2

Description of the Proposal

This chapter presents a description of the proposal, under the following headings:

- Overview
- Objectives and benefits of the proposal
- Timeframe, schedules and staging
- Local planning context
- Relationship to other actions
- Supporting infrastructure
- Construction methods, machinery and equipment requirements
- Materials
- Ongoing maintenance
- Employment

2.1 Overview

The EAW precinct currently comprises a 754 m berth wharf, approximately 18 ha of hardstand area, and a single rail line spur linking the wharf to the Adelaide-Darwin rail line. Since the existing EAW development was approved in 1993, utilisation of the EAW for export of bulk minerals has increased, and storage / stockpiling requirements have increased.

This section of the DEIS discusses the design of the expanded infrastructure components and supporting facilities, the proposed construction methods and processes, construction timing / staging, and operation of the proposed development.

The proposed expansion of EAW broadly comprises four separate developments within the EAW precinct. The scope of this DEIS includes the four main developments, along with required works associated with these developments. The four main proposed developments within the scope of this DEIS are:

- Hardstand area and barge ramp
- Marine supply base
- Additional rail loop spur into the bulk stockpile area
- Tug and small vessel berths

The scope of each of these four developments is outlined below and presented in Figure 2-1, Figure 2-2, and Figure 2-3. All designs shown are preliminary only, and are to be finalised by the contractor(s) appointed to undertake the proposed expansion works. In addition to the four main developments, associated works such as earthworks, dredging and upgrades / additions to infrastructure (e.g. internal roads, sewers), and processes such as spoil reuse / disposal and waste management, are also within the scope of this DEIS. Area 4 of the development as described in the NOI is therefore no longer within the footprint of the proposed development.

As noted in Section 1, subsequent to discussions with the LDC, DLP has stipulated that the extension of the LDC owned industrial lots west of the current Muramats Road allotments, as described in Section 4.6 of the NOI (AECOM, 2009), is no longer within the scope of this DEIS.

Another component of the proposal described in the NOI, “fill and reclamation north of the existing East Arm Wharf Ponds”, is still within the scope of this DEIS but will be undertaken on a significantly reduced scale. The NOI indicated that the entire area north of the wharf, up to approximate alignment with Bleesers Creek, will be filled; however the only filling north of the wharf within the scope of this DEIS will be associated with the proposed rail loop spur (refer section 2.1.3).

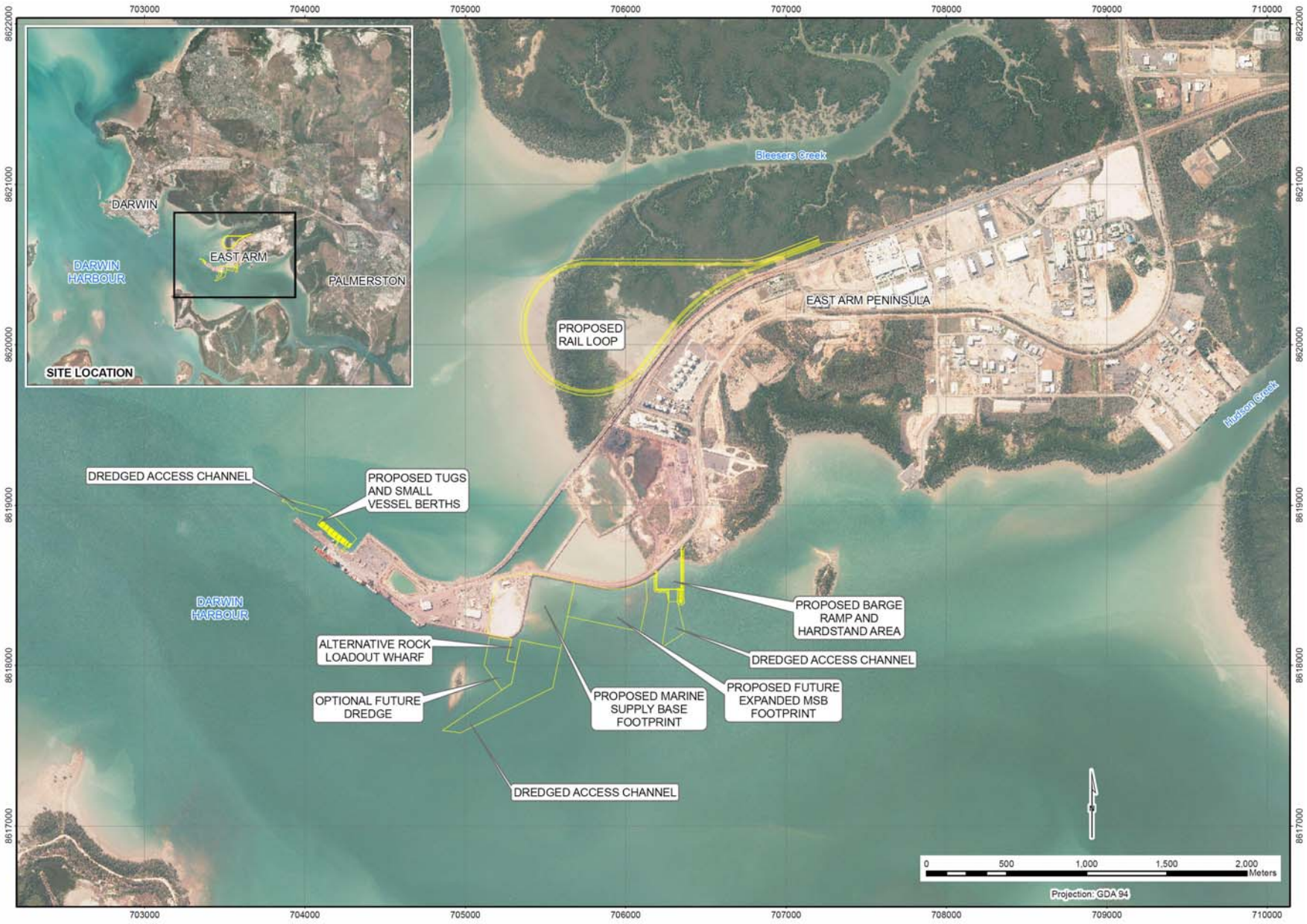
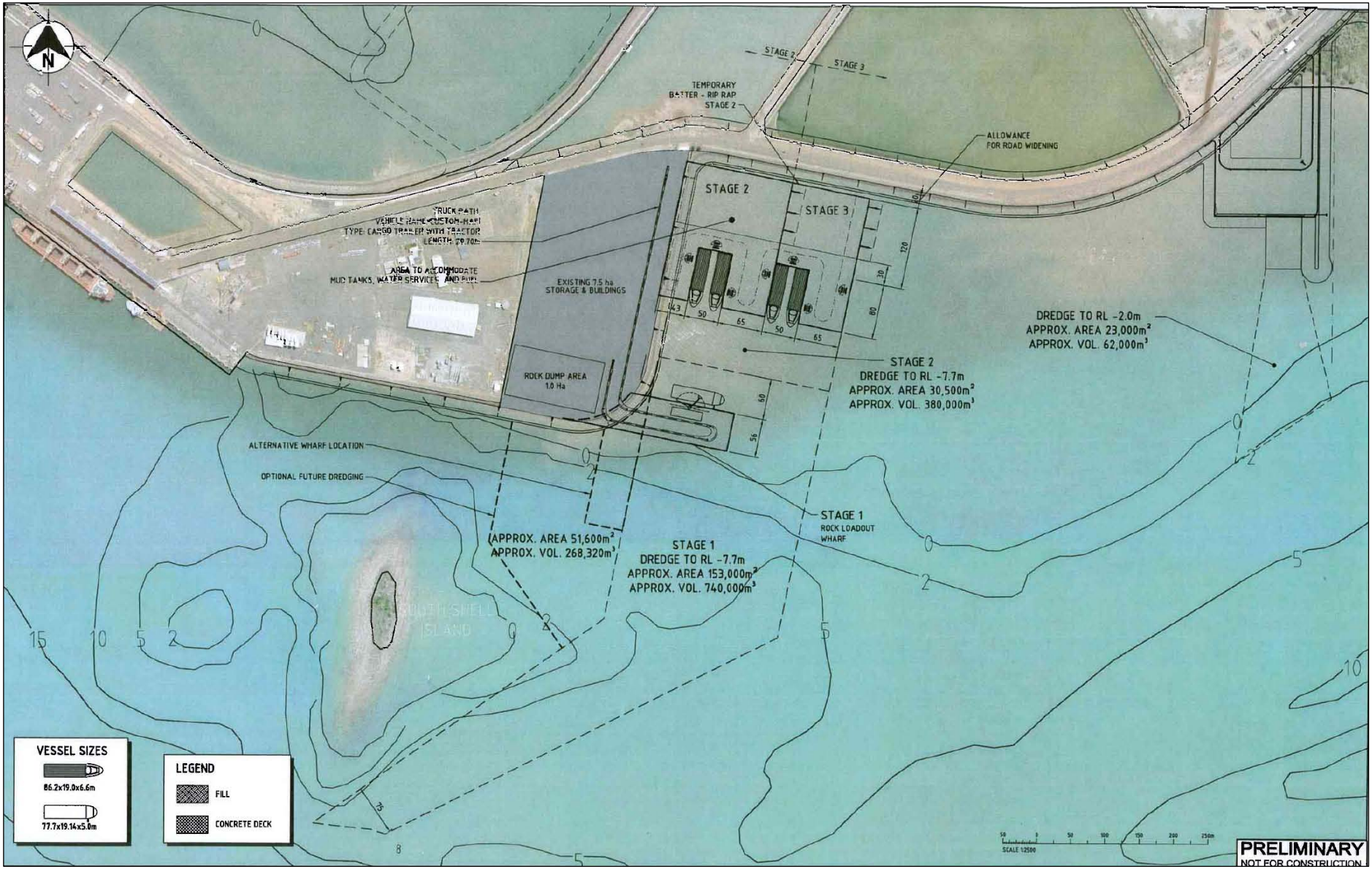
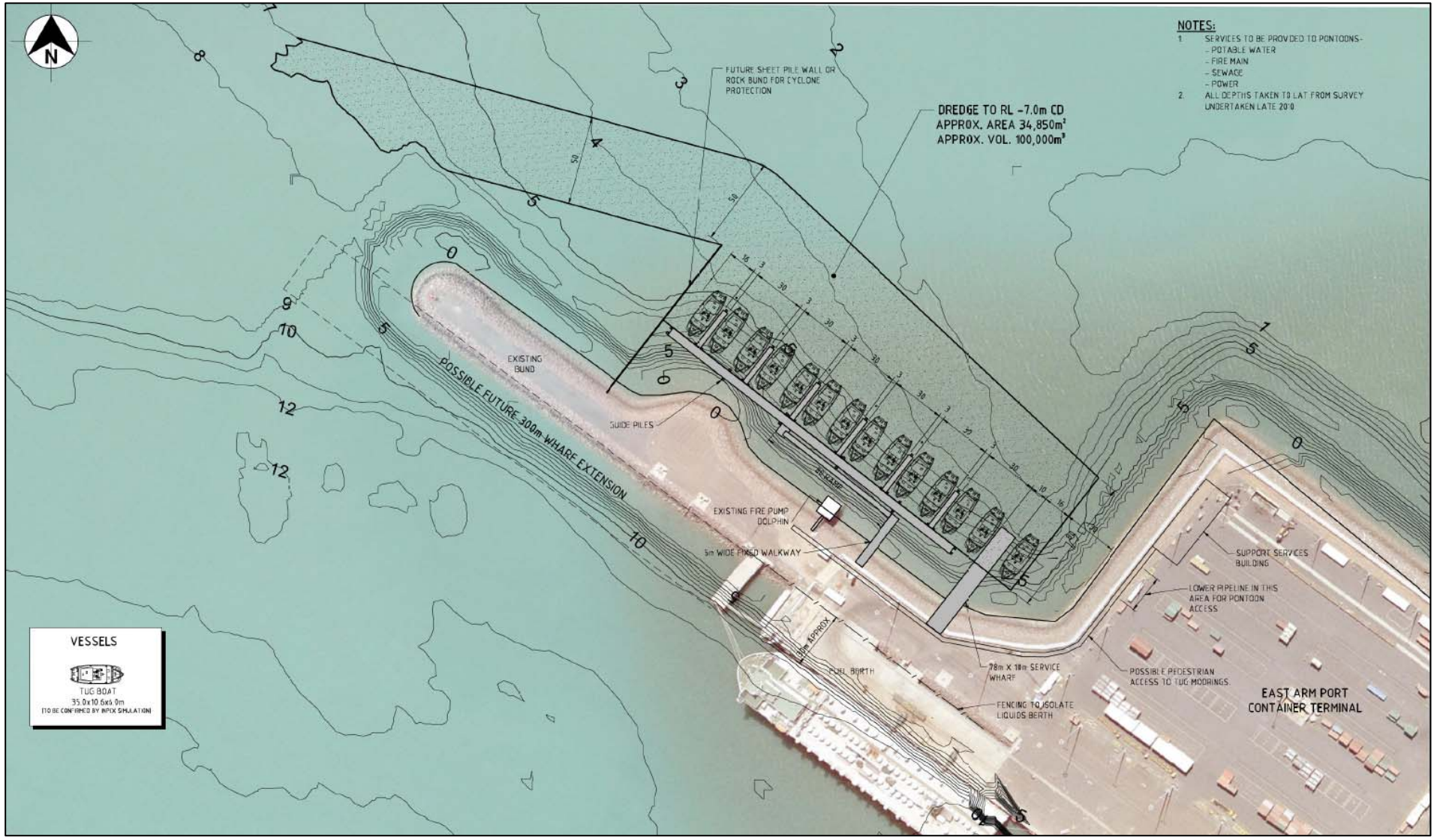


Figure 2-1 General arrangement of proposed EAW expansion



Source: Aurecon, 2010

Figure 2-2 Concept arrangement of proposed EAW expansion



Source: Aurecon, 2010

Figure 2-3 Concept arrangement of proposed EAW expansion

2.1.1 Barge Ramp and Hardstand Area

This component of the proposed development is the establishment of a hardstand area and barge ramp on the southern side of the peninsula, located adjacent to and west of the Paspaley lease, and east of the Wharf (refer Figure 2-2).

This area will be used by barge operators including Defence for the berthing of barges and loading or unloading of cargo and Defence equipment. The general operations of cargo consolidation, loading and unloading would comprise the greatest use of the facility. However it is anticipated that on occasions, numerous tracked vehicles could be unloaded prior to a military exercise and then reloaded after the exercise. Similarly an emergency response operation could initiate significant use of the barge ramp and laydown area.

The hardstand will have an area of approximately 2.94 ha, and will function as a storage area for barge operators. A shed will be constructed to temporarily house loads for each barge operator. It is anticipated that one or two barge operators would typically be operating from the barge ramp at any given time, and loads would be stored on site for up to 48 hours (prior to transfer to a barge).

An existing power line runs along the northern boundary of the proposed hardstand site. The shed will be connected to power via this line, and will be able to hold refrigerated containers.

The first flush of stormwater from the hardstand will be collected in pipework along the southern edge of the reclamation, and passed through an oil interceptor before being discharged to the sea.

The barge ramp will be located at the southern end of the hardstand. It will replace the current Defence loading area at Fort Hill Wharf. Access to the hardstand, shed and barge ramp will be available on a 24/7 basis.

The hardstand area, barge ramp, and channel will encompass an area of approximately 7.12 ha:

- Hardstand: 2.94 ha
- Barge ramp: 0.4 ha
- Access channel: 2.32 ha
- Bunds and batters: 1.46 ha.

2.1.2 Marine Supply Base

The offshore oil and gas industry based in the seas surrounding Darwin is expanding, and is currently serviced to a significant extent by the EAW. Approximately 185,000 tonnes of rig tender supplies were handled by the EAW in 2007/08, and forecasts indicate strong growth in offshore oil and gas rig services through the EAW until at least 2030 (GHD, 2009).

A dedicated MSB is required to efficiently service the expanding offshore oil and gas industry into the future. Initially the MSB wharf will be used for rock loadout (RLO) as part of the INPEX Icthys LNG project (INPEX Browse, 2009) (the RLO facility is expected to operate for approximately 133 days).

The core business of the MSB will be the provision of logistics services to the offshore petroleum industry, including loading and unloading platform support vessels (PSVs), intermodal transfer, and freight consolidation. The MSB will also provide refuelling and victualling services for vessels and docking for vessels requiring maintenance.

2 Description of the Proposal

The MSB will provide berths and laydown areas for platform supply vessels (rig tenders) which undertake regular transport services to the oil and gas platforms offshore. An arriving vessel could be in port for 6-12 hours loading such materials as potable water, brine, fuel oil, drilling mud, chemicals, methanol, (all via pipelines), dry bulk material and large mechanical items including drill pipe (via crane).

Other activities expected at the MSB will include:

- Surge pile of 6,000 t of armour rock adjacent to the berth and loading into a specialised vessel which will dump the rock to provide protection to the Inpex LNG pipeline within Darwin Harbour (over about 6 months during the initial operation phase of the MSB)
- Loading and offloading of pre-assembled modules associated with large scale construction and engineering of the development of oil and gas projects.

The proposed MSB will be located east of the existing reclamation at East Arm, and to the west of the proposed barge ramp and hardstand (refer Figure 2-1 and Figure 2-2). A Request for detailed proposals (RFP) has been issued to pre-qualified proponents to design and construct the MSB. Figure 2-1 shows the approximate footprint of the proposed MSB, and also the footprint of a potential future MSB expansion. Development of the possible future expansion of the MSB would be undertaken by the MSB operator under a separate approvals process.

The final configuration of the proposed MSB is at this stage unconfirmed, and the final design and construction of the MSB would be determined through the EOI process. The NTG has specified that the Operator will provide the services appropriate for the facility, and will prepare the final design.

Whilst the final configuration will be the subject of further development following the selection of the preferred proponent, a possible concept configuration for the MSB is shown in Figure 2-2. This configuration can accommodate up to 5 vessels in four berths of 86 m length, 19 m beam and 6.6 m draft, and one berth of 77 m length, 19 m beam and 5 m draft. Note that the RLO wharf is shown to the east of the RLO rock dump area, but an alternative RLO wharf location is also shown to the south of the RLO rock dump area.

The MSB concept design shown in Figure 2-2 incorporates the following features:

- Dredged channel to -7.7 m CD (Chart Datum) to provide access for deep-draft vessels
- A large hardstand area on existing reclaimed land. This area will be used for storage of supplies, and will also include an administrative building. A RLO facility (stockpile and wharf) of approximately 1 ha will be provided at the southern end, and a truck path will run along the seaward edge of the hardstand. The RLO wharf will be adjacent to the southern end of the hardstand, with one deep water (-7.7 m CD) berth for a vessel to take on rock for offshore use (e.g. undersea pipeline armouring). The truck path extends from the hardstand on to the rock loadout wharf, and has been designed such that a Custom-Mafi type vehicle (a cargo trailer with a tractor 20.7 m length) can access the wharf, turn around, and exit the wharf.
- A wharf adjacent to northern end of the hardstand for the accommodation of drilling mud and brine tanks and supply systems, potable water supply services, and fuel storage and supply systems. This wharf includes deep water (-7.7 m CD) berths for up to four vessels to take on supplies.
- Services provided across the entire facility will include power and fire-fighting water systems, which will be designed and constructed to the appropriate Australian Standards. The fire fighting system will comprise either hydrants connected to the mains water supply, or pumps, pipes and hoses connected to sea water in the harbour.

- Suitable bins will be installed for disposal of the various waste streams. Bins will collected by a licensed waste contractor/s.

It is expected that the wharf structures will comprise reinforced concrete wharf decks supported by steel piles to provide berths for offshore platform supply vessels (rig tenders), or sheetpile structures with a land backed area. The hardstand area will be bitumen paved. Hazardous chemicals and other will be stored in dedicated covered, bunded storage areas. The refuelling infrastructure will also be covered and bunded. Stormwater treatment infrastructure will be constructed and the facility designed such that the first 'flush' of runoff (during rainfall events) is captured and treated prior to release.

The ultimate footprint of this project component will be approximately 49 ha. On the configuration shown in Figure 2-2, this includes:

- Hardstand (including storage, buildings, and truck path) – approximately 8 ha
- Wharf for mud tanks, water services, and fuel storage – approximately 5 ha
- Potential Extension to Wharf for mud tanks, water services, and fuel storage – approximately11 ha
- Rock loadout wharf (option 1) – approximately 1 ha
- Rock loadout wharf (option 2) – approximately 1 ha
- Dredged channel – approximately 18.5 ha, with optional future dredging of another approximately 4.5 ha.

2.1.3 Rail Loop and Spur

The Adelaide-Darwin rail line currently extends to the container and bulk goods loading / unloading facilities at the eastern extremity of the EAW (refer Figure 2-4). Rail activity within EAW is expected to increase in the future, particularly as a result of development of new mining projects. With increasing rail movements, the current one way in / out rail access along East Arm peninsula will ultimately become inefficient. A rail loop (refer Figure 2-1) is proposed to increase the storage capacity and efficiency of the rail network at EAW.

The railway loop will enable rakes of rail wagons carrying dry bulk material such iron ore, manganese, etc, to discharge product via a dump station and conveyor to stock yards and return south. Activities are restricted to railway employees. The rail loop will include a rock dump facility additional to the existing dump facility. The rail loop dump facility will connect to a dedicated conveyor which will transfer the ore to the existing ore stockpile. The rail loop spur will connect to the existing rail line before (east of) the existing passenger station.

Construction of the rail loop is expected to commence in 5-10 years, so available details of the design are currently limited. The design shown in Figure 2-1 is therefore necessarily conceptual. The approximate location will be as shown, however, and the basic infrastructure required is as described, so the likely environmental impacts of the development can be assessed.

A bund to carry the future railway turning loop will be required in a location north east of the wharf and west of the fuel storage area. In an area where mud is quite deep, the removal of significant quantities of mud before construction of the earthen bund will be necessary to limit settlement and propagation of mud waves. The bund will be approximately 3,000 m long and will be constructed by truck dumping fill on two fronts as the arms of the loop diverge, until eventually the bund loop will be joined. The seaward faces of the bund will require rock armour and the inner faces would be protected with rip-rap.

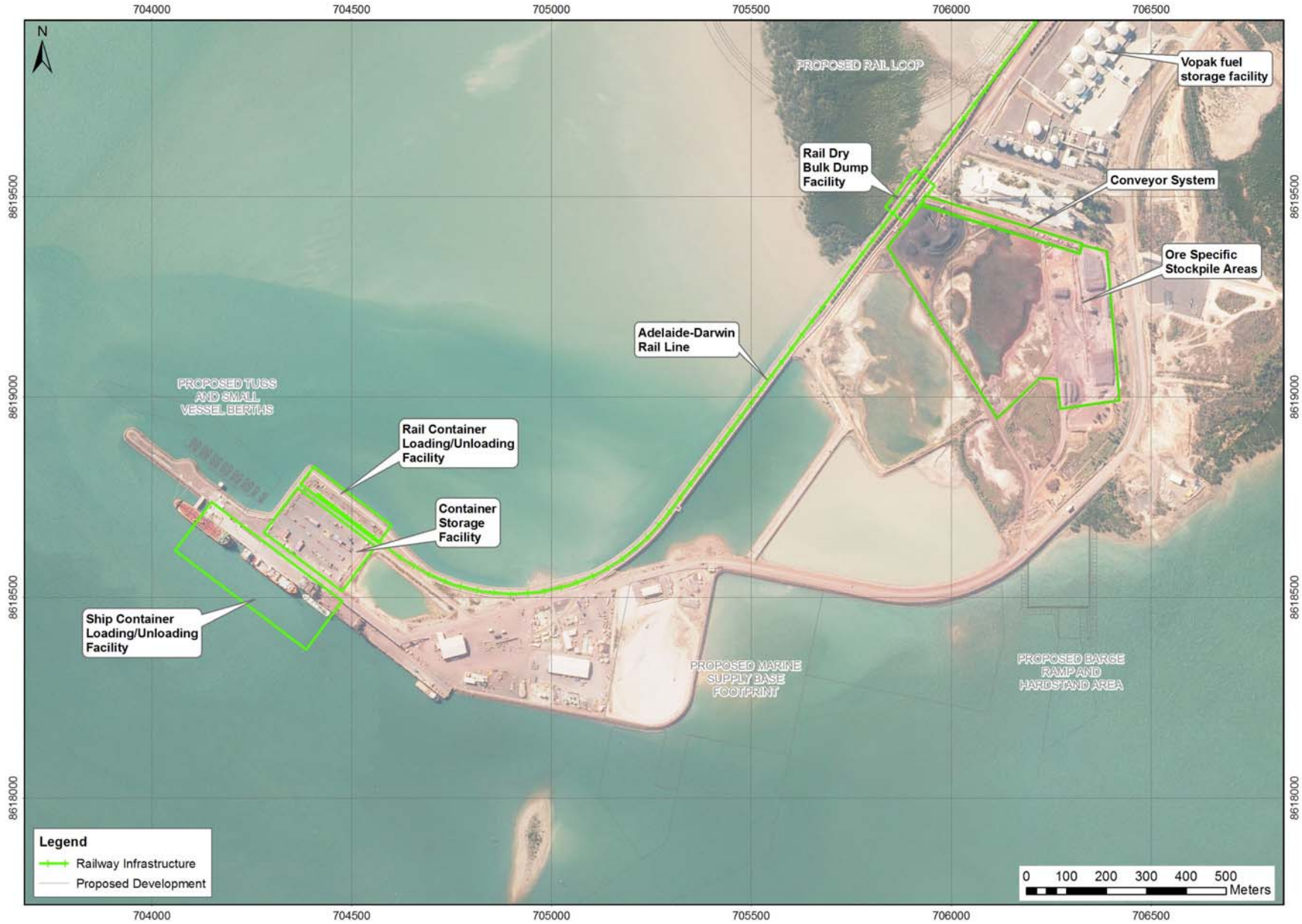


Figure 2-4 Existing EAW rail infrastructure

The construction methodology will be:

- Remove the mud on the route of the loop using a very small CSD which will discharge the spoil in accordance with the approved draft Dredge Management Plan (DMP) (refer **Appendix B**).
- Dump earth fill to form the bund core. A fleet of dump trucks would be used and a bulldozer would push the material into position.
- Provide rock armour to the seaward slopes. Dump trucks would deliver the rock and long reach excavators would place the rock in position on the face of the bunds.
- Provide rip-rap to the inner slopes. The internal battered slopes will be protected with rip-rap dumped by trucks and placed in position by long reach excavators.

The footprint of this project component will be approximately 89ha, with the causeway comprising approximately 31 ha. The rail loop will enclose an area of approximately 58 ha.

2.1.4 Construction of Tug Pens and Small Vessels Berths

The current wharf has a capacity of four trade berths, all located on the southern side of the wharf. The existing four berths include a fuel berth, a container loading / unloading berth, and two dry bulk berths. Tug boats currently berth at Stokes Hill wharf, and there are no dedicated berths for other smaller craft at EAW.

Increased traffic at East Arm is necessitating a greater number of tug boats and other small vessels, requiring the construction of a dedicated mooring facility suitable for tug and other small craft.

An area north west of the liquids berth (at the western end of EAW) is proposed to accommodate up to 12 tugs (35 m LOA), 10.6m beam, 6m draft) (refer Figures 2-1 and 2-2). The tugs will be moored to finger pontoons connected to a series of main pontoons 200 m long. The pontoons will be restrained in position by vertical steel piles along which the pontoons can rise and fall with the tide. A ramp will connect the pontoons to a fixed walkway to provide access to the tugs. A dredged access channel to -7 m CD will provide all tide access to the moorings for the tugs.

A support services building and parking will be provided in the northwest corner of the container stacking yard. Personnel associated with the various vessels will walk from the car park along a defined path to the walkways and ramps which connect to the floating main and finger pontoons where the vessels are moored. A service wharf 75 m long by 10 m wide will be provided to enable maintenance and refuelling of the tugs. It is expected that the construction methodology will comprise:

- Dredge to -7.0 m CD (120,000 m^3) using a small CSD which will discharge the spoil in accordance with the approved draft DMP.
- Drive steel piles to locate pontoons and to the service wharf. A crane would lift the tubular steel pile (delivered by semi trailer in approximately 9 m lengths and welded on site into longer sections for driving) from the land out to the barge. A pile driver would then drive the pile to the required depth. Some drilling of sockets to house the pile toes may be required in the higher strength rock which may be encountered.
- Construct reinforced concrete service wharf. After the piles have been driven, precast concrete headstocks (delivered by truck) would be lifted by crane onto the piles. Precast slabs would then be lifted into position spanning between headstocks. Concrete (delivered by ready mix trucks) would be lifted in skips to the areas to be concreted on the deck and deposited in situ onto the slabs to form an integral deck. Alternatively concrete pumps could avoid the use of cranes for this latter operation.

- Erect fixed walkway. The fixed walkways are horizontal concrete, steel or aluminium pedestrian bridges supported by an abutment onshore and by piles over the sloping rock revetment and water. The walkways would be fabricated off site and would be carried by semi trailer to the site where a crane would lift them into position.
- Install prefabricated pontoons. The pontoons would be fabricated in suitable lengths off site and would be carried by semi trailer to a launching ramp where a crane would lift them into the water. A small workboat would tow the pontoons into position adjacent to the piles to which they will be attached by guides.
- Install ramps. The ramps would be fabricated off site and would be carried by semi trailer to the site where a crane would lift them into position. The ramps enable ease of access from ground level down to the mooring pontoons at any state of tide. They would probably be steel or aluminium trusses with mesh or timber flooring.

The following features are proposed to be included at the proposed small vessel berths:

- Dredged channel to -7 m CD to provide access for deep-draft vessels
- Extension of channel dredged to -3.5 m CD to provide access to the eastern side of the mooring area for shallow drafted vessels only
- Extension of the existing wharf bund to provide a sheltered berthing facility for smaller vessels.
- Pontoon type mooring pontoons for tug, DPC, police, and other small vessels
- 10 m wide service wharf, 5 m wide fixed walkway, and 3 m wide ramp
- Possible future 300 m wharf extension
- Fire protections pump system (this is existing, but may need upgrading).

The total footprint of this project component will be approximately 9.37 ha. This includes:

- Dredged channel: 5.88 ha
- Wharf bund extension: 0.66 ha
- Anchorage: 2.83 ha

2.1.5 Dredging Methodologies

Depending on availability of dredgers and the contractor's preferred construction method, a range of dredging methodologies is available using:

- A small / medium CSD which is likely to take significantly longer to complete the work, especially in areas of high strength material than a medium size CSD.
- A medium size CSD with greater power to remove high strength material, thus reducing the time for the operation.
- A large backhoe dredger to excavate the material and load the spoil into barges for disposal in accordance with the approved draft DMP. This is also likely to be slower than a medium size CSD.
- An excavator and dump trucks where appropriate for individual stages of the work.

It should be noted that some of the dredge spoil may be of such a quality that it could be used in reclamation work (refer to Chapter 27).

2.1.6 Dredged Spoil Ponds (if required under the Dredge Management Plan)

There are a series of existing ponds which may be utilised if the material is suitable for reclamation (refer Figure 11 of the draft DMP, **Appendix B**). Should additional capacity be required to achieve the water quality standards required for discharge, additional ponds will be constructed as indicated in Figure 12 of the draft DMP.

These ponds will provide an area for deposition of dredge spoil obtained from capital projects such as the MSB, barge ramp, tug berths, and ongoing maintenance dredging. The material is deposited into a pond where settlement of silt occurs and water is drained out when sufficient water quality has been achieved.

2.2 Objectives and Benefits of the Proposal

Trade and traffic at EAW has increased since the development was approved in 1993, with the wharf handling a total trade of nearly 4.57 million tonnes in 2009 / 10, and exports of 3.39 million tonnes during the same period (DPC, 2010). Trade is forecast to continue to increase to between 6.5 million tonnes in 2011 and 45 million tonnes in 2016, with the most likely scenario a trade of almost 15 million tonnes in 2012 (GHD, 2009).

The over-arching objective of the proposed expansion of the EAW is to facilitate efficient operation of the port into the future, as trade and vessel traffic continue to grow. Deepening of channels accessing the EAW will facilitate access by larger ships, which will have a positive effect on the NT economy.

The increased operational efficiency of the proposed EAW expansion, and associated facilitation of increased trade volumes, will have positive effects on the local, regional and national economy. The objectives and benefits specific to each major component of the proposed development are discussed below.

2.2.1 Barge Ramp and Hardstand

The facility will be utilised by private barge operators and also Defence. Private barges are utilised to transfer goods to islands and communities in the Northern Territory. Defence typically transfer loads to a barge at a ramp, then barge transfers the load to a larger ship anchored offshore. Demand for an additional barge ramp, including covered, secure storage areas with power supplied, has been identified by DPC.

Access to the EAW is restricted to the general public for security purposes, and access to the barge ramp and hardstand would be further restricted within the greater EAW precinct, with additional security fencing and lockable gates to be installed.

2.2.2 Marine Supply Base

Considerable hydrocarbon (oil and gas) reserves lie beneath the Timor Sea and in the Bonaparte basin with known reserves estimated at 20-25 Trillion cubic Feet (TcF). Of these known reserves, less than 5 TcF have been developed. Although a significant and lucrative industry has already grown to support the offshore oil and gas industry, it is clear that there is the potential for considerable future growth in support for the offshore oil and gas industry.

The construction and operation of the proposed marine supply base is a strategically important development for the NT and Australia, as the oil and gas industry is a major contributor to the Australian economy. The Oil and Gas Production industry is expected to generate revenue of about $34.58 billion in 2010-11, compared with $29.44 billion five years earlier.

Australia is the third-largest LNG exporter in the Asia-Pacific region, and the Australian Government has identified Brunei, Indonesia, and Malaysia as priority export opportunities (Australian Trade Commission, 2010). Darwin is the only large city to adjoin the Timor Sea, and given its close proximity to South East Asian markets, it is a natural base to support the Timor Sea offshore oil and gas industry.

Oil and gas industry support ships presently dock at the EAW, where they are refuelled and loaded with supplies. These support ships then deliver the supplies to the various oil rigs, exploration vessels, and other associated craft located in the Timor Sea. The EAW is nearing the limit of its capacity to serve this support function, and a dedicated marine supply base is required to support the forecast growth of the offshore oil and gas industry.

The RLO elements of the MSB are proposed to specifically service the rock armouring requirements of the forthcoming INPEX Icthys LNG project.

The lack of such a facility threatens to impede the forecast growth of the offshore oil and gas industry, which is a very important industry to Australia. If the support industry cannot be run efficiently from Darwin, it is possible that a competitor country or state could develop a more efficient industry base and detract from Australia's and / or the NT's future growth opportunities to support for the offshore oil and gas industry.

A secondary purpose of the MSB will be for refuelling of tugs. Tugs will commence refuelling at the MSB once construction is complete.

2.2.3 Rail Loop

The Adelaide-Darwin railway was opened in 2004, and is utilised for both freight and passenger transport services. The physical asset is owned by Genesee and Wyoming Incorporated (GWI). The passenger service (the 'Ghan'), which is operated by Great Southern Rail, presently runs twice a week, originating / terminating at the Darwin Railway Station, which is outside of the EAW precinct. Six Darwin-Adelaide freight services per week are presently operated by GWI.

Current rail freight volumes on the Darwin-Adelaide line are approximately 870,000 t/a (800,000 t/a of intermodal freight and 70,000 t/a of bulk liquids). In addition to Adelaide-Darwin freight, GWI also currently operates 24 bulk trains per week between various mine sites and the Port of Darwin (Genesee & Wyoming, 2011). These include the OM Manganese Bootu Creek mine, Territory Resources Frances Creek iron ore mine, and the OZ Minerals Prominent Hill copper and gold mine in South Australia.

The Adelaide-to-Darwin railway has supported growth of the mining sector in Australia, and is expected to continue to drive growth in the long term. As well as continued and potential expansion of the EAW for export of ores and concentrates from the above mines, volume is expected to increase from other mines, e.g. the Olympic Dam DEIS (BHP Billiton, 2009) indicates export of concentrates from the EAW area. The efficient operation of the railway, including loading / unloading of wagons, is a critical element of supporting this growth.

Additional capacity of the current rail line is limited by the existing layout. The current layout is a 'one way in-out' design. This restricts the ability of rail cars to manoeuvre within the EAW precinct, and also restricts the number of trains which can enter the precinct and be loaded / unloaded at any given time.

Intermodal trains can operate at lengths up to 1800 m and weigh up to 4,500 t in total mass. Under the existing EAW infrastructure arrangements, depending on the rail traffic within the EAW precinct, congestion within the Berrimah Freight Terminal can occur requiring some trains to perform shunting manoeuvres across the Berrimah Road rail crossing. This activity is potentially unsafe (as the Berrimah Road rail closing may be blocked for extended periods) and will be alleviated with the construction of the grade separated crossing of Berrimah Road currently in progress. Road access to other enterprises located at East Arm peninsula, such as Northern Cement Limited, the Darwin Railway Station, and the East Arm fuel storage facility, is also impeded when shunting activities across the Berrimah Road rail crossing are occurring.

To address operational efficiency of rail activities at EAW as bulk export traffic grows, a rail loop is proposed for the EAW precinct (refer Figure 2-1), to be located to the west of the fuel storage facility.

The proposed rail loop will provide additional capacity for trains to unload within the EAW precinct whilst removing congestion within the freight terminal. The loop will incorporate an additional rail dump facility adjacent to the existing facility, significantly increasing dry bulk unloading speeds – two trains will be able to unload dry bulk concurrently. The loop will also allow trains to enter and exit the EAW precinct concurrently, meaning that a train entering the precinct to unload at the berths will be able to pass a train already unloading at the dry bulk dumps. Following completion, shunting outside of the freight terminal limits will be required only occasionally and loading and unloading of trains will be faster.

2.2.4 Construction of Tug Pens and Small Vessel Berths

There are currently dedicated berths for two tug boats at EAW, located adjacent and to the east of the four main 'trade' berths. There is no room in this area for additional tug boats, which are required to deal with the growing volume of traffic utilising EAW and the growth of LNG Tanker traffic within the harbour.

The proposed construction of dedicated berths for tug boats and various other smaller vessels at the western end and on the northern side of the existing wharf structure will provide a total 12 additional berths for tugs and smaller vessels (Figure 2-3).

2.3 Timeframes, Schedules and Staging

The first component of the development to commence construction will be the MSB. It is anticipated that dredging will commence in the first quarter of 2012. Completion of stage 1 of the MSB, comprising three berths (of up to 6 planned berths), is projected for the fourth quarter of 2013. Operations will commence in the first quarter of 2014, under a 25+5 year leasing arrangement. The RLO elements of the MSB are projected to operate for 133 days (after which time the supply of rock for the INPEX Icthys LNG project will be complete).

The dredging program for the proposed development will be sequentially staged. Dredging for the barge ramp will occur once MSB dredging is complete, currently planned for the second quarter of 2012, with dredging for the tug and small vessel berths likely to occur in the third quarter of 2012

subject to availability of equipment. The proposed dredging program is detailed in a draft DMP, which is summarised in Chapter 27 and included at **Appendix B**.

Pile driving for the tug berths will take approximately three months, and pontoon / deck / walkway construction an additional 12 months. Construction of the tug berths will not commence until 2014 as operation of the facility is planned to commence in 2016.

A construction schedule for the rail loop has not been devised at this stage. Construction of this project component is likely to commence in 5-10 years, subject to demand from future mining projects.

2.4 Local Planning Context

Expansion of Darwin port facilities was a long term goal of the NTG after self government was achieved in 1978. In 1992 the NT Government announced the intention to develop additional port facilities at East Arm, to make provision for the Alice Springs-Darwin railway and generally service expanding trade requirements. The development was approved in 1993, and the current EAW was opened in 2000.

In recognition of the role of the EAW, to facilitate operation and to expedite future development of the facility, the wharf and surrounding infrastructure is designated the 'East Arm Port Development Zone' (Zone DV in the *East Arm Control Plan 1998* (the Control Plan), NT *Planning Act 2008* (the Planning Act)). The Zone DV allows for development of major strategic industries including gas-based, road, rail or ports industries, and provides land for major industrial development.

The site of the proposed development is primarily located within the DV – Development Zone. In addition, sections of the Project area outside of the DV – Development Zone include:

- the AustralAsia Railway corridor (plus some adjoining land) is located within the RW – Railway Zone
- there is a web of U-Utilities Zone that extends across East Arm

Also situated within East Arm (but outside the Project Area) are the following additional zones:

- Road Zone that follows the existing Berrimah Road alignment and a Proposed Main Road Zone that extends outwards from this road near its terminus
- a small PS – Public Open Space Zone along Campion Road

The proposed development is consistent with the existing industrialised character of the Port of Darwin, and the associated Control Plan zones as described above.

In addition to the Planning Act and the Control Plan, strategic planning objectives at the local level are expressed in the *Darwin Harbour Strategy* (the Strategy) and the *East Arm Wharf Facilities Masterplan 2030* (the Masterplan). These documents are discussed in the context of NT and regional policy and planning in Section 4.3.1; however the implications for the proposed development in terms of the local planning context are summarised here.

2.4.1 Darwin Harbour Strategy

A diverse range of values and functions are associated with the Darwin Harbour. The Strategy was prepared to ensure that future development maintained or enhanced these values and functions. The Strategy guides the responsible stewardship and sustainable development of the Darwin Harbour region and supports the integrated management of the Darwin Harbour region's environmental, social,

cultural and economic values and uses. To achieve this aim, the Strategy identifies five key goals for Darwin Harbour (including EAW):

- Maintain a healthy environment.
- Support recreational use and enjoyment of the environment.
- Ensure that development is implemented in an ecologically sustainable manner.
- Protect cultural values and heritage.
- Foster community awareness, industry partnerships and stewardship of the Darwin Harbour region.

The Strategy contains a series of detailed Guidelines that are intended to support the achievement of the above goals.

2.4.2 East Arm Wharf Facilities Masterplan 2030

The EAW Masterplan (GHD, 2009) shapes the land and sea-based activities at the EAW precinct to the year 2030. It was prepared to outline objectives for managing land and sea-based activities at EAW, with the objectives of facilitating trade growth and local and regional economic development. The main components of the proposed development were identified by the Masterplan as being integral to accommodating projected trade and vessel demands through EAW and facilitating trade growth in order to enhance local and regional economic development.

The key outcome of the Masterplan is to identify future development requirements for EAW, and to provide a framework and strategy for progressing development at the precinct, thus ensuring it can meet its future customer demand.

2.4.3 Tenure

The MSB is to be constructed on land owned by DLP (the sea bed) and DPC, or which is vacant Crown land.

The other project components will be constructed on land owned by DPC. The components of the proposed development fall within a number of tenures, which are listed at Table 2-1.

Table 2-1 Project Components and Tenure

Project Component	Tenure
Barge Ramp and Hardstand	Offshore in DV Hundred of Bagot Part Section 4444
Marine Supply Base	Offshore in DV Hundred of Bagot Part Section 5632
Rail Loop and Spur Line	Hundred of Bagot Section 5412 Section 5630 Section 5631 Offshore DV
Tug and Small Vessel Berths	Offshore in DV NT Portion 5987

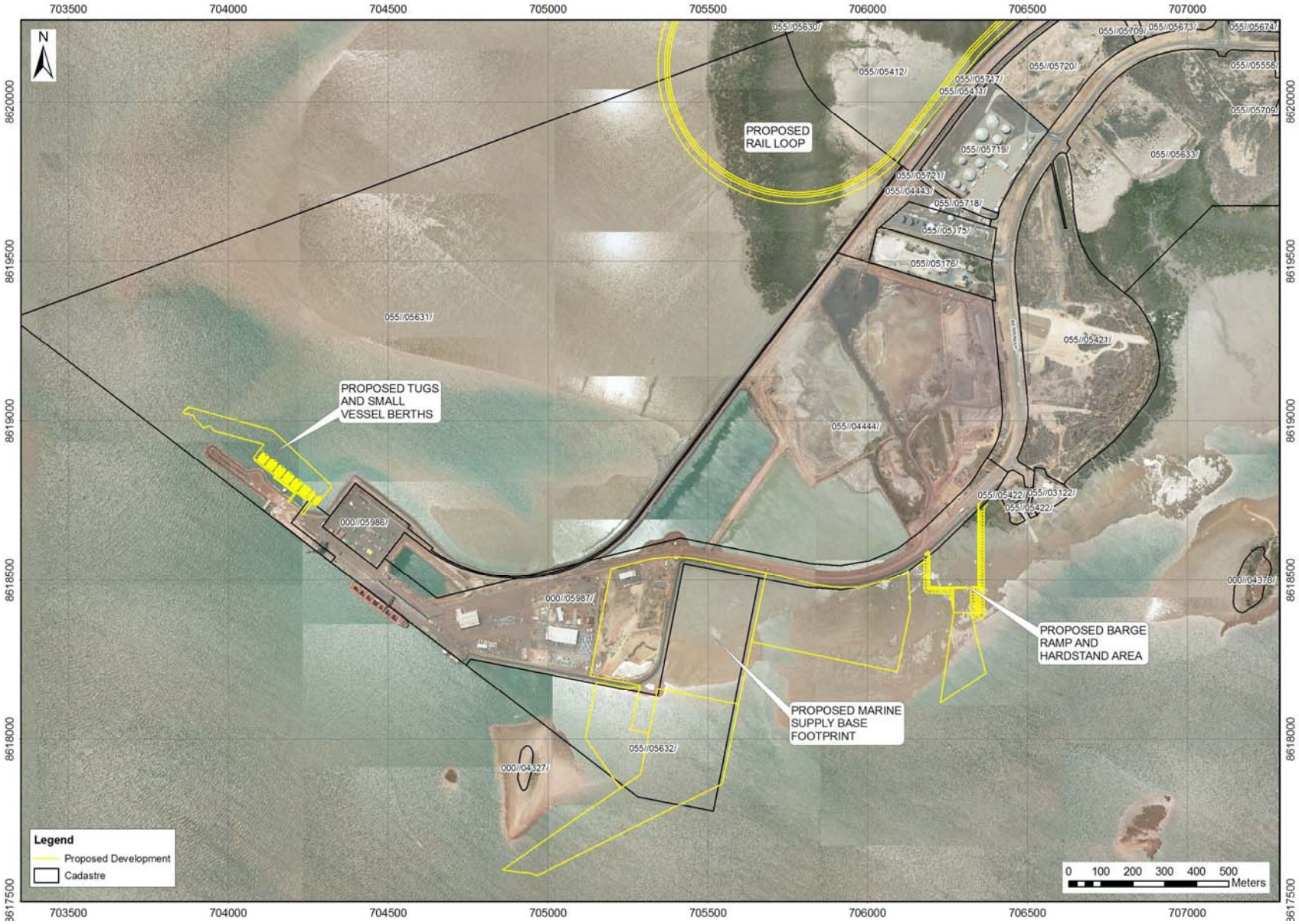


Figure 2-5 Land tenure for proposed development components

2.5 Relationship to Other Actions

The proposed expansion of EAW is a response to the current and forecast expansion of trade in Darwin, the Northern Territory, and Australia, and the associated traffic increase at EAW (and the Port of Darwin in general), as well as increase and change in Defence and Customs activities. As such, the proposed development relates indirectly to a wide range of actions.

The barge ramp and hardstand area is in part a response to the planned acquisition of new amphibious craft by Defence (refer to Section 2.2.1), which will necessitate the development of a dedicated amphibious craft berth additional to facilities at Larrakeyah.

The requirement to develop the MSB relates to the increasing activities of the offshore oil and gas industry, specifically in the Timor Sea (refer to Section 2.2.2). Oil and gas industry support ships currently dock at the main berths of the EAW. The EAW is nearing the limit of its capacity to serve this support function, which is expected to grow as new offshore projects are developed.

As noted in Section 2.1.2, the most immediate requirement offshore industry service requirement is for a rock loadout facility to support the Ichthys LNG Project, which would be the first stage of the MSB. The rock loadout structure would be subsequently converted into MSB berths, and when complete the MSB will be capable of supporting projects in locations ranging from the Browse Basin to Papua New Guinea.

Although not directly related to any one action, the proposed rail loop will increase the capacity of EAW to efficiently accept rail freight, including mined ore. As noted in Section 2.2.3, the export of ores and concentrates from existing and other mines is expected to increase from other mines, including from the proposed Olympic Dam expansion via the Adelaide-Darwin rail line (BHP Billiton 2009).

The proposed extension of the wharf quay line and construction of small vessel berths (refer Section 2.2.4) is not directly related to any other activities, other than general increased demand and the benefit of additional berthing for tug and Police craft associated with the normal operation of the expanded EAW.

2.6 Infrastructure

The EAW is the major commercial and industrial port facility in Darwin, and is comprehensively serviced by necessary infrastructure. The existing infrastructure servicing the site includes a single carriageway access road, a one way in / one way out rail line (connected to the Adelaide-Darwin railway), mains water, mains sewer, and high voltage electrical power supply.

The changes to infrastructure for the proposed development are described below. In addition an assessment of potential constraints imposed upon the proposed development by local, regional, and national infrastructure is provided in Section 5.

2.6.1 Traffic and Access

The EAW is an important inter-modal (rail, road and marine) transfer facility and transport hub for the Northern Territory, Australia, and South East Asia. It is located at the western tip of the East Arm peninsula, and the only road access to the precinct is via Berrimah Road. Rail access to the EAW is provided by the Adelaide-Darwin railway, which is a single line except for the length between Berrimah

Road and the approximate shoreline, where it splits into two or more lines (one way in, one way out, and additional lines for shunting, carriage storage, etc).

It is intended that the EAW will remain operational throughout the construction phase of the proposed development. Construction materials and equipment will largely be delivered by road, with some exceptions such as work boats, dredges and barges travelling to the site by sea. Disruptions to road access will therefore impact upon site operations and construction of the proposed development, and so will be kept to a minimum.

In the longer term, the proposed development will result in more efficient marine access to the site (dedicated berths for small vessels, amphibious access) and better and more efficient rail access (rail balloon loop). In addition the proposed road access changes discussed below will also reduce road traffic disruptions.

2.6.2 Roads

Some disruption to site access and local traffic is inevitable during the construction phase of the proposed development. All construction works will be carried out within the EAW precinct, however; the impacts on external roads will be limited to increased traffic. In particular, traffic on the main access road to East Arm (Berrimah Road), and also Wishart Road and Tiger Brennan Drive, will increase during the construction phase of the proposed development, especially heavy vehicle traffic (refer Figure 5-3).

In this respect it is noted that East Arm is an industrial precinct, and local road infrastructure has been designed and constructed to cope adequately with construction activities at the scale of the proposed development.

Berrimah Road, a single carriageway with speed limits of 60-80 km/h, is the key access road to the EAW precinct. It links EAW to the Stuart Highway, and also intersects Tiger Brennan Drive and Wishart Road. A traffic study by URS (2010) found that utilisation of the southern end of Berrimah Road by commercial vehicles is high (28%).

The condition of Berrimah Road is poor in parts but the Federal and NT Governments are jointly funding upgrades to the East Arm access route, which will further enhance the capacity of local roads to cope with increased traffic volumes. The upgrade includes the duplication of Berrimah Road between Tiger Brennan Drive and Wishart Road, extending Tiger Brennan Drive to the Stuart Highway (with a grade separated interchange), and constructing a rail overpass on Berrimah Road near the existing weigh bridge. These works will enhance freight capacity between Darwin, Palmerston, and rural areas by reducing congestion and providing a direct link to East Arm Port.

Significant quantities of hard rock and riprap (for armouring), will require transport from quarries to the EAW precinct. Suitable quarries in the region are located at Mount Bundy (100 km east of Darwin along the Arnhem Highway) and Katherine (300 km south of Darwin along the Stuart Highway).

The Arnhem Highway carries mostly light vehicle traffic, but the heavy vehicle traffic on Arnhem Highway also includes freight trucks and other vehicle servicing the Ranger uranium mine. The road is subject to flooding in the wet season and can be closed in parts for periods of several days. The Stuart Highway links Darwin to other Australian cities, and carries all classes of traffic. It is well surfaced and graded, and is not prone to flooding even in the wet season, although closure does occur occasionally.

The stockpiling areas on the opposite side of Berrimah Road to the barge ramp hardstand will be used as a temporary work zone (fill / armour stockpiling, equipment storage, vehicle turn-around) until the hardstand and MSB construction sites are developed sufficiently, and can be further utilised for construction activities.

Rail

Although the proposed rail loop will be constructed adjacent to the existing rail lines, the majority of construction activities will be occurring at a sufficient distance from the existing line that the rail corridor will not be intruded upon. There is also sufficient space within the alignment of the proposed rail loop for a work zone to be established that would service construction of the loop, and not intrude upon the rail corridor in any way (although the access route to the work zone would necessarily cross the rail line).

A section of the loop extension (the eastern section) will however be constructed adjacent and in close proximity to the existing railway line within the EAW precinct. Construction of this section would be staged to minimise the disruption to rail operation. Delays would be limited in duration, however, as it will be possible to use one of the lines within the site at all times.

Part of the current container storage area adjacent to the container loading / unloading berth will be utilised temporarily for the construction work zone of the wharf quay line extension. During this time, some minor disruptions to rail container loading / unloading may be experienced as a result of less space for container storage.

2.7 Construction Methods, Machinery, and Equipment Requirements

2.7.1 Dredging

Dredging activities will be limited to daylight hours for all project components. Disposal of dredged material will also be undertaken only during daylight hours. The dredging program is detailed in the draft DMP, which is summarised in draft form in Chapter 27 and included as **Appendix B**.

2.7.2 Barge Ramp and Hardstand Area

The hardstand area (Figures 2-1 and 2-2) will comprise a land-based section and an offshore section, and will be constructed on a combination of disturbed land, backfilled bunded ponds, and harbour foreshore. An area of up to 2.5 ha is proposed for a storage area for Defence and barge operators, located just west of the Paspaley lease and east of EAW. The on-shore and off-shore sections will be constructed by linking the sections with a harbour facing sea wall, and then backfilling the enclosed space with suitable materials.

The proposed construction methodology for the hardstand area and ramp is as follows:

- Construct a bund 330 m long with an 8 m wide access road at the top from imported fill, probably phyllite, delivered by truck and dumped directly in position, starting from the existing port access road. A fleet of side tippers or rear dump trucks would be used and a bulldozer would push the material into position.
- A second bund 110 m long with a 5 m wide emergency escape road at the top will be placed in a similar manner parallel to and 150m west of the first bund
- A third bund 150 m long will connect the two bunds.

- The seaward battered slopes of all bunds will be armoured with two layers of rock (600 kg) on an under layer of 60 kg rock with geotextile. Sidetippers or rear dump trucks would deliver the rock and long reach excavators would place the rock in position on the face of the bunds.
- The inner area between the three bunds will be filled with imported fill until an area of 2.5 ha is achieved. The area will be drained into pipes along the southern edge of the reclamation with the stormwater passing through an oil interceptor before discharge into the sea. The internal battered slopes will be protected with rip-rap dumped by trucks and placed in position by long reach excavators.

A concrete barge ramp up to 50 m wide and approximately 79 m long (sloped at a maximum of 10 degrees) will be provided on the southern face for access by landing craft and barges. After preparation of the sloping ground with a front end loader, formwork for the ramp will be erected down to a level of 0.0 m CD, the lower section during low spring tides. Reinforcement would be placed before a fleet of concrete trucks would supply ready mixed concrete to the site, working up from the bottom, and using concrete pumps if access is not adequate.

The two roads on top of the bunds will be sealed using roadmaking equipment (graders, tip trucks, rollers, bitumen sprayers) and provided with Armco barriers using truck mounted augers to drill holes and concrete tucks to fix posts in position. A crane would lift the panels of barriers onto the posts for bolting.

A channel dredged to -2m CD will provide all tide access to the ramp. Dredged volume will be approximately 62,000 m^3. A small cutter suction dredge (CSD) would dredge the approach channel and discharge spoil in accordance with the approved draft DMP.

2.7.3 Marine Supply Base

The MSB (Figures 2-1 and 2-2) will be established on a combination of disturbed land, backfilled bunded ponds, and harbour foreshore east of the existing reclamation at East Arm. It is expected that it will comprise reinforced concrete wharf decks supported by steel piles to provide berths for PSVs (rig tenders). The initial wharf structure will be used for rock loadout for the Inpex project. Dredging to -7.7m CD is proposed for these deep drafted platform supply vessels. Anticipated dredge spoil volume for the first stage is approximately 950,000 m^3.

One possible construction methodology for a suspended concrete deck on driven piles could be:

- Dredge to -7.7m CD using a medium size CSD which will discharge the spoil into available ponds (unless offshore dumping is adopted).
- Drive steel piles using a barge mounted pile driver. A crane would lift the tubular steel pile (delivered by semi trailer in approximately 9 m lengths and welded on site into longer sections for driving) from the land out to the barge. Some drilling of sockets to house the pile toes may be required in the higher strength rock which may be encountered.
- Construct reinforced concrete decks. After the piles have been driven, precast concrete headstocks (delivered by truck) would be lifted by crane onto the piles. Precast slabs would then be lifted into position spanning between headstocks. Concrete (delivered by ready mix trucks) would be lifted in skips to the areas to be concreted on the deck and deposited in situ onto the slabs to form an integral deck. Alternatively concrete pumps could avoid the use of cranes for this latter operation
- Fit fenders and bollards using a crane.

- Provide services (power, water, fire fighting, waste receival, fuel). After construction of the concrete decks to the berths, the services will be installed and connected to existing services. At the wharf, these would be installed by crane in service trenches precast into the concrete deck. At appropriate locations, take off points would be provided along the wharf face for electrical power outlets, valves for potable water and hydrant connections for fire.

An alternative construction methodology could use a retaining wall with some elements of land backing and areas of potential reclamation using dredged/imported material with competent engineering properties. This would entail the following:

- If the existing reclamation is to be utilised as a berth face, a retaining wall would be installed through or landward of (i.e. behind) the existing armoured revetment. The geotechnical conditions below the existing fill indicate medium to high strength rock which may be too hard for sheetpiling to be driven to achieve adequate penetration without buckling of the sheetpiles. A method which employs stronger steel members ("king piles") such as tubular steel or universal column sections to reinforce the wall intermittently could be used.
- The king piles would be driven into the rock to achieve adequate penetration well below dredged level. Pre-drilling of holes to socket the piles may be necessary if driving conditions are too difficult. The sheet piles are then connected to clutches on each side of the king piles and driven to a higher level than the king piles.
- A concrete capping beam (with deck behind) would then be cast onto the line of king and sheet piles.
- When the wall is complete, the material seaward of it (rock armour and fill) could be removed by crane and grab onto the shore behind the wall.
- This type of retaining wall construction could be installed at various locations on the site and backfilled with dredged or imported material with competent engineering properties.
- Dredge to provide a clear berth for vessels.
- Fit fenders and bollards using a crane.
- Provide services (power, water, fire fighting, waste receival, fuel). After construction of the concrete decks behind the wall, the services would be installed and connected to existing services. .At the berths, these would be installed by crane in service trenches precast into the deck. At appropriate locations, take off points would be provided along the wharf face for electrical power outlets, valves for potable water, and hydrant connections for fire.

Another alternative construction methodology could involve the construction of earth bunds protected with rock armour. On one side of the bunds could be constructed concrete wharf decks. Further developments could include tidal regulation structures comprising concrete walls with gated access at each end. The MSB will be designed and constructed to withstand a 1 in 100 year return event storm.

2.7.4 Rail Loop and Spur

The proposed rail loop (Figure 2-1) will be constructed to the west of the fuel storage facility, and will extend (westward) beyond the current East Arm peninsula shore line: thus reclamation of an area of land will be required.

The reclaimed area will be constructed by establishing a sea wall bund, and then backfilling inside the bund using suitable dredged material sourced from onsite dredging, and also dredged and excavated materials from offsite projects. Sand and gravel will also be brought in as necessary to finish the hardstand area inside the rail loop. The sea wall bund will be approximately 3000 m long. The

seaward faces of the bund will be armoured using 600 kg rock, and the inner faces will be protected with riprap.

The proposed construction methodology for the rail loop and spur is as follows:

- Mud from the rail loop alignment will be excavated using a small CSD.
- The sea wall bund will be constructed by dumping fill using trucks on two fronts, from where the arms of the loop diverge, until the bund loop is completed.
- Road trains will deliver clean fill and rock, and dump the material directly along the rail loop and pond wall alignments to form the bund cores. Bulldozers will shape the fill and rock core, and rollers will compact the material.
- Road trains will deliver rock armour and riprap to stockpiles in the vicinity of the work zones. Excavators will place the armour rock on to the rail loop bund seaward slope, and riprap on the rail loop inner slope.

2.7.5 Berths for Tugs and Small Vessels

The extension of the quay line and berths for tug boats and other smaller vessels is shown in Figures 2-1 and 2-3. Deeper draft tugs will be moored to finger pontoons connected to a series of main pontoons 200 m long. The pontoons will be restrained in position by vertical steel piles along which the pontoons can rise and fall with the tide. A ramp will connect the pontoons to a fixed walkway to provide access to the tugs. A dredged access channel to -7 m CD will provide all-tide access to the moorings for the tugs.

Lower draft vessels will be similarly accommodated at another pontoon mooring facility in shallower water, to the east of the moorings for the tugs. Access to these moorings will be by an extension of the dredging for tugs of -3.5m CD.

The construction methodology for the extension of the EAW quay line will be as follows:

- A small CSD will dredge a channel to -7.0 m CD for tug boats, and -3.5 m CD for other small vessels. Dredging of the -7 m CD section of the channel will create 106,000 m^3 of spoil, and dredging the -3.5 m CD section will create 75,000 m^3 of spoil. The total of 181,000 m^3 of spoil would be disposed of to sea at the dredge spoil disposal ground utilised by INPEX for the Ichthys LNG Project (INPEX Browse, 2009).
- Steel piles for the location of the floating pontoons will be driven into the sea floor using a pile driver. Concrete will be delivered by concrete delivery trucks and the pile footings formed using concrete pumps.
- A steel walkway, which will be fixed to the piles, will then be erected. A transportable crane will be utilised to lower the walkway sections into place.
- Prefabricated pontoons will then be installed, and attached to the piles such that they can move vertically with the tides
- Hinged steel ramps would be installed to provide access to the floating pontoons from the fixed walkway.

2.7.6 Laydown Areas

Construction laydown areas to service the various project components will be constructed.

Some of the laydown facilities are already in place for the existing EAW, including Laydown 1, which is already fully paved, and some stormwater infrastructure in the currently operational container berth facility. Laydowns 2 and 3 are also in place and currently consist of earthen, ungraded surfaces. Their surfaces will be graded, compacted, and covered with loose gravel to minimise dust generation and erosion. The surfaces of Laydowns 2 and 3 will each be graded towards sediment traps and oil separators for stormwater treatment. Once treated, stormwater from the laydown areas will be disposed of into the existing stormwater system at the EAW.

Security fencing will be installed around each laydown area, with a lockable gate to provide access. Road access to Laydown 1 is already available using Berrimah Road, which extends to the western tip of EAW.

Access to Laydown 2 will be via a compacted gravel surfaced access road to be constructed off Berrimah Road. It will necessarily cross the Adelaide-Darwin rail line at a temporary level crossing. The proposed Laydown 3 is directly adjacent to Berrimah Road, and so an access road will not be necessary. The compacted gravel surface of laydown 3 will extend to Berrimah Road.

Facilities to be provided at the laydown areas will include:

- Portable office / crib buildings (with power supply connected to EAW precinct mains supply)
- Security flood lighting
- Portable toilets
- Covered, bunded, storage facilities for fuels, lubricants, and other hazardous materials.

2.7.7 Dredged Spoil Ponds

Should there be a requirement under the draft DMP, it is proposed to construct some ponds adjacent to and south west of the rail loop to accommodate future dredge spoil reclamation.

The mud below the bunds would need to be removed before delivery of the fill to form the core of the bunds. Truck access along the bunds will enable the extension of the bunds progressively until three ponds are completed. The seaward faces of the bunds will require rock armour and the inner faces would be protected with rip-rap.

The construction methodology would be:

- Remove the mud at the location of the bund walls using a small CSD which will discharge the spoil in accordance with the approved draft DMP.
- Dump earth fill to form the bund core. A fleet of dump trucks would be used and a bulldozer would push the material into position.
- Provide rock armour to the seaward slopes. Dump trucks would deliver the rock and long reach excavators would place the rock in position on the face of the bunds.

2.8 Materials

2.8.1 Inputs

Construction

The main inputs required for construction of the proposed development are rock and riprap (for armouring of bunds and railway ballast), clean fill (for construction of bunds and reclamation areas), sand and gravel (for compacted hardstand areas) concrete (for footings), and steel (for piles, pontoons, and walkways).

The quantities of construction materials required for each component of the proposed development are yet to be finalised. Final quantities will be determined by the contractor/s during detailed design.

Rock will likely be sourced from quarries at Mount Bundy (100 km east of Darwin along the Arnhem Highway) and Katherine (300 km south of Darwin along the Stuart Highway). Riprap and clean fill would also be sourced from these quarries, but demolition waste suitable for use as riprap may also become available from sites in and around Darwin as the development assessment and construction phases progress. Similarly, clean fill may become available from construction sites in and around Darwin, or from other sources around Darwin (such as rural properties).

The raw materials for concrete production would be imported from interstate by road and rail. The concrete would be mixed offsite, and parts prefabricated offsite at a temporary concrete fabrication yard. Steelwork would be prefabricated offsite and transported to the EAW precinct via road and rail. Construction laydown areas (Section 2.7.6) will have dedicated storage areas for prefabricated parts and other construction materials.

Hazardous materials required during construction will be limited mainly to fuels and lubricants for construction machinery and other vehicles. Each construction laydown will have a dedicated storage area for fuels, lubricants, and small quantities of other hazardous materials (e.g. pesticides, herbicides, cleaning products, paint). These storage areas will be covered and bunded to reduce the risk of spills and leaks.

Contractors and subcontractors will be required to prepare construction environmental management plans (CEMP) in accordance with the requirements of NRETAS and DPC. The scope of the CEMPs will include construction inputs, and potential environmental aspects such as spills.

Operation

The main inputs during operation of the proposed development will be associated with the MSB. The MSB will be used to store supplies for off-shore oil and gas rig tender vessels. Various goods and materials will therefore be stored at the MSB at times, including drilling mud, rock, construction materials, paint, fuels, lubricants, food, safety equipment, and maintenance materials. Some of these materials will be hazardous materials. The volumes and quantities of the various materials to be stored at the MSB are unknown at this stage.

Storage areas of the MSB will be covered and bunded to prevent spills or leakages of any hazardous materials stored within. Security fencing and lockable doors will also be installed at the MSB to prevent misuse of any goods and materials stored within. The fuel supply area will be paved, bunded,

and graded away from the harbour to an oil-water separator. This will contain any spillage that may arise during refuelling or fuel loading activities.

The operator of the MSB will be required to prepare an environment management plan (EMP) in accordance with NRETAS and DPC requirements.

2.8.2 Outputs

Construction

The most significant waste product resulting from construction of the proposed development, in terms of volume, is dredged spoil. Channels will be dredged for the barge ramp, hardstand, MSB, and wharf quay line extension; in total approximately 1,363,000 m^3 of spoil is expected to be dredged. The area within the rail loop would be used for disposal of dredged spoil (if properties are suitable as fill material); all other dredged spoil is proposed to be disposed of offsite. A geotechnical investigation into the properties of the spoil to be dredged was underway during the writing of the DEIS and results will be presented in the EIS Supplement.

It is proposed to dispose of dredge spoil (other than that suitable as fill within the rail loop) to the dredge spoil disposal site approved for the Ichthys LNG Project (INPEX Browse, 2009). The spoil disposal site was identified in consultation with a range of stakeholders, including NRETAS, the former Department of Planning and Infrastructure (DPI), DPC, Amateur Fishing Association of the Northern Territory, and local shipping companies.

Other wastes associated with construction of the proposed development are mainly limited to domestic-type waste generated by workers on site, sewage, and packaging of some industrial / construction materials. The EAW precinct is currently serviced by municipal waste collection, and domestic waste associated with construction of the proposed development would be collected by this service. Toilet / washroom facilities for construction workers will be provided in the form of portable facilities. Licensed contractors will be engaged to maintain these facilities and dispose of sewage as required.

Skips will be provided at construction laydown areas for the duration of construction activities, and additional skips will be provided at work zones. The skips would be used for waste generated by construction activities, and will be emptied / removed by licensed contractors as necessary.

Operation

Only minor quantities of waste would arise from operation of the proposed development. The MSB will include a small administrative building, which will have toilet, washroom and kitchen facilities. A Support Services Building will operate at the tug / small vessel berth. These buildings will be connected to the sewerage system by a rising main. The current municipal waste service at EAW would collect domestic waste from these facilities.

Sewage from offshore rigs will be delivered to the MSB by rig tender vessels. It will be transferred from the ships to liquid waste disposal trucks, and then transported to a licensed waste treatment facility (outside of EAW).

Skips will be provided at the small vessel berth (in the quay line extension) and MSB for miscellaneous domestic waste generated by small vessels or offshore supply vessels, respectively. These will be emptied regularly by licensed contractors.

2.9 Ongoing Maintenance

Each component of the proposed development will require maintenance over the life of the project. Maintenance programs and their execution will be the responsibility of the operators of the various project components.

All project components will require regular cleaning and rust proofing (as the project will be developed in a marine environment). The Rail Loop will require regular inspection for subsidence, and possibly reinstatement of ballast if subsidence is observed.

All channels and berths will be regularly surveyed to assess silting. It is proposed that maintenance dredging will be undertaken every ten years, or as indicated from the marine surveys. Marine surveys would also be undertaken prior to and after any maintenance dredging program.

2.10 Employment

The workforce required for the construction of the various project components will depend on the construction methodologies selected by the contractors. An estimated number should be able to be provided in the EIS Supplement.

A maximum of 20 full time equivalent (FTE) staff would be employed once the proposed development is operational.

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