FLANAGAN CONSULTING GROUP
Trusted Advisor to Northern Australia

Ports North

CAIRNS SHIPPING DEVELOPMENT PROJECT

Revised Draft Environmental Impact Statement

Chapter C1: Construction Environmental Management Plan

TABLE OF CONTENTS

List of Figures

List of Tables

C1.1 Purpose

This document draws from the mitigation and monitoring recommendations provided within each of the preceding chapters of the EIS. The broad purpose of this Construction Environmental Management Plan (CEMP) is to achieve the following:

- provide practical and achievable strategies and plans for complying with environmental requirements
- demonstrate compliance with relevant legislative obligations
- outline performance criteria to be met by the Project
- provide evidence to stakeholders and the community that construction and operation of the Project will be managed in an environmentally and socially responsible manner
- specify roles and responsibilities, monitoring regimes and corrective actions.

It is a framework document that will be used to guide detailed design, site establishment and construction stages of the Project. For a description of the activities to be undertaken in each of these stages, refer to **Chapter A3** (Project Description).

C1.2 Scope

This document applies only to land-based construction activities at Northern Sands and Tingira Street DMPAs (**Figure C1-1**), Wharves 1-5 upgrade (including Wharf 6 demolition) and landside services installation works. Separate construction phase environmental controls are detailed in **Chapter C2** (Dredge Management Plan), **Chapter C3** (Vessel Traffic Management Plan) and **Chapter C4** (Maritime Operations Management Plan). **Chapter C2** (Dredge Management Plan) addresses environmental management of dredging (including pump out, pipeline) and land placement of the soft clay and stiff clay at the Northern Sands DMPA and Tingira Street DMPA respectively, including construction and decommissioning of the Northern Sands DMPA delivery and tailwater pipelines.

This CEMP addresses the environmental management of construction works for the DMPAs and post placement aspects up to the Northern Sands DMPA bund removal stage and final profiling of the Tingira Street DMPA. Environmental management of the Northern Sands DMPA after this time becomes the responsibility of Northern Sands in accordance with a commercial agreement to be developed during the detailed design and contractor procurement phase. Ports North will have ongoing responsibility for the Tingira Street DMPA.

Whilst this document has been prepared for EIS purposes, a more detailed and specific CEMP is to be prepared by the appointed construction contractor(s). The CEMP will be regularly reviewed and updated during construction either on a monthly basis, or when there is an incident or a change in scope.

The document contains strategies, guidance and commitments to monitoring and other environmental management measures that will be required to be carried through into more detailed approvals (such as operational works approvals under the *Planning Act 2016*, an environmental authority for dredging under the *Environmental Protection Act 1994*) and by the future dredge contractor(s) for the works as part of the Contractor Environmental Management Plans.

Ports North's existing Environmental Management System will be reviewed and updated to address any additional environmental management requirements outlined in this document.

It should be recognised that compliance with the requirements of this CEMP does not remove general obligations and responsibilities under relevant legislation or for approvals or permits that will need to be obtained in the future in order to carry out the works.

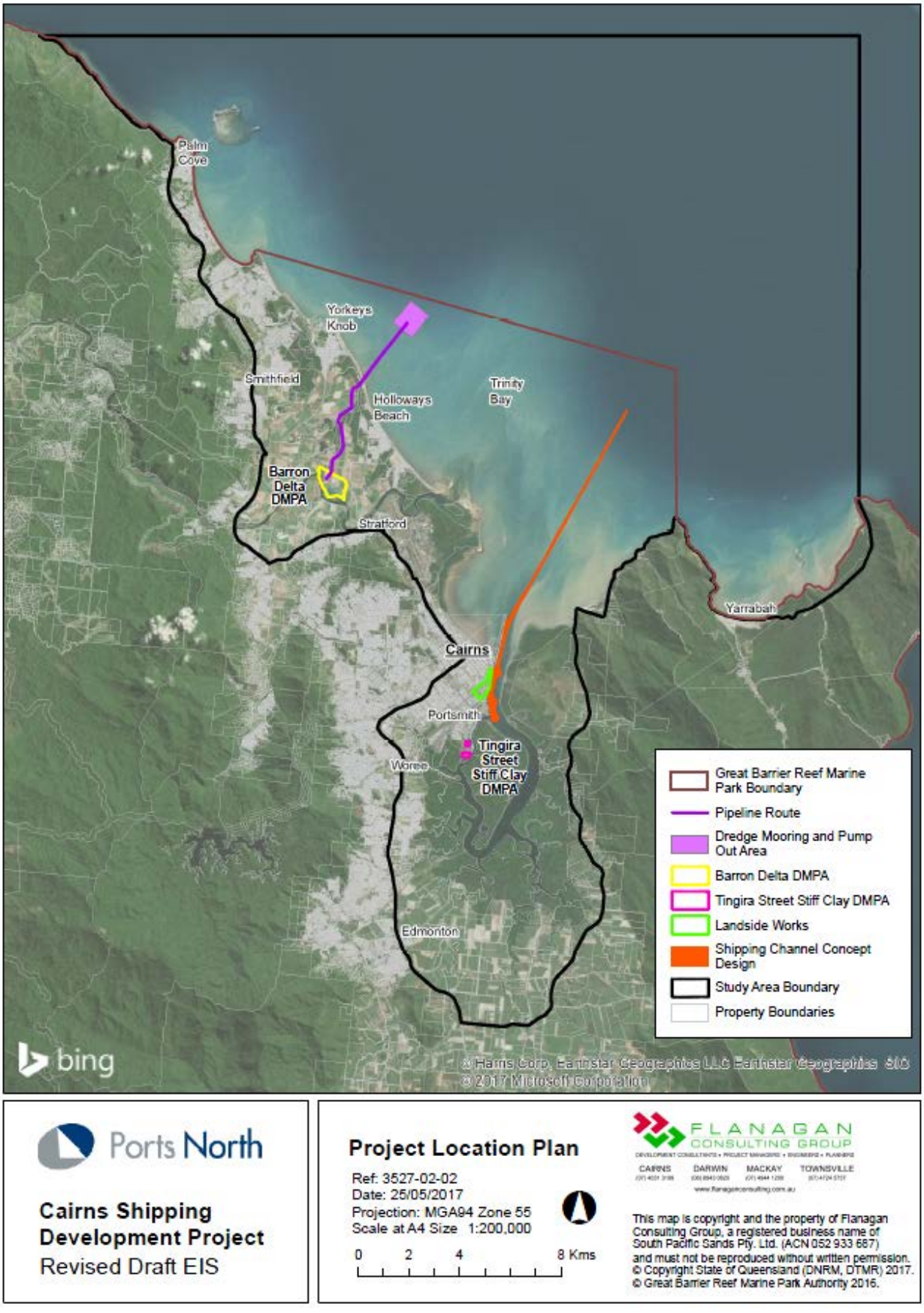

Figure C1-1 Project Location Plan,

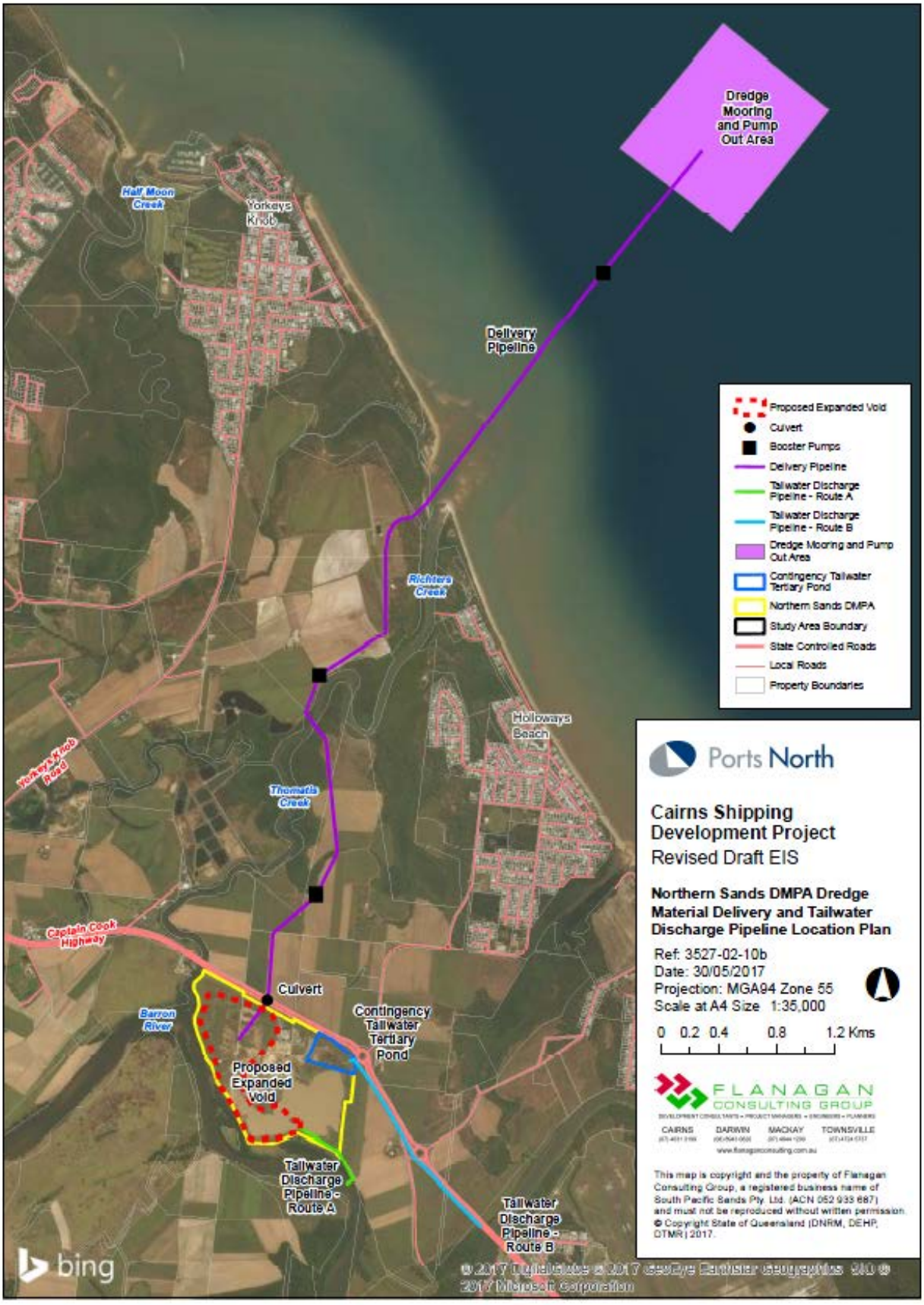

Figure C1-2 Northern Sands DMPA and pipeline layout.

The configuration of the Tingira Street DMPA is shown on **Figure C1-3**.

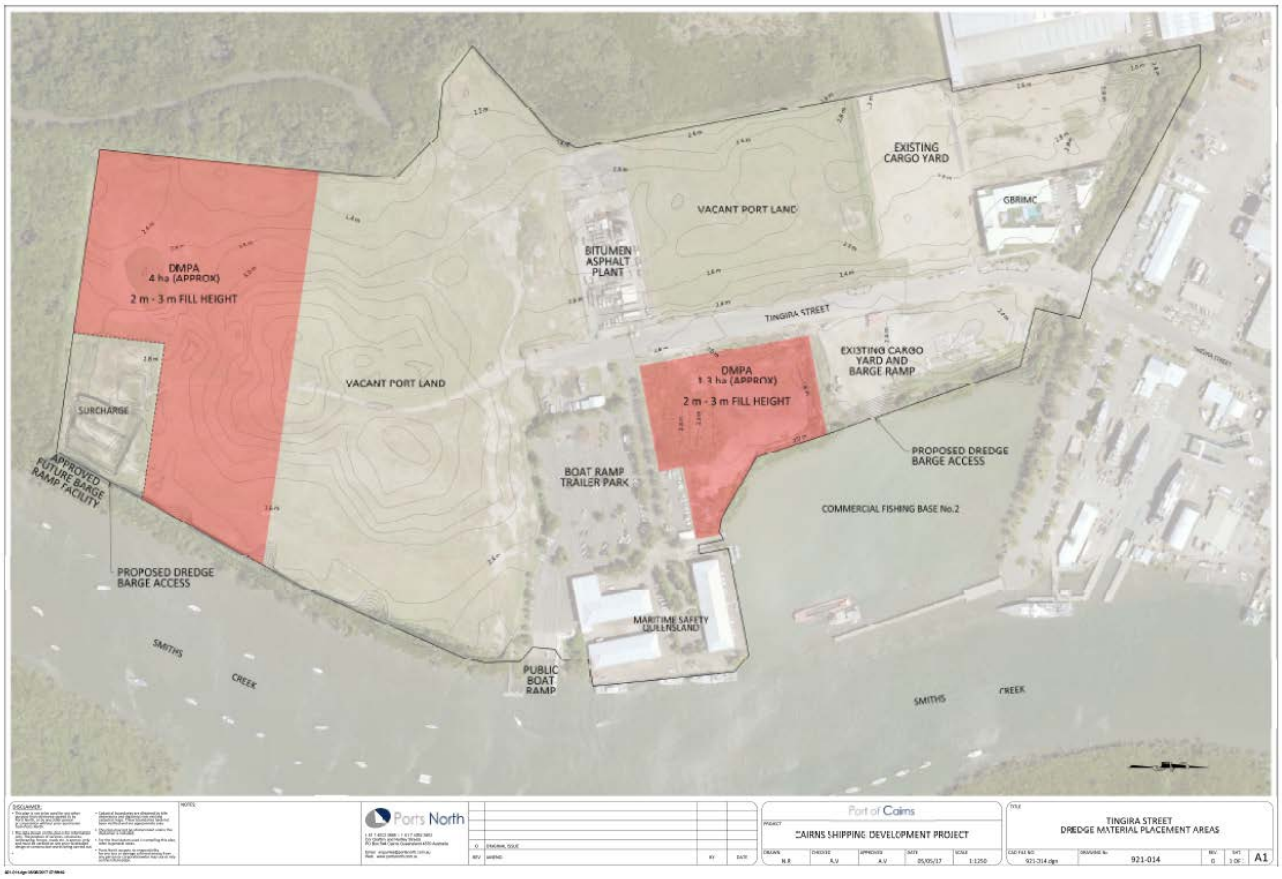

Figure C1-3 Tingira Street DMPA layout.

C1.3 Project Description

The following description of construction of project elements should be taken as preliminary and subject to amendment during the detailed design, approvals and contractor procurement phase.

C1.3.1 Northern Sands DMPA

The delivery pipeline will cross the Captain Cook Highway via existing drainage culverts before entering the Northern Sands site for delivery of dredged materials into the bunded DMPA.

The concept design for the Barron Delta DMPA is described in **Chapter A3** (Project Description). The operation will consist of underwater placement of soft clay dredge material within the existing water filled quarry void, which will be bunded to 7.5 m Australian Height Datum (AHD) and enlarged to the north as part of future 'business as usual' quarry expansion plans, forming a total bunded placement area of 30 ha (**Figure C1-4**). The perimeter level of the existing void is approximately 3.5 m AHD therefore bund height will be up to 4 m above ground (**Figure C1-5**). The DMPA operations will be separated from ongoing sand extraction and construction and demolition waste disposal by a temporary soil lined rock wall, which may be removed at completion of the CSDP project at the owner's discretion.

The Barron River DMPA (at Northern Sands) will consist of the following elements:

- facility capacity required during placement is up to 3 000 000 m^3 (including 2 600 000 m^3 ' bulked up' dredge material and 400 000 m^3 processing water) based on an insitu dredge material volume of up to 900 000 m^3 consisting of 450 000 m^3 potential acid sulfate soil (PASS) and 580 000 m^3 self-neutralizing PASS (SNP)and a conservative bulking factor of up to 2.9
- material is expected to further consolidate with time to approximately 1 700 000 m^3 (with additional void shaping, estimated final settled bed level at approximately 0.0 m AHD approx.)
- temporary perimeter bunding to at least 100-year flood immunity (Q100) plus freeboard (6.0-7.5 m AHD), which will minimise risk of sediment remobilisation in the event of event exceedance
- water volume above 6.0 m AHD approx. 350 000 m^3 (allowing 300mm free board from top of bund)
- soil/rock wall at Reedy/Snake island to separate DMPA from southern sand pit
- dredged material will be delivered into the DMPA as a slurry of approximately 1:6 (solid:water ratio) through the dredged material pipeline in approximately five pulses per 24 hr period
- an adjustable weir (e.g. drop-board weir box) will be used to control supernatant water levels and to pass it into a final pumping pond prior to its release as tailwater. The weir box typically has boards that can be added or remove to set the height of the overflow (and hence water levels) inside the DMPA and is used to control tailwater quality
- a temporary 9 ha tailwater treatment pond may also be constructed on site depending on the outcome of further detailed design phase considerations
- tailwater is proposed to be discharged via pumping to an outfall in the Barron River, preferably under the Captain Cook Highway bridge.

C1.3.1.a Northern Sands DMPA Construction

Bunding will be constructed using insitu soils borrowed from the northern 'business as usual' resource expansion area, which will be designed and placed under RPEQ supervision in accordance with detailed engineering design and Environmental Authority conditions. The design phase will include further geotechnical assessment of ground conditions of the bund footprint site to investigate presence of any preferential flow paths in the surface soils and assessment of suitability of borrow soils and construction specifications. Bunding construction will be undertaken in late 2017 to early 2018, subject to project approval by the existing site owner/operator utilising largely plant and materials on the site and in accordance with existing site Environmental Authorities and permits

Following the completion of placement activity and subsequent material settlement, the containment bund will be fully or partially lowered to a height such that at least 1.7 m of water will be maintained over the surface of

the material to prevent resuspension should flooding occur during the subsequent wet season following the works. It is expected that the bunds will be lowered to a minimum height of 5.8 m AHD (Q100 level) over the next 12 months and following further consolidation, bunds will be removed as the material will not resuspend.

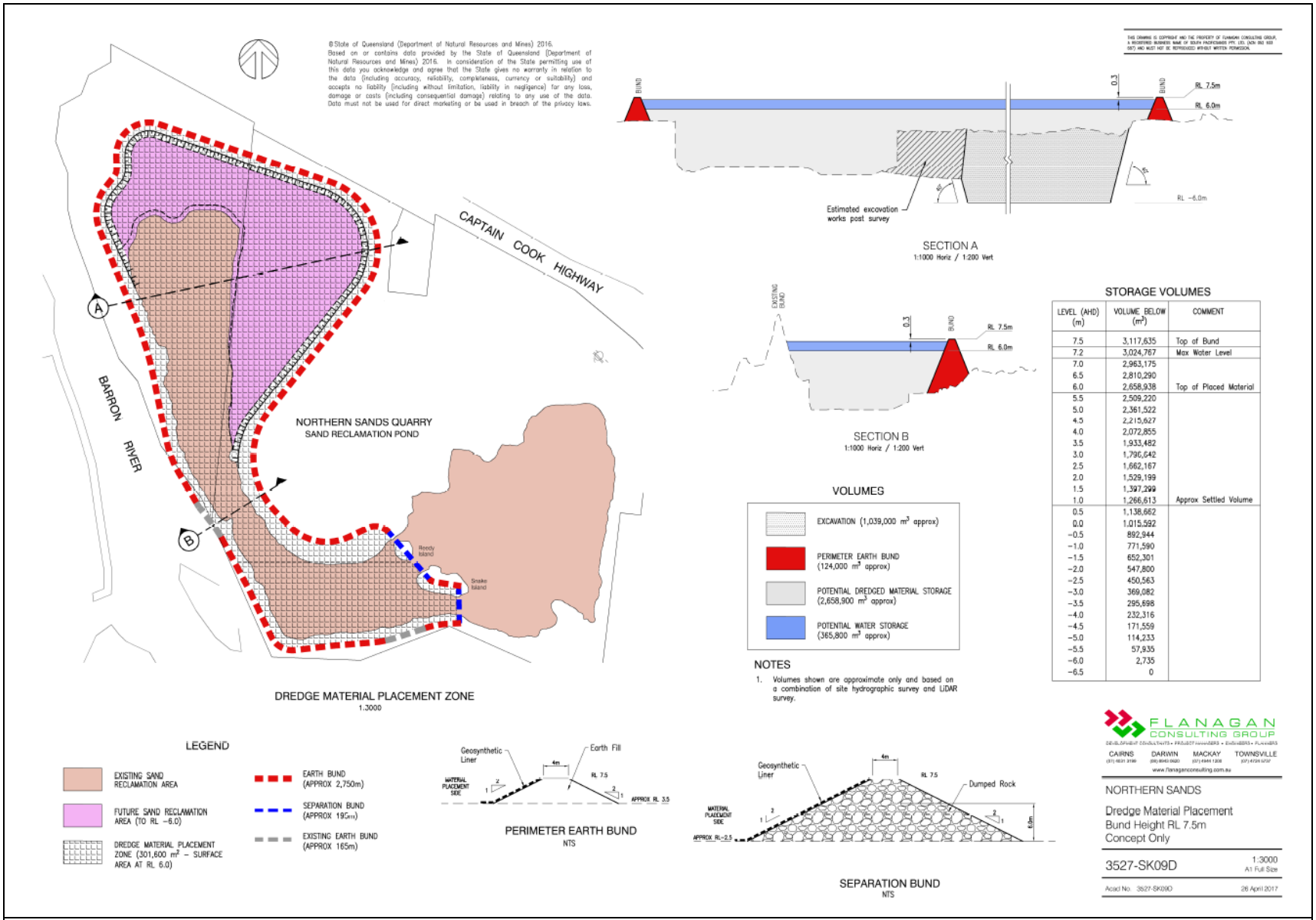

Figure C1-4 Northern Sands DMPA.

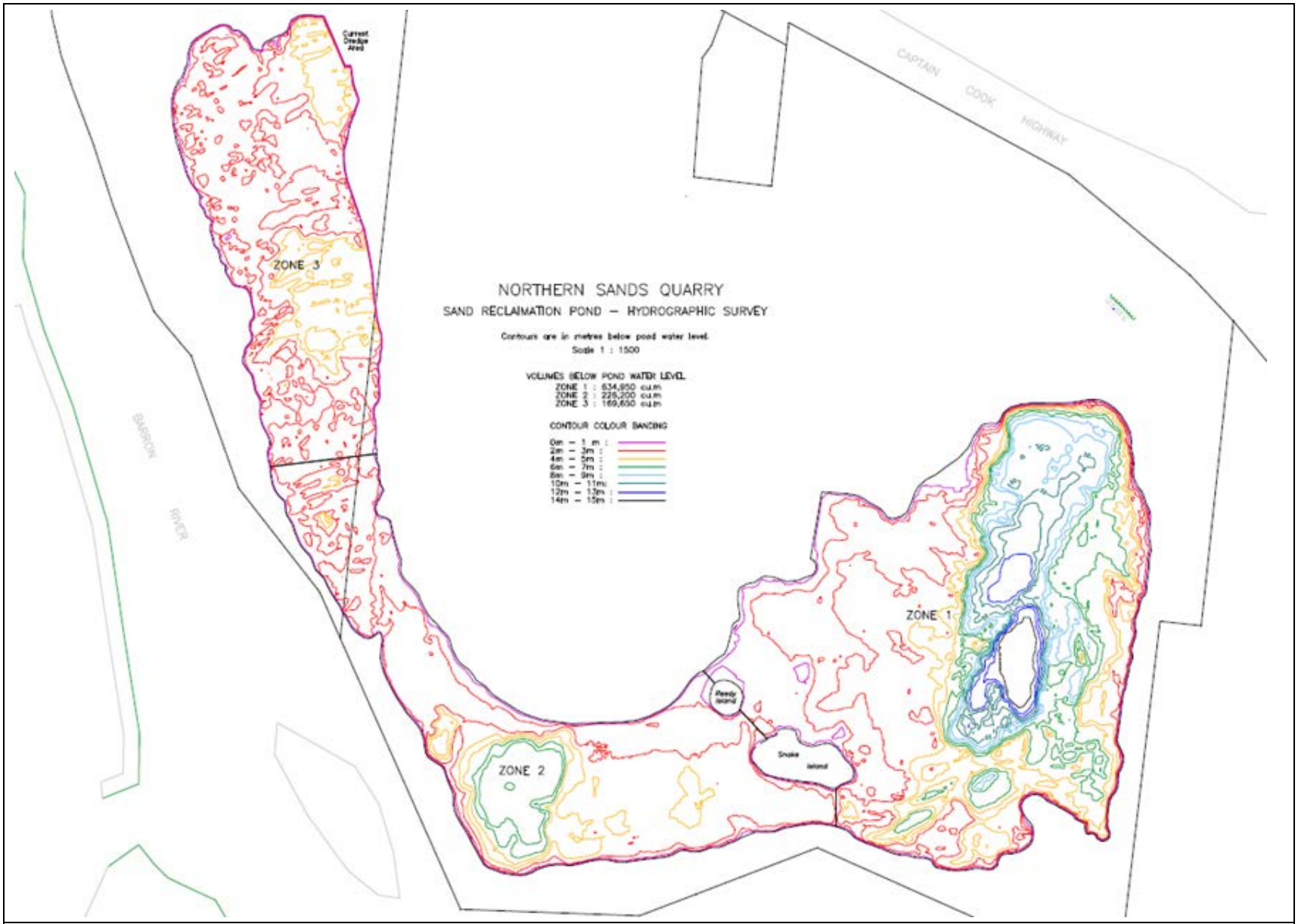

Figure C1-5 Northern Sands void levels.

C1.3.2 Tingira Street DMPA

C1.3.2.a Overview

The Tingira Street DMPA is described in **Chapter A3** (Project Description). The DMPA at Tingira Street is identified in Ports North Land Use Plan as an industrial hardstand. Its use as a DMPA will mean that the placed stiff clay will provide fill as well as surcharge required to accelerate the settlement of the land and thereby bring forward the site development. Once the placement campaign is completed, site development is likely to proceed as a project, or series of site developments, unrelated to the CSDP.

The total area of the DMPA is approximately 53 000 m^2 indicating that with about 100 000 m^3 of dredged material, filling to an average thickness of about 2.0 m would be required, if the material is evenly spread across the area.

C1.3.2.b Construction

It is expected that relatively minor site preparation will be required at the DMPA site prior to placement of dredged stiff clays. This is expected to involve trimming of the surface to remove the existing terrestrial grasses/vegetation and then formation of bunds (estimated to be <0.5 m high) around the perimeter of the disposal areas using insitu clay materials.

As the material is placed mechanically into bunded cells on the DMPA site, there is no supernatant dredge tailwater to manage. However, dredging of these clays is likely to generate 'chunks' of material and relatively small amounts of seawater and potentially small amounts of soft clay containing PASS. Even with relatively small amounts of seawater these materials are likely to be 'sticky' until drying occurs. A strategy for PASS monitoring of placed material is included in **Chapter C2** (Dredge Management Plan).

Placement operations are expected to comprise unloading of trucks into stockpiles along a 'working face' for subsequent spreading, drying as required and compaction. Spreading is expected to require tracked plant (i.e. dozers) rather than wheeled plant (i.e. graders) and should aim to achieve layers of about 0.3 m maximum thickness. The construction activities are earthworks only and similar to that undertaken in filling the site to date and in establishing the Great Barrier Reef International Marine College, the Amrun Project Cargo yard, Barge Ramps and bitumen and asphalt plant on the land. Construction Environmental Management Plans including Traffic Management, Erosion and Sediment Control Plans, Stormwater Management, Dust and Noise controls will be developed by the Contractor, approved and monitored by Ports North as per the previous site developments.

C1.3.3 Wharf and Landside Works

C1.3.3.a Overview

The upgrade of Wharves 1-5 has been designed so that landside work is minimised to limit disturbance of the heritage-listed Wharves 1-5. To cater for the projected increase in ship arrivals it will be necessary to rebuild Wharf 6 which will allow for berthing of two mega class ship simultaneously.

It will include the installation of a new independent berthing and mooring structures (known as 'dolphins') to protect the heritage listed wharves, which will involve piling works.

Landside Services upgrades include:

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

- The existing potable water pipeline along the face of wharves 1 and 5 would be replaced due to the wharf structural upgrade.
- Although the current use of tanker trucks for sewage removal may be adequate for the future situation, it is proposed to include an option for the potential future introduction of a more robust system of direct discharge into the CRC's sewerage reticulation system. The system upgrade is to provide a tank which will buffer the discharge flows of large cruise ships.

C1.3.3.b Construction

The nature and scale of this construction is well within that recently managed by Ports North in developing the Cruise Liner Terminal and Foreshore Development and will utilise CEMPs detailed by suitably selected contractors in accordance with Ports North's EMS and Guidelines for CEMPs.

C1.4 Legislation

All parties are required to undertake their work in accordance with all relevant Acts, Policies and Regulations. These include, but are not limited to the following.

C1.4.1 Commonwealth Legislation

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*

C1.4.2 Queensland State Legislation

- *Biosecurity Act 2014*
- *Coastal Protection and Management Act 1995* (Coastal Act)
- *Environmental Protection Act 1994* (EP Act)
- *Fisheries Act 1994*
- *Land Act 1994*
- *Nature Conservation Act 1992* (NC Act)
- *Queensland Heritage Act 1992*
- *State Development and Public Works Organisation Act 1971* (SDPWO Act)
- *Transport Infrastructure Act 1994* (TI Act)
- *Transport Operations (Marine Pollution) Act 1995*
- *Transport Operations (Marine Safety) Act 1994*
- *Vegetation Management Act 1999* (VM Act)
- *Waste Reduction and Recycling Act 2011*
- *Work Health and Safety Act 2011.*

C1.4.3 Client Documents

- Contractual documentation.
- Contractor CEMS.

C1.4.4 Other

- Ports North Environmental Policy.
- Ports North Environmental Management System (EMS).

All relevant construction and operational approvals and licenses must be obtained during the detailed design and approvals phase prior to the commencement of any construction works.

C1.5 Ports North Environmental Management

Ports North frequently carries out construction and maintenance works at the Port of Cairns, as well as operating the existing Cairns Cruise Liner Terminal and wharf. The following sections outline their existing environmental management processes.

C1.5.1 Environmental Policy

The Ports North Environmental Policy has the following commitments to demonstrate environmental leadership:

- Implement and maintain an environmental management system to meet the standard set by AS/NZ ISO14001:2204, as a tool for continual improvement in environmental performance.
- Comply with relevant environmental laws, regulations, policies, procedures, and standards.
- Identify, assess and minimise environmental risk and impacts of port activities.
- Integrate environmental considerations and principles of sustainable development into management processes and decision making.
- Maintain emergency, fire protection, security systems and infrastructure to protect the environment.
- Strive to use resources efficiently, minimise waste and prevent pollution.
- Apply sufficient and appropriate people and resources to achieve this Environmental Policy.
- Define, measure, and report regularly against objectives and targets and review the effectiveness of performance.
- Communicate this policy to staff and stakeholders to build collaborative relationships to promote superior environmental outcomes.
- All construction contractors should be familiar with this policy and actively promote achievement of these commitments in consultation with Ports North.

C1.5.2 Environmental Management System

Ports North maintains an Environmental Management System (EMS) that is consistent with international standard ISO14001: 2204. This EMS identifies all risks including safety, business and environment as well as management controls or actions to prevent or minimise impacts. A register of risks and treatment plans is maintained for all significant risks. A key element of the EMS is the commitment to conducting environmental audits of all construction activities so that risks associated with these are identified so that Ports North can verify relevant permits, licences and project objectives are being achieved.

The Construction Contractor(s) will be provided with a copy of the EMS and CEMP guidelines and be expected to adhere to any relevant treatment plans.

C1.5.3 Incident Management

Ports North have a system in place for recording, reporting and investigating incidents that result in, or have the potential to result in, adverse environmental impacts. This ensures that all environmental incidents and near miss events are investigated in an effective and timely manner to ensure the cause is identified and corrective actions completed. All Construction Contractors will have an obligation to report events that have or may cause environmental harm.

C1.5.4 Environmental Monitoring

Ports North undertake monitoring to manage potential impacts of the Port of Cairns. These include monitoring of water quality, biosecurity, land contamination and marine habitats.

Subject to resolution during the detailed design and project procurement phases, the monitoring arrangements for the project will be defined, and this may include a requirement for the respective Construction Contractor(s) to assist with, or contribute information to, these monitoring programmes where relevant.

C1.6 Action Program

C1.6.1 Training

The appointed Construction Contractor(s) or operational providers are to provide training for the site workforce on environmental management requirements as part of the site specific induction. Training is to be provided prior to construction and for any staff, including contract staff, subcontractors, and consultants who may be employed at any stage throughout the duration of the construction period. The induction should inform workers of the content and requirements of the site-specific CEMP. All personnel directly involved in environmental management must be appropriately experienced to undertake their relevant tasks. Records of such training are to be maintained.

C1.6.2 Complaints Procedure

Ports North existing complaints procedure will be reviewed to ensure it is adequate to address any issues that may arise as a result of the project. Records of any arising complaints are to be maintained, monitored and responded to in a timely manner.

C1.6.3 Roles and responsibilities

All parties are required to undertake their work in accordance with all relevant Acts, Policies and Regulations. **Table C1-1** outlines the roles and responsibilities for each Party taking part in management of the Project.

TABLE C1-1 ROLES AND RESPONSIBILITIES

Role	Responsibility
The Proponent (Ports North)	• Minimise the potential environmental impacts associated with the Project Address issues raised by the community. • Ensure that the Contractor/Operator has appropriate environmental controls and systems in place. • Ensure this CEMP is regularly reviewed and updated.
Appointed Contractor (s)	• Ensure all necessary environmental approvals are secured prior to commencement of work. • Plans work in a way that avoids or minimises the impact on the environment • Ensure all site personnel, including sub-contractors, are aware of their environmental responsibilities. • Conduct activities in accordance with this CEMP. Ensure regular audits are undertaken. • Ensure all necessary environmental management procedures are in place. • Ensure environmental risks are identified and appropriate measures are put in place. Respond to any complaints received. • Monitor CEMP compliance regularly and update if required. • Notify any legislative breaches or environmental incidents to authorities.
Operator (Ports North)	• Conduct activities in accordance with the requirements of this plan. • Ensure environmental inspections/audits are carried out regularly to ensure compliance with this CEMP and relevant legislative requirements. • Notify any legislative breaches or environmental incidents to authorities. • Undertake environmental management actions as directed by regulatory agencies and/or council.

C1.6.4 Auditing

Ports North will ensure that regular internal and external third party audits are undertaken for the duration of construction activities. Once construction activities cease, audits will be undertaken as per their normal operating procedures.

C1.7 Impacting Processes and Management

The project description provided in **Section 0** describes both the completed works and the construction process required to achieve these works. The construction works will involve potential impacts on the environmental values of the project environs; the risk of potential impacts occurring and their mitigation are discussed in detail in the Technical Chapters. A summary of key impacts of all types is provided in **Table C1-2** below. Only unmitigated impacts assessed as low or higher are addressed.

TABLE C1-2 SUMMARY OF IMPACTS AND MANAGEMENT NEEDS

Chapter/Element	Adverse Impact	Beneficial Impact	Consequential Impact	Cumulative Impact	Short Term	Long Term	Reversible	Irreversible	Predictable	Unpredictable
1 Land	**Northern Sands** Borrow material from the Northern Sands 'Business as Usual' quarry extension must be PASS free and have suitable geotechnical properties for bund construction. **Wharf side works** Wharf services installation may disturb PASS soils. **Tingira Street DMPA** Construction of the approved southern Tingira Street barge ramp (if required) is likely to disturb PASS soils. Creation of perimeter containment bund (0.5m) could expose PASS or contaminated soil. Minor amounts of entrained soft clay PASS may be present within the placed stiff clay. Instability along Smiths Creek, western wetlands following placement could result in slippage of dredge material into the waterway	Nil	Salinity increase in surface soils could lead to cane crop mortality or yield depression Disturbance of PASS, contaminated soils could result in acidic stormwater runoff to Trinity Inlet Potentially reduction of stormwater runoff quality. Potentially reduction of stormwater runoff quality	Nil Nil Nil Nil	x x x x		x x x x		x x x x	

(Continued over)

Chapter/Element	Adverse Impact	Beneficial Impact	Consequential Impact	Cumulative Impact	Short Term	Long Term	Reversible	Irreversible	Predictable	Unpredictable
6 Water Resources	**Northern Sands** Preferential shallow groundwater flow channels could be present under the containment bund footprints which could create localized saturated high salinity seepages to adjacent areas Breach of perimeter bunds could result in discharge of water to the adjacent mangrove areas	Nil	Nil Instability could result in discharge of sediment into wetlands	Nil	x		x		x	
7 Marine Ecology	Construction of Tingira Street perimeter bunds and southern barge ramp will disturb volunteering marine plants.	Nil	All necessary permits for the southern barge ramps are current, however permits may be required for the placement area	Nil		x		x	x	
8 Terrestrial Ecology	Due to the proposed final landform at Tingira Street study DMPA, it is unlikely that migratory wading birds will return to utilise the area. The migratory shorebirds that utilise two sites within the Tingira Street study area are likely to be permanently displaced by the Project. With five invasive flora species recorded within the Northern Sands study area, plant washdown procedures will be identified in consultation with the landowners	Nil Nil	Negligible loss of temporary foraging and roosting habitat Potential loss of farming productivity	Nil Nil	 x	x x	 x	x x	x x	 x
10 Noise	Piling noise from wharf upgrade works may create noise and vibration impacts to nearby apartments and marine mammals	Nil	Temporary loss of resident amenity Injury/ disturbance to marine mammals		x x		x x		x	 x

Chapter/Element	Adverse Impact	Beneficial Impact	Consequential Impact	Cumulative Impact	Short Term	Long Term	Reversible	Irreversible	Predictable	Unpredictable
12 Landscape and Visual	Additional light glow from wharf upgrade construction activities(construction compounds)	Nil	Temporary loss of resident amenity values		x		x			x
13 Indigenous Cultural Heritage	Potential exists for disturbance of Indigenous cultural heritage material from the Yirrganydji camp at the NW of the Northern Sands DMPA site.	Nil	Loss of Indigenous Cultural Heritage values	Nil		x		x	x	
13 Non-Indigenous Cultural Heritage	Potential exists for disturbance of Non-Indigenous cultural heritage material as a result of: • the wharf services construction works near Wharf 6 (Old Malay Town) • demolition of Wharf 6	Nil	Loss of Non- Indigenous Cultural Heritage Values	Nil		x		x	x	

C1.8 Environmental Strategies and Management Plans

C1.8.1 Purpose

The strategies, actions and requirements in this Section represent the PN commitments to management and monitoring for the CSDP as they relate to construction activities. These measures and commitments will be required to be addressed by the construction contractor in addition to any statutory approval requirements and conditions for the project (noting in the event of an inconsistency, the statutory approval requirement will prevail).

Unless specifically stated, commitments to activities such as environmental monitoring may be undertaken by the construction contractor, by Ports North or by a third party contracted by Ports North depending on the procurement approach taken for the works.

As such, the focus of the CEMP is on outlining the management and monitoring strategy commitments, with the responsibility for implementing the commitments to be further developed as part of the procurement strategy for the project and subsequently as part of the Contractor(s) Construction Environmental Management Plans.

C1.8.2 Details

Contractor(s) Construction Environmental Management Plan elements will typically address:

- Erosion and Sediment Control
- Acid Sulfate Soil
- Cultural Heritage
- Water Quality
- Waste
- Noise
- Air Quality (dust, vehicle emissions)
- Flora and Fauna
- Land Contamination (in situ, fill)
- Hazardous Materials management

For each element the plans will identify:

- Objective
- Performance Indicators
- Monitoring and Reporting
- Mitigation Strategies
- Corrective Actions/ Contingency Plans

TABLE C1-3 OUTLINE OF IMPACT MITIGATION AND MANAGEMENT STRATEGIES

Strategy	Outline
Acid Sulfate Soil Management	This strategy includes specific actions required during the design and construction phases, to be reflected in future Contractors Environmental Management Plans which will consider the following: • Documenting further sampling required of bund soil borrow areas including ASS/PASS sample collection and analysis to achieve compliance with the Department of Science Information Technology and Innovation Soil Management Guidelines (Dear et al. 2014). • Detailed groundwater and surface water quality monitoring of borrow areas to determine pre-development baseline conditions relating to ASS/PASS. • Using results from sampling to avoid disturbance of soils with higher acid generating potential, where possible. • Ensuring the EMP (Construction) specifies that soil stockpiling prior to treatment is limited to reduce the risk of oxidation. • Impact mitigation by lime treatment (carried out in accordance with DSITI Soil Management Guidelines (Dear et al. 2014)), • During soil borrowing operations, undertake monitoring of surface water and any extracted groundwater/dewatering discharges (Northern Sands bund borrow area) and implementing water treatment where required. • Adopt a minimum setback from the perimeter of Tingira Street DMPA and a batter profile to achieve the required factor of safety against instability of proposed profile. If minimum setback cannot be achieved place appropriate high strength geotextile reinforcement to achieve required factor of safety against instability of proposed profile. • Assess minimum thickness of existing fill required within the Tingira Street DMPA to achieve required factor of safety against instability. If minimum thickness cannot be achieved place appropriate high strength geotextile reinforcement to achieve required factor of safety against instability of proposed profile.
Fauna Management	Fauna management strategies include: • Incorporation of flying animal strike mitigation. • Ensure the water bodies have steep sides to discourage use by waders. • Manage void design and placement such that consolidated material levels achieve at least adjacent ground levels to minimize ponding and bird habitat. • Minimising new or novel foraging opportunities. • To minimise impacts on P. conspicillatus (Spectacled Flying Fox), any new fences at northern Sands DMPA should have a plain wire as a top strand, rather than barbed wire to reduce the risk of entanglement. • Standard measures to avoid injuries to fauna species during construction such as the covering of holes / cavities overnight or the provision of ladders to enable fauna species to escape the hole should they fall, should be implemented across the Project.

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Strategy	Outline
Crocodile Management	Crocodiles are known to currently inhabit Lake Narelle at Northern Sands. Hence, a strategy is required to coordinate a variety of actions to be implemented during construction and will include: • Crocodile management plan to be developed to reduce risk of interaction with visitors. • Design initiatives that could reduce the attractiveness of the void to crocodiles: - Construct the sides of the lake as steep as possible to restrict access to the water (and once in the water, to the adjacent land) - Installation and maintenance of appropriate signage to maximise visitor awareness in higher risk areas. - Warning signs adjacent to Barron River (tailwater discharge site and Lake Narelle) warning of the potential presence of crocodiles. - Design of lake edges to provide minimal crocodile entry / exit points. Steeper sided or vertical banks would be preferred.
Stormwater Management and Erosion and Sediment Control	The Northern Sands DMPA stormwater management strategy will include the following measures: • The detailed Contractors Erosion and Sediment Control Plan (ESCP) to be prepared by the appointed contractor(s) will incorporate measures in accordance with FNQROC guidelines including attention to the following key aspects: - Batter and crest stabilization - Revegetation specifications - Diversion of turbid run off to the unbunded void where possible; to grass lined swales otherwise - Installation of sediment fencing around all material stockpiles and unstabilised batter toes - Monitoring and maintenance - Diversion of clean stormwater away from DMPA and tailwater bund footprints prior to commencement of construction - The wharf services work contractor's ESCP to be prepared by the appointed contractor(s) will incorporate measures in accordance with FNQROC guidelines including attention to the following key aspects: - Installation of sediment fencing around all material stockpiles and contractor's laydown site - Installation of rock shaker pad at site entry/exit - Diversion of clean stormwater around soil disturbances - Backfilled trench stabilisation - Diversion of turbid run off to grass lined swales - Monitoring and maintenance • Following placement and short term consolidation of dredge material at Northern Sands, containment bunds are to remain in place at a minimum height of 5.8 m AHD (Q100 Flood Height) until after the 2018/2019 wet season, after which bunds can be lowered, such that a void buffer of 0.7 to 1.7m between top of material and top of bund or natural surface, depending on the degree of crusting, will be present to prevent sediment remobilisation in the event of a flood.

Strategy	Outline
	• Ports North will assume post placement responsibility for environmental management of the Northern Sands DMPA following short term settlement and supernatant removal by the Dredge Contractor. Following further consolidation and crusting of the dredge material, anticipated to be before the 2020/2021 wet season, environmental management of the DMPA will revert to Northern Sands Pty Ltd, who will recommence waste disposal activities, under an agreement with Ports North. • Whilst afflux (increase in flood height) as a result of the containment bund is anticipated to be minimal and restricted to already flooded caneland, in the event of a greater than 5 year ARI flood during the 2019/2020 wet season, any requests for compensation would be negotiated with Ports North in accordance with an agreement to be negotiated prior to construction of the Northern Sands DMPA.
Landscape and Visual Amenity	During the project refinement stage a number of opportunities were identified to improve the landscape: • Lighting of compounds and works sites will be in accordance operational works approvals • Directed lighting will be used at wharf construction site (if night works required), works compounds and the DMPAs to minimise glare and light spill
Indigenous Cultural Heritage	Management of cultural heritage risks will be managed through development of CHMPs with Yirrganydji Gurabana Aboriginal Corporation (YAC), Gimuy Walubara Yidinji People (GWY) and Mandingalbay Yidinji (MY) Aboriginal parties including: • Precautionary measures such as survey of the proposed pipeline at Northern Sands, particularly at Richters Creek crossings. • The existing 80 m buffer from waterways, as per existing Northern Sands quarry conditions, should be retained to ensure an adequate buffer around the Yirrganydji camp. This should be confirmed during further site inspections with Yirrganydji representatives during development of the CHMP. • Management of impacts to GMY story places within and adjacent to the Shipping Channel. • Facilitate face to face meetings with the Aboriginal parties regarding potential environmental impacts. • Address Native Title implications prior to commencement of any works • Aboriginal parties should be kept informed during design, construction and operation of the project in relation to potential impacts and results of monitoring the environmental health of the mangroves, rivers, creeks and harbour from the proposed project. • If any previously unidentified potential Aboriginal or non- Aboriginal cultural heritage is found, all works are to cease pending an inspection by heritage representative. • Establish a minimum of a 10m buffer zone around the outer extent of the find and all project activities will cease within this buffer zone. As a minimum, the CHMPs for the project will contain the following framework in accordance with Part 7 of the ACH Act: • Approaches that will manage avoidance of harm to ICH, or if harm cannot reasonable be avoided, to minimise harm. • The reasonable requirements and methodologies for carrying out cultural heritage surveys and preparing cultural heritage survey reports. • Ways in which acceptable management or mitigation of ICH will be conducted.

Strategy	Outline
	• Arrangements to ensure workplace health and safety requirements are observed during cultural heritage surveys and management or mitigation work programs. • Arrangements for notification about project activities and work programs, including project area access. • A dispute resolution process. • A new finds process. • Details of Cultural Awareness Training.
Non Indigenous Cultural Heritage	Strategies to manage Non Indigenous Cultural Heritage include: • Lodge development application for required approvals from Queensland Heritage Council for wharf 6 demolition and partial preservation in accordance with Statement of Heritage Impact (Extent Heritage). • Industrial Archaeologist to be present during trenching works around wharf 6 to assess presence of non indigenous cultural heritage value from the old Malay Town.
Noise	Strategies to manage noise impacts from wharfside dolphin installation (piling installation works) include: • A resilient pad (dolly) to be used between the pile and hammer head in order to reduce airborne noise impacts. • Vibration criteria to be set for piling activities to avoid damage to the heritage-listed wharf. • Limit piling activities to daytime only. • If night time works are required, community consultation with residents should occur to explore the following options: • Noise monitoring of piling works • Respite periods • Temporary alternative accommodation if night works occur over an extended period • Observation zone to be instigated during piling works to spot for marine fauna within the vicinity of piling • Piling 'soft start' procedures to be implemented • Vehicles and machinery are to be regularly maintained and muffling devices checked to minimise noise levels. • When selecting construction techniques and equipment/machinery, give consideration to minimising noise disturbance. • Intermittently used machines are to be shut down or throttled down in intervening periods. • Works to be limited to 6:30 am to 6:30 pm Monday to Saturday for land-based works; except for specific identified activities for which approval from the DEHP/local authority is obtained. Potentially affected residents to be notified of any out-of- hours construction works.
Weed and Pest Management	Weed and pest control strategies will include: • The control of *Hymenachne* presents an opportunity to control significant potential weeds before they have an opportunity to spread to local water bodies. • Measures to be implemented to prevent and control the spread of weeds as a result of the project such as vehicle washdown facilities at the NS DMPA and pipeline laydown areas on Pappalardo's farm. • Specific attention to the management electric ants.

<table>
<tr><th>Strategy</th><th>Outline</th></tr>
<tr><td>Environmental Monitoring and Management</td><td>

Management Responsibilities

Ports North will assume post placement responsibility for environmental management of the Northern Sands DMPA following short term settlement and supernatant removal and demobilization by the Dredge Contractor. After further consolidation and crusting of the dredge material, anticipated to be before the 2020/2021 wet season, environmental management of the DMPA will revert to Northern Sands Pty Ltd who will recommence waste disposal activities; responsibility for ongoing environmental monitoring of any long term impacts of the placed dredge material will be subject to commercial arrangements between Ports North and Northern Sands prior to commencement of construction. Ports North will prepare a detailed Post Placement Management Plan during the detailed design and approvals phase, which will incorporate inputs from further research into material consolidation. The PPMP address the following elements:

Northern Sands Post Placement Monitoring Strategies

Groundwater

- Post placement groundwater monitoring program will focus on the main potential impacts on groundwater using existing and additional bores (as identified in **Chapter B6 (**Water Resources)):
  - localised increase in groundwater level adjacent to lake during and shortly after dredged material placement
  - changes in groundwater quality (salinity) associated with flow of saline water outwards from the lake.
- A more detailed monitoring plan and approach to establishment of groundwater baseline and trigger values will be developed, including appropriate reactive management measures in accordance with project approvals requirements, however it is anticipated that the program will include the following monitoring scopes:

Water Level	Hourly (data logger) and manually during monthly sampling events
Electrical Conductivity and pH	Hourly (data logger) and monthly during sampling events
Field physicochemical parameters (EC, pH, DO, Redox Temp)	Monthly during sampling events
Major Ions	Monthly
**Metals (Total / Dissolved)	Monthly

**The need for ongoing metal analysis will be assessed based on background concentrations and exceedances observed during filling. pH will be systematically monitoring and should pH values show a decrease to below 6, then metals testing would be recommenced.

Air Quality and Noise

- Should any complaints be received in relation to air quality or noise monitoring may be implemented as part of complaint resolution in accordance with the State Environmental Protection Policy (Air) and (Noise).

Geotechnical Characteristics

- The Post Placement Management Plan will include a program of settlement and consolidation monitoring.

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Strategy	Outline
	Tingira Street *PASS/AASS and Surface Water Quality* • **Chapter C2** (Dredge Management Plan) includes placement monitoring strategies to ensure residues of soft clays within the placed stiff clay materials are limited, however it is possible that some PASS material will be mixed with the stiff clay. Following Dredge Contractor site relinquishment, Ports North will develop and implement a strategy for monitoring and management of this risk albeit low, including event based run off quality monitoring (turbidity, total suspended solids, pH) and soil pH, Field peroxide assessments in accordance with approval conditions. *Geotechnical Stability* • Ports North will develop a procedure within the Environmental Management System to monitor short term to medium term geotechnical stability of placed materials, including erosion and sediment control performance.

C1.9 References

Dear, S-E., Ahern, C. R., O'Brien, L. E., Dobos, S. K., McElnea, A. E., Moore, N. G. & Watling, K. M. 2014. Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines. Brisbane: Department of Science, Information Technology, Innovation and the Arts, Queensland Government.