Port Expansion Project EIS

Executive Summary

AECOM BMT WBM

1.1 Introduction

1.1.1 Proponent

The Port of Townsville Limited (POTL) is a government owned corporation under the *Government Owned Corporations Act 1993*. It is declared as a port authority under the *Transport Infrastructure Act 1994* and responsible for establishing, managing and operating effective and efficient port facilities in the Port of Townsville and the Port of Lucinda. POTL, as proponent of the Port Expansion Project (PEP), is responsible for gaining all relevant approvals necessary to facilitate its development.

POTL contact details are listed below:

PO Box1031

Townsville

Queensland 4810

1.1.2 Environmental Record

POTL has a successful history of compliance with its environmental obligations and has maintained a strong and important facility against a backdrop of the region's high-value environmental resources. POTL has successfully and efficiently managed the port's operations within existing legislative frameworks and strongly encourages all port operators to do the same. Section 88R(j) of the *Great Barrier Reef Marine Park Regulations 1983* requires applicants proposing works within the Great Barrier Reef Marine Park (GBRMP) to supply details of their current environmental record. POTL's environmental record includes:

- compliance with all Environmentally Relevant Activity (ERA) licence requirements under the *Environmental Protection Act 1994* (EP Act)
- compliance with approval conditions for dredging and placement of capital and maintenance dredge material under the *Environment Protection (Sea Dumping) Act 1981* (Cth)
- ISO 14001 accreditation for an independently certified Environmental Management System
- undertaking ongoing environmental monitoring and associated annual reporting of monitoring results
- recording and applying conditions specified through approvals (Berths 10A and 8 redevelopment, Townsville Marine Precinct, other development approvals).

1.1.3 Overview of Port of Townsville

Since the site was first established in 1864, the Port of Townsville has been integral to the development of the economy of Townsville and North Queensland. The port is now Queensland's third largest multi-commodity port, handling 14% of the total international trade export by earned value, yet only 4 to 5% of the total tonnage emanating from Queensland seaports. It provides North Queensland with a gateway for commerce and trade. It services the north-east and north-west minerals provinces of the state, handling 73% of all metals traded through Queensland in the 2009/10 financial year. As such, the port is one of Queensland's most strategic assets, playing a significant role in the local, regional and state economy.

The port is well located to support the regional mineral and agricultural industries and as a regional trade hub for North Queensland. It is strategically situated to serve the Mount Isa region, and is the terminus for the Mount Isa rail line. It is also strategically situated to serve the activities of the Townsville State Development Area, which is located to the port's south-east (Figure ES.1). The Townsville State Development Area was declared in 2003 to assist the Townsville region to achieve its potential as a major base metals processing centre. Its proximity to the port and the minerals rich north-west makes it strategically positioned in relation to North Queensland commerce including new opportunities for processing minerals and transport and distribution services connecting Australia to the Asia-Pacific region.

The significance of the Townsville port for the economy is recognised in the *Northern Economic Triangle Infrastructure Plan 2007-2012* (DI, 2007b) and the *Townsville Economic Gateway Strategy* (DI, 2007c). A major strategic objective of these plans is to ensure the future development and efficient operation of the port. A key contributory factor for the continued economic development of the region is achieved through the adoption and progressive implementation of the *Port of Townsville Master Plan* (Maunsell AECOM, 2007).

A significant expansion of sea-borne trade is expected in North Queensland in the next few decades and beyond. Growth at the Port of Townsville in the near term is expected to exceed the Australia-wide average, due to some major resource projects in magnetite, nickel and fertiliser, and the potential introduction of the coal trade to Townsville, which is expected to cause very high growth rates.

1.1.4 Project Rationale

The PEP evolved from comprehensive master planning for the port and its surrounds involving key stakeholders, with consideration given to supply chain activities and planning of land transport systems.

The PEP responds to both the immediate need for additional berths as trade increases, but also has a function to plan, investigate and design the necessary infrastructure to allow the port to grow incrementally as trade demand arises over the next 30 years and possibly longer.

In this context, the PEP design recognises existing port infrastructure and future port activities and seeks to integrate the development of port components to achieve an optimum path of development. The design considered the cumulative spatial and capacity planning requirements of cargo handling facilities, road, rail and shipping.

A summary of PEP infrastructure and activities is:

- construction of breakwaters and land perimeter revetments
- dredging works for channel augmentation (principally channel deepening) and development of an outer harbour
- development of port land for future throughput of goods and trade
- development of port infrastructure including new wharves and berths
- road and rail development on port land and ancillary services

A study into the port's future, including the Preliminary Engineering and Environmental Study in 2009 (AECOM, 2009), identified the requirement for demand responsive expansions of the existing port to meet North Queensland's predicted growth. POTL's development strategy relies on an extension of the port and its infrastructure into Cleveland Bay to cater for increases in demand for trade and port capacity, including a greater emphasis on bulk goods handling, especially for mineral products. The seaward extension of the port also responds to the proximity and historical encroachment, as the City of Townsville grows residential areas to the south and west of the current port. The extension seaward as envisioned by the PEP will provide a greater distance between essential port operations and existing residential land uses.

The increase in trade will ultimately require shipping with larger vessels, along with the development of additional berth space, deepening and other minor modifications to the channels to the port (the Platypus and Sea channels). These capital improvements are required to overcome constraints imposed on vessel size by the present channel geometry.

Dredging works will be undertaken in stages according to shipping requirements and demand for additional port facilities. Geotechnically suitable dredged material where possible will be re-used as reclamation fill. The quantity of dredged material will exceed the volume required for reclamation and part of it will not be of suitable geotechnical quality. Remaining dredged material will be placed offshore, including the uppermost metre of soft silty sediment, which has a compressible nature.

The potential environmental impacts of PEP have been a key consideration in the design process and development of a construction methodology. Studies, surveys and data collection have been undertaken since 2008 in support of the Project; with many of these studies included in the EIS appendices. As a

result, the preferred designs and methodologies have responded to and reflect a long period of design refinement that seeks to avoid environmental impacts or otherwise derive environmental management measures that seek to reduce impacts as far as practicable.

The construction of the port will be incremental, not continuous over the estimated 30-year time horizon. Construction will be in defined stages interspersed with consolidation and monitoring of construction and operational activities. Given this, a long-term adaptive strategy to environmental management and monitoring is endorsed in the PEP EIS to ensure environmental values are monitored and protected over time and corrective actions can be implemented if unacceptable impacts are detected.

PEP provides a new outer harbour, cargo shipping berths and backing land to support new berths. Channel deepening is also required. PEP will allow POTL to:

- satisfy its responsibility under the *Transport Infrastructure Act 1994*, including establishment, management and effective and efficient operation of port facilities
- respond to forecast trade growth and provide essential trade pathways for current and future trades in accordance with the National Ports Strategy (IA, 2010), thereby enhancing the economic prosperity of the region
- provide competitive market conditions for import and export of bulk and general cargo through the Port of Townsville
- establish and maintain strong links between the local, regional, state and global economies
- accommodate future trends in global shipping practices.

The infrastructure and services provided by PEP will enable sufficient capacity to be delivered ahead of expected demand, avoid capacity constraints at the port from impacting on trade growth opportunities, and provide sufficient flexibility to accommodate demand.

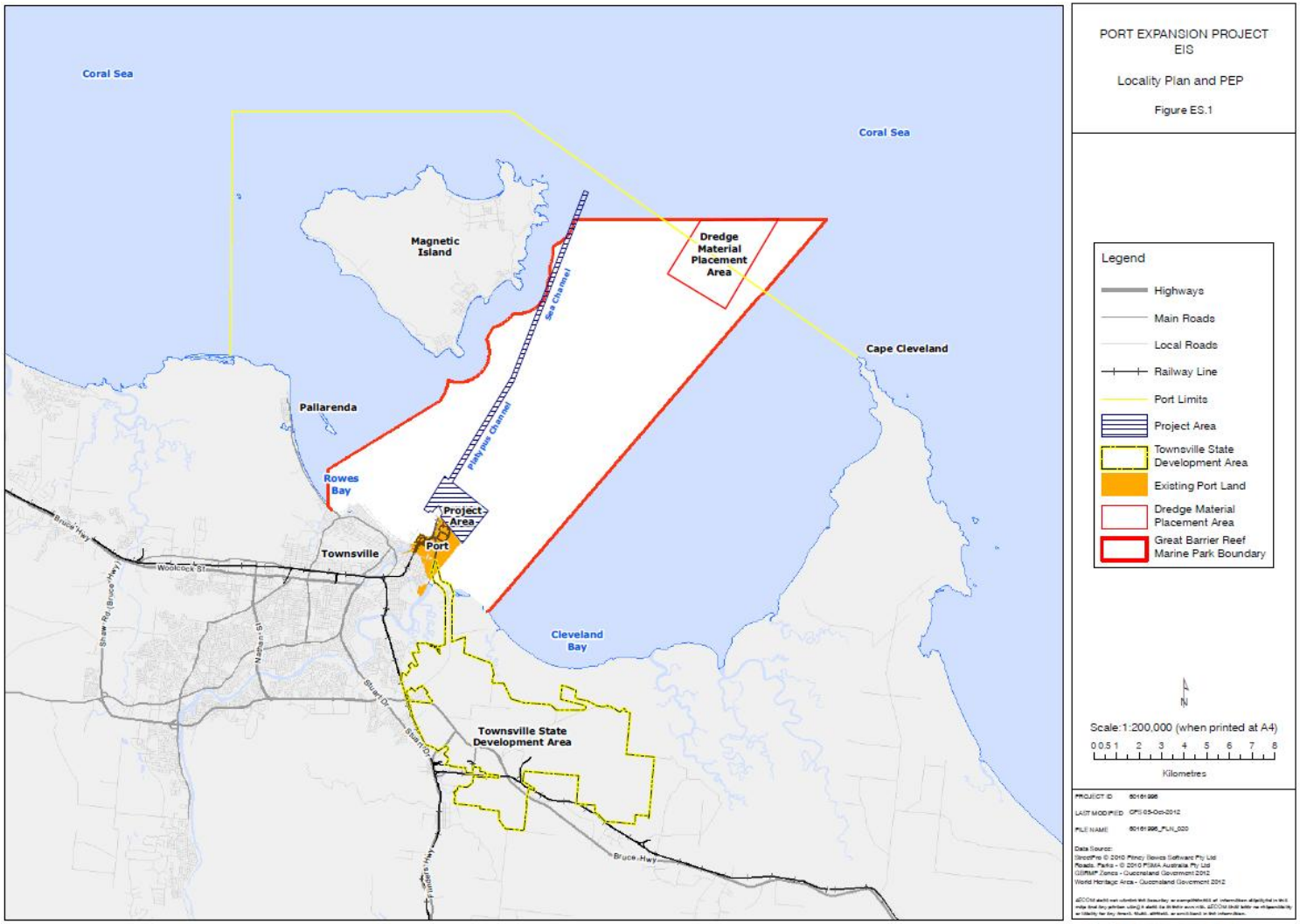

Figure ES.1 Locality Plan and PEP

1.1.5 Potential Alternatives

Essential in the planning is that the best potential infrastructure development is determined for full and complete assessment. Consideration was given to potential alternative options to the final PEP arrangement. Six alternative options with different sites and/or infrastructure configurations were examined as well as a 'no action' option. Key points with respect to the consideration of these alternatives are:

- Under a do nothing scenario there would be insufficient capacity within existing port infrastructure to accommodate the forecast increase in trade. The development of additional port infrastructure is required to provide increased capacity to service projected trade forecasts and economic growth, so the 'no action' option was seen as untenable.
- Port expansion options considered were:
  - a new harbour to the west of the inner harbour at Cape Pallarenda
  - a new harbour to the east of the inner harbour
  - unprotected berthing outside the inner harbour using exposed port berths
  - a new harbour without reclamation using remote land cargo transfer (conveyor) and storage
  - additional berthing in a new harbour at Cape Cleveland
  - preferred new harbour adopted as PEP.

The most feasible arrangement is the port expansion layout in the *Port of Townsville Master Plan* (Maunsell AECOM, 2007), which creates a protected outer harbour seaward of the existing port with a significant reclaimed area for cargo storage.

Other design options that were assessed tended to:

- fragment and duplicate port facilities
- disconnect from existing land and sea access infrastructure
- require a major new approach channel to be dredged
- not provide opportunities for beneficial re-use of the dredged material produced from the harbour basin and berths
- have significant additional capital costs (including the provision of road and rail access) and additional risks of adverse environmental effects in excess of those applying to the development of berth space in the environs of the current developed port and supporting infrastructure.

The preferred option, the PEP, provides the following benefits:

- protected berths for cargo transfer and better protection during extreme events
- does not require new landside and sea access infrastructure corridors by making use of the existing shipping channels and the Eastern Access Corridor now under construction
- reduces additional channel dredging required as it uses the existing channels (which minimises dredge campaign period)
- reduces the amount of dredged material placed at sea by placing some of it into reclamation
- has the least overall capital cost of the alternative options considered
- reduces port infrastructure duplication and operating costs by being an extension of the existing port facility
- can be built in an area of modified existing environmental values within an existing port area (adjacent to the existing port and urban areas) with manageable wider-field environmental effects in the world heritage area
- consistency with the Great Barrier Reef ports strategy

1.2 The Environmental Impact Statement

1.2.1 Purpose and Structure of This Document

The objectives of the EIS are to provide:

- an understanding of the Project and existing environmental, social and economic values and potential impacts that may occur and measures to be adopted to mitigate potential adverse impacts
- a framework for assessing impacts of the Project in view of legislative and policy provisions
- a mechanism for sustainable environmental outcomes, including control measures and strategies to be implemented during the construction and operational phases through environmental management plans (EMPS).

The EIS consists of four parts that provide the following information:

Part A: Background information about the Project and the proponent to assist in setting spatial, environmental, economic, social and legislative contexts for the PEP

Part B: Impact assessments on a range of potential environmental, economic and social effects including residual and cumulative effects, as well as recommended measures for mitigating potential impacts

Part C: Descriptions and specification of recommended environmental management requirements through specific management plans to be implemented at different stages using prescribed standards or recommended practices

Part D: Appendices that present more detailed technical investigations (studies, analyses and assessments) that support the statements made in preceding EIS parts.

Each Part of the EIS is further broken down into chapters to provide discussion on specific environmental factors and development aspects. The EIS chapters address elements of the natural and built environment such as land, water, air, acoustics, nature conservation, heritage, waste, health and safety, as well as key social and economic conditions.

1.2.2 Consultation Findings

POTL consulted stakeholders at the commencement and during the preparation of the EIS in order to understand and address concerns raised by the community, government and industry. This helped with the framing of technical investigations and analysis for the Project's planning, design and assessment. Consultation facilitated community understanding of the PEP and provided opportunities for community involvement through raised awareness and contribution.

Overall, the community engagement activities undertaken during the past and recent phases of consultation have confirmed:

- there is strong support for the Project based on economic and employment indicators; however, potential environmental impacts are of concern and are expected to be managed appropriately
- the community appreciates positive action from POTL, which position it as a good neighbour, such as the installation of park infrastructure and planting of vegetation
- concerns around mitigating noise, light and dust re-enforced in that they need to be managed
- dredging and associated potential impacts on the Great Barrier Reef are of particular concern
- consideration needs to be given to existing and future infrastructure (roads and rail) with regard to an increase in port traffic
- the community is concerned about types of products that may be transported through the port.

Key matters raised through consultation have been addressed in the respective EIS parts and chapters. Ongoing communication through existing Port communication mechanisms will provide opportunity for community and stakeholders to respond to the effectiveness of these measures, allowing POTL to amend them as necessary for maximum benefit.

1.2.3 Terms of Reference and EIS Guidelines

The location of the PEP, the multiple approval jurisdictions and instruments that apply to the Project, its potential significance to the State of Queensland as major infrastructure investment, its location adjacent to sensitive environments and recent decisions regarding a number of other projects led to the referral of the Project to the Coordinator-General who subsequently declared it a 'significant project' under the *State Development and Public Works Organisation Act 1971.* The location of the PEP within the Great Barrier Reef World Heritage Area (GBRWHA) and its relationship with other matters of national environmental significance under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* led to the Project being determined a 'controlled action' by the Minister for Sustainability, Environment, Water, Population and Communities.

As a result of those instruments the PEP EIS has been prepared to address two separate regulatory requirements set by terms of reference for the preparation of an EIS as required by the state and Commonwealth governments under two legislative instruments being:

- Coordinator-General's *Townsville Port Expansion Project Terms of Reference for an environmental impact statement* (ToR) (Appendix A1)
- Department of Sustainability, Environment, Water, Population and Communities and the Great Barrier Reef Marine Park Authority *Guidelines for an Environmental Impact Statement for the Port of Townsville Port Expansion Project, Queensland (EPBC 2011/5979/GBRMPA G34429.1)* (EIS Guidelines) (Appendix A2)

The PEP EIS needs also be considered in the context of the comprehensive strategic assessment of the GBRWHA and the adjacent coastal zone that is being undertaken by the Commonwealth, the Great Barrier Reef Marine Park Authority (GBRMPA), and the Queensland government. That assessment is a key recommendation of the recent UNESCO mission and report on the status of the GBRWHA property. In the context of that strategic assessment, Townsville's port is recognised as historically significant, long-standing and established, with future development subject to approval on the basis that the proposed expansion does not result in significant or unacceptable impacts to the Great Barrier Reef and its protected values.

1.3 Impact Assessment Methodology

The assessment methodology used to address the matters stated in the ToR and EIS Guidelines during the preparation of this EIS is summarised in Figure ES.2. This risk-based assessment framework takes into account the specific requirements of these documents as they relate to matters of national environmental significance as well as state interests. The EIS has been consolidated into a single comprehensive document for public consultation purposes and any submissions made on the document will be reviewed by both the Australian and Queensland governments.

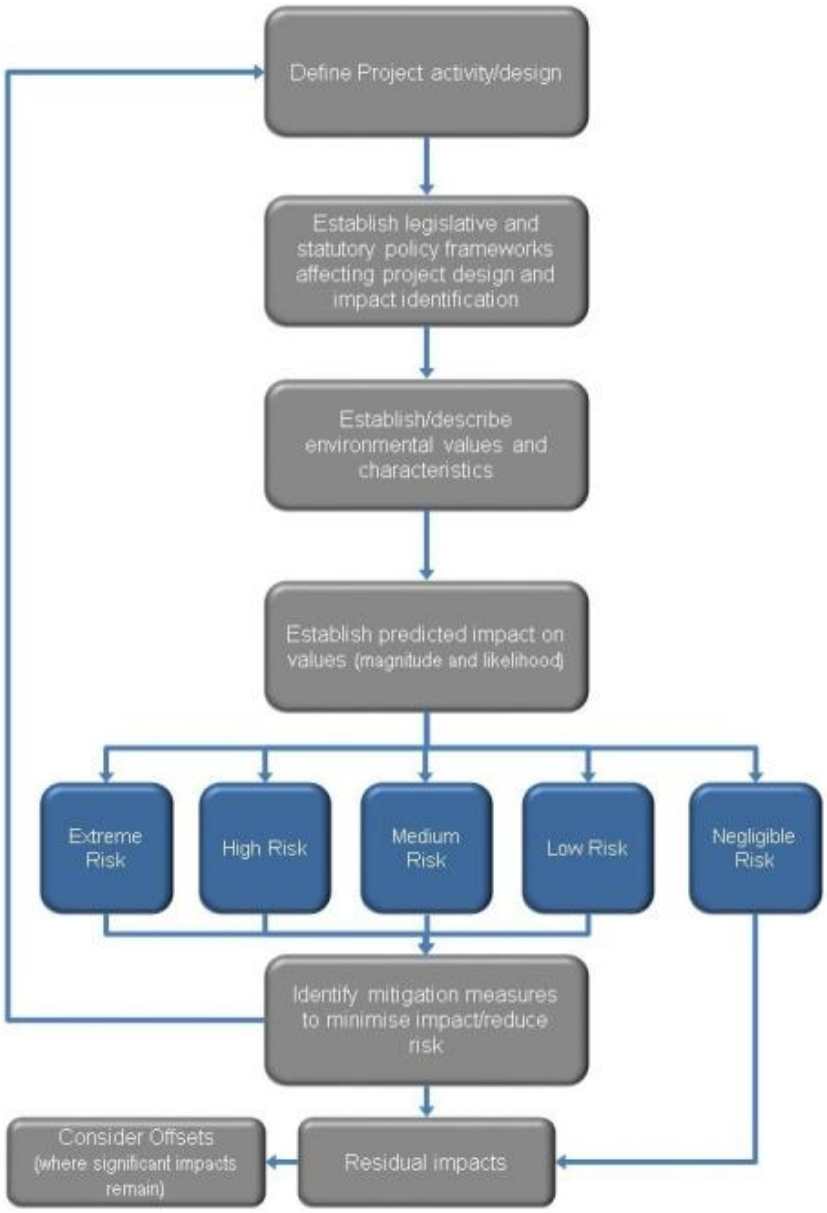

Figure ES.2 Overview of the impact assessment process

1.3.1 Project Assessment and Approvals Framework

Approvals are considered in terms of Commonwealth, state and local government jurisdictions and deal with matters that are referred under specific legislation. Detailed assessment requirements are dealt with in each of the technical chapters of the EIS Part B under the heading 'Assessment Framework and Statutory Policies'.

The legislation that applies to the PEP is discussed in terms of its general intent and operation with a separate, more detailed discussion in Section A2.6, providing the context of the approval requirements.

Approvals for further development as part of the operational phase of the PEP (i.e. by port tenants once reclamation and servicing of the site has been completed) will be dealt with under separate approval

processes by the specific tenants. This will occur when the land is included as Strategic Port Land and will be determined by the *Sustainable Planning Act 2009* (SP Act) and POTL's *Land Use Plan* (POTL, 2010b), the *Environmental Protection Act 1994* and other environmental legislation.

In addition to assessment requirements that are typical of a planning or environmental nature, the EIS also identifies a number of legislative requirements in relation to quarantine, maritime safety and operations, security, safety and land transportation that need to be considered during the construction and subsequent operation of future stages of PEP.

The EIS recognises that the *State Development and Public Works Organisation Act 1971* includes provisions to ensure that any conditions required by the Coordinator-General for a significant project have primacy. Any conditions imposed under a future approval applying to the assessment of development applications that are inconsistent with the conditions of the Coordinator-General are superseded by the Coordinator-General's conditions. This does not apply to Commonwealth legislation, including approvals required under the *Great Barrier Reef Marine Park Act 1975*, *Environmental Protection (Sea Dumping) Act 1981* where a future approval is warranted for offshore disposal of dredge material, or *Native Title (Queensland) Act 1993* legislation.

1.4 Proposed Construction and Staging Methodology

The following outlines a strategy for staging of the PEP development over the planning horizon based on the adopted trade forecast (Section **Error! Reference source not found.**) and an assessment of the cargo capacity requirements. The staging includes two navigation design depths based on a forecast of ship sizes and ship traffic. Although the development stages are indicative, they do provide a reasonable basis for identifying likely construction methodology for each stage and to undertake an assessment of impacts.

1.4.1 Development Staging

It is expected that the PEP works in the new outer harbour will be undertaken progressively to match the need for additional port facilities, which will be driven primarily by the demand to accommodate the growth in existing and/or new trades. While development decisions for each stage will be made when favourable business cases can be demonstrated and will be subject to the availability of capital funding, a feasible development schedule has been prepared which the EIS is based on.

The north-eastern breakwater defining the entire footprint for the new outer harbour will need to be built at the beginning of the Project to provide the appropriate protection for the progressive development of new berths. However, the berths and reclamation areas behind the breakwater will be developed in a staged manner in response to demand from increase in cargo throughput or the advent of new trades. This expansion may be developed on a sequential berth-by-berth basis or in stages involving the development of multiple berths.

The ensuing staging of the works for marine infrastructure, reclamation and channel development will be determined by a number of factors, in particular:

- The removal of all soft material from the north-eastern breakwater footprint, bunded reclamation area and from the initial outer harbour basin dredging area will be undertaken at the outset of the Project.
- The construction of the north-eastern breakwater and revetments will be undertaken at the outset of the Project.
- The development of marine infrastructure in the new outer harbour may be undertaken on a berth-by-berth basis or groupings of two or more berths at a time.
- The dredging of the outer harbour basin will be undertaken in a staged manner to provide the vessel manoeuvring area appropriate to the staged berth development.
- The development of the reclamation area will be undertaken in a staged manner to match the berth development requirements.
- The deepening of the approach channels will be undertaken in stages to meet shipping requirements. The driving parameters will be the draught of the prevailing vessel fleet and the level of service for the vessels in terms of access criteria and the level of tide-assisted transits required. For the purposes of the EIS the channel deepening is envisaged to be undertaken in two stages.

1.4.2 Project Timetable Overview

While it is not possible to predict exactly when the new berths and associated infrastructure will be developed, an estimate of the timetable for development has been put together as a feasible development scenario to guide the preparation of the EIS, based on the long-term trade forecast prepared for the EIS. In practice the sequence and timing will be regularly reviewed and adjusted to reflect the actual demand for cargo handling capacity and shipping requirements.

The indicative timing of the main components of the PEP development is shown on Figure ES.3 and discussed below.

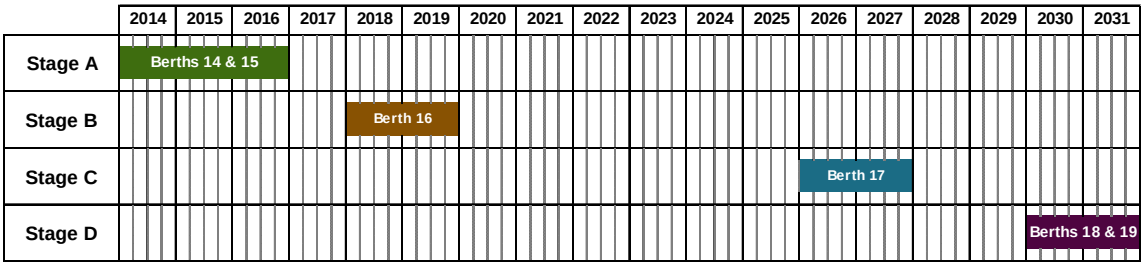

Figure ES.3 - Indicative development program

1.4.2.1 Stage A (2014 to 2016)

Stage A development of the PEP is planned for construction from 2014 to 2016 involving:

- develop bunded outer harbour reclamation area (entire outer harbour reclamation footprint) with revetments and north-eastern breakwater protection (western breakwater if required)
- develop new Berths 14 and 15
- undertake dredging works:
  - dredging of soft marine sediments in the footprints of the reclamation area, bund and north-eastern breakwater structures, Berths 14 and 15 manoeuvring basin with relocation of dredged material to the existing offshore DMPA
  - deepening of the basin of Berths 11 and 12, with placement of dredged material in bunded areas as reclamation fill
  - dredging of Berths 14 and 15 manoeuvring basin with placement of dredged materials in the bunded areas as reclamation fill or relocated to the existing offshore DMPA
  - Stage 1 deepening of the Sea and Platypus channels and widening of Platypus Channel (between beacons P11/P13 and P12/P14) with relocation of the dredged material to the existing offshore DMPA.
- development of a rail loop and wagon unloading/loading infrastructure required for Berths 14 and 15
- construction of landside infrastructure for cargo storage and transfer (by port tenants) required for Berths 14 and 15
- construction of road and other infrastructure to support port operations required for Berths 14 and 15.

1.4.2.2 Stage B (2018 and 2019)

Stage B development of the PEP (refer outer harbour layout in **Error! Reference source not found.**) is planned for construction during 2018 and 2019 involving:

- development of new Berth 16
- Undertake dredging works:
  - dredging of soft marine sediments in the footprint of Berth 16 manoeuvring basin with relocation of dredged material to the existing offshore DMPA
  - dredging of Berth 16 manoeuvring basin with placement in bunded areas as reclamation fill.
- development of additional rail and wagon unloading/loading infrastructure required for Berth16
- construction of landside infrastructure for cargo storage and transfer (by port tenants) required for Berth 16
- construction of road and other infrastructure to support port operations required for Berth16.

1.4.2.3 Stages C and D

Development of Stages C and D of the PEP (refer outer harbour layouts in **Error! Reference source not found.** and **Error! Reference source not found.**) is planned for construction from 2026 to 2035 involving:

- sequential development of new Berths 17, 18 and 19.
- undertake dredging works during Stage C:
  - dredging of soft marine sediments in the footprint of new manoeuvring basin areas with relocation of dredged material to the existing offshore DMPA
  - dredging of the remaining manoeuvring basin area, plus deepening of previously dredged basin area, with placement in bunded areas as reclamation fill
  - Stage 2 deepening of the Sea and Platypus channels with relocation of dredged material to the existing offshore DMPA
- sequential development of additional rail and wagon unloading/loading infrastructure required for Berths 17, 18 and 19
- sequential development of landside infrastructure for cargo storage and transfer (by port tenants) required for Berths 17, 18 and 19
- sequential construction of road and other infrastructure to support port operations required for Berths 17, 18 and 19.

1.5 Economic Values

1.5.1 Economic Environment

Townsville is located in Queensland's Northern Economic Triangle supporting the local, regional and state economy by ensuring capacity meets demand and providing local Queensland producers and industries with access to international markets. The economy of Townsville performs well, shows strong population growth, enjoys incomes on par with Queensland and is well-diversified. The main competitive advantage of this region and particularly Townsville, as the main urban centre in the Northern Economic Triangle, lies in its skilled population, diversified and growing economy and existing infrastructure linking major resource centres in North West Queensland.

POTL has prepared trade forecasts to 2039/40 fiscal year, which underpin the need for the PEP. Those forecasts are based on a detailed assessment of individual resource projects being developed by several major resource companies, particularly nickel, magnetite, copper, coal and fertiliser. The summarised forecasts are supported by a detailed mine-by-mine analysis of port capacity needs. The export of magnetite is a trade that has recently been introduced to Townsville following several magnetite mine developments. The coal export trade could be a possible new trade, which may be developed at Townsville to handle coal exports from the northern end of the Galilee Basin. Nickel, copper and fertiliser are existing trades whose volumes are also forecast to grow as the economy develops towards 2040. The result is that the port's current trade of 11 Mtpa (million tonnes per annum) in 2010/11 is expected to more than double to nearly 25 Mtpa within 5 years and 30 Mtpa within 10 years once new mines are developed and commence exporting. These projections exceed the current capacity of the port, which is approximately 23 Mpta (including the development of Berth 12).

The expected growth in key exports from Townsville is reflected in the growth also being experienced by the Townsville (7% net migration rate), which is largely occurring to support the growth of industries.

The initial construction phase of the PEP involves a significant boost of around 6 to 7% above usual investment levels in the region over the period to 2025. This additional investment will impact on the employment levels and living standards of the region.

On average, over the period to 2040, the Project will create an additional 616 full-time equivalent positions per annum in the Townsville area[1], with a peak impact of just under 2,300 full-time equivalent positions at the height of the construction activity. Combining the associated mining developments in the Northern Economic Triangle with the port results in an employment impact of close to 8,400 person-years of employment in the initial phase of port and mine construction to the end of 2019.

[1] From 16,620 person years of employment.

The best measure of the impact on living standards is gross national income, which takes national production (gross domestic product or gross regional product; gross regional product at the regional level) and adjusts for income flows overseas. On this measure, the total increase in Australian living standards from the PEP and associated mining developments is $12.6 billion in net present value terms at a discount rate of 7%. Of that boost to living standards, $8.1 billion remains in the Northern Economic Triangle region, just over $10 billion accrues to Queenslanders and the remainder benefits residents in other jurisdictions of Australia (mainly due to tax revenues flowing to the Commonwealth and being redistributed to the other states and territories).

The PEP is likely to create a short-lived peak in labour demand during the initial construction period. Townsville already experiences transition movements of personnel as a result of defence personnel fluctuations. In the longer term any adverse effects of the PEP on the housing and labour markets will be minimal, given the background growth in employment in the area and the consequent needs for housing.

1.5.2 Port Operations

Given the pivotal nature of the development impetus, POTL, as a port authority under the *Transport Infrastructure Act 1994*, will be responsible for planning the development of PEP. The operational framework will be a progressive expansion of existing port infrastructure and operations under the same management structure. The operations that will result from the PEP will be conducted using established road and rail networks and shipping channels used by the existing port and other separate developments that are underway or being planned by POTL. In addition, road and rail as part of the Eastern Access Corridor (EAC) will also service the PEP as they come online. As such, the PEP planning and design was integrated with the broader port operations.

Significant port operations relate to shipping, road and rail, since the above-wharf development of cargo handling facilities will be by the port's as-yet-unidentified tenants who would lease POTL land and berth facilities. They will construct their own operating infrastructure, as and when they take up their lease and the operating approvals would be independently undertaken by those proponents at the appropriate time.

In order to manage potential impacts from the port, management plans have been prepared that include both existing and additional measures that are to be applied to the operation of PEP to manage environmental impacts and reduce risk from a range of hazards.

Specifically, the Maritime Operations Management Plan provides mitigation measures to address the potential impacts of increased shipping associated with upgrades to facilities being implemented across the port, other planned upgrades and expansion projects and the PEP. It details a range of management measures for maintaining safe, efficient and effective vessel operations in the Port of Townsville. It also details the relationship with Maritime Safety Queensland and its Regional Harbour Master.

With the management plans in place the predicted growth in port operations can be appropriately managed with operational procedures being reviewed over time and amended to account for the staged development of the PEP.

1.6 Natural Physical and Ecological Values

The following sections describe existing conditions and predicted effects of the PEP on natural and built values.

1.6.1 Land – its Qualities and Uses

The Port of Townsville is underlain by Quaternary-age alluvium and colluvium sediments, which in turn overlie basement geology comprising Late-Palaeozoic age Granite (Golder Associates, 2012b). The near surface lithology comprises Holocene sediments more than 12,000 years old, including silts, mud and sand described as coastal tidal flats, mangrove flats and supratidal saltpans.

Seismic analysis beneath the PEP undertaken in 2008 and more recently in 2011 confirmed the presence of relatively shallow density (soft) sediments generally matching the stratigraphy identified by the drilling programs conducted by Golder Associates (2008a) and GHD (2008a). According to the Golder

Associate's investigation offshore of the north-east boundary of the existing port land, bedrock is probably at least 16.5 m below the current seabed.

The soil profile in the Platypus and Sea channels is broadly similar to that of the outer harbour and proposed reclamation area. Along the Platypus Channel, prior to dredging in 1993, the reported surface sediment thickness generally ranged from 1 to 3 m. The soft surface sediments vary in thickness but are relatively thin, thought to arise from tidal and seasonal movement of the seabed sediments. The underlying in situ material is generally comprised of very stiff sandy clay and medium to coarse grained clayey sand.

Previous dredging campaigns and borehole investigations indicate that there are some areas of low strength rock or cemented material in the channel, which were not successfully dredged previously by a trailer suction hopper dredger. A grab dredge was employed for excavation of small quantities of these cemented materials.

Risk of land contamination from the Project is low, being mainly associated with potential contamination from spills and leaks during construction and operational stages. These risks will be managed through construction and operational EMPs. Without the implementation of suitable mitigation measures development and operational activities may contaminate land created by PEP. Past port operations have successfully occurred without significant incidents of land or water contamination because of dutiful use of EMPs.

Land use and tenure of land adjacent to the port have been assessed to identify potential impacts including on:

- surrounding land uses and human activities, specifically:
  - surrounding (non-port) land uses
  - recreational uses on Cleveland Bay
- town planning objectives, controls and development constraints.

Mitigation measures that relate to land use matters apply primarily to potential direct and indirect impacts including:

- Boating and yachting activity in Cleveland Bay: notably for craft navigating from Ross River and Ross Creek, due to removal of water area from Cleveland Bay, and obstruction to navigation resulting from seaward extension of the port
- Residential and other sensitive land uses along or near Boundary Street: due to potential reductions in amenity and safety resulting from increases in heavy-haulage vehicle movements, Residential and other sensitive land uses along the existing rail corridor to the port
- Potential increased noise resulting from more frequent rail movements to and from the port in the future
- The Eastern Access Corridor aims to alleviate future road and rail constraints once full operational status is achieved.

Other mitigations concerning land uses will require:

- consultation and community awareness of the PEP's staged works and updates on its progress relating to the development timeframes, including communication regarding likely effects and opportunities that this may have regarding additional housing or land and property development for industrial or commercial use development by port growth
- ongoing engagement with local government about strategic and statutory planning needs for the surrounding area to preserve the port as a significant land use of local and regional importance and to emplace controls in the new planning scheme to highlight future land use along Boundary Street
- liaison with Department of Transport and Main Roads and Townsville City Council in relation to the transport planning and any related land use planning control needed for development along Boundary Street.

1.6.2 Surface Waters and Hydrology

The Ross River Basin has an area of 1,707 km² and flows to the sea at Townsville with the main rivers being Bohle, Little Bohle and Ross. The Ross River catchment is the single largest in the Townsville City Council area. The majority of the Ross River catchment is upstream of Ross River Dam with approximately 760 km² draining to the dam. Downstream of the dam a further 145 km² drains to Ross River through the tributaries of Stuart Creek, Gordon Creek, Annandale Drains and University Creek. Ross Creek drains most of the urbanised area of Townsville, including the suburbs of South Townsville, Hyde Park, Mundingburra, Gulliver, Currajong, Pimlico, Mysterton, Aitkenvale, Vincent and Cranbrook. With the exception of Castle Hill, the catchment area is flat and almost fully urbanised.

During wet seasons, Townsville commonly receives intense and heavy rainfall often associated with severe weather forming in the vicinity of monsoonal troughs. The heavy rainfall generally occurs between November and April; January and February are usually the wettest.

Modelling of potential flooding and storm-event catchment discharges clearly show that there would be no change to flood levels, flood extents or inundation times as a result of the PEP, as it sits entirely in the ocean.

As a result of severe runoff events, like other developed Queensland coastal catchments, there are potential effects on the surface water via stormwater drainage during the construction and operation stages. Such effects will potentially arise from:

- leaks from storage of oil, fuel and chemicals on site
- handling and leaks from storage of hazardous goods, with contaminants from liquid and solid materials potentially entering the existing waterways
- runoff of stormwater enriched with suspended sediments from the construction period.

Once the site has been filled and sealed, infiltration from rainwater directly below the surface will cease (as it is capped and paved). Localised recharge on areas outside of sealed surfaces (grassed verges; vacant land) is likely to continue to result in small groundwater mounds. The presence of sealed surfaces and purpose-built drainage will result in surface water flowing into a port-wide reticulated drainage system. Outflow of surface waters through drainage will be swift due to anticipated heavy tropical storms. Site management will be required at the operational sites of each port tenant as management of stormwater contamination risk is best done at source.

Depending on the bulk materials stored and handled on PEP, there is likely to be purpose designed water and runoff site treatment system such as sub-catchment bunding and roofing, treatment systems (including diversions), proprietary products and/or retention ponds. Land management aspects of stormwater management will be consistent with *Queensland Urban Drainage Manual* (DNRW, 2007).

A range of mitigation measures have been recommended associated with maintaining the integrity of surface and ground water in and around the PEP footprint through the management of sediment and erosion and prevention of spills. The identified management measures for the construction and operational phases of the Project will reduce the potential impacts on water resources. If managed properly the impacts associated with adjacent marine surface waters will be minimal.

Groundwater will not exist during the initial land development phase. Judicious management (including testing and placement of clean reclaim material) will prevent the development of an acidic and/or contaminant enriched content in any artificial aquifer that may establish after the final land development.

1.6.3 Marine Waters

Cleveland Bay is a naturally turbid environment, with wind driven re-suspension of fine seabed sediments, particularly in winter months, and significant fluvial influences as a result of flooding in summer months. Benthic primary producers such as seagrass have adapted to the highly variable water quality conditions that occur in the bay and provide critical habitat for fisheries and marine species of conservation significance.

The PEP has the potential to influence water quality in Cleveland Bay during both construction and operation. Impacts on water quality during construction will result from dredging the outer harbour,

Platypus Channel and Sea Channel, including placement of dredged material, reclamation, and construction of breakwaters. The influences on water quality from these activities will be short-term.

Dredging is the principal activity that will result in the resuspension of sediment particles into waters of the bay. Visible turbid plumes will occur as a result of Project activities, particularly from dredging in the Platypus and Sea channels. Turbid plumes, containing natural sediments re-suspended from the seabed of Cleveland Bay, will likely be carried by currents across the bay and into parts of greater Cleveland Bay, risking impacts to nearby sensitive ecological receptors such as hard corals. During winter, wind and wave fetch moves surface waters westward. Numerical modelling has shown that the extent of those plumes during dredging will depend on a range of factors including season, wind strength and direction, currents, tide status, location and type of dredge, as well as dredge working methods and productivity.

The primary means of managing changes to ambient marine water quality will be through establishing monitoring programs for contemporary baseline conditions, and providing ongoing water quality data during the staged dredging and construction phases of PEP. In addition to data analysed as part of the EIS, a 12 month water quality data collection campaign is currently being undertaken at key habitats in Cleveland Bay to establish a seasonal baseline.

A reactive monitoring program for water quality and ecological health will form part of the EMP as well as a specific Dredge Management Plan. The Dredge Management Plan sets out a framework to develop trigger water quality levels which, if being approached or exceeded, will require the works program to be adjusted, changed or suspended to manage marine water quality to within acceptable levels, prior to ongoing works recommencing. This approach will be combined with marine ecological assessment of coral and seagrass health prior to, during and following major dredging events.

1.6.4 Coastal Processes

Cleveland Bay is located approximately 50 km north of the Burdekin River and halfway between the Burdekin and Herbert Rivers, which provide the dominant sediment supply to the central Great Barrier Reef coast (Belperio, 1983; Moss, Rayment, Reilly, & Best, 1993). Bedload sediment, which is predominantly sand, comes under the influence of wind and wave-induced longshore drift, and is transported northwards along the coastline, along with more local inputs. During summer floods, suspended load muds, and some finer sand, are discharged directly onto the inner shelf, where they either accumulate on the seabed at depths out to 20 m, or are processed back into the mangrove systems that fringe the coastal plain.

Cleveland Bay has accumulated sediments to become relatively shallow, deepening to only 10 to 11 m (chart datum) along its northern entrance. The predominant source of this ongoing supply of fine sediments and very fine sands is the Burdekin River. Kroon et al (2012) have estimated that the average yearly export of suspended sediment from the Burdekin River is 4 Mtpa. These sediments, once deposited on the sea floor, are advected northward by longshore currents driven by the prevailing south-easterly winds and waves (Belperio, 1983). Orpin *et al* (1999) conclude that wave-induced bed stress is the most significant mechanism of sediment re-suspension with non-cyclonic suspended-sediment concentration events mostly limited to the inner shelf in water depths less than 15 m.

Woolfe and Larcombe (1998) indicate that the three embayments north of the Burdekin River (Bowling Green, Cleveland and Halifax Bays) show successively decreasing rates of terrigenous infill. Orpin et al (2004) conclude that 80 to 90% of the Burdekin River sediments are captured in Bowling Green Bay. Orpin et al. (1999) estimate the longshore sediment export from Bowling Green Bay into Cleveland Bay to be approximately $3x10^8$ kg per annum. Orpin et al (2004) find that Cleveland bay traps about the same amounts of sediment, about 5 to 10% of the total average Burdekin River fluvial discharge, with accumulation rates less than 1 mm per annum. They note that the accumulation rate is a function of re-suspension and re-deposition as well as supply, and that the Cleveland Bay tidal and sub-tidal zone is extensively reworked, re-suspended and re-deposited with relatively small net inputs during the last century. Further, they suggest an episodic rather than continuous pattern of deposition, as deduced from core data.

Two broad coastal process categories can be made, based on the predominant sediment transport mechanisms and the observed effects:

- Cleveland Bay hydrodynamics and sedimentation, including direct siltation in dredged areas and effects from dredged material placement
- indirect beach processes along the shoreline.

Extensive numerical modelling has been undertaken as part of the EIS to understand any potential impacts from the Project on these hydrodynamic, sediment re-suspension and shoreline processes.

Once the bunds, revetments and breakwaters of the PEP are constructed changes in hydrodynamic current velocities of ocean waters are confined to areas immediately surrounding the PEP, with small magnitude changes of up to 0.2 m/s in ocean currents. The velocities within the outer harbour and adjacent channels are generally reduced.

Numerical modelling of sediment transport and deposition showed that the outer harbour rock walls will cause the redirection of the suspended sediment to drift around the PEP reclamation. A small net reduction in fine sediment drift from east to west of the port may occur due to the combined interception effect of the outer harbour extension and the partly wider and deeper Platypus Channel. This small reduction in fine cohesive sediments would not be expected to generate a perceptible morphological change to sand supply to The Strand, either in the short or long term. The PEP reclamation may cause a slight increase in sediment deposition rates in Cleveland Bay immediately to the east of the outer harbour and Platypus Channel.

There will be a reduction in the energy of certain types of waves at The Strand due to the PEP. Waves generated locally in Cleveland Bay, presently incident on The Strand beach from east south-east to east north-east direction, will be reduced in height and altered in incident angle to varying degrees along the beach length. There will be a somewhat less effect on the longer period sea waves that propagate from offshore past Cape Cleveland. This will result in a very slight reduction in a northward component of the longshore transport of sand to varying degrees along the beach length. Wave propagation analysis shows no increase in wave heights at any location along The Strand beach; in fact, storm waves at the southern to mid parts of The Strand are likely to be reduced in height. The beaches there will be less subject to erosion or wave overtopping from storm events.

Because of the uncertainties and the complexity of interaction of various processes and events, it is not feasible to predict any clear climate change tendency in marine sedimentation and siltation in the shipping channel or harbour. Over time maintenance dredging will be required to remove deposited sediments from the channel as it is now. While the larger channel cross-sections will be more efficient at trapping fluxful sediments, a significant reduction in siltation will arise because of the enclosure of the outer harbour. This will contribute to a predicted net 25% reduction in the current annual maintenance dredging volume. Maintenance dredging of the port has been undertaken in Cleveland Bay for over 100 years in order to maintain navigable shipping channels, berths and vessel manoeuvring areas (GHD, 2008a). The existing, approved offshore Dredge Material Placement Area (DMPA) in Cleveland Bay has a long history of use, as have two inshore DMPA that are no longer in use. The implications of the placement of a large volume of capital dredge material from channel deepening as part of PEP into the existing Cleveland Bay DMPA has been assessed with the following key findings:

- There is sufficient volumetric capacity within the existing DMPA to accept the dredge material from PEP, as well as cater for other proposed projects and future maintenance dredge requirements.
- Water quality impacts from the placement activity have been modelled and turbid plumes are predicted to be minor, temporary and localised. There are no sensitive receptors in close proximity to the existing DMPA.
- Sediment re-suspension processes within the bay are significant and occur over a broad scale. The relative contribution of additional dredge material placement at the DMPA when compared to bay-wide re-suspension processes is considered to be minor. Although some material placed at the DMPA will be naturally advected toward the north-eastern coast of Magnetic Island under normal wave and tidal conditions, the marine ecology assessment has not predicted any significant impacts from this process on corals or other key habitats present.
- Two alternative DMPA sites have been examined further offshore from the existing DMPA. These sites do not present any specific or significant environmental benefits over the existing site. They

would introduce potential conflicts with other marine uses (commercial fishing and shipping), represent 'greenfield' sites in the Great Barrier Reef Marine Park (GBRMP) that have not been exposed to previous disturbance, and do not provide hydrodynamic benefits in the context that they would remain dispersive, despite placement at greater water depths.

1.6.5 Marine Sediments

The principal impacts from marine sediment quality are associated with the liberation of potential contaminants within them as a result of dredging disturbance.

Catchment land uses, coastal zone industry, urban development and transportation have resulted in elevated levels of nutrients and other contaminants in surface sediments, particularly in places within the Ross River and Ross Creek waterways and nearshore areas of Cleveland Bay. Deeper, stiffer clay sediments below 1 m within native seabed of the outer harbour and channels can be characterised as being uncontaminated.

Acid sulfate material is present in marine sediments beneath the PEP, as nearshore marine sediments are often naturally-rich in sulfur. These have high capacity to neutralise sulfur that oxidises due to the presence of carbonates from shell and coral debris in the sediment itself. As the sediments of the seabed are fully submerged, Golder Associates (2012b) concluded that there could be no actual acidity. Where any disturbance of acid sulfate soils is undertaken (limited to the upper seabed layers), generation of acid through prolonged exposure above water would be unlikely as the majority of that material is to be placed at the DMPA.

Low level contamination that triggers the requirement for further scientific investigation exists in some surface marine sediments adjacent to the existing Berth 11 and the future Berth 12 area. These sediments are being further investigated and managed as part of POTL's long term dredge material disposal strategy and will largely be removed prior to PEP capital dredging commencing (the PEP involves further deepening of these areas). Sediment that is to be disturbed by PEP will undergo further testing and activities will meet the requirements of *Environment Protection (Sea Dumping) Act* for onshore and offshore handling and placement of segregated clean or potentially contaminated sediments.

1.6.6 Marine Ecology and Conservation

Cleveland Bay is known to support a broad range of marine ecological values and functions. Notable marine ecological values include:

- a wide diversity of marine habitat types including beaches, mangrove forests, saltmarshes, intertidal shoals, subtidal soft sediment habitats, rock walls, fringing coral reefs and rocky shores
- one of the largest seagrass meadows in the North Queensland region
- coral communities of high biodiversity significance around Magnetic Island
- habitats for a wide range of fish and shellfish of direct economic significance
- significant feeding areas for marine turtles and dugongs, which are listed as threatened or migratory under Commonwealth and/or state legislation
- habitat for a range of other threatened or otherwise listed marine megafauna species, including whales and dolphins protected under the *Environment Protection and Biodiversity Conservation Act 1999*.

Habitats and biological communities in the port, the dredged channels and the foreshore of Townsville are in a modified condition. Habitats and biological communities elsewhere in Cleveland Bay are considered to be in a slightly to moderately modified condition and relatively resilient to disturbance; however, climate-induced disturbances can create conditions that make them more susceptible to anthropogenic disturbance.

Impacts and impacting processes include:

- Permanent irreversible impacts as a result of reclamation and breakwater construction. While there are no seagrass communities (observed as part of current sampling or historically) or rocky reefs present within the area of the works, the reclamation and associated breakwater construction will

result in the loss of approximately 110 ha of unvegetated soft substrate. These habitats are characterised as having low to moderate biodiversity values, but are contained in the core habitat area of the Australian snubfin (*Orcaella heinsohni*) and other coastal dolphin species.

- Temporary residual impacts will arise from capital dredging in the outer harbour and the deepening of the Platypus and Sea channels. The total area of capital dredging in the outer harbour and channels is estimated to be approximately 220 ha. The areas subject to capital dredging in the nearshore are characterised as having low to moderate biodiversity values. The footprint of capital dredging in the outer harbour has no seagrass communities (observed as part of current sampling or historically) or rocky reefs present. The capital dredging associated with the PEP is a temporary activity. The deeper areas will recolonise with benthic organisms rapidly (in the order of months) following disturbance. The benthic assemblages that recolonise these areas will be similar in character to other areas of the port where dredging has previously occurred.
- There will be a permanent beneficial impact from the creation of rock wall habitat around the perimeter of the reclamation along the major breakwaters. This has been estimated in the design as creating 10.55 ha of subtidal rock wall habitat and 1.45 ha of intertidal rock wall habitat. The ecosystem services provided by the created rock wall habitat are considered to be significantly greater than the current unvegetated soft sediments they will replace. Key values include habitat for fisheries of commercial and recreational significance, supplemental feeding habitat for foraging green turtles and opportunistic high tide roosting habitat for migratory and resident waterbirds.
- Potential effects arising from introduction of marine pests from an increase in foreign vessels visiting the port. Such occurrences have not been known to occur in Townsville's waters. Visiting ships will be expected to manage ballast in accordance with existing Commonwealth and international legislation and biosecurity requirements.
- Potential effects on animals such as dolphins, whales, dugongs, turtles and other marine megafauna associated with underwater noise generation, light, vessel strike and marine pollution events. A series of management plans (construction environmental management; vessel traffic management (construction) and maritime operations management) will be adopted to manage associated development and operational risks.

Based on historical seagrass mapping, very sparse ephemeral deep seagrass habitat has been known to occur in central Cleveland Bay. If present at the time of dredging, these deep water seagrass communities could be directly disturbed by channel deepening activities and placement of dredged material in the DMPA. Survey work since 2010 conducted for PEP, by each of GHD and BMT WBM, did not detect these deepwater seagrass communities, so they are not known to have occurred since the 2007 surveys undertaken by the Department of Agriculture, Fisheries and Forestry.

The PEP areas are not known to support the nearshore permanent seagrass that occurs in Cleveland Bay that provides high quality foraging habitat for marine megafauna, fish or shellfish of economic significance.

With minimal direct impacts, the greater risk to environmental values from the Project will be indirect impacts to benthic habitats and communities (particularly permanent seagrass beds and hard coral communities) associated with the generation of turbid plumes during dredging.

Extensive predictive modelling of key water parameters such as turbidity and photosynthetic active radiation (a measure of water clarity) have been undertaken to assess if dredging – particularly deepening of the Platypus and Sea channels by a medium-sized trailing suction hopper dredge - could have acute (short term) or long-term chronic (press-type) disturbance to those nearest seagrass meadows and corals at Magnetic Island and Middle Reef.

This assessment has also drawn on the findings and data from the environmental monitoring undertaken during the 1993 dredge campaign in Cleveland Bay, which was the last major capital dredging campaign for the Platypus and Sea channels.

To reduce the residual risk to sensitive benthos (being soft bottom benthos, seagrass and hard corals) the following mitigation measures will be adopted:

- Use of green valve by the trailing suction hopper dredge to reduce sediment spill and plume dispersion.
- Implement a range of measures to reduce sediment laden tailwater discharges into Cleveland Bay.
- Dredging during winter months to reduce the potential likelihood for turbid plumes to impact on sensitive receptors such as seagrass and coral communities. These communities are considered to be more resilient during winter.
- Implement a reactive monitoring program to prompt feedback and facilitate appropriate corrective action if nominated triggers are exceeded.

While the modelling does not predict significant or long-term impacts to these systems from PEP, an integrated reactive monitoring program has been devised based on the inter-connection of rapid pressure/stressor monitoring of water quality combined with receptor monitoring of sensitive and/or valued indicator taxa. This monitoring programme will be implemented to ensure exceedences to water quality and ecological limits are detected during the dredge operation and corrective actions are implemented before permanent impacts occur. The reactive monitoring program will be further refined and implemented by an advisory group made up of government and non-government experts similar to the approach taken to dredge environmental monitoring in 1993.

An increase in vessel traffic around the port area during port construction activities will increase the likelihood of boat strike and the avoidance of the work area by megafauna. A dredge management plan and vessel traffic management plan have been developed to take into consideration of cumulative impacts of port activities with strategies such as speed limits, fauna spotters, and other controls to avoid interactions with megafauna.

Specific commitments to marine megafauna include:

- implementation of management actions to reduce construction related events
- implementation of controls to reduce the potential for underwater noise impacts; including the implementation of a scientifically-based exclusion zone around pile driving activities
- undertaking monitoring of marine megafauna during construction to reduce the risk of interactions with construction vessels
- designing lighting to reduce potential disruption on the minimal nesting and hatching of marine turtles that occurs on nearby mainland beaches.

Through the implementation of these and other mitigation measures, the PEP is assessed as not having significant impacts to matters of national environmental significance or unacceptable impacts to marine species and features of high conservation or fisheries significance. It remains that the Project (due to its size and scope) will result in some residual impacts that cannot be completely designed or mitigated out.

The key residual impacts associated with marine ecological matters include:

- permanent loss of soft bottom benthic habitat associated with reclamation and breakwaters
- the temporary direct impacts to benthos in dredged areas
- potential indirect impacts to adjacent marine habitats associated with turbidity from Platypus channel dredging.

Environmental offsets are only applicable to residual impacts – that is when the impacts from a development or action cannot be avoided or reduced and if all other government standards are met.

Based on Commonwealth and state environmental offset policies and guidance, and based on preliminary consultation with relevant agencies, POTL has outlined a preliminary offsets proposal for the key residual impacts of PEP for consideration as part of the EIS. The offsets proposal includes a range of direct (habitat protection, water quality improvement) and indirect (research and long term monitoring) offset measures.

1.6.6.1 Terrestrial Ecology

As PEP is a marine development, it does not require any vegetation clearing and it will not result in the disturbance of any natural terrestrial habitat. The focus is on terrestrial environmental values in the broader region particularly of migratory and wading shorebirds that may use nearshore habitats at the interface of terrestrial landscapes. Emphasis has been placed on shorebird habitat associated with the surrounding areas of Ross River and along the coastline of Magnetic Island where indirect effects may potentially occur.

Environmental values of the Study Area assessed included:

- GBRWHA, wetlands of international and state importance and other protected areas
- East Asian – Australasian Flyway, wildlife corridors and avian foraging and roosting habitats
- vegetation communities and regional ecosystems as potential fauna habitat
- threatened species and ecological communities
- migratory species.

The potential impacts to terrestrial ecology associated with construction and operation of the PEP potentially include:

- direct removal and/or creation of land forming habitat for plants and animals
- indirect effects from changed hydrology and potential sedimentation at the interface with intertidal lands
- spread of invasive terrestrial species
- noise, vibration and light emissions during construction and port operations.

The permanent creation of land will provide opportunistic foraging and/or roosting potential for migratory and resident shorebirds known in the area. A relatively small migratory bird population is known to have infrequently inhabited parts of the existing eastern reclaim of the port for feeding, and species richness there approaches that of the Ross River site (NRA, 2012). The eastern sandspit, across the Ross River from the Marine Precinct, is the primary natural roosting and foraging habitat for birds in the immediate area. The existing port land, breakwaters and revetments provide alternative additional habitat in the natural landscape. Birds opportunistically using the port land, breakwaters and revetments may temporarily be displaced from the northern edge of the port's eastern reclaim to the eastern Ross River sandspit during construction. Such an effect is unlikely to be significant to regional bird populations.

The removal of the existing north-eastern revetment will temporarily affect rock wall habitat as it affects shellfish and fish availability as food. The revetment currently supports algal and invertebrate communities and removal of the revetment will reduce foraging resources there in the short term. The sooty oystercatcher, among other species, is known to use rock walls for roosting. This impact will be temporary, as a new and longer breakwater and revetment will be constructed to counteract any longer term habitat loss. The seaward side of the new breakwater and revetments will have a frontage that results in a net gain of over 1,600 m.

The eastern reclaim area and Marine Precinct reclamation ponds provide lower-lying transitional foraging areas and their use by birds will change throughout the PEP reclamation program. Stage A of PEP development will increase the area of partially-filled cells with settlement ponds covering approximately 75 ha. During construction, the reclamation ponds will increase from 11 ha to 75 ha and during their use will have the effect of maintaining the opportunistic foraging area available to avian species.

The PEP construction activities will take place at a distance well away from the sensitive natural bird roosting and feeding habitats of Ross River sandspit and, given construction will be undertaken in intermittent campaigns, it is unlikely that birds will be significantly affected by noise, light or vibration, particularly not in the long term. From NRA (2012) there is no indication that construction works undertaken in the recent past at the Marine Precinct had any effect on the local bird population abundances on POTL land or in dissuading their visitation levels on adjacent Ross River mudflats and

sandspit. The Construction EMP and Operational EMP will use measures to reduce noise and vibration, light spill and accidental pollution emissions for site management.

1.6.7 Matters of National Environmental Significance

For PEP, the following matters of national environmental significance have been considered:

- world heritage properties
- national heritage places
- wetlands of international importance
- listed threatened species and ecological communities
- listed migratory species
- Commonwealth marine areas
- Great Barrier Reef Marine Park.

1.6.7.1 World Heritage properties and National Heritage places

PEP is situated entirely within the Great Barrier Reef World Heritage Area (WHA), which is both a world heritage property and national heritage place. Key impacts relate to the irreversible loss of soft sediment benthic habitat due to PEP reclamation, and ongoing effects associated with day-to-day operations of the port facility. Temporary impacts may occur to other benthos as a result of dredging. Noise generated by maritime activities such as dredging, piling and construction is also likely to result in the temporary avoidance by marine megafauna and fish. Adverse impacts to ecological values are expected to occur at localised spatial scales (measured in hundreds of metres in the vicinity of the construction/dredging footprints) and, with the exception of reclamation, expected to occur only in the short to medium term (measured in months to years). A wide range of mitigation measures and strategies will be adopted to reduce harm to marine ecological values supported by the Great Barrier Reef WHA.

Given highly localised spatial scales, the PEP is not expected to result in the loss of or have significant impacts on any of the environmental values that contribute to the 'outstanding universal value' of the GBRWHA such as hard corals fringing Magnetic Island. With reference to the *Matters of National Environmental Significance; Significant Impact Guidelines 1.1* (DEWHA, 2009b), it is not expected that the PEP would result in world heritage values being lost, degraded or damaged; or notably altered, modified, obscured or diminished.

1.6.7.2 Wetlands of International Importance

The PEP area is located 9 km from the Bowling Green Bay Ramsar listed wetland, which will not be directly affected by the Project. Indirect effects from turbid plumes generated by the Project, due to the dominant winds and currents, will not be likely to advect into southern Cleveland Bay waters or near the Ramsar site. PEP is unlikely to affect populations of marine fauna that inhabit the Cleveland Bay region, which inter-connects with part of the Ramsar site.

1.6.7.3 Threatened Species and Communities and Listed Migratory Species

Cleveland Bay supports habitats for migratory or transient threatened or protected marine fauna including whales, dugongs, dolphins and marine turtles. These animals have different likelihoods of occurring in the PEP area. The species with the highest likelihood of occurring in the PEP area are green turtles (*Chelonia mydas*). Loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*) and flatback turtles (*Natator depressus*) are not common in Cleveland Bay inshore waters (GHD, 2008a; GHD, 2011a). Two dolphin species are relatively common in and adjacent to the PEP footprint and the nearshore environments throughout Cleveland Bay: Australian snubfin dolphin (*Orcaella heinsohni*) and Indo-Pacific humpback dolphin (*Sousa chinensis*) (GHD, 2011a). These two dolphin species are likely to regularly feed in port areas (including over the PEP seabed) as both species have feeding and nursing areas in around Ross River.

Most other listed marine species tend to favour offshore waters (e.g. whales, turtles), and could potentially occur at the DMPA from time to time. Humpback whales (*Megaptera novaeangliae*) have been observed in the waters of Cleveland Bay (October to January) as they undertake their annual migration.

Dugongs (*Dugong dugon*) are relatively abundant in Cleveland Bay, particularly over the seagrass nearest Cape Cleveland. They occur throughout Cleveland Bay as they move between seagrass meadows in and outside the bay. As there is no seagrass in PEP areas, and sparse, sporadic seagrasses at the DMPA and adjacent to dredged channels, it is most likely that dugongs only pass through these areas.

For migratory birds, recent studies by NRA (2012) showed that sooty oystercatcher, among other species, is known to use existing breakwaters and revetments for roosting and other migratory birds use the eastern reclamation from time to time for foraging. No significant adverse impacts are expected to arise through PEP development. In the years soon after its development, the new reclaim areas are likely to enhance opportunistic foraging opportunities in emplaced marine sediments and roosting along greater lengths of breakwater and revetments.

The following processes are of relevance to listed threatened and/or marine migratory species:

- disturbances to feeding and foraging habitats including
  - permanent loss of benthic habitat due to reclamation
  - potential temporary reduction of benthic habitat productivity (particularly seagrass and reefs) and their resident prey populations due to water quality and/or sedimentation effects from dredging
  - pollution resulting from spills, or inadequate stormwater management
- animal and construction and operations interactions:
  - vessel strike
  - noise emissions and visual disturbance, resulting in modified foraging and breeding behaviours, and movement patterns
  - light pollution and its effects on habitat usage patterns.

An increase in vessel traffic during port construction will increase the likelihood for megafauna interactions, particularly green turtles, or the avoidance of the area by some mobile species such as the dolphins. A Vessel Traffic Management Plan will be implemented for construction plant used for PEP works, which will include strategies such as speed limits, fauna spotters and other strategies to avoid interactions with marine megafauna.

By 2025, cargo ship numbers to the Port of Townsville are projected to increase to over 1,000 pa. This will see the current average rate of two ships per day increase to an average of less than four ships per day. Increased ship movements may lead to increased potential for interactions with megafauna. The management of vessel interaction risk is outside the control of POTL, as it rests with vessel operators. Harmful vessel interactions with marine fauna occur infrequently, if at all; therefore, it is unlikely that there would be a significant impact on these megafauna populations.

1.6.7.4 Great Barrier Reef Marine Park

PEP is largely located outside the Great Barrier Reef Marine Park (GBRMP); however, the existing Sea Channel (adjacent to Bremner Point) intersects the GBRMP in an area zoned as Habitat Protection. The deepening of the Sea Channel will extend the overall length into the GBRMP General Use Zone. The Sea Channel deepening has a total length of 2.7 km and area of 24.8 hectares. After dredging and recovery of the soft bottom benthos, no major changes to the functional or biodiversity values presently supported in this portion of the Sea Channel are predicted.

Impact significance has been assessed against the *Matters of National Environmental Significance; Significant Impact Guidelines 1.1* (DEWHA, 2009b) for the GBRWHA and GBRMP. Based on the implementation of appropriate mitigation strategies, PEP will not have a significant impact on the environment inside the GBRMP.

1.6.7.5 Commonwealth Marine Areas

The PEP is located in Queensland State waters, as is the DMPA which is approximately 3 nautical miles from the coastline. Those parts of PEP in the GBRMP are in the Commonwealth marine area. Potential impacts on the Commonwealth marine area will be far less than for the previously discussed Great Barrier Reef WHA, which includes the entire PEP area and Cleveland Bay. Based on the implementation of appropriate mitigations, PEP will not have a significant impact on the environment in the Commonwealth marine area.

1.6.8 Climate and Natural Disaster Risks

Climate change relates to trends in the average pattern of weather over a long period of time. POTL is proposing to expand the port to address current capacity constraints and accommodate forecast growth in trade for a planning horizon to 2040. Changes in climate and natural hazards are projected for this time period as well. Design, construction, operation and maintenance of the PEP take into account predicted changes to avoid significant adverse effects.

Climate change scenarios and projected changes to climatic conditions have been investigated by the Intergovernmental Panel on Climate Change (IPCC, 2007). IPCC reported evidence from all continents and most oceans showing that many natural systems are now being affected. Warming of the climate is unequivocal. In order to determine the potential risks to the port for the timeframe of the PEP, a risk assessment was undertaken in relation to those climatic parameters likely to change. Predictions of increased occurrence of severe tropical cyclones, resulting in increased storm surge frequency and height are likely to result in a number of potential impacts for PEP. Impacts requiring mitigation actions were also identified for factors such as increased temperature, increase number of days over 35°C and rising sea level. POTL already has existing procedures in place for addressing emergency extreme weather situations at the port, which will continue for PEP; for example, ensuring appropriate onsite emergency equipment and suitable site access for emergency vehicles, undertaking channel assessments and inspections of the condition of port infrastructure after cyclone events, and evacuation of ships prior to cyclone events.

1.6.9 Air Quality

The port is bounded directly by Cleveland Bay to the north and east and a combination of commercial and residential lands immediately to its south and west. The nearest residences are located adjacent to the port's southern boundary, along Archer Street, South Townsville. Prevailing winds are typically from the south-east during the morning hours, shifting to stronger sea breezes from the north-easterly direction in the afternoon.

The Project will have a number of emission sources during both construction and operation. Construction works will generate particulate and dust emissions through vehicle movements, materials handling and wind erosion of exposed surfaces. These emissions were collectively assessed through dispersion modelling using the CALPUFF[2] model to estimate likely pollutant concentrations at specific receptor locations in close proximity to the port. As the emission sources will typically emit pollutants (including dust) at a low height (generally at ground level), any adverse effects on air quality will occur relatively close to the site of generation. Ground level pollutant concentrations at distances further from the development would be expected to be lower.

Ambient concentrations of total suspended particulates (TSP) were typically lower than the *Environmental Protection (Air) Policy 2008* (EPP(Air)) criterion, with an annual concentration of 43.6 µg/m³ in 2011. Exceedences of the EPP (Air) 2008 criterion for 24 hour PM_{10} have been recorded between 1994 and 2011 at Berth 10. However, modelling predictions undertaken for construction predicted that concentrations of TSP will generally be below the EPP(Air) criterion (established for health and wellbeing).

Longer term annual average PM_{10} concentrations were predicted to comply with NSW criterion (Queensland does not adopt a criterion for the annual time period). If the PEP construction is operated in

[2] CALPUFF is an advanced non-steady-state meteorological and air quality modelling system developed by Atmospheric Studies Group scientists (ASG, 2012)

accordance with a well-designed and targeted site management plan that takes into account predicted winds, adverse effects are not expected to occur during construction.

The operational phase will consist of a number of material handling and storage activities, which are yet to be determined. All product would be stored in enclosures away from weather (wind, sunlight and rain), and minimal amounts of particulates would be expected to be emitted to the atmosphere. While the lack of information upon which to base modelling of the bulk trade activities means it was not quantitatively assessed, reference to other port facilities undertaking large bulk loading and unloading activities indicate that air quality conditions can be managed to protect the risk to communities and people, often in the absence of enclosed handling and storage facilities.

Activities on the site will be undertaken with the objective of preventing visible emissions of dust beyond the site boundary. In order to reduce adverse impacts, a range of mitigation measures will be implemented during construction. Air quality monitoring and management, with mitigation measures and site practices to reduce the generation of dust from the site, particularly during periods where dry and windy conditions may mobilise dust, will be implemented for both the construction and operational periods in common user areas.

1.6.10 Noise and Vibration

The area immediately adjacent to the landside boundary of the PEP is an operating port. The area surrounding the existing port is mainly residential, with some commercial buildings and the nearest school in South Townsville. The existing ambient acoustic environment is characterised by noise from both port and urban traffic from Townsville and noise from port activities.

Sensitive receptors, as defined in the Environmental Protection (Noise) Policy 2008, include dwellings, libraries and educational institutions, childcare centres and kindergartens, outdoor school playground areas, medical institutions, commercial and retail activities, protected areas, marine parks and passive parks and gardens. For this Project, these receptors include:

- dwellings in Townsville, South Townsville, and Railway Estate comprising traditional single-storey, traditional double-storey apartments and Jupiters Townsville Hotel and Casino and dwellings on Magnetic Island
- Townsville South Primary School in South Townsville
- buildings with commercial and retail activity in Townsville and South Townville
- commercial and retail buildings in the otherwise predominantly industrial Townsville Marine Precinct
- passive recreational parks/gardens in Townsville and South Townsville.

Noise impacts are influenced by the sound of the most noise-intensive activity and not necessarily a cumulative effect of sources. The impact of construction noise is negligible for most construction activities. Predicted noise levels are below the existing daytime background typical quietest and ambient average noise levels for construction activities, except piling at berths and wharves and limited rock breaking work for breakwaters and revetments. Predicted noise from sheet piling (for constructing bulkhead wharves) may be up to 14 dB(A) higher than the average ambient noise levels and 25 dB(A) higher than the existing daytime background typical quietest noise levels at the nearest sensitive receptors.

The likely highest construction and operation vibration levels at the nearest sensitive receptor will be well below the most stringent goals for human comfort and the threshold limit for potential building damage.

Operation of the PEP outer harbour (including access traffic noise and low frequency noises) will result in only small increases in noise levels at most sensitive receptors (worst-case predicted noise levels achieve the identified noise limits) and are predicted to be within existing daytime ambient levels. Operational noise at the closest residential locations assessed (that is, Jupiters Townsville Hotel and Casino and Breakwater Quays) may exceed the identified noise goals, with predicted noise levels greater than existing night-time ambient levels and potentially audible.

The cumulative daytime operational noise impact of the PEP along with the Townsville Marine Precinct is predicted to be negligible at all receivers (up by 1 dB). The night-time cumulative noise levels of the

existing and future port operations indicates negligible change in amenity for the residences in South Townsville, and small but unnoticeable (that is, less than 3 dB) at Picnic Bay, Magnetic Island and at Jupiters Townsville Hotel and Casino. At Breakwater Quays, the estimated cumulative effect on the acoustic environment by known port related developments is just noticeable at 3 dB, in combined effect when compared to the set of developments without the PEP.

1.6.11 Greenhouse Gases

A strengthening scientific position, heightened public interest and expectations, and an increasing focus on national and international policy means that managing greenhouse gas emissions at the corporate and national level has become standard practice. The business environment now includes a price cost on greenhouse gas emissions as a direct result of government action, and companies see adapting to climate change as a long-term risk averse and cost effective position.

Scope 1 emissions refer to direct emissions where the point of emission release is owned by the organisation in question, such as company-owned equipment. Scope 2 emissions refer to indirect emissions, which are from the purchase of electricity, heat or steam consumed by the organisation. Scope 3 emissions refer to all other indirect greenhouse gas emissions that are not Scope 2 emissions. These occur outside the boundary of the organisation's operations, but are a result of activities of the organisation, such as embodied energy emissions from construction materials, air travel and waste production. Reporting under the *National Greenhouse and Energy Reporting Act 2007* requires that organisations report Scope 1 and Scope 2 emissions, but not Scope 3 emissions which are reported voluntarily.

The existing sources of greenhouse gas emission by the Port of Townsville Limited include refrigerants (from air conditioning), stationary energy fuel use (from emergency generators) and electricity use, plus POTL owned fleet, pilot vessel and machinery. This will continue in the future in relation to PEP operations. The quantity of these or future emissions does not trigger the *National Greenhouse and Energy Reporting Act 2007* and are considered minimal in the context of Australian corporations.

The total greenhouse gas emissions will be higher for PEP construction than from routine POTL operations. Over the entire construction phase, emissions are estimated at 237,900 t of CO_{2e}[3] comprising:

- transportation of materials to site (28.5%)
- onsite machinery (11.4%)
- capital dredging (29.1%)
- embodied energy in construction materials (31.0%).

The responsibility for managing and reporting the Scope1 and 2 emissions will be determined during development of PEP construction contracts. Although unlikely to be affected directly by a carbon pricing mechanism, POTL may be exposed to a range of indirect costs associated with a carbon price including increased costs of energy and materials.

1.6.12 Waste

Ports act as the interface between marine vessels and land-based waste disposal systems for wastes generated while at sea. In addition to vessel waste, port activities produce their own waste through the loading and unloading of cargoes, effluents, and runoff from the handling of raw cargo. Waste is also generated from port activities as a result of maintenance and upkeep of port infrastructure, as well as domestic waste generated by port employees and users.

POTL currently manages waste generated by its activities through its Environmental Management System. The primary performance objective in relation to waste is to ensure appropriate management for the handling and storage of waste materials in the common port areas.

[3] CO_{2e} (equivalent CO_2) is the concentration of CO_2 that would cause the same level of radiative forcing as a given type and concentration of greenhouse gas.

Waste can be generated on vessels and in facilities at the port. It is important that this waste be managed with respect to the waste hierarchy; that is, avoid (cleaner production), reduce, reuse, recycle, recover and reclaim and finally treat and dispose of wastes. POTL manages wastes in the common areas of the port under its Environmental Management System, via waste contractors which must include waste management practices and procedures in accordance with legislation and regulations. This system seeks to reduce waste, prevent pollution, promote efficient use of resources, reduce environmental impacts, and continually improve environmental and management system performance. Future tenants will be required to implement required waste measures in accordance with separate approvals sought prior to commencing individual operations, and in accordance with Port guidelines and requirements.

Waste management is an integral part of planning for any new project and appropriate planning will be taken into consideration for each Project phase (pre-construction and construction, operation and decommissioning) to ensure that appropriate waste management strategies and provisions are implemented to reduce potential offsite effects in the receiving environment.

A Construction EMP will be implemented through the PEP construction phase to promote the efficient use of resources, limit the release of waste into the receiving environment, and provide for the safe handling, transport and disposal of waste materials. The placement and management of dredging material will be undertaken in accordance with the Dredge Management Plan.

1.7 Social Values

1.7.1 Sustainable Development

Ecological sustainability is the fundamental purpose of *Sustainable Planning Act 2009* (SP Act). The PEP represents development that is subject to the provisions of SP Act for assessable development. The assessment manager for development on strategic port land is the port authority and, where a development application is assessed under the provisions of SP Act, consideration of the principle of ecological sustainability applies to any such development.

The need for and development of the PEP is a result of ongoing strategic planning at state, regional and local levels. This planning pertains to the sustainable development of Queensland and, in particular, the optimal development of the port. A key aspect throughout the EIS is the incorporation of the principles of sustainable development.

The sustainability of the PEP has driven an impact assessment that has used a risk based approach to identify those impacts of higher consequence and risk. Subsequently mitigation measures have been recommended that aim to reduce impacts to levels that can be considered sustainable, not just environmentally but also economically and socially. Specifically, the principles of sustainable development have been addressed in relation to the factors below:

- a detailed review of the potential impacts to ecological systems and natural processes, including potential impact to the hydrology of Cleveland Bay has been undertaken
- consideration and characterisation of net benefits of investment and growth of industry
- a balance that integrates environmental considerations and short-term economic outcomes
- maintenance of the economic, physical and social wellbeing of people and communities of Queensland.

1.7.2 Public and Community Engagement

Stakeholder consultation and community engagement has helped gather information from stakeholders including relevant interest groups and local residents about their attitudes regarding PEP. A full list of stakeholders, methods used to engage with stakeholders, content of the material distributed, and the detailed responses received from the consultation process are described in Part B and Appendices. The information received has been used in the assessment of potential social and cultural impacts that may result from the PEP, notably in the Study Area (being the local area nearest the port).

Following Project inception formal community consultation for the Project was first notified to the public on 16 July 2011. Prior to this date, POTL had undertaken extensive informal consultation with a range of

stakeholders to more clearly identify issues that may be relevant to the PEP. Community consultation was also undertaken to support public notification of the Coordinator-General's draft Terms of Reference. The PEP has been the subject of stakeholder and community engagement through a range of community information sessions, engagement activities and the maintenance of open feedback channels to POTL and its consultants.

Results from recent feedback indicate respondents generally believed the PEP will have mixed effects with positive impacts on the local economy and employment opportunities, neutral impacts on lifestyle and community aspects, and negative impacts on the environment. The two main reported environmental impacts were noise and dust. Other community concerns raised included the impacts on roads and rail, the potential increase in traffic, products to be transported through the port and the potential impacts on the Great Barrier Reef.

Consideration of the community's concerns is reflected throughout this EIS with attention paid to areas of concern in order to reduce potential impacts from PEP through thorough assessment and recommendations of mitigation measures.

The community will be kept informed over the course of the development. This includes engagement at the local and regional levels and in a manner that is sensitive to the needs and issues of the community, noting that social values and the concerns of the community are likely to change over time.

Key issues for future consideration in further stakeholder engagement include informing people about approvals (for example, legislative and statutory requirements affecting decision making), timetables for construction works, environmental management, safety, workforce participation opportunities and leveraging opportunities for other businesses and residents (e.g. housing accommodation).

1.7.3 Social Environment

Existing social and cultural values and characteristics are influenced by many factors. A large part of the social and cultural values and characteristics are determined by assessment frameworks and statutory policies that apply to an area, its development and the use of land in public and privates holdings. While these framework elements provide guidance and 'rules' for planning and development of land and property, social values and characteristics are usually a reflection of demographic characteristics of a growing community that is responding to changes in development patterns, the function of urban centres and opportunities for access to new services and other opportunities that population growth can bring.

Key characteristics influencing the social and cultural values of communities likely to be affected by the Project are considered in detail in the EIS including:

- populations and households: to identify the baseline characteristics of people that are likely to be affected by the PEP
- workforce: to identify current and required skill capacity and workforce numbers to cater for the growth in production and service needs of the community, both due to the Project and the broader growth management requirements of Townsville and the region.
- housing and accommodation: to identify the extent of housing availability and affordability, and the effects of any increased demand resulting from the needs of the Project.
- socio-economic indexes for areas: to determine the welfare of areas based on census information
- population projections: to identify trends in changing population and related living characteristics
- land use and tenure: to identify patterns of land use surrounding the Project and any expected changes in land uses (residential; commercial, including fishing; industrial; recreational, including fishing; entertainment; and services) and associated infrastructure over time; to identify the strength of association of residents in an area through different ownership.
- social infrastructure: to identify the level and accessibility of services in communities that are likely to be affected by any changes that may be attributable to the Project.

1.7.3.1 Workforce and Employment Opportunity

The expected PEP workforce is likely to remain small compared to the overall workforce of Townsville; both present and projected. The PEP workforce will be used over a considerable construction period during which time the overall workforce of Townsville is expected to grow significantly, with an estimated increase by almost 45,000 people. The ability to absorb and cater for the PEP workforce will be assisted as Townsville grows over the life of the PEP.

The PEP is still regarded by the respondents to the community consultation program, in particular, as representing an employment benefit. Strengthening of employment opportunities due to the PEP is likely to contribute to a stronger economy at the social and cultural levels, acting as a catalyst for further private and public sector investment in the region and district.

POTL has existing programs in place that facilitate Indigenous employment opportunities in the port. Project specific plans will be developed when PEP is ready to proceed. The policies include the existing *Local Industry Participation Plan* and *Employment and Procurement Policy*.

1.7.3.2 Housing and Accommodation

The establishment of an additional workforce due to PEP construction and operation has the potential to impact on the demand for housing in the regional and local area. At the local level, this impact is expected to be masked by the larger housing market, but is likely to have a more pronounced impact cumulatively, when considering the PEP in the context of multiple other projects and their combined effect.

More pronounced impacts are likely to be experienced in the local area. There is a likelihood that parts of an additional long-term workforce generated by the PEP may find living options close to the port attractive, especially when considering the large range of services and entertainment options that the area offers. This is considered to represent a positive impact for the district and local areas.

1.7.3.3 Access to fishing grounds and boating opportunities

Reclamation works for the PEP will remove an area of water that is currently available for small craft passage, fishing and any other marine recreational activity. This area is not known to have significant value for commercial fisheries efforts. This reclamation is also likely to restrict the passage of craft in and around the harbour areas that are to be created. Use of the DMPA is only likely to be restricted during dredge placement operations, in accordance with existing maritime navigation requirements. Use of the Sea Channel will not significantly change as a result of the PEP. Restrictions regarding small craft passage and other vessels in the vicinity of larger ships are regulated by legislation.

1.7.3.4 Lifestyle

Lifestyle effects relate to effects associated with dust, noise and changed visual cues including vehicular movement patterns, primarily by heavy-haulage vehicles, and alteration of views and landscape features. These particular effects are specifically assessed in individual chapters in Part B, such as Chapter B17 – Scenic Amenity, Chapter B9 – Air Quality and Chapter B10 – Noise and Vibration.

Incorporated into the overarching stakeholder engagement plans, the existing Port Community Partnerships Forum is an excellent means to maintain ongoing consultation with interested community-based groups, who provide comment on port related policies, development plans, management programs and ongoing operations that may also serve specific community interests. The forum will also provide an opportunity for POTL to provide the community with information regarding operations and future development activities at the port.

1.7.4 Scenic Amenity and Lighting

The Project will result in the extension of the existing port boundary approximately 1 km northwards from the mainland, through reclamation of subtidal land, forming a prominent peninsular.

Cleveland Bay provides visual containment of the port from the wider maritime landscape through two key headlands (Cape Pallarenda in the north and Cape Cleveland in the south). Activities during construction and operations are likely to affect several near and distance receptor groups and the scenic values associated with the GBRWHA designation. Receptor groups include people living, working and

visiting residential properties, local attractions and recreational tracks, such as The Strand, Magnetic Island and Castle Hill, their roads and the Port of Townsville.

Thirteen representative locations gave a broad regional perspective on viewpoints enabling an assessment of the scenic amenity of PEP, against the backdrop of current established conditions. Key activities during the construction and operational phases that are anticipated to affect these receptors include:

- an increase in the transit of light vehicles carrying workforce and visitors between places of accommodation in Townsville and the port on a daily basis
- some increased movement of heavy vehicles, although the completion of the Townsville Port Access Road in the Eastern Access Corridor (EAC) will considerably alleviate the amenity values of traffic on the local road network
- activities occurring during construction (e.g. the breakwater and bund construction, harbour dredging, reclamation works, bulk earthworks and ground treatment, civil works, and installation of wharf structures), which would be visible from various viewpoints; including potential visibility of temporary turbid plumes in Cleveland Bay during breakwater and revetment placement and dredging
- operational impacts of the Project, which would also be observable from each of the nominated 13 representative viewpoints, including the presence of container handling gantry cranes, up to six vessel berths, ship loaders, cargo operations zone, materials and cargo storage area, internal access roads, rail loop and dredge pond and the movement of Panamax sized bulk ships across the port.

Most views illustrated a change reflective of open marine waters becoming land dominated by industrial architecture. The three views assessed as a neutral change were those at a longer distance, where (in most cases) the works would be viewed against an existing port landscape.

The most important designated landscape in the Study Area is the GBRWHA. Both the construction and operational activities of the PEP change its scenic values of natural views. Given the construction and operational activities associated with the Project would be viewed in the context of existing industry, the GBRWHA views are already affected by the existing development (and mostly in place prior to the WHA listing), which lowers the magnitude of perceived change. PEP development and infrastructure is entirely consistent with port development, first commenced on the nearby coastline almost 150 years ago. PEP, in concert with existing port infrastructure, is only a small section of the GBRWHA landscape and its broader scenic values would be maintained beyond Cleveland Bay.

An assessment of the visual impact of lighting was undertaken at representative viewpoints. It is predicted that there would be an intensification of night-time light levels in close proximity to the Project. Night lighting can be divided into light glow, which is effectively the glow of night lighting off air particles and light spill, which refers to those areas from which light sources are visible. This increase in night-time light levels is predicted to increase. In all cases the change is anticipated to be an incremental increase in existing light levels of neutral effect due to the existing lit context and because many viewers would expect to see a port illuminated at night.

1.7.5 Transport and Services Infrastructure

PEP will increase the shipping capacity through the port by staging its development. In order to accommodate trade throughput, rail and road infrastructure will be upgraded. Substantial previous studies of the capacity and constraints of road access to the port have been undertaken by the Department of Transport and Main Roads as part of the Townsville Port Access Road (TPAR) project. Traffic assessments prepared as part of the TPAR project formed the basis for evaluation of road capacity and constraints for the PEP, with a key assumption that the Eastern Access Corridor will be operational prior to any traffic generation (construction or operational) from the PEP.

Based on the traffic demand derived for this assessment and utilising the layouts and signal phasing developed for the assessment of the Townsville Marine Precinct EIS, traffic modelling of five intersections identified as being potentially worst affected by PEP showed that, at existing capacity, Intersection 4

(Boundary Street/Saunders Street) will not operate sufficiently under future traffic demand scenarios. Investigations into road traffic impacts identified a potential need to upgrade road pavements as a result of additional PEP-related road traffic volumes and tonnages. POTL will negotiate the funding of road maintenance programs with the relevant road owners, with responsibilities for road maintenance being either Department of Transport and Main Roads or council, if subsequent modelling at detailed design phase confirms early indications.

Upon completion, TPAR will link Flinders and Bruce highways directly to the port. It will provide a more direct access to the port from the west and south as well as reducing heavy vehicle traffic on the local road network and residential areas of Townsville. In line with Department of Transport and Main Roads' intention to limit the volume of non-port related traffic on the TPAR, as part of an overall network strategy for PEP, port related traffic will need to be segregated from the general traffic accessing the city. Options will be considered in more detail during the detailed design phase.

Increased traffic generated by heavy-haulage truck movements using the port create perceived adverse social impacts on amenity, safety, sense of place and wellbeing. An increase in the capacity of the port is expected to generate higher numbers of truck movements. Heavy vehicle traffic through South Townsville and Railway Estate is expected to reduce significantly once the TPAR opens in December 2012. This will relocate movements from the west along Flinders Highway and from the south along the Bruce Highway through the Townsville State Development Area and is expected to lead to significant amelioration in the rates and tonnage of vehicles.

Rail will be the main mode of land transportation for cargo handled through the PEP. The likely drivers for the development of the PEP is expected to be high tonnage dry bulk commodities e.g. nickel, magnetite, copper, coal and fertiliser, as identified in the latest trade forecast. These will require the development of rail access through the Eastern Access Corridor due to the capacity and efficiency limitations of the existing rail network.

The development of rail access via the Eastern Access Corridor and tenanted sites in the PEP will require further assessment and approvals in the future. POTL, Queensland Rail and other stakeholders will continue the collaborative development of a long-term strategy for the interface between rail and port infrastructure, to optimise rail network efficiency.

1.7.6 Indigenous Cultural Heritage

Aboriginal cultural heritage values are interwoven with Aboriginal and Torres Strait Islander people's ongoing connection to and use of the landscape and country to connect with their past and retell their stories. It is defined and managed by Aboriginal parties who are culturally responsible for a place's heritage values.

An Indigenous cultural heritage assessment was undertaken in consultation with representatives of the Aboriginal parties, which identified the significant Aboriginal cultural heritage values of the Project Area and its surrounds (Bird & Heijm, 2009). It is recognised that although the surrounding area has been substantially modified, it still plays a role in understanding the Aboriginal cultural landscape and values of the greater Townsville region. The development area of the PEP is completely on subtidal land and the adjoining port land has been highly modified over decades through previous dredging and reclamation activities. As a result, the risk of disturbing or destroying items of Aboriginal cultural significance is low.

Through a consultative process with representatives of the Aboriginal parties, a Cultural Heritage Management Plan has been developed with a number of practical strategies and actions that identify Aboriginal cultural heritage values and specifies the mitigation measures to manage potential impacts and development risks. The Cultural Heritage Management Plan has been registered with Department of Environment and Resource Management (now Department of Natural Resources and Mines). Its implementation fulfils the requirement for a Cultural Heritage Management Plan under the *Aboriginal Cultural Heritage Act 2003* and POTL's duty of care under the Act.

1.7.7 Non-Indigenous Cultural Heritage

Archival and library research of relevant documents and written histories were reviewed to complete a thematic history of the area. The thematic approach is consistent with the framework recommended by the Australian Heritage Commission in its publication *Australian Historic Themes* (AHC, 2001). It provides

a broad framework through which to interpret the heritage values of the Study Area and assists in the interpretation of specific places of heritage significance.

The port has played a leading role in the development of Townsville since 1864. The non-Indigenous cultural heritage study describes a vibrant and exciting European heritage dating back nearly 150 years. The study found that the Port of Townsville and the adjacent suburb of South Townsville have a complex and interrelated history. In the case of South Townsville, this history is represented in a number of places and sites of cultural heritage significance that appear on the Queensland Heritage Register and the Townsville City Council Local Heritage Database.

As the PEP is to be constructed entirely on reclaimed subtidal land, it is highly unlikely that any places or sites of heritage significance will be directly affected during the construction or operational phase of the Project. Should there be any items of potential heritage significance discovered during dredging activities, work around the object should cease and Department of Environment and Heritage Protection will be notified immediately in accordance with s. 89 of the *Queensland Heritage Act 1992*.

Existing heritage values of the port and its immediately adjacent areas are recognised with a limited number of mitigation measures provided to manage the potentially low risks of adverse impact on existing historic heritage items and values.

1.8 Hazard and Risk

1.8.1 Health and Safety

POTL's commitment to providing and maintaining the best possible standard of occupational health and safety for employees and contractors at the port is supported by its safety policy, which sets out the occupational health and safety standards necessary for achieving the objectives of the port Occupational Health and Safety Management System, which is certified to *AS/NZS 4801:2001 Occupational health and safety management systems - Specification with guidance for use* (Standards Australia, 2001).

Serious events such as cyclones, storms, explosions, major chemical spills, or acts of vandalism or terrorism can place the port and the safety of port workers and the broader communities at risk. Planning for prevention, preparation, response and recovery of such events are managed through POTL's security and emergency plans and procedures.

A Project risk assessment identified, prioritised and recommended mitigation for potential effects to property and people by undertaking a preliminary risk assessment following the principles of *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines* (Standards Australia, 2009). That standard aligns with the basis of the port's *Risk Management Policy and Procedures*.

Health and safety impacts from the construction and operation of the PEP covered ten work hazard categories: biomechanical (manual tasks), mechanical, electrical, chemical, noise/vibration, potential and stored energy, thermal, radiation, biological and work stressors.

Risk levels can be attenuated by existing or planned mitigation measures. These issues are largely covered by work health and safety legislation (including supporting Codes of Practice) and by meeting compliance requirements. The hazards may be mitigated to avoid or reduce health and safety impacts. POTL's Occupational Health and Safety Management and Environmental Management systems provide processes to facilitate risk mitigation actions and the monitoring and review of control performance. Risk management during design presents an essential step in the delivery of work health and safety and environmental objectives across PEP's lifecycle.

1.8.2 Security, Property and Critical Infrastructure

A variety of threats associated with aspects of national security have the potential to impact on critical infrastructure and the continuity of essential services associated with the Port of Townsville, including PEP operations.

The Port of Townsville is essential infrastructure, described by the Queensland government as part of Australia's physical facilities and supply chains, which if destroyed, degraded or rendered unavailable for an extended period would impact on social or economic values.

The nature of maritime business and infrastructure associated with the Port of Townsville falls in the statutory requirements of the *Maritime Transport and Offshore Facilities Security Act 2003* (Cth), which provides safeguards against unlawful interference with maritime transport and establishes security levels for the port, its projects and its infrastructure.

POTL has:

- an existing security plan and associated governances to support the conduct of port operations to protect the security of facilities, infrastructure, people, maritime operations and the wider community
- operational safeguards and security training and awareness for its staff
- preparation for response to security events.

Changes associated with the construction and operation of the PEP will require variation and modification of the existing arrangement to suit the nature of work, risk of security event and degree of preparedness required to mitigate the risk. It is anticipated that additional Project risk specific security management plans will be required as applicable.

Updates of POTL security management governances from change in risk profile will translate directly to variation of the existing *Local Disaster Management Plan* (TCC, 2011d) .

1.8.3 Emergency Management

Queensland is highly susceptible to extreme climatic events and natural hazards such as tropical cyclones, floods, bushfires and storms. Additional potential hazards resulting from the presence of humans such as inadequate design, industrial incidents, anti-social behaviour and potentially terrorism have resulted in the development of a coordinated approach including response frameworks to deal with these events.

Emergency management planning for the port follows formal processes structured on the principles of *AS 3745-2010 Planning for emergencies in facilities* (Standards Australia, 2010a). Governances used have been independently audited and accredited. These approaches are consistent with current industry practice for emergency management.

POTL recognises the need to meet its obligations in respect of work health and safety, environmental and other regulatory areas by instigating appropriate corporate governances and responsibilities to inform and direct compliance. This extends to its contribution to the district and state disaster management strategies, which will continue during the construction and operation of the PEP.

1.9 Environmental Management

POTL maintains its commitment to sustainable development and operation through its Environmental Management System (EMS).It provides a framework for environmental management at the Port of Townsville, and reflects POTL's environmental policy and commitment to manage its activities with concern for people and the environment.

Throughout the EIS, recommended mitigation measures have been applied to the various construction and operational activities that may risk environmental impacts. Different mitigation measures apply to different phases and geographical (landside or portside) areas of implementation. To accommodate these variances a suite of EMPs has been prepared, which separates construction and operational requirements, and landside and portside requirements. This format will aid in the EMP implementation and the effectiveness of the plans. The structural relationship of the set of EMPs is illustrated in Figure ES.4.

The EMS provides clear objectives and outcomes based on the results of the impact assessment phases. The EMPs are designed to implement appropriate controls and mitigation actions, and provide for continual feedback and reporting allowing internal and external stakeholders to conduct audits or investigations as necessary in the event of an incident, or as a means of identifying areas of improved environmental management.

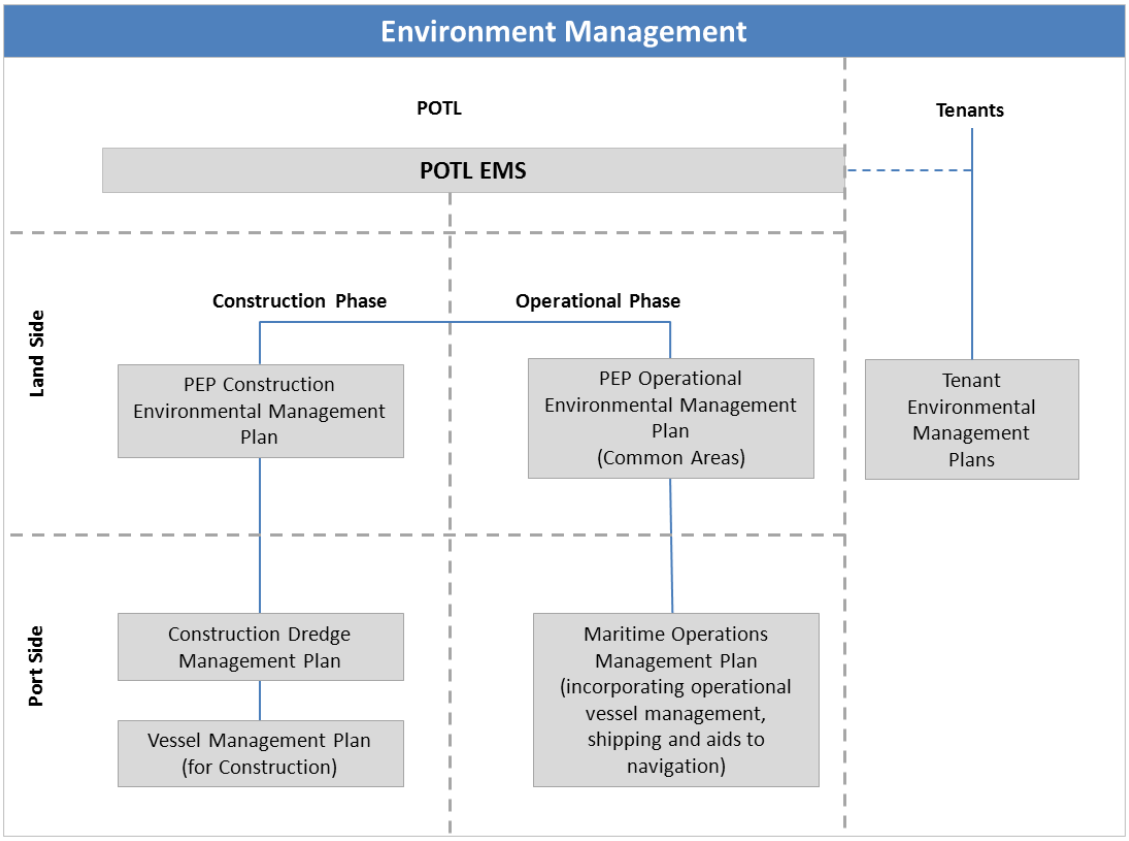

Figure ES.4 Interaction of the PEP Environmental Management Plans

To apply appropriate mitigation measures to manage potential impacts, the set of management plans shown in Figure ES.4 have been prepared. They include a range of management measures that relate to identified environmental risks from the body of the impact assessment in Part B. Those primary aspects where the PEP may potentially cause impacts are listed below, along with a summary of key mitigation measures.

- Marine water quality:
  - implement the Construction EMP for maritime works, such as marine piling, berth construction and breakwater construction
  - implement the Dredge Management Plan during dredge construction periods that involves the pumping of dredge material into the reclamation area and management of supernatant tailwater
  - implement the Dredge Management Plan for capital dredging activities, including monitoring programs that include a framework for a reactive monitoring plan. Using 12 months of real-time water quality data being collected by POTL, this plan will set trigger levels for water quality that will be combined with ecological monitoring to ensure an adaptive approach to dredging that protects marine environmental values. The plan sets out corrective actions for the dredge contractor to vary work practices where trigger levels are exceeded and sets out the formation of an expert advisory panel to oversee development of the reactive monitoring plan as well as implementation of the dredge campaign.
- Marine ecology:
  - implement the Dredge Management Plan, including -

        - operate dredge and support vessels in a manner that reduces impact and potential impacts to marine megafauna
        - undertake monitoring of coral and seagrass communities in accordance with the reactive monitoring plan
        - reduce effects to soft bottom benthos by only working in designated areas
    - implement Maritime Operations Management Plan, including vessel operations which reduce potential impacts to marine megafauna
- Marine sediment quality:
    - implement the Dredge Management Plan, including screening and testing, planning for recovery and approval for disposal of potentially contaminated sediments in accordance with the National Assessment Guidelines for Dredging (DEWHA, 2009a)
    - implement the Construction EMP and Operations EMP for potentially contaminating incidents
- Terrestrial ecology/migratory species including shorebirds:
    - implement the Construction and Operations EMP to reduce offsite noise and light spill that might disrupt migratory patterns or roosting behaviours of birds
- Introduced marine species/exotic species:
    - implement the Dredge Management Plan for dredge vessels and Vessel Traffic Management Plan for construction vessels in relation to inspection and ballast water management
    - implement Maritime Operations Management Plan to ensure that vessels:
        - operate in accordance with Australian regulatory inspection and reporting procedures for international ships
        - manage ballast water in accordance with Department of Agriculture, Forestry and Fisheries requirements
- Noise and air quality:
    - implement the Construction EMP and Operations EMP to monitor ambient conditions and log, assess and respond to public information
    - implement the Construction EMP
        - for noise management practices throughout the construction phase through a range of operational techniques and procedures
        - for a range of operational techniques and procedures to reduce the exposure and mobilisation of dust (for example, use of water carts and limit dust generating activities during wind speeds above mobilising velocities).

1.10 Conclusions

PEP involves:

- the development of a new harbour (the outer harbour) enclosed in a new breakwater (north-eastern breakwater)
- deepening the bathymetry of existing channel alignments, together with minor widening near the outer harbour entrance
- the development of a new reclamation to the north-east of the existing port area based on re-use of over 4,000,000 m³ of dredged material

The EIS has investigated potential environmental impacts including social, economic and cultural effects that could result from the construction and operation of PEP. Detailed consideration has been given to the need for and alternatives to the Project. Literature reviews, database searches, baseline studies and

original marine and atmospheric numerical models and calculations provide quantification and context to the assessment of impacts and identification of relevant mitigation and management measures.

Based on analysis and assessment presented in the EIS, a range of potential impacts were identified. Potential impacts can be largely managed through the adoption and monitoring of recommended mitigation measures. It was found that for certain marine environmental quality matters, residual impacts would occur or be at risk of occurring to an extent requiring an offset in response to development effects on the seabed of Cleveland Bay. These impacts relate to the permanent reduction in the seabed area inhabited by soft bottom benthos and a temporary reduction of benthos on seabed disturbed by shipping channel augmentation. Indirect effects such as on coral health on Magnetic Island fringing reefs and marine megafauna such as dolphins, dugongs and turtles, will be managed in frequency, extent and magnitude through the adoption of mitigation actions that reduce the effect of noise, vessel activity and re-suspended sediments in turbid plumes on marine waters. Because of its maritime situation, only a few landside biophysical effects may eventuate. These include management of construction activities to minimise potential impacts on migratory birds.

Air and noise effects will arise during PEP's construction phases. A high quality air monitoring system and predictive tools will enable adaptive management of port activities to both control emission levels and manage potential exposures at sensitive locations in the nearest suburbs of South Townsville and Townsville, and elsewhere. Further environmental assessments will precede industrial port side development through the *Sustainable Planning Act* and other approval mechanisms. More detailed analysis and validation will be given to those derived developments when the nature of potential emissions is known.

Construction and operational impacts, including potential cumulative impacts, have been identified for specific biophysical, socio-economic and cultural factors. Having assessed the likelihood and consequences of the set of development aspects and potential impacts, a detailed set of mitigation measures has been formulated and compiled into succinct outcome-based EMP to guide their implementation, monitoring and corrective actions throughout the development of PEP. Relevant mitigation and management strategies are prescribed in EMPs put forward, in response to the ToR and EIS Guideline stipulations, as outlined in Part C of the EIS.

An overall assessment has been made in relation to risks of cumulative impacts on significant factors and values especially for matters of national environmental significance. This assessment has concluded that the project will not lead to significant cumulative impacts on matters of national environmental significance or other environmental values.

The PEP can potentially deliver considerable economic benefits, not only to the economy and community of Townsville, but also to the North Queensland region, Queensland and Australia. The positive flow-on economic impacts resulting from the PEP would support employment in a number of industries and associated service providers, both at the port and further afield in the transport and mining sectors. This in turn would lead to positive social benefit of increase population growth, quality of housing and services and revenue base for government to place into public assets.