an integrated economic development composed of zones: a sea port, industrial area, new town, fishing harbour, tourist zone, a logistics centre and an education and training zone, all of which are supported by a multimodal transport system that connects it with nearby regions (e.g., the Arabian Gulf countries, Middle East, East Africa and Southeast Asia). The Port of Duqm is seen as a catalyst for the development of the Al Wusta region, in particular, the Special Economic Zone at Duqm. The Port and the dry docks are being developed to increase cargo transshipments, ship repairs, manufacturing industry and tourism.

The Special Economic Zone is administered, regulated and developed by the Duqm Special Economic Zone Authority (SEZAD), a financially and administratively independent government entity. SEZAD was established as per the provision of the Royal Decree (RD) 119/2011 and is responsible for the management, regulation, and development of all economic activity in the SEZD.

The IP7 Project involves development of storage tanks and sheds for bulk liquid and solid products from Duqm Refinery, along with associated facilities, utilities, and jetties and berths for export of the refinery products. The IP7 Project is located on the Lee Breakwater (LBW) of the Port of Duqm, and represents the second phase of the port development.

## 1.1 PROJECT BACKGROUND – LIQUID BULK BERTH TERMINAL

SEZAD is now in the process of developing a liquid bulk berth terminal within the Duqm Port for the export of finished petroleum products from refineries via pipelines. The terminal will be located at the existing Lee Breakwater and its adjacent sea areas, and the Port approaches. The consultant for the project is Worley Parsons Engineering Oman Engineering LLC, who is responsible for the project definition, FEED design and supervision of the new liquid berth terminal.



Figure 1: LOCATION OF IP7 IN LEE BREAK WATER

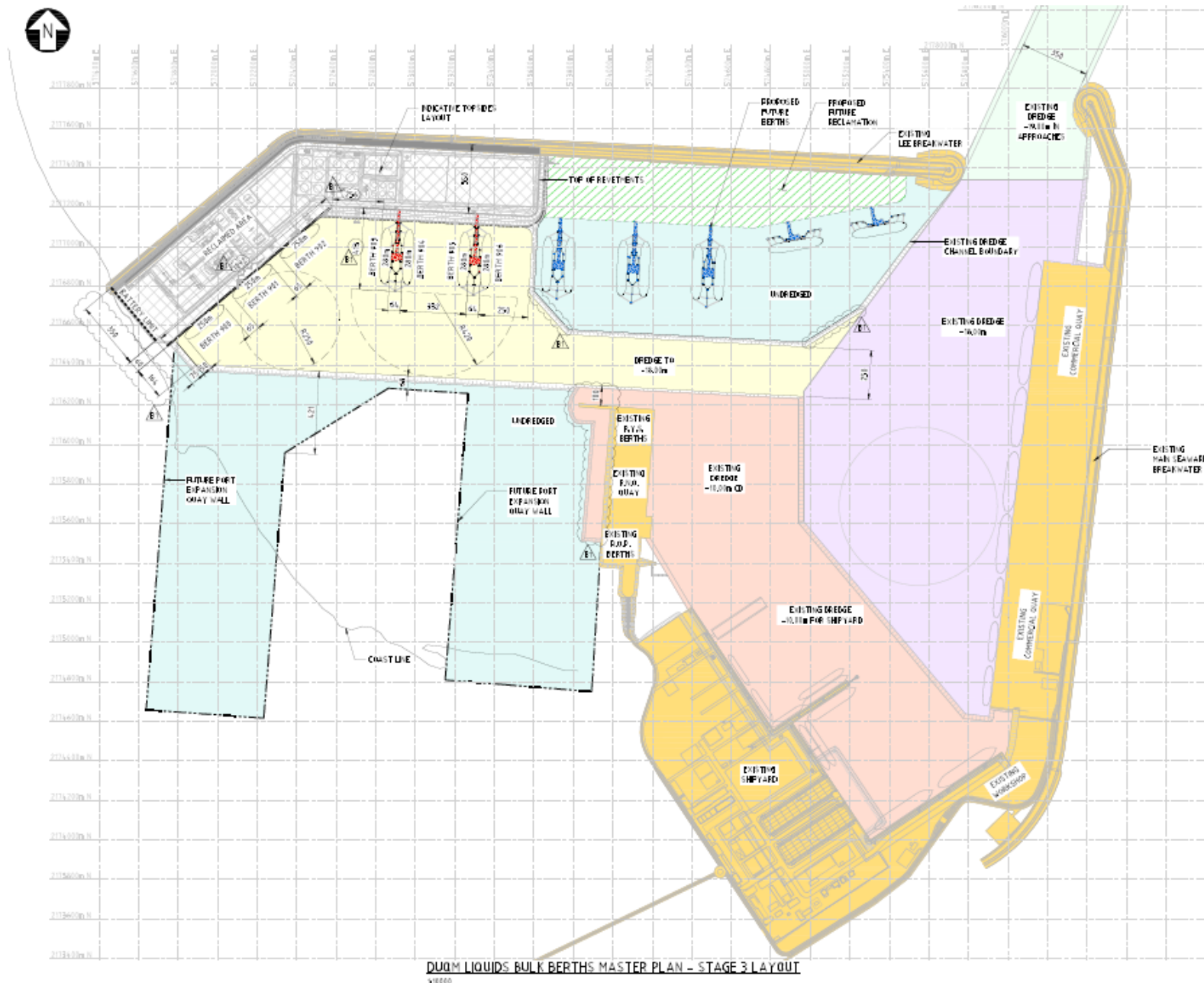


Figure 2: LAYOUT FOR THE PROPOSED LIQUID BERTH TERMINAL IN DUQM

The Duqm Liquid Bulk Berth Project (also referred to as DLBB or Infrastructure Package 7 – IP7) will involve the development of liquid bulk berths and tank facilities for the import of crude oil and the export of finished refinery products. The finished liquid products to be handled at the new terminal are naphtha, jet fuel, diesel oil, high sulphur fuel oil, and pressurized liquefied petroleum gas. Solids product from refineries such as dry bulk products and solid sulphur pellets will also be exported through the terminal. The completion of the Liquid Berth Terminal will improve the efficiency of transporting the petroleum products, which will make the Duqm Special Economic Zone more attractive for refineries and other industries.

The Liquid Berth Terminal will be constructed in two stages. Stage 1 will involve the reclamation of land adjacent to the Lee Breakwater and dredging works to deepen the existing seabed for the bulk berths. The tank facilities, utilities and other infrastructure will be constructed in Stage 2 after the completion of the Stage 1 works. This Project involves the Stage 1 works: Engineering, Procurement and Construction for dredging, reclamation and marine infrastructures for the Liquid Berth Terminal. The summary of the IP7 project is as follows :

PROJECT	CONTRACT NO	CONTRACTOR	ORIGINAL PROJECT EXECUTION PROGRAMME	EXPECTED DATE OF COMPLETION
Design, dredging and marine infrastructure works for the new Liquid Bulk Berths in the Port of Duqm	IP7 - Contract C78/2017	Boskalis Duqm LLC	36 Months	Q2 2020

## 1.2 REGULATORY CONTEXT AND STANDARDS

### 1.2.1 Omani Legislation and Guidance

While the SEZAD is the responsible authority for the Duqm SEZ, the Project was implemented in compliance with the “Guidelines on Environmental Impact Assessment” issued by the Omani Directorate General of Environmental Affairs (DGEA) at the Ministry of Environment and Climate Affairs (MECA).

Omani environmental law has two main legal instruments, viz., Royal Decrees (RDs) and Ministerial Decisions (MDs). Typically, an RD provides a general framework relating to a particular area in need of statutory control, while MDs provide specific regulation using the framework provided in the RD. Where Omani environmental regulations and standards were not available, acceptable international environmental regulations and standards has been referenced. Additionally, the applicable Best Available Technique (BAT) Reference (BREF) documents published by the European Integrated Pollution Prevention and Control Bureau (EIPPCB) has been referred. The DLBB Project will work within with the range of applicable legislation in Oman.

## 1.3 ENVIRONMENTAL AND SOCIAL CONTEXT

An Environmental and Social Impact Assessment Study (ESIA) has been conducted as part of the permitting process for the DLBB Project by Worley Parsons Oman Engineering LLC in 2015. The FEED works for this Project was also completed by Worley Parsons. Boskalis Westminster Oman LLC was awarded with the EPC1 Contract comprising the design, dredging and marine infrastructure works for the Port. Following award of project, Boskalis has updated various studies as required in the initial ESIA study like dredge plume modelling study, oil spill contingency study, update of marine baseline etc and developed a Construction Environmental Management Plan for the construction phase in CY 2017. A summary of the environmental baseline condition is presented in Section 3 of the document.

Boskalis has further conducted addendum studies for onshore disposal of dredged material in the Port of Duqm area (12 million m<sup>3</sup> of material) when the optional scope for marine work was awarded to Boskalis in Aug 2018. The dredged material is disposed primarily onshore and permit for the same was issued by SEZAD

and has been used for levelling the PDC areas used for landside infrastructure development. The permit for offshore dredging disposal is issued by MECA in an approved and already existing disposal site. As part of the CEMP, the contractor developed a dredging management plan which captures monitoring and management measures. Dredging complies with the rates modelled and permitted by MECA.

SEZAD Corporate Social Responsibility (CSR) section of the Partnership and Development Department (PDD), provides access for communities to provide any grievance (written and in person) through the Grievance Mechanism (GM) form. The GM form is available on SEZAD website at <https://www.duqm.gov.om/sezad/csr/grievance-form>.

The ways grievance can be registered are as follows-

1. **Via Phone** - The Partnership & Development Department (PDD) can be contacted between the hours of operation (8am – 3 pm) Sunday to Wednesday on 24507216.
2. **Via Official Letter** - The Official letter can be directed to the Manager of the Partnership and Development Department and can be dropped of either directly to any one of our offices in DUQM or Muscat
3. **Via Email** - An Email can be sent to the Partnership & Development Department to CSR@duqm.gov.om
4. **Website Portal** - All information regarding the process of the grievance system is available as well as a form that can be filled online and sent directly to the Partnership and Development Department though <https://www.duqm.gov.om/sezad/csr/grievance-form>

All Grievance issues are handled by the Partnership and Development Department (CSR Section). In the event the department is unable to assist or respond, it will be raised to the Deputy CEO of SEZAD where responses will be answered within a 7 days from the date of the letter/ grievance received, however can change depending on the complexity of the grievance.

## 1.4 DOCUMENTATION

The environmental reports available for IP7 project are as follows -

1. Environment Impact Assessment Report Doc No: SEZAD-DPTC-00-WP-EV-REP-3001-B2, Worley Parson Oman Engineering LLC Sep 2015
2. Dredge Plume Dispersion Study Report, Doc No: SEZAD-DPTC-11-WP-MC-REP-2001-B1, Worley Parson Oman Engineering LLC Nov 2015
3. Construction Environmental Management Plan Doc No: SEZAD-IP7-00-BO-EV-PLN-4001-00, B2, Boskalis Duqm LLC, May 2017
4. Waste Management Plan Doc No: SEZAD-IP7-00-BO-EV-PLN-4006-00 C1, Worley Parson Oman Engineering LLC May 2017
5. Duqm Liquid Bulk Berths Project. Addendum to Initial Environmental Permit (IEP) for Onshore Disposal, Boskalis Duqm LLC. June 2017.
6. Periodic Environmental Monitoring Reports

The following No Objections letters from Port of Duqm Company via following referenced letters were also received for the project -

7. PDC/CEO/000254/2017- No Objection Certificate of Dry Excavation Materials within 2.0 km areas from root of Lee Breakwater
8. PDC/PT/3/17- No Objection Certificate for Disposal of additional Dry Excavated Materials (1,500,000 m<sup>3</sup>) within 2.0-3.0 km areas from root of Lee Breakwater
9. PDC/PT/000095/18- No Objection Certificate for Disposal of 8.5 Mm<sup>3</sup> Dry Excavated Materials within 2.0-3.0 km areas from root of Lee Breakwater

10. PDC/PT/00111/18- Addendum to No Objection Certificate for Disposal of 8.5 Mm3 Dry Excavation Materials within 2.0-3.0 km areas from root of Lee Breakwater
11. PDC/PT/000013/18- No Objection Certificate for Disposal of 12 Mm3 Dry Excavation Materials within 2.0–3.0 km areas from root of Lee Breakwater

All the reports mentioned above are available with SEZAD Environment Regulatory Department and can be accessed on email request to ERD Manager Mr.Ahmed Harib Al Balushi at [EMIPS@duqm.gov.om](mailto:EMIPS@duqm.gov.om).

## **1.5 THE PURPOSE AND CONTENT OF NON-TECHNICAL SUMMARY (NTS)**

This NTS provides an overview, in layman's terms, of the main environmental and social findings from the ESIA of the Project. This current Section introduces the Project and the legal, environmental and social context. The following Section 2 presents a summary of baseline conditions. The specifications of the Project are presented in more detail in Section 3 and the methodology for impact assessment with reference to ESMPs have been summarised in Section 4 for the Project's construction phase, while Section 5 provides the findings and conclusions of the ESIA.

This Summary serves as an overarching disclosure document to disclose the Environmental and Social findings from the ESIA study. It is important to note that this NTS does not, and is not intended to, convey all of the information relating to the aspects and impacts of the Project. Its intention is to present key information, describe the main findings and conclusions, enabling the reader to understand the significant environmental and social effects of the Project without needing to refer to the detailed assessments.



## 2 PROJECT DESCRIPTION

### 2.1 PROJECT COMPONENTS

Salient features of the DLBB Project construction and operations, which has been covered in the previous ESIA, are as follows:

- Dredging of the liquid bulk berth basin
- Reclamation to the south of the existing LBW including ground improvement and foundation to support equipment, buildings, tanks, pipeline, and other equipment (as required)
- 1 km length of continuous quay for solids bulk berths
- 1.6 km length of revetment wall;
- Construction of the following berths:
  - Liquid product export berths (4 Nos)
  - Bulk solids export berth (1 No)
  - Spare berth (2 Nos)
- Installation of the following items on the berths:
  - Ship loading equipment
  - Pipelines
  - Tanks
  - Flare
  - Auxiliary equipment
  - Utilities
  - Equipment for control of loading and shipping operations
  - Access Road

As part of the Project, land will be reclaimed along the south of the LBW; and the sea south of this reclamation area will be dredged to -18 m CD. As part of the DLBB Project, seven berths will be constructed as summarized below.

BERTH	USE	STRUCTURE
900	900 Dry Bulk Material Export Berth – Spare	Continuous Quay (Blockwork wall)
901	Dry Bulk Material Export Berth for Pet Coke and Sulphur	Continuous Quay (Blockwork wall)
902	Multi-purpose /Small Vessel Refined Product Export	Continuous Quay (Blockwork wall)
903 and 904	Liquid Refined Product Export Berth for Jet-A1 and Diesel	Double-sided Island Jetties (Concrete deck on steel piles)
905	Liquid Refined Product Export Berth for Naphtha and PLPG	Double-sided Island Jetties (Concrete deck on steel piles)
906	Liquid Refined Product Export Berth - Spare	Double-sided Island Jetties (Concrete deck on steel piles)

The operation of the terminal will consist of the following activities:

- Storing of Naphtha, Jet A-1 and Diesel in tanks at the terminal
- Loading of stored Naphtha, Jet A-1 and Diesel onto the vessels
- Loading HSFO and PLPG directly from the refinery onto the vessels
- Loading Diesel and Jet A-1 from storage tanks onto road trucks
- Loading of bulk Pet Coke and Sulphur onto the vessels

White products, i.e., Naphtha, Jet A-1 and Diesel will be pumped from the refinery to the Terminal Storage Tanks, through the pipeline network from refinery. Black products, i.e., HSFO and PLPG will be pumped from the refinery by pipeline directly to the ships – no storage facility will be built for the black products on the Project terminal. The Pet Coke and Sulphur will be transported from the refinery to the terminal by trucks owned and operated by the Duqm Refinery.

## **2.2 CONSTRUCTION PHASE**

The construction contract will be divided into 3 Work Packages, which are:

- Work Package 1 – Dredging and Reclamation
- Work Package 2 – Marine Structures and Civil Works
- Work Package 3 – Topside Works

These three Work Packages will be awarded to two EPC Contractors – EPC-1 (Marine side) and EPC-2 (Topside). Work Package 1 and 2 is included in the scope of the EPC-1 Contractor (Boskalis), while Work Packages 3 will be included in the scope of the EPC-2 Contractor.

### **2.2.1 Work Package 1 - Dredging and Reclamation**

The liquid berths basin area is currently un-dredged, varying in elevation from approximately Chart Datum (CD) to the dredge level for the existing port at -18m CD. Figure 2 below presents the area earmarked for dredging in the port basin as part of Work Package 1.

As per the ESIA, the DLBB Project involves the dredging of about 27 million m<sup>3</sup> of soil from the port area and about 6.5 million m<sup>3</sup> of sand from the offshore borrow area. In addition to the dredging, reclamation will need to be undertaken along the LBW for construction of tanks and other facilities along the LBW. Approximately 6.5 million m<sup>3</sup> of soil will be required to create 350 m wide reclamation along the LBW, which may be sourced from the offshore borrow area.

Soil for reclamation will be obtained from the offshore borrows area. Unsuitable material dredged within the port will be disposed offshore in an offshore disposal area. The borrow and disposal area was located outside SEZAD jurisdiction, requisite approvals were obtained from MECA prior to construction activity.

Dredging was carried out with the use of a Cutter Suction Dredger (CSD). The dredged material consists of silty sand, mudstone, calcarenite and siltstone. For initial dredging activity, dry excavation activity was also carried out. The purpose of the dry excavation is to create a construction pit that will allow for the construction of the quay wall and jetty islands in the dry. This work method has several advantages to building these structures in the wet, including:

- faster construction schedule;
- better construction quality and assurance
- beneficial re-use of the excavated material onshore for the creation of land in the future Port development area, instead of disposing this material offshore;
- no underwater noise from marine piling, as the piling for the jetty islands will take place in the dry.

Once the area within the (temporary) bunds has been made dry by means of a well point dewatering system, the material located on the seabed, consisting of silty sand and mudstone, was excavated by means of hydraulic excavators and bulldozers equipped with rippers.

The excavated soil is transported by means of dumper trucks and tipper trucks from the excavation area to the designated onshore disposal location in Port of Duqm area. The placed material is levelled by means of Bulldozers. Before disposal, soil quality analysis is also conducted to check suitability of material for dumping.

In case the material dredged in the port basin cannot be beneficially re-used for construction of reclamation areas in the port basin, due to geotechnical restrictions, the material has to be disposed offshore.

### **2.2.2 Optional Scope**

Boskalis Westminster Oman LLC was also awarded the dredging and reclamation works as part of the optional scope for the Duqm Liquid Bulk Berth Project EPC 1, on 16<sup>th</sup> July 2018. The dredged material will be disposed offshore and optionally beneficially re-used into the reclamation area part of the optional scope. The reclamation area will be reclaimed with sand from the offshore borrow area, optionally in combination with beneficial re-used dredge material.

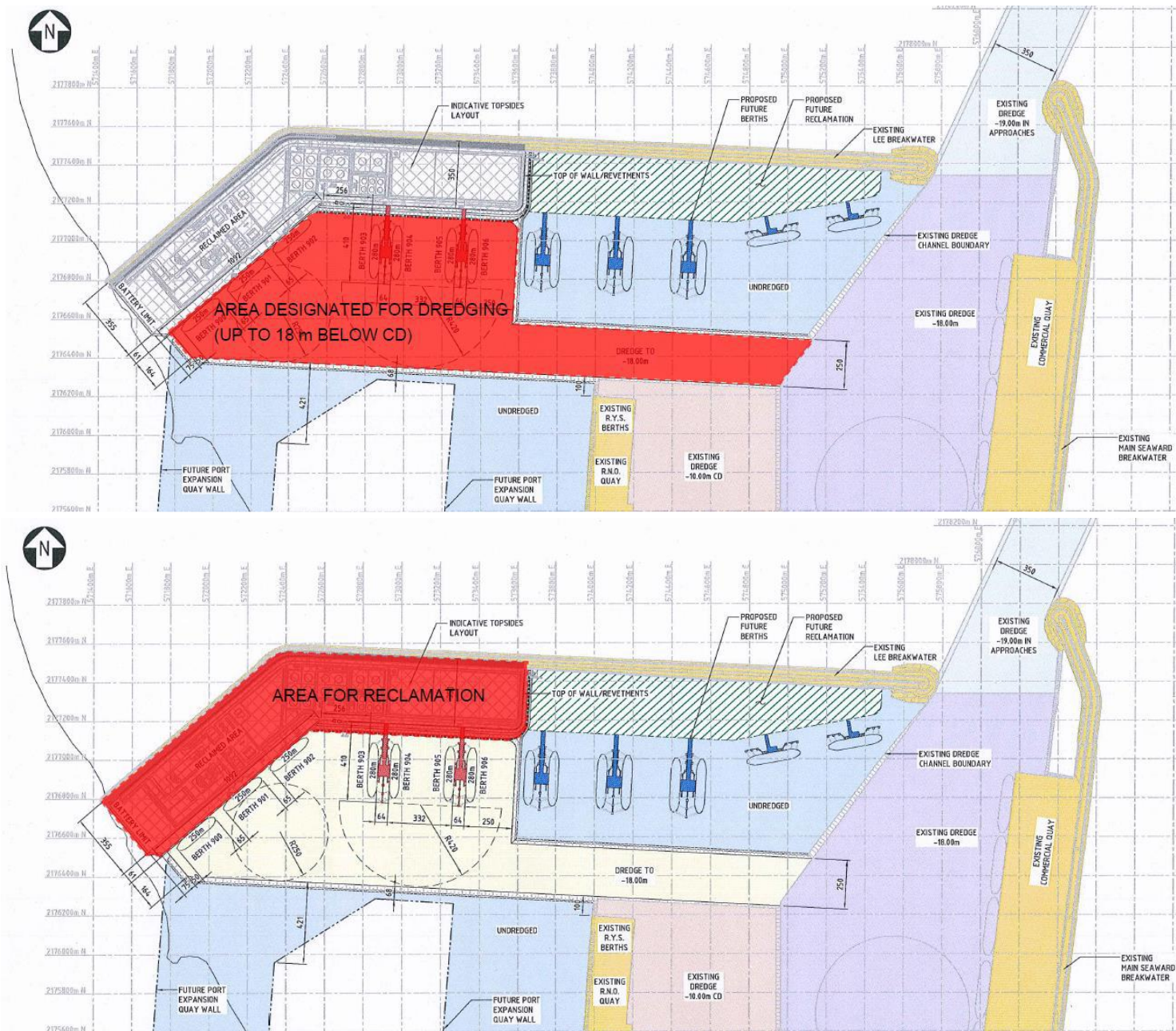


FIGURE 3: AREA EARMARKED FOR DREDGING AND RECLAMATION (HIGHLIGHTED IN RED)

## 3 BASELINE CONDITION

### 3.1 INTRODUCTION

The DLBB Project is located in the Al Wusta Region of the Sultanate of Oman. Al Wusta Governorate makes up 25.8 % of the land area of Oman, however only represents about 1 % of the population in the Sultanate with population density of 0.5 persons per square kilometre. The ecology in Al Wusta is diverse with many birds passing the Al Wusta region, and stopping over at Duqm coast for roosting and feeding, during their annual migration. On land, the climate, influenced by the annual autumn season in Dhofar, helps the growth of a variety of plants and rare mammals such as the Arabian Oryx and the Nubian Ibex. The waters off Al Wusta are home to marine cetaceans of conservation concern.

### 3.2 BASELINE ASSESSMENT SUMMARIES

Detailed environmental baseline reports comprising primary data collection were compiled and are available in separate reports, and presented as part of the ESIA Report. This Section provides a summary of baseline data -

#### 3.2.1 Climate and Meteorology

The DLBB Project is located on the eastern coast of Oman and experiences average temperatures between 15.4 °C and 40.8 °C and sparse rainfall. The main weather systems that deliver rainfall to the region comprise:

- Frontal systems: originating in the Red Sea or Mediterranean Sea and occur late December to April. These are also known as the winter monsoons or Shamal. The winter monsoon is characterized by a relatively gentle and variable, dry northeast wind;
- Cyclones: Originating in the Arabian Sea during May, June and October-November, they are relatively infrequent, occurring once every 7 to 10 years; and
- Summer Monsoon – ‘Khareef’: occurs annually between late June and September as wind, light drizzle and mists.

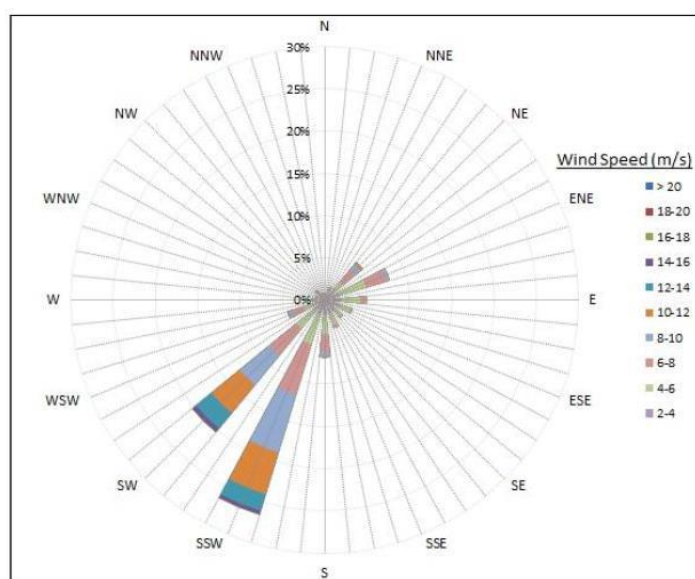


FIGURE 4: ANNUAL WIND ROSE (CSFR AT WAVEWATCH NODE 52567, 1979-2009)

Analysis of the hind-cast wind data (CSFR) shows that winds are predominantly from the South- Southwest and Southwest directions. The maximum and average hourly wind speeds in the wind dataset under analysis are 21.2 m/s and 6.7 m/s, respectively. Winds from the north east, north-north east, south and west south

west directions are also frequent but have lower wind speeds and percentages of occurrence compared to the prevailing south-south west winds. The hind-cast wind data also indicates that the most energetic winds occur during the summer months, peaking in June and July.

### **3.2.2 Earthquake and Tsunami**

Oman is a part of the Arabian plate, which comprises the continent of Arabia as well as oceanic areas consisting of parts of the Red Sea, Arabian Sea, Gulf of Aden and Gulf of Oman. Along the northeastern margin, the Arabian plate is in continental collision, which has given rise to the folded Zagros Mountains. The oceanic part of the Arabian plate is subducting along the Makran Trench. The destructive plate-margin of the Arabian plate along the Zagros and Makran is marked by intense earthquake activity. As the Arabian plate moves north-eastwards, parts of the plates are differentially deformed and periodic release of such stress accumulations causes earthquakes within the plate.

The south of Oman has very low seismic activities. In contrast, the northern portion of Oman has a moderate to high seismic activity. The Middle East Seismic Hazard Map prepared by the Global Seismic Hazard Assessment Program (GSHAP) indicates a Low seismic hazard in the Project area.

Based on recorded earthquakes and tsunami events, the risk of a large tsunami reaching the DLBB Project site is considered medium to small since the site is relatively sheltered from the main tsunami generating areas, i.e., the Makran and the Sumatran subduction zones.

### **3.2.3 Topography**

The DLBB Project is located in the Port of Duqm on the eastern coast of Oman approximately 7 km to the east of the Say village (also known as Al Duqm). The area immediately around the root of the LBW is *sabkha* (salt flats). The *sabkha* comprised of several infralittoral mud areas, intertidal sand and mud habitats, tidal and non-tidal lagoons, vegetated and non-vegetated dunes, and supra-littoral sand bars. These sand bars were broken through in areas, more so within the Port area than north of the LBW, with tidal inlets leading to tidal lagoons. North of the LBW are a series of non-tidal lagoons (otherwise known as '*khawrs*'), whereby the water has seeped underground to produce highly saline lagoons. The lagoons were then surrounded by a variation of sand and mudflats. On the whole the site topography is generally low lying and very flat, with the nearshore area fronting the port generally between 1 and 2 m above MSL.

### **3.2.4 Landscape and Visual Amenity**

The area around root of the LBW is a large salt flat, making the LBW visible from Highway #32, which passes through Say village. It should be noted that SEZAD has earmarked the salt flats between the LBW and Highway #32 for development into an industrial zone. Plastic and other litter is spread across the area near the root of the LBW. This litter is a result of Wadis flow carrying waste from its catchment and depositing around the project site. Other sources of litter are fishermen operating in the area and locals using the LBW for recreational fishing.

### **3.2.5 Geology**

The surface geology of the DLBB project area is characterized by low lying and flat salt flats, also called '*sabkha*', consisting of mud areas, intertidal sand and mud habitats, tidal and non-tidal lagoons, dunes and sand bars. North of the lee breakwater (LBW) area a series of non-tidal lagoons, also called '*khawrs*', are present. Due to the generally high temperatures and low precipitation rates on this wetland area, groundwater is highly saline and unfit for human consumption.

Furthermore, the subsurface geology at the DLBB project consists of Al Huqf's rock, the oldest sedimentary sequence found in Oman and Shuwayr formation, consisting of limestone with corals, debris-flow deposits. The wider Project area is dominated by Ras Duqm headland, a north-south directed limestone ridge with steep sea cliffs on the eastern side and a height of 100 m or more.



Dredged material in the harbour consists of silty sand and rocks consisting of calcarenite, mudstone and siltstone.

### 3.2.6 Soil Quality

In most of Oman the effective rainfall is very limited and soils are very dry most of the time. Soil formation is therefore very slow and weak. The General Soil Map prepared by the Ministry of Agriculture and Fisheries and Food and Agriculture Organization of the United Nations identifies the DLBB Project area is mostly composed of tidal flats, with poor soil unsuitable for agriculture. Past analysis of soil in the region has found no evidence of hydrocarbon contamination without any evidence of industrial contamination.

### 3.2.7 Hydrology

The DLBB Project lies within the Huqf hydrologic area. In the Al Wusta region groundwater discharge is in the dune fields of Ar Rub al Khali in the west and Huqf in the east, where highly fractured pre-tertiary basement outcrops borders the Arabian Sea. The main regional aquifer in the area is the Umm ar Raduma (UAR) formation. Groundwater in the area is saline and unfit for human consumption.

### 3.2.8 Wave conditions

The offshore yearly average significant wave height is approximately 1.5 m with average wave period of 10 seconds (WorldWave database). Maximum significant wave height offshore is around 4 m. Waves can be distinguished between swell and wind sea. The dominant swell direction is from S to SE direction and lower, wind dominated waves are from NE and NW directions.

### 3.2.9 Currents

Figure 5 presents current roses based on historic current measurements near the port of Duqm. This shows that maximum current speed within the port is 0.2 m/s and outside the port in the access channel 0.3 m/s. Hydrodynamic model study report carried out as part of the FEED showed flow conditions during flood and ebb phase of a typical spring tide as presented in Figure 6.

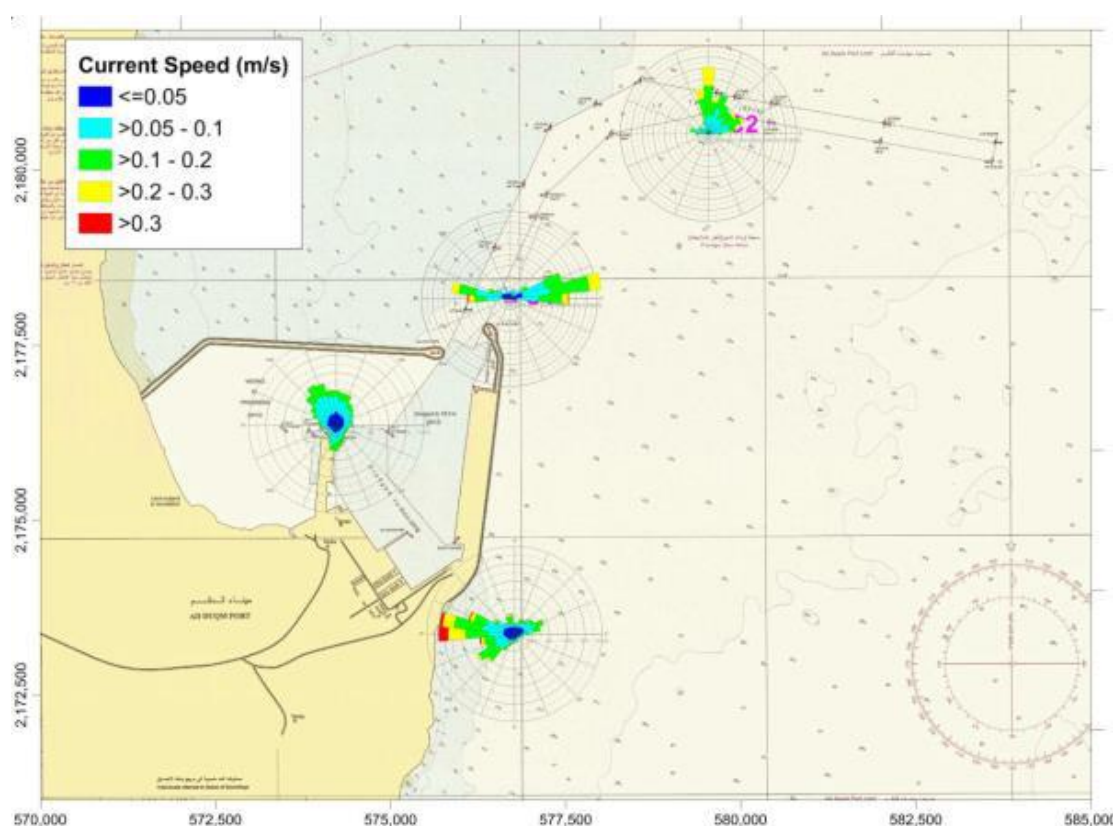
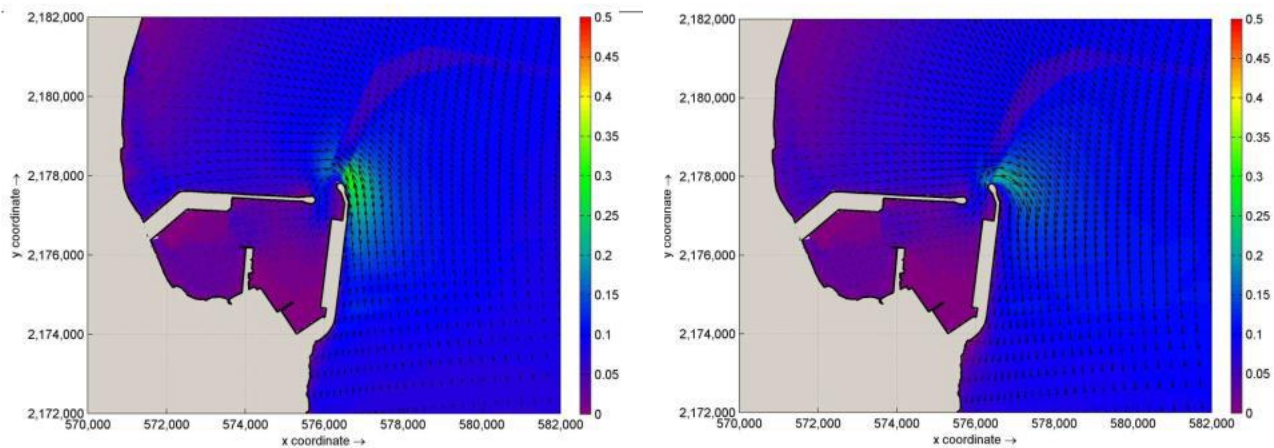


FIGURE 5: HISTORIC CURRENT MEASUREMENTS NEAR THE PORT OF DUQM FROM 9 MAY 2012 TO 9 JUNE 2012



**FIGURE 6: FLOW CONDITIONS DURING SPRING TIDE NEAR PORT OF DUQM, LEFT: FLOOD PHASE, RIGHT: EBB PHASE**

### 3.2.10 Water Quality

For the marine environmental baseline study conducted as part of the ESIA, water samples were taken inside the port, in the nearshore area outside the port and at the offshore borrow and disposal area and analyzed for physiochemical (Temperature, Salinity, pH, Dissolved Oxygen, Turbidity) and chemical (metals, BTEX, hydrocarbons, poly aromatic hydrocarbons, nutrients) water quality.

Results insight the port showed temperature varied between sites and over depth between 24.5 °C and 25.6 °C, mean turbidity ranged from 2.3 to 9.1 FNU, salinity between 36.4 and 37.3 psu, mean dissolved oxygen (DO) from 97.9% to 59.3% and pH between 7.7 and 7.8. No exceedances of chemical water quality guidelines.

In the nearshore area outside the port temperature varied between sites and over depth between 24 °C and 24.8 °C, mean turbidity ranged from 1.3 to 3.1 FNU, salinity of 37 psu at all sites and depths, dissolved oxygen (DO) from 66.2 % to 85.3 % and pH around 7.7. All metals concentrations were below laboratory detection limits except for copper and zinc which exceeded the adopted ANZECC guideline but remained below other adopted guidelines.

At the offshore disposal area mean temperature were similar at all sites 23.8 °C, mean turbidity ranged from 0.6 to 2.2 FNU, salinity of 37.4 psu at all sites and depths, mean dissolved oxygen (DO) from 72.2 % to 85.9 % and pH around 7.8. No exceedances of chemical water quality guidelines were measured.

Finally, at the offshore borrow area mean temperature were similar at all sites 25 °C, mean turbidity ranged from 0.1 to 0.3 FNU, salinity of 37.3 psu at all sites and depths, mean dissolved oxygen (DO) from 76.7 % to 90.4 % and pH around 7.8. All metals concentrations were below laboratory detection limits except for copper which exceeded the adopted ANZECC guideline but remained below other adopted guidelines.

### 3.2.11 Sediment Quality

For the marine environmental baseline study conducted as part of the ESIA sediment samples were taken inside the port, in the nearshore area outside the port and at the offshore borrow and disposal area and analyzed for metals, BTEX, petroleum hydrocarbons and organics. As no sediment quality guideline currently exist in Oman, the internationally recognized guideline for comparable tropical environments have been adopted: Australian and New Zealand Recommended Sediment Quality Guidelines [66].

Inside the port no exceedances of the adopted guideline were detected. In the nearshore area outside the port and offshore disposal and borrow area minor exceedance of cadmium and nickel were detected, however remaining below upper guideline values.

### 3.2.12 Ambient Air Quality

Ambient air quality studies undertaken for the region found that parameters are within the United States Environment Protection Agency (USEPA) National Ambient Air Quality Standards (NAAQS), excluding O<sub>3</sub> at one



location, where the ozone level is marginally above the USEPA NAAQS limit. Measurements of dust in the area also showed compliance with the USEPA NAAQS.

### **3.2.13 Noise**

Historic noise monitoring is available through several baseline studies which have been conducted for the Duqm Master Plan EIA (June 2011) and Environmental Baseline Study for Duqm Development and Surroundings (March 2013). Results of measurements along the roads showed values were below the proposed standard (70 dBA for industrial area). Additional measurements were carried out for the EIA [62] at the nine ambient air quality monitoring locations and at Say village. Measured values were below the limits as specified in MD 79/94 for industrial activity.

### **3.2.14 Terrestrial Ecology**

The Duqm region is important from the perspective of biological diversity which needs to be conserved for its productivity, regulation of climate and ecosystem services. Duqm plays a vital role for migratory and wintering shorebirds in Oman along the East-African – Central Asian Migratory Flyway and the Ghubbat Quwayrat bay (i.e., Port of Duqm site) at Duqm is designated as an Important Bird Area (IBA) by Birdlife International due to the presence of overwintering and passage waterfowl. Essentially all the birds at Duqm are migratory.

The terrestrial environment near the project location of Duqm consists of wetland habitat used by migratory and wintering shorebirds as feeding and roosting ground. The area is therefore classified as an Important Bird Area (IBA) by Birdlife International. All birds are listed as Least Concern by IUCN except for the Eurasian Curlew which is listed as Near Threatened.

Reptiles are well represented in the area with high abundance of lizards. Vegetation was mostly found in patches immediately around the LBW. The flora in the study area is dominated by halophyte plant community.

### **3.2.15 Marine Baseline**

Numerous cetacean species are observed in the project area. The most commonly recorded nearshore species in Duqm area are the Arabian Sea Humpback Whales and various species of the Delphinidae family such as dolphins, pilot whales and killer whales. The Arabian Sea Humpback Whale is listed 'Endangered' by International Union for Conservation of Nature and Natural Resources (IUCN). Most

humpback whales were recorded between August to November and February to April. Furthermore, species of the Delphinidae family, such as dolphins, pilot whales and killer whales are found nearshore of Duqm.

The main turtle species in the project area are the green (*Chelonia mydas*) and loggerhead turtles (*Caretta caretta*). There is evidence that turtles nest and feed on the coastline along the Port as shown in Figure 5.8. It should be noted that this map is from 1991, and since then the Green turtle nesting site along the southern beach of Duqm bay (indicated by the red circle) no longer exists as a result of the development of Duqm port that has taken place since. The Green turtle nesting site indicated in green is located approximately 10km north from the entrance to the port and the dredging and reclamation works to be performed inside the port. Nesting season for loggerhead and green turtles is in summer and autumn (July to September).

In addition, in the EIA it is stated that the abundance of turtles in the Duqm area is relatively low compared to the internationally recognized Marine Protected Areas located nearby: Ras Madrasah (located 70km to the southeast), Barr al Hilkam (90km to the northeast) and Masirah Island (approximately 100km northeast).

All turtle species are protected by both Omani national legislation and international agreements to which Oman is a signatory. In addition, Port of Duqm Company (PDC) and Oman Oil Company (OOC) have an agreement with Environment Society of Oman (ESO) to support marine turtle conservation on Masirah Island.

Benthic life is sparse in the nearshore area of Duqm as well as in the offshore borrow and disposal area. No coral, seagrass or substantial areas of macroalgae were identified in the area probably due to the absence of hard substrates.

### 3.2.16 Socio Economic

The DLBB Project is located on the LBW within Duqm Port and the nearest inhabited village is the Say village located on the banks of Wadi Say. The name Say village is often used in synonym with Duqm Town and is the administrative headquarters of Duqm Wilayat. Majority of the population within the Al Wusta region lives in the coastal zone in small towns or villages.

The Governorate is divided into four Wilayats, viz., Mahout, Al Jazer, Duqm and Haima (in the order of the population number). The local people rely heavily on fishing for its income. However, a number of Government-planned initiatives for industrial and tourism developments in Al Wusta are expected to supplant the traditional reliance on agriculture and fisheries.

As part of the DLBB Project there will be no relocation or displacement of the local population. Additionally the local community could be impacted as a result of influx of migrant labour and accidents. During constructive discussion in Wali office, many representatives of institutions as well as community members, raised questions about the storage tanks safety and firefighting measures, types of liquid and bulk materials to be handled, whether risk assessment was conducted for the DLBB Project, environmental study of the projects, type of contractors to be mobilized for DLBB Project and employment opportunities, materials to be processed in refinery and how they will be transferred to vessels. Overall response was positive and participants were pleased that these consultations were carried out to inform them about the upcoming project. A summary of the discussion with institutions are presented below:

- Institutions see the upcoming developments in Duqm as highly positive for overall economic and social development in Duqm
- They expect / require from companies coming to the SEZD to provide job opportunities for people of Duqm in the long term and more contracts to be awarded to Duqm companies. These requirements were imposed to authorities in Duqm already by local population.
- They expect / require more information about the upcoming developments, promotion of industry requirements in order to plan education curricula for young generation to match the local professional requirements. This should involve education authorities
- Participants expect development and upgrade of all city facilities, infrastructure, utilities and services
- The challenge of the development will be not to impact environmental quality and to protect the fish wealth and fish stock
- The institutions are concerned about overall safety once the massive expat labour force moves in. To prepare for this, the Royal Omani Police (ROP) is going to move into new office. Safety wise, the ROP requires companies to organize induction programs for expats about living in the interior of Oman and about local culture and customs, and to prevent interference to local culture, etc.
- No complaints were recorded on environmental quality in Duqm
- The opinion about the overall development in Duqm is positive and the projects are very welcome, and be'ah did not express any expectations from this particular Project related to the waste management (industrial or communal) nor has identified any advantages / issues/challenges in this context that might result from the upcoming development.

### 3.2.17 Archaeology

As the DLBB Project will be established on reclaimed/backfilled land within the existing port it is unlikely the DLBB Project will interact with any archaeological resources. However, should any archaeological resources be identified during the construction phase, the same will be reported to SEZAD and the Ministry of Heritage and Culture.

## 4 SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND MANGEMENT PLAN

### 4.1 INTRODUCTION

Impacts have been assessed as planned and unplanned impacts. Planned environmental impacts are those which result from routine operation and maintenance, while unplanned are those which will result from accidents or non-routine operation and maintenance.

#### 4.1.1 Planned Impact

Planned impacts have been rated considering the duration of the impact, the area of influence and the intensity of the impact, while unplanned impact have been assessed considering their likelihood and severity. The impacts will be rated 'Low', 'Medium' or 'High' significance based on the area of influence, spread duration of the impacts. Further, mitigation measures will be proposed based on rated significance.

**TABLE 1: IMPACT ASSESSMENT MATRIX – PLANNED IMPACTS**

Area										
	Regional Spread			Moderate Spread			Local Spread			
Duration	Long	H	H	H	H	H	M	H	M	M
	Medium	H	H	M	H	M	M	M	M	L
	Short	H	M	M	M	M	L	M	L	SS
	High	Moderate	Low	High	Moderate	Low	High	Moderate	Low	
Intensity										

#### 4.1.2 Unplanned/Accidental impacts

Unplanned impacts have been assessed in the ESIA considering the severity of the impact and likelihood of the impact.

**TABLE 2: IMPACT ASSESSMENT MATRIX – PLANNED IMPACTS**

		Likelihood					
Severity	Social & Health	Environmental	Very Unlikely	Unlikely	Likely	Very Likely	Certain
	No Adverse Impact	No Adverse Impact	LOW				
	Negligible	Slight					
	Minor	Minor	MEDIUM				
	Moderate	Localised					
	Major	Major	HIGH				
	Massive	Massive					

### 4.2 IMPACT ASSESSMENT

The tables (Table 3 through Table 6) below summarise planned and unplanned impacts during construction and operation phase of the Project, after implementation of the mitigation plans

**TABLE 3: SUMMARY OF PLANNED IMPACTS – CONSTRUCTION PHASE**

IMPACT TO	AREA OF INFLUENCE	DURATION	INTENSITY	SIGNIFICANCE
Soil quality from land take and earthworks	Local Spread	Long term	Low	Medium Impact
Hydrology from Storm water runoff and waste management	Local Spread	Short to Medium term	Low	Slight to Low Impact
Terrestrial ecology from land take and light and noise	Local Spread	Medium to Long term	Moderate	Medium Impact
Air quality from combustion emissions and dust	Local to Moderate Spread	Short to Medium term	Low	Low to Medium Impact
Ambient noise level from construction activity	Local Spread	Medium Term	Low	Low Impact
Soil quality from waste management	Local Spread	Medium Term	Low	Low Impact
Marine ecology from marine construction	Moderate Spread	Medium Term	High	Medium Impact
Marine water quality from marine construction	Moderate Spread	Medium Term	High	Medium Impact
Socio-economical from DLBB Project construction	Moderate Spread	Medium Term	Moderate	Medium Impact

**TABLE 4: SUMMARY OF UNPLANNED IMPACTS – CONSTRUCTION PHASE**

IMPACT FROM ACCIDENTAL	LIKELIHOOD	SEVERITY	SIGNIFICANCE
Release of hydro test water	Unlikely	Localized	Medium Impact
Spill of chemical – fuel during transport	Unlikely	Major	Slight to Low Impact
Spill of chemical – fuel on land	Unlikely	Major	Medium Impact
Spill during marine refueling	Unlikely	Major	Low to Medium Impact

**TABLE 5: SUMMARY OF PLANNED IMPACTS – OPERATION PHASE**

IMPACT TO	AREA OF INFLUENCE	DURATION	INTENSITY	SIGNIFICANCE
Land use from land take	Local Spread	Long term	Low	Medium Impact
Air quality from VOC emissions, fugitive dust and combustion emissions	Local to Moderate Spread	Short to Long term	Low	Low to Medium Impact
Ambient noise from operation	Local Spread	Long Term	Low	Medium Impact
Soil quality from waste management	Local Spread	Long Term	Low	Medium Impact
Terrestrial Ecology from Light and noise	Local Spread	Long Term		Medium Impact
Marine ecology from operation	Local Spread	Long Term	Low	Medium Impact
Marine water quality from operation	Local Spread	Short Term	Low	Medium Impact
Socio-economic	Overall positive impact			

**TABLE 6: SUMMARY OF UNPLANNED IMPACTS – OPERATION PHASE**

IMPACT FROM ACCIDENTAL	LIKELIHOOD	SEVERITY	SIGNIFICANCE
Leak from tanks	Unlikely	Major	Medium Impact
Spill of Pet Coke and Sulphur	Unlikely	Minor	Medium Impact

### 4.3 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN (ESMP)

The environmental management plan presents mitigation measures ensure that negative impacts are reduced to ALARP, and meet relevant Omani national laws and regulations, and internationally acceptable standards. An EMP with the process adopted and its organization, the mitigation measures for each phase and the scope of the supporting monitoring and management plans has been developed as part of the ESIA study by Worley Parsons. Boskalis has prepared detailed site specific management plans, including Construction Environment Management Plan, Waste Management Plan, Oil Spill Contingency Plan, Emergency Response Plan etc prior to outset of any activities and the document was approved by SEZAD.

SEZAD Corporate Social Responsibility (CSR) section of the Partnership and Development Department (PDD), provides access for communities to provide any grievance (written and in person) through the Grievance Mechanism (GM) form. The GM form is available on SEZAD website at <https://www.duqm.gov.om/sezad/csr/grievance-form>. Boskalis also have their grievance reporting format in line with SEZAD GM.

Operational phase environmental management will be prepared before operation of the facility to ensure compliance with required Omani/International regulation and international conventions.

The commitments made in the ESMP will be actioned on the ground during construction, primarily by the appointed EPC Contractors and with oversight from Tatweer and during operation by Duqm Refinery and Petrochemical Industries Company L.L.C (DRPIC).

#### 4.3.1 Construction Environment Management Plan

A detailed CEMP has been produced by Boskalis which provides receptor specific mitigation and management measures as well as monitoring requirements throughout the duration of construction activities. A summary of management plan is provided below for identified aspects

##### 4.3.1.1 Turbidity

Dredging activities and work methods will be selected such that suspended sediment has minimal impact on sensitive environmental receivers. Contractor will apply an adaptive management plan to ensure that the dredging activities work within possible required turbidity thresholds. Preliminary dredge plume results shows that the turbidity limit will be met for reclamation, borrow, dredging in the harbor basin and disposal activities.

In addition to the mitigation measures proposed in the EIA, Contractor's proposed adaptive management steps as included in CEMP are:

- Measure turbidity at the designated locations continuously;
- Well maintained dredging equipment;
- Well maintained hopper doors on the TSHD to reduce the potential of sediment loss during transport;
- Raising the level of the overflow to its highest position to reduce potential spillage during sediment transport by the TSHD;
- In case turbidity monitoring shows levels reach the turbidity limit, limited overflow of TSHD dredging operations can be applied;
- Disposal of dredge at non-sequential locations inside the designated disposal site, to avoid localized accumulation of suspended sediments;
- Prolonging periods between (maintenance) disposal activities by combining disposal activities with borrow area activities etc

##### 4.3.1.2 Traffic Management

- Managing the traffic during construction will be considered to help reduce noise problems due to transporting or delivering of materials and equipment on site. The following control measures will be implemented:

- Traffic movement to be minimized outside the site and awareness training to be provided to vehicle drivers.
- Speed limits at the site to be adhered to and Tyres and tyre pressure to be maintained to reduce friction between the wheel and surface.
- Light and heavy vehicle movement will be separated as much as practical possible.

#### **4.3.1.3 Ambient Air**

As part of the implementation of the Air Quality Impacts Mitigation, the Contractor ensure that weather forecast data and warnings from local Weather Station are monitored on daily basis and communicated to the construction team as alert in case of any bad weather forecast. The data will contribute to the implementation of the management measures and risk management measures as required (e.g. high wind speeds could mean more dust generated during the earthworks). If data from the weather stations indicates high winds, where possible and the programme allows, postpone particularly dust generating activities until wind speeds have reduced.

There is a potential for dust to arise during the earthworks (i.e. grading, bulldozing and compaction) material loading and hauling, vehicle movements over unpaved surfaces, excessive vehicle speeds and drop heights during backfilling operations have the potential to generate significant airborne particulates. Mitigation measures to reduce dust problems shall include the following:

- All access roads to the site shall be watered as required to minimise dust generation.
- The surrounding roads and sidewalks to be kept free from construction debris
- Measures such as water spraying and enclosing (with tarpaulin sheets or permanent structures) are to be adopted to minimise dust from loading/unloading area
- Footprint of disturbance from construction operations at the working area to be kept to a minimum and movement of vehicles, mobile equipment and machinery to be restricted within the work areas.
- Haul roads to be paved and / or watered (i.e. sprayed) as much as possible. The speed of vehicles on haul road will be limited.
- Uncovered stockpiles and the areas other than haul roads if they are a source of dust to be watered. Non-potable water sources to be used as an alternative to potable water use etc

#### **4.3.1.4 Ambient Noise**

Following mitigation measures Contractor will be implemented to minimize (exposure to) high noise activities by:

- Scheduling high noise activity for the day time as much as feasible;
- Shielding of equipment and use of enclosures to reduce noise;
- Regular maintenance of equipment to protect from noise;
- PPE shall be provided to workers in high noise areas as per MD 80/94.

#### **4.3.1.5 Gaseous Emissions**

Some measures that will be adopted during the construction works as part of the implementation of the Gaseous Emissions Management are as follows-

- All construction vehicles and machinery to have up to date inspection certificates to demonstrate that they are in good working condition before they can be used on site.
- Whenever excessive smoke is identified from any construction vehicle or machinery, it shall be serviced as soon as possible and taken out of use until the maintenance has been satisfactorily completed.
- All activities, related to engine idling (trucks, vehicles, machinery) to be limited as much as practical.
- The burning of any material or waste stream is strictly prohibited on site or in unauthorised/licensed facilities.

#### **4.3.1.6 Terrestrial Ecology**

Mitigation measures to manage the impact to terrestrial ecology include:

- All reasonably practical measures to minimise injury and disturbance to wildlife or their habitats caused by any work, light, noise, vibration, dust, other air pollution, and pollution incidents to be undertaken and all other management plans to be followed as these provide measures which will also protect wildlife.
- Other measures of particular note include pollution prevention and spillage control, where use of designated refuelling areas, use of drip trays, and availability of spill kits close to works are key, and sediment/ erosion control and stockpile management.
- Deep excavations to be covered or fenced to prevent fauna from falling in and being unable to escape.
- Artificial lighting will be kept to a minimum. The major lighting sources shall be pointed inward and downwards where practicable to reduce light spill
- Erect fences along the boundary of the works area before the commencement of works to prevent vehicle movements, and encroachment of personnel, onto adjacent areas
- Regularly check the work site boundaries to ensure that they are not breached and that damage does not occur to surrounding areas.
- Hunting or trapping of birds or animals by Project personnel is Prohibited.

#### **4.3.1.7 Marine Mammals**

Slow moving marine fauna such as turtles that regularly swim at the water surface, may be impacted by vessels movements. Dolphins and whales are far less likely to get struck by a vessel, but attention needs to be paid regardless, especially to the Humpback whales, as they form a small and unique population along the coast of Oman.

To minimize impact of vessel movement on large marine fauna, a number of operational control procedures for vessels will be implemented. A trained, qualified and experienced Marine Mammal Observer (MMO) will give training to relevant project personnel, navigational watch crewmembers on each vessel at the start of the project. Reminders and updated information will be provided in toolboxes throughout the project.

During all phases of the Project, the general principle guiding vessel operations will be to avoid, as far as practicable, any interaction with marine mammals. Therefore, vessels in the vicinity of a cetacean or cetaceans will (with the exception of emergency situations) adhere to the following guidelines. These guidelines are based on guidelines from JNCC for oil & gas industry and piling and blasting activities. As no guidelines exist for dredging, Contractor has adopted applicable guidelines from JNCC which are to be adhered to by dredging vessels.

- Do not intentionally approach within 300 m of marine mammals (Figure 8.3);
- Always operate at a 'no wash' speed when they are within 300 m of a large cetacean;
- Do not approach cetaceans from an angle of less than 60° into or away from the direction of travel of the cetacean(s)
- Do not encourage bow riding by cetaceans. Should any cetacean(s) commence bow riding in front of a vessel, the vessel master will not change course or speed suddenly;
- Report any marine fauna activity in the area to the Marine Environmental Manager and vessel captain (if applicable);
- Report instantly any observed (possible) danger for marine fauna or related environmental aspects to the Marine Environmental Manager;
- Record any marine mammal sightings on the MMO recording form;
- In case a marine mammal enters the 300 m safety zone around the dredger, communicate to other vessels of Contractor in and near the safety zone to allow compliance with mitigation measures;

- Attend and participate in marine mammal observer toolboxes and environmental meetings relating marine mammal observing, where relevant.

#### 4.3.1.8 Monitoring Plan

The results obtained from the monitoring activities have been recorded in fortnightly, monthly and quarterly results. The following monitoring are being undertaken and reported to SEZAD on a periodic basis -

- Marine monitoring (turbidity, water quality, marine mammal, PSA) (fortnightly, monthly, quarterly);
- Air quality and ambient air quality (quarterly);
- Noise (monthly);
- Waste reporting (monthly); and

#### 4.3.2 Monthly and quarterly inspection audits.Climate Affairs

The GHG emissions from the DLBB Project is being reported to SEZAD during the construction phases. It should be noted that during the construction phase the major source of GHG emissions will be attributed to the movement and operation of the various construction equipment. During the operation phase the major source of GHG emissions will be from the operation of the emergency flare. Being a coastal project the DLBB Project is in particular vulnerable to sea-level rise and in order to mitigate this, a sea level rise (SLR) of 5 mm/y is applied to the DLBB Project. This equates to an allowance of 0.25 m over a 50-year design life. The climate change adaptation has been highlighted in the ESIA report.

#### 4.3.3 Operation Environment Management Plan (OEMP)

During the operation phase the project will be handed over to DRPIC). A framework OEMP is included in the EIA report which will be updated by DRPIC before operational phase. Table 7 summarizes the management and monitoring scope during the operation phase

**TABLE 7: ENVIRONMENTAL MANAGEMENT AND MONITORING**

ASPECT	SCOPE OF MANAGEMENT
Air Quality	Assessment and management of fugitive VOC, fugitive dust, and combustion emissions from the operational phase of the project
Noise	Management and monitoring of public and work place noise to comply with the relevant standards
Waste	Assessment of waste generated; life cycle of all project generated and disposed waste
Marine Water Quality	Management and monitoring program to provide actions and supplemental measures to be employed should any adverse marine impacts arise from accidental leakage or spills or due to vessel movement
Marine Ecology	Avoidance, protection and mitigation of the designated nature conservation site like the IBA, marine cetaceans etc and monitoring of the same
Terrestrial Ecology	
Community and Social	Outline the key mitigation requirements to monitor and ensure economic and social development in Duqm as a result of the project
Hydrology	Outlines mitigation measures to minimize any impacts due to accidental spills



## 5 FINDINGS AND CONCLUSIONS

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The Project area is surrounded by wetland area/Sabkha. The nearest inhabited village is the Say village located about 5.5 km south west, with a fish landing area located 4 km north. The predominant wind direction is towards north east away from these population centres. The social baseline survey conducted as part of this EIA study indicated that the local population supports the ongoing developments in Duqm and is looking for an improvement in their quality of life as result of the developments. The terrestrial and coastal environments around the DLBB Project are sensitive on account of the terrestrial area adjoining the DLBB Project being designated an IBA and the presence of the Arabian Sea Humpback Whale which is endemic to the region and endangered. It should be, however, noted that the study area on the whole is undergoing major development as part of the SEZD development and all stakeholders will contribute to environmental impact in the region.

The DLBB will be operational for decades so the temporal and spatial extent of activities will be ongoing and long-term. The management and monitoring of environmental and social aspects is also long-term and will thus become part of everyday activities. At the same time, legislation in Oman, and potentially new environment-related Conventions, as well as new requirements from SEZAD (e.g. technical guidance, audit visits, monitoring reporting) will grow in scope and rigour. The ESMP will evolve to keep pace with any changes. Staff will be appointed to take responsibility of environmental and social/socio-economic matters. The Contractors will develop their own systems, documentation and staff to effectively implement measures in the ESMP and be able to demonstrate how compliance is being met. Those involved in the Project will regularly liaise with stakeholders), other proponents in the Duqm SEZ and the regulator to bring all the identified impacts to an ALARP level.