AFRICAN DEVELOPMENT FUND

DJIBOUTI

DORALEH CONTAINER TERMINAL PORT PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT SUMMARY (ESIAS)

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1 INTRODUCTION

Dubai Ports World (DP World) operates ports and container terminals at numerous locations throughout the world. One such location is Doraleh within the Republic of Djibouti. The DP World operations in Djibouti currently include the existing port facilities (a petroleum terminal and the Port Autonome International de Djibouti (PAID)) and the Djibouti International Airport. Due to its strategic location at the southwestern corner of the Red Sea, the Port of Doraleh has been identified by DP World as an appropriate location for the development of a container terminal. However, DP World has recognized the environmental values of the Project site and as such has commissioned this environmental and social impact assessment (ESIA) to assess the potential environmental impacts that may arise during the construction and operation phases. GHD Global Pty Ltd (GHD) was commissioned by DP World to undertake an Environmental Impact Assessment (EIA) of the construction and operation of the proposed Doraleh Container Terminal in Djibouti.

2 PROJECT DESCRIPTION AND JUSTIFICATION

2.1 PROJECT DESCRIPTION

The Doraleh Container Terminal (DCT), Djibouti (the Project) is a proposed container terminal for the handling of container transported products located in the Republic of Djibouti, northeastern Africa. The Project will be located on the Red Sea at Pointe Noire along the southern coast of the Gulf of Tadjoura. The nearest inhabited area is the village of Doraleh, in the proximity of the Project site, while approximately 12 km to the southeast is the city of Djibouti. The Project will be constructed in 2 phases, consisting of: Phase 1: Dredging a basin area and berth pocket to a depth of 18m, construction of a 1,050 m container berth, dredging and earthworks (including land reclamation activity) for an operating area of 54 ha; and Phase 2: Additional 900 m of berth and corresponding dredging and additional operating area.
The completed Project will consist of: (i) A naturally deep channel, dredged basin area and protected port area; (iii) Reclaimed land; (iii) A quay wall; Operations yard and associated structures; and Approximately 2,000 m of container ship berths.

The Project will consist of three key elements:

a. **Land Facilities**: these will cater for all gated, container freight stationing, stuffing and stripping activities. The Land Facilities will be located on a reclaimed platform approximately 300 m wide and extending approximately 750 m into the sea, between two wadis on a strip of coastal land. The Land Facilities will include: Port Authority building; Traffic circulation system plus truck parking; Terminal inspection gate; stuffing and stripping yard; Empty container depot with repair and cleaning;

b. **Marine Facilities**: these will facilitate the transshipment, import and export of the containers. The Marine Facilities will be located on a reclaimed platform covering an area of approximately 450 m by 1,050 m and approximately 2 km offshore in a northwesterly direction from the Land Facilities. The Marine Facilities will include: Quay Wall; Apron; stacking yard; Marine empty yard; Out of gauge yard; Equipment parking; Operations and engineering office building; Amenities building; Miscellaneous support facilities.

c. **Transport Areas**: these will allow for the approach to, docking at and egress from the Marine Facilities, as well as connecting the Marine Facilities with the Land Facilities. The transport Areas will include: an access channel to a depth of 18m below sea level (no dredging is required for creation of this access channel due to the existing depth of the waters); a protected port area to a depth of 18m below sea level (dredging will be required for the basin in front of the berths); and a causeway between the Marine Facilities with the Land Facilities.

### 2.2 PROJECT JUSTIFICATION

Due to its location on the southwestern corner of the Red Sea, the Project site is strategically located along shipping routes that utilize the Red Sea and the Suez Canal for travel between port facilities to the north (such as northern Africa, the Middle East and Europe) and those to the south and east surrounding the Indian Ocean. Due to the political stability of Djibouti in comparison to a number of its neighbors in northeastern Africa, the Port of Doraleh has also been identified as a preferred alternative for the location of a container terminal for the importation and export of various goods from a number of northern Africa nations, particularly Ethiopia.

The purpose of the Project will be to facilitate the importation, export and transshipment of container transported products. The key materials and sources of material being transported through, exported from and imported to the Project site are expected to be: aid cargo; and various goods going to and from various northern Africa nations, particularly Ethiopia.

The Project will facilitate the growing shipping and cargo traffic of the Port of Djibouti. Due to limitations on the opportunity for expansion of the existing port facilities at Doraleh, the Project has been identified as important to facilitate this increase in traffic and provide necessary facilities for future expansion.

### 3 LEGAL FRAMEWORK

The environmental laws, regulations and requirements that apply to the construction of the Port and its environmental performance include: current Djibouti legislation and regulations; and the requirements of international financial institutions including the World Bank (EA Procedures in
the Environmental Assessment Operational Policy 4.01 (1989) and the Environmental Assessment Sourcebook (1991), and African Development Bank’s 2001 Environmental and Social assessment Procedures (ESAP).

3.1 OUTLINE OF THE ENVIRONMENTAL LAW IN DJIBOUTI

A French translation of a summary of the Environmental Law in Djibouti provides guidelines for the protection of inland water, marine water, air, the terrain and of fauna and flora. It also deals with the production and disposal methods sanctioned by the Djibouti government for toxic and dangerous wastes, and highlights the potential fines imposed for any infringements (articles 43 – 51). The relevant clauses of the United Nations agreed systems (World Health Organization (WHO) and World Bank Group (WBG)) are used to define toxicity and danger levels of waste. At the time of writing, Djibouti does not have national guidelines for acceptable noise and vibration levels. Article 42 of the translated Environmental Laws for Djibouti (2001) recommends the use of United Nations (WHO and WBG) guidelines for reference in the absence of Djiboutian guidelines. Similarly the Environmental Laws for Djibouti do not provide any guidelines on safe limits for air quality, and water and sediment quality, within Djibouti.

4 DESCRIPTION OF THE PROJECT ENVIRONMENT

4.1 TOPOGRAPHY

The landscape of Djibouti is dominated by a series of high, arid plateaus and low coastal plains, formed by the volcanic action that accompanied the uplifting and faulting of the East African shield and the Rift Valley system, with many areas exhibiting thick layers of lava flow. An extensive alluvial delta fan extends across the expanse between the Project site and the city of Djibouti, formed from the outflow from the Oued Ambouli wadi. The Project site is located on an approximately 300m stretch of land between two wadis (Goon Maan to the west and Bugdo Gaal to the east), approximately 5 km to the west of the city of Djibouti, with a steep cliff face approximately 200 m to the south of the Project site rising to a plateau approximately 50m above sea level (ASL). The Project Site is uneven, with a mound approximately 5m in height and 350m in length located on the land side of the Project site, and a troughed region on the southern boundary.

4.2 SOILS AND GEOLOGY

The Djiboutian soils are almost entirely of volcanic origin: two thirds of the country has generally deep basaltic soil, while the higher land is gravely, and the only sedimentary zone is a narrow coastal plain in the east by the Project site (where there is an annual rainfall of approximately 100-150 mm). The geological survey of the Project site identified predominantly silty sands and sandy clay in the shallow waters, becoming more sandy coral, coral limestone with progression towards the coral reef out to sea.

Djibouti lies on a tectonic plate fault line and is subject to extensive seismic activity. Although there have been approximately 15 seismic events in Djibouti in the last 50 years, the predicted likelihood of a magnitude 5.0 earthquake in the region is only one every 16 years. Djibouti lies in an area of tectonic instability, with an open air fault running northwest to southeast from the Danakil depression in Ethiopia to Lake Assal, and gradually separating the Horn of Africa from the rest of the African continent. Most of Djibouti is underlain by Quaternary volcanic rocks, with Lower Cretaceous limestone occurring in the south of the country at the border with Ethiopia and Somalia, and coral reef limestone occurring along the coastal area.
4.3 AIR QUALITY

The Project site is located in an undeveloped area distant from existing primary stationary sources of air pollution in Djibouti such as the industrial area at Djibouti Free Zone (approximately 3.5 km to the east), the Djibouti Ethiopia rail line (approximately 5 km to the southeast), the PAID (approximately 5 km to the northeast) and the Oil Terminal (approximately 2 km to the west), which all contain a number of industrial plants and processes that potentially emit a number of air pollutants.

4.4 CLIMATE

The climate of Djibouti is classified as arid to extremely arid and it is among the hottest in the world. The average temperature varies between 25°C in December and 40°C in July. The average annual rainfall in Djibouti is 147 mm and varies from 50 mm in the northeast, to 300 mm in the region west of Tadjoura. Because of the low annual rainfall and its irregular distribution, there are no perennial or permanent rivers and surface runoff takes place during one or two days only after relatively heavy rainfall. In Djibouti, the rains are distributed approximately over 26 days during an entire year.

4.5 MARINE WATER

4.5.1 Physiochemical Water Quality

The water temperature was consistent over the four sampling stations and ranged from 29 to 30°C. These temperatures deviated little with depth, indicating a well mixed water column. The mean turbidity indicates minimal suspended particulate matter (such as clay, silt, detritus and organisms) in the water column. However, turbidity is expected to increase during input of fine sediments released from the ephemeral delta after heavy rain. The salinity values recorded across the four sample stations are indicative of a highly saline marine environment and showed no variation between sampling stations, or with depth. The pH of seawater remained constant between sampling stations and throughout the water column, with a mean pH value of 8.1, typical of marine waters. The oxygen reduction potential (ORP) readings showed no variability between sites, or with depth. ORP is a measure of the oxidation and reduction processes occurring in the water.

4.5.2 Analytical Water Quality

Water quality across sampling stations can be considered as non-polluted. Heavy metals, BTEX, total petroleum hydrocarbons and polynuclear aromatic hydrocarbons (PAH) were not detected in the water samples around the Project site. Detectable concentrations of phosphorus and warm sea temperatures pose a risk to water quality in the form of algal blooms.

4.5.3 Sediment Quality

Sediment quality in Djibouti, across the sampling stations, can be considered polluted, based on the high oil and grease content (average concentration of 58.25µg/kg). No BTEX or polynuclear aromatic hydrocarbons were detected within the sediments. Some heavy metals, namely aluminium, arsenic, cadmium, iron, mercury, selenium and vanadium were detected in the sediment, however all heavy metal concentrations remained below international guidelines.

4.6 GROUNDWATER QUALITY
Djibouti has limited groundwater resources, closely linked to the frequency of floods, the infiltration conditions in the wadis, the hydraulic contact with the substratum as well as to the permeability of the substratum. Groundwater is rarely used for irrigation purposes due to its highly saline properties and boron content. However groundwater aquifers are drawn on for both agricultural and potable drinking water uses. Fresh water supplied to Djibouti town is essentially groundwater located in the fractured Gulf and Somali basalt aquifers. The overexploitation of Djibouti’s aquifer and the high pumping rate are contributing to an increase in the salinity of groundwater due to the intrusion of seawater (Houssein and Jalludin, 1996). Total renewable groundwater resources in the Djibouti district are estimated at between 10 and 21 million m³/year.

4.7 TERRESTRIAL ECOLOGY

The terrestrial habitat surrounding the proposed development is predominantly low laying dry scrub land surrounded by a 30 m high hillside. Mangroves were observed on the coastal fringe within and adjacent to the project site during field studies undertaken as part of this EIA. Mangroves appear along the upper inter tidal zone in bays and other protected areas. Several wadis drain into the sea creating mini deltas suitable for mangroves. In particular, the annual deposition of silt from the alluvial fan delta has produced an environment suitable for the growth of fringing mangrove plants. Stunted mangroves delineate the coastline, ranging from the proposed site towards the city of Djibouti for 5km. The mangrove trees at the Project site cover an area of approximately 1.2 hectares. These mangroves constitute part of a large belt of trees that fringe the outer reaches of an inter tidal mudflat towards the Ampoule Wadi, covering a total area of 13 ha. Mangroves, seagrass beds and coral reefs are linked together by the water masses that move in and out with the tide, and by the animals that move between these habitats. Tides and currents transport nutrients from the mangroves to seagrass beds and inshore coral reefs. These nutrients enrich the seagrass and reef environments which are important habitats for fish and turtles. By reducing current speed and trapping sediments in their tangled roots, mangroves play an important role in preventing coastal erosion and help to reduce siltation in adjacent marine habitats. Terrestrial wildlife observed during a five field study in November 2006, included the African Scops Owl (*Otus senegalensis*), the Blackheaded Heron (*Ardea melanocephala*), the dromedary (*Camelus dromedaries*) and Abyssinian Roller (*Coracias abyssinica*). No terrestrial species of conservation significance were sighted during the field study.

4.8 MARINE FAUNA AND FLORA

**Marine Fauna**: The waters of Djibouti host a profusion of marine life, similar to that of the northern Red Sea. Plankton blooms occur in Djibouti between September to December, particularly in an enclosed bay near Djibouti town called the Goubet al – Kharab, (the Devils Cauldron). These planktonrich waters attract many pelagic species into the area surrounding Djibouti including the Whale Shark (*Rhincodon typus*) and Manta Rays (*Manta sp.*). Large schools of Barracuda (Family *Sphyraenidae*), Jacks (Family *Carangidae*) and Snapper (Family *Lutjanidae*) are often seen feeding off the reef. Small cetaceans are also common to the area including the Spinner Dolphin (*Stenella longirostris*), the Beaked Whale (Family *Ziphiidae*) and Pilot Whale (*Globicephala sp.*).

**Macro algae**: Sparse covering of the seagrass *Halodule ovalis* was observed during the recent field study growing on coarse sands in the shallow subtidal zones. Species such as *Halophila* are
referred to as pioneer species as they have the ability to recolonize quickly after disturbance events due to their asexual and sexual reproduction strategy and high growth rates (Inglis, 2000; and Waycott et al., 2005). *Halophila* is also relatively tolerant to light deprivation or sedimentation events.

**Coral**: Key findings of the epibenthic survey undertaken for the DCT construction footprint are summarized below:

Despite their limited extent, Djibouti’s coral reef systems are recognized internationally for their high ecological values. The reef slope immediately adjacent to the construction footprint is currently in good ecological condition as are the coral communities surveyed at the reference sites (Navigation Reef, Maskali Island and Musa Island). Reef slope communities in the vicinity of the proposed DCT (Doraleh Container Terminal) construction footprint are considered to be in good ecological condition as indicated by percentage coral cover of approximately 20%. The ecological condition of reference site reef slope communities surveyed is considered to be comparatively better given that percentage of coral cover recorded ranged from 36% to 54%. Seagrass meadows (*Halophylla* spp) were recorded to occur within the construction footprint. Mucus production observed among many massive Porities coral specie along the impact reef slope indicates that these corals are naturally subjected to environmental stress associated with sediment deposition. Mucus production by these corals affords them tolerance to periodic elevations in sediment deposition processes likely to be encountered during dredging and reclamation works. Impact and reference reef slope communities showed negligible signs of environmental stress as indicated by: relatively low numbers of *Acanthaster planci* (Crown Of Thorns Starfish) relatively low incidence of partial, or total bleaching of coral communities; and relatively low incidence of observed coral disease.

**4.9 TRAFFIC AND TRANSPORT**

**Road**: Djibouti Doraleh Road has been recently upgraded to provide adequate transport links between the Oil Terminal, PAID (Port Autonome International de Djibouti) and the Project site. It adjoins the southern boundary of the Project site and is a sealed, dual carriageway that runs along the coastline between the Oil Terminal at Doraleh and PAID. The road continues the 40 km west to Arta, and although paved, is not up to the same standard. The road is currently fairly quiet, except for personnel transport from the city and construction trucks transporting fill material from the nearby borrow pit. A few rough and unpaved roads run off the Djibouti Doraleh Road to the towns to the southwest of the Project site.

**Rail**: The rail line is approximately 5 km to the south of the Project site, and the main station is located 6.5 km to the northeast of the Project site. There is an unconfirmed possibility that a branch rail link will connect the existing line to the Project site and Oil Terminal.

**Airport**: The Djibouti International Airport is located on the southern boundary of the city of Djibouti, and approximately 7 km to the southeast of the Project site. The capacity of the airport has grown in the last few years with regular flights to Dubai, Paris and other major cities.

**Maritime**: PAID has the capacity to handle approximately ten millions tonnes of cargo and 500,000 containers per Annum. The Oil Terminal has been operational since September 2005, with a capacity of 240,000 m3 of covered storage (tanks) and two berths of 20 metres water depth. The Fishing Port caters for local fisherman and as such the berths are designed for 12m fishing boats. The Fishing port (Port a Peche) is most busy in the mornings (before 8am) when
the fishermen bring in their catch. The marina and ferry terminal 500m is between PAID and the fishing port and provides boast trips to the islands of Musha & Maskali, and ferries to Tadjoura and Obock. A few pleasure yachts are moored at the marina, but are not large in size or number.

4.10 WASTE

Sewage treatment plants are few in number and are, generally, poorly maintained. Large volumes of solid and liquid waste are therefore disposed of untreated into the waters surrounding Djibouti City, or are disposed of in an unsatisfactory manner and end up by being washed or blown out to sea, where they pose a threat to wildlife and human health.

4.11 VISUAL

The Project site is visible along the coastline from the PAID approximately 7 km to the northeast, from the Oil Terminal approximately 2 km to the west, and also from the approximately 50 m high plateau approximately 100 m to the south of the Project site. The presence of a mound approximately 6 m in height and running in a southeasterly direction along the southern boundary of the Project site, screens most of the Project site from traffic using the Djibouti Doraleh road (see Figure 14). A stunted Mangrove forest along the shoreline of the Project site provides a visual barrier for marine traffic, as well as being a key visual component to the Project site.

4.12 SOCIAL AND ECONOMIC

The Republic of Djibouti covers an area of 23 000 km2 with 370 kilometers of maritime coasts and had a population of more than 806 818 inhabitants in 2006, of which two-thirds (65% of the population) live in the capital. The country has a semi-desert climate characterized by low rainfall, hence the scarcity of water resources. Djibouti lies in a geostrategic position opening out to the Aden Gulf at the Southern entry to the Red Sea and is ringed in by Ethiopia, Eritrea and Somalia and faces the Arabic peninsula. The geostrategic position of the country is enhanced by the new context of counter-terrorism with the stationing of the Combined Joint Task Force-Horn of Africa in the country since 2002.

Djibouti is a transit country for most of Ethiopia’s external trade, which constitutes close to 70% of the national port traffic. This re-export trade constitutes a major economic activity, mainly because Djibouti lacks major natural resources and its level of industrialization remains low. Services based on port activities as well as road and rail traffic supported by the financial sector constitutes the country’s main source of economic growth. Djibouti is classified among lower middle-income countries owing to its per capita income which was estimated at US$ 815 in 2004. Monetary poverty has attained alarming proportions, estimated at close to 74% of the population, with a higher concentration in rural and peri-urban areas. Despite the recent improvement in living conditions, human development indicators such as the gross enrolment ratio; the infant, child and maternal mortality rates and access to potable water remain below levels that should enable the country to attain the MDGs by 2015.

4.13 CULTURAL HERITAGE

The majority of the Project site appears largely undeveloped, with little indication of previous development. However a causeway constructed approximately 200 years ago by the French army, marks the eastern extremity of the Project Site. Due to the relatively undisturbed nature of the Project site, there is potential for artefacts associated with the French army’s occupation of
this area (associated with the causeway) or from other phases of Djibouti’s history to be present either on the surface or in subsurface soils.

5 PROJECT ALTERNATIVES

5.1 LOCATION

A Master Plan for the Doraleh Container Terminal undertaken by HanPadron Associates Engineers (2005) assessed three key alternatives to service the predicted increase in traffic using port facilities in Djibouti: (i) Improved management and operation of the existing facilities; (ii) Upgrading of the existing PAID to allow receipt of larger vessels and additional cargo traffic; and (iii) Construction of a new container terminal at Doraleh and relocation of facilities from PAID.

5.1.1 Existing Facilities

Forecasts undertaken of the anticipated container traffic through Djibouti concluded that growth in the use of the Port is limited due to the short quay length (approximately 400 m) dedicated to container handling and the depth of waters along this quay (12 m below sea level for approximately 220 m and 9.5 m below sea level for approximately 280 m). These constraints prohibit larger modern container vessels stopping in Djibouti and largely prohibit or limit the ability of intermediate sized vessels stopping in Djibouti. Modeling indicated that based on the predicted cargo traffic, a quay length of approximately 1,500m would be required in Djibouti by the year 2028, while a depth of 18m below sea level is likely to be required to facilitate larger modern container vessels.

5.1.2 Upgrade of Existing Facilities

As such, the Master Plan assessed expansion of the existing port facilities, with consideration of two key factors: deepening of the water along the quay to 12 m, 14 m, 16 m or 18 m below sea level; and Extending the existing quay wall by approximately 200 m, both to the east and/ or the west. The Master Plan found that the opportunity for expansion of the existing facilities was limited due to the following: lengthening the quay wall to the east would be expensive due to very poor soil conditions and limited due to the location of the existing port gate and Venise Road; and Lengthening the quay wall to the west would require closing the interior basin of the existing port, disrupting existing port operations. The cost estimates for expansion of the existing facilities were found to be comparable to the construction of a new container terminal at Doraleh. The Master Plan recommended the construction of a new container terminal at Doraleh.

5.2 PROJECT LAYOUT

The Master Plan identified five layout options:

Alternative 1: a development on the edge of the coral reef immediately west of the Ambouli River alluvial fan. Key components of this alternative are: (i) a breakwater built near the edge of the coral reef and the development of an approximately 100 m wide strip inside the breakwater. The breakwater and the strip would be developed in three phases; (ii) dredging and earthworks would be required on the inside of the breakwater to create the berths; (iii) a causeway connecting the breakwater and strip to the mainland and the initial phase of a container yard adjoining the berths would be reclaimed; (iv) subsequent reclamation would extend the container yard back to the mainland.
Alternative 2: slips would be dredged into the coral reef in locations utilizing existing deepwater pockets. Key components of this alternative are: (i) dredging of the slips; (ii) a causeway/ access road and the initial phase of the container yard; (iii) breakwaters to protect the slips; (iv) extension of the container yard to connect with the mainland;

Alternative 3: A wharf facing a northeasterly direction would initially be constructed, followed by berths in a northerly direction. Key components of this alternative are: (i) dredging for the berths (done in three phases); (ii) a causeway and the initial phase of the container yard; (iii) extension of the container yard to the west; (iv) a breakwater to protect the north facing berths.

Alternative 4: A dual-sided pier connected to a container yard by a bridge would be constructed on the edge of the reef, taking advantage of the protection provided by the Banc Des Salines and key components of this alternative are: (i) a pier approximately 65 m in width with wharves on both sides; (ii) dredging for the berths and shipping channels; (iii) a container yard requiring reclamation of the inter tidal flats adjoining the mainland; (iv) a bridge would connect the pier and the container yard so as to minimize restrictions on the flow of the Ambouli River, which enters the Red Sea immediately to the southeast; and

Alternative 5: Largely the same as Alternative 4, however the pier is only one sided.

Following further investigation of the Doraleh geotechnical and wave action characteristics, the design for the facilities was further refined and the Project design and Option 3 was selected.

6 ENVIRONMENTAL IMPACTS ASSESSMENT AND MITIGATION MEASURES

The following were considered in relation to the potential aspects and impacts of construction and operation of the Project:

6.1 TOPOGRAPHY

The Project has the potential to impact on local topography. Earthworks required for the following will alter local topography: Construction of access and site roads; Creation of laydown areas for construction equipment; Construction of a temporary site offices and associated facilities for construction workers; Excavation and filling may alter flow paths and impact upon flows within the Oued Ambouli wadi; and the reclamation required for the land facilities, marine facilities and the causeway will permanently alter the local topography.

To address these potential impacts, the following mitigation measures would be implemented: Limit earthworks and the extent of filling to the minimum required for the proposed facilities; excavation material generated during construction should be reused within the Project site; install fences, trees and shrubbery to minimize the visual impact of the Project; stabilize landscaped areas of soil; and assess the hydrological conditions of the Oued Ambouli wadi and other watercourses to confirm the appropriate size and location for culverts and other drainage structures.

6.2 SOILS AND GEOLOGY

Potential impacts on soils and geology from the Project include the following:

Construction: Compaction of soil during construction of site roads, laydown area and temporary site offices; Erosion of unconsolidated, exposed and stockpiled soils during a rain event; Disturbance and dispersion of soils due to movement of construction traffic and equipment over
unsealed tracks and exposed, unconsolidated soils; Damage to infrastructure and equipment in the event of a seismic event; Use of contaminated fill material originating from polluted dredged sediments or polluted terrestrial borrow pit material; Contamination of soil due to spills or leaks of fuels, lubricants and / or chemicals stored and used on site; Contamination of soil due to leaks from wastewater and effluent storage vessels; Contamination of soils due to poor storage and management of solid and liquid wastes prior to disposal; and Contamination of the soils due to leaks of fuels and lubricants from construction vehicles and plant.

**Operation:** Vehicle movements on any remaining unsealed area; Water flows within the site and over unsealed or unconsolidated soils; and Contamination of the soils due to leaks of fuels and lubricants from operation vehicles and plant.

To address these potential impacts, the following **mitigation measures** would be implemented:

**Construction:** Water used for dust suppression during earthworks should meet municipal health standards and should not exceed the salinity levels of the groundwater on site; The use of water for dust suppression should be controlled to ensure that the amounts applied to internal roads and tracks do not exceed the amounts required, and consequently cause excessive runoff and erosion; Include appropriate seismic event response procedures in the site safety plan and site induction training; Progressively compact (stabilise) the ground to minimize the erosion of unconsolidated and unvegetated material; Undertake vehicle maintenance and refueling on covered, impermeable surfaces (such as concrete slabs) with runoff to be captured in lined drains and sumps and collected material taken to appropriate waste management facilities; Store fuels, oils and chemicals in concrete lined and bunded areas, which are designed to contain 110% of the total volume the bunded area is designed to store; Analysis of contaminant levels in the dredged material and borrow pit material should be undertaken to determine the appropriate use or disposal option, and whether remediation is required prior to use or disposal to reduce contaminant levels to below internationally accepted levels; Implement appropriate emergency spill response measures; Develop and implement an erosion and sediment control plan that identifies the following: Restrictions on vehicle movements to driving on defined internal roads and tracks as appropriate; Excavation work plans to minimize the area of disturbed and unconsolidated soil; Measures to manage surface runoff due to rainfall, site maintenance activities, or vehicle and hardstand washdown; The formal drainage drainage system developed for the site; Appropriate erosion and sediment control structures (such as geotextile fabric and hay bales) and their locations; and Implement waste management measures as described below.

### 6.3 AIR QUALITY

Potential impacts on local air quality from the Project include the following:

**Construction:** Dust generated from construction activities including Disturbance of the arid land surface; Movement of construction vehicles on unsealed roadways; Wind blowing over unprotected stockpiled and exposed soils, particularly those that are unconsolidated; Loading and unloading of materials on site; Emissions from uncovered truckloads; Movement and placement of fill material and dried dredged material; Exhaust (and greenhouse gas) emissions from construction vehicles, plant, machinery and vessels. Exhaust emissions are likely to include nitrogen oxides (NOx), carbon monoxide (CO), sulphur oxides (SO2), hydrocarbons (HC), ozone (O3) and total suspended particulates (TSP); and Odours generated from exposed dredged material.
**Operation:** Dust generated from the following: Movement of operation vehicles on any remaining unsealed roadways; Wind blowing over any remaining unprotected and exposed soils, particularly those that are unconsolidated; and Exhaust (and greenhouse gas) emissions from operation vehicles, plant, machinery and vessels. Exhaust emissions are likely to include nitrogen oxides (NOx), carbon monoxide (CO), sulphur oxides (SO2), hydrocarbons (HC), ozone (O3) and total suspended particulates (TSP).

To address these potential impacts, the following mitigation measures would be implemented:

**Dust Emissions:** Minimize the area of land to be disturbed at any one time by staging construction activities; Retain existing sparse vegetation for as long as possible prior to commencement of earthwork activities; Dust generating vehicle loads transported to, from and on the Project site should be covered by tarpaulin sheets and should not be overloaded; Regular use of water trucks to suppress dust on high use site access and haul roads; Side enclosure and covering, by impervious sheeting where practicable, of any aggregate or other dusty material stockpiles, and placing of stockpiles in sheltered or covered areas; Cease earthworks in areas of visible dust generation, where dust is moving in the direction of residential areas (Doraleh) or other sensitive land uses; Minimize drop height of excavated materials to a practicable level to limit fugitive dust generation; Fence work areas, with the fence lined with cloth or fabric (such as green garden type mesh) to minimize dust migration and generation off site; Undertake regular checks throughout the day by Site Supervisor’s representative to visually inspect dust generation and to recommend mitigation measures; Ensure compaction of soils as soon as possible following earthworks to minimize areas of unconsolidated soils; and Implementation of a construction phase dust monitoring program on site (incorporating use of a dust monitor such as a dust deposition gauge or volumetric air sampler) to monitor respirable dust and nuisance dust. This can provide trigger data to justify alteration of work practices during periods of high dust generation (e.g. strong winds).

**Exhaust Emissions:** Use of modern machinery with adequate pollution control devices (such as catalytic converters). A manifest of all machinery used (including date of manufacture, hours of operation, maintenance schedule, fuel type and emissions control devices installed) should be kept on site by the Site Supervisor; Proper and efficient use and operation of construction vehicles, plant and machinery by qualified and skilled personnel (in accordance with the manufacturer’s instructions); Use of appropriate fuels, including low sulfur diesel and unleaded petrol in accordance with the manufacturer’s instructions; Regular maintenance and inspections for all construction vehicles, plant and machinery (to be documented and checked by Site Supervisor’s representative) in accordance with the manufacturer’s instructions; Minimize unnecessary idling and operation of earthwork and construction machinery, including efficiency of trip times and reduction of double handling through appropriate placement of stockpiles, haul roads, works depots and work areas. This will also aid in fuel efficiency and will assist in reducing overall costs associated with unnecessary fuel consumption; Daily visual checks by a representative of the Site Supervisor to ensure the above criteria are followed, particularly in regards to smoky emissions from vehicles, vessels and plant; and Equipment with excessive visual emissions should be given defect notices and taken out of service until repaired and approved for redeployment by Site supervisor. The above mitigation measures will also assist in reducing the emissions of carbon dioxide and nitrogen dioxide, which are greenhouse gases.

**Volatile Emissions**
The following management measures should be adopted during construction to minimize the generation of volatile emissions from solvents, paints, and fuels stored or used at the Project site:

1. Ensure all machinery is in good order and repair, and not leaking fuel or volatile emissions from fuel tanks or fuel lines; The number of fuel and chemical storage areas should be minimized and properly managed. A full list of all volatile fuels and chemicals stored on site should be kept by the Site Supervisor, including accompanying volumes, locations, and MSDS; Ensure proper on-site storage of volatile fuels and chemicals in appropriately sealed containers, and in cool, covered areas with adequate venting. Avoid on-site storage of highly volatile fuels, such as unleaded petrol, and volatile chemicals such as solvents and oil-based paints. The above measures will also assist in safety regarding the use and storage of dangerous goods.

2. Odor: In the event that dredged materials generate odors upon exposure to the air; and To minimize potential odor emissions, there should be provision of appropriate temporary amenities for construction laborers and visitors to the Project site. Amenities should be well maintained and effluent storage facilities frequently emptied by a wastewater contractor for off-site treatment and disposal.

3. Operation: Implementation of the applicable construction mitigation measures during operation; Container ships typically use auxiliary diesel engines for power when they are in port (hotelling). One way to reduce these emissions at the port would be to have them connect to shore power; The use of electric rather than diesel powered terminal equipment will result in lower emissions at the terminal site; Consider the use of commercially available fuel additives for diesel fuel that increase the combustion efficiency of diesel engines; Traffic routes should avoid traveling through residential areas where possible; and Landscaping should be included along the perimeters of the Project site, to reduce visual impacts, as well as acting as a dust barrier.

6.4 NOISE AND VIBRATION

Potential noise and vibration impacts from the Project can be generated through the following:

Construction: The use of construction equipment, including dredging, excavation, piling and earthworks equipment; and trucks delivering fill material and other construction materials to the Project site; waste materials from the Project site; and vehicles transporting construction personnel to and from the Project site.

Operation

Piloting of ships in the vicinity of the Marine Facilities and associated berthing activities; Operation of RTG and other machinery for the transportation of containers within the Project site; Truck and vehicle movements within the Project site and trucks importing and exporting goods; Maintenance activities undertaken at workshops within the Project site; The placement and stacking of containers within the storage areas, onto trucks or onto ships; and to address these potential impacts, the following mitigation measures would be implemented:

Construction: Ensure all plant, machinery, and vehicles are fitted with appropriate mufflers, and that all mufflers and acoustic treatments are in good working order; Ensure all plant, machinery, and vehicles are regularly maintained and broken parts (such as mufflers) are replaced immediately; Ensure all plant, machinery, and vehicles are operated efficiently and according to the manufacturers specifications, by trained and qualified operators; and Development and implementation of appropriate safety measures for site personnel, including the provision of suitable hearing protection.
**Operation:** The detail design for the Project site to include appropriate noise reduction measures, including earth mounds and landscaping along the Project site perimeter; Ensure all plant, machinery and vehicles are fitted with appropriate mufflers, and that all mufflers and acoustic treatments are in good working order; Ensure all plant, machinery and vehicles are regularly maintained and broken parts (such as mufflers) are replaced immediately; Ensure all plant, machinery and vehicles are operated efficiently and according to the manufacturers specifications, by trained and qualified operators; and Development and implementation of appropriate safety measures for site personnel, including the provision of suitable hearing protection.

### 6.5 MARINE WATER AND SEDIMENTS

Potential impacts on marine water and sediment quality from the Project include the following:

**Construction**

*SEDIMENTATION:* Increased sediment suspension (turbidity) in marine waters due to the dispersal of reclaimed sediment during dredging and reclamation of the container terminal and causeway has the potential to reduce light penetration, smother benthic habitats and reduce water quality; Re-suspension of contaminants in sediments during dredging, reclamation and erosion can remobilize metals from the sediments into the water column. They may then enter aquatic organisms through body and respiratory surfaces, and by ingestion of particulate matter and water.

*Contamination of seawater:* Release of contaminants into the marine system including: Litter and construction waste carried by wind, dewatering runoff or periodic rainfall; and Construction related contaminants such as grease, heavy metals, solvents, effluent and fuel through accidental spills, inadequate storage and management, vehicle wash down and overuse of water for site road wetting.

An increase in concentration of heavy metals would have a negative impact on the water quality at Djibouti, and ultimately the marine ecology of the area. Anthropogenic sources of metals include: Industrial and municipal waste products; Urban and agricultural runoff; Fine sediments eroded from catchments such as the delta and smaller wadis adjacent to the site; and Antifouling paints from ships (mainly tin and copper).

*Contamination of groundwater:* The following may contaminate ground water exposed during construction works: Hydrocarbons such as oils, fuels and grease from construction machinery; Disturbed sediment; Effluent from construction workers temporary amenities leaching into the groundwater carrying with it nutrients and microorganisms. These contaminants may enter the groundwater as a result of: Exposure of standing groundwater to pollutants during soil excavation (e.g. constructing foundation pits); and Spills and leaks from poorly maintained construction vehicles and plant.

**Operation:** A number of adverse impacts on water quality may occur as a result of: Any direct or indirect discharge or polluting substances (fuel, oil) to receiving waters; Storm water run off collected in hard stand areas leading to greater flows reaching the receiving waters and reduced natural soak away; Nutrients from fertilizers used during the potential greening of landside facilities; Pathogenic organisms from sewage pipe leaks; and Litter from operation personnel not correctly disposed of, and thus entering the water.
To address these potential impacts, the following **mitigation measures** should be implemented:

**Construction:**

**Sedimentation:** Engineering controls (tidal dredging, minimizing duration of dredging, seasonal restrictions (e.g. avoiding seagrass flowering periods or coral spawning periods), limiting overdredge quantities, stopping dredging when turbidity thresholds are exceeded); Physical barriers (confined land disposal, and use of silt screens or pneumatic silt curtains); Environmental dredging techniques (hydraulic dredging techniques, encapsulated bucket lines for bucket chain dredgers, closed clamshells for grab dredgers, auger dredgers, disc cutters, scoop dredgers and sweep dredgers and subsuction dredging (Erftemeijer and Robin Lewis, 2006); and, Detailed environmental modeling and monitoring (turbidity plume prediction modeling, assessment of turbidity thresholds, seagrass and coral monitoring and mapping, research on seagrass recovery, salvage of coral for use in transplantation to mitigate losses, post dredging seagrass and coral restoration).

**Stormwater/Contamination of seawater:** Establish appropriate aggregate and materials storage with sealed floors and impermeable walls that minimize the amount of storm water passing over the stockpile; Locate aggregate and material stockpiles on flat areas away from water drainage flow paths (e.g. wadis) to minimize runoff from sediment rich sources; Establish sealed and bunded storage areas for fuels and chemicals to be stored on site; Limit the height and slope of stockpiles to minimize erosion of unconsolidated materials; Divert storm water around work areas to storage sites where practicable; Use of gross pollutant traps to remove littler and gross pollutants from dewatering and storm water discharge; Regular inspections of all erosion and sedimentation controls during the construction period to maintain their continued effectiveness; Preparation of an emergency response plan to be implemented in case of a spill. This should detail appropriate response procedures, provide the location(s) of spill response and cleanup equipment, delineate the responsibilities of site staff and describe the communication requirements with site management and relevant authorities. Appropriate disposal of spill and cleanup materials should also be described; Hazardous liquids (such as fuels and chemicals) should be stored in accordance with a dangerous goods management plan in secure bunded compounds during construction. These compounds should be capable of holding at least 1.5 times the volume of the anticipated capacity of the storage area; Creation of a materials safety and data sheet (MSDS’s) for all stored liquids to be kept in an accessible and central location.

**Operation**

A storm water drainage system should incorporate the following water sensitive urban design principles wherever practicable, prior to discharge: A hydrological study should be carried out to examine the drainage requirements for the Project including appropriate level of treatment and filter of storm water discharge; Control of potential pollutants at the point of infiltration; Use of catchment pits to remove litter, heavy sediment and the majority of hydrocarbons in the storm water runoff; and Investigation into the potential for the storage and reuse of the non potable storm water (e.g. for irrigation or firefighting purposes).

### 6.6 HYDROLOGY AND BATHYMETRY

Based on a preliminary hydrodynamic modeling assessment, the potential impacts on hydrology and bathymetry from the Project include the following: Changes in tidal currents will likely occur around the proposed container terminal. This change is due to the greater volume of water
which is predicted to pass over specific locations either side of the terminal (i.e. reduced flow areas) with greater velocities; Given the close symmetry of the flood and ebb tidal currents in the vicinity of the proposed terminal, the likelihood of significant sedimentation or erosion appears unlikely and Pollutant build up is generally unlikely to be an issue, in the absence of major pollutant inputs.

To address these potential impacts, the following mitigation measures should be implemented: The results of this preliminary hydrodynamic modeling exercise indicate no serious potential impacts, and hence no requirement for mitigation measures from a hydrodynamic perspective. However, the model could be further developed to incorporate meteorological variables and be calibrated to include measured tides and currents in order to refine additional mitigation measures. However the current magnitude of velocities is suggested as being low.

### 6.7 TERRESTRIAL ECOLOGY

Potential impacts on terrestrial ecology from the Project include the following: Destruction of terrestrial fauna habitat through the removal of vegetation during construction activities – the Project will result in the clearance of approximately 1.2 Ha of the mangrove vegetation; Loss of estuarine and beach habitat and roosting / nesting sites; Impact on ecology due to dust and exhaust emissions from the construction vehicles and machinery; Increased grazing pressure on the balance of the peninsula as a result of removal of grazing land; and Introduction of weeds through construction activity and landscaping.

To address these potential impacts, the following mitigation measures should be implemented: Vegetation clearance is to be limited to the required footprint for the Project. Vehicle movements and equipment and material storage in any vegetated areas outside of the Project site is to be avoided where possible; Habitat offset measures should be designed and implemented locally to rehabilitate mangrove forests of an equivalent area destroyed during construction and operation of the proposal; Disturbance of land surface should be minimized, including restricting traffic to defined access tracks and minimizing movement of vehicles and construction plant in areas not subject to disturbance by construction activity; The Contractor should use locally indigenous plant species in landscaping works at the Project site; DP World should protect remaining mangrove areas within and immediately surrounding the Project site from grazing through appropriate fencing; If a threatened species is encountered on site, all nearby construction activity should cease and the site supervisor notified. No further work should continue in the vicinity of the sighting until a qualified biologist carries out a field assessment. No attempts should be made by site personnel to capture, harm or disturb the animal/s; Appropriate waste storage to limit the potential proliferation of nondesirable fauna (such as rats and flies); and Implementing the air quality and noise measures previously described will also minimize impacts on terrestrial ecology.

### 6.8 MARINE ECOLOGY

Potential impacts on marine ecology from the Project include the following:

**Construction:** The construction activities of the Project will result in the excavation and or smothering of approximately 24.15 ha of benthic habitat: (i) 450 x 1050 m² (0.6ha) of coral reef (direct impact during the construction of the marine facility); (ii) 750 x 300 m² (22.5ha) of semi-inter tidal mud flat (direct impact during the construction of the land facilities) and (iii) 30 x 2000 m² (1.05ha) of predominantly inter tidal mud flat, but also some coral reef habitat (direct
impact during the construction of the transport causeway to the marine facility). Dredging causes the direct removal of benthic habitats located within the dredging footprint. Communities located outside the development footprint will also be affected due to the mobilization of fine sediment plumes derived from the dredging process. The action of tides and currents will result in the migration of sediment plumes away from the original point of mobilization. Sediment plumes increase the turbidity within the water column, thus causing light attenuation (reduced light penetration). Marine plants and coral rely on photosynthetic processes and may be sensitive to the migration of sediment plumes, especially in deeper water where plant individuals may already be near their limit of tolerance to low light conditions. The primary cause of seagrass degradation and loss globally is reduction in water clarity, both from increased turbidity and increased nutrient loading. As sediment plumes migrate, particles fall out of suspension. This causes a depositional footprint that will extend past the boundary of the dredge area. Benthic plants and corals can tolerate moderate rates of sediment deposition as is normal in shallow coastal waters. However, excessive sediment loading can deleteriously influence the ecophysiology, morphology and ultimately the population structure of coral and seagrass species. Excessive sediment loading can ultimately determine the benthic organism’s ability to naturally shed the sediment in mucus nets or cause local coral, seagrass and algae die off. Coral reefs on site typically colonize the marine waters up to a depth of 6m. Such site specific zonation is likely attributable to varying light attenuation influenced by the ephemeral river delta and inordinate pulses of sediment. The proposed dredging program will involve the removal of benthic substrata and associated biota to a depth of 18m, resulting in a greater impact on sensitive marine communities within the top 6m. New habitats may also be created as a result of the operation, either directly in the dredged area or by introduction of new habitats on the slopes of a reclaimed area (e.g. hard substratum in the form of breakwaters and revetments). The combined impacts of increased turbidity and physical removal or burial during dredging, and eutrophication from nutrients in domestic and industrial discharges will be of some detriment to coral reefs and seagrass.

**Operation:** The accidental release of potential contaminants from large shipping (hydrocarbons, bilge water, solvents and litter); The accidental release of potential contaminants from the use of plant machinery such as the diesel hammer, compressor and the power generator; Accidental ship grounding on the fringing coral reef slope; Potential introduction of exotic pest species from ships ballast water; The mobilization of sediment plumes via propeller wash; and Stormwater runoff (pollutants, sediment and gross debris).

To address these potential impacts, the following **mitigation measures** should be implemented:

**Construction:** The use of favorable rock material or pieces of rock armor that encourage the regeneration of corals (e.g. contain limestone); Maintain good ambient water quality (as discussed in Section 8.1) (including sedimentation controls, use of sediment ponds to collect storm water runoff, use of settling ponds for Reclaimed material, wastewater/storm water management and prevention, and management of spills and leaks); Timing of marine works to coincide to reduce overall impact of marine works eg. Commence dredging works during natural periods of elevated sediment suspension, and concentrate efforts during the ebb tide to maximize potential dilution; Use of appropriate storm water control measures such as the diversion of overland flow around work areas, the progressive stabilization of disturbed areas, and the use of sediment ponds to collect storm water; During construction the Project area may be visited by threatened species such as the Whale Shark or similar sensitive species such as the Spinner
dolphin. If a threatened species is encountered on site, a record of the encounter should be made and all nearby construction or operational activity should cease and the site supervisor notified.

**Operation:** Regulated coastal developments for tourism and urban expansion between countries including socio and environmental impact studies for proposed projects; Establish a biologically interconnected network of reserves to maintain species viability. The coral reefs within the Project site are situated adjacent to a marine system, which comprises the first declared Marine Protected Area for the southern Red Sea region. As such, all endeavors should be made to preserve the long term integrity of the site and it’s biodiversity; Implement effective regulation of fishing in the vicinity of the proposed Port, such as the establishment of ‘no take’ zones for security and environmental advance; and Implement obligations under regional and international conventions, including adoption of Port State Control, improved navigation systems and oil spill response capacities, surveillance and enforcement (AIMS, 2004).

### 6.9 TRAFFIC AND TRANSPORT

Potential impacts due to traffic and transport associated with the Project include the following:

**Construction:** Increased traffic generation has the potential to generate the following: Noise impacts from the Project site and along transport routes; Air quality impacts due exhaust emissions from within the Project site and along transport routes; Increased rate of degradation of local roads due to increased traffic levels and a large number of larger, heavier vehicles; Poor internal traffic management could increase safety risks to construction personnel; Reduction in traffic efficiencies along the transport routes and roads surrounding the Project site; and The Marine Facilities and the causeway may impact traditional operating grounds of existing fishing and other smaller maritime operations.

**Operation:** Increased traffic generation has the potential to generate the following: Air quality impacts due exhaust emissions from within the Project site and along transport routes; Noise impacts from the Project site and along transport routes; Increased rate of degradation of local roads due to increased traffic levels and a large number of larger, heavier vehicles; Poor internal traffic management could increase safety risks to construction personnel. However, implementation of the traffic management measures described in Section 4.3 will address these potential impacts; Reduction in traffic efficiencies along the transport routes and roads surrounding the Project site; The operating activities of the existing PAID and Oil Terminal will need to be considered in scheduling of ship movements for the Project; and The proposed shipping channels for the Project may impact traditional operating grounds of existing fishing and other smaller maritime operations.

To address these potential impacts, the following *mitigation measures* should be implemented:

**Construction:** Transport routes for all construction vehicles to use main roads and avoid traveling through residential areas where possible; Drivers employed are to possess appropriate licensing and to have undertaken driver training; and Provision of shared worker’s transport (such as buses) from workers accommodation to the Project site. Alternatively, the worker’s accommodation is to be located to allow worker’s to walk to the Project site; Clearly identify truck routes for heavy vehicles (trucks and buses) entering and traveling within the Project site; Limit vehicle speed on site roads to 15 km/h through the installation of warning signs and speed limit signs; Provision of appropriate lighting on site roads and in parking areas; and All vehicles should sign in and out of the Project site so that vehicle numbers can be monitored.
**Operation:** Transport routes for all vehicles to use main roads and avoid traveling through residential areas where possible; Drivers employed are to possess appropriate licensing and to have undertaken driver training; Provision of shared worker’s transport (such as buses) from workers accommodation to the Project site; Clearly identify truck routes for heavy vehicles (trucks and buses) entering and traveling within the Project site; Shipping movements from the Project should be coordinated with the operating activities of the existing PAID and Oil Terminal; and DP World should consult with fishing and other smaller maritime operations to discuss the potential access restrictions to the waters surrounding the Project site.

### 6.10 WASTE

Potential impacts from waste generated by the Project include the following:

**Construction:** Construction will potentially generate the following wastes: Excess construction materials, including offcuts and packaging; Oils, fuels and other chemicals generated by on site maintenance and repair of construction equipment and machinery; Green wastes from vegetation clearance; Excavation materials; Food wastes from construction personnel; Site office wastes; and Human waste; Poor waste handling procedures could potentially contamination of the soils, groundwater, surface water and air; Poor storage and handling of waste materials, particularly food wastes, could attract undesirable fauna, such as rats, flies and mosquitoes; and Poor construction procedures that generate excessive wastes increase construction costs and results in disposal of otherwise valuable resources.

**Operation:** Operation of the Project will potentially generate the following wastes: Excess packaging materials removed following the emptying of the containers; Oils, fuels and other chemicals generated by on site maintenance and repair of operational equipment and machinery; Goods received at the Project site and damaged during transport or handling; Food wastes from operation personnel; Office wastes; Human waste; Poor waste handling procedures could potentially contamination of the soils, groundwater, surface water and air; Poor storage and handling of waste materials, particularly food wastes, could attract undesirable fauna, such as rats, flies and mosquitoes; and Poor operational procedures that generate excessive wastes increase costs and results in disposal of otherwise valuable resources.

To address these potential impacts, the following **mitigation measures** would be implemented:

**Construction:** Prepare a Waste Management Plan (WMP) that addresses the following: No wastes are to be landfilled within the Project site or dumped into the surrounding waters; Efficient ordering and use of construction materials to avoid generation of excess materials; Reuse excavated material within the Project site; Provision of appropriate containers to dispose of food waste that will prevent access by local fauna and pest species; Order construction materials with limited packaging, where practical; Separation of reusable and recyclable materials from other waste streams; Waste storage areas should be well maintained and contained to minimize the potential for leaching or runoff to contaminate soils and water; Waste storage areas should be located in a cleared area outside of drainage lines, and should be afforded protection from wind to prevent wind driven refuse reaching marine waters; Hazardous wastes should be handled, stored, transported and disposed of in accordance with relevant Djibouti and/or internationally accepted guidelines; Wastes should be regularly transported from the Project site to appropriate waste management facilities or landfills; Human waste should be collected and transported for disposal at an appropriate facility by a licensed operator.
**Operation**

Prepare a Waste Management Plan (WMP) that addresses the following: No wastes are to be landfilled within the Project site or dumped into the surrounding waters; Efficient ordering and use of materials to avoid generation of excess materials; Provision of appropriate containers to dispose of putrescible and food waste that will prevent access by local fauna and pest species; Order products with limited packaging, where practical; Separation of reusable and recyclable materials from other waste streams; Waste storage areas should be well maintained and contained to minimize the potential for leaching or runoff to contaminate soils and water; Waste storage areas should be located in a cleared area outside of drainage lines, and should be afforded protection from wind to prevent wind driven refuse reaching marine waters; Hazardous wastes should be handled, stored, transported and disposed of in accordance with relevant Djibouti and/or internationally accepted guidelines; and Wastes should be regularly transported from the Project site to appropriate waste management facilities or landfills.

**6.11 VISUAL**

Potential visual impacts from the Project include the following: Earthworks required for the Land Facilities will alter the local topography and therefore the local visual environment; Reclamation required for the Marine Facilities, part of the Land Facilities and the causeway will alter the local visual environment by replacing open water with developed land areas; Poor building material selection could result in sunlight reflection to both surrounding residents, site offices and work areas within the Project site; and Poorly directed flood lighting used at night during construction and operation could impact upon surrounding residents by shining light into houses during normal sleeping periods.

To address these potential impacts, the following mitigation measures should be implemented: Inclusion of landscaping, including landscaped earth mounds, along perimeter fencing and within the Project site should be considered where practical. Local flora species should be used where appropriate; Buildings within the Project site should use colors and materials consistent with the existing visual environment and minimize potential for reflection; Earthworks should be limited to the minimum area required for construction of the Project site so that existing topographical features can be retained and screen the Project site where possible; and Buildings are to be of a low height (maximum two storeys) to maintain existing visual corridors.

**6.12 SOCIAL AND ECONOMIC**

Potential social and economic impacts from the Project include the following: The Project will provide employment opportunities for a number of people within Djibouti during both construction and operation phases, including those employed directly and contractors providing goods and services. This increased employment will potentially improve the standard of living for a number of people and families in Djibouti; The additional income and resulting increased spending within the Djibouti economy will potentially generate employment opportunities in existing commercial operations within Djibouti; The Project may also provide the impetus for further development and investment in Djibouti, potentially generating further employment in Djibouti; The potential air quality and traffic related impacts could adversely impact on surrounding residents and decrease the overall amenity of the natural environment.

To address these potential impacts, the following mitigation measures would be implemented: Djibouti nationals should be employed during the construction and operation phases wherever
practicable; Djibouti companies should be contracted to supply construction and operation goods and services wherever practicable; The air quality, noise, traffic and visual impact mitigation measures previously described should be implemented to minimize environmental impacts on nearby residents; Consultation should be undertaken with existing fishing and other smaller maritime operations that currently utilize the waters that include and surround the Project site so that they are aware of access restrictions and other issues; The historic causeway at the eastern end of the Project site should be retained if and where possible. Access to the causeway should be limited to avoid damage; and in the event that a potential item of cultural heritage is unearthed during construction, works in that area should cease and an archaeologist brought in to examine the item and, if a cultural heritage item, develop appropriate management measures (such as removal, relocation, or record and dispose).

7 ENVIRONMENTAL HAZARD MANAGEMENT

During construction and operation phases of the project, some potential health and safety impacts have been identified such as traffic accidents, fire and explosion due to flammable fuels and chemicals, air pollution. To minimise the potential health and safety impacts, a Construction Site Safety Plan as a component of the Work Action Plan has been developed to details the safety procedures associated with construction tasks.

The following measures should be implemented: Implement the operation air quality mitigation measures; Implement the noise mitigation measures to protect personnel hearing; Implement the traffic management measures; Implement the waste management procedures; Develop and implement an emergency response procedure, including fire fighting and explosion response; and The Site Safety Plan to include appropriate procedures in response to seismic events.

8 MONITORING PROGRAM

The overall effectiveness of the mitigation measures is assessed through monitoring programs to be implemented during the construction and operation of the Project. The monitoring programs are designed to gauge the Project’s compliance against relevant environmental guidelines and targets. The overall effectiveness of the EMP should be regularly audited during the construction and operation of the Project. Audits can be undertaken as regular internal checks (once a fortnight) or end of phase ‘milestone’ checks against regulatory guidelines by internal staff or independent external auditors. With all of the categories, it is advisable to begin with a collection of baseline data from site vicinity (and regular monitoring), as well as regular meetings with site management and stakeholders. All monitoring results should be recorded in tabular digital form in the construction and operation Environmental Monitoring Program site register, including field observations regarding weather conditions, nearby activities and other relevant information likely to influence the monitoring results.

Checklists should also be compiled in the site Environmental Monitoring Program register, including details of non conformances, rectification notices and follow up actions.

An Environmental Monitoring Program Site Register should be kept and maintained by the site supervisor including the following information: All monitoring data; Dated field observations (temperature, wind direction/speed, humidity, cloud cover, rain events, etc); Checklists detailing non-conformances, rectification notices and follow-up actions; Updated dangerous goods register / chemical register; Pollution events / cleanup; and Threatened species.
As there are no known communities in the vicinity of the proposed container terminal, public consultations largely involved key stakeholders such as the various ministries. Once a full Environmental & Social Management Plan is developed, public at large will also be included in consultation process.