VOLUME 1

Draft : Environmental Impact Statement

Chapter A4 Project Description

A4.1 Glossary Terms

- CD: Chart Datum
- CSDP: Cairns Shipping Development Project
- IFO: Intermediate Fuel Oil
- LAT: Lowest Astronomical Tide
- RL: Reduced Level

A4.2 Overview of Current Infrastructure in the Project Area

A4.2.1 Existing Channel and Swing Basins

The Cairns Cruise Liner Terminal (CCLT) and heritage listed wharf, together with other cargo handling berths, lie on the western bank of Trinity Inlet adjacent to the Cairns Central Business District (see **Figure A4.2.3a** and **Figure A4.2.3b**). The current shipping channel includes an outer channel and an inner harbour channel. The inner harbour channel terminates at the Main Turning (Swing) Basin, while the outer channel commences at the channel bend adjacent to beacon number 20 and extends out to sea, to the end of the channel.

The outer channel is approximately 9.8km in length, 90m wide with a declared depth of -8.3m below Lowest Astronomical Tide (LAT). This profile was achieved during the last capital dredging program in 1990 and maintained by annual maintenance dredging.

The inner channel extends for 2.5km in length, with variable widths adjacent to the swing basins. The two current swing basins are the Main Swing Basin (310m in diameter and -8.3m LAT) and the Crystal Swing Basin (360m at -7m LAT design depth and 380m at -6.3m LAT design depth [Transport and Main Roads, 2012]). These are shown in **Figure A4.2.3a** and **Figure A4.2.3b**.

The Crystal Swing Basin is the principal swing basin currently used by cruise ships to access Wharves 1–5 (see **Figure A4.2.3a** and **Figure A4.2.3b**). The Main Swing Basin is primarily used by cargo ships and vessels berthing at the Cairns Naval Base (HMAS Cairns). The existing location of the Main Swing Basin restricts future opportunity for HMAS Cairns to expand the number of berths for Australian Naval and Customs ships. Both these swing basins are currently self-cleansing and do not require annual maintenance dredging.

A4.2.2 Existing Wharves and Berths

Wharves 1-5 at the Port of Cairns are currently available for passenger vessels, forming a continuous quayline of 460m (See **Figure A4.2.3b**). The wharves are 5m above LAT and 1.5m above Highest Astronomical Tide (HAT), with berth design depths of -8.4m (LAT). The wharf apron width, adjacent to the terminal, is 8.0m wide and the wharf deck width at wharves 4 and 5 is 27m. Wharves 1-5 were built between 1911 and 1914 and are heritage listed under the *Queensland Heritage Act 1992*.

Currently, wharves 1-3 are predominately used for berthing cruise vessels and are serviced by the international CCLT, located within Shed 3 of the Port's heritage listed wharf sheds.

Wharves within the project area are shown in **Figure A4.2.3c** and **Figure A4.2.3d**. Berth information is shown in **Table A4.2.2a**.

Table A4.2.2a Berth Information (from Transport and Main Roads 2012, pp. 32)

Berth	Design Depth (m) (Below LAT)	Berth Face (m)	Wharf Height (m) (Above LAT)
Wharves 1-6	8.4	595	5
Wharf 7	9.3	250	5
Wharf 8	10		5
Wharf 10	9.3	20	4.8
Wharf 11	-	-	-
Wharf 12	10.5	190	5.0

A4.2.3 Yorkeys Knob

Yorkeys Knob is a northern beach suburb of Cairns, approximately 13km from the Cairns CBD. Currently larger cruise ships, due to their size, are unable to access the Port of Cairns, so instead they anchor off Yorkeys Knob and transfer passengers by tender to shore before they are loaded into coaches for transfer to tour locations or into Cairns City. The facilities at Yorkeys Knob Boating Club and Half Moon Bay Marina are utilised to facilitate this process.

Ports North is currently working with Yorkeys Knob Boating Club on upgrading the facilities at Yorkeys Knob including:

- Improved bus parking and passenger pickup/drop-off
- Covered areas and seating for waiting passengers
- Upgraded pontoon and walkways to allow improved and increased capacity for berthing of ship tenders
- Landside hardstands and landscaping.

These works are expected to be completed in 2015 and will provide improved facilities and amenities for the regional recreational boating population as well as improve the transfer efficiency and the passenger experience for the largest mega cruise ships that will continue to anchor offshore at Yorkeys Knob in the future (e.g. the Queen Mary 2 and Celebrity Millennium).

The upgrade will also provide an intermediate improvement to the transfer efficiency and passenger experience for any mega cruise vessels utilizing Yorkeys Knob until they are able to be serviced at the Port of Cairns upon completion of the project.

Figure A4.2.3a Existing Channel and Swing Basins

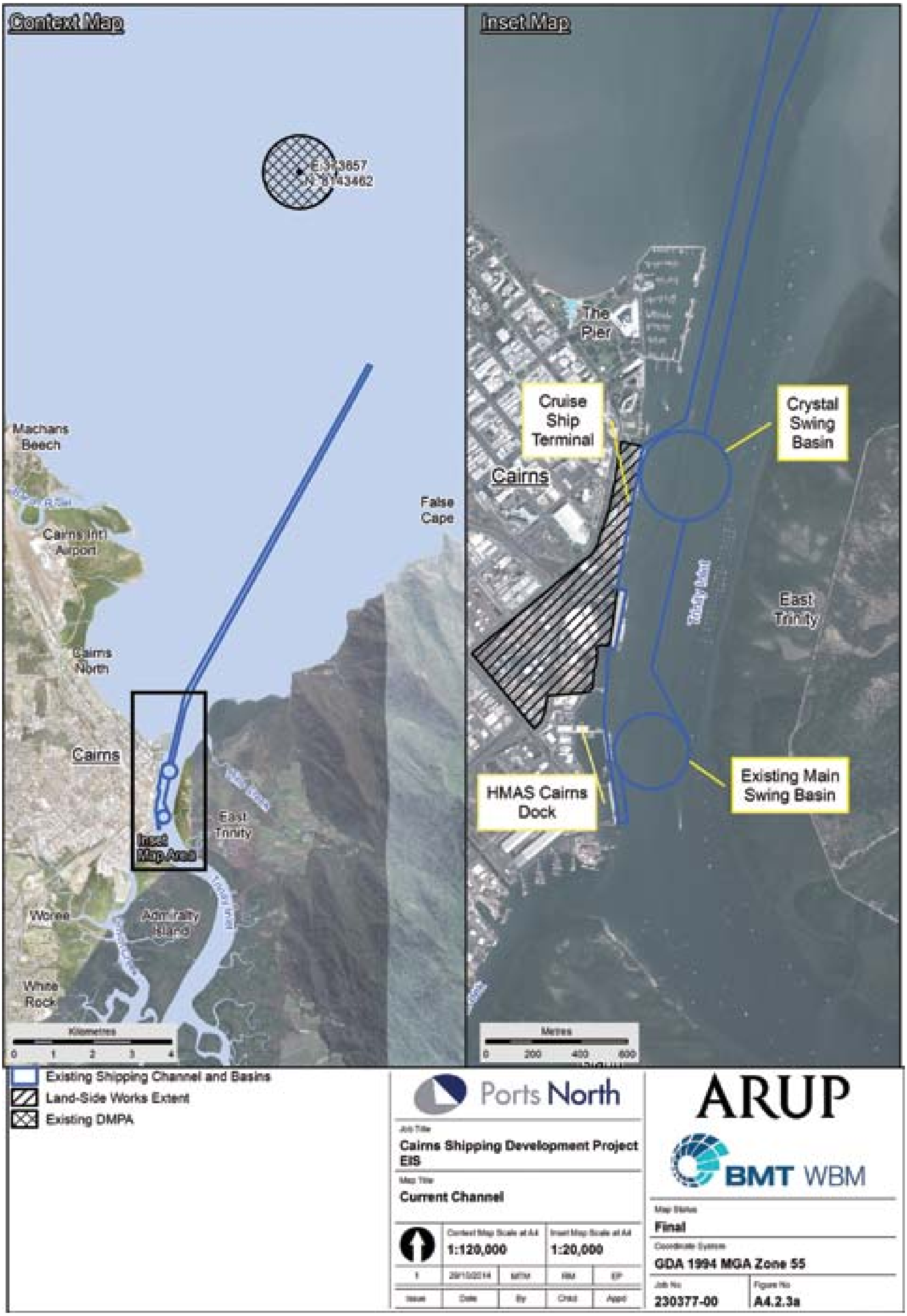


Figure A4.2.3b Plan and Aerial Photo with Cruise Ship at Port

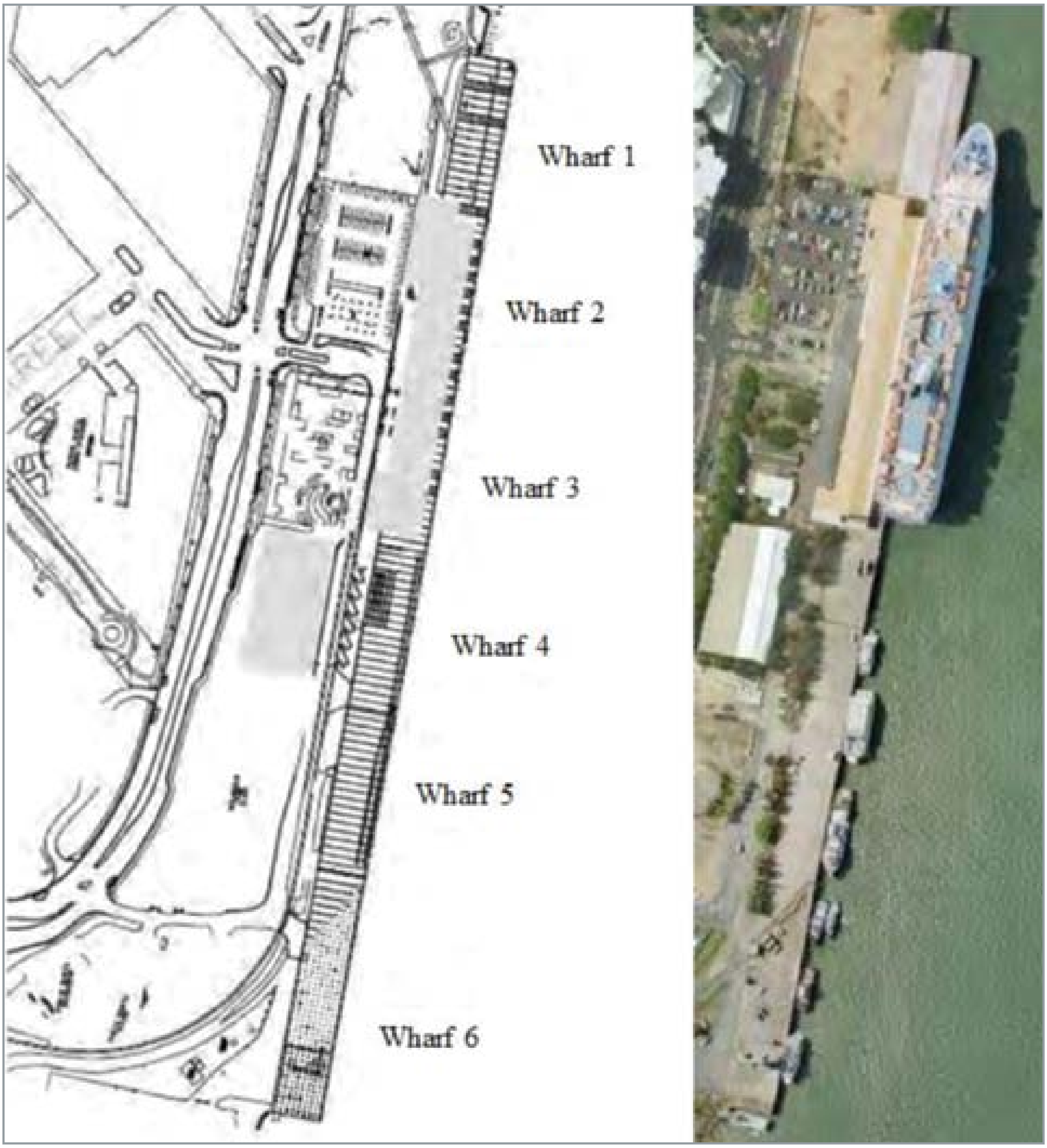


Figure A4.2.3c Cairns Berth (northern layout) (from pp. 74-75 of Transport and Main Roads 2013)

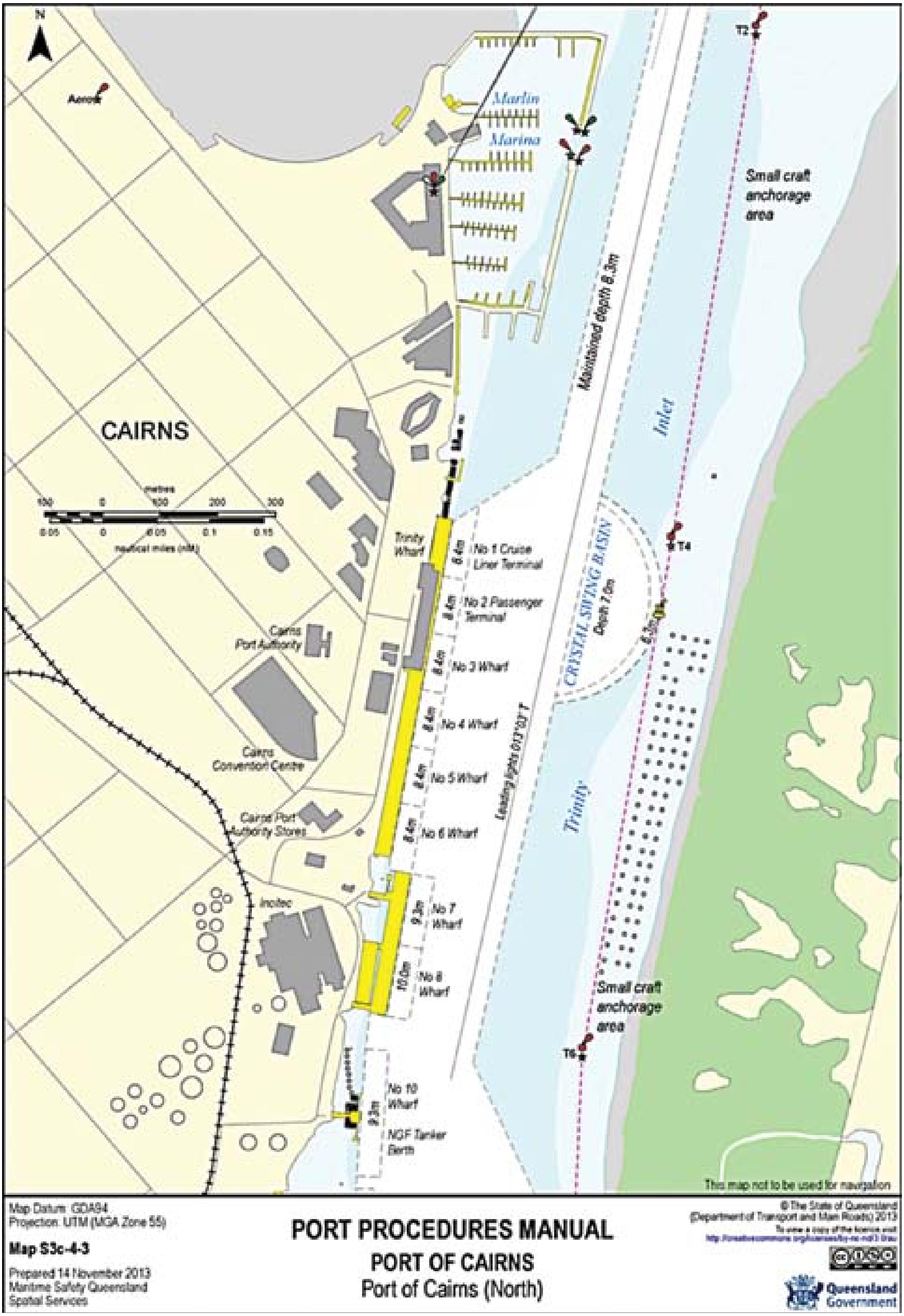
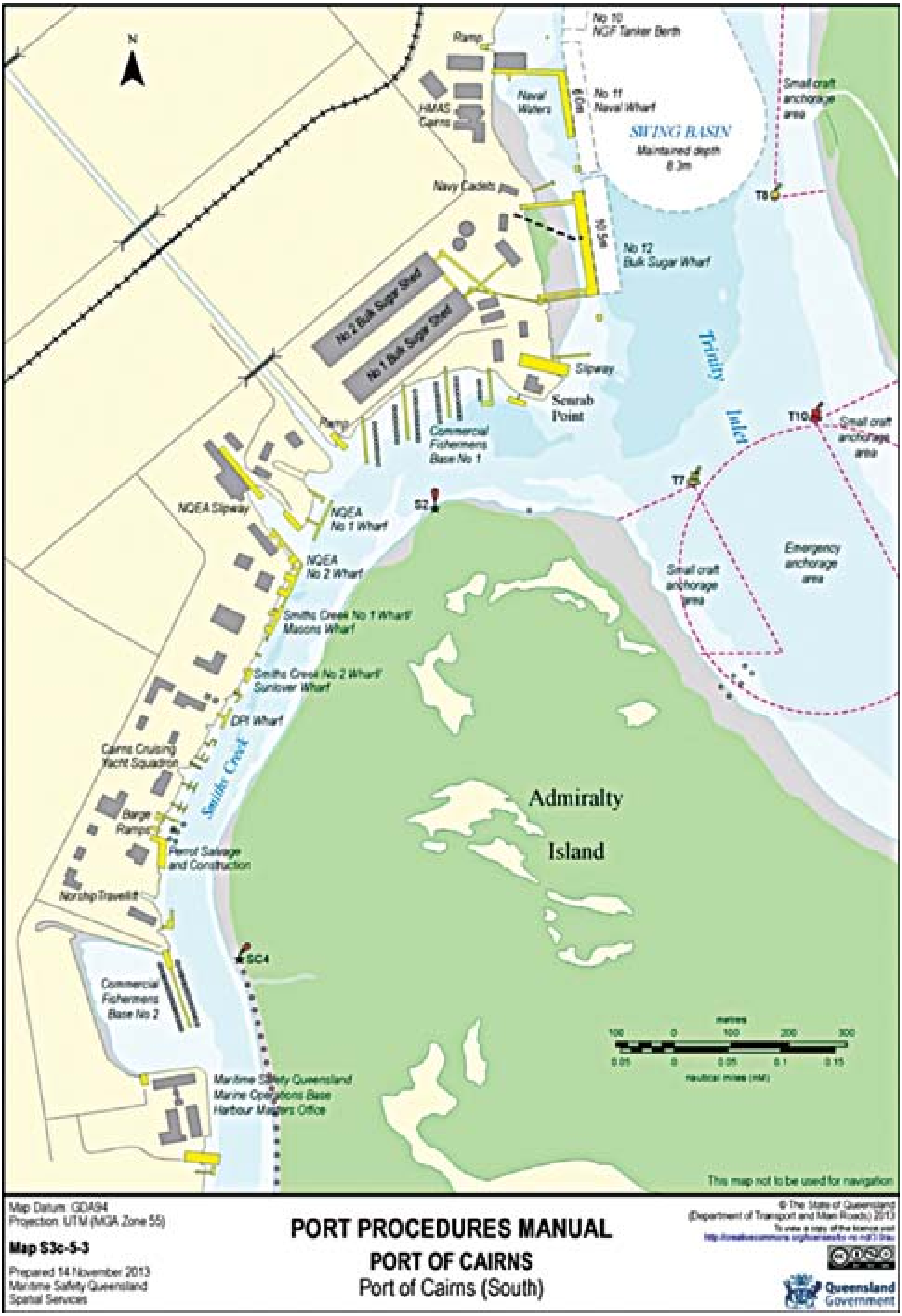


Figure A4.2.3d Cairns Berth (southern layout) (from pp. 74-75 of Transport and Main Roads 2013)



A4.2.4 Historical and Current Maintenance Dredging of Trinity Inlet

Although Trinity Inlet is a natural harbour, access to the sea is across a broad shallow mudflat. Since the declaration of the port in 1876, it has been necessary to maintain an access channel through these mudflats by regular dredging to remove sediment which collects in the channel. The first capital dredging works were undertaken within the access channel and berths by ***The Platypus*** dredge in 1887. Unable to keep up with the task of maintaining required depths, the ***Trinity Bay*** dredge took up operations from 1913. Dredging was so essential for the port's survival that for many years the Cairns Harbour Board owned and operated the ***Trinity Bay*** to ensure the dredging could be carried out whenever it was required.

As the size of ships servicing the Port of Cairns has increased over the years, it has also been necessary to periodically widen and deepen the channel to accommodate larger vessels. In 1929 the channel had a width of 45m, which was then widened to 60m by the early 1940s. In 1970 the channel had widened further to 75m and at present, the channel is about 13.2 km in length from its outer extent to the port area, has a typical width of 90m and a declared depth of -8.3m LAT.

In 1972, the ***Trinity Bay*** was decommissioned and since that time dredging has been undertaken by the Port of Brisbane, firstly by the ***Sir Thomas Hiley*** and since 2001 by the ***Brisbane***. Because the dredger services all ports along the Queensland coast, it is only in Cairns for a short period of time. The compressed dredging program, an absence of available land-based placement areas and the lack of appropriate landfill areas means that all recent dredged material has been disposed at sea, other than some minor quantities used for reclamation of industrial land at the end of Tingira Street in Portsmith.

A4.2.4.1 Current Maintenance Dredging

Currently, the existing shipping channel is regularly monitored and dredged as required by Ports North to maintain safe navigation for all vessels entering the Port of Cairns. Maintenance dredging typically occurs annually, and in certain sections of the channel, dredging of up to 1.7m is undertaken below the designated channel depth for insurance to counter the annual siltation of the channel caused by the depositing of marine sediments resulting from natural coastal processes.

Ports North undertakes routine maintenance dredging operations generally within three separate campaigns. Each campaign differs in dredging volumes, frequency and dredging plant. The campaigns include dredging of the:

- Outer shipping channel by Trailer Hopper Suction Dredge Brisbane
- Inner port (main wharves 1-12), Marlin Marina, Commercial Fishing Base (CFB) 1 and CFB2 by grab dredge and hopper barges
- HMAS Cairns Navy Base berth by grab dredge and hopper barges under contract with the Royal Australian Navy
- The inner shipping channel and associated swing basins typically require no maintenance dredging.

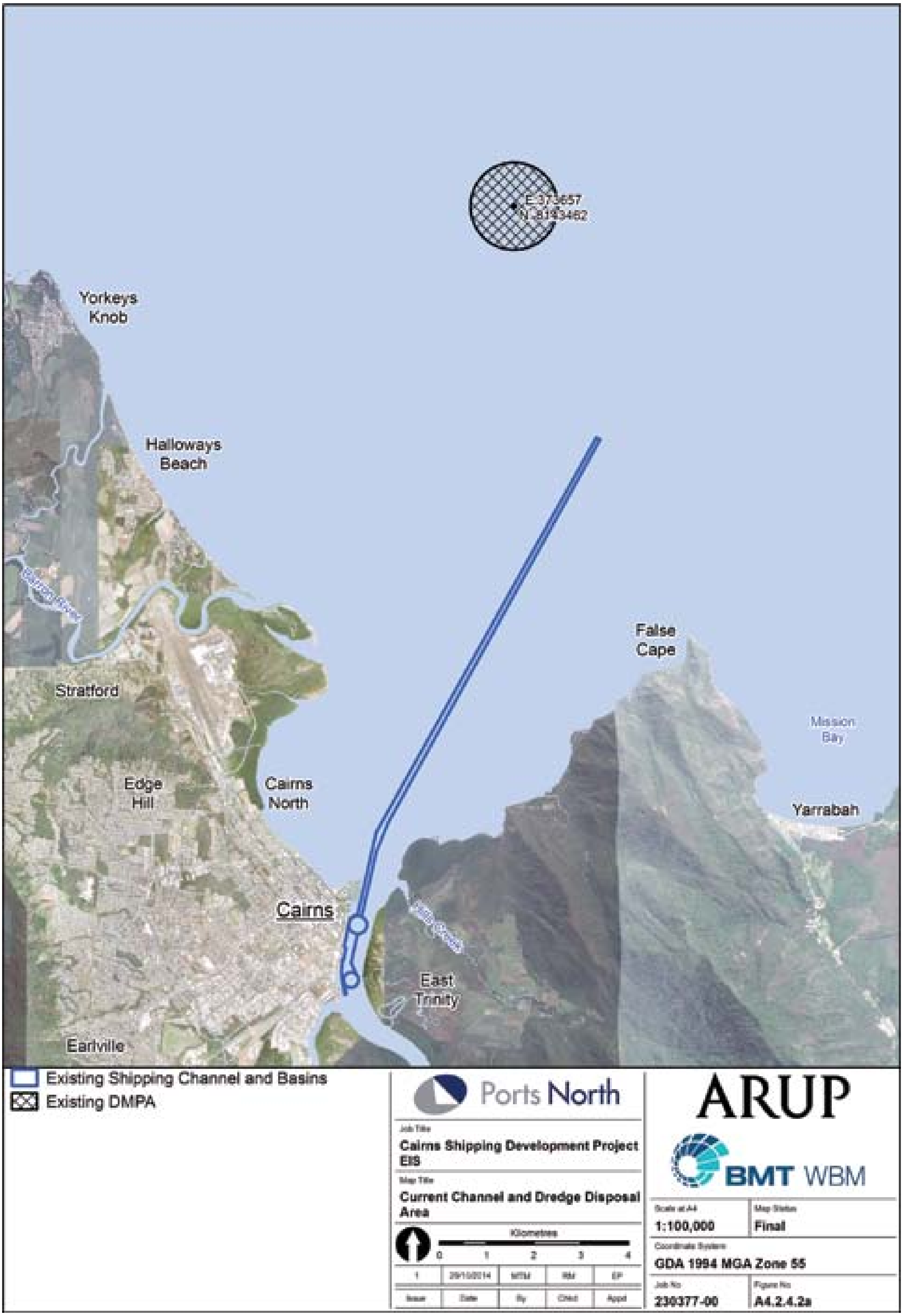
A4.2.4.2 Maintenance Dredge Material Placement

Approximately 350,000 cubic metres (m3) per year of "in-situ" dredge material from maintenance works is currently removed from the channels and basins and placed at an existing Great Barrier Marine Park Authority (GBRMPA) approved site. Dredge material volumes vary year to year in response to climatic influences. The in-situ material volume increases by the addition of water in the dredging process and therefore a greater 'wet' volume is actually deposited in the placement area.

The current permitted dredge placement area is located approximately 14.6 km north of the Port of Cairns, is one nautical mile in diameter (1,852m) centred on Latitude 16° 47'24'' and Longitude 145° 48' 48'' East and is 269ha in area (see **Figure A4.2.4.2a**). This site has been in use since 1990 for placement of mainly maintenance material and minor volumes of capital material from the port.

Since 1986, disposal of dredge spoil at sea has been controlled by the issue of Sea Dumping Permits by the Federal Government (under the *Environmental Protection (Sea Dumping) Act 1981*). These permits require the Port Authority to demonstrate that the disposal of material does not have any significant detrimental effects on the environment and does not contain toxic levels of contaminants Environmental impacts associated with dredging and its disposal has been well-managed and carefully monitored by Ports North through the implementation of a series of Long-term Dredging and Disposal Management Plans. Significant environmental investigations and studies over the past decades have consistently shown that these activities have a limited impact on the surrounding environment. The Federal Government have issued a 10-year permit for material recovered from channel maintenance dredging to be placed at sea. The permit was issued in 2010 by GBRMPA and has an allowance of 6.6 million wet cubic metres of dredged material. The current permit will lapse in March 2020 or when the dredging volume allowance has been exhausted. Based on current filling rates it is estimated that the current permitted volume will be exhausted by 2017.

Figure A4.2.4.2a Existing Maintenance Dredge Material Placement Area



A4.2.5 Existing Land Side Infrastructure and Services

A4.2.5.1 Cairns Cruise Liner Terminal

The Wharf Shed 3 building was originally constructed in 1912 to service the wharf, and has since been heritage listed. The adaptive reuse of the shed in 2010 has been designed to operate as a Cruise Liner Terminal (passenger terminal building) as well as a function and exhibition space (see **Figure A4.2.5.1a**). The floor space is approximately 930m^2.

The terminal has been designed for cruise ships berthing in transit and home port arrangements. Whilst the design service levels set the minimum design passengers as 600 for home porting and 1,800 for transit operation, based on practical experience and site testing, the facility can cater for 3,100 transit passengers at one time. Therefore, the terminal can effectively cater for transit passengers for the mega class vessels and for home porting vessels with greater than 600 passengers. Overflow can be catered for via the adjacent undercover breezeway and the Wharf 4 deck using marquees, if required.

The facility will be able to accommodate increases in transit passengers associated with this project, and as such, no upgrades are proposed.

Figure A4.2.5.1a Landward view of the Cruise Terminal (Shed 3)

A4.2.5.2 Transportation and Access

Wharves 1 to 5 exist parallel to Wharf Street in the CBD. Vehicular access to the CCLT is provided via a driveway at the intersection with Lake Street and Wharf Street. A car park is provided in front of Shed 2, with bus and taxi access also provided along the face of the CCLT on port land. As cruise ship passengers do not have their own means of vehicular transport, most passengers utilise tours, buses and taxis to experience the city.

The majority of pedestrians entering and exiting the port building use the existing shared area linking the Port Terminal to Wharf Street via the park. The other major link to the north provides access to the boardwalk and the Esplanade, however, this link is not used as much.

The Northern Coast rail Line runs through the port area, dissecting the Strategic Port Land (SPL). The rail line is part of Queensland Transports' regional freight and passenger network.

An assessment of baseline traffic conditions and predicted traffic impacts are provided in **Chapter B14, Transport**.

A4.2.5.3 Fuel

Quantities of marine diesel fuel (also called Marine Gas Oil or MGO) over 30,000 litres can be supplied to vessels at Wharf 10. A bunkering barge service is available if required. There is no direct fuel line to the cruise shipping wharves.

Intermediate Fuel Oil (IFO) is used as another fuel in marine diesel engines. IFO is a blend of heavy fuel oil and distillate oil. IFO is not currently available and supplied in Cairns. An existing fuel farm lies immediately to the west of the cruise ship wharfs (see **Figure A4.2.5.3a**).

Figure A4.2.5.3a Existing Fuel Farm

A4.2.5.4 Water

The potable water supply was upgraded as part of the recent Foreshore Redevelopment Project in 2012. The current design is shown in **Figure A4.2.5.8a**.

A4.2.5.5 Fire Fighting Services

The existing firefighting infrastructure is connected to the potable water main and allows the supply of water to the dedicated external fire main. This includes the fire protection system for the CCLT.

The firefighting services were upgraded as part of the recent Foreshore Redevelopment project in 2012. The current design is shown in **Figure A4.2.5.8b**. The system is designed to protect all landside assets.

A4.2.5.6 Electricity

Electricity is connected to all wharves with both single-phase power and three-phase power available at most berths on arrangement with the Seaport Operations Office.

Electrical supply to services (e.g. lighting) was also recently upgraded during the Foreshore upgrade in 2012.

A4.2.5.7 Sewage and Waste

General garbage, incinerator ash and recyclables generated on cruise ships is currently disposed of at the Port of Cairns via agreements with appropriately qualified and licenced waste contractors. When ships book into the port, the required waste facilities (timing and capacity) are identified by the ship's agent and waste contractors are then engaged to collect the waste when the ship arrives. All waste is transported to a suitable licenced facility. Recording of waste volumes/masses and types is the responsibility of waste contractors. Quarantine waste services are arranged through Ports North who engage approved contractors to collect the waste and transfer it to an approved receiving facility. The packaging, transport and treatment of quarantine waste is conducted in accordance with Department of Agriculture (DOA) requirements.

Waste generated or deposited at the CCLT in waste receptacles is managed via agreements with appropriately qualified and licenced waste contractors. General waste bins are provided throughout the terminal and are collected regularly. All waste is transported to a suitable licenced facility.

Whilst the discharge of sewage is allowed to sea under the ***Transport Operations (Marine Pollution) Act 1995*** (TOMPA), the discharge of sewage into the Port of Cairns does not occur due to its proximity the GBRMP. The discharge of both greywater and sewage at sea is prohibited under the MARPOL for ships and vessels greater than 100 gross tonnage and/or carrying more than 15 persons unless appropriately treated. Sewage tanker truck services are provided for cruise ships and other vessels berthing at the Port of Cairns. Each tanker uses a vacuum method for obtaining the sewage from vessels. The trucks transfer waste to one of the Cairns Regional Council's (CRC) Pollution Control Plants. This can be a 24-hour operation for the duration of the ship's stay. Recording of waste volumes/masses and types is the responsibility of waste contractors.

The port has an existing sewerage reticulation network that is connected to CRC's sewer main in Wharf Street (**Figure A4.2.5.8c**).

A4.2.5.8 Customs and Quarantine

Customs services are provided within the CCLT building for ships that are embarking or disembarking international passengers from the wharves.

Quarantine and inspection services are arranged through the DOA for ships and passengers at the wharves as well as for ships and passengers arriving by tender at Yorkeys Knob. These services are provided on a fees and expenses basis and are arranged by the cruise shipping companies and their agents. DOA officials board the vessel prior to disembarking passengers to provide the appropriate clearances. Scanning and searches can be carried out in the terminal, or at temporary facilities where required.

Figure A4.2.5.8a Schematic Existing Potable Water Supply Services. This figure is not to scale.

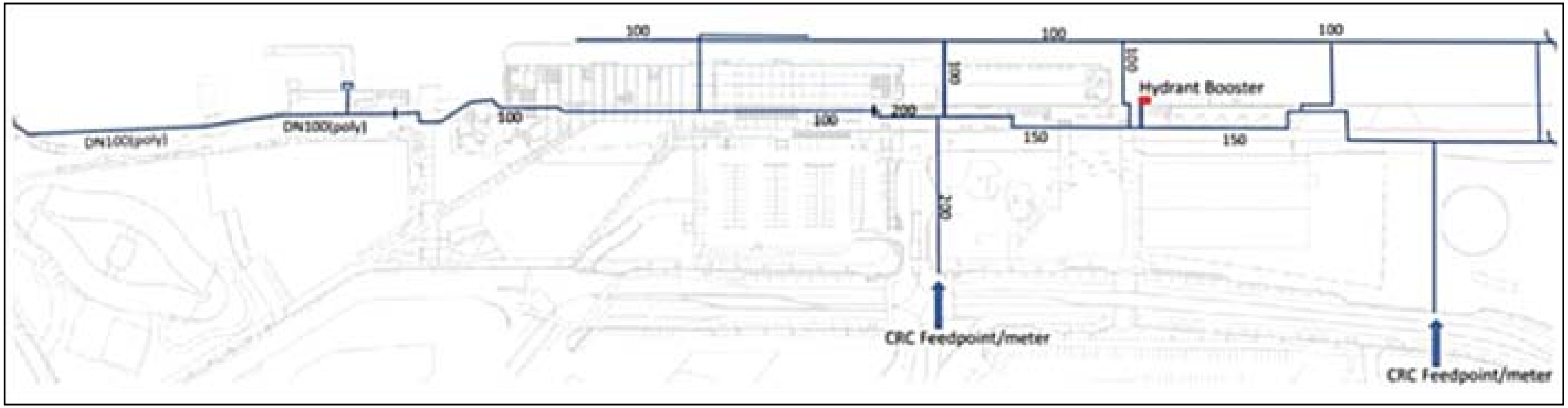


Figure A4.2.5.8b Schematic Design of Fire Services. This figure is not to scale.

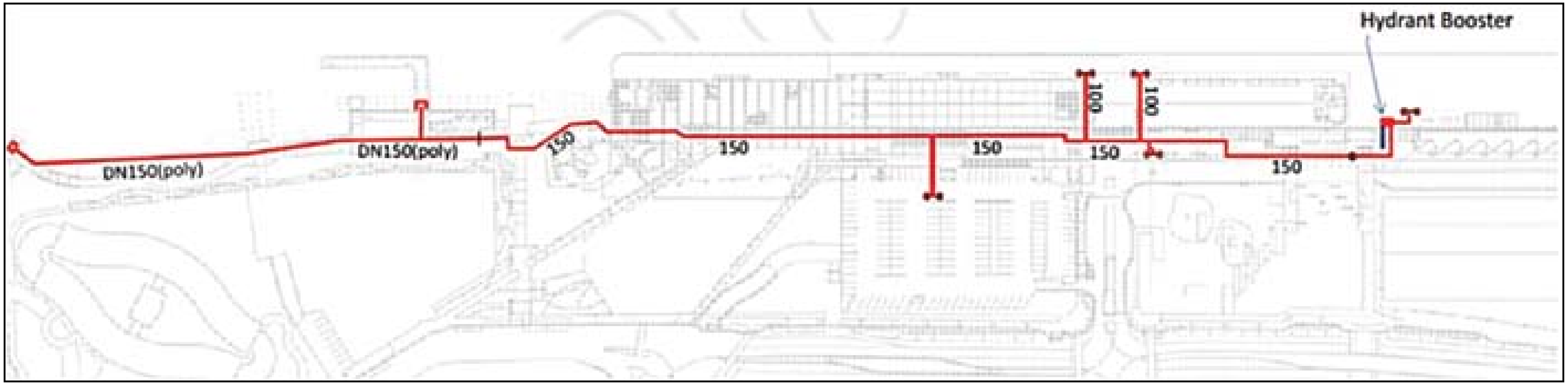
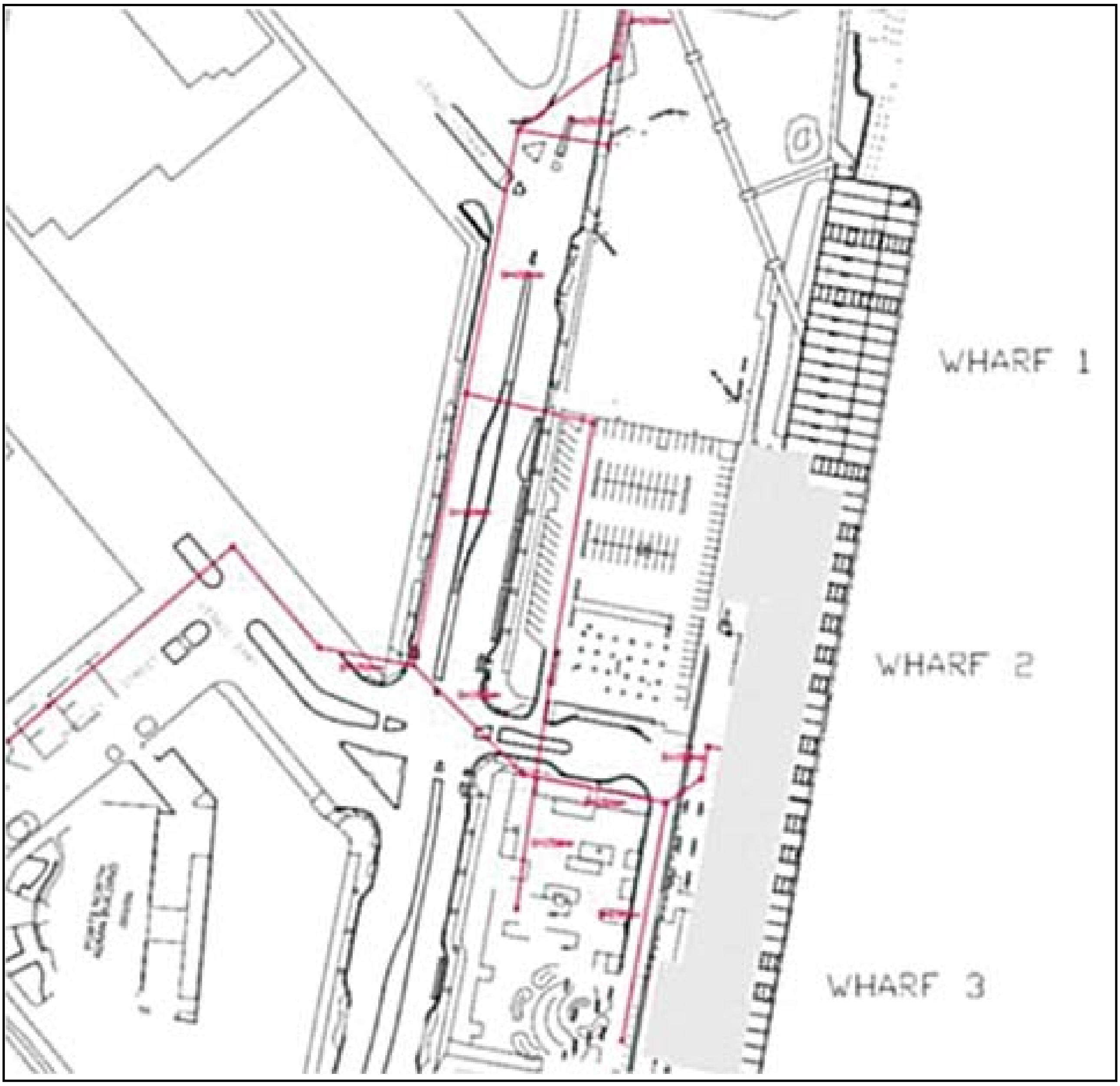


Figure A4.2.5.8c Existing Sewerage Services



A4.2.5.9 Security

The Port of Cairns is a Regulated Port under the *Maritime Transport Security and Off Shore Facilities Act 2003*. A security plan for the port is in place and there are specific requirements for all port users to comply with this plan.

Security fencing is erected around the wharf when cruise ships are calling at the Port of Cairns. Access is restricted to persons having business on board or as bona fide visitors.

There is no security plan covering passenger transfer operations at Yorkeys Knob. When at anchor the cruise ship is responsible for its own security arrangements.

A4.3 An Overview of Shipping at Cairns Port

A summary of historic and current cruise shipping activity at the Port of Cairns is provided in **Chapter A1, Project Introduction**.

A4.3.1 Non-cruise Shipping

The Port of Cairns has two types of cargo shipping that use its facilities. This includes:

- Supply trade to northern communities in Gulf and Torres Strait
- Bulk cargo – sugar, molasses, fuel products, fertilisers and general cargo.

The northern supply trade currently supplies the major Freeport McMoRan mine in Papua Indonesia and Seaswift and Toll supply to the Torres Strait and to Weipa. The existing channel is wide and deep enough to allow navigation of these vessels, and no upgrade is required for these purposes (Cummings Economics 2014).

The bulk cargo ships are of a size that cannot enter the port at low tide, even with restricted loads. This means they are subject to a six-to-eight hour wait for the tides (Cummings Economics 2014). This equates to approximately 12-to-16 hour turnaround, as vessels are required to wait for suitable tides while entering and leaving the Port of Cairns. Even at high tide, bulk cargo ships are unable to enter the port fully loaded and as such, they share loads with other ports, mainly with Townsville (45 ships per year).

The average number of bulk cargo ships a year is estimated at 62 (Cummings Economics 2014), and is made up of:

- Fuel: 40 ships a year
- Sugar ships: 15 ships a year
- Fertiliser ships: 7 ships a year.

There is likely growth in non-cruise shipping in the future due to the demand in Asia for tourism, minerals and basic agricultural commodities. It is also possible that growth could result from the local production of ethanol which could result in a reverse trade of fuel (Cummings Economics 2014).

The Port of is also a base for the Royal Australian Navy patrol boats and a large fishing fleet. In addition, Cairns Marlin Marina was established as a key component of the Cityport precinct and caters for super yachts and a significant fleet of tourist vessels that provide daily tours to the Great Barrier Reef.

A4.4 Proposed Infrastructure

A4.4.1 Introduction

A Concept Design for the channel upgrade and associated infrastructure has been prepared. The Concept Design has aimed to minimise the extent of dredging to the minimum required, whilst still maintaining safe navigation standards for cruise ships. Originally, the channel was proposed to be up to 160m wide, but has been reduced through a number of design iterations to 130m width. This has significantly reduced the amount of dredge material requiring disposal, and associated potential environmental impacts. Further detailed design shall be carried out to confirm channel dimensions and any design refinement would seek to further reduce the channel width and subsequently the amount of material requiring dredging. However, this EIS is based upon the Concept Design described in the following sections and assesses the potential environmental impacts based on this design. Throughout project planning, measures to reduce the impact of the project will be further refined.

A4.4.2 Channel, Swing Basins and Berths

The channel design has been developed to a conceptual stage by experienced maritime engineers at Arup, with significant input from the Maritime Safety Queensland (MSQ) Regional Harbour Master (RHM). The design has also been subject to a series of simulation runs over a number of days using a simulator at Smartship Australia, a Brisbane-based navigation simulator.

In developing the design, a key consideration was to provide safe access for the targeted mega class cruise ships while minimising the overall dredge volumes to limit both project cost and environmental impacts. This iterative design process resulted in a reduction of channel dredge volumes, initially predicted to be 10,058,000m^3 to a final dredge volume of 4,400,000m^3. This significant reduction was achieved through the optimisation of channel width, and more critically, by establishing an optimum workable channel depth, whilst introducing some tidal constraints for access by the very large cruise ships. This concept design forms the basis of the EIS.

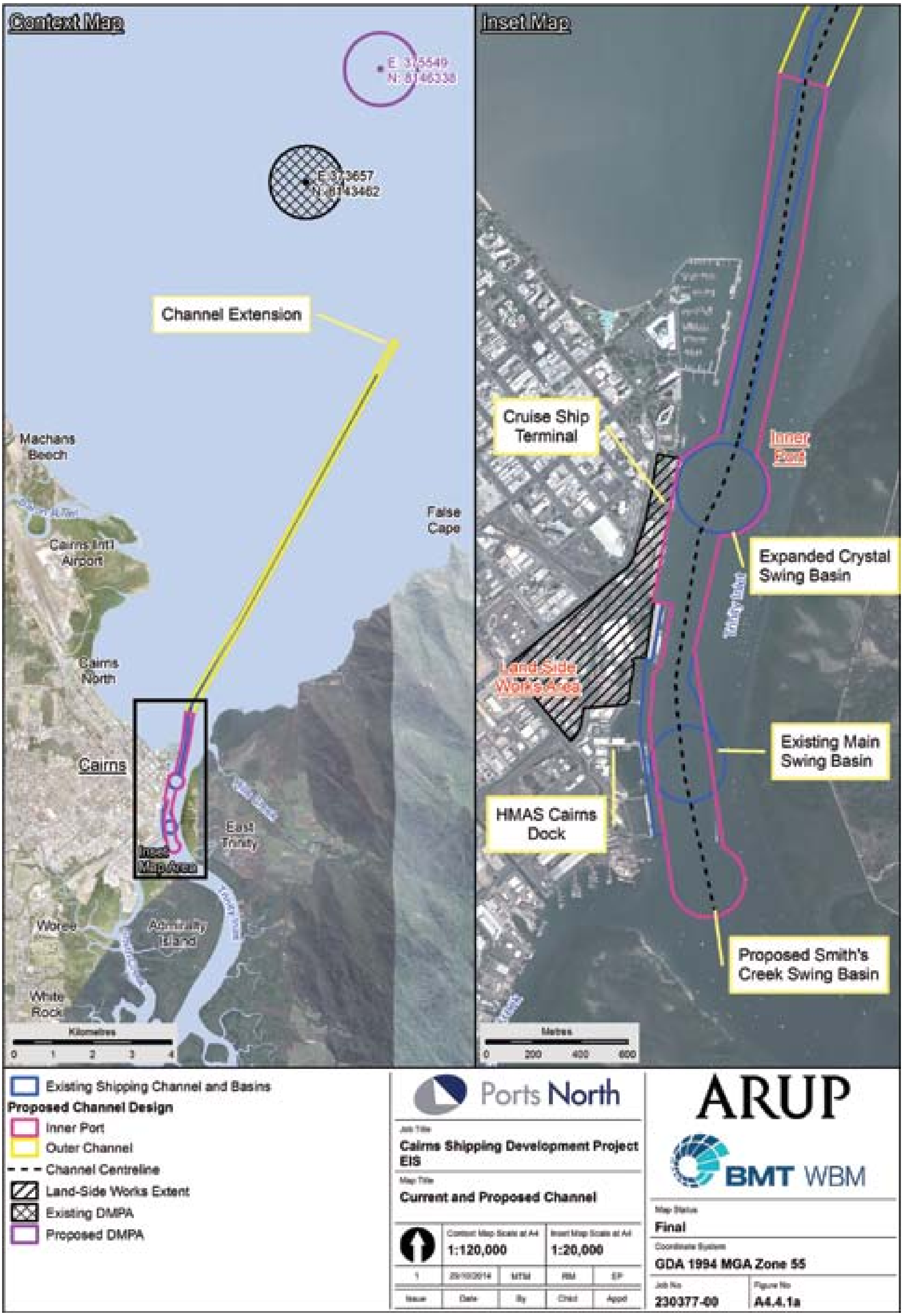
Detailed design of site infrastructure for the wharf upgrade will also be undertaken in order to optimise the design; however, the design is not expected to alter significantly from the concept design.

The channel design was based on widening the existing 90m channel to 130m and increasing the depth from 8.3m to 9.4m to cater for large-size cruise ships, as shown in **Table A4.4.1a**.

Table A4.4.1a Mega Class Cruise Ships Catered for by the Project

Ship Class	Ship Name	Overall Length (m)	Beam (m)	Draft (m)
Regal	Pacific Dawn	245.1	32.3	7.8
Vista	Queen Victoria	294.0	32.3	8.1
Grand	Emerald Princess	290.0	36.0	8.5
Voyager	Voyager of the Seas	311.0	38.6	8.8

Figure A4.4.1a Current and Proposed Channels and Swing Basins



A4.4.3 Crystal Swing Basin, Wharf Berths and Outer Channel Upgrade

The upgrade of the swing basins, wharf berths and outer channel upgrade includes the following elements (as shown in **Figure A4.4.1a**):

- Extension of the northern end of the existing outer channel by 1.0km
- The extent of the widening varies over the channel, with the outer channel being widened by 40m to a new width of 130m. The declared depth will be -9.4m LAT for the outer channel
- In the bend of the channel, further widening will be carried out to a maximum width of 210m to provide safe manoeuvring space for the cruise vessels while passing through the bend
- The Crystal Swing Basin diameter will be increased to 400m with a declared depth of -8.0m LAT outside the direct channel alignment
- The declared depth of the berth pockets will be -9.3m LAT, with a width of 50m.

The channel will extend outside of the nominated widths stated above due to the channel side slope batters. The channel side slope batters extend from the proposed channel bed, outwards to the natural seabed level at a typical slope of 1 on 4.

A summary of the proposed concept design channel depth and the proposed dredge depth (inclusive of insurance) is given in **Table A4.4.2a**.

Table A4.4.2a Concept Design Depth

Chainage	Proposed Design Depth (m LAT)	Proposed Dredge Depth (m LAT)	GPS Coordinates (Central point)
Berth Pocket	-9.3	-9.6	370180E, 8127618N
Smith's Creek Swing Basin	-8.0	-8.3	370290E, 8126573N
Inner Harbour - Crystal Swing Basin	-9.4	-9.7	370560E, 8129089N
Crystal Swing Basin (Outer)	-8.0	-8.3	370342E, 8128237N
Crystal Swing Basin to Marlin Marina	-9.4	-9.7	370477E, 8128721N
Marlin Marina to Bend (Chainage 14500)	-9.4	-9.7	370644E, 8129588N
Chainage 14500 - 15000	-9.4	-9.7	370811E, 8130231N
Chainage 15000 – 16250	-9.4	-11.1	371222E, 8130990N
Chainage 16250 – 18500	-9.4	-10.1	372085E, 8132476N
Chainage 18500 – 19000	-9.4	-10.6	372748E, 8133676N
Chainage 19000 – 21000	-9.4	-11.1	373357E, 8134779N
CHhainage21000 – 21500	-9.4	-10.3	373985E, 8135917N
Chainage 21500 – Channel Entrance	-9.4	-9.9	374966E, 8137694N

A4.4.4 Expansion of the Inner Harbour Channel and Creation of the Smith Creek Swing Basin

Relocation of the Main Swing Basin to a new location adjacent to Senrab Point and the Tropical Reef Shipyard (designated as the Smith's Creek Swing Basin) will enable future expansion of HMAS Cairns and provide a wider and deeper inner channel for the full length of the inner port.

The Defence Force Posture Review (Hawke & Smith 2012) recommends upgraded or expanded bases at Cairns and Darwin to accommodate future Offshore Combatant Vessels (OCV) and replacement Heavy Landing Craft (HLC). There has been no decision from the Federal Government regarding approval of this project at the time of writing. This directive and consultation with Navy has determined that the ships within **Table A4.4.3a** could potentially visit Cairns.

Table A4.4.3a Potential Navy Ship Requirements

Ship Name	Overall Length (m)	Beam (m)	Draft (m)
HMAS Choules	176	26.4	6.0
HMAS Canberra (new Landing Helicopter Dock Class)	231	32	7.5
USS Boxer (Mid-size US Navy Carrier)	257	32	8.5

Australian Navy ships could be accommodated by the existing shipping channel and swing basin, however, the wider and deeper channel provided for cruise shipping will also provide safer access for the new Landing Helicopter Dock (LHD) Class ships, with reduced operational restrictions. The larger US Navy Carriers that cannot currently berth at the Port of Cairns could also be accommodated by the proposed channel upgrade (as per **Table A4.4.1a**).

Consequently, the upgrade of the Main Swing Basin and channel south of the Crystal Swing Basin included as part of this project would provide potential opportunities for expansion of the naval facilities in Cairns. The proposed concept design relocates the Main Swing Basin adjacent to HMAS Cairns to a new location adjacent to the Smith's Creek entrance (see **Figure A4.4.1a**). All cruise ships will manoeuvre at the larger 400m diameter Crystal Swing Basin, while navy ships and general cargo ships will swing at the new Smiths Creek Swing Basin. The expansion includes the following components:

- The design extends the existing 90m wide inner harbour channel to the proposed Smith Creek Swing Basin (providing 80m clearance between the channel and the expanded navy infrastructure as advised by the RHM)
- The inner part of the channel will become 180m wide, widening to 240m adjacent to the Smith's Creek Swing Basin and ending in the new Smith's Creek Swing Basin with a diameter of 310m
- The design deepens the inner channel to a declared depth of -9.4m LAT between the Crystal Swing Basin and the new Smith's Creek Swing Basin.

The proposed services upgrades are on non-tidal land or within the existing wharf footprint. The new fender/dolphin fenders will be cut into the existing concrete wharf so the outside edge footprint of the existing wharf should not change. During construction, there may be some temporary loss of access to tidal land due to barges being moored at the wharf. This impact is considered minor and short term.

A4.4.5 Navigational Aid Requirements

Some existing navigation aids will need to be relocated as part of the project and number of new navigation aids will also be required. These changes are summarised in Table A4.4.4a. These requirements were determined in consultation with MSQ.

Marker buoys are required to demarcate the Crystal and Smith's Creek swing basins. Market buoys will be held by weights at the bottom. The numbers of marker buoys required at each location will be confirmed by the RHM during detailed design.

Further details on aids to navigation are provided in **Chapter C4, Maritime Operations Management Plan**.

Table A4.4.4a Navigational Aids Requirements

Location / Reference	Status	Type	Description
New arrival sector light in inner harbour	New	Fixed Structure	New sector light (PEL) on Sugar Shed.
Beacon 17	Existing	Fixed Structure	Move beacon to 50m outside of new channel toe line.
Arrival front lead	Existing	Fixed structure	Move front lead to new location.
Arrival sector light	Existing	Fixed structure	Remain on Pier.
Departure front lead	Existing	Fixed structure	Remove from current location.
Departure sector light	Existing	Fixed structure	New sector light at position of departure rear lead beacon.
Channel entrance	New	Fixed structure	New beacons at port and starboard side.
Weather stations on beacons C2 and C20	New	Fixed structure	New weather stations to provide wind data for Pilots.

A4.4.6 Moorings

The port provides approximately 75 mooring points for casual moorings of vessels. Two of these mooring locations will be removed to accommodate the Crystal Swing Basin expansion as these moorings are not all currently utilised and a number of other mooring points are out of commission. If demand necessitates, new mooring points may be provided in alternative locations to meet demand.

A4.4.7 Proposed Wharf Facilities

The existing wharf is at capacity in terms of allowable berthing and mooring loads to the existing heritage listed wharf structure (Refer to Chapter B13, Cultural Heritage). In order to allow larger cruise ships to berth and also to provide long-term protection of these culturally important wharves, additional wharf upgrade works are required. The wharf upgrade has been designed so that landside work is minimised to limit disturbance of the heritage-listed wharf.

It will include the installation of a new independent berthing and mooring structures (known as 'dolphins') to protect the heritage listed wharves, as shown in **Figure A4.4.6a** to **Figure A4.4.6c**.

It is not envisaged there will be any temporary or permanent loss of tidal land as a result of the proposed wharf upgrade.

Figure A4.4.6a The Wharf Design - Berthing Structure Every Five Piles

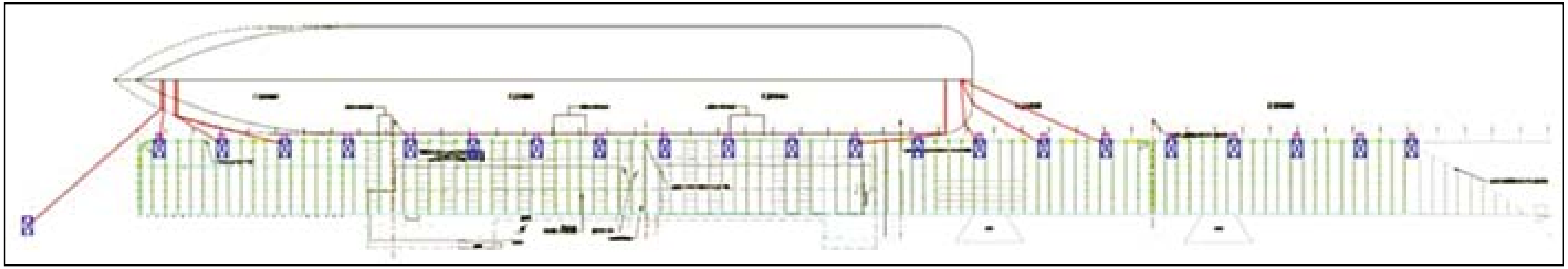


Figure A4.4.6b Typical section Showing Berthing Structure and Berthed Design Vessel

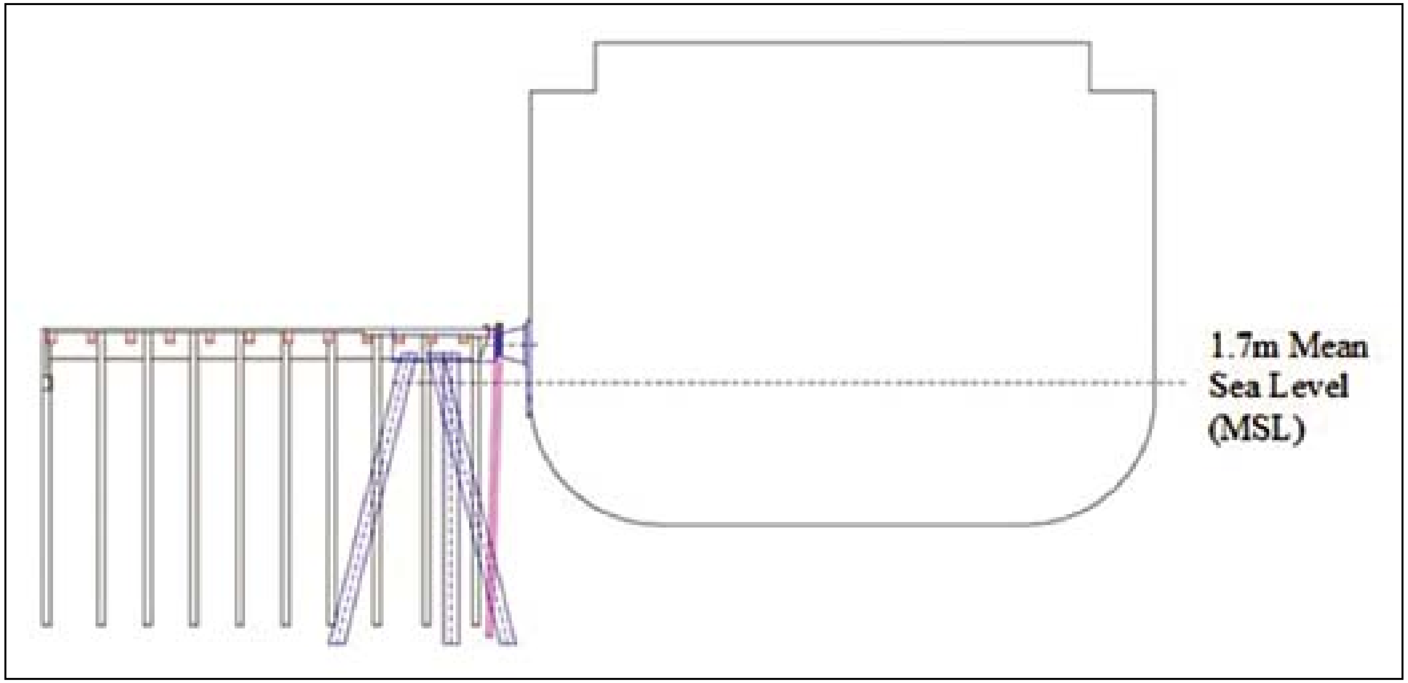
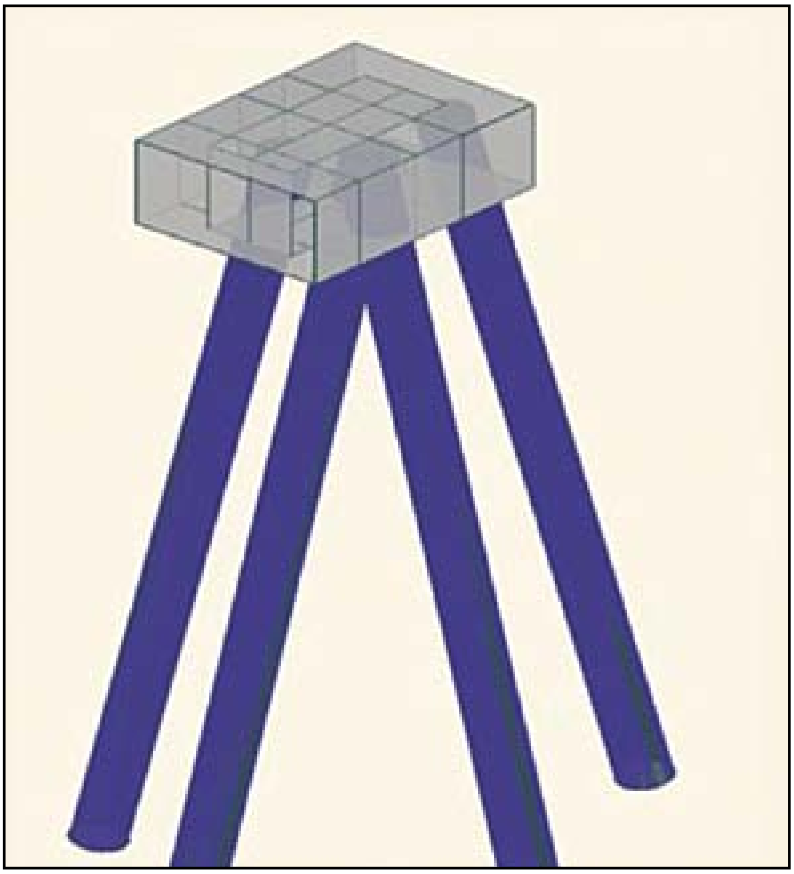


Figure A4.4.6c Isometric View of Berthing Structure



A4.4.8 Proposed Land-side Infrastructure

This section describes the provision and upgrade of the following services to support the design ship size categories considered in the study:

- Traffic and Access
- Fuel supply
- Potable water supply
- Firefighting services
- Discharge of sewerage.

The following will not be provided as part of this project:

- Shore Power, as recent upgrades cater for wharf requirements and ships will not rely upon on-shore power
- Upgrade to the CCLT building as sufficient capacity is already available to cater for an increase in passengers
- Solid waste management infrastructure (including quarantine waste), as current facilities are adequate for the proposed expansion
- Providoring (the provision of goods to the vessel) as existing facilities are suitable for this activity
- A gangway from docked ships, as current gangway provision arrangements will satisfy future requirements.

Hence, details of these items are not provided in this EIS.

A4.4.8.1 Traffic and Access

Based on scenarios modelled by Ports North, infrastructure upgrades would not be warranted to cater for future increased vehicular and pedestrian traffic; however, a more streamlined operation will be required to fully utilise the existing facilities. Traffic management measures are outlined in **Chapter B14, Transport**.

A4.4.8.2 Fuel Provision

An additional IFO storage tank(s) will be required within the existing fuel farm area (see **Figure A4.4.7.2a**). The exact design and size of the IFO supply will be finalised during detailed design. However, based on preliminary demand forecasts, it is anticipated that an additional IFO storage tank(s) with a capacity of approximately 10,000m^3 (7,500T) will be required within the existing fuel farm area to store monthly fuel deliveries.

The fuel farm area is currently leased to three major petroleum suppliers; therefore, the exact location for the new storage tank would involve future agreement between Ports North and the successful fuel IFO supplier. It is likely that IFO supply to the fuel farm would be via a dedicated IFO supply ship that delivers IFO to Gladstone from Singapore.

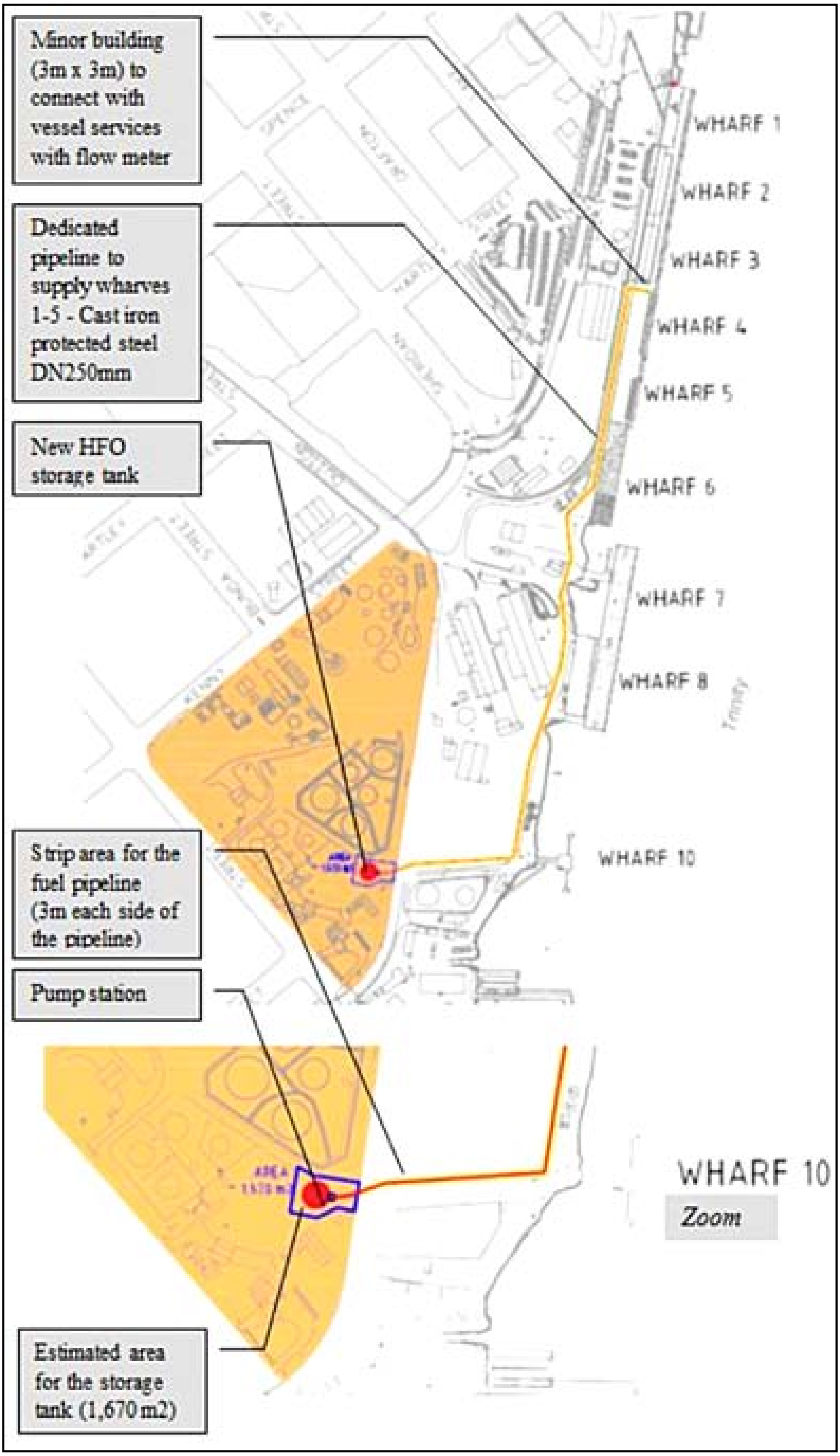
IFO to wharves shall be provided via a dedicated pipeline and a pump station. The concept design has identified that a one kilometre long 250mm pipeline will be required between the storage tank and Wharf 3. It is expected the pipeline will be buried to assist with mitigating the risk of damage, corrosion and fire. Construction and installation would be via trenching and piping construction methods.

A storage area at the wharves would also be required and a small building near Wharf 3 will be constructed to allow the connection of the onshore services with the vessel fuel services (see **Figure A4.4.7.2a**).

The location of the storage tank in **Figure A4.4.7.2a** is indicative only and will be subject to negotiation between Ports North and the operator. The exact pump station characteristics and location will be determined during future detailed design and subsequent approvals processes.

Potential environmental risk and its management associated with the provision and supply of IFO have been assessed and are outlined in **Chapter B17, Hazard and Risk**, for which the appropriate changes to Ports North's operational and environmental management procedures will be updated as required.

Figure A4.4.7.2a Proposed IFO Supply Infrastructure



A4.4.8.3 Water

The existing potable water pipeline along the face of wharves 1 and 5 would be replaced due to the wharf structural upgrade (See **Figure A4.2.5.8a**).

A4.4.8.4 Fire Fighting Services

Three new fire hydrant pillars are proposed to be installed along the face of Wharves 1 to 3 at even spaces. The pillars will be connected back under the wharf to the existing dedicated fire main running along the back of the wharf (see **Figure A4.2.5.8b**). Also, the current 'dead end' to the fire main at the northern end would be extended and connected to the existing fire main at the Marina.

A4.4.8.5 Sewerage Services

Although the current use of tanker trucks for sewage removal may be adequate for the future situation, the proposal is to introduce a more robust system of direct discharge into the CRC's sewerage reticulation system.

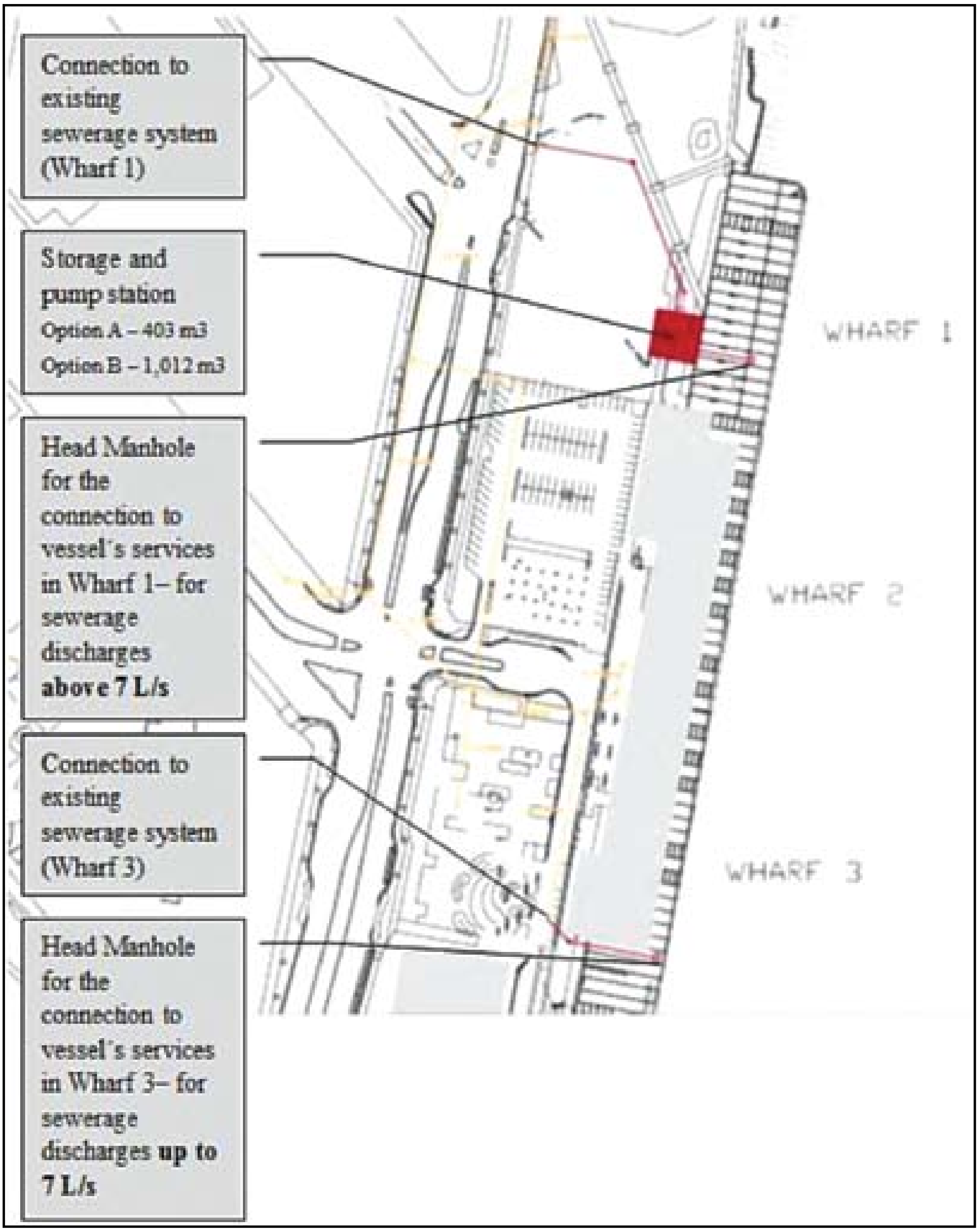
The challenge is to provide a tank which will buffer the discharge flows of large cruise ships (which can pump up to 15 litres per second [L/s]) to that of the limited capacity of council's infrastructure to accept these (which is 7L/s).

For this reason, two connections to the existing sewerage system are required:

- One connection in the Wharf 3 area which allows a discharge of up to 7 L/s (limited use to vessels that comply with the required discharge flow) into council's reticulation
- One connection in the Wharf 1 area that allows a discharge greater than 7 L/s. For this connection, a 150 millimetre (mm) diameter sewer line will discharge sewage to a storage facility and a submersible pumping station will limit the sewage discharge in the CRC's reticulation system to 7 L/s.

Figure A4.4.7.5a shows the sewerage infrastructure proposed as described above.

Figure A4.4.7.5a Proposed Sewerage Infrastructure



A4.5 Construction

Construction of the project is divided into pre-construction activities and construction activities (construction of the channel, wharf and land-side services).

A4.5.1 Pre-construction activities

The following activities must be undertaken before construction:

- Detailed design of the channel, wharf and land-side services
- Obtain all permits and approvals, as outlined in **Chapter B3**
- Construction contractor procurement
- Site mobilisation of construction equipment e.g. dredge equipment
- Implementation and monitoring of Environmental and Safety Management Plans and Procedures (see **Chapter B18, Cumulative Impacts Assessment** and **Chapter C1, Construction and Operational Environmental Management Plan**).
- Apply and obtain (if necessary pre operation) all other project permits and approvals triggered by the project. Refer **Chapter A1, Project Introduction** for more details.

A4.5.2 Channel Construction Activities

As the channel dredging is the largest construction activity associated with the project, this will occur as soon as possible after the-preconstruction phase is completed. Construction associated with the wharf and land-side services will occur simultaneously to the channel dredging. More information on the construction methodology for each of these aspects is provided below.

A4.5.2.1 Capital Dredging Works

The channel will be dredged using two types of dredging plant subject to the final option, dredge windows and methodology, and Government legislative changes. The total volume of material to be dredged is approximately 4.4 million m^3. The material to be dredged ranges from very soft clay through to stiff clays. It is the intention that dredging of both the inner port and outer channel will occur concurrently. Two methodologies were considered and modelled using two types of dredge plant to undertake the capital dredging, which is described below. For both methodologies the best likely and worst likely scenarios were modelled and the predicted impacts are described in the relevant chapters of **Part B**. Specialist advice and guidance on dredging design, logistics and management was provided by experienced Dredging Advisors, who were engaged as part of the Study Team.

Trailer Suction Hopper Dredger (TSHD)

The outer channel and parts of the inner port will be dredged using a Trailer Suction Hopper Dredge Vessel (TSHD). The seabed material to be dredged in the outer channel comprises of very soft to soft clay and firm clay suitable for a TSHD. A TSHD can also be used to dredge the firm clays in the inner port although they are more likely to be removed by a back hoe dredger.

A TSHD is a self-propelled, sea-going hydraulic dredger equipped with a hopper and dredging installations to fill and unload the hopper. The dredging takes place at the draghead on the seabed which is connected to a suction pipe to fill the hopper. Two sets of suction pipes and dragheads, one on each side of the TSHD are used when dredging. The dredging process and hopper filling takes place while the TSHD is sailing along the dredged areas. The trailing speed during dredging is in the order of 1 to 2 knots.

For the project, widening of the navigation channel requires dredging in areas as shallow as about -2m to -2.5m CD. Therefore, a shallow draft TSHD is required, which still can comparatively hold large amounts of dredged material in the hopper and have enough power to dredge the firm clay. A medium-size TSHD of hopper capacity of about 5,500m^3 with suction pipe of 1.0m diameter is proposed for the project. The loaded draft of the TSHD is in the order of 6m to 7m, therefore dredging has to be planned to commence at low tide at deeper areas and progress to shallow areas during high tide.

The dredging process of TSHD involves the following sequences:

1. Position TSHD at the dredging area
2. Lower the suction pipe with draghead at the end
3. Dredging at draghead and hopper filling simultaneously while sailing
4. When the hopper is filled to its capacity, TSHD will sail to the preferred dredge material placement area (DMPA)
5. TSHD disposes of dredge material by bottom dumping
6. TSHD sails back to the dredging area.

The TSHD will operate 24 hours per day, seven days per week with the aim of more than 90 percent efficiency. It is proposed that the TSHD will mainly operate in non-overflow mode during the capital dredging program in order to minimise the resuspension of fine sediment during dredging.

However, it is possible that constrained overflowing may be required to facilitate dredging of consolidated material. Water quality modelling of a constrained overflow scenario has been undertaken and it has been determined that this limited overflow is not predicted to result in water quality impacts that would result in unacceptable ecological impact.

The constrained overflow scenario comprises the following:

1. Soft silt and clay material - 10 minutes of overflow dredging during 50 percent of TSHD cycles.
2. Firm to stiff clays - 60 minutes of overflow dredging in areas of firm to stiff clays during TSHD

Overflow dredging in excess of this amount is unlikely to be required, however, additional mitigation and monitoring measures as outlined in subsequent sections will be employed to manage such activity and minimise potential impacts.

The average production rate with no overflow will be an estimated 120,000m^3 per week. The typical time it will take to dredge and dispose of a typical load of very soft and soft clays will be 2.65 hours, and the typical time it will take to dredge and dispose of a typical load of firm clays will be 2.25 hours. The time required to dredge and transport the firm clays is less than the very soft and soft clays as they are generally located towards the seaward end of the outer channel and hence the sailing distance to the DMPA is reduced. It is anticipated that dredging of the outer channel and part of the inner port using the TSHD will require approximately 20 weeks to completely dredge to the required design levels.

Figure A4.5.2.1a and Figure A4.5.2.1b Example of TSHD

TSHD Marieke

TSHD Capitan Nunez

Back Hoe Dredger (BHD)

The stiff and potentially the firm clays in the inner port will be dredged using a Back Hoe Dredger (BHD). Also, in addition to the firm and stiff clays, a BHD will be more efficient to dredge berth pockets, swing basins and other complex dredging areas. Therefore, a dredging fleet comprising BHD, barges and tug boats are proposed for some areas of the inner port.

A BHD is a mechanical dredger, similar to an excavator which is mounted on a barge. A BHD is a stationary dredger anchored by three spud piles. It works by dredging the seabed using the bucket at the end of the excavator arm and placing the dredged material into a hopper barge which is moored alongside for disposal at the preferred dredge material placement area.

A medium-size backhoe dredger having installed power in the order of 700 to 1,000 kW with bucket capacity of about $5m^3$ to $11m^3$ is proposed for the project. Examples of proposed BHD are shown in **Figure A4.5.2.1c** and **Figure A4.5.2.1d** The BHD will be supported by a number of hopper barges of about $1,000m^3$ capacity towed by tug boats.

The dredging process of BHD involves the following sequences:

- Position BHD at the dredging area
- Excavation using bucket fixed at the end of the excavator arm
- Load the dredged material into a hopper barge which is moored alongside the BHD
- Tug boat tows hopper barge when it is full to the preferred marine dredge material placement area
- Hopper barge disposes of dredge material by splitting the hopper or through bottom doors which is also called bottom dumping
- Tug boat tow hopper barge back to the BHD.

The BHD will operate concurrently to the TSHD. Production rates in the stiff clay will be between $17,000-20,000m^3$ per week. The BHD will operate 24 hours a day, seven days per week with 60 percent efficiency. This will result in the BHD operating for approximately 100 hours per week. The typical total time to dredge and dispose of net load of $900m^3$ of sediment will be nine hours. Based on these production rates it is expected the BHD campaign will be 23 weeks.

Figure A4.5.2.1c and Figure A4.5.2.1d Examples of BHD

BHD Machiavelli

BHD Jerommeke

Modelled Dredging Scenarios

Two capital dredging scenarios were modelled to predict the water quality impacts as follows:

- TSHD dredging of all very soft, soft and firm clay material in the outer channel and BHD dredging of all inner port areas. The total in-situ volume removed by the TSHD in this scenario is $3,585,542m^3$, with the remaining $764,074m^3$ of inner port material accounted for by the BHD. The duration of TSHD dredging would be approximately 18 weeks (not including mobilisation and demobilisation) while the BHD component would actively dredge for approximately 34 weeks
- TSHD dredging of all very soft, soft and firm clay material in the outer channel and inner port areas, and BHD dredging of the stiff material only in the inner port. The total in-situ volume removed by the TSHD in this scenario is $4,030,000m^3$, with the remaining $319,000m^3$ of stiff clay accounted for by the BHD. The duration of TSHD dredging would be approximately 21 weeks (not including mobilisation and demobilisation) while the BHD component would actively dredge for approximately 19 weeks.

The actual dredging program will be established following detailed geotechnical investigations to clearly define the extent and classification of the dredge material, following assessment of the dredging plant capability and subject to Government legislative changes. However, it is expected that the final dredging program will be nearer to the second scenario and will involve a TSHD for around 21 weeks and a BHD for around 23 weeks, i.e. the overall dredging program of 23 weeks.

Both scenarios have been modelled using a best likely case of no overflow and a worst likely case of constrained overflow as described above.

A4.6 Dredge Material Placement Area (DMPA) Selection

As part of the EIS assessment, a study was carried out to identify and assess land based and marine based options with the outcome of determining a preferred DMPA site to bring to full assessment. **Chapter A1** describes alternative methodologies considered to achieve the project objectives and provides an overview of the process employed to consider the appropriateness of a land based placement site. The appropriateness assessment considered potential environmental impacts, potential human health impacts and cost disproportionately. **Chapters A2** and **A3** describe in detail the assessment undertaken to identify a suitable DMPA.

The DMPA study considered the appropriateness of a land placement site at East Trinity and concluded that it is not appropriate in terms of its potential environmental, planning, engineering and socio-economics impacts. It also identified potentially significant human health and safety impacts with the East Trinity land placement and that it is significantly cost disproportional compared to marine placement. Therefore the EIS has considered marine placement as the preferred option and assesses the environmental impact in accordance with the requirements of the Queensland Government TOR and the Federal Government EIS Guidelines. Justification for this conclusion is provided in **Chapter A3, Appropriateness of Preferred Land Placement Site at East Trinity**. **Chapter A3** also provides commentary on the emerging issues related to Port development and dredging that could lead to a change in the assessment processes for capital dredging. A number of key environmental reports, Port project announcements, environmental and costs considerations could, in the future, open the opportunity to reframe the criteria for assessing the acceptability of undue risk to human health or the environment or disproportionate costs that is included in the appropriateness test in the NAGD. If this does occur, particularly around the measure of cost disproportionality, then it provides an opportunity for further examination of East Trinity as a fill placement site option. Therefore, **Part D** of this EIS provides a preliminary assessment of the identified preferred land placement option East Trinity and considers what additional studies would be required in order to address the TOR and EIS Guidelines.

Part B and **C** of this EIS assesses a new marine based DMPA which has been identified to accommodate both the capital dredging volume and ongoing maintenance dredging campaigns addressing the State Terms of Reference and the Commonwealths EIS Guidelines. Modelling and assessment of the new DMPA has found the site to be more retentive than the existing DMPA and to be 'like for like' in terms of its substrate and the material to be deposited. Once the new DMPA is approved, permitted and operational the existing DMPA will be retired.

A4.7 Dredging

A4.7.1 Dredge Technology Constraints

The methodology proposed for the capital dredging campaign utilises two types of dredging plant as described in **Section A4.5.2.1 Capital Dredging Works**. During the detailed design and procurement it may be possible that different sized plant will be selected to undertake the capital dredging campaign. If a significantly different capacity vessel is selected, then additional simulation modelling will be carried out to illustrate and ensure that no greater environmental impact results than that proposed by this EIS.

A4.7.2 Scheduling

The estimated duration for the capital dredging campaign is 23 weeks with a further 12 weeks for mobilisation. The capital dredging campaign is program to occur in 2017.

A4.7.3 Work Hours

The capital dredging works will occur 24 hours per day, seven days per week over the capital dredging campaign.

A4.7.4 Workforce

The estimated workforce required during the dredging program is outlined in **Table A4.7.4a**

Table A4.7.4a: Dredging Workforce.

Dredge Machinery	Staffing
Trailer Dredge	24
Survey Boat	4
Backhoe Dredge	8
Tug	8
Total	44

A4.7.5 Dredge Disposal

A4.7.5.1 Characteristics of the Spoil

The material to be dredged consists of very soft, soft, firm and stiff clays. There is little or no sand material expected to be dredged and if any sand is present it would be expected to be mixed in with the silt/clay or in very thin layers. The fines content in the dredge material is expected to be greater than 90 percent (< 75 µm). The depth of different classifications of material varies across the channel profile.

The characterisation of the physical and chemical properties of proposed dredged sediment was undertaken in accordance with a Sampling and Analysis Plan (SAP) prepared in accordance with requirements set out in the National Assessment Guidelines for Dredging (NAGD) and approved by the Great Barrier Reef Marine Park Authority (GBRMPA). Initial sampling took place in October 2013. Further grab samples were retrieved in November 2013. A supplementary SAP was undertaken in June 2014.

A total of 44 locations (14 inner port and 30 outer channel) were sampled using piston and vibrocoring with supporting grab sampling in accordance with the SAP and NAGD requirements.

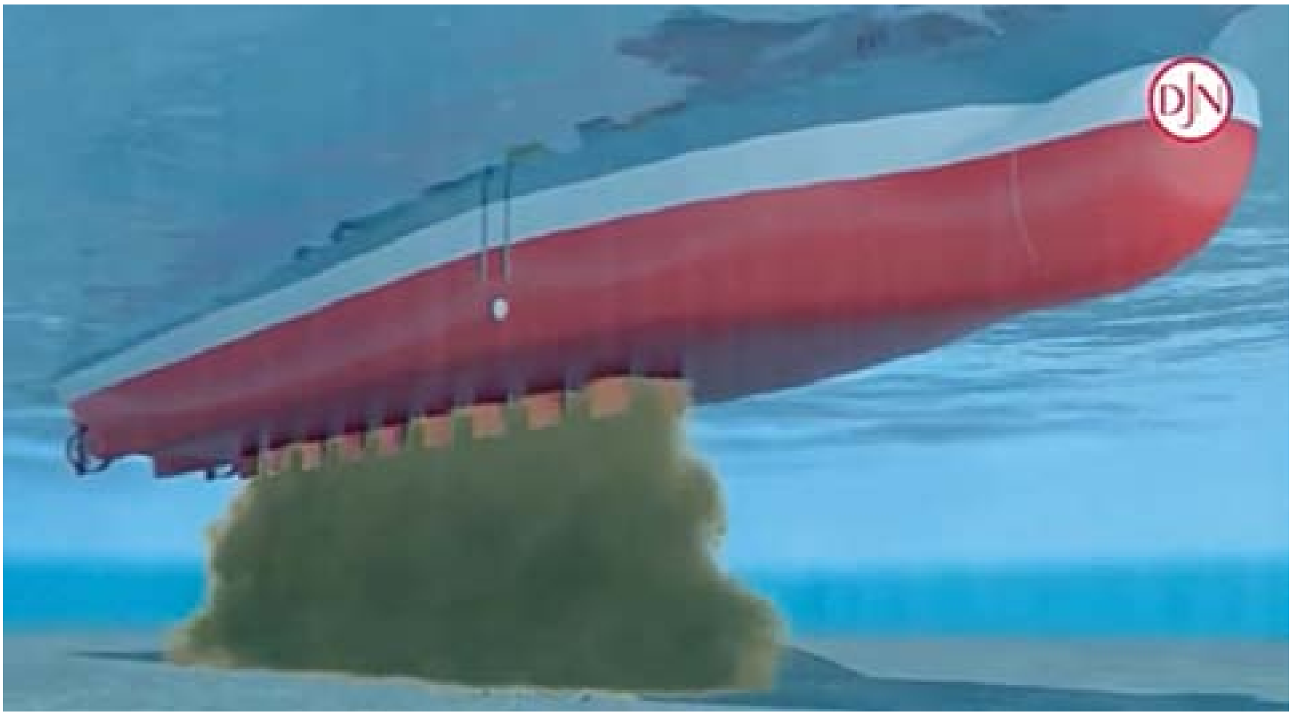
The sediments in both the inner port and outer channel were found suitable for ocean disposal in accordance with the NAGD.

Chapter B4, Marine Sediment Quality details the sediment sampling undertaken and provides a commentary of the physical and chemical characteristics of the dredge material.

A4.7.5.2 Disposal Method

Material dredged during the capital dredging campaign will be disposed of at the preferred DMPA site (Option 1A), subject to Government legislative changes. Material will be released from the bottom of the TSHD hopper and from the BHD hopper respectively. Losses will occur during placement of the sediment. For modelling purposes it is predicted that there is maximum of 10 percent primary losses (i.e. sediment that is lost in the water column while being released) outlined in **Chapter B3, Coastal Processes**. In addition re-suspension of fine sediment will occur when the material drops on the DMPA. The levels and movement of re-suspension depend on current and tidal conditions. Three-D modelling of the dredging and DMPA disposal has been carried out in order to quantify maximum potential losses from the inner port and outer channel and DMPA. The modelling results will inform the reactive monitoring plan (**Chapter C2, Dredge Management Plan**) which will be employed during the capital dredging campaign. The reactive monitoring plan will set trigger levels for turbidity which if exceeded at a particular location will result in either the TSHD or BHD being moved or dredging being suspended for a set period of time until turbidity levels return to an acceptable level. Refer **Chapter B5, Marine Water Quality**.

Figure A4.7.5.5a TSHD Bottom Dumping (Courtesy of JDN)



A4.7.6 Marine Construction Vessels

The use of marine equipment will generate vessel traffic during dredging and wharf upgrade works. A Vessel Traffic Management Plan (Construction) will be implemented to manage risks, while maintaining safe navigation, support efficient port operations and reduce disruption to other vessel traffic and shipping activities.

The capital dredging works will require the deployment of a number of marine construction vessels. The likely marine vessels required are shown in **Table A4.7.6a**.

Table A4.7.6a Marine Construction Vessels for Dredging Works.

Dredging Fleet	Construction Activity	Location
Main Vessels		
1 x Medium BHD 2 x self-propelled hopper barges or 2 x hopper barges plus 1 tug boats	Dredge firm and stiff clay.	Inner harbour and preferred DMPA
1 x Medium TSHD	Dredge very soft to soft clay and firm clay.	Outer channel and part of inner harbour and preferred DMPA
Ancillary Vessels		
1 x Survey boat	Hydrographic surveys.	All dredging areas and preferred DMPA.
1 x Work boat	Support for all vessels.	All dredging areas.

A4.7.6.1 Navigation Aids and Wharf Upgrade Works

The installation or removal of navigation aids and the piling associated with the wharf upgrade will require the use of marine construction vessels.

The likely marine vessels required are:

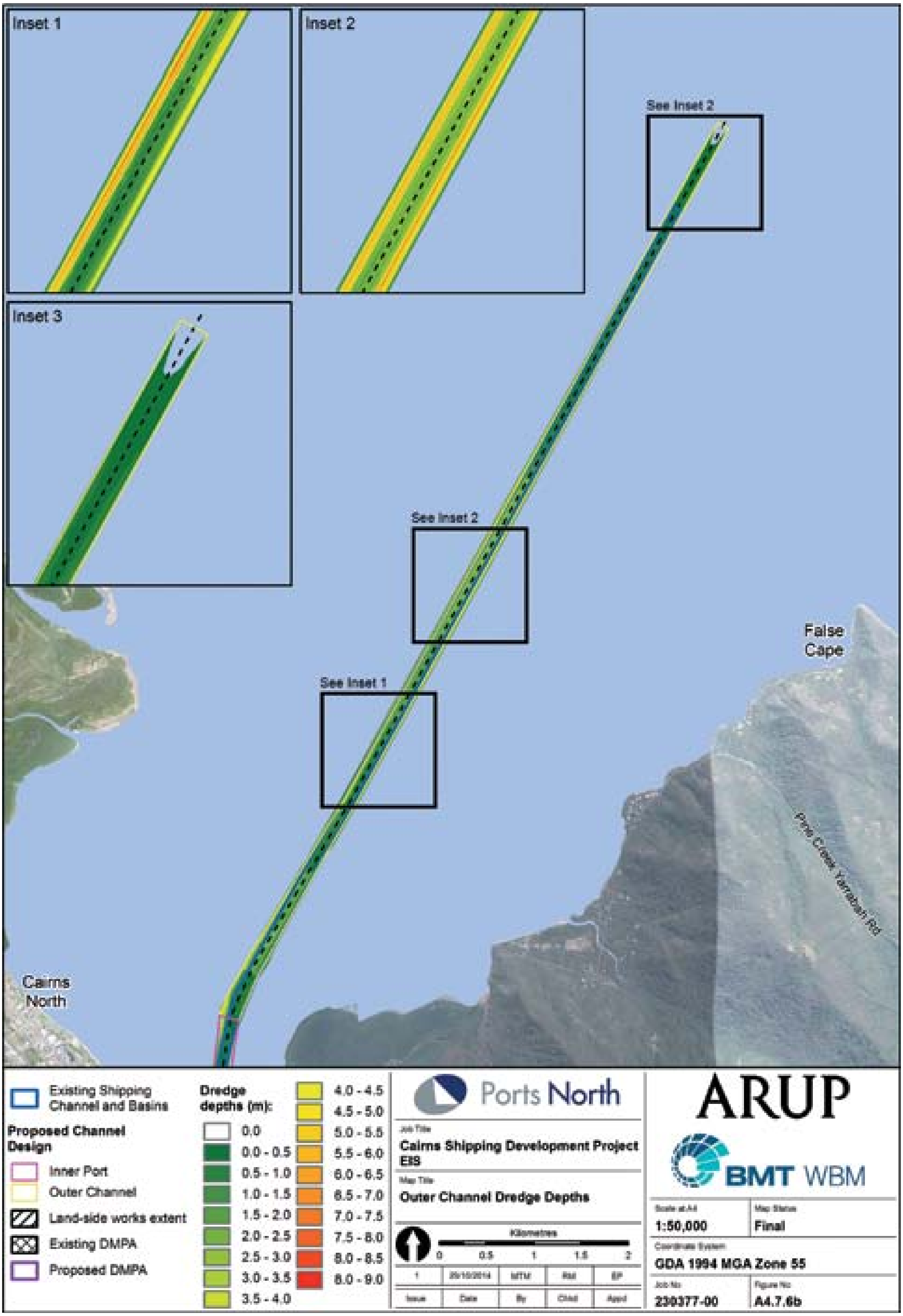
Table A4.7.6b Typical Vessels for Navigation Aids and Wharf Upgrade Works

Primary	Construction Activity	Location
Main Vessels		
1 x Piling barge	Pile driving (or removal) for navigation aids and wharf upgrade.	Navigation aids and wharf area.
1 x Work / supply barge	Delivery of pile and general construction support	Navigation aids and wharf area.
Ancillary Vessels		**Ancillary Vessels**
1 x Small tug / work boat	Support for piling barge and work/supply barge.	Navigation aids and wharf area.
1 x Crew boat	Transfer of construction workers from barges to landing point.	Navigation aids and wharf area, crew landing point.

includes time for mobilisation and demobilisation

Figure A4.7.6a Dredge Depths (Inner Harbour)

Figure A4.7.6b Channel Dredge Depths (Outer Channel)



A4.8 Wharf Upgrade Construction

The works for the installation of each berthing structure will include:

- Removal of the existing concrete beam/deck for an area of approximately four by seven metres ($28m^2$)
- Installation of four racking steel piles. It is likely that the piles will be driven by a piling rig with crane and hammer from a barge
- If required, a drilling rig on the barge will be used for rock sockets. It has been assumed that one socket will be required per dolphin. The most seaward pile is assumed to require a socket to resist tension due to berthing forces. The drilling will be undertaken from a barge and all other socketing works including placement of a reinforcement cage and concreting will be undertaken using land-based equipment
- Installation of an in-situ reinforced concrete pile cap with the surface flush with the existing deck level. The pile cap will be connected to the existing deck through expansion joints (such as sliding steel plates) to eliminate any load transfer. It is envisaged that the berthing structures will be constructed using land-based equipment except for the northern structure, which will be constructed from a barge
- Installation of a mooring bollard at one metre from the front edge of the concrete pile cap
- Installation of a ‘Supercone’ fender system (boat bumpers) at each new location (one every five piles).

The works will comprise 21 independent berthing structures in total. Each structure (Dolphin) has four legs; thus, 84 piles will be required during construction.

Construction equipment required includes:

- Mobile crane (approx. 35T – 80T)
- Franna crane (approx. 20T)
- Concrete pump truck
- Site office, crib hut and equipment lockup
- Power generators
- Approximately seven concrete trucks per berthing structure for in situ concrete pours.

A4.9 Land-side Infrastructure Construction

A4.9.1 IFO

The proposed IFO facilities within the fuel farm are likely to consist of the following elements:

- 1 x 7500T steel welded storage tank
- 50 x 50m concrete spill containment bund
- IFO delivery pump station
- Wharf 3 pipe and fittings storage facilities
- Oil containment boom facilities, land-side spill containment equipment
- IFO feed pipeline of approximately one km in length
- Fire services upgrades.

Construction equipment required for the construction of IFO infrastructure includes:

- 20T hydraulic excavators
- Rigid dump trucks
- Mobile crane (approx. 35T – 80T)
- Franna crane (approx. 20T)
- Site office, crib hut and equipment lockup

- Power generators
- Mobile welding equipment.

As part of the handover of newly constructed infrastructure, a quality assessment will be undertaken in line with the Contractor contractual requirements. Infrastructure will be integrity tested as appropriate to meet appropriate industry standards.

The IFO pipeline is proposed to cross the North Coast rail Line. The detailed design, construction and operation of the IFO pipeline crossing of the rail line will be undertaken in consultation with and approval from the appropriate authority (QR/TMR). No impact upon the operation of the rail line is envisaged.

A4.9.2 Sewerage

The proposed sewerage infrastructure is expected to be buried flexible pipelines. These would be installed via trenching and piping construction methods.

The proposed sewerage facilities will likely consist of the following:

- 200-300m pipeline and manhole
- Sewer pump station and underground storage tank
- Odour control system.

Construction equipment required for construction includes:

- 20T hydraulic excavators
- Rigid dump trucks
- Franna crane (approx. 20T)
- Concrete trucks
- Concrete placement boom truck
- Site office, crib hut and equipment lockup.

As part of the handover of newly constructed infrastructure, a quality assessment will be undertaken in line with the Contractor contractual requirements. Infrastructure will be integrity tested as appropriate to meet appropriate industry standards.

A4.9.3 Potable Water

The existing potable water pipeline along the face of Wharves 1 and 5 would be replaced due to the wharf structural upgrade (See **Figure A4.2.5.8a**). Installation of new water pipe infrastructure along the wharf would require the use of either marine work platform vessels or suspended safe working platforms.

Land-side heavy equipment required includes:

- Franna Crane
- Site office, crib hut and equipment lockup.

As part of the handover of newly constructed infrastructure, a quality assessment will be undertaken in line with the Contractor contractual requirements. Infrastructure will be integrity tested as appropriate to meet appropriate industry standards.

A4.9.4 Fire Fighting Services

Land-side heavy equipment required for construction is likely to include:

- 20T hydraulic excavators
- Rigid dump trucks
- Site office, crib hut and equipment lockup.

As part of the handover of newly constructed infrastructure, a quality assessment will be undertaken in line with the Contractor contractual requirements. Infrastructure will be integrity tested as appropriate to meet appropriate industry standards.

A4.10 Construction Transport, Access Routes and Storage

The main construction activity will be the offshore capital dredging campaign which will not generate significant construction traffic. Construction associated with the wharf and land-side services will occur simultaneously to the channel dredging. Installation of piles will be undertaken from a barge. It is envisaged that the berthing structures will be constructed using land-based equipment except for the northern structure, which will be constructed from a barge.

The construction period for the wharf upgrade will be approximately seven to eight months. The average construction time will be three days per berthing structure resulting in on average three concrete truck deliveries per day.

Landside infrastructure works (IFO, sewerage, potable water and firefighting services upgrade) are expected to take approximately eight to 10 months and will be undertaken simultaneously with the wharf upgrade. It is expected that approximately four rigid dump trucks/concrete trucks will be required per day for the construction of the land-side infrastructure upgrades.

A4.11 Transport and Vehicle Movements

A4.11.1 Passenger Vehicles

It is predicted that the wharf upgrade and the landside construction works will involve approximately 60 passenger vehicle trips/day travelling to/from the project during construction.

A4.11.2 Construction Vehicles

It is predicted that seven dump/concrete trucks can be expected to travel to/from the CSDP daily during construction.

A4.11.3 Railway Line

No impact on the operation of the North Coast rail Line is anticipated due to construction of the CSDP.

A4.12 Site Access

All vehicles will access the site from the southern intersection and will turn north on to the wharf. A contractor’s construction compound will be provided to the south of the White Shed. When ships are docked in port, general public access is restricted through vehicle barriers.

A4.13 Construction Timing

The capital dredging works will take approximately 23 weeks. Dredging will occur 24 hours per day, seven days per week for the duration of the campaign.

The construction period for the wharf upgrade will be approximately seven to eight months. An allowance of two to three weeks has been made for contingencies such as crane, piling hammer or drill breakdown, in addition to three weeks mobilisation and de-mobilisation.

Other land-side infrastructure works are expected to take approximately eight to 10 months and will be undertake simultaneously with the wharf upgrade.

Land-side construction will operate to normal construction hours of 6:30am to 6:30pm Monday to Saturday. No piling work will be undertaken on Sundays to abide by noise restrictions; however, some other construction activities that do not generate significant noise may continue on Sundays.

A4.14 Construction Personnel

The workforce required to complete the wharf upgrade is estimated at approximately 30 personnel (full-time equivalent) and may vary depending on how many work fronts are engaged and the program of works. Land-side infrastructure works are estimated to require approximately 60 personnel (full-time equivalent). Capital dredging activities will result in approximately 44 personnel (full-time equivalent) working on a shift basis over a 24-hour period. Therefore, the total construction workforce is estimated at 134 personnel.

A4.15 Construction Cost

The estimated cost of the project based on the Concept Design outlined in **Section 4.4 Proposed Infrastructure** is approximately $102m. The cost of dredging is estimated to be $59 million and the landside infrastructure will cost $11.8m. Other projects costs include design, project management and other professional fees and an allowance for ongoing monitoring and offsets.

A4.16 Operational Activities

The project is expected to be operational by the end of 2017.

Currently, the number of large-size cruise ships that visit Cairns is approximately 32 ships per year (noting almost all of these vessels must moor at Yorkeys Knob due to their size and channel restrictions). As described earlier in this chapter on completion of the channel and wharf upgrades the total demand for Cairns Port will be 110 ships by 2026 (including 63 mega class) compared to a demand of 79 ships without any improvement of infrastructure (of which 32 mega class will be moored at Yorkeys Knob), refer **Chapter A1, Project Introduction**. The channel currently requires annual maintenance dredging with all material placed at the existing DMPA. Maintenance will continue to be required for the widened and deepened channel. This is further discussed below.

Future operating hours for the Port of Cairns will be similar to current arrangements, with vessels having 24 hour access to essential services.

As a result of the project, additional staff are likely to be required for the delivery of services such as providoring, fuelling, custom and quarantine, security and operations of CCLT.

A4.17 Maintenance Dredging

In order to retain the depths achieved during the capital dredging campaign, regular maintenance dredging will be required. As discussed in **Section A4.2.4 Historical and Current Maintenance Dredging of Trinity Inlet**, maintenance dredging has always been required at the Port of Cairns to retain its functionality.

The annual maintenance dredging volume of the outer channel will increase by approximately 30 percent. This will result in the dredging and disposal of approximately 450,000m^3 per annum, inclusive of the current maintenance amount. The siltation material is expected to be soft and fluid and will be easily removed by means of trailing suction or grab dredge. It is envisaged that future maintenance dredging will be carried out using the Port of Brisbane Ltd's TSHD (or similar) which is currently used for the maintenance dredging works.

It is proposed the preferred DMPA is used for ongoing maintenance dredge disposal and that the existing DMPA is no longer used. A separate Sea Dumping Permit and Long Term Management Plan for maintenance dredging activities will be required under the *Environmental Protection (Sea Dumping) Act 1981*.

A4.18 Other Maintenance

Maintenance of land-side infrastructure and wharf facilities will be undertaken as required, and in line with relevant maintenance plans established for Ports North's existing operations.

A4.19 Operating Life and Decommissioning

It is assumed that the channel will be used indefinitely into the future, unless it is no longer required, or there is no longer capacity to maintain the channel. As such, active decommissioning of the channel is not expected to occur in the timeframe of the project.

The DMPA has been designed to have a design life of 25 years. The capacity of the DMPA will be assessed as part of Ports North's normal operations and permit requirements. After 25 years the remaining capacity will be determined and if insufficient capacity remains the DMPA will be decommissioned. Any rehabilitation identified at that time will be carried out on the DMPA as necessary.

Current plans in the City Port Local Area Plan (Cairns Port Authority, 2006) intend for the Port of Cairns to be developed to support the CCLT. There are no plans beyond the project's current planned operational period. Decommissioning of land-side infrastructure and the wharf structure will be assessed in the future, when it is required.

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