Rio Tinto Alcan

# Appendix 7-B

## Sea Dumping Permits

# Sea Disposal Application
# Dredged or Excavated Material

## Important Information

**ABOUT THIS FORM**

Important – Please read this information carefully before you complete your application. Once you have completed your application we strongly advise that you keep a copy for your records.

**WHO SHOULD USE THIS FORM?**

This application form was approved on 26 June 2012, pursuant to subsection 18(2) of the *Environment Protection (Sea Dumping) Act 1981* (the Sea Dumping Act). If you propose to dispose of dredged or excavated material at sea then you must complete this form.

**COMPLETE APPLICATIONS**

The department encourages the lodgement of complete applications. If further information is required to assess your sea disposal application, then the time within which the Minister is required to assess your application will be paused and reset pursuant to section 18 of the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act).

You should read this application in conjunction with the **National Assessment Guidelines for Dredging 2009** (NAGD). The NAGD detail the procedures which should be followed in sampling, testing and assessing the suitability of material to be disposed of at sea. The guidelines also detail how disposal sites are to be evaluated and monitored. The NAGD are available at:
www.environment.gov.au/coasts/pollution/dumping/guidelines.html

Where you require a specialist report to fulfil the requirements set out in the NAGD, then you should attach the specialist report to your application. You should also provide brief answers to the questions provided, cross-referenced to the relevant sections of the report.

Your application must clearly:

- demonstrate that you have considered alternatives to sea disposal;
- describe the material to be disposed of at sea including how it will be transported from the origin to the disposal site and how it will be disposed of at sea;
- identify the origin and quantity of the material to be disposed of at sea;

- provide details of the physical and chemical composition of the material to be disposed of at sea;
- detail any toxicity characteristics of the material to be disposed of at sea; and
- provide details regarding the disposal locality and any potential environmental impacts at the disposal site.

**OBLIGATION TO COOPERATE WITH INSPECTORS**

Sections 26 to 32 of the Sea Dumping Act provide amongst other things that the Minister may appoint inspectors for the purpose of policing the Sea Dumping Act. An inspector may board vessels, aircraft or platforms or stop and detain vessels or aircraft.

**ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999**

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places, the Commonwealth marine area and the Great Barrier Reef Marine Park — defined in the EPBC Act as matters of national environmental significance. For a detailed discussion of assessment under the EPBC Act and how it interacts with the Sea Dumping Act refer to Section 2.1.2 of the NAGD.

The EPBC Act affects any group or individual (including companies) whose actions may have a significant impact on a matter of national environmental significance. Persons who may have a significant impact on a matter of national environmental significance must refer their proposed action pursuant section 68 of the EPBC Act.

Section 160 of the EPBC Act requires the a decision maker in some circumstances to seek advice under the EPBC Act prior to making a decision with respect to a sea disposal permit. To ensure efficient co-ordination of the assessment process, it is important that the department is aware of any referrals the proponent has made under the EPBC Act. As such, it is advisable that proponents discuss proposed actions with the department prior to submitting a sea disposal application.

Please note that if the project has been referred under the EPBC Act that a decision on a sea disposal permit application cannot be made until the project has either been determined to be "not a controlled action" or the Minister has approved the proposal.

**APPLICATION FEE**

The *Environment Protection (Sea Dumping Regulations) 1983* (the Sea Dumping Regulations) prescribe the fee payable for a sea disposal application. For an application for a permit to dispose of dredged or excavated material into any part of the sea, the following fees are prescribed pursuant to clause 5(2) of the Sea Dumping Regulations as follows:

(a) if the volume of the material exceeds 100,000$m^3$ -- $23,500;

(b) if the volume of the material does not exceed 100,000 $m^3$ -- $10,000.

Clause 5B of the Sea Dumping Regulations requires the application fee to be paid no later than 30 days after the application is submitted. A failure to pay the application fee within the prescribed timeframe will result in the application been invalid. This means

that if your application is invalid you will need to submit a new application to the Department if you wish to pursue an application.

**METHOD OF PAYMENT**

To make a payment, the department's preferred methods of payment are by credit card, bank cheque, money order or by electronic funds transfer (EFT).

*Cheques*

You must make your payment payable to "Department of Sustainability, Environment, Water, Population and Communities". You should include a remittance advice.

*EFT Payments*

EFT Payments can be made to:

BSB: 092-009
Bank Account No. 115859
Amount: $
Account Name: Department of Sustainability, Environment, Water, Population and Communities
Bank: Reserve Bank of Australia
Bank Address: 20-22 London Circuit Canberra ACT 2601
Reference: Cost Centre 12106, GL A/c 52300
Description: Sea Disposal Permit Application – Name of Project

**LODGING YOUR APPLICATION**

You may lodge your application at the following address:

***Director***
***Ports and Marine Section***
***Department of Sustainability, Environment, Water, Population and Communities***
***GPO Box 787***
***Canberra ACT 2601***

**WHAT HAPPENS NEXT?**

Your application will be considered and you may be asked to provide additional information to enable a decision to be made.

**FURTHER INFORMATION**

Further information may be obtained from: portsandmarine@environment.gov.au

# PART A – APPLICATION SUMMARY

What is the legal name of the business, organisation or company?

RTA Weipa Pty Ltd (RTAW)

Contact Person: Fiona Talbot, phone (07)3625 4983

Type of Material Requiring Disposal:

- ☒ Capital
- ☐ Maintenance
- ☒ Dredge
- ☐ Excavation

WGS84 co-ordinates of disposal site:

| Spoil Ground | Latitude | Longitude | Radius |
|---|---|---|---|
| New Spoil Ground | S12º 54' 46.3" | E141 º 28' 52.7" | 1000m |

Dates of proposed disposal operations:

Dredging and sea dumping of spoil would commence once all necessary permits and approvals are obtained and as soon as a suitable dredge can be mobilised. The current schedule allows for the dredging and sea dumping covered in this application to commence in January 2014 and to continue until January 2017These dates are yet to be confirmed. The schedule may vary depending on dredge availability or conditions during dredging. RTA Weipa (RTAW) will provide final dates once a dredging contractor and timing have been confirmed.

Volume (cubic metres) of material to be disposed of:

The volume of material to be disposed from initial capital dredging campaign – berth pocket, departure area and departure channel: 2,600,000$m^3$.

Length of permit applied for in this application:

Three (3) years.

Details of previous sea disposal permits that you have been granted:

RTAW's existing Weipa operations have not previously applied for a sea dumping permit for dredging in this area.

As part of the broader South of the Embley bauxite mine extension and port Project (EPBC 2010/5642), a separate Sea Dumping Permit application form has been completed for capital dredging for transport facilities on the Hey and Embley Rivers; however, the two forms comprise a single application.

| Permit number | Volume approved for disposal (cubic metres) |
|---|---|
| | |

# PART B – APPLICANT

## 2.0 Identity of applicant

2.1 Applicant Details

What is the legal name of the business, organisation or company?
RTA Weipa Pty Ltd (RTAW)

What is the registered business name or trading name under which you operate? (if different from legal name)
N/A (same as legal name)

Australian Business Number (ABN)
54 137 266 285

Australian Company Number (ACN)
137 266 285

Street address of the business (where the business is physically located)
123 Albert Street, Brisbane QLD, 4000

Postal address of the business (If same as street address, write 'AS ABOVE')
PO Box 2470, Brisbane 4000

2.2 Contact Person

Contact person for enquiries: Fiona Talbot

Phone: (07) 3625 4983

Email: fiona.talbot@riotinto.com

## 3.0 Identity of the owner of the material to be disposed of at sea

State of Queensland

3.1 Owner Details

What is the legal name of the business, organisation or company?
What is the registered business name or trading name under which you operate? (if different from legal name)
Australian Business Number (ABN)
Australian Company Number (ACN) (if applicable)
Street address of the business (where the business is physically located)
Postal address of the business (If same as street address, write 'AS ABOVE')

3.2 Contact Person

Contact person for enquiries:
Phone:
Email:

# PART C – ALTERNATIVES TO SEA DISPOSAL

## 4.0 Consider alternatives to sea disposal

4.1 You should identify alternative options for the disposal of dredged or excavated material other than sea disposal. These options should include:

- not dredging or excavating;
- re-use (e.g. land creation, beach nourishment, offshore berms, fill);
- off-site recycling (for example, as construction material);
- treatment to destroy or remove hazardous constituents for beneficial use; and
- disposal on land.

Please specify the options you have considered.

The following options for disposal of dredged spoil were considered:

- not dredging or excavating;
- re-use (e.g. land creation, beach nourishment, offshore berms, fill) or off-site recycling (for example, as construction material;
- treatment to destroy or remove hazardous constituents for beneficial use; and,
- disposal on land.

4.2 Explain why your preferred option for disposal of the dredged or excavated material is sea disposal. In explaining why sea disposal is your preferred option you should provide:

- comparative cost estimates of the above alternatives (including sea disposal);
- detail any risk(s) to human health of the above alternatives (including sea disposal); and
- detail any risks to the environment of the above alternatives (including sea disposal).

Sediment characterisation (Worley Parsons 2012) has shown that the material is of a quality suitable for unconfined ocean disposal, so there should be no contaminant risks to human health or the environment should it be placed on land or at sea.

The assessment of alternative disposal options and reasons why sea disposal is the preferred option is set out in Table 1.

In summary:

- Barging to the Albatross Bay spoil ground would be twice the distance as compared to the proposed new spoil ground, substantially increasing the dredge campaign time and making it cost prohibitive. There would be no environmental benefit from this option. In addition, the use of the Albatross Bay spoil ground would shorten its useable life;
- The cost of disposal on land would be substantially higher than the sea disposal option at the proposed new spoil ground due to the volume of dredged material;
- A relatively large area of remnant native vegetation would have to be cleared, a containment facility would need to be constructed and the resultant dewatering process could adversely affect a shallow aquifer via infiltration of saline seepage through the porous coastal soils. The aquifer currently sustains baseflow in surface streams in the area and has very low salinity. The containment facility would need to be designed and constructed to minimise the potential for saline seepage from the marine sediment and the potential for impact on water quality; and,
- Revegetation of a large elevated emplacement of saline marine sediment would pose difficulties and would likely require long-term maintenance as exemplified by the difficulties in attempts to rehabilitate dredge spoil disposed to land at Bing Bong in south west Gulf of Carpentaria.

In addition, the Queensland Coordinator General has not approved land disposal and an amendment would need to be made to the existing Project approval. Reasons for discarding these options were based primarily on environmental, material suitability, construction needs and economic viability.

Sea dumping of the dredge material is being proposed based on the lack of suitable alternatives for the volume of material to be disposed and the clean nature of the material.

**Table 1: Alternatives for Disposal of Dredged Material**

| | **Disposal at Proposed New Spoil Ground** | **Reuse for Beach Nourishment and Land Creation** | **Removal of Hazardous Constituents and off-Site Recycling** | **Disposal on Land** | **Disposal at the Existing Albatross Bay Spoil Ground** | **No Dredging** |
|---|---|---|---|---|---|---|
| **Technical/ Operational Feasibility** | Preferred: Sediments have been assessed as suitable for sea disposal. The material would only be required to be barged half the distance than to the existing Albatross Bay spoil ground, which reduces costs. | Not Preferred: Poor environmental outcome. | Not Feasible: Although there are no hazardous materials to be removed, beneficial reuse opportunities do not exist. Material to be dredged is not suitable for recycling. | Not Preferred: Would require the construction of a large containment facility. | Not Preferred: Would require the material to be barged twice the distance than the proposed new spoil ground which is cost prohibitive. | Not Feasible: Due to the length of the structures for the Port, dredging is required to create sufficient depth in order to achieve the required draft. |
| **Applicable MNES Controlling Provisions** | **Comparative Description of Mitigated Impacts** | | | | | |
| **Listed Threatened Species and Ecological Communities** | ***Negligible Impact (Estuarine and Marine Species)*** ***No Impact (Terrestrial Species)*** Ocean disposal of marine sediments is likely to present a lower risk to the marine environment than land disposal would present to the terrestrial environment. Impacts on threatened marine and estuarine fauna would be | ***High Impact (Marine Turtles)*** ***No Impact (All other Threatened Species)*** Placement of dredged material on the beach would impact marine turtles' ability to nest and may reduce the viability of nests through constant inundation of water through dewatering. | Assessment not required as not feasible | ***Moderate Impact (Terrestrial Flora)*** ***No Impact (All other Threatened Species)*** If the material was pumped ashore, the dewatering process could adversely affect a shallow, low-yield aquifer via infiltration of saline seepage through the porous coastal soils. The | ***Negligible Impact (Estuarine and Marine Species)*** ***No Impact (Terrestrial Species)*** Ocean disposal of marine sediments provides a lower risk to the marine environment than land disposal. Impacts on threatened marine and estuarine fauna would be the same whether the material is disposed at the proposed | Assessment not required as not feasible |

| | Disposal at Proposed New Spoil Ground | Reuse for Beach Nourishment and Land Creation | Removal of Hazardous Constituents and off-Site Recycling | Disposal on Land | Disposal at the Existing Albatross Bay Spoil Ground | No Dredging |
|---|---|---|---|---|---|---|
| | the same whether the material is disposed at the proposed new spoil ground or the Albatross Bay spoil ground, although disposal at the proposed new spoil ground would require disturbance of a new area. | | | revegetation of a large elevated emplacement of marine sediments would pose difficulties and would be likely to require long-term maintenance. These impacts have not been fully assessed as this was not the preferred option. | new spoil ground or the Albatross Bay spoil ground, although disposal at the proposed new spoil ground would require disturbance of a new area. | |
| **Listed Migratory Species** | ***Negligible (Avian)*** ***Negligible Impact (Non Avian)*** Ocean disposal of marine sediments is likely to present a lower risk to the marine environment than land disposal would present to the terrestrial environment. Impacts on migratory marine fauna would be the same whether the material is disposed at the proposed new spoil ground or the Albatross Bay spoil ground, although | ***High Impact (Marine Turtles)*** ***Negligible Impact (All other Threatened Species)*** Placement of dredged material on the beach would impact marine turtles' ability to nest and may reduce viability of nests through constant inundation of water through dewatering. | Assessment not required as not feasible | ***Negligible Impact*** | ***Negligible Impact (Avian)*** ***Negligible Impact (Non Avian)*** Ocean disposal of marine sediments in a marine environment provides a lower environmental risk than land disposal. Impacts on migratory marine fauna would be the same whether the material is disposed at the proposed new spoil ground or the Albatross Bay spoil ground, although | Assessment not required as not feasible |

| | Disposal at Proposed New Spoil Ground | Reuse for Beach Nourishment and Land Creation | Removal of Hazardous Constituents and off-Site Recycling | Disposal on Land | Disposal at the Existing Albatross Bay Spoil Ground | No Dredging |
|---|---|---|---|---|---|---|
| | disposal at the proposed new spoil ground would require disturbance of a new area. | | | | disposal at the proposed new spoil ground would require disturbance of a new area. | |
| **Commonwealth Marine Areas** | ***Negligible -Minor Impact*** | ***Negligible -Minor Impact*** Not in Commonwealth marine areas. | Assessment not required as not feasible | ***Negligible Impact*** Not in Commonwealth marine areas. | ***Negligible -Minor Impact*** Not in Commonwealth marine areas. | Assessment not required as not feasible |

**Justification for the preferred alternative:**

The preferred alternative would have no greater impact on the applicable controlling provisions than the Albatross Bay spoil ground alternative and less impact than the other two alternatives assessed.

The re-use of material for beach nourishment is not considered appropriate given that the beach area is a known nesting area for marine turtles. Placement of dredged material on the beach would impact marine turtles' ability to nest and may reduce viability of nests through constant inundation of water through dewatering. Peer-reviewed literature documents negative impacts on marine turtles from beach nourishment activities. Using the material for land creation is considered inconsistent with the use of the area by marine turtles for nesting. The material is not suitable for use at the proposed small reclaim area at Hey River terminal.

The material to be dredged is not suitable for construction material. The material from the Port area is comprised of a relatively thin layer of sandy silts on the surface overlying stiff clays and underlying siltstone. Material beneficial for offsite recycling typically requires relatively clean sands. Beneficial re-use opportunities do not exist.

If the material was pumped ashore, the dewatering process could adversely affect a shallow, low-yield aquifer via infiltration of saline seepage through the porous coastal soils. The shallow aquifer currently sustains baseflow in surface streams in the area. This water has very low salinity levels. Saline seepage from the marine sediment could adversely impact water quality. The disposal of dredged spoil to land would require construction of a suitable containment facility to store the material to minimise potential for impact on water quality. Awaiting construction of the containment facility would prevent commencement of dredging activities for some months, subsequently delaying the construction of the Port which is on the critical path for construction of the Project. The revegetation of a large elevated emplacement of marine sediments would pose difficulties and would be likely to require long-term maintenance.

Placement of the spoil from the Port area at the Albatross Bay spoil ground would require the material to be barged about twice the distance than to the proposed new spoil ground. This would require at least three hopper dump barges and contractors' dredging spreads do not typically extend to that number of barges, particularly in such a remote area. If a suitable contractor was found then the costs would be significantly greater. If three hopper dump barges could not be secured, the dredging and sea disposal timeline would increase, potentially extending persistence of turbid conditions.

Ocean disposal of marine sediments is likely to present a lower risk to the marine environment than land disposal would present to the terrestrial environment, due to: using the material for beach nourishment or land disposal is inconsistent with the use of the area by marine turtles; disposal on land could adversely affect water quality in the shallow aquifer; and revegetation of marine sediments would pose difficulties.

# PART D – DETAILS OF TESTING AND MONITORING PREVIOUS TO THIS APPLICATION

## 5.0 Testing and Monitoring

5.1 Details of previous permits

| Permit Number | Testing Conducted | Monitoring Conducted |
|---|---|---|
| Sampling and Analysis Plan approved 20 October 2008 (2008/02302) | Y | |
| Revision approved 27 July 2009 (SD2008/1004) | Y | |
| Revised Sampling and Analysis Plan approved 8 June 2010 (no reference provided) | Y | |

Note: for the purpose of question 5.1 “testing” means testing of sediment undertaken in the course of being granted a previous sea disposal permit and “monitoring” means any monitoring required as a condition of that sea disposal permit.

Please attach any information on testing (for example a Sampling and Analysis Plan (SAP) Implementation Report) and/or monitoring that was conducted in relation to previous sea disposal permits.

### Sampling and Analysis Plan and sediment characterisation

Sediment characterisation has been undertaken for the capital dredge material that would be removed for the proposed new wharf facilities (Worley Parsons 2012). Sampling was undertaken in October 2007 and was based on a draft sediment Sampling and Analysis Plan (SAP) for dredging approximately 250,000m$^3$. A draft sediment SAP was submitted to Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC, formerly DEWHA) in September 2007 and comments were responded to in a sediment characterisation report submitted in February 2008. The approach to sampling and analysis recognised the remote location of the proposed dredge area with no likely input of contaminant substances from the surrounding catchment. A pilot-program level of assessment comprising 20% of the total number of sample locations required under Table 1 of the NODGDM (Commonwealth of Australia 2002) was adopted.

The October 2007 sampling campaign included collection of sediments at five sites (SoE1 – SoE5; refer to Figure 1) using a pneumatic head vibrocorer operated by GeoCoastal Pty Ltd off the stern of the James Cook University research vessel “James Kirby”. A total of nine samples were collected from a maximum of two horizons (0-0.5m and 0.5-1.0m) depending largely on the depth of surface sediments overlying stiff clays. Power analysis on results indicated that the number of samples taken was sufficient to provide a statistically rigorous comparison with the NODGDM screening levels for contaminants. Sampling to the intended dredge depth through stiff clays was not possible as the vibrocorer met resistance typically from about 0.2m to 0.5m sediment depth and refusal marginally beyond that. Typically, at least half the lower horizon sample submitted consisted of stiff clay material. It is extremely

unlikely that any anthropogenic contaminants could have been introduced to the underlying clay material due to the high binding capacity of the clay sediments and lack of porosity.

The collected sediment samples were consigned to NATA registered laboratories (Advanced Analytical Australia (AAA) and Australian Laboratory Services (ALS)) and analysed for the constituents detailed below:

- Total trace elements (Ag, Al, As, Cd, Cu, Co, Cr, Fe, Mn, Pb, Hg, Ni, Sb, Se, V, Zn);
- Bioavailability of trace elements using dilute acid extraction (1M HCl; DAE) (Ag, Al, As, Cd, Cu, Co, Cr, Fe, Mn, Pb, Hg, Ni, Sb, Se, V, Zn);
- Elutriate concentration of trace elements (Ag, Al, As, Cd, Cu, Co, Cr, Fe, Mn, Pb, Hg, Ni, Sb, Se, V, Zn);
- Organotin compounds (MBT, DBT, TBT);
- Nutrients (TN, $NO_2$, $NO_3$, TKN, TP);
- Total Organic Carbon (TOC);
- Particle size distribution (PSD); and,
- Acid sulphate soils (ASS).

Analysis of metals in elutriate water and metals bioavailability was undertaken as published studies of sediments within northern Australia by Munksgaard and Parry (2002) indicated that total metals concentrations could naturally exceed relevant guideline screening levels.

Following correspondence, DSEWPaC confirmed on 15 October 2008 that sediment characterisation had been characterised according to the NODGDM.

2009 Sediment Sampling and Analysis

In 2009, the volume of proposed dredging was increased to 505,800$m^3$ following a change in the design of the proposed new wharf facilities. A supplementary SAP was submitted to DSEWPaC on 5 June 2009 and approved for implementation on 27 July 2009. Sampling for the expanded dredge area was completed at ten sites (2SoE6-10, 2SoE12, 2SoE14, 2SoE18-20), making a total of 15 sites over the whole dredge area over the 2007 and 2009 surveys. Elutriate and porewater analyses were undertaken on samples from seven locations making a total of twelve sampling locations over the 2007 and 2009 surveys. Sampling locations are shown on Figure 1.

Based on the prior experience of there being a relatively thin layer of unconsolidated material overlying stiff clays, surface samples only were collected using a stainless steel grab instead of a coring device.

Samples were tested for the same suite of analytes as in the 2007 survey.

**Figure 1: 2007 and 2009 sediment sampling sites at the Port berth and departure area**


## 2010 Sediment Sampling and Analysis

Following review of the Project, RTAW proposed to further develop the Port to accommodate Cape size vessels, loading to a draft of 18.1m. A new SAP was developed and sampling undertaken in June 2010 to accommodate a major expansion in dredge footprint which now included a 5.5km departure channel, and increase in proposed dredge depth to -20.2mLAT and volume increase to approximately 6,500,000m$^3$.

Sampling was undertaken at 20 locations, more than the minimum 17 locations required for the conservatively estimated volume of 730,000m$^3$ of 'potentially contaminated' loose surface sediments overlying stiff clays. The volume of 'potentially contaminated' material determines the number of sampling locations under the NAGD. The NAGD recommends that for capital dredging projects, this volume would be represented by the upper 1m of sediment over the dredging footprint area. The volume of 'potentially contaminated' sediments was

calculated from the proposed dredge footprint of 1,460,062m$^2$ and a typically maximum depth of 0.5m to stiff underlying clays. The number of sampling locations required under the NAGD (34) was halved on the basis that there was good quality current data available for the area from the two previous sampling campaigns in 2007 and 2009. The position of sampling locations is provided in Figure 2. Samples were collected using vibrocorer, deployed from the research vessel "James Kirby".

Penetration into the substrate was again limited by the stiff underlying clays, with a maximum of 0.6m but typically less than 0.2m, particularly along the departure channel. Because of the shallow penetration, samples were submitted as single horizons.

Samples were analysed only for metals and particle size distribution since organotin concentrations in all previous samples were below the Limit of Reporting (LOR).

Sampling and analysis of sediments was also undertaken at the proposed new spoil ground in 2010. This provides baseline information on concentrations of contaminant substances and particle size at the proposed new spoil ground prior to disposal of dredged material. The results of this inform the application for a sea dumping permit for dredging and sea disposal of dredged material.

In accordance with NAGD requirements, seven sites within the proposed new spoil ground were sampled and were analysed for trace metals and particle size analysis. Organotins were not analysed as these were not identified in sediments to be dredged from the proposed Port area.

2013 Proposal

It should be noted that the current proposal (an initial capital dredge campaign of 2,600,000m$^3$) is within the footprint of the approved realignment. This is described in the Commonwealth EIS (RTA 2013) and shown in the plan in Attachment 2.

Sediment Characterisation Reports

DSEWPaC has previously been provided a copy of the 2007 sediment characterisation report:

- South of the Embley River Project – Sediment Characterisation Report (Worley Parsons, 2008).

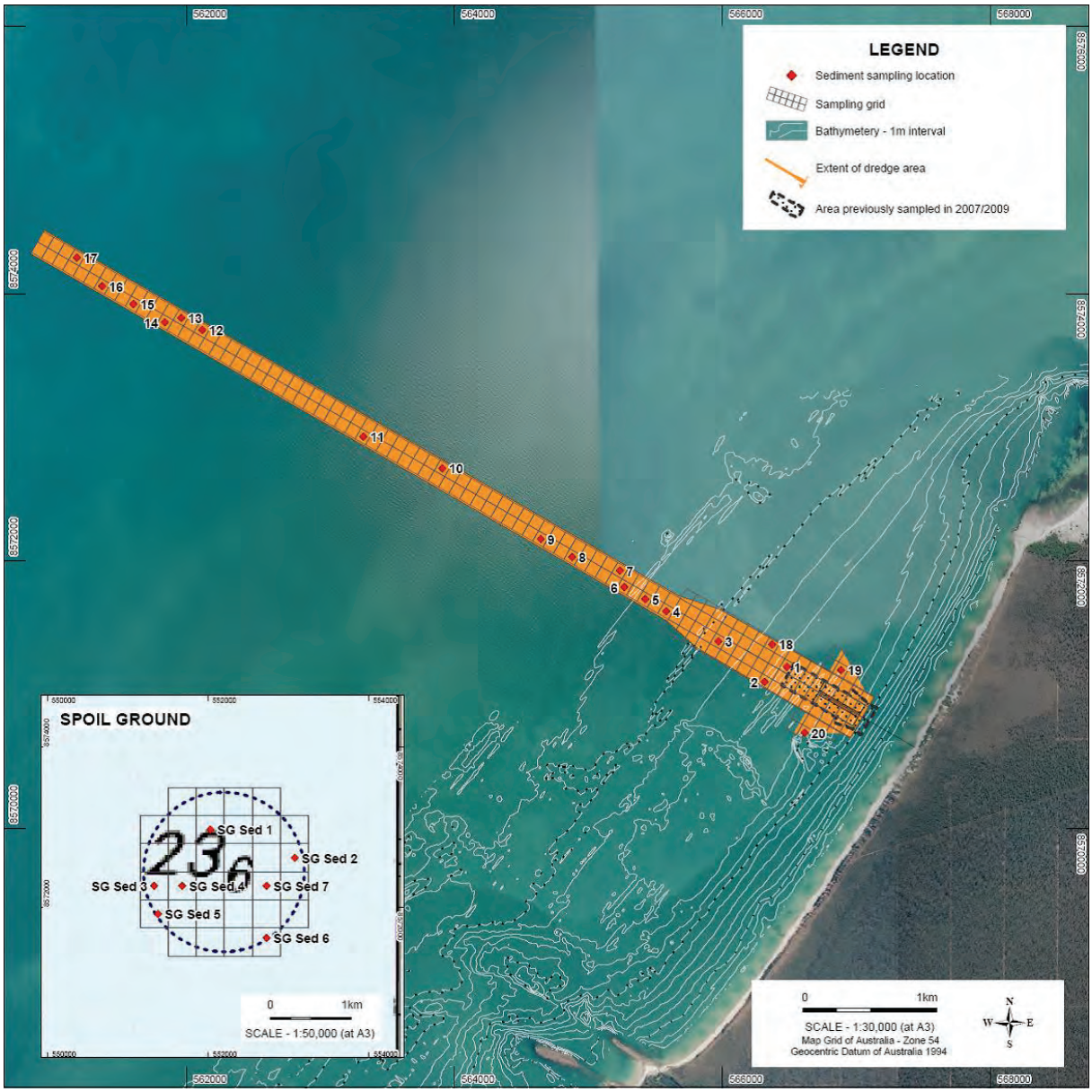
A copy of the 2009 sediment characterisation report is provided as an appendix to the 2010 report (also previously provided to DSEWPaC):

- South of the Embley Project: 185,000DWT Vessel Port Development Plan – Sediment Characterisation Report (Worley Parsons 2010).

The most recent sediment characterisation report submitted to DSEWPaC was *South of the Embley Project: 185,000DWT Vessel Port Development Plan – Sediment Characterisation Report* (Worley Parsons 2012). This report provides a compilation of all data from the previous reports and the exemption request (see Section 6.0 below).

These reports identify dredged material is considered chemically suitable for unconfined disposal at sea and will not require management for contaminants or acid sulphate soils if disposed on land.

**Figure 2: 2010 sediment sampling locations at the Port berth, departure apron, departure channel areas and proposed new spoil ground (inset)**



### Other studies and surveys

A range of studies and surveys have been undertaken at the proposed dredging area and proposed new spoil ground including:

- water quality;
- turbidity plume modelling;
- benthic infauna surveys; and
- particle size analysis.

A range of studies and surveys have been undertaken in relation to the dredging site:

- marine turtle nesting survey;
- coastal processes modelling;
- turbidity plume modelling; and
- benthic habitat surveys.

Details of these studies are documented in the Project's Commonwealth EIS (RTA 2013).

## 6.0 Exemptions

Has an exemption from detailed testing requirements been given? (refer to section 4.2.1 of the NAGD for grounds for exemption).

If yes, attach a copy of the exemption notice.

Yes. An exemption was granted on 20 January 2012 (refer Attachment 1), following a request to amend the application with a request for exemption from further sediment sampling on 31 October 2011.

RTA acknowledges that, due to delays in approvals for the Project, some of the sediment samples may be older than the 5 years recommended by the NAGD when dredging is due to commence. The risk of change in sediment characterisation in this area is very low due to the absence of anthropogenic influences; however RTA will submit a request for exemption from further sediment sampling once approval for the Project is received and the dredging date can be confirmed.

# PART E – DESCRIPTION AND ANALYSIS OF MATERIAL TO BE DISPOSED OF AT SEA

## 7.0 Description of the material to be disposed of at sea

7.1 Type of Material Requiring Disposal:

| | | | |
|---|---|---|---|
| ☒ | Capital | ☒ | Dredge |
| ☐ | Maintenance | ☐ | Excavation |

7.2 What is the volume of material (in situ) in cubic metres to be disposed of?

The volume of material required to be removed for development of the proposed new wharf facilities, including berth pocket, swing basin and departure channel, and disposed of at the proposed new spoil ground is 2,600,000$m^3$.

7.3 Describe the project that will generate the dredged or excavated material.

Works to be covered by this application include capital dredging required to construct the proposed new wharf facilities, including berth pocket, departure channel and swing basin, between Boyd Point and Pera Head, approximately 40km south of Weipa. This will include:

- berth pocket dredging to dredge depth of up to -20.2m RL (declared depth -19.7m RL);
- departure area dredging to a dredge depth of -17.8m RL (declared depth -17.3m RL); and,
- departure channel dredging to a dredge depth of -17.8 m RL (declared depth -17.3m RL).

7.4 Location of material to be dredged or excavated.

Attach a location and site plan including WGS84 co-ordinates and street address (where relevant). For dredged material include bathymetric contours. For excavated material, specify the location where the material can be inspected.

A plan of the proposed Port dredging is provided in Attachment 2.

7.5 Physical description of material

Characterise the material (for example, gravel, sand, mud, clay, peat, rock or mixtures of these) and provide a brief summary of the geological features (such as, rock types, sediments found in dredge area, thicknesses of individual strata).

Generally, the sediment profile at the proposed Port area, including berth areas, departure apron and departure channel, comprises a relatively thin, moist, silty surface layer (0.1m - 0.5m) overlying a mottled, firm, relatively dry clay layer. Geotechnical coring completed in the vicinity of the proposed jetty and berth area identifies that this clay layer grades into siltstone around 2-3m depth below the sediment surface and has a significantly reduced fines content.

A graphical summary of the PSD results for Port development area sediments collected in 2007, 2009 and 2010 surveys is presented in Figure 3. The 2007 sampling results have greater sand and gravel content than 2009 samples; however this is likely to be due to different sample collection methods. 2007 samples were collected using vibrocorer while 2009 samples were collected using a sediment grab. The vibrocoring apparatus was able to partially penetrate into the underlying stiff clays while sediment grabs collect only surface sediments up to about 0.1m depth.

2010 samples were collected using a vibrocoring apparatus and demonstrate a significant change in particle size distribution approximately 4km offshore in about -17mLAT water depth, between sampling locations 9 and 10. Due to the significant change of PSD, summary statistics are provided separately for inshore sample locations (locations 1-9) and offshore sample locations (locations 10-17) shown in Figure 3 and in Table 2 and Table 3 respectively.

Inshore sediments are dominated by silt and clay fractions, comprising approximately 84% of the sediments (Table 2). The remainder of the material is comprised of gravel and sand in similar proportions. Offshore sediments are dominated by sand particles, comprising about 66% of the sediments (Table 3). The remainder is comprised of slightly greater proportion of silts and clays (19%) than gravel (15%).

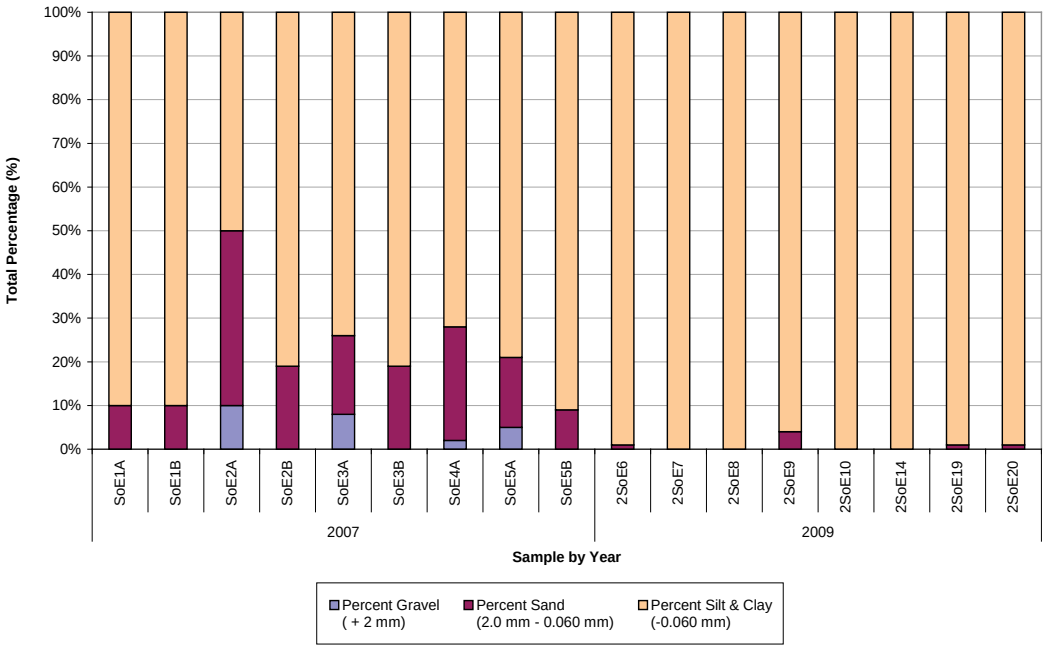
**Table 2: Summary of 2010 inshore particle size distributions**

| Statistic | Gravel (+2mm) | Sand (2mm - 0.060mm) | Silt & Clay (-0.060mm) |
|---|---|---|---|
| Number of samples | 12 | 12 | 12 |
| Mean (per cent) | 13 | 13 | 84 |
| Standard deviation | 3 | 7 | 9 |
| Minimum (per cent) | 0 | 3 | 71 |
| Maximum (per cent) | 12 | 24 | 96 |

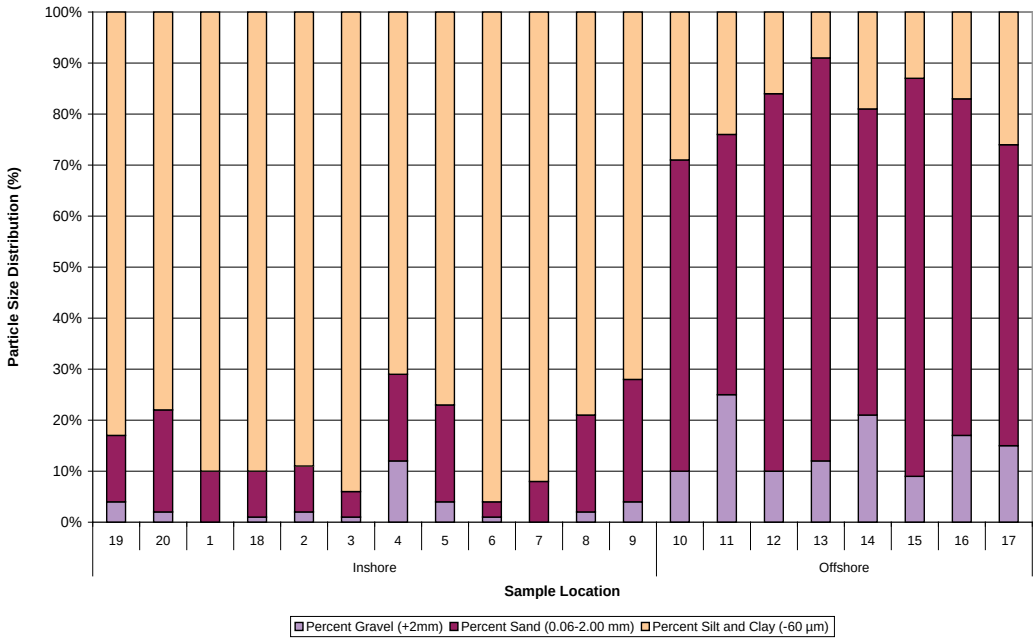
**Table 3: Summary of 2010 offshore particle size distributions**

| Statistic | Gravel (+2mm) | Sand (2mm - 0.060mm) | Silt & Clay (-0.060mm) |
|---|---|---|---|
| Number of samples | 8 | 8 | 8 |
| Mean (per cent) | 15 | 66 | 19 |
| Standard deviation | 6 | 10 | 7 |
| Minimum (per cent) | 9 | 51 | 9 |
| Maximum (per cent) | 25 | 79 | 29 |

**Figure 3: Particle size distribution at the proposed port dredging area during 2007 and 2009 (top) and 2010 surveys (bottom)**




Note: 2007 sample suffixes relate to depth horizons: A = 0-0.5m; and B = 0.5-1m. 2009 samples were surface grabs so contain only one horizon.




Note: 2010 samples were surface grabs so contain only one horizon.

7.6 Chemical description of material

Provide data on the average composition of the material to be disposed of at sea (expressed as percentage of dry weight). In addition, for this application to be considered for a permit, the following sediment quality questions must be answered (refer to section 4.2 of the NAGD). If any of these questions are not applicable due to an exemption being given (refer to 6.0 above) please state 'Exempt'.

**Trace metals and arsenic**

Total acid extractable trace metals and metalloid results are summarised in Table 4 and Table 5 and identify the following:

- total metals and metalloid concentrations were similar across the three sampling events, although the 2007 results demonstrated higher variability than those of 2009 and 2010, particularly for: antimony, cadmium, copper, manganese, mercury, nickel and zinc. The differences likely reflect the 2007 survey footprint being the most inshore of all the surveys and hence likely to contain a greater content of beach sand, which contains ironstone and pisolitic material (bauxite) eroded from the adjacent cliff faces;
- except for nickel and antimony, all total metals and metalloid concentrations for individual samples were below respective NAGD screening levels in all three surveys. In 2007 only, nickel and antimony exceeded respective screening concentrations at sites SoE1 (upper and lower horizon) and SoE 4 (upper horizon);
- the mean and 95% UCLs of the mean for nickel and antimony were below respective NAGD screening levels for combined inshore (2007 and 2009) surveys and for the 2010 survey over the extended dredge footprint;
- mercury concentrations were below the LOR of 0.01mg/kg except for three samples collected in 2007, which were well below the NAGD screening level; and,
- silver was not detected at any location in any survey.

Graphing of metals and arsenic concentrations from inshore to offshore locations (refer Figure 4:) demonstrates a distinct reduction in total concentrations at around sampling locations 9 and 10 approximately 4km from shore. The trend in metals and arsenic concentrations is consistent with a reduction in silt and clay (fines) content.

Chemical characteristics of the proposed new spoil ground sediments are presented in Table 6.

All metals and metalloid concentrations were very consistent between samples and well below the respective NAGD screening levels. Antimony, cadmium, mercury and silver were not detected at any site. Mean concentrations were all less than one-tenth the NAGD screening levels. The 95%UCL of the mean was a maximum of 12.5% of the NAGD screening levels.

Comparison of trace metals concentrations between proposed new spoil ground sediments, sediments from the Port area and regional inshore (Bing Bong, Karumba offshore and

Norman Channel) background levels reported by Munksgaard and Parry (2002) is presented in Table 7. This comparison identifies that:

- the mean of the majority of metals and metalloids in the proposed dredge area and regional inshore data exceeded the 80th percentile value from the proposed new spoil ground. Exceptions were antimony, manganese and silver; and
- the mean of Port area sediments was generally consistent with or slightly lower than those reported for regional inshore areas.

**Organotins**

In 2007 and 2009, organotin concentrations (MBT, DBT, and TBT) at each sampling location were less than the LOR of 0.5µgSn/kg and the NAGD screening level for TBT (9µgSn/kg).

Organotins were not tested for in 2010.

**Nutrients**

Nutrients were analysed in 2007 and 2009.

- nitrate was below detection levels across all sites;
- nitrite was below detection levels across all sites in all surveys, except two sites in 2007;
- total nitrogen across all sites was comprised almost entirely of organic nitrogen with TKN equal to TN and total ammonia <0.3%. Total nitrogen concentrations ranged from <20mg/kg to 2050mg/kg;
- total phosphorus concentrations ranged from 310mg/kg to 710mg/kg;
- total ammonia was analysed in the 2009 sampling campaign and ranged from 3.5 to 7mg/kg across sites; and,
- there are no guideline values for nutrients in sediments or NAGD screening levels.

## Table 4: Summary of sediment quality for metals, metalloids and organotins – Port berth and departure area in 2007 and 2009

| | | | | | 2007 Sampling Campaign | | | | | | | | | 2009 Sampling Campaign | | | | | | | | | Summary Statistics | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analytical Parameter | Units | LOR | NAGD PQL | NAGD Screening Level | SoE1A | S0E1B | SoE2A | SoE2B | SoE3A | SoE3B | SoE4A | SoE5A | SoE5B | 2SoE6 | 2SoE7 | 2SoE8 | 2SoE9 | 2SoE10 | 2SoE12 | 2SoE14 | 2SoE18 | 2SoE19 | 2SoE20 | Mean/ Geomean | Standard Deviaiton | 95% UCL | Normal (N) Lognormal (L) Neither (X) |
| Horizon Depth (m) | | | | | 0-0.5 | 0.5-1.0 | 0-0.5 | 0.5-1.0 | 0-0.5 | 0.5-1.0 | 0-0.5 | 0-0.5 | 0.5-1.0 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date sampled | | | | | 20/10/07 | 20/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 22/10/07 | 21/10/07 | 21/10/07 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | | | | |
| Moisture Content | (%) | < 0.1 | 0.1 | | 45.1 | 27.2 | 24.7 | 24.6 | 28.4 | 24.3 | 25.6 | 24.8 | 24.6 | 63.6 | 67.9 | 66.2 | 69 | 67.2 | 66.3 | 70.4 | 68.3 | 70.6 | 69 | 48.83 | 21.12 | 57.24 | X |
| Total Organic Carbon | (%) | 0 | 0.1 | | 1.1 | 0.74 | 1.1 | 1.4 | 1.3 | 1.6 | 1.3 | 0.61 | 1.3 | 1.4 | 1.5 | 1.4 | 1.1 | 1.6 | 1.4 | | 1.7 | 1.5 | 1.6 | 1.314 | 0.293 | 1.434 | X |
| **Trace Elements** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | (mg/kg) | <0.1 | 200 | - | 6800 | 6300 | 3800 | 4100 | 3800 | 3800 | 5000 | 4200 | 3900 | 17238 | 19642 | 19511 | 20023 | 20735 | 15934 | 17843 | 17816 | 17097 | 17135 | 11825 | 7138 | 14665 | X |
| Antimony | (mg/kg) | <0.3 | 0.5 | 2 | 3.5 | 3.4 | 0.88 | 0.64 | 0.5 | <0.3 | 2.3 | 0.77 | <0.3 | | | <0.5 | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.88 | 1.13 | 1.37 | X |
| Arsenic | (mg/kg) | <0.1 | 1 | 20 | 5.9 | 5.7 | 5.8 | 5.4 | 7.3 | 11 | 8 | 13 | 15 | 5.1 | 5.1 | 5.6 | 5.1 | 5.3 | 5.2 | 5.2 | 4.7 | 4.9 | 4.9 | 6.75 | 2.97 | 7.93 | X |
| Cadmium | (mg/kg) | <0.1 | 0.1 | 1.5 | 0.81 | 0.92 | 0.21 | 0.18 | 0.12 | 0.15 | 0.59 | 0.31 | 0.15 | 0.14 | 0.11 | 0.13 | <0.1 | <0.1 | 0.11 | 0.11 | 0.11 | 0.11 | <0.1 | 0.23 | 0.25 | 0.33 | X |
| Chromium | (mg/kg) | <0.1 | 1 | 80 | 15 | 8.7 | 5.7 | 5 | 4.6 | 4.3 | 7.7 | 5.1 | 4.3 | 33 | 39 | 36 | 39 | 39 | 35 | 40 | 39 | 38 | 38 | 23.0 | 16.1 | 29.4 | X |
| Cobalt | (mg/kg) | <0.1 | 0.5 | - | 23 | 38 | 1.6 | 1.8 | 2 | 1.4 | 33 | 1.6 | 1.4 | | | 4.1 | | 4.5 | 3.9 | 4.4 | 4.3 | 4.2 | 4.2 | 8.3 | 11.8 | 13.5 | X |
| Copper | (mg/kg) | <0.1 | 1 | 65 | 42 | 40 | 8 | 11 | 16 | 11 | 24 | 14 | 15 | 5.8 | 6.5 | 6.2 | 6.3 | 6.6 | 5.8 | 6.3 | 6.4 | 6.2 | 6.2 | 12.8 | 11.1 | 17.2 | X |
| Iron | (mg/kg) | <0.1 | 100 | - | 38000 | 47000 | 9000 | 7100 | 2800 | 6500 | 29000 | 15000 | 6900 | 22000 | 25000 | 25000 | 25000 | 25000 | 23000 | 25000 | 25000 | 24000 | 25000 | 21332 | 11221 | 25796 | X |
| Lead | (mg/kg) | <0.1 | 1 | 50 | 5 | 7 | 4.4 | 4.3 | 8.8 | 9.2 | 4.7 | 4.9 | 9.3 | 5.2 | 6 | 5.7 | 6 | 6.1 | 6 | 6.5 | 6.3 | 6.2 | 6.2 | 6.0 | 1.5 | 6.8 | L |
| Manganese | (mg/kg) | <0.1 | 10 | - | 120 | 99 | 15 | 5.6 | 9.5 | 4.5 | 56 | 5.7 | 3 | 170 | 190 | 180 | 180 | 190 | 170 | 200 | 190 | 180 | 190 | 114 | 82 | 146 | X |
| Mercury | (mg/kg) | <0.01 | 0.01 | 0.15 | 0.02 | 0.03 | <0.01 | <0.01 | 0.04 | <0.01 | <0.01 | <0.01 | 0.03 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.011 | 0.011 | 0.015 | X |
| Nickel | (mg/kg) | <0.1 | 1 | 21 | 31 | 42 | 2.9 | 3.4 | 3.2 | 2.9 | 27 | 2.8 | 2.9 | 11 | 12 | 11 | 12 | 12 | 11 | 12 | 12 | 12 | 12 | 12.4 | 10.5 | 16.5 | X |
| Selenium | (mg/kg) | <0.43 | 0.1 | - | 0.52 | <0.43 | <0.43 | <0.43 | <0.43 | <0.43 | <0.43 | <0.43 | <0.43 | | | 0.51 | | 0.63 | 0.62 | 0.61 | 0.53 | 0.88 | 0.55 | 0.41 | 0.22 | 0.51 | X |
| Silver | (mg/kg) | <0.1 | 0.1 | 1.0 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | | <0.1 | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.062 | 0.048 | 0.083 | X |
| Vanadium | (mg/kg) | <0.16 | 2 | - | 26 | 22 | 11 | 9.5 | 9.6 | 17 | 23 | 23 | 11 | | | 33 | | 36 | 32 | 36 | 34 | 32 | 33 | 24.3 | 10.0 | 28.6 | X |
| Zinc | (mg/kg) | <0.1 | 1 | 200 | 120 | 170 | 11 | 13 | 23 | 13 | 110 | 31 | 14 | 17 | 19 | 18 | 19 | 20 | 17 | 19 | 19 | 18 | 18 | 36.3 | 44.7 | 54.0 | X |
| **Nutrients** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phosphorus | (mg/kg) | <0.1 | 0.1 | - | 550 | 530 | 350 | 310 | 410 | 510 | 480 | 460 | 510 | 610 | 700 | 650 | 680 | 710 | | | | 690 | | 543 | 129 | 602 | N |
| Nitrate-N | (mg/kg) | <0.5 | 100 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | | | <0.1 | | <0.5 | 0 | <0.5 | - |
| Nitrite-N | (mg/kg) | <0.5 | 100 | - | <0.5 | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | | | <0.1 | | 0.31 | 0.26 | 0.45 | X |
| Total Kjeldahl Nitrogen | (mg/kg) | <20 | 100 | - | 920 | 82 | 190 | <20 | 120 | <20 | 270 | 49 | <20 | 1820 | 1950 | 1930 | 1870 | 2010 | | | | 2050 | | 949 | 918 | 1383 | X |
| Total Nitrogen | (mg/kg) | <20 | 100 | - | 920 | 82 | 190 | <20 | 120 | <20 | 270 | 49 | <20 | 1820 | 1950 | 1930 | 1870 | 2010 | | | | 2050 | | 949 | 918 | 1383 | X |
| Total Ammonia as N | | | | | | | | | | | | | | 3.5 | 5 | 5 | 4 | 7 | | | | 6.5 | | 5.17 | 1.37 | 6.29 | N |
| **Organotins** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Monobutyl tin | (µgSn/kg) | <0.5 | 1 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1.0 | <1.0 | <1.0 | <1.0 | <0.5 | <1 | | <1 | <1 | <1 | <1 | 0 | <1 | - |
| Dibutyl tin | (µgSn/kg) | <0.5 | 1 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1 | | <1 | <1 | <1 | <1 | 0 | <1 | - |
| Tributyl tin | (µgSn/kg) | <0.5 | 1 | 9 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1 | | <1 | <1 | <1 | <1 | 0 | <1 | - |

**Legend**

| | |
|---|---|
| Note | When calculating averages and 95% UCLs, values below detection for individual results were set to half the detection levels, consistent with the NAGD |
| mg/kg | Milligrams per kilogram |
| PQL | Practical Quantitation Limit |
| LOR | Laboratory Limit of Reporting |
| 50 | Value exceeds NAGD Screening Level |

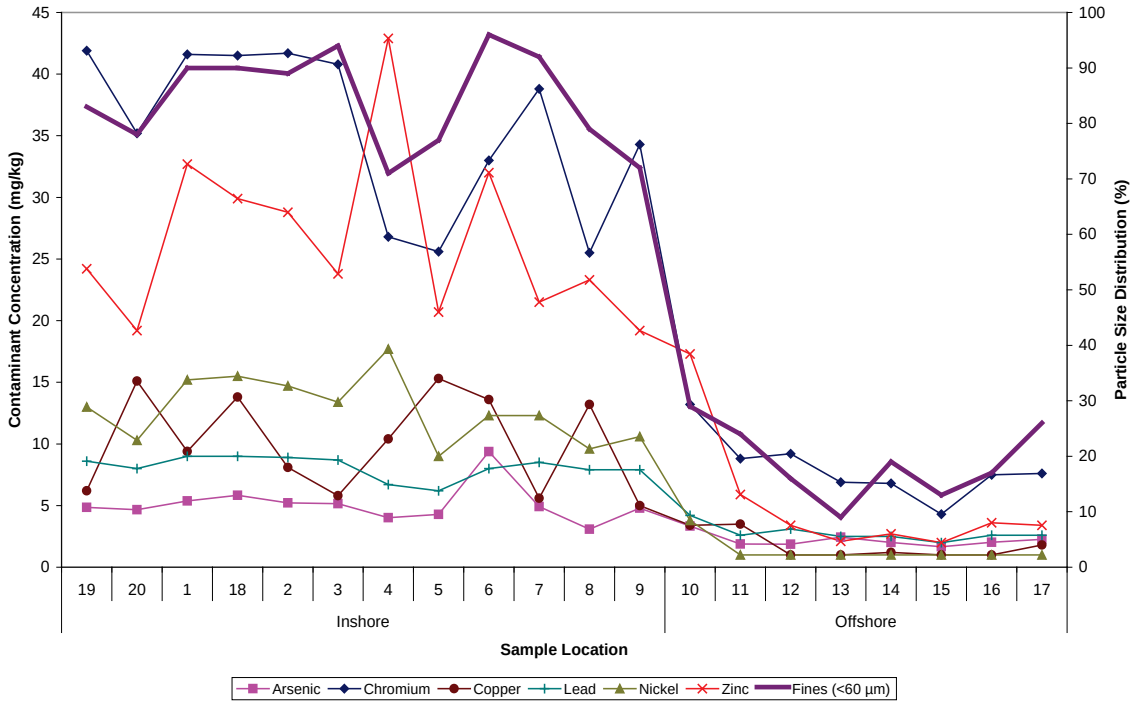
## Table 5: Summary of sediment quality for metals and metalloids – Port berth, departure area and departure channel area in 2010.

| | | | | | Sampling Location | | | | | | | | | | | | | | | | | | Summary Statistics | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Units | LOR | NAGD PQL | NAGD Screening Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Mean/ Geomean | Standard Deviation | 95% UCL | Normal (N) Log-normal (L) Neither (X) |
| **Date Sampled** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Moisture Content | % | 1 | | | 64.4 | 68.4 | 61.1 | 41.5 | 54.6 | 60.5 | 56 | 43.5 | 52.2 | 30.5 | 35.1 | 28.8 | 33 | 28.8 | 30.3 | 30.2 | 29.8 | 63.4 | 67.3 | 63.7 | 47.16 | 15.28 | 53.06 | X |
| **Total Metals** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminium | mg/kg | 50 | 200 | - | 18100 | 18600 | 17300 | 11900 | 11300 | 13200 | 16500 | 11500 | 14400 | 3790 | 3890 | 2750 | 1760 | 2190 | 1480 | 2830 | 2700 | 16800 | 18000 | 15000 | 10200 | 6654 | 12772 | X |
| Antimony | mg/kg | 0.5 | 0.5 | 2 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | - | <0.50 | - |
| Arsenic | mg/kg | 1 | 1 | 20 | 5.38 | 5.21 | 5.15 | 4.01 | 4.28 | 9.37 | 4.92 | 3.08 | 4.79 | 3.34 | 1.88 | 1.86 | 2.43 | 2.01 | 1.66 | 2.02 | 2.26 | 5.83 | 4.86 | 4.66 | 3.54 | 1.9 | 4.69 | L |
| Cadmium | mg/kg | 0.1 | 0.1 | 1.5 | 0.1 | 0.1 | 0.2 | <0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | 0.1 | 0.09 | 0.05 | 0.11 | X |
| Chromium | mg/kg | 1 | 1 | 80 | 41.6 | 41.7 | 40.8 | 26.8 | 25.6 | 33 | 38.8 | 25.5 | 34.3 | 13.2 | 8.8 | 9.2 | 6.9 | 6.8 | 4.3 | 7.5 | 7.6 | 41.5 | 41.9 | 35.2 | 24.55 | 14.79 | 30.27 | X |
| Cobalt | mg/kg | 0.5 | 0.5 | - | 7 | 7.2 | 5.9 | 10.1 | 5 | 6 | 5.3 | 4.9 | 4.8 | 4.6 | 1.4 | 1.2 | 1 | 1 | 0.8 | 1.3 | 1.3 | 7.1 | 6 | 4.8 | 4.34 | 2.7 | 5.38 | X |
| Copper | mg/kg | 1 | 1 | 65 | 9.4 | 8.1 | 5.8 | 10.4 | 15.3 | 13.6 | 5.6 | 13.2 | 5 | 3.4 | 3.5 | 1 | <1.0 | 1.2 | <1.0 | 1 | 1.8 | 13.8 | 6.2 | 15.1 | 7.41 | 5.11 | 9.51 | N |
| Iron | mg/kg | 50 | 100 | - | 24600 | 23500 | 22800 | 18800 | 16000 | 34700 | 21100 | 13100 | 20100 | 16200 | 11600 | 6110 | 6030 | 5430 | 3610 | 4880 | 6240 | 23100 | 23700 | 19500 | 16055 | 8608 | 19383 | N |
| Lead | mg/kg | 1 | 1 | 50 | 9 | 8.9 | 8.7 | 6.7 | 6.2 | 8 | 8.5 | 7.9 | 7.9 | 4.2 | 2.6 | 3.1 | 2.5 | 2.5 | 2 | 2.6 | 2.6 | 9 | 8.6 | 8 | 5.98 | 2.8 | 7.06 | X |
| Manganese | mg/kg | 10 | 10 | - | 233 | 209 | 233 | 171 | 188 | 158 | 236 | 123 | 215 | 110 | 78 | 81 | 57 | 60 | 48 | 91 | 84 | 231 | 208 | 172 | 149.3 | 68.25 | 175.7 | X |
| Mercury | mg/kg | 0.01 | 0.01 | 0.15 | 0.02 | 0.02 | 0.02 | 0.12 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | X |
| Nickel | mg/kg | 1 | 1 | 21 | 15.2 | 14.7 | 13.4 | 17.7 | 9 | 12.3 | 12.3 | 9.6 | 10.6 | 3.8 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 15.5 | 13 | 10.3 | 12.11 | 3.56 | 13.87 | N |
| Selenium | mg/kg | 0.1 | 0.1 | - | 0.8 | 0.4 | 0.4 | 0.6 | 0.8 | 1.8 | 0.5 | 2.9 | 0.4 | 0.2 | 0.2 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.7 | 0.7 | 0.5 | 0.56 | 0.69 | 0.83 | X |
| Silver | mg/kg | 0.1 | 0.1 | 1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | <0.1 | - |
| Vanadium | mg/kg | 2 | 2 | - | 40.2 | 40.5 | 37 | 26.6 | 35.9 | 61.1 | 34 | 34.4 | 31.1 | 20.6 | 43.7 | 11.2 | 10.1 | 10.2 | 5 | 7.7 | 12.8 | 39.5 | 42.4 | 40.2 | 29.21 | 15.36 | 35.15 | N |
| Zinc | mg/kg | 1 | 1 | 200 | 32.7 | 28.8 | 23.8 | 42.9 | 20.7 | 32 | 21.5 | 23.3 | 19.2 | 17.3 | 5.9 | 3.4 | 2.1 | 2.7 | 2 | 3.6 | 3.4 | 29.9 | 24.2 | 19.2 | 17.93 | 12.43 | 22.74 | N |

**Legend**

| | |
|---|---|
| Note | When calculating averages and 95% UCLs, values below detection for individual results were set to half the detection levels, consistent with the NAGD |
| mg/kg | Milligrams per kilogram |
| PQL | Practical Quantitation Limit |
| LOR | Laboratory Limit of Reporting |
| 50 | Value exceeds NAGD Screening Level |

**Figure 4: NAGD metals and arsenic concentrations and percentage fines content from inshore to offshore in 2010 survey**



## Table 6: Summary of Sediment Quality for Metals and Metalloids at Proposed New Spoil Ground in 2010

| | Units | LOR | NAGD PQL | NAGD Screening Level | SGsed1 | SGsed2 | SGsed3 | SGsed4 | SGsed5 | SGsed6 | SGsed7 | Mean/ Geomean | Standard Deviation | 95% UCL | Normal (N) Log-normal (L) Neither (X) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 05/06/2010 | 05/06/2010 | 05/06/2010 | 05/06/2010 | 05/06/2010 | 05/06/2010 | 05/06/2010 | | | | |
| Moisture Content | % | 1 | | | 37.4 | 25.7 | 35.6 | 38.3 | 41.7 | 34.6 | 37 | 35.76 | 4.976 | 39.41 | N |
| **Total Metals** | | | | | | | | | | | | | | | |
| Aluminium | mg/kg | 50 | 200 | - | 3120 | 690 | 5100 | 3870 | 4760 | 1940 | 4620 | 3443 | 1632 | 4642 | N |
| Antimony | mg/kg | 0.5 | 0.5 | 2 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | - | <0.50 | - |
| Arsenic | mg/kg | 1 | 1 | 20 | 1.54 | 1.14 | 2.83 | 1.36 | 1.96 | 1.84 | 1.84 | 1.787 | 0.545 | 2.188 | N |
| Cadmium | mg/kg | 0.1 | 0.1 | 1.5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | <0.1 | - |
| Chromium | mg/kg | 1 | 1 | 80 | 6.5 | 1.7 | 10.2 | 7.8 | 10.6 | 5 | 10.2 | 7.429 | 3.295 | 9.848 | N |
| Cobalt | mg/kg | 0.5 | 0.5 | - | 1.2 | 0.6 | 1.9 | 1.4 | 1.7 | 1 | 1.6 | 1.343 | 0.447 | 1.671 | N |
| Copper | mg/kg | 1 | 1 | 65 | 2.7 | 1.6 | 2.1 | 1.7 | 1.9 | <1.0 | 1.6 | 1.729 | 0.655 | 2.217 | N |
| Iron | mg/kg | 50 | 100 | - | 5110 | 2260 | 6960 | 5570 | 8100 | 3980 | 6700 | 5526 | 1970 | 6973 | N |
| Lead | mg/kg | 1 | 1 | 50 | 2.8 | 1.8 | 3.7 | 3 | 4.7 | 2.6 | 3.9 | 3.214 | 0.958 | 3.918 | N |
| Manganese | mg/kg | 10 | 10 | - | 134 | 250 | 229 | 147 | 214 | 120 | 151 | 177.9 | 51.75 | 215.9 | N |
| Mercury | mg/kg | 0.01 | 0.01 | 0.15 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | - | <0.01 | - |
| Nickel | mg/kg | 1 | 1 | 21 | 1.2 | <1.0 | 3 | 1.8 | 2.7 | <1.0 | 2.8 | 1.786 | 1.079 | 2.578 | N |
| Selenium | mg/kg | 0.1 | 0.1 | - | 0.2 | <0.1 | 0.3 | 0.1 | 0.1 | <0.1 | <0.1 | 0.096 | 0.095 | 0.191 | L |
| Silver | mg/kg | 0.1 | 0.1 | 1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | <0.1 | - |
| Vanadium | mg/kg | 2 | 2 | - | 5 | <2.0 | 8 | 5.9 | 7.4 | 3.9 | 7.2 | 5.486 | 2.448 | 7.284 | N |
| Zinc | mg/kg | 1 | 1 | 200 | 2.8 | 1.2 | 4.7 | 3.5 | 4.3 | 1.8 | 4.5 | 3.257 | 1.375 | 4.267 | N |

**Legend**

| | |
|---|---|
| Note | When calculating averages and 95% UCLs, values below detection for individual results were set to half the detection levels, consistent with the NAGD |
| PQL | Practical Quantitation Limit |
| LOR | Laboratory Limit of Reporting |
| 50 | Value exceeds NAGD Screening Level |

## Table 7: Comparison of Sediment metal and metalloid concentrations between Proposed New Spoil Ground and Port Area

| | | | Summary Statistics | | | | | | | | | Regional Data | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 & 2009 Dredge Area | | | 2010 Dredge Area | | | Spoil Ground 2010 | | | Munksguaard & Parry 2002 | | | | | |
| | Units | NAGD Screening Level | Mean/ Geomean | Standard Deviation | 95% UCL | Mean/ Geomean | Standard Deviation | 95% UCL | Mean/ Geomean | Standard Deviation | 80th Percentile | Mean | Max | Mean | Max | Mean | Max |
| | | | | | | | | | | | | Bing Bong | | Karumba Offshore | | Norman Channel | |
| Aluminium | mg/kg | - | 11825 | 7138 | 14665 | 10200 | 6654 | 12772 | 3443 | 1632 | 4732 | | | | | | |
| Antimony | mg/kg | 2 | 0.88 | 1.13 | 1.37 | <0.50 | - | <0.50 | <0.50 | - | <0.50 | | | | | | |
| Arsenic | mg/kg | 20 | 6.75 | 2.97 | 7.93 | 3.54 | 1.9 | 4.69 | 1.787 | 0.545 | 1.936 | nd | nd | 3.55 | 5.38 | 5.5 | 8.23 |
| Cadmium | mg/kg | 1.5 | 0.23 | 0.25 | 0.33 | 0.09 | 0.05 | 0.11 | <0.1 | - | <0.1 | 0.09 | 0.15 | 0.09 | 0.15 | 0.06 | 0.14 |
| Chromium | mg/kg | 80 | 23.0 | 16.1 | 29.4 | 24.55 | 14.79 | 30.27 | 7.429 | 3.295 | 10.2 | | | | | | |
| Cobalt | mg/kg | - | 8.3 | 11.8 | 13.5 | 4.34 | 2.7 | 5.38 | 1.343 | 0.447 | 1.68 | 10.3 | 13.4 | 10 | 12.9 | 11.53 | 21.24 |
| Copper | mg/kg | 65 | 12.8 | 11.1 | 17.2 | 7.41 | 5.11 | 9.51 | 1.729 | 0.655 | 2.1 | 14.6 | 21.8 | 13.3 | 16.6 | 16.51 | 24.8 |
| Iron | mg/kg | - | 21332 | 11221 | 25796 | 16055 | 8608 | 19383 | 5526 | 1970 | 6908 | 36200 | 52000 | 35900 | 44000 | 35327 | 59500 |
| Lead | mg/kg | 50 | 6.0 | 1.5 | 6.8 | 5.98 | 2.8 | 7.06 | 3.214 | 0.958 | 3.86 | 15 | 19.6 | 17.2 | 22.3 | 20.2 | 31 |
| Manganese | mg/kg | - | 114 | 82 | 146 | 149.3 | 68.25 | 175.7 | 177.9 | 51.75 | 226 | 283 | 423 | 366 | 563 | 456 | 1330 |
| Mercury | mg/kg | 0.15 | 0.011 | 0.011 | 0.015 | 0.02 | 0.03 | 0.03 | <0.01 | - | <0.01 | | | | | | |
| Nickel | mg/kg | 21 | 12.4 | 10.5 | 16.5 | 12.11 | 3.56 | 13.87 | 1.786 | 1.079 | 2.84 | 19.4 | 22.2 | 24.4 | 32.4 | 22.52 | 47 |
| Selenium | mg/kg | - | 0.41 | 0.22 | 0.51 | 0.56 | 0.69 | 0.83 | 0.096 | 0.095 | 0.24 | | | | | | |
| Silver | mg/kg | 1 | <0.1 | 0.000 | <0.1 | <0.1 | - | <0.1 | <0.1 | - | <0.1 | | | | | | |
| Vanadium | mg/kg | - | 24.3 | 10.0 | 28.6 | 29.21 | 15.36 | 35.15 | 5.486 | 2.448 | 7.4 | | | | | | |
| Zinc | mg/kg | 200 | 36.3 | 44.7 | 54.0 | 17.93 | 12.43 | 22.74 | 3.257 | 1.375 | 4.46 | 41.1 | 52.1 | 50.5 | 60.1 | 54.2 | 80.3 |

| | |
|---|---|
| 0.15 | Value exceeds NAGD screening level |
| 0.15 | Mean value exceeds 80th percentile of background (spoil ground) |

The results of the comparison of Port area and proposed new spoil ground background concentrations are not unexpected given the presence of pisolitic and ironstone materials in sediments proposed to be dredged from the Port area. This material is likely to have originated from the adjacent bauxite cliff face and surrounding geology of the dredge area and, by nature, these geological materials are elevated in a range of metals concentrations. These metals, however, are strongly bound and not bioavailable or likely to dissolve into the water column as evidenced from the DAE and elutriate testing (refer Sections 7.7 and 7.8 and Worley Parsons 2012) .

7.6.1 Is the concentration of any chemical constituent above the Screening Levels in Table 2 of the NAGD?

☐ Yes ☒ No

If 'No', go to question 7.10.

If 'Yes', list the chemical constituents and their levels.

7.6.2 Are any of the chemical constituents listed in 7.6.1 (that is, those above Screening Levels) also above the background levels at the disposal site?

☐ Yes ☐ No

If 'No', go to question 7.10.

If 'Yes', list the chemical constituents and their background levels at the disposal site.

7.7 Elutriate testing

If you answered 'Yes' to question 7.6.2, elutriate testing may be required to be carried out. Refer to Section 4.2.3 and Appendix A of the NAGD for further information.

Under the NAGD sediment assessment framework, elutriate and bioavailability assessment is generally only required if sediments do not pass screening level assessment. Even though contaminants were below NAGD screening levels over the dredge area at the 95%UCL of the mean, elutriate and bioavailability assessments for trace elements were undertaken.

Summary results of elutriate analysis over 2007, 2009 and 2010 surveys are provided in Table 8 and Table 9. Results identify the following:

- Elutriate metal concentrations were generally below respective ANZECC/ARMCANZ (2000) marine water quality guidelines at the 95% species protection level. The exceptions to this are cobalt and copper during the 2007 survey and zinc in 2010 survey. It should be noted that sediment total copper, cobalt and zinc concentrations within respective surveys were below NAGD screening levels;
- Cobalt exceeded the ANZECC/ARMCANZ (2000) guideline for 95% species protection level at two sites (SoE1 and SoE3) in 2007 and occurred in the sub-surface horizon. Exceedances do not take into account dilution during placement;

- Copper exceeded the ANZECC/ARMCANZ (2000) guideline for 95% species protection level at four sites for samples SoE1, SoE3a, SoE4a, SoE5a and SoE5b in 2007. Exceedances do not take into account dilution during placement at the proposed new spoil ground;
- Zinc exceeded the ANZECC/ARMCANZ (2000) guideline for 95% species protection level at one sampling location (site 4) in 2010. This single result appears to be an outlier, given it is about 20 times greater than other concentrations in 2010; and,
- Cobalt, copper and zinc marginally exceed the ANZECC/ARMCANZ (2000) guideline for 95% species protection level at the 95th percentile value, prior to allowing any dilution following disposal. Exclusion of the 2010 zinc outlier results in a concentration of 7.1µg/L, less than half the guideline.

While cobalt, copper and zinc exceed the guidelines, the NAGD recommends the application of an initial mixing within the spoil disposal area when making an assessment of suitability for sea disposal. The NAGD states that "The elutriate test uses a dilution of 1:4, wet sediment: added seawater, and will greatly overestimate water quality impacts given that, within the four hour period, dilutions of the order of a hundred times or more would normally be expected". In the present study, minimal dilution of up to four times would be required for the material to achieve concentrations less than the ANZECC/ARMCANZ (2000) water quality guideline level. A conservative estimate of immediate dilution alone over the proposed new spoil ground is at least 13 times, prior to any allowance for dilution over the next four hours.

7.7.1 Are all results of elutriate testing below the *ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality* marine water quality criteria for any chemical parameter after allowable dilution?

☒ Yes ☐ No

If 'Yes, go to question 7.8.

If 'No', you should consult the department on further actions that maybe required. You have the option of carrying out detailed toxicity and bioavailability testing, and evaluating control measures to minimise the impact (such as treatment of the waste or confined disposal). It is important to note that if control measures are unlikely to be effective, the material may be considered unacceptable for sea disposal

7.8 Bioavailability testing

Summary results of dilute acid extraction (DAE) analysis over 2007, 2009 and 2010 surveys are provided in Table 10 and Table 11. Results identify the following:

The DAE analyses indicate that bioavailable metal concentrations are below respective NAGD screening levels across all samples in all surveys. The 95%UCL of the mean for metals was also below NAGD screening levels.

## Table 8: Summary results for elutriate analysis of metals and arsenic – Port berth and departure area in 2007 and 2009.

| Sample | Units | LOR | ANZECC/ARMCANZ 95% Species Protection Level | SoE1A | SoE1B | SoE2A | SoE2B | SoE3A | SoE3B | SoE4A | SoE5A | SoE5B | SoE8 | 2SoE10 | 2SoE12 | 2SoE14 | 2SoE18 | 2SoE19 | 2SoE20 | 95th Percentile (and dilution factor required to meet WG Guideline) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date sampled | | | | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | |
| Aluminium | µg/L | < 20 | | 710 | 860 | 320 | 340 | 570 | 290 | 170 | 190 | 280 | | | < 20 | < 20 | < 20 | < 20 | < 20 | 763 |
| Antimony | µg/L | < 30 | | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 | 2.2 | 1.3 | 1.4 | < 1 | 1.3 | 1.8 | 1.1 | 15 |
| Arsenic | µg/L | < 1 | | 2 | < 1 | 2 | < 1 | 4 | < 1 | 3 | 3 | 1 | | | 9.3 | < 5 | 6.3 | 11 | 6.5 | 9.9 |
| Cadmium | µg/L | < 0.7 | 5.5 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | | | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | <0.7 |
| Chromium (VI) | µg/L | < 2 | 4.4 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | | | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Cobalt | µg/L | < 1 | 1 | < 1 | 2 | < 1 | 1 | < 1 | 2 | < 1 | 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | 2 (2) |
| Copper | µg/L | < 1 | 1.3 | < 1 | 4 | < 1 | < 1 | 2 | < 1 | 2 | 4 | 2 | | | < 1 | < 1 | < 1 | < 1 | < 1 | 4 (4) |
| Iron | µg/L | < 20 | | 570 | 1200 | 220 | 250 | 270 | 180 | 150 | 170 | 190 | | | < 20 | < 20 | < 20 | < 20 | < 20 | 790 |
| Lead | µg/L | < 1 | 4.4 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | | | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Manganese | µg/L | < 2 | | 7 | 6 | 3 | 7 | < 2 | 10 | < 2 | 2 | 3 | | | 2.3 | 14 | 10 | 36 | 13 | 21.7 |
| Mercury | µg/L | < 0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nickel | µg/L | < 6 | 70 | 9 | 10 | 10 | 30 | 10 | 30 | 6 | 10 | 10 | | | 3 | 3 | 3 | 3 | 3 | 30 |
| Selenium | µg/L | < 40 | | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 40 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 40 |
| Silver | µg/L | < 1 | 1.4 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Vanadium | µg/L | < 4 | 100 | < 4 | < 4 | < 4 | < 4 | < 4 | < 4 | < 4 | < 4 | < 4 | 20 | 15 | 24 | 9.9 | 15 | 21 | 17 | 21.8 |
| Zinc | µg/L | < 5 | 15 | < 4 | 10 | 9 | 4 | 7 | 10 | < 4 | < 4 | < 4 | | | < 5 | < 5 | < 5 | < 5 | < 5 | 10.0 |

Legend

0.15 Value exceeds ANZECC/ARMCANZ (2000) water quality toxicant guideland for 95% species protection.

## Table 9: Summary results for elutriate analysis of metals and arsenic – Port berth, departure apron and departure channel in 2010

| | | | | Sampling Location | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analyte | Units | LOR | ANZECC/ARMCANZ 95% Species Protection Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Seawater Blank | 95th Percentile (and dilution factor required to meet WG Guideline) |
| Aluminium | µg/L | 10 | | < 10 | < 10 | < 10 | 20 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | 6.5 |
| Antimony | µg/L | 0.5 | | 2.1 | 1.5 | 3 | 2.1 | 1.7 | 2.5 | 2.9 | 2.1 | 3.8 | 0.9 | 0.6 | <0.5 | 0.6 | 0.9 | <0.5 | <0.5 | 1.3 | 2 | 1.4 | 1.2 | <0.5 | 3.08 |
| Arsenic | µg/L | 0.5 | | 12.4 | 9.8 | 13.3 | 10.3 | 10.8 | 9.9 | 12.6 | 13.3 | 9.2 | 3.5 | 7.9 | 7.3 | 6.4 | 15.7 | 7.1 | 18.9 | 13.5 | 13.1 | 7.3 | 7.1 | 1.2 | 16.02 |
| Cadmium | µg/L | 0.2 | 5.5 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | 0.3 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Chromium (VI) | µg/L | 0.5 | 4.4 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Cobalt | µg/L | 0.2 | 1 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | 0.2 | < 0.2 | < 0.2 | < 0.2 | 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Copper | µg/L | 1 | 1.3 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Iron | µg/L | 5 | | < 5 | 9 | 5 | 5 | < 5 | < 5 | 7 | < 5 | < 5 | 12 | 22 | 7 | 6 | < 5 | < 5 | 6 | 7 | < 5 | 6 | < 5 | < 5 | 13 |
| Lead | µg/L | 0.2 | 4.4 | < 0.2 | 0.3 | < 0.2 | < 0.2 | 0.4 | 0.3 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | 0.5 | < 0.2 | 0.3 | < 0.2 | 0.2 | < 0.2 | < 0.2 | 0.2 | 0.2 | < 0.2 | < 0.2 | 0.41 |
| Manganese | µg/L | 0.5 | | 1.7 | 1.8 | 24.1 | 1.3 | 1.5 | 1.6 | 2.9 | < 0.5 | 2.5 | 4.1 | 2.4 | 3.1 | 2.5 | 3.7 | 1.7 | 4.1 | 2.5 | 1 | 3.9 | 5 | <0.5 | 6.1 |
| Mercury | µg/L | 0.1 | 0.4 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Nickel | µg/L | 0.5 | 70 | 0.7 | < 0.5 | 1.4 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 0.9 | 1.1 | 0.8 | 1.6 | 1.1 | 0.7 | 1.1 | < 0.5 | 1.7 | 1.2 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 1.61 |
| Selenium | µg/L | 2 | | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Silver | µg/L | 0.1 | 1.4 | 0.1 | 0.5 | 0.1 | 0.1 | 0.3 | < 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.1 | 0.2 | 0.2 | <0.1 | 0.41 |
| Vanadium | µg/L | 0.5 | 100 | 18.2 | 14.9 | 15.7 | 15.3 | 14.8 | 14.2 | 15.6 | 16.5 | 14.4 | 5.7 | 3.8 | 7.1 | 3.8 | 7.4 | 3.4 | 4.6 | 8.4 | 19.8 | 11.5 | 8.9 | 1.4 | 18.4 |
| Zinc | µg/L | 5 | 15 | < 5 | 6 | < 5 | 100 | < 5 | < 5 | < 5 | 7 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | 8 | < 5 | < 5 | < 5 | 17.2 (2) |

Legend

0.15 Value exceeds ANZECC/ARMCANZ (2000) water quality toxicant guideland for 95% species protection.

## Table 10: Summary results for DAE analysis on metals and metalloids – Port berth and departure area in 2007 and 2009

| | | | | | 2007 Sampling Campaign | | | | | | | | | 2009 Sampling Campaign | | | | | | | Summary Statistics | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample | Units | LOR | NAGD PQL | NAGD Screening Level | SoE1A | SoE1B | SoE2A | SoE2B | SoE3A | SoE3B | SoE4A | SoE5A | SoE5B | 2SoE8 | 2SoE10 | 2SoE12 | 2SoE14 | 2SoE18 | 2SoE19 | 2SoE20 | Mean/ Geomean | Standard Deviaiton | 95% UCL | Normal (N) Lognormal (L) Neither (X) |
| Horizon | m | | | | 0-0.5 | 0.5-1.0 | 0-0.5 | 0.5-1.0 | 0-0.5 | 0.5-1.0 | 0-0.5 | 0-0.5 | 0.5-1.0 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | | | | |
| Date sampled | | | | | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 21/10/07 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | 30/06/09 | | | | |
| Aluminium | mg/kg | <0.2 | 200 | | 1100 | 760 | 330 | 400 | 540 | 460 | 570 | 440 | 410 | | | 2080 | 2147 | 2306 | 2237 | 2216 | 1143 | 838.4 | 1539 | X |
| Antimony | mg/kg | <0.5 | 0.5 | 2 | <1.37 | <1.37 | <1.37 | <1.37 | <1.37 | <1.37 | <1.37 | <1.37 | <1.37 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0 | <0.5 | - |
| Arsenic | mg/kg | <1.0 | 1 | 20 | <1.82 | <1.82 | <1.82 | <1.82 | <1.82 | 2.5 | <1.82 | <1.82 | <1.82 | | | 1.9 | 2.2 | 1.7 | 1.6 | 1.8 | 1.4 | 0.6 | 1.6 | X |
| Cadmium | mg/kg | <0.1 | 0.1 | 1.5 | <0.09 | <0.09 | <0.09 | <0.09 | <0.09 | <0.09 | <0.09 | <0.09 | <0.09 | | | 0.13 | <0.1 | 0.11 | 0.13 | <0.1 | 0.06 | 0.03 | 0.08 | X |
| Chromium | mg/kg | <0.1 | 1 | 80 | 2.8 | 0.59 | 0.73 | 0.37 | 0.4 | <0.18 | 0.89 | 0.25 | <0.18 | | | 10 | 11 | 11 | 11 | 10 | 4.23 | 4.98 | 6.59 | X |
| Cobalt | mg/kg | <0.2 | 0.5 | | 0.46 | 0.41 | <0.27 | 0.52 | 0.31 | <0.27 | <0.27 | <0.27 | <0.27 | 0.84 | 0.9 | 0.85 | 0.94 | 0.93 | 0.86 | 0.92 | 0.538 | 0.344 | 0.689 | X |
| Copper | mg/kg | <0.1 | 1 | 65 | 5.4 | 6.4 | 1.2 | 2.2 | 3.7 | 2.2 | 4 | 2.7 | 4.4 | | | 2.4 | 2.5 | 2.6 | 2.5 | 2.4 | 3.2 | 1.4 | 3.9 | N |
| Iron | mg/kg | <0.5 | 100 | | 1700 | 350 | 850 | 360 | 520 | 270 | 780 | 840 | 420 | | | 5300 | 5600 | 5900 | 6300 | 5900 | 2506 | 2580 | 3727 | X |
| Lead | mg/kg | <0.3 | 1 | 50 | 1.9 | 1.1 | 0.62 | <0.55 | 0.73 | 1.1 | 1.2 | <0.55 | 0.71 | | | 6.1 | 6.6 | 6.5 | 6.2 | 6.2 | 2.8 | 2.7 | 4.1 | X |
| Manganese | mg/kg | <0.1 | 10 | | 34 | 9.8 | 12 | 4.8 | 7.8 | 2.1 | 11 | 22 | 2.2 | | | 130 | 150 | 140 | 140 | 140 | 23 | 64 | 88 | L |
| Mercury | mg/kg | <0.01 | 0.01 | 0.15 | <0.018 | <0.014 | <0.013 | <0.013 | <0.014 | <0.013 | 0.13 | 0.01 | 0.01 | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.0155 | 0.033 | 0.0312 | X |
| Nickel | mg/kg | <0.15 | 1 | 21 | 1.1 | 0.66 | 0.54 | 0.6 | 0.49 | 0.4 | 0.53 | 0.4 | 0.28 | | | 2 | 2.2 | 2.3 | 2.4 | 2.1 | 1.143 | 0.843 | 1.542 | X |
| Selenium | mg/kg | <0.5 | 0.1 | | <1.82 | <1.82 | <1.82 | <1.82 | <1.82 | <1.82 | <1.82 | <1.82 | <1.82 | 0.55 | 0.52 | 0.56 | 0.53 | 0.53 | <0.5 | <0.5 | 0.71 | 0.25 | 0.82 | X |
| Silver | mg/kg | <0.1 | 0.1 | 1 | <0.11 | <0.11 | <0.11 | <0.11 | <0.11 | <0.11 | <0.11 | <0.11 | <0.11 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0 | <0.1 | - |
| Vanadium | mg/kg | <0.16 | 2 | | 3.3 | 0.5 | 1.2 | 0.76 | 3.4 | 1.7 | 3.2 | 2 | 1.8 | 11 | 11 | 11 | 12 | 11 | 11 | 11 | 6.0 | 4.8 | 8.1 | X |
| Zinc | mg/kg | <0.2 | 1 | 200 | 5.3 | 3.6 | 1.9 | 1.9 | 5.3 | 2.1 | 2.9 | 7.8 | 3.5 | | | 3.7 | 4.2 | 4.1 | 3.8 | 3.9 | 3.9 | 1.5 | 5.0 | N |

**Legend**

| | |
|---|---|
| Note | When calculating averages and 95% UCLs, values below detection for individual results were set to half the detection levels, consistent with the NAGD |
| PQL | Practical Quantitation Limit |
| LOR | Laboratory Limit of Reporting |
| 50 | Value exceeds NAGD Screening Level |

## Table 11: Summary results for DAE analysis on metals and metalloids – Port berth area, departure apron and departure channel in 2010

| | | | | | Sample Location | | | | | | | | | | | | | | | | | | | | Summary Statistics | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Units | LOR | NAGD PQL | NAGD Screening Level | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Mean/ Geomean | Standard Deviation | 95% UCL | Normal (N) Log-normal (L) Neither (X) |
| Aluminium | mg/kg | 50 | 200 | - | 1780 | 1900 | 1560 | 1100 | 1120 | 1690 | 1400 | 1180 | 1270 | 500 | 280 | 460 | 340 | 400 | 300 | 440 | 470 | 1730 | 1710 | 1260 | 1045 | 585 | 1271 | X |
| Antimony | mg/kg | 1 | 0.5 | 2 | <1.0 | <1.0 | <1.0 | 1* | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | - | <1.0 | - |
| Arsenic | mg/kg | 1 | 1 | 20 | 1.5 | 2 | 1.7 | 1.1 | 1.3 | 1.7 | 1.6 | <1.0 | 1.5 | 1.1 | <1.0 | 1.2 | 1.2 | <1.0 | <1.0 | <1.0 | <1.0 | 1.5 | 1.6 | 1.8 | 1.19 | 0.52 | 1.39 | X |
| Cadmium | mg/kg | 0.1 | 0.1 | 1.5 | <0.1 | <0.1 | 0.1 | 0.1 | <0.1 | 0.1 | 0.1 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.06 | 0.02 | 0.07 | X |
| Chromium | mg/kg | 1 | 1 | 80 | 8.4 | 8.6 | 7.3 | 4.3 | 4.7 | 7.4 | 6.3 | 4.2 | 5.5 | 1.8 | 1.4 | 1.8 | 1.6 | 1.6 | 1.2 | 1.8 | 2 | 8 | 6.4 | 5 | 4.47 | 2.59 | 5.49 | X |
| Cobalt | mg/kg | 0.5 | 0.5 | - | 0.6 | 0.9 | 0.6 | 0.7 | <0.5 | 0.5 | 0.6 | <0.5 | 0.7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 1 | 0.5 | <0.5 | 0.44 | 0.25 | 0.54 | X |
| Copper | mg/kg | 1 | 1 | 65 | 2.9 | 7.4 | 2.3 | 3.5 | 2.5 | 2.1 | 2 | 3.1 | 2 | 1.2 | 1 | <1.0 | <1.0 | 1.1 | <1.0 | <1.0 | 1.9 | 3.6 | 2.2 | 11.4 | 1.82 | 2.6 | 3.62 | L |
| Iron | mg/kg | 50 | 100 | - | 3710 | 3980 | 3140 | 1930 | 2020 | 3210 | 2650 | 1800 | 2590 | 1660 | 1610 | 1390 | 1140 | 1220 | 1050 | 1180 | 1230 | 3170 | 3510 | 2700 | 2245 | 960 | 2616 | N |
| Lead | mg/kg | 1 | 1 | 50 | 6.7 | 7.2 | 6.2 | 4.2 | 4.6 | 6.2 | 5.3 | 3.7 | 5.3 | 2.6 | 2 | 2.1 | 2 | 1.7 | 1.4 | 1.8 | 2.2 | 6.4 | 6 | 5.9 | 4.18 | 2.02 | 4.96 | X |
| Manganese | mg/kg | 10 | 10 | - | 118 | 124 | 123 | 84 | 80 | 120 | 106 | 71 | 108 | 66 | 59 | 60 | 62 | 48 | 32 | 62 | 71 | 120 | 108 | 103 | 86.25 | 28.66 | 97.33 | N |
| Mercury | mg/kg | 0.1 | 0.01 | 0.15 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | - | <0.10 | - |
| Nickel | mg/kg | 1 | 1 | 21 | 2.2 | 1.9 | 1.4 | <1.0 | 1 | 1.5 | 1.4 | <1.0 | 1.4 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 1.6 | 1.4 | 1.5 | 1.02 | 0.57 | 1.24 | X |
| Selenium | mg/kg | 0.5 | 0.1 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | <0.5 | - |
| Silver | mg/kg | 1 | 0.1 | 1 | <1.0 | <1.0 | <1.0 | 1* | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | - | <1.0 | - |
| Vanadium | mg/kg | 2 | 2 | - | 10.3 | 10.5 | 9.2 | 8 | 7.9 | 9.2 | 7.9 | 6.9 | 7.6 | 2.5 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | 2.4 | 10.6 | 9.2 | 8.4 | 5.83 | 3.88 | 7.33 | X |
| Zinc | mg/kg | 1 | 1 | 200 | 3.2 | 5.5 | 2.7 | 4.7 | 2.1 | 2.2 | 2.2 | 2.1 | 3.5 | 2.2 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 3.3 | 5.7 | 2.6 | 2.28 | 1.68 | 2.93 | X |

**Legend**

| | |
|---|---|
| 1* | Results were adjusted to the LOR given that they were recorded above total concentrations, which is not plausible |
| Note | When calculating averages and 95% UCLs, values below detection for individual results were set to half the detection levels, consistent with the NAGD |
| PQL | Practical Quantitation Limit |
| LOR | Laboratory Limit of Reporting |
| 50 | Value exceeds NAGD Screening Level |

7.8.1 Has bioavailability testing been undertaken for all chemical constituents listed at 7.6.2?

☒ Yes ☐ No

If “No”, go to question 7.9.

7.8.2 Are all chemical constituents below relevant bioavailability criteria?

☒ Yes ☐ No

If “Yes”, go to question 7.10.

7.9 Sediment toxicity testing (refer to 4.2.4 of the NAGD)

If you answered ‘No’ to question 7.8.1 and/or question 7.8.2, sediment toxicity testing is required to be carried out, unless an exemption has been granted.

7.9.1 Are the sediments to be dredged highly toxic? (refer to page 42 of the NAGD)

☐ Yes ☐ No

7.9.2 Are the sediments to be dredged significantly toxic? (refer to page 42 of the NAGD)

☐ Yes ☐ No

If ‘No’ to both 7.9.1 and 7.9.2, go to question 7.10.

If Yes to either question, the material is most likely unsuitable for unconfined sea disposal. You should consult the department to discuss further actions, including the investigation of control measures to minimise the impact (such as treatment of the waste or confined disposal). It is important to note that if the control measures are likely to be ineffective, it is likely that the material will not be suitable for sea disposal.

7.10 Biological Assessment

7.10.1 Have any introduced marine organism surveys been undertaken at or near the dredging location.

☐ Yes ☒ No

If “No”, go to question 8.0.

7.10.2 Have any introduced marine organisms (including micro-organisms) been identified at or near the dredging location?

☐ Yes ☐ No

If “Yes”, please provide details.

If “No”, go to question 8.0.

7.10.3 Has the potential for these organisms to be transported in the dredged material been assessed?

☐ Yes ☐ No

If “Yes”, please provide details.

The Port development site between Boyd Point and Pera Head is a remote and undeveloped area and as such there are few potential contaminant sources either from shipping activity or land use (RTA 2013). No pest species are known to occur within the undisturbed footprint of the proposed Port.

7.10.4 Has the potential for these organisms to become established at the disposal site been assessed?

☐ Yes ☐ No

If “Yes”, please provide details.

**8.0 Contamination Management**

8.1 Provide details of any recent contamination management audit(s) undertaken to identify the potential source(s) of contamination at or near the dredging or excavation location. Include an evaluation of the:

- types, amounts and cumulative physical impacts of contaminants generated;
- point and diffuse sources of contaminants to which material is exposed; and
- feasibility of strategies to prevent further contamination.

The Port development site between Boyd Point and Pera Head is a remote and undeveloped area and as such there are no known contaminant sources either from shipping activity or land use. As such it would be expected that there should be no anthropogenic contaminants in the sediments to be dredged and concentrations should represent natural background levels.

The proposed new spoil ground has not been previously used for disposal of dredged spoil.

Therefore no contamination audits have been undertaken for the proposed dredging location.

# PART F – DESCRIPTION OF DISPOSAL SITE AND PROCEDURES

## 9.0 Dredging or loading procedures

Briefly describe the dredging procedure, or for excavation, the loading procedure. In doing so you should provide details of the type of dredger or equipment to be used and the date, time period or stages over which dredging or excavation will take place.

It is proposed that dredging would be conducted over a 24 week period starting following receipt of relevant Project approvals. The 24 weeks of dredging does not allow for any delays that may occur due to breakdowns or stand-downs which could result from cyclonic weather if dredging occurs during the wet season.

Dredging methodology will depend on equipment availability and suitability. Two methods were assessed for the Commonwealth EIS (RTA 2013) as follows:

1. CSD and TSHD - A large self-propelled Cutter Suction Dredger (CSD) would be required to dredge the hard clays and siltstones. The CSD would be solely used to break up the hard substrate, with the dredged material re-deposited directly on the sea bed behind the submerged pump of the cutter dredger. A Trailing Suction Hopper Dredger (TSHD) would be used to pick up the crushed material deposited by the CSD and load the material into its hopper. The loaded TSHD would transport dredged material to the proposed offshore spoil ground for marine dumping. The hopper capacity would be 11,500$m^3$, with a “green valve” allowing overflow discharge during loading to occur at the keel level of the vessel.

2. CSD and SHB - An alternative dredging method with the use of the CSD loading directly into four self-propelled SHBs has also been assessed. This CSD would be of similar size to that used in the CSD and TSHD combination; however, material would be loaded directly into the SHBs during dredging. The nominal capacity of the four separate SHBs used in this arrangement would be approximately 3,700$m^3$, with these vessels capable of overflowing at the keel level due to the presence of the same “green valve” system present on the TSHD.

The method will be confirmed following engagement of the dredging contractor and included in the final Dredge Management Plan.

Once the TSHD or SHB is filled with dredged material the vessel would then relocate the material to the proposed new spoil ground. Upon entering the designated area for dumping, the vessel would slow whilst material is being placed, however, a minimum steaming speed is required to maximise agitation within the hopper and clear dredged material, which would not otherwise be effected if the dredge were to remain stationary.

Once the dredge has been emptied and cleared of dredged material, the vessel would return to the dredge site to collect the next load.

Figure 5 shows the proposed cut levels and sediment profile. Figure 6 shows the schedule of dredger operation times for the two methodologies. For layers 2-4 the time series has been set up such that the departure channel is dredged first before moving in to the Berth Pockets and Departure Area. This allows the CSD and TSHD to alternate areas and work on different sections at the same time.

**Figure 5: Longitudinal sediment profile along dredging footprint**

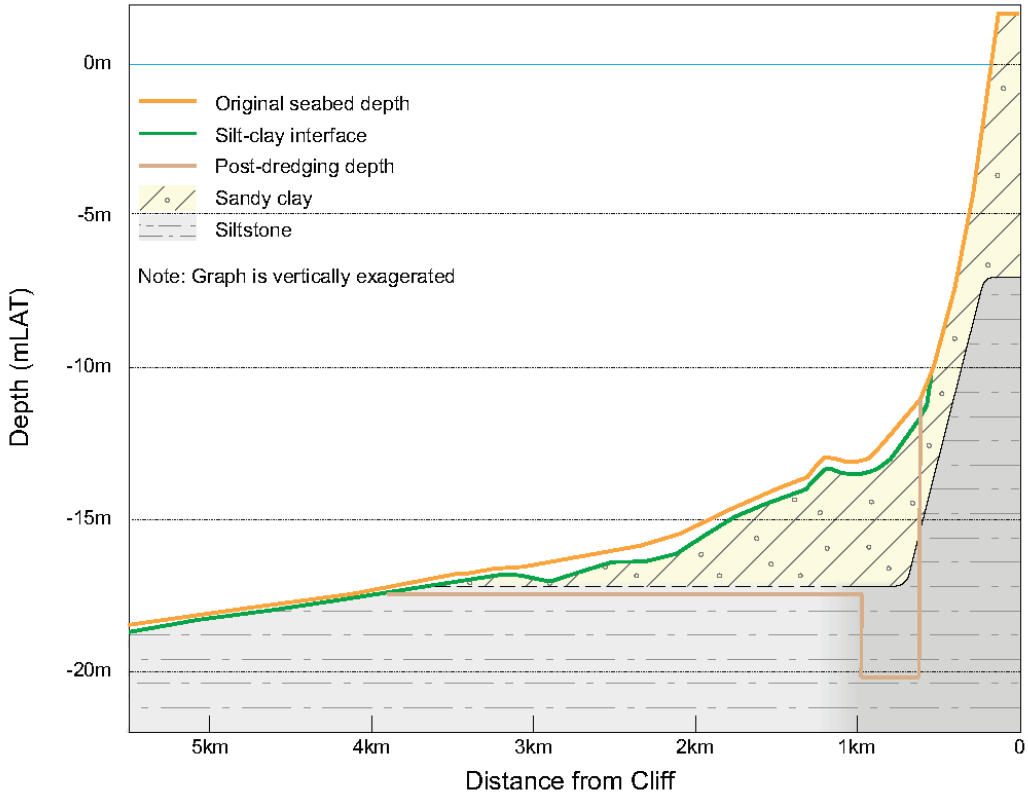
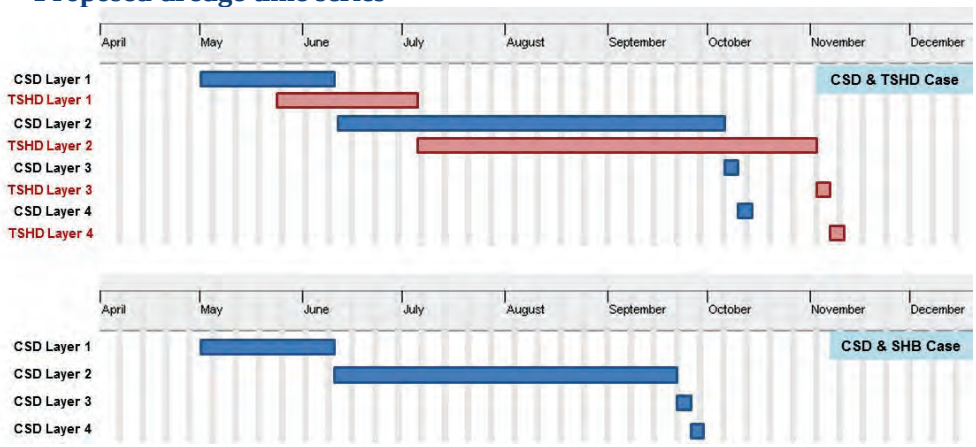



**Figure 6: Proposed dredge time series**



## 10.0 Description of Proposed Disposal Site

10.1 Location of site

Attach a suitably scaled map of the proposed disposal site, including WGS84 co-ordinates and showing bathymetric contours, the boundaries of the disposal site and distance from land.

The proposed new spoil ground is located approximately 17km offshore from the proposed new wharf facilities located between Pera Head and Boyd Point, 40km south of Weipa. Specifically, the location of the proposed new spoil ground is described as 1000m radius around the central point:

S12° 54' 46.44" E141° 28' 51.60" (GDA94; equivalent to WGS84).

Figure 7: identifies the location of the proposed new spoil ground in relation to the proposed Port site and existing Albatross Bay spoil ground.

The relevant AusMap is Au301.

Has approval previously been granted for disposal at this site?

☐ Yes ☒ No

If “Yes”, provide sea disposal permit number(s).

**Figure 7: Locality plan – Proposed Boyd (SoE) Port site and proposed spoil ground in relation to the existing Albatross Bay (Port of Weipa) spoil ground**

10.2 Position fixing

Describe method to be used in positioning the disposal vessel.

Each spoil placement would be logged using both satellite navigation and standard bridge equipment, and would be electronically fixed using a differentially corrected global positioning system (GPS). Electronic track plots would mark the start of each placement process (hopper open), and the end of the process (hopper closed). Placement tracks usually show an arc, which the dredge follows to ensure that all dredged material is placed within the designated spoil ground boundary. Positions would be determined with an accuracy of at least 10m.

10.3 Is the disposal site located within the boundaries of or in the vicinity of a Marine Protected Area?

For the purpose of this application form, 'Marine Protected Area' refers to waters declared to be marine parks, aquatic reserves or any other type of zoning or planning for the purpose of management, protection and development of marine resources or areas including wildlife and their habitats and for scientific, educational, or recreational purposes. Typically, Marine Protected Areas are declared under legislation enacted by the Commonwealth (e.g. the *Environment Protection and Biodiversity Conservation Act 1999; Great Barrier Reef Marine Park Act 1975),* or a State or Territory Government.

☐ Yes ☒ No

If "Yes", provide details.

10.4 Describe any sensitive areas in the vicinity of the proposed disposal site. Sensitive areas include, but are not limited to, seabed communities within which algae (e.g. macroalgae, turf and benthic microalgae), seagrass, mangroves, corals or mixtures of these groups are prominent components.

Nine Mile Reef is a soft coral-sponge dominated benthic habitat 6km south-west of the proposed new spoil ground.

10.5 Provide information on the physical and any other relevant characteristics of the disposal site. Include the:

- water depth;
- sea-bed topography;
- sediment characteristics;
- biological characteristics;
- information as to whether the site is expected to be dispersive or retentive; and
- other relevant information.

**Water Depth**

The proposed new spoil ground offshore from Boyd Point is located in approximately -25m water depth to LAT.

## Sea-Bed Topography

Navigation chart information identifies that the proposed new spoil ground location is relatively flat. This is supported by towed video transect surveys undertaken in October 2007 for this Project which characterise the proposed new spoil ground and adjacent area as flat-open muddy-sandy substrate that are sparsely colonised by epibenthic organisms.

## Benthic Habitats

Section 7.2 of the Commonwealth EIS (RTA 2013) details the key benthic marine reef habitats in the Port development and the proposed new spoil ground.

Near shore fringing reef communities in the vicinity of the proposed Port area occur at Boyd Point, Pera Head and between Pera Head and Thud Point. These comprise both reefs containing hard corals and low profile reefs containing soft coral-sponge assemblages. Figure 8 and Table 12 show the reefal areas between Boyd Point and Pera Head (RTA 2013). The importance of these reef systems (Boyd Point to Thud Point) in a regional context may be considered to be high as they support resources that are of conservation, cultural, commercial and recreational importance. In particular, the near shore sponge and soft coral reefs provide a food resource for a range of marine turtle species in the area.

**Table 12: Inshore Reef Areas and Extent of Dominant Benthic Assemblages**

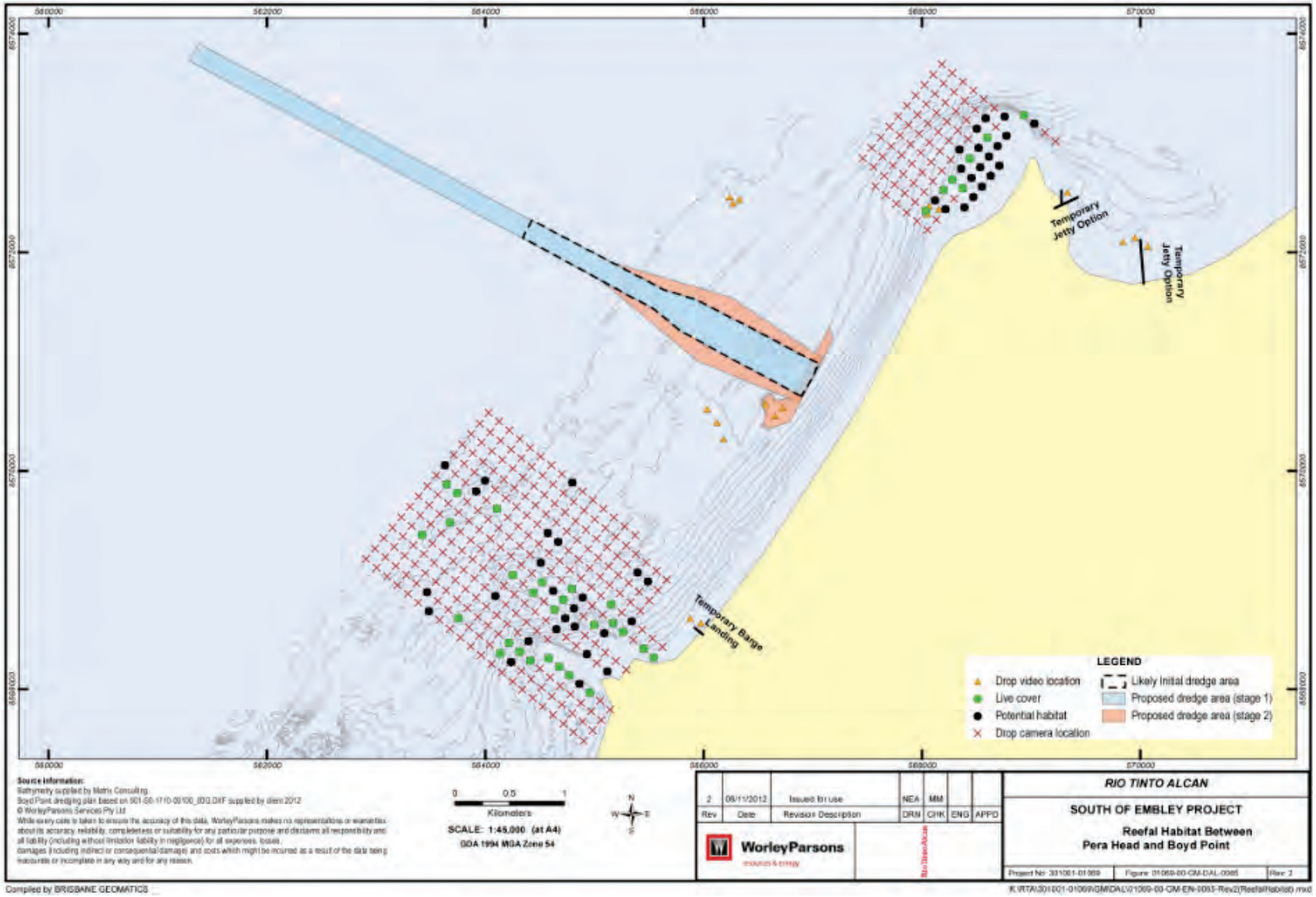
| Location | Total estimated substrate available for reefal colonisation (ha) | Estimated % Hard coral cover | Estimated Total Hard Coral (ha) | Estimated % Soft coral cover | Estimated Total Soft Coral (ha) | Estimated % Sponge cover | Estimated Total Sponges (ha) |
|---|---|---|---|---|---|---|---|
| Boyd Point | 49 | 4.2% | 2.1 | 2.7% | 1.3 | 2.1% | 1.0 |
| Port area (between Boyd Point to Pera Head)[1] | 23 | 0.0% | 0.0 | 1.0% | 0.2 | 1.8% | 0.4 |
| Pera Head | 72 | 6.2% | 4.5 | 6.3% | 4.5 | 3.7% | 2.7 |
| South from Pera Head to Thud Point (inferred)[2] | 274 | 6.2% | 16.9 | 6.3% | 17.2 | 3.7% | 10.2 |

1 The estimate of reefal area available, and estimates of live cover for the Port area was based on a review of only six video transects (with limited resolution). See Section 6.1.2 of the EIS for details.

2 The estimated reefal area available for colonisation south from Pera Head to Thud Point was inferred from analysis of aerial photographs. As there is no direct data on live cover from this area, the estimates are based on the maximum percentage cover from the areas where data was available.

The development footprints for the Port facility has been confirmed by benthic surveys with drop camera and towed video as consisting primarily of soft sediment habitats that contain sparse epifauna typical of soft sediments, such as seapens and tube-dwelling anemones, soft-corals or sponges ( Commonwealth EIS, Section 7.2.4 and Figure 7-1 Sub-tidal video survey locations, (RTA, 2013)).

**Figure 8: Reefal habitat between Boyd Point and Pera Head**



These areas can also contain diverse and abundant assemblages of macrobenthic infauna. The proposed new spoil ground contains unvegetated soft sediments and is not considered sensitive marine habitat.

Within the vicinity of the proposed Port and proposed new spoil ground, Nine Mile Reef and the "Three Mile" recreational and charter fishing area are accessed frequently by recreational fishers.

Significant epibenthic habitats, such as seagrass or hard-coral, were not observed in the disposal area during field investigations and are highly unlikely to occur there due to the depth of -25mLAT and resulting low light availability for photosynthesis. Drop video camera inspection has identified that soft-coral/sponge benthic habitat is present at Nine Mile Reef approximately 6km south west of the proposed new spoil ground.

### Water Quality

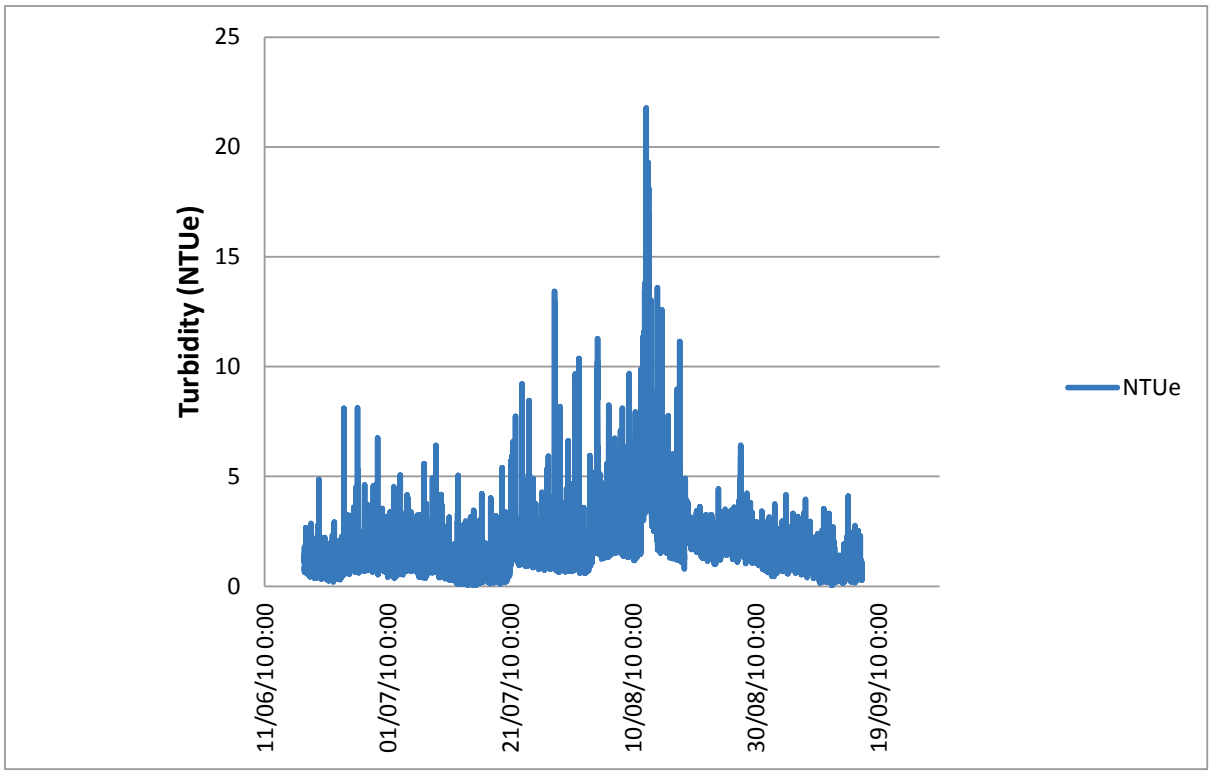
The sediment characterisation results (Worley Parsons, 2012) show there would be negligible change in water quality at the proposed Port site resulting from initial capital dredging of the sediments, apart from turbidity (suspended sediments). Any potential impacts in this area would result from increased suspended sediment plumes and sedimentation.

Table 13 shows a summary of the background turbidity and TSS at sites in the proposed Port area and at the nearest reef areas, Pera Head and Boyd Point. The data shows higher turbidity and TSS in the wet season compared to the dry season with maximum TSS in the wet and dry seasons of 755mg/L and 154mg/L, respectively. Figure 9 shows the range of background turbidity in the dry season at Pera Head.

**Table 13: Summary of background water quality near the proposed Port**

| Location | Season | Parameter | Median | 80%ile | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Port area | Wet season | Turbidity | 15 | 38 | <0.1 | 503 |
| | | TSS | 22.5 | 56 | <1 | 755 |
| | Dry season | Turbidity | 6 | 11 | <0.1 | 79 |
| | | TSS | 9 | 16 | <1 | 119 |
| Pera Head | Wet season | Turbidity | 2.2 | 23 | <0.1 | 339 |
| | | TSS | 3.3 | 34.4 | <1 | 509 |
| | Dry season | Turbidity | 1.2 | 2.1 | <0.1 | 22 |
| | | TSS | 1.8 | 3.1 | <1 | 33 |
| Boyd Pt (Chalco data) | Wet season | Turbidity | 14 | 39 | 0.2 | 225 |
| | | TSS | 18 | 56 | <1 | 338 |
| | Dry season 2007 | Turbidity | 2.4 | nd | <0.1 | 103 |
| | | TSS | 3.6 | nd | <1 | 154 |

**Figure 9: Background dry season turbidity at Pera Head (June – September 2010)**




Periods of high turbidity (and TSS) result in corresponding periods of photosynthetically active radiation (PAR) below detection limits (effectively zero). Figure 10 shows the reef area at Pera Head during the wet season had elevated background turbidity and zero PAR for 27 days followed by 12 days of available light up to 100µE/cm$^2$ and a further period of 24 days of high turbidity and zero PAR. The reef at Boyd Point showed the same periods of very high background TSS and zero PAR (Figure 11).

**Figure 10: Background wet season turbidity and Photosynthetically Active Radiation (PAR) at Pera Head (December 2007 to March 2008)**

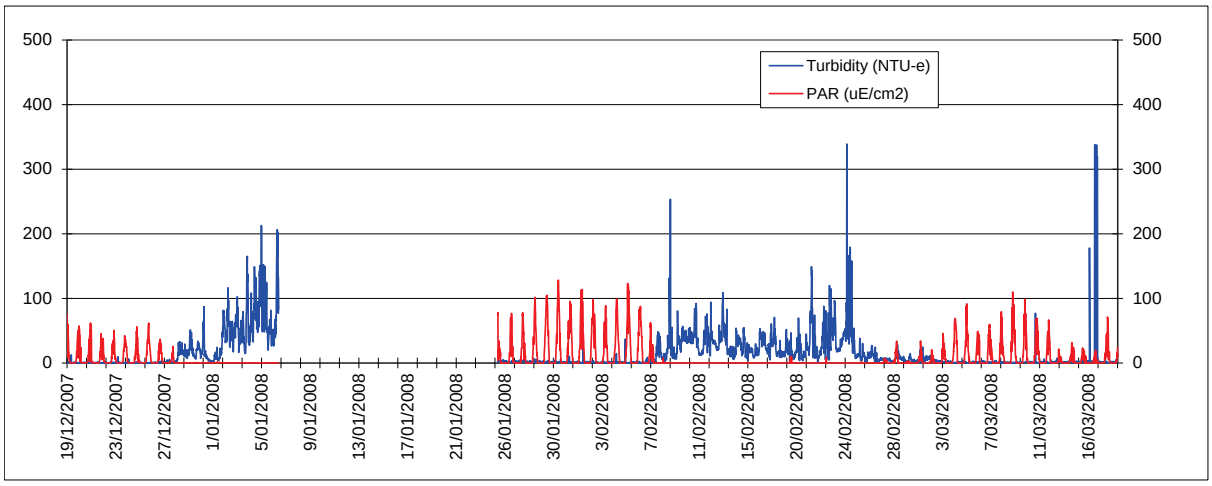
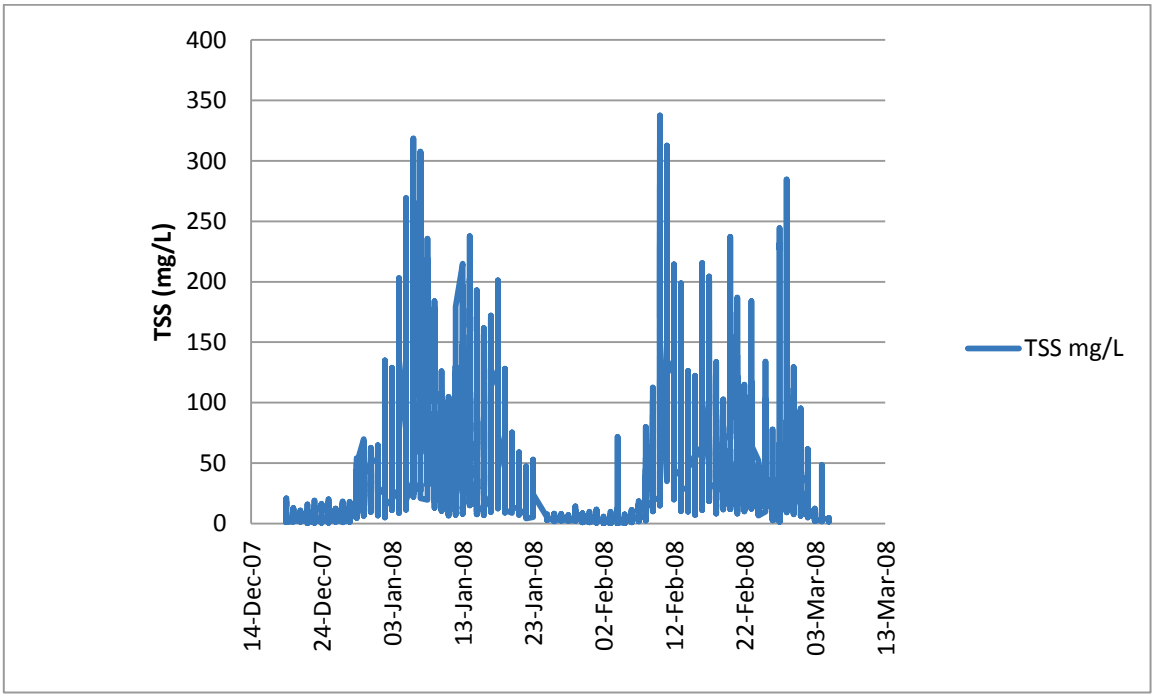


**Figure 11: Background wet season TSS (mg/L) at Boyd Point (December 2007 – March 2008) (PAR not shown).**

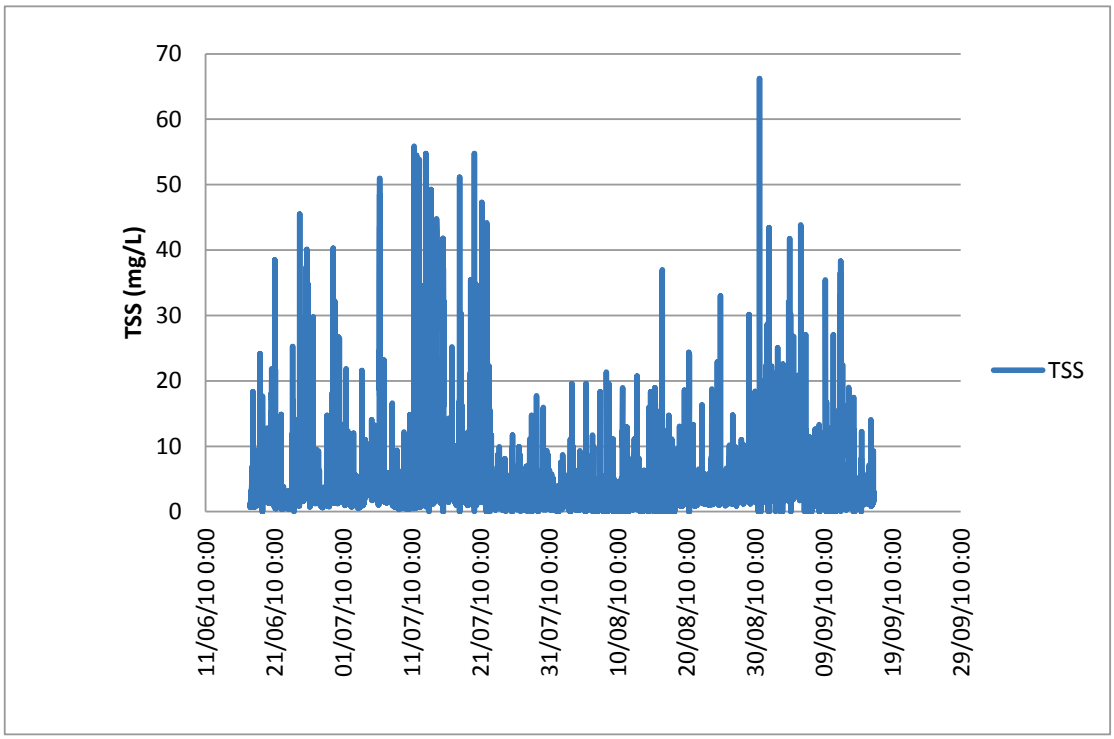



Baseline turbidity has been monitored in the wet and dry season at the proposed new spoil ground with TSS calculated based on a calibration coefficient where 1.5mg/L TSS equals 1NTUe. Table 14 shows the background turbidity and TSS is lower under dry season conditions compared to wet season conditions. Figure 12 and Table 14 show the background dry season TSS ranges from <1 to 66mg/L.

**Table 14: Summary of background water quality at the proposed new spoil ground**

| Season | Parameter | Median | 80%ile | Minimum | Maximum |
|---|---|---|---|---|---|
| Wet (Nov 2007- Mar 2008) | Turbidity (NTUe) | 5.3 | 27 | <0.1 | 149 |
| | TSS (mg/L) | 7.9 | 40 | <1 | 224 |
| Dry (Jun – Sep 2010) | Turbidity (NTUe) | 1.4 | 2.5 | <0.1 | 44 |
| | TSS (mg/L) | 2.1 | 3.7 | <1 | 66 |

**Figure 12: Background dry season TSS at proposed new spoil ground**




Dissolved metal and arsenic concentrations in water samples collected from the proposed new spoil ground are summarised in Table 15. Aluminium, arsenic, iron and zinc were the only elements above respective detection limits. Zinc was the only metal which exceeded the ANZECC/ARMCANZ (2000) guideline for 95% species protection. There are no industrial processes in the area that would have resulted in such elevations so far offshore (17km) and may have resulted from sample contamination during collection or analysis. There are no guideline values for aluminium, arsenic or iron.

**Table 15: Dissolved metal and arsenic concentrations in water samples taken from the proposed new spoil ground in October 2007**

| Location | Date Sampled | Aluminium (µg/L) | Arsenic (µg/L) | Cadmium (µg/L) | Chromium (µg/L) | Copper (µg/L) | Iron (µg/L) | Manganese (µg/L) | Mercury (µg/L) | Nickel (µg/L) | Lead (µg/L) | Zinc (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANZECC/ ARMCANZ Guideline (95% protection) | | | | 5.5 | 4.4 | 1.3 | | | 0.4 | 70 | 4.4 | 15 |
| Proposed new spoil ground | 22/10/ 2007 | 35 | 1.7 | <0.1 | <1 | <1 | 70 | <2 | <0.1 | <1 | <1 | **41** |

Note: Bold values indicate an exceedance of ANZECC/ARMCANZ (2000) water quality guideline for respective metals
µg/L – micrograms per litre
LOR – limit of reporting by the laboratory

The concentration of chlorophyll-a was less than the ANZECC/ARMCANZ (2000) water quality guideline of 0.9µg/L and the majority of nutrients were above respective ANZECC/ARMCANZ (2000) water quality guidelines for offshore waters (Table 16). Nitrate and phosphorous concentrations were found to be similar to previous studies undertaken in Albatross Bay (Burford and Rothlisberg 1999) while chlorophyll-a concentrations were slightly lower.

**Table 16: Nutrient and chlorophyll-a concentrations in water samples, October 2007**

| Location | Date Sampled | Ammonia as N (mg/L) | Nitrate as N (mg/L) | Nitrite as N (mg/L) | Total Kjeldahl Nitrogen (mg/L) | Total Nitrogen (mg/L) | Reactive Phosphorus (mg/L) | Phosphorus – Total (mg/L) | Chlorophyll –a (µg/L) |
|---|---|---|---|---|---|---|---|---|---|
| ANZECC/ ARMCANZ Guideline - Offshore | | 0.006 | 0.004 | 0.004 | | 0.1 | 0.005 | 0.01 | 0.9 |
| New spoil ground | 10/22/2007 | **0.03** | <0.01 | <0.01 | 0.7 | **0.7** | <0.01 | **0.03** | 0.09 |

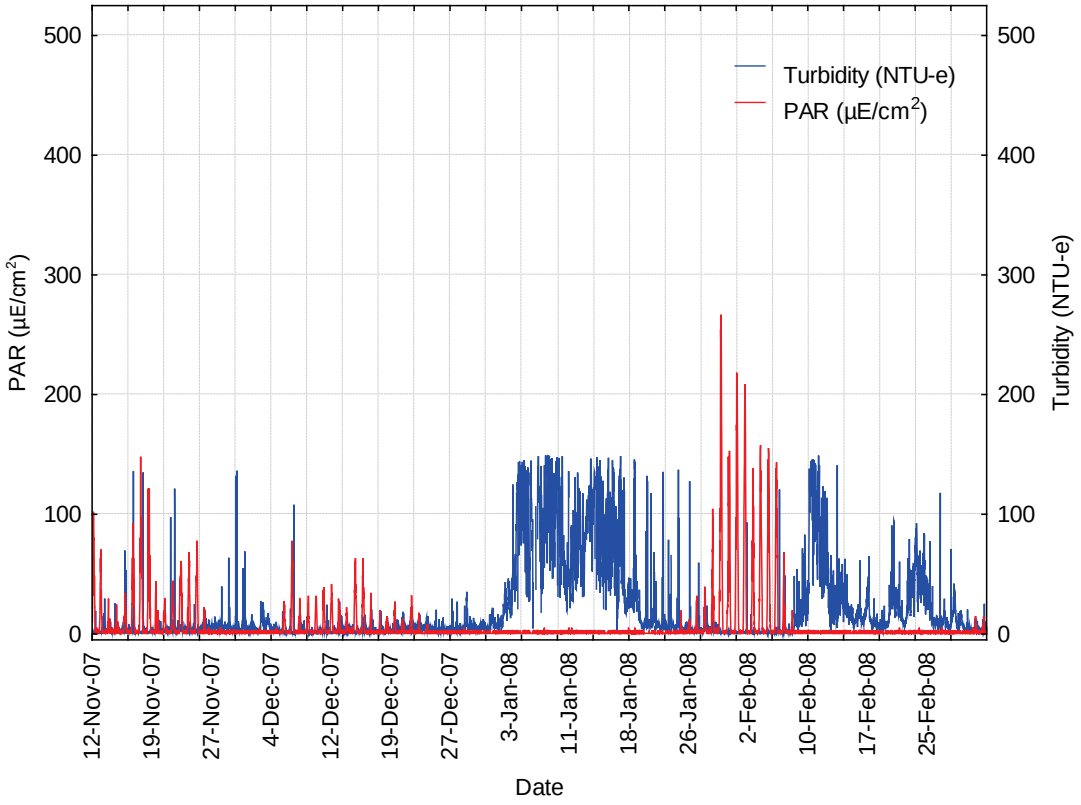
Note: Note: Bold values indicate an exceedance of ANZECC/ARMCANZ (2000) water quality guideline for respective nutrients or chlorophyll-a
mg/L – milligrams per litre
LOR – limit of reporting by the laboratory

Photosynthetically active radiation (PAR) measures the spectral range of solar light from 400-700 nanometers (nm), which is the range that organisms are able to use in the process of photosynthesis. The level of PAR penetrating the water column can be greatly affected by turbidity and water depth.

As to be expected, PAR was negatively correlated to turbidly levels (Figure 13). The intensity of light reaching the sea bed decreases markedly when suspended materials enter the water column following physical disturbance. Median PAR levels were 2.4 micro-Einsteins per square centimetre (µE/cm$^2$). Maximum light levels were in the range of 266µE/cm$^2$ at the proposed new spoil ground.

PAR within the proposed new spoil ground was extinguished at median turbidity levels of 8NTU-e.

**Figure 13: Turbidity and PAR results for the proposed new spoil ground location**




## Sediment Quality

Sampling and analysis of sediments at the proposed new spoil ground was undertaken to characterise seafloor sediments. This provides baseline information on concentrations of contaminant substances and particle size at the proposed new spoil ground prior to disposal of dredged material. Samples were collected using Van-Veen grab and analysed for particle size distribution (PSD) and total metals concentrations.

## Physical Characteristics

A graphical summary of the PSD results is presented in Figure 14 while summary statistics are provided in Table 17.

The surface sediments are relatively uniform in their composition, being dominated by sand, which had a mean of 57% across all samples. The remainder of the material contains slightly greater percentage of silt and clay (23%) than gravel (20%). Such sediments would be typical for benthic habitats in the area judging by the high degree of uniformity observed.

**Figure 14: Particle size distribution for proposed new spoil ground location samples**

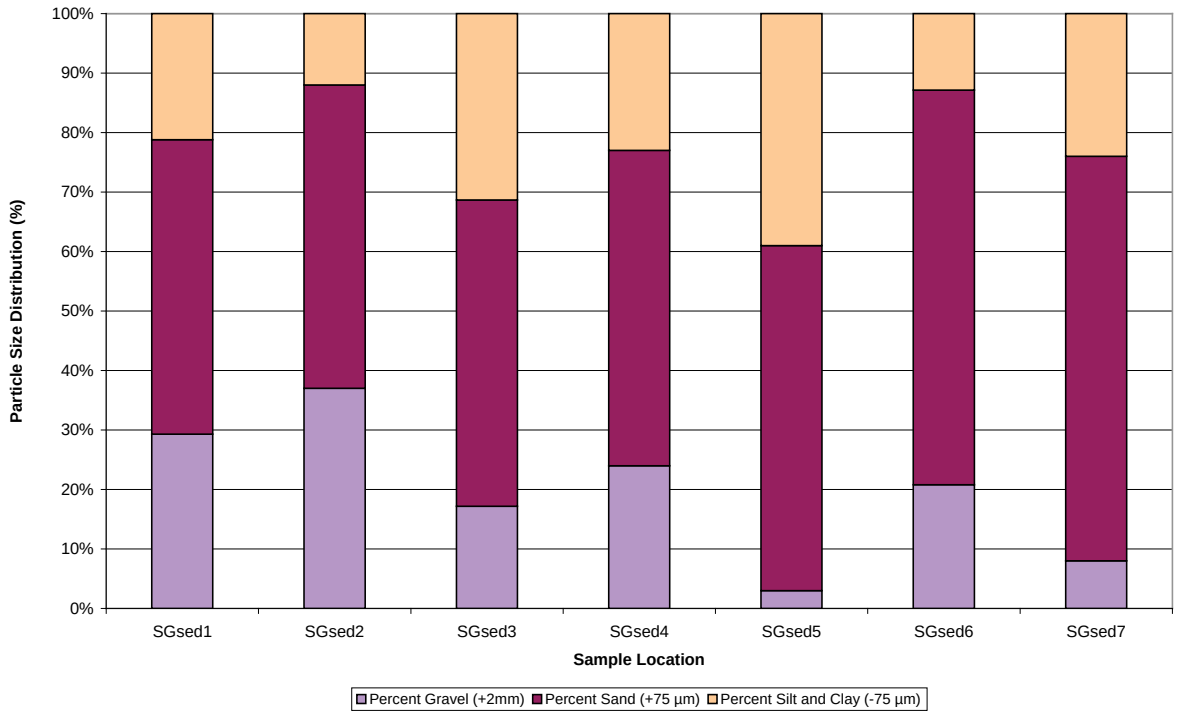



**Table 17: Summary of sediment particle size at the proposed new spoil ground**

| Statistic | Gravel (+2mm) | Sand (2mm - 0.075 mm) | Silt & Clay (-0.075mm) |
|---|---|---|---|
| Number of samples | 7 | 7 | 7 |
| Mean (per cent) | 20 | 57 | 23 |
| Standard deviation | 12 | 8 | 10 |
| Minimum (per cent) | 3 | 49 | 12 |
| Maximum (per cent) | 37 | 68 | 39 |

### *Chemical Characteristics*

All metals and metalloid concentrations were very consistent between samples and well below the respective NAGD screening levels (Table 18). Antimony, cadmium, mercury and silver were below the LOR at all sites. Mean concentrations were all less than one-tenth the NAGD screening levels. The 95%UCL of the mean was a maximum of 12.5% of the NAGD screening levels.

Comparison of trace metals concentrations between proposed new spoil ground sediments, sediments from the Port area and regional inshore (Bing Bong, Karumba offshore and

Norman River Channel) background levels reported by Munksgaard and Parry (2002) is presented in Table 18. This comparison identifies that:

- the mean of the majority of metals in the proposed dredge area exceeds the 80th percentile value from the proposed new spoil ground. Exceptions were antimony, manganese and silver; and,
- the mean of Port area sediments were generally consistent with or slightly lower than those reported for Bing Bong, offshore from Karumba and in the Norman River Channel.

The results of the comparison of Port area and proposed new spoil ground background concentrations are not unexpected given the presence of pisolitic and ironstone materials in sediments proposed to be dredged from the Port area. This material is likely to have originated from the adjacent bauxite cliff face and surrounding geology of the dredge area and by their nature, these geological materials have elevated metals concentrations. These metals, however, are bound in mineral phases and not bioavailable or likely to dissolve into the water column as evidenced from the DAE and elutriate testing.

**Benthic Habitat**

The footprint of the proposed new spoil ground contains unvegetated soft sediment habitats (RTA 2013). These soft sediment habitats are common throughout the Gulf of Carpentaria and are not considered to be sensitive marine habitats or areas of high importance. Modelling predicts that dredge spoil disposal would result in smothering of benthic infauna within the proposed new spoil ground footprint, however the deposition above background rates (0.5 to 2mg/cm$^2$/day) would not extend beyond 4km outside the proposed new spoil ground area for either dredging methodology that is proposed. Therefore the increase in deposition outside the proposed new spoil ground area is expected to be negligible compared to the mean ambient conditions in the area.

Nine Mile Reef is located approximately 6km southwest of the proposed new spoil ground and is estimated to cover an area of approximately 287ha, based on available bathymetry information and video inspection (refer Section 7.2.3.2, RTA 2013). Its structure contains mixed sponge and soft coral assemblages developing a low profile reef system in depths approximately –22m to –25m lowest astronomical tide (LAT), arising from a silty sand substrate and occasional rock outcrops. Zoanthid colonies are known to occur at some locations attached to the rock structure. The reef is accessed frequently by recreational fishers targeting species such as mackerel, cobia, tuna, finger mark and trevally.

Extensive towed video and drop camera surveys completed during October 2007 at the proposed new spoil ground location confirmed that seagrass is absent, as would be expected in water depths of 25m (RTA 2013).

An assessment of potential impacts on Nine Mile Reef concluded the impact to be negligible (RTA 2013).

## Table 18: Comparison of sediment metal and metalloid concentrations between proposed new spoil ground and Port area

| | | | Summary Statistics | | | | | | | | | Regional Data | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2007 & 2009 Dredge Area | | | 2010 Dredge Area | | | Spoil Ground 2010 | | | Munksguaard & Parry 2002 | | | | | |
| | Units | NAGD Screening Level | Mean/ Geomean | Standard Deviation | 95% UCL | Mean/ Geomean | Standard Deviation | 95% UCL | Mean/ Geomean | Standard Deviation | 80th Percentile | Mean | Max | Mean | Max | Mean | Max |
| | | | | | | | | | | | | Bing Bong | | Karumba Offshore | | Norman Channel | |
| Aluminium | mg/kg | - | 11825 | 7138 | 14665 | 10200 | 6654 | 12772 | 3443 | 1632 | 4732 | | | | | | |
| Antimony | mg/kg | 2 | 0.88 | 1.13 | 1.37 | <0.50 | - | <0.50 | <0.50 | - | <0.50 | | | | | | |
| Arsenic | mg/kg | 20 | 6.75 | 2.97 | 7.93 | 3.54 | 1.9 | 4.69 | 1.787 | 0.545 | 1.936 | nd | nd | 3.55 | 5.38 | 5.5 | 8.23 |
| Cadmium | mg/kg | 1.5 | 0.23 | 0.25 | 0.33 | 0.09 | 0.05 | 0.11 | <0.1 | - | <0.1 | 0.09 | 0.15 | 0.09 | 0.15 | 0.06 | 0.14 |
| Chromium | mg/kg | 80 | 23.0 | 16.1 | 29.4 | 24.55 | 14.79 | 30.27 | 7.429 | 3.295 | 10.2 | | | | | | |
| Cobalt | mg/kg | - | 8.3 | 11.8 | 13.5 | 4.34 | 2.7 | 5.38 | 1.343 | 0.447 | 1.68 | 10.3 | 13.4 | 10 | 12.9 | 11.53 | 21.24 |
| Copper | mg/kg | 65 | 12.8 | 11.1 | 17.2 | 7.41 | 5.11 | 9.51 | 1.729 | 0.655 | 2.1 | 14.6 | 21.8 | 13.3 | 16.6 | 16.51 | 24.8 |
| Iron | mg/kg | - | 21332 | 11221 | 25796 | 16055 | 8608 | 19383 | 5526 | 1970 | 6908 | 36200 | 52000 | 35900 | 44000 | 35327 | 59500 |
| Lead | mg/kg | 50 | 6.0 | 1.5 | 6.8 | 5.98 | 2.8 | 7.06 | 3.214 | 0.958 | 3.86 | 15 | 19.6 | 17.2 | 22.3 | 20.2 | 31 |
| Manganese | mg/kg | - | 114 | 82 | 146 | 149.3 | 68.25 | 175.7 | 177.9 | 51.75 | 226 | 283 | 423 | 366 | 563 | 456 | 1330 |
| Mercury | mg/kg | 0.15 | 0.011 | 0.011 | 0.015 | 0.02 | 0.03 | 0.03 | <0.01 | - | <0.01 | | | | | | |
| Nickel | mg/kg | 21 | 12.4 | 10.5 | 16.5 | 12.11 | 3.56 | 13.87 | 1.786 | 1.079 | 2.84 | 19.4 | 22.2 | 24.4 | 32.4 | 22.52 | 47 |
| Selenium | mg/kg | - | 0.41 | 0.22 | 0.51 | 0.56 | 0.69 | 0.83 | 0.096 | 0.095 | 0.24 | | | | | | |
| Silver | mg/kg | 1 | <0.1 | 0.000 | <0.1 | <0.1 | - | <0.1 | <0.1 | - | <0.1 | | | | | | |
| Vanadium | mg/kg | - | 24.3 | 10.0 | 28.6 | 29.21 | 15.36 | 35.15 | 5.486 | 2.448 | 7.4 | | | | | | |
| Zinc | mg/kg | 200 | 36.3 | 44.7 | 54.0 | 17.93 | 12.43 | 22.74 | 3.257 | 1.375 | 4.46 | 41.1 | 52.1 | 50.5 | 60.1 | 54.2 | 80.3 |

| | |
|---|---|
| 0.15 | Value exceeds NAGD screening level |
| 0.15 | Value exceeds 80th percentile of background (spoil ground) |

10.6 Describe the history of the disposal site if previously used for sea disposal of dredged, excavated and/or other waste material. If the site is retentive and has been used previously for sea disposal, provide an estimate of the remaining capacity at the disposal site.

This site has not previously been used for spoil disposal. It is within the trawl area of the extensive Northern Prawn Fishery, so is subject to trawling disturbance.

**11.0 Disposal Procedures**

11.1 Describe the anticipated period and frequency of sea disposal operations and the quantities of dredged and/or excavated material involved for each.

| Period of Proposed Sea Disposal | Number of Runs | Average quantity of dredged material to be disposed of per Run | Quantity of excavated material to be disposed of per Run |
|---|---|---|---|
| 24 weeks | CSD/TSHD = 168<br>CSD/SHB = 280 | CSD/TSHD = 2,750 $m^3$<br>CSD/SHB = 1,220 $m^3$ | N/A |

Note: For the purpose of question 11.1, 'number of runs' means the total number of vessel movements from the loading point to the disposal site.

The dredging and disposal activity is anticipated to be approximately 24 weeks duration. If all necessary approvals are attained, it is anticipated to occur between May 2014 and May 2016 The proposed dredging is capital works and so would occur only once under this permit. Approximately 2,600,000$m^3$ would be removed and placed at sea during initial capital dredging.

Future maintenance dredging would be undertaken under a separate Sea Dumping Permit.

11.2 Describe the route from loading to the disposal site.

The route from loading to the proposed new spoil ground is a direct line west-north west from the loading area. There are no obstacles or hazards along this route.

11.3 Provide details of how the material will be disposed of at sea, in doing so you must provide information on the rate and duration of the disposal, the proposed method of disposal, the intended heading and speed of the vessel.

Once the TSHD or SHB has filled its hopper at the dredging location, the material would be transported to the proposed new spoil ground located approximately 17km west (central point) of Boyd Point. Upon entering the designated area for dumping, the dredge would typically slow whilst material is being placed, however, a minimum steaming speed is required to maximise agitation within the hopper and clear dredged material, which would not otherwise be effected if the dredge were to remain stationary. Spoil would be discharged below keel level to minimise turbidity generation. Placement of spoil material at the proposed new spoil ground would be completed so as to achieve a relatively uniform cover. The duration of each dumping event within the proposed new spoil ground would be, approximately 10 minutes for SHB with

a return trip from the dredge area being approximately 3 hours and for TSHD 20 minutes for dumping and cycle time of approximately 3 hours.

To minimise potential turbidity impacts at the proposed new spoil ground, the following practical measures to reduce loss of bulk material into the marine environment during dredging operations will be considered:

- specifications for trailing suction hopper dredger used during Port development dredging would include low wash hull-design, below keel discharge and electronic positioning systems;
- taking loaded hopper dredge to spoil disposal areas and discharging material as soon as possible to minimise clays settling and adhering to the hopper lining; and/or,
- developing a spoil dumping plan to manage the even distribution of material over the spoil ground.

# PART G – IMPACT HYPOTHESIS

## 12.0 Projected Impact of Disposal

12.1 Describe the projected physical, chemical and biological impacts on the disposal site and surrounding areas (see Section 4.3 of the NAGD).

- Predict the turbidity levels and dispersal of disposed material in the water column;
- Delineate the area of sea bed that will be substantially impacted (the zone of impact) and the movement of disposed dredged material;
- Assess physical impacts such as smothering of biota, change in substrate, light attenuation for sea grasses;
- Assess the severity of impacts on marine life, including possible translocation of species, increased predation and loss of available habitat. Also consider the existence and cumulative impacts of other disposal at the site or other nearby disposal sites;
- Assess changes in the concentration of nutrients, oxygen depletion, and any increased bio-availability of contaminants; and
- Assess possible effects on other users of the area.

12.2 Describe and provide details of any intended investigations or studies of the possible impacts on the environment of the proposed action.

A detailed impact assessment is provided in the Commonwealth EIS (RTA 2013).

### Water Quality

The key potential impacts of dredging and spoil disposal on water quality are:

- possible mobilisation of contaminants into the water column;
- generation and migration of turbid plumes;
- reduction in benthic light regimes; and,
- increased local sediment deposition.

Water quality at the proposed Port and new spoil ground exhibit significant natural fluctuations in suspended sediment and turbidity (refer Section 10.5). The extent of this natural variation buffers water quality impacts associated with dredging, disposal, construction and operation to some extent. Generally, these habitats may be described as being more resilient to short-term water quality changes.

Periodic alterations in chemical water quality are currently experienced during event based elevations in background turbidity. These alterations include natural increases in nutrient and metal concentrations as fine sediments are mobilised throughout the water column. Seasonal alterations in chemical water quality are also experienced during the monsoon and cyclone periods. Impacts on chemical water quality attributable to dredging and disposal are expected to be minor in duration and extent, and well below those natural variations experienced during the wet season.

Analysis of the sediments to be dredged from the proposed Port area have not identified any contaminants present at levels of environmental concern that would persist in the water column during sea disposal at the proposed new spoil ground. Impacts from oxygen depletion or release of nutrients are not considered likely as the material does not have high levels of organic carbon and does not have high levels of bioavailable nutrients.

The turbid plume generated by proposed Port area initial capital dredging extends generally parallel to the coast, to beyond Pera Head and Thud Point in the south (migrating during flood tide) and to Boyd Point in the north (migrating during ebb tide).

Periods of elevated TSS concentration generally coincide with the TSHD and CSD operating in the inshore area while dredging the top layer of sediments (which have a higher content of fines). Whilst Boyd Point experiences higher instantaneous TSS levels (due to its closer proximity to the dredging operations), Pera Head is predicted to receive lower but more consistently elevated TSS levels due to the net migration south.

The modeling predicts that the 80th percentile of TSS above background at Boyd Point and Pera Head, for the CSD and SHB case over the entire dredge campaign, would be 2 – 5mg/L and 3 – 7.5mg/L, respectively (Figure 15). These above background TSS concentrations result in incremental increases in TSS. This would result in minor impacts on water quality given that there are periods during the wet and dry seasons when background TSS is at least an order of magnitude higher than the TSS in the dredge plumes. The TSS in the dredge plumes is less significant than natural TSS resulting from storms and wind driven sediment resuspension in this area.

The dredge spoil disposal would result in smothering of benthic infauna within the proposed new spoil ground footprint. Deposition rates above background (0.5 to 2mg/cm2/day) would not extend beyond 4km outside the proposed new spoil ground area for either dredging methodologies (Figure 16). The increase in deposition outside the proposed new spoil ground area is expected to be negligible compared to the mean background rates in the area of 47mg/$cm^2$/day and 31mg/$cm^2$/day for dry and wet season, respectively.

Full details of the 3D dredge modelling is provided in Worley Parsons (2013).

**Figure 15: 80th Percentile TSS (above background) for CSD & SHB case over simulation period**

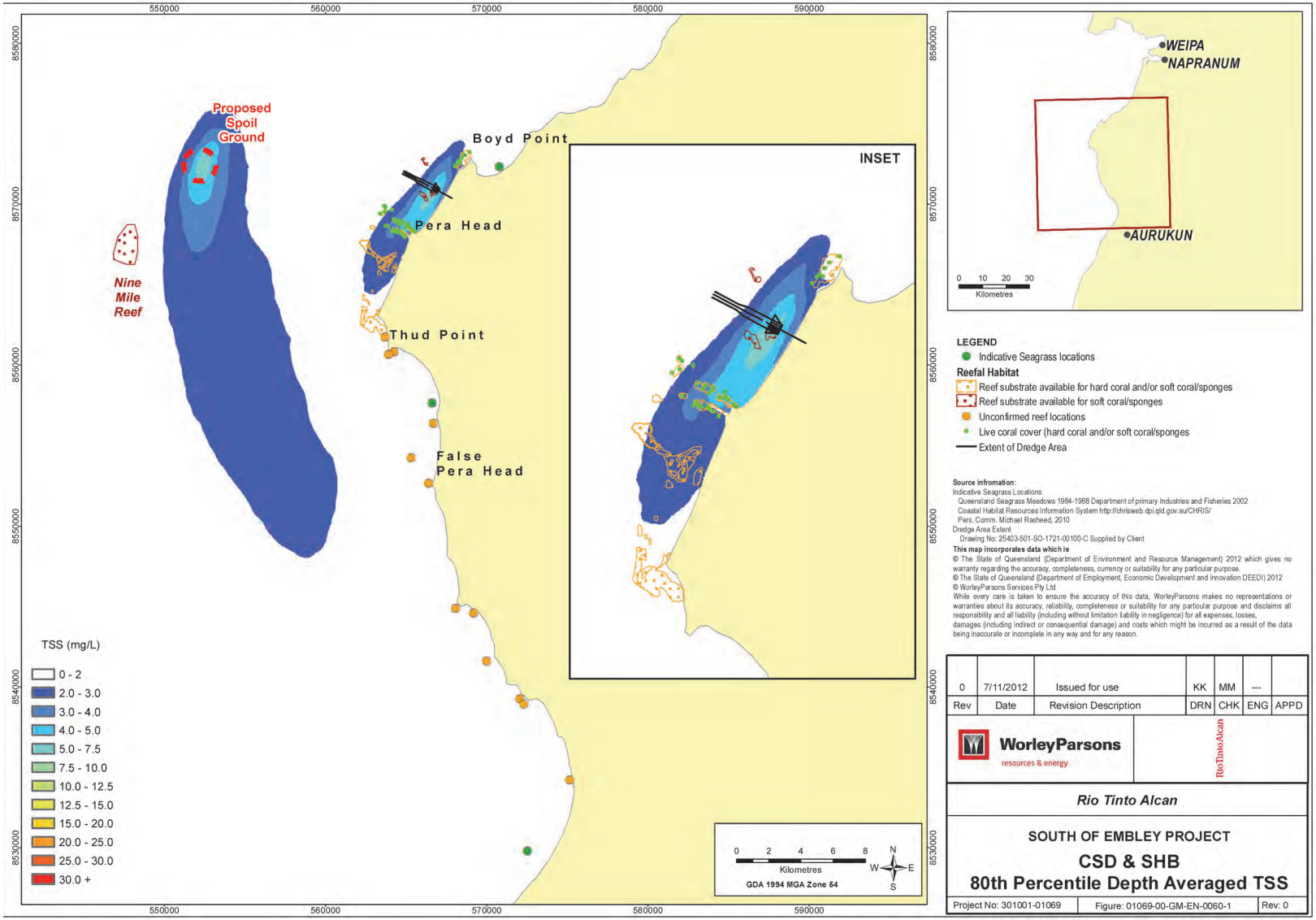
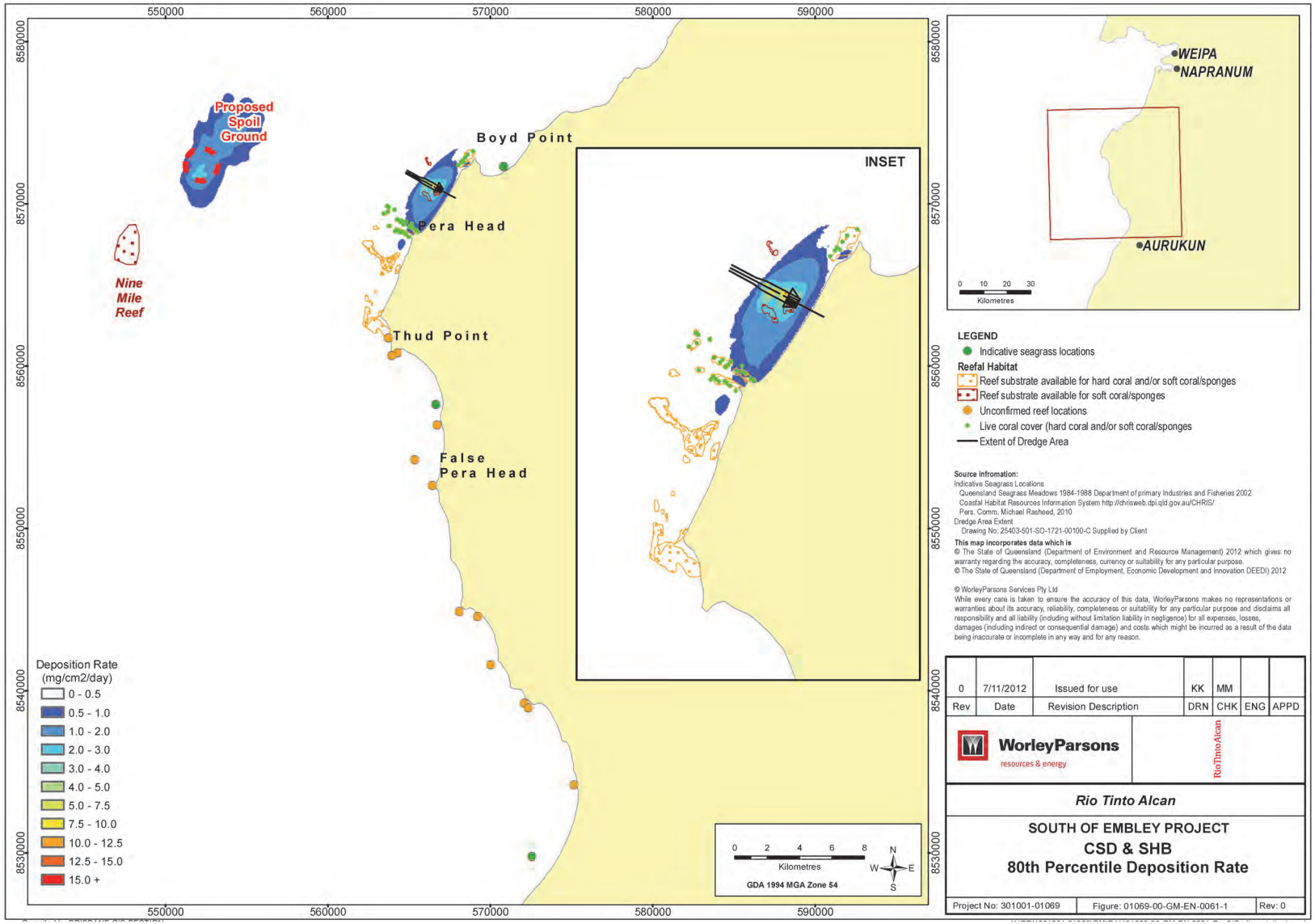


**Figure 16: 80th Percentile daily deposition rate (above background) for CSD & SHB case over simulation period.**



**Reef, Benthic Infauna and Seagrass**

The proposed new spoil ground is remote from sensitive hard coral reef habitats, which occur inshore adjacent to the coastline. The nearest hard-coral reefs are those located at Pera Head and Boyd Point, approximately 17km east of the proposed new spoil ground.

Benthic habitats within and adjacent to the proposed new spoil ground are sparsely colonised, open muddy-sand substrates. Significant epibenthic habitats, such as seagrass or hard-coral, were not observed in the disposal area during field investigations and are highly unlikely to occur there due to the depth of (25m) and resulting low light availability for photosynthesis.

It is anticipated that the proposed new spoil ground would receive 1-2m thickness of dredge spoil from initial capital dredging, and an annual maintenance dredging load of about 0.4m, therefore localised smothering of benthic infauna would be significant and the ongoing nature of the disturbance would limit the potential for full recovery. However, the area affected would be less than 1% of the area of unvegetated sedimentary habitats in the Weipa region, and although spoil disposal from initial capital dredging may have a significant effect on the local infaunal community, it would not be substantial on a regional scale and unlikely to affect ecosystem function. While the dredge spoil disposal would result in smothering of benthic infauna within the proposed new spoil ground footprint, deposition rates (0.5 to 2mg/cm$^2$/day) above background would not extend beyond 4km outside the proposed new spoil ground area for either dredging methodologies (Figure 16) (WorleyParsons 2012). The increase in deposition outside the proposed new spoil ground area is expected to be negligible compared to the mean background rates in the area of 47mg/cm$^2$/day and 31mg/cm$^2$/day for dry and wet season, respectively.

The nearest rocky reef habitat occurs at Nine Mile reef approximately 6km south-west of the proposed new spoil ground. Modelling of changes in water quality indicates that there would be a negligible increase in turbidity and sediment deposition at Nine Mile Reef, and therefore habitat at Nine Mile Reef would not be impacted by spoil disposal. Remobilisation of sediments would only tend to occur during storm events. The predominant direction of currents at the proposed new spoil ground would result in any plumes from dredge spoil disposal moving in a south – south-east trajectory, and pass by Nine Mile Reef to the east (Figure 15).

**Threatened and migratory species**

The sediment plume passes over unvegetated soft sedimentary habitat and is at low TSS concentration outside the proposed new spoil ground area. The plume should not result in any impact on threatened marine turtles or cetaceans that may be foraging in the area or transiting through the area. Hawksbill, Flatback and Leatherback Turtles that may forage in the area of the proposed new spoil ground and/or on Nine Mile Reef would not be impacted as the sediment plume does not impact Nine Mile Reef and the suspended sediment concentrations within the plume are at the low end of the natural range for the area. These species may avoid the immediate area of the proposed new spoil ground due to the barges which would be disposing spoil daily throughout the dredging campaign. This would not create any barrier to

the species transiting the area to forage on Nine Mile Reef, or to move towards the coast to access feeding grounds in shallower water.

**Other Users**

The proposed new spoil ground is located within the Northern Prawn Fishery (NPF). As such the NPF may potentially be affected by the proposed new spoil ground as a result of:

- providing habitat less suitable for banana prawns after spoil is deposited;
- changing the local distribution of banana prawns as they respond to the turbidity plume generated by spoil disposal; and,
- trawlers being unable to access the proposed new spoil ground area due to the uneven seabed, a consequence of spoil deposition. Trawl nets snagging on an uneven seabed may lead to safety being compromised and expensive trawling equipment being lost.

Initial capital dredging of the Port area and spoil disposal at the proposed new spoil ground is expected to take approximately six months. The fishery is active in the Weipa area from July to March. Hence there is the potential for an effect on the local distribution of banana prawns as a result of spoil deposition.

Overall, the area where the NPF operates is large (thousands of $km^2$) and there is considerable area of suitable habitat remaining in the Weipa area for banana prawns, and where the fishery can still operate unimpeded. It is predicted that operators in the NPF would be able to, if necessary, adapt their fishing operations to avoid the proposed new spoil ground without incurring a significant financial impact. Fine scale spatial information on the actual area of operation of the fishery in the Weipa area is lacking and the actual area will vary considerably between years. However, it is predicted that the area of the proposed new spoil ground represents less than one per cent of the available prawn trawl habitat in the Weipa area. The proposed new spoil ground footprint has been constrained to 0.5nm radius to minimise the area sterilised from the NPF.

The Gulf of Carpentaria Commercial Line Fishery is managed by the Queensland Government and extends from the Queensland – Northern Territory border to Slade Point on the north-west coast of Cape York Peninsula. In 2006, 27 licensed fishers harvested 237 tonnes of fish with a landed gross value of production of $1.6 million. In approving the Queensland EIS, the Queensland Coordinator General has required RTA to pay compensation and the Queensland Rural Adjustment Authority (QRAA) to administer compensation to relevant fishers and to buyout an appropriate level of fishing effort (Queensland Government 2012).

The Nine Mile Reef and other areas in the vicinity of the Port are accessed frequently by recreational fishers. In approving the Queensland EIS, the Queensland Coordinator General has supported the commitment given by RTAW to establish a local recreational fishing reference group to identify a suitable community fisheries project and to commit funding to the project (Queensland Government 2012).

# PART H – MONITORING

## 13.0 Proposed Monitoring Program

It is essential that monitoring programs have clearly defined and stated objectives.

13.1 Within the predicted zone of impact, describe your proposed monitoring program to determine the actual extent of change. In doing so you must address the specific effect(s) on the benthic community. You must also include boundary measurements that demonstrate the reliability of your impact hypothesis with respect to the impact on the zone of impact.

Your proposed monitoring program(s) should detail both your compliance and effects monitoring programs.

13.2 Outside the predicted zone of impact, describe any proposed monitoring program to determine whether:

- the actual zone of impact is as predicted; and
- the projected extent of change is within the scale projected.

### Inshore Monitoring

Monitoring of the initial capital dredging operations will include:

- continuous telemetered turbidity monitoring at concern and reference sites at Boyd Point and Pera Head, to the north and south of the dredge operations, respectively; and,
- coral health monitoring at Boyd Point and Pera Head.

The monitoring sites will be established based on the results of the plume modelling (for example, Figure 15 and Worley Parsons (2013)).

### Spoil Disposal Site

The plume modelling shows that Nine Mile Reef should not be impacted during disposal. The model prediction will be validated with continuous telemetered turbidity monitoring at a site immediately north-north-east of Nine Mile Reef.

### Marine Fauna Monitoring

Marine fauna observers will monitor the dredging operations and to help implement the following Queensland Government Coordinator General's conditions:

- Mobile dredging operations:
    - must not commence if Dugongs, marine turtles, or cetaceans are observed within 300 metres of the dredge.

    - where underway, must alter course if Dugongs, marine turtles, or cetaceans are likely to be struck or captured.

- Stationary dredging operations:
    - must not commence if Dugongs, marine turtles, or cetaceans are observed within 300 metres of the dredge.
    - must cease if Dugongs, marine turtles or cetaceans are observed within 50 metres of the dredge head.

Marine turtle monitoring will also be carried out as follows:

- Daily monitoring for impacted marine turtles will be undertaken at the dredge and at the shoreline down-current from the dredging operation.
- If monitoring indicates that more than two marine turtles are killed within a 24 hour period as a result of dredging, the dredge will relocate from the area until an incident investigation has been carried out and relevant preventative actions implemented.

# PART I – MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

**14.0 Referring Actions under the EPBC Act**

14.1 Has the proposed action been referred to the Commonwealth Environment Minister under the EPBC Act?

☒ Yes ☐ No

If 'Yes, please provide the EPBC identification number.

The proposed Port forms part of the broader South of the Embley bauxite mine extension and port Project (EPBC 2010/5642).

14.2 Has a decision on this proposed action been reached?

☐ Yes ☒ No

If 'Yes, please provide details of the decision.

Rio Tinto Aluminium (RTA) referred the broader South of the Embley bauxite mine extension and port Project to the then Minister for Sustainability, Environment, Water, Population and Communities for a decision as to whether the Project constituted a controlled action under the provisions of the EPBC Act. On 2 October 2008, the Project was declared a "controlled action" (Referral No. 2008/4435).

Following changes to the proposed Port design to accommodate larger bulk carriers, and at the advice of DSEWPaC assessment officers, RTA withdrew Referral No. 2008/4435.

On 13 September 2010, RTA submitted the revised Project design to the Minister for a decision as to whether the Project constituted a controlled action (Referral No. 2010/5642).

On 29 October 2010, a delegate of the Minister determined that the proposal was a controlled action under Chapter 4 of the EPBC Act and that the proposed action be assessed by Environmental Impact Statement (EIS) in accordance with Tailored Guidelines provided by the Minister's office.

On 23 February 2011, RTA notified the Minister of a change of person proposing to undertake the SoE Project, transferring the Project to RTAW.

RTAW published and made available for public consultation a draft EIS from 1 August 2011 to 12 September 2011.

In November 2011, the Minister received a request to reconsider the referral decision on the basis of new information presented in the draft EIS related to shipping activities through the Great Barrier Reef.

On 15 March 2012, the Environment Minister revoked the referral decision of 29 October 2010 and substituted it with a new one. Under this decision the Project is a controlled action under the EPBC Act for the following controlling provisions:

- World Heritage properties;
- National Heritage places;
- Listed threatened species and ecological communities;
- Listed migratory species;
- Commonwealth marine areas; and
- Great Barrier Reef Marine Park.

On 11 May 2012, the delegate to the Environment Minister approved RTAW's variation request to incorporate shipping activities associated with the Project as part of the action to be assessed under the provisions of the EPBC Act.

Following the new controlled action decision for the Project, new EIS Guidelines were issued by the Minister in July 2012. RTAW submitted a draft Commonwealth EIS to DSEWPaC in November 2012 (RTA 2012b) which was subsequently placed on public exhibition between 22 November and 19 December 2012. The EIS has subsequently been finalised, taking account of and summarising comments received within the submission period, and stating how such comments are addressed in this "final EIS" (RTA 2013).

14.3 Will the dredging, excavation, disposal or a related activity significantly impact upon:

☐ a declared World Heritage property

☐ a declared Ramsar wetland

☐ a Commonwealth marine area

☐ Great Barrier Reef Marine Park

☐ a listed threatened species

☐ a listed threatened ecological community

☐ a listed migratory species

☐ a national heritage place

The assessment presented in the Commonwealth EIS (RTA 2013b) concludes that there will be no significant impacts on any matters of National Environmental Significance.

# PART J – CONSULTATION

## 15.0 Consultation with advisory bodies

Applicants should consult with relevant stakeholders prior to submitting an application. Section 3.6 of the NAGD outlines the guidelines for stakeholder consultation.

15.1 List the organisation or parties that you have consulted with on your proposed sea disposal activity.

Community and stakeholder consultation has been and will continue to be undertaken for the whole of the South of the Embley Project including consultation for the terminal developments, dredging and placement of dredge spoil at sea (RTA 2013).

To date the consultation has involved the following stakeholder groups:

- Government Agencies and Service Providers;
- Local Government;
- Community Groups and Organisations;
- Traditional Owners and Other Aboriginal Groups;
- Recreational and Professional Fishing Groups;
- Industry, Local Businesses and Service Providers;
- General Public and Residents of Local Communities; and,
- Regional Landholders.

The extensive consultation already undertaken with relevant stakeholders is documented in the Project's Commonwealth EIS (RTA 2013).

15.2 Attach any record of consultation and any responses received.

Information about the proposed dredging activities for the Project were included in the Queensland EIS (RTA 2011), which was prepared to meet the assessment requirements for the Project under the *State Development and Public Works Organisation Act 1971 (Qld).* Submissions in response to the EIS were received in relation to dredging, and these were documented in Appendix A of the Supplementary Report to the EIS (RTA 2012a). Appendix A of the Supplementary Report also provides a response to the issues raised.

Responses to the EIS, relating to dredging, were received from the following submitters:

- Department of Transport and Main Roads – Rail, Ports, and Freight;
- Western Cape York Turtle conservation Project;
- Western Cape Chamber of Commerce;

- Two separate Private submitters;
- Queensland Seafood Industry Association;
- Department of State Development and Infrastructure Planning (formerly DEEDI); and,
- Department of Environment and Heritage Protection (formerly DERM).

Information about the proposed dredging activities for the Project were also included in the Draft Commonwealth EIS (RTA 2012b), which was place on public exhibition between 22 November and 19 December 2012 and prepared to meet the assessment requirements for the Project under the EPBC Act and the *Environment Protection (Sea Dumping) Act 1981* (Cth). Submissions in response to the Draft Commonwealth EIS were received in relation to dredging, and these are documented in Appendix 2D of the Final EIS (RTA 2013). Appendix 2D of the Final EIS (RTA 2013) also provides a response to the issues raised.

Responses to the Draft Commonwealth EIS (RTA 2012b), relating to dredging, were received from the following submitters:

- Weipa Town Authority;
- Gulf of Carpentaria Commercial Fishermen; and,
- The Wilderness Society (noise only).

## PART K – DECLARATION

I declare that to the best of my knowledge the information I have given on, or attached to, this form is complete, current and correct. I understand that giving false or misleading information is a serious offence.

**Signed:**

**Name:**

**Date:**

## References


ANZECC/ARMCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. National Water Quality Strategy. Australian and New Zealand Environment Conservation Council and Agricultural Resource Management Council of Australia and New Zealand, Canberra.

Commonwealth of Australia (2009). National Assessment Guidelines for Dredging. Commonwealth of Australia, Canberra, 2009.

DERM (2009). Queensland Water Quality Guidelines 2009. Queensland Department of Environment and Resource Management.

Erftemeijer, PLA, Riegl, B, Hoeksema, BW and Todd, PA, (2012). Environmental impacts of dredging and other sediment disturbances on corals: a review. Marine Pollution Bulletin, http://dx.doi.org/10.1016/j.marpolbul.2012.05.008)

Munksgaard, N.C. and Parry, D.L. (2002). Metals, arsenic and lead isotopes in near-pristine estuarine and marine coastal sediments from northern Australia. Marine and Freshwater Research, 53: 719-729.

IMO (2000). Specific Guidelines for Assessment of Dredged Material. Adopted by the 22nd Consultative Meeting of Contracting Parties to the London Convention 1972 by resolution LC.22/5 (2000)18-22 September 2000. International Maritime Organisation.

NQPB (2011). *Port of Weipa Environmental Management Plan.* North Queensland Bulk Ports Corporation.

Queensland Government (2012). South of the Embley project Coordinator-General's report on the environmental impact statement, May 2012. Available online at: http://www.dsdip.qld.gov.au/resources/project/south-of-the-embley/south-embley-cg-eis-report.pdf (accessed 11/09/2012).

RTA (2012a). South of Embley Project Supplementary Environmental Impact Statement.

RTA (2012b). South of Embley Project draft Commonwealth Environmental Impact Statement.

RTA (2013). South of Embley Project Commonwealth Environmental Impact Statement.

SKM (2009a). Port of Weipa Long Term Environment Management Plan for Dredging and Dumping Activities. Report prepared by Sinclair Knight Merz for North Queensland Bulk Ports. 31 August 2009.

Sofonia, JJ and Anthony, KRN, (2008). High-sediment tolerance in the reef coral *Turbinaria mesenterina* from the inner Great Barrier Reef lagoon (Australia). Estuarine, Coastal and Shelf Science, 78, 748 -752.

Worley Parsons (2011). South of the Embley Project: Revised capital dredge results and maintenance dredging requirements. Report to Rio Tinto Alcan.

Worley Parsons (2012). Sediment Characterisation Report – South of Embley Project: 185,000 DWT Vessel Port Development Plan. Report for Rio Tinto Alcan.

Worley Parsons (2013). South of Embley Project: Marine environmental modelling of dredging methods. Report to Rio Tinto Alcan (provided as Appendix 7A of the Commonwealth EIS (RTA 2013).

## Attachment 1: Exemption notice

**Australian Government**

**Department of Sustainability, Environment, Water, Population and Communities**

Mr Laurie Hicks
Project Director
South of the Embley Project
Rio Tinto - Technology and Innovation
443 Queen Street
Brisbane QLD 4000

Dear Mr Hicks

**Exemption request from further sediment sampling for the South of the Embley Project**

The department has reviewed your request for an exemption from further sediment sampling dated 31 October 2011 for the change in the alignment of the proposed new port, the change in the area and volume of the Humbug terminal, the change in the area and volume of the Hey River terminal.

An exemption from further sediment sampling for the above locations as outlined in your letter of 31 October 2011 has been granted by the Department.

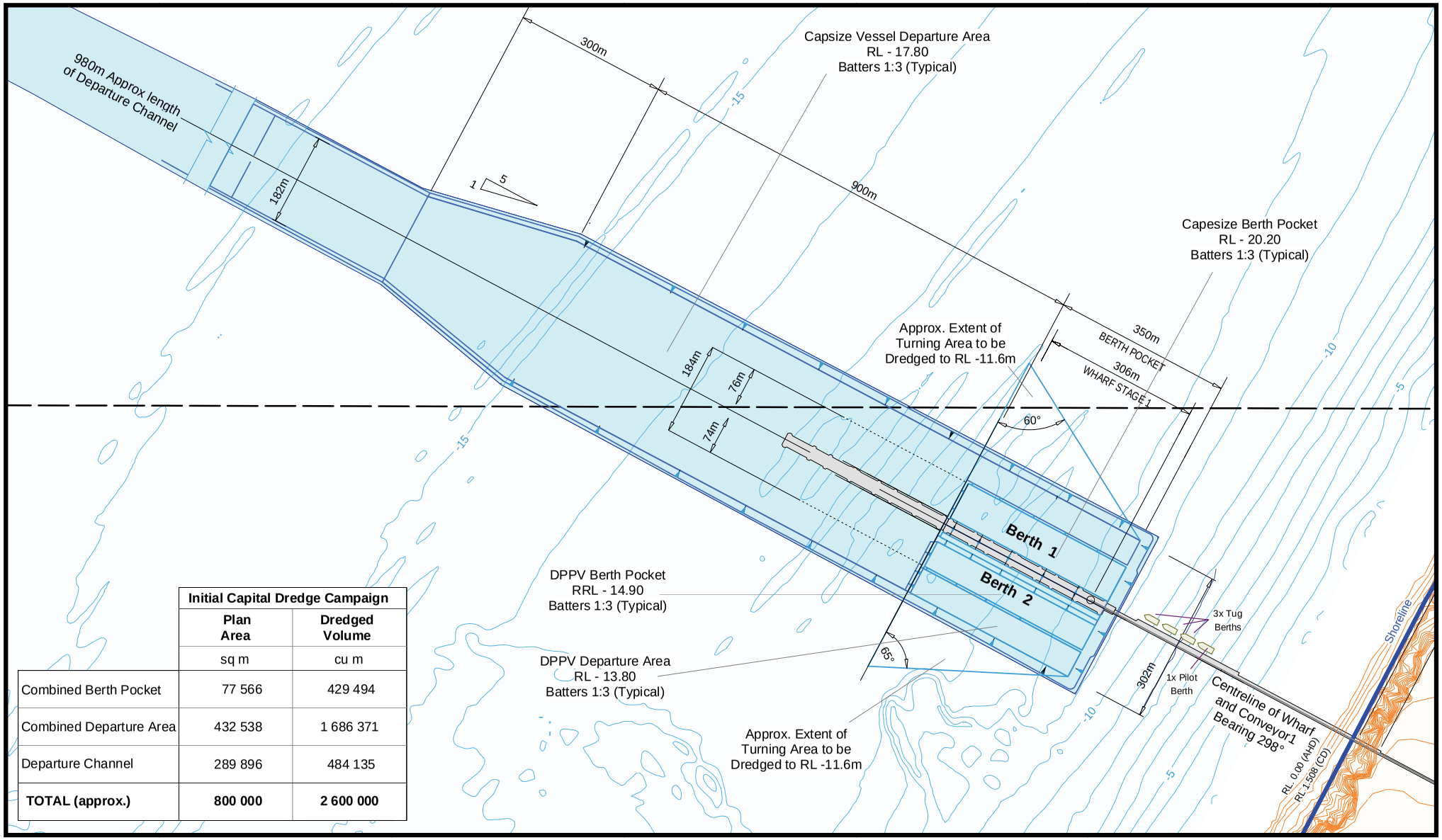
Please note that this exemption does not affect obligations to comply with any other laws of the Commonwealth, state or territory that are applicable to the action. If you require any further information please contact, Ms Eszter Szabo on 02 6274 2171 or eszter.szabo@environment.gov.au.

Yours sincerely

Michael Ward
Director
Ports and Marine Section
20 January 2012

GPO Box 787 Canberra ACT 2601 Phone (02) 6274 1111 Fax (02) 6274 1666 Internet: www.environment.gov.au

**Attachment 2: Proposed Boyd Port Layout**




| | Initial Capital Dredge Campaign | |
|---|---|---|
| | **Plan Area** | **Dredged Volume** |
| | sq m | cu m |
| Combined Berth Pocket | 77 566 | 429 494 |
| Combined Departure Area | 432 538 | 1 686 371 |
| Departure Channel | 289 896 | 484 135 |
| **TOTAL (approx.)** | **800 000** | **2 600 000** |

**NOTES:**

Vertical Datum:
Depths are in metres and are reduced to chart datum (CD) which is approximately the level of lowest astronomical tide (LAT).
CD (LAT) is 1.508m below AHD.

N

0 100 200 300m

Data Source: 501-S0-1710-00100_00G.DXF

**South of Embley Project**

Datum/Projection: GDA94/MGA Zone 54

Date: 02/10/2012

# Sea Disposal Application
# Dredged or Excavated Material

## Important Information

**ABOUT THIS FORM**

Important – Please read this information carefully before you complete your application. Once you have completed your application we strongly advise that you keep a copy for your records.

**WHO SHOULD USE THIS FORM?**

This application form was approved on 26 June 2012, pursuant to subsection 18(2) of the *Environment Protection (Sea Dumping) Act 1981* (the Sea Dumping Act). If you propose to dispose of dredged or excavated material at sea then you must complete this form.

**COMPLETE APPLICATIONS**

The department encourages the lodgement of complete applications. If further information is required to assess your sea disposal application, then the time within which the Minister is required to assess your application will be paused and reset pursuant to section 18 of the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act).

You should read this application in conjunction with the **National Assessment Guidelines for Dredging 2009** (NAGD). The NAGD detail the procedures which should be followed in sampling, testing and assessing the suitability of material to be disposed of at sea. The guidelines also detail how disposal sites are to be evaluated and monitored. The NAGD are available at:
www.environment.gov.au/coasts/pollution/dumping/guidelines.html

Where you require a specialist report to fulfil the requirements set out in the NAGD, then you should attach the specialist report to your application. You should also provide brief answers to the questions provided, cross-referenced to the relevant sections of the report.

Your application must clearly:

- demonstrate that you have considered alternatives to sea disposal;
- describe the material to be disposed of at sea including how it will be transported from the origin to the disposal site and how it will be disposed of at sea;
- identify the origin and quantity of the material to be disposed of at sea;

- provide details of the physical and chemical composition of the material to be disposed of at sea;
- detail any toxicity characteristics of the material to be disposed of at sea; and
- provide details regarding the disposal locality and any potential environmental impacts at the disposal site.

**OBLIGATION TO COOPERATE WITH INSPECTORS**

Sections 26 to 32 of the Sea Dumping Act provide amongst other things that the Minister may appoint inspectors for the purpose of policing the Sea Dumping Act. An inspector may board vessels, aircraft or platforms or stop and detain vessels or aircraft.

**ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999**

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places, the Commonwealth marine area and the Great Barrier Reef Marine Park — defined in the EPBC Act as matters of national environmental significance. For a detailed discussion of assessment under the EPBC Act and how it interacts with the Sea Dumping Act refer to Section 2.1.2 of the NAGD.

The EPBC Act affects any group or individual (including companies) whose actions may have a significant impact on a matter of national environmental significance. Persons who may have a significant impact on a matter of national environmental significance must refer their proposed action pursuant section 68 of the EPBC Act.

Section 160 of the EPBC Act requires the a decision maker in some circumstances to seek advice under the EPBC Act prior to making a decision with respect to a sea disposal permit. To ensure efficient co-ordination of the assessment process, it is important that the department is aware of any referrals the proponent has made under the EPBC Act. As such, it is advisable that proponents discuss proposed actions with the department prior to submitting a sea disposal application.

Please note that if the project has been referred under the EPBC Act that a decision on a sea disposal permit application cannot be made until the project has either been determined to be "not a controlled action" or the Minister has approved the proposal.

**APPLICATION FEE**

The *Environment Protection (Sea Dumping Regulations) 1983* (the Sea Dumping Regulations) prescribe the fee payable for a sea disposal application. For an application for a permit to dispose of dredged or excavated material into any part of the sea, the following fees are prescribed pursuant to clause 5(2) of the Sea Dumping Regulations as follows:

(a) if the volume of the material exceeds 100 000 $m^3$ -- $23 500;

(b) if the volume of the material does not exceed 100 000 $m^3$ -- $10 000.

Clause 5B of the Sea Dumping Regulations requires the application fee to be paid no later than 30 days after the application is submitted. A failure to pay the application fee within the prescribed timeframe will result in the application been invalid. This means that if your application is invalid you will need to submit a new application to the Department if you wish to pursue an application.

**METHOD OF PAYMENT**

To make a payment, the department's preferred methods of payment are by credit card, bank cheque, money order or by electronic funds transfer (EFT).

*Cheques*

You must make your payment payable to "Department of Sustainability, Environment, Water, Population and Communities". You should include a remittance advice.

*EFT Payments*

EFT Payments can be made to:

BSB: 092-009
Bank Account No. 115859
Amount: $
Account Name: Department of Sustainability, Environment, Water, Population and Communities
Bank: Reserve Bank of Australia
Bank Address: 20-22 London Circuit Canberra ACT 2601
Reference: Cost Centre 12106, GL A/c 52300
Description: Sea Disposal Permit Application – Name of Project

**LODGING YOUR APPLICATION**

You may lodge your application at the following address:

***Director***
***Ports and Marine Section***
***Department of Sustainability, Environment, Water, Population and Communities***
***GPO Box 787***
***Canberra ACT 2601***

**WHAT HAPPENS NEXT?**

Your application will be considered and you may be asked to provide additional information to enable a decision to be made.

**FURTHER INFORMATION**

Further information may be obtained from: portsandmarine@environment.gov.au

# PART A – APPLICATION SUMMARY

What is the legal name of the business, organisation or company?

RTA Weipa Pty Ltd (RTAW)

Contact Person: Fiona Talbot, phone (07) 3625 4983

Type of Material Requiring Disposal:

☒ Capital ☒ Dredge

☐ Maintenance ☐ Excavation

WGS84 co-ordinates of disposal site:

Albatross Bay spoil ground, Port of Weipa, Gulf of Carpentaria.

| Spoil Ground | Latitude | Longitude | Radius |
|---|---|---|---|
| Albatross Bay (existing) | S12º 39' 34.7" | E141 º 39' 24.1" | 2000m |

Dates of proposed disposal operations:

Dredging and sea dumping of spoil would commence once all necessary permits and approvals are obtained and as soon as a suitable dredge can be mobilised. The current schedule allows for the dredging and sea dumping covered in this application to commence in January 2014 and to continue until the end of January 2017. These dates are yet to be confirmed pending other Project approvals and RTAW will provide final dates once dredging contractor and timing have been confirmed.

Volume (cubic metres) of material to be disposed of:

| Source | Capital ($m^3$) | Disposal Location |
|---|---|---|
| Humbug roll on/roll off barge terminal | 15,600 | Existing Albatross Bay spoil ground |
| Hornibrook Point ferry terminal and tug berths | 57,600 | Existing Albatross Bay spoil ground |
| Hey River barge/ferry terminal | 37,380 | Existing Albatross Bay spoil ground |
| **TOTAL** | **110,580** | |

Refer to Section 3.8.2 of the Commonwealth EIS (RTA 2013) for more details.

Length of permit applied for in this application:

Three (3) years

Details of previous sea disposal permits that you have been granted:

RTAW's existing Weipa operations have not previously applied for a Sea Dumping Permit for dredging. Dredging is currently carried out in the Port of Weipa under a Sea Dumping Permit by North Queensland Bulk Ports (NQBP) to maintain an export Port which is utilised by RTAW.

As part of the South of the Embley bauxite mine extension and Port Project (EPBC 2010/5642), a Sea Dumping Permit application form has also been completed for initial capital dredging for a new Port development between Boyd Point and Pera Head; however, the two forms (river and Port) comprise a single application.

| Permit number | Volume approved for disposal (cubic metres) |
|---|---|
| | |

# PART B - APPLICANT

## 2.0 Identity of applicant

2.1 Applicant Details

What is the legal name of the business, organisation or company?
RTA Weipa Pty Ltd (RTAW)

What is the registered business name or trading name under which you operate? (if different from legal name)
N/A (same as legal name)

Australian Business Number (ABN)
54 137 266 285

Australian Company Number (ACN)
137 266 285

Street address of the business (where the business is physically located)
123 Albert Street, Brisbane QLD, 4000

Postal address of the business (If same as street address, write 'AS ABOVE')
PO Box 2470, Brisbane 4000

2.2 Contact Person

Contact person for enquiries: Fiona Talbot

Phone: (07) 3625 4983

Email: fiona.talbot@riotinto.com

## 3.0 Identity of the owner of the material to be disposed of at sea

State of Queensland

3.1 Owner Details

What is the legal name of the business, organisation or company?
What is the registered business name or trading name under which you operate? (if different from legal name)
Australian Business Number (ABN)
Australian Company Number (ACN) (if applicable)
Street address of the business (where the business is physically located)
Postal address of the business (If same as street address, write 'AS ABOVE')

3.2 Contact Person

Contact person for enquiries:
Phone:
Email:

# PART C – ALTERNATIVES TO SEA DISPOSAL

## 4.0 Consider alternatives to sea disposal

4.1 You should identify alternative options for the disposal of dredged or excavated material other than sea disposal. These options should include:

- not dredging or excavating;
- re-use (e.g. land creation, beach nourishment, offshore berms, fill);
- off-site recycling (for example, as construction material);
- treatment to destroy or remove hazardous constituents for beneficial use; and
- disposal on land.

Please specify the options you have considered.

The following options for disposal of dredged spoil were considered:

- not dredging or excavating;
- re-use (e.g. land creation, beach nourishment, offshore berms, fill) or off-site recycling (for example, as construction material);
- treatment to destroy or remove hazardous constituents for beneficial use; and,
- disposal on land.

4.2 Explain why your preferred option for disposal of the dredged or excavated material is sea disposal. In explaining why sea disposal is your preferred option you should provide:

- comparative cost estimates of the above alternatives (including sea disposal);
- detail any risk(s) to human health of the above alternatives (including sea disposal); and
- detail any risks to the environment of the above alternatives (including sea disposal).

Sediment characterisation (Worley Parsons 2012) has shown that the material is of a quality suitable for unconfined ocean disposal, so there should be no contaminant risks to human health or the environment should it be placed on land or at sea.

The assessments of the alternatives and reasons why sea disposal is the preferred option is set out in Table 1.

In summary:

- Cost of disposal on land would be approximately 75% of the sea disposal option based on the current proposed dredge volumes; however, further feasibility study would be required to estimate relative costs should the volume of dredged material decrease;
- Remnant native vegetation would have to be cleared and a containment facility would need to be constructed. The containment facility would need to be designed and constructed to minimise the potential for impact on the shallow aquifer via infiltration of saline seepage through the porous coastal soils; and,
- Revegetation of a large elevated emplacement of saline marine sediment would pose difficulties and would likely require long-term maintenance as exemplified by the difficulties in attempts to rehabilitate dredge spoil disposed to land at Bing Bong in south west Gulf of Carpentaria.

In addition, the Queensland Coordinator General has not approved land disposal and an amendment would need to be made to the existing Project approval.

Placement of the spoil from the river facilities at the proposed new spoil ground would require the material to be barged about twice the distance than to the Albatross Bay spoil ground. This would require at least three hopper dump barges and contractors' dredging spreads do not typically extend to that number of barges, particularly in such a remote area. If a suitable contractor was found then the costs would be significantly greater. If three hopper dump barges could not be secured, the dredging and sea disposal timeline would increase, potentially extending persistence of turbid conditions.

Use of the proposed new spoil ground provides no environmental benefit compared to use of the Albatross Bay spoil ground.

## Table 1: Alternatives for Disposal of Dredged Material

| | **Disposal at the Existing Albatross Bay Spoil Ground** | **Disposal on Land** | **Removal of Hazardous Constituents and Off-Site Recycling** | **No Dredging** |
|---|---|---|---|---|
| **Technical/ Operational Feasibility** | Preferred: Sediment has been deemed suitable for ocean disposal. Dredged sediment is currently transported from the Port of Weipa to the Albatross Bay spoil ground. | Not preferred: However if dredge volumes decrease following detailed design, improved relative cost of land disposal and potentially reduced environmental impact may improve the feasibility of this option. Due to small volumes, dredged sediment could be piped to an on land containment facility at lower cost than barge transport. Would require additional impact assessment and regulatory approvals (impact to construction schedule) as well as the construction of a suitable containment facility. | Not Feasible: Although there are no hazardous materials to be removed, beneficial reuse opportunities do not exist. Material to be dredged is not suitable for recycling. | Not Feasible: A large volume of reclaim or additional piling would be required if dredging was not carried out in order to achieve the required draft. |
| **Applicable MNES Controlling Provisions** | **Comparative Description of Mitigated Impacts** | | | |
| **Listed Threatened Species and Ecological Communities** | ***Negligible Impact (Estuarine and Marine Species)***<br>***No Impact (Terrestrial Species)***<br>Ocean disposal of marine sediments is likely to present a lower risk to the marine environment than land disposal would present to the terrestrial environment. Impacts on threatened marine and estuarine fauna would be the same whether the material is disposed at the proposed new spoil ground or the Albatross Bay spoil ground, although disposal at the proposed new spoil ground would require disturbance of a new area. | ***Moderate Impact (Terrestrial Flora)***<br>***Negligible Impact (All other Threatened Species)***<br>If the material was pumped ashore, the dewatering process could adversely affect a shallow, low-yield aquifer via infiltration of saline seepage through the porous coastal soils. The revegetation of an elevated emplacement of marine sediments would pose difficulties and would be likely to require long-term maintenance. These impacts have not been fully assessed as this was not the preferred option. | Assessment not required as not feasible | Assessment not required as not feasible |

| | Disposal at the Existing Albatross Bay Spoil Ground | Disposal on Land | Removal of Hazardous Constituents and Off-Site Recycling | No Dredging |
|---|---|---|---|---|
| **Listed Migratory Species** | ***Negligible Impact (Avian)***<br>***Negligible Impact (Non Avian)***<br>Ocean disposal of marine sediments in a marine environment provides a lower environmental risk than land disposal. Impacts on migratory marine fauna would be the same whether the material is disposed at the proposed new spoil ground or Albatross Bay, although disposal at the proposed new spoil ground would require disturbance of a new area. | ***Negligible Impact*** | Assessment not required as not feasible | Assessment not required as not feasible |

**Justification of alternatives for consideration:**

Disposal at the existing Albatross Bay spoil ground would have less impact on applicable listed threatened species than disposal on land. However, disposal at the Albatross Bay spoil ground would have a slightly greater impact on migratory species than disposal on land.

The material to be dredged is not suitable for construction material. The material from the barge and ferry terminals is comprised primarily of silty-clays. Material beneficial for offsite recycling typically requires relatively clean sands. Beneficial re-use opportunities do not exist.

If the material was pumped ashore, the dewatering process could adversely affect a shallow aquifer via infiltration of saline seepage through the porous coastal soils. The shallow aquifer currently provides potable water to the existing Weipa operations. Saline seepage from the marine sediment could adversely impact water quality. The disposal of dredged spoil to land would require construction of a suitable containment facility to store the material to minimise potential for impact on the aquifer. At the Hey River location, the construction of such a facility would require the removal of some vegetation. At Humbug Wharf and Hornibrook Point, the construction of a containment facility may sterilise the site for a prohibitive period prior to development of the onshore terminal infrastructure, further the silty-clay dominated sediments would not be suitable for engineered use, especially in supporting heavy machinery. Awaiting construction of the containment facility may prevent commencement of dredging activities for some months, subsequently delaying the construction of the barge and ferry facilities. These facilities are on the critical path for construction of the Project. The revegetation of a large elevated emplacement of marine sediments would pose difficulties and would be likely to require long-term maintenance. However, if dredge volumes decrease following detailed design, these potential environmental impacts may be reduced, which may improve the feasibility of this option.

Placement of the spoil from the river facilities at the proposed new spoil ground would require the material to be barged about twice the distance than to the Albatross Bay spoil ground. This would require at least three hopper dump barges and contractors' dredging spreads do not typically extend to that number of barges, particularly in such a remote area. If a suitable contractor was found then the costs would be significantly greater. If three hopper dump barges could not be secured, the dredging and sea disposal timeline would increase, potentially extending persistence of turbid conditions.

Ocean disposal of marine sediments is likely to present a lower risk to the marine environment than land disposal would present to the terrestrial environment, as disposal on land could adversely affect water quality in the shallow aquifer; and revegetation of marine sediments would pose difficulties.

# PART D – DETAILS OF TESTING AND MONITORING PREVIOUS TO THIS APPLICATION

## 5.0 Testing and Monitoring

5.1 Details of previous permits

| Permit Number | Testing Conducted | Monitoring Conducted |
|---|---|---|
| Sampling and Analysis Plan approved 2 February 2009 (2008/24651) | Y | |
| Supplementary Sampling and Analysis Plan approved 16 June 2009 (SD2008/1004) | Y | |

Note: for the purpose of question 5.1 “testing” means testing of sediment undertaken in the course of being granted a previous sea disposal permit and “monitoring” means any monitoring required as a condition of that sea disposal permit.

Please attach any information on testing (for example a Sampling and Analysis Plan (SAP) Implementation Report) and/or monitoring that was conducted in relation to previous sea disposal permits.

The *South of Embley Project Barge/Ferry Terminal Sediment Characterisation Study, 25 June 2012* was sent to DSEWPaC in June 2012. This report provides a compilation of all data from the two SAPs and the two exemption requests (see Section 6.0 below).

## 6.0 Exemptions

Has an exemption from detailed testing requirements been given? (refer to section 4.2.1 of the NAGD for grounds for exemption).

If yes, attach a copy of the exemption notice.

Yes. Exemptions were granted on 20 January 2012 and 20 July 2012 (refer **Attachment 1**), following a request to amend the application with a request for exemption from further sediment sampling on 31 October 2011 and again on 27 June 2012, respectively.

RTA acknowledges that, due to delays in approvals for the Project, some of the sediment samples may be older than the 5 years recommended by the NAGD when dredging is due to commence. The risk of change in sediment characterisation in this area is low; however RTA will submit a request for exemption from further sediment sampling once approval for the Project is received and the dredging date can be confirmed.

# PART E - DESCRIPTION AND ANALYSIS OF MATERIAL TO BE DISPOSED OF AT SEA

## 7.0 Description of the material to be disposed of at sea

7.1 Type of Material Requiring Disposal:

| | | | |
|---|---|---|---|
| ☒ | Capital | ☒ | Dredge |
| ☐ | Maintenance | ☐ | Excavation |

7.2 What is the volume of material (in situ) in cubic metres to be disposed of?

| Source | Capital ($m^3$) | Disposal Location |
|---|---|---|
| Humbug roll on/roll off barge terminal | 15,600 | Existing Albatross Bay spoil ground |
| Hornibrook Point ferry terminal and tug berths | 57,600 | Existing Albatross Bay spoil ground |
| Hey River barge/ferry terminal | 37,380 | Existing Albatross Bay spoil ground |
| **TOTAL** | **110,580** | |

Refer to Section 3.8.2 of the Commonwealth EIS (RTA 2013) for more details.

7.3 Describe the project that will generate the dredged or excavated material.

RTA proposes to develop a roll-on roll-off barge terminal at Humbug Wharf in the Embley River, a ferry terminal and tug berths at Hornibrook Point in the Embley River, and a combined barge/ferry terminal south of Hey Point in the Hey River. The barge and ferry terminals would provide a transport route for equipment and personnel to the proposed South of Embley mine development. The tug berths would provide berthing for tugs during inclement weather (they would normally be moored at the proposed Boyd Port). The works to be covered by this form include capital dredging requirements at each of the three terminals (note that a separate form has been provided for dredging at the proposed Boyd Port and the two forms comprise a single application).

The Humbug barge terminal would be required to be dredged to a target depth of -2.5m RL, the Hornibrook ferry terminal to a depth of -2.0m RL, the Hornibrook tug berths to a depth of -7.2m RL and the Hey River barge/ferry terminal to -2.0m RL (ferry terminal) and -2.5m RL (barge terminal).

The volume for dredge spoil from these areas proposed is as per the table above. Refer to Section 3.6.2 of the Commonwealth EIS (RTA 2013) for more details on these facilities.

7.4 Location of material to be dredged or excavated.

Attach a location and site plan including WGS84 co-ordinates and street address (where relevant). For dredged material include bathymetric contours. For excavated material, specify the location where the material can be inspected.

Plans of the proposed works are provided in Attachment 2.

The relevant navigation charts are Au301 and Au4 (a).

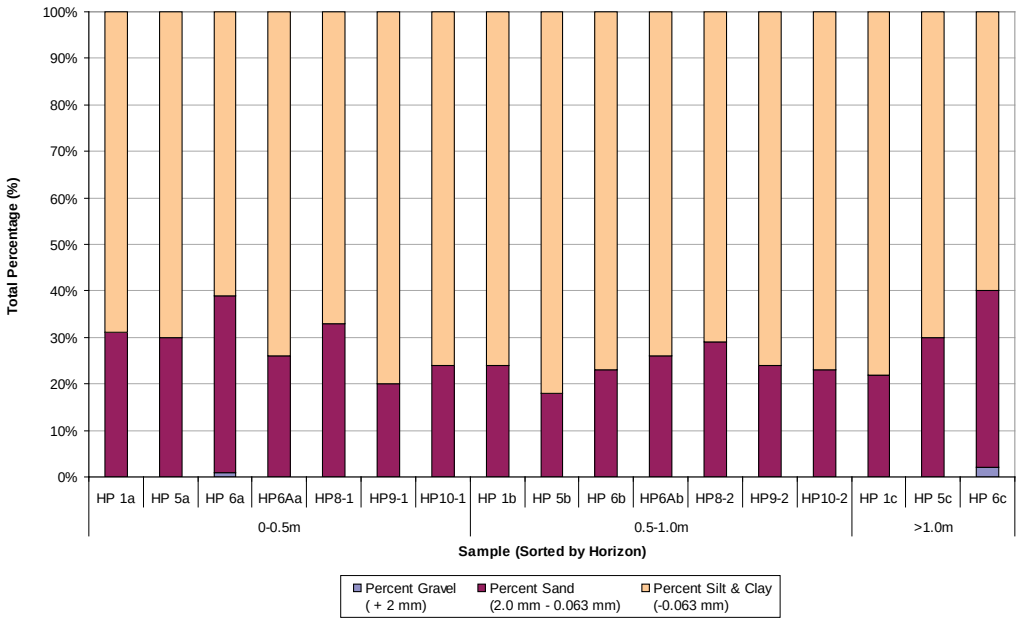
7.5 Physical description of material

Characterise the material (for example, gravel, sand, mud, clay, peat, rock or mixtures of these) and provide a brief summary of the geological features (such as, rock types, sediments found in dredge area, thicknesses of individual strata).

## Hornibrook Terminal

Sediments located at the Hornibrook terminal are dominated by silt and clay fractions, which combined account for a mean of 73% of sediments within the dredge area. The remainder of the samples were almost entirely comprised of sand (27%). Gravel was reported from only two samples. There was minimal difference in particle size distribution between horizons (Figure 1).

**Figure 1: Particle size distribution of sediments at Hornibrook terminal area**

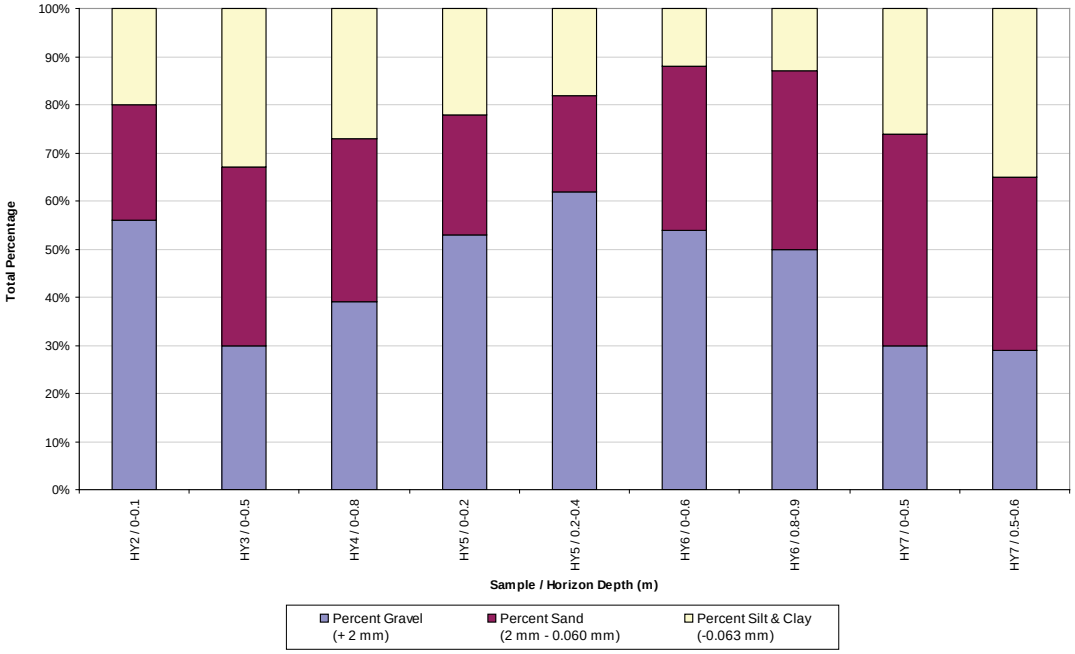



## Hey River Terminal

Targeted dredging depths were not reached at all sampling locations as refusal frequently occurred between 0.1m and 0.8m sediment depth, typically on kaolin clay. Sediments located within the Hey River terminal dredging area are dominated by

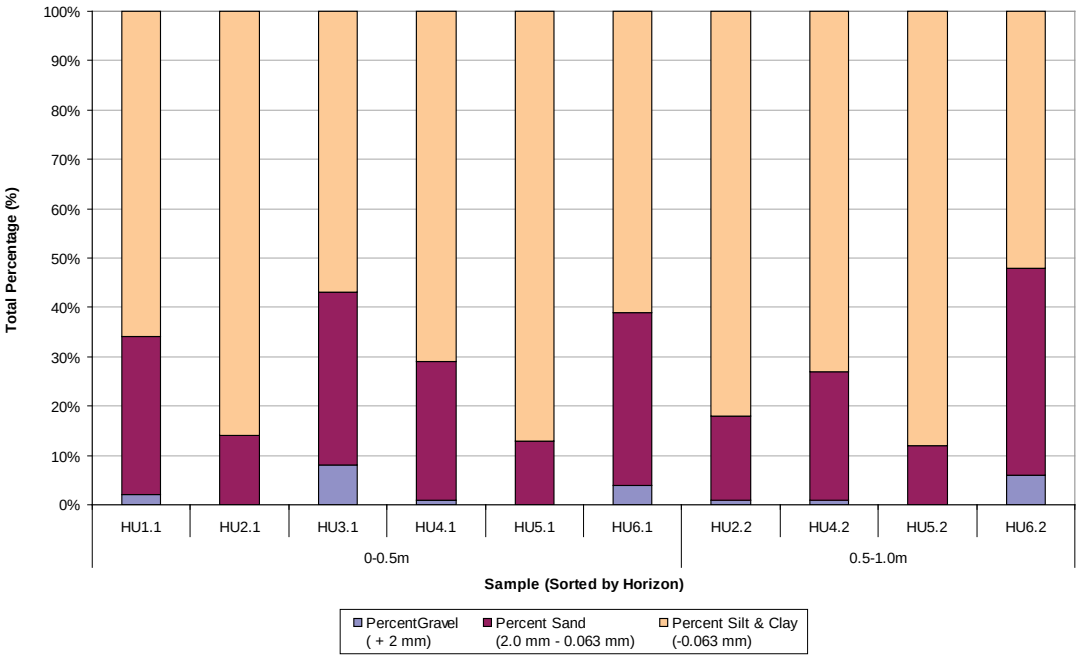
gravel and sand fractions. Gravel was the dominant particle size (45%), followed by sand (32%), silt and clay (24%) (refer to Figure 2).

**Figure 2: Particle size distribution of sediments in Hey River terminal area**




Sediments at the Humbug terminal are dominated by combined silt and clay fractions (72%), followed by sand (25%) and minimal gravel (2%). There is minimal difference in particle size distribution between horizons (Figure 3).

**Figure 3: Particle size distribution of sediments in Humbug terminal area**



7.6 Chemical description of material

Provide data on the average composition of the material to be disposed of at sea (expressed as percentage of dry weight). In addition, for this application to be considered for a permit, the following sediment quality questions must be answered (refer to section 4.2 of the NAGD). If any of these questions are not applicable due to an exemption being given (refer to 6.0 above) please state 'Exempt'.

Sediment chemical analysis of material to be dredged was undertaken in accordance with the approved SAP and supplementary SAP. Samples were analysed from a total of 20 sites over the three dredging locations and four sampling surveys for the following contaminants:

- Metals ( Cd, Cu, Cr, Fe, Pb, Hg, Mn, Ni and Zn) and As;
- Polyaromatic hydrocarbons (PAHs);
- Organotin Compounds (TBT, DBT, MBT);
- Total Organic Carbon;
- Acid Sulphate Soils (using SPOCAS method);
- Particle size distribution (PSD, to 75µm); and,
- Moisture content.

Full sediment reporting is provided in *South of the Embley Project Barge/ Ferry Terminals Sediment Characterisation Study* (Worley Parsons 2012). A brief summary of the results is provided in Table 2 and below:

**Hornibrook terminal**

- All metals and metalloids were below respective NAGD (2009) screening levels.
- PAHs were present at the majority of sites; however some sites had PAHs below detection limits. There are no NAGD screening levels for individual PAHs for comparison. Total PAHs are below the screening level for the mean and 95% UCL of the mean.
- Tributyltin was detected from one location only, below the NAGD screening level of 9µgSn/kg. All other locations were below Limit of Reporting.
- Acid sulphate soils results indicated that there is the potential for the soils to generate sulphidic acidity; however this has not yet taken place. The sediment has low net acidity and the ability to neutralise some acid which means that the addition of lime to manage acid generation from the dredged material would not be required if the material was to be placed on land.

**Hey River terminal**

- Except for arsenic, all metals were below respective NAGD screening levels. Arsenic was recorded above the NAGD screening level of 20mg/kg at three of the seven locations and in addition the mean and 95% UCL of the mean was above this screening level. In accordance with the NAGD further sampling and analysis was undertaken to assess the potential arsenic bioavailability to benthic organisms and potential water quality impacts during disposal. Arsenic concentrations in the dilute acid extraction (bioavailability) were substantially lower than the screening levels and therefore unlikely to have an effect on water quality or benthic organisms at the disposal site.
- PAHs were below Limit of Reporting (LOR) for all samples.
- Organotins were below LOR for all samples.
- Acid sulphate soils results indicate that there is the potential for the soils to generate sulphidic acidity; however this has not yet taken place. The sediment has low net acidity and the ability to neutralise some acid which means that the addition of lime to manage acid generation from the dredged material would not be required if the material was to be placed on land.

**Humbug terminal**

- All metals and metalloids were below respective NAGD screening levels.
- PAHs were present at the majority of sites; however there are no NAGD screening levels for individual PAHs for comparison. Total PAHs at each site were below the NAGD screening level.
- Tributyltin was below LOR at all sites.
- Acid sulphate soils results indicate that there is the potential for the soils to generate sulphidic acidity; however this has not yet taken place. The sediment has low net acidity and the ability to neutralise some acid which means that the addition of lime to manage acid generation from the dredged material would not be required if the material was to be placed on land.

According to the NAGD assessment framework the material from each of the three dredge areas is chemically suitable for unconfined sea disposal.

**Table 2: Summary of results of chemical analysis at Hornibrook Point, Humbug Wharf and Hey River sediments**

| | | | | | Hornibrook Point | | | | Humbug Wharf | | | | Hey River | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Analyte** | **Units** | **LOR** | **NAGD PQL** | **NAGD Screening Level** | **Mean/ Geomean** | **Standard Deviation** | **95% UCL** | **Normal (N) Lognormal (L) Neither (X)** | **Mean/ Geomean** | **Standard Deviation** | **95% UCL** | **Normal (N) Lognormal (L) Neither (X)** | **Mean/ Geomean** | **Standard Deviation** | **95%UCL** | **Normal (N) Lognormal (L) Neither (X)** |
| Moisture Content | % | < 0.1 | 0.1 | | 42.84 | 4.918 | 44.92 | X | 46.0 | 5.3 | - | - | 36.1 | 3.566511 | - | - |
| Total Organic Carbon | % | <0.02 | 0.1 | | 0.854 | 0.175 | 0.949 | X | 1.0 | 0.2 | - | - | 1.01 | 0.311127 | - | - |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminium | mg/kg | <0.1 | | | 16093 | 1559 | 17375 | N | 17460 | 2761 | 19060 | N | | | | |
| Arsenic | mg/kg | <0.4 | 1 | 20 | 7.2 | 0.852 | 7.726 | N | 8.76 | 0.49 | 9.04 | N | **20.7** | 6.9 | **25.8** | N |
| Cadmium | mg/kg | <0.1 | 0.1 | 1.5 | 0.271 | 0.224 | 0.366 | X | 0.126 | 0.025 | 0.141 | X | 0.11 | 0.06 | 0.15 | N |
| Chromium | mg/kg | <0.1 | 1 | 80 | 22.24 | 3.597 | 23.76 | N | 25.9 | 5.9 | 29.8 | L | 40.6 | 6.6 | 45.4 | N |
| Copper | mg/kg | <0.1 | 1 | 65 | 3.759 | 0.902 | 4.141 | X | 3.7 | 0.9 | 4.2 | N | 2.3 | 0.5 | 2.7 | N |
| Iron | mg/kg | <0.1 | 100 | | 18824 | 2651 | 19946 | N | 22100 | 2079 | 23305 | N | 43429 | 10830 | 51383 | N |
| Mercury | mg/kg | <0.01 | 0.01 | 0.15 | 0.00941 | 0.00464 | 0.0114 | X | 0.030 | 0.053 | 0.069 | X | <0.01 | 0 | <0.01 | N |
| Manganese | mg/kg | <0.1 | 10 | | 93.06 | 26.84 | 104.4 | X | 102.6 | 17.3 | 112.6 | X | 131 | 25 | 150 | N |
| Nickel | mg/kg | <0.1 | 1 | 21 | 5.641 | 0.953 | 6.045 | N | 5.72 | 1.17 | 6.40 | N | 4.13 | 0.65 | 4.61 | N |
| Lead | mg/kg | <0.1 | 1 | 50 | 5.176 | 1.037 | 5.615 | N | 5.3 | 0.6 | 5.7 | N | 6.94 | 1.80 | 8.42 | L |
| Zinc | mg/kg | <0.1 | 1 | 200 | 15.69 | 4.067 | 17.42 | X | 15.2 | 3.8 | 17.4 | N | 8.10 | 1.16 | 8.95 | N |
| **Polyaromatic Hydrocarbons** | | | | | | | | | | | | | | | | |
| Naphthalene | µg/kg | <5 | 5 | - | - | - | - | - | <5 | 0 | <5 | - | <5 | 0 | <5 | - |
| 1-Methylnaphthalene | µg/kg | <5 | 5 | - | - | - | - | - | <5 | 0 | <5 | - | <5 | 0 | <5 | - |
| 2-Methylnaphthalene | µg/kg | <5 | 5 | - | - | - | - | - | <5 | 0 | <5 | - | <5 | 0 | <5 | - |
| Acenaphthylene | µg/kg | <5 | 5 | - | - | - | - | - | <5 | 0 | <5 | - | <5 | 0 | <5 | - |
| Acenaphthene | µg/kg | <5 | 5 | - | - | - | - | - | <5 | 0 | <5 | - | <5 | 0 | <5 | - |
| Fluorene | µg/kg | <5 | 5 | - | | | | | <5 | 0 | <5 | - | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | | 2.579 | 0.327 | 2.718 | X | | | | | | | | |
| Phenanthrene | µg/kg | <5 | 5 | | | | | | | | | | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | - | 6.0021 | 9.547 | 10.06 | X | 6.59 | 3.57 | 8.66 | N | | | | |
| Anthracene | µg/kg | <5 | 5 | | | | | | <5 | 0 | <5 | - | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | - | 2.724 | 0.925 | 3.116 | X | | | | | | | | |
| Fluoranthene | µg/kg | <5 | 5 | | | | | | | | | | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | - | 9.28 | 12.26 | 14.47 | X | 9.1 | 7.0 | 13.1 | N | | | | |
| Pyrene | µg/kg | <5 | 5 | | | | | | | | | | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | - | 8.556 | 10.56 | 13.03 | X | 8.5 | 6.3 | 12.1 | N | | | | |
| Benz(a)anthracene | µg/kg | <5 | | | | | | | | | | | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | - | 4.271 | 4.603 | 6.22 | X | 4.6 | 2.4 | 6.0 | X | | | | |
| Chrysene | µg/kg | <5 | 5 | | | | | | | | | | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | - | 4.324 | 4.634 | 6.286 | X | 4.9 | 2.8 | 6.5 | X | | | | |
| Benzo(b)&(k)fluoranthene | µg/kg | <10 | 5 | | | | | | | | | | <10 | 0 | <10 | - |
| *Normalised to 1% TOC* | | | | - | 8.696 | 7.905 | 12.04 | X | 8.3 | 3.7 | 10.4 | X | | | | |
| Benzo(a)pyrene | µg/kg | <5 | 5 | | | | | | | | | | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | - | 4.559 | 4.191 | 6.333 | X | 4.1 | 1.7 | 5.1 | X | | | | |
| Indeno(1,2,3-cd)pyrene | µg/kg | <5 | 5 | | | | | | | | | | <5 | 0 | <5 | - |

| | | | | | Hornibrook Point | | | | Humbug Wharf | | | | Hey River | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Analyte** | **Units** | **LOR** | **NAGD PQL** | **NAGD Screening Level** | **Mean/ Geomean** | **Standard Deviation** | **95% UCL** | **Normal (N) Lognormal (L) Neither (X)** | **Mean/ Geomean** | **Standard Deviation** | **95% UCL** | **Normal (N) Lognormal (L) Neither (X)** | **Mean/ Geomean** | **Standard Deviation** | **95%UCL** | **Normal (N) Lognormal (L) Neither (X)** |
| *Normalised to 1% TOC* | | | | - | 3.95 | 2.659 | 5.076 | X | 5.2 | 3.0 | 6.9 | X | | | | |
| Dibenz(a,h)anthracene | µg/kg | <5 | 5 | - | - | - | - | - | <5 | 0 | <5 | - | <5 | 0 | <5 | - |
| Benzo(g,h,i)perylene | µg/kg | <5 | | | | | | | | | | | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | - | 3.637 | 2.329 | 4.623 | X | 3.3 | 1.4 | 4.1 | X | | | | |
| Coronene | µg/kg | <10 | 5 | - | - | - | - | - | <10 | 0 | <10 | - | <10 | 0 | <10 | - |
| Benzo(e)pyrene | µg/kg | <5 | 5 | | | | | | | | | | <5 | 0 | <5 | - |
| *Normalised to 1% TOC* | | | | - | 3.637 | 2.772 | 4.81 | X | 3.3 | 1.4 | 4.1 | X | | | | |
| Total PAHs (as above) | µg/kg | <100 | 100 | 10,000 | | | | | | | | | <100 | 0 | <100 | - |
| *Normalised to 1% TOC* | | | | | 52.94 | 12.13 | 58.08 | X | 54 | 11 | 60 | X | | | | |
| **Organotins** | | | | | | | | | | | | | | | | |
| Monobutyl tin | µgSn/kg | <0.5 | 1 | - | - | - | - | - | <0.05 | 0 | <0.05 | - | <0.5 | 0 | <0.5 | - |
| Dibutyl tin | µgSn/kg | <0.5 | 1 | | | | | | | | | | <0.5 | 0 | <0.5 | - |
| *Normalised to 1% TOC* | | | | - | 0.45 | 0.255 | 0.558 | X | 0.33 | 0.13 | 0.41 | X | | | | |
| Tributyl tin | µgSn/kg | <0.5 | 1 | 9 | | | | | <0.05 | 0 | <0.05 | - | <0.5 | 0 | <0.5 | - |
| *Normalised to 1% TOC* | | | | | 0.265 | 0.0606 | 0.29 | X | | | | | | | | |

**Bold**: Value exceeds NAGD screening level.

7.6.1 Is the concentration of any chemical constituent above the Screening Levels in Table 2 of the NAGD?

☒ Yes ☐ No

If 'No', go to question 7.10.

If 'Yes', list the chemical constituents and their levels.

Arsenic exceeded the NAGD screening level at three sites from the Hey River terminal dredge area as shown in Table 3. The mean and 95% UCL of the mean for arsenic also exceeded the NAGD screening level.

**Table 3: Chemical constituents that exceeded the NAGD screening level**

| | NAGD Screening Level (mg/kg) | HY4 | HY6 | HY7 | Mean (whole location dataset) | 95% UCL (whole dataset) |
|---|---|---|---|---|---|---|
| Arsenic | 20 | 27 | 36 | 22 | 20.7 | 25.8 |

7.6.2 Are any of the chemical constituents listed in 7.6.1 (that is, those above Screening Levels) also above the background levels at the disposal site?

☐ Yes ☒ No

If 'No', go to question 7.10.

If 'Yes', list the chemical constituents and their background levels at the disposal site.

7.7 Elutriate testing

If you answered 'Yes' to question 7.6.2, elutriate testing may be required to be carried out. Refer to Section 4.2.3 and Appendix A of the NAGD for further information.

Elutriate arsenic concentrations were all reported above the 'low reliability' water quality trigger values for arsenic (III) and arsenic (V)[1]. Application of an initial dilution factor of four, as allowed for under the NAGD, means that the concentration of arsenic from the Hey River terminal dredge area would be diluted below the ANZECC/ ARMCANZ 'low reliability' trigger value almost immediately upon release from a hopper over the spoil ground.

Full sediment reporting is provided in the *South of the Embley Project Barge/ Ferry Terminals Sediment Characterisation Study* (Worley Parsons 2012).

[1] No guideline for arsenic in marine waters is provided in the toxicant table of ANZECC/ARMCANZ (2000); however recommended 'low reliability' values are provided in supporting rational and background information.

7.7.1 Are all results of elutriate testing below the *ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality* marine water quality criteria for any chemical parameter after allowable dilution?

☒ Yes ☐ No

If 'Yes, go to question 7.8.

If 'No', you should consult the department on further actions that maybe required. You have the option of carrying out detailed toxicity and bioavailability testing, and evaluating control measures to minimise the impact (such as treatment of the waste or confined disposal). It is important to note that if control measures are unlikely to be effective, the material may be considered unacceptable for sea disposal

7.8 Bioavailability testing

DAE arsenic concentrations were well below the NAGD screening level of 20mg/kg. On that basis, arsenic is unlikely to have a significant toxic affect on benthic organisms following disposal at the Albatross Bay spoil ground. Results indicated that arsenic is strongly bound to the sediments and is likely of geological origin. This is consistent with there being no potential arsenic sources in the vicinity of the Hey River terminal.

Full sediment reporting is provided in *South of the Embley Project Barge/ Ferry Terminals Sediment Characterisation Study* (Worley Parsons 2012).

7.8.1 Has bioavailability testing been undertaken for all chemical constituents listed at 7.6.2?

☒ Yes ☐ No

If "No", go to question 7.9.

7.8.2 Are all chemical constituents below relevant bioavailability criteria?

☒ Yes ☐ No

If "Yes", go to question 7.10.

7.9 Sediment toxicity testing (refer to 4.2.4 of the NAGD)

If you answered 'No' to question 7.8.1 and/or question 7.8.2, sediment toxicity testing is required to be carried out, unless an exemption has been granted.

7.9.1 Are the sediments to be dredged highly toxic? (refer to page 42 of the NAGD)

☐ Yes ☐ No

7.9.2 Are the sediments to be dredged significantly toxic? (refer to page 42 of the NAGD)

☐ Yes ☐ No

If 'No' to both 7.9.1 and 7.9.2, go to question 7.10.

If Yes to either question, the material is most likely unsuitable for unconfined sea disposal. You should consult the department to discuss further actions, including the investigation of control measures to minimise the impact (such as treatment of the waste or confined disposal). It is important to note that if the control measures are likely to be ineffective, it is likely that the material will not be suitable for sea disposal.

7.10 Biological Assessment

7.10.1 Have any introduced marine organism surveys been undertaken at or near the dredging location.

☒ Yes ☐ No

A detailed baseline survey for introduced marine pests in the Port of Weipa was completed in 1999 by Hoedt *et al* (2001) using the methodology established by CSIRO's Centre for Research on Introduced Marine Pest Species (CRIMP).

The detailed baseline survey of the Port of Weipa has been supplemented since 2006 by inspection every three months of larval monitoring devices installed in the port and targeted surveys by DAFF of high risk areas in the port. This monitoring was instigated following the discovery of the high-risk species Asian green mussel (*Perna viridis*) on a non-trading vessel that had been in the Port of Weipa.

If "No", go to question 8.0.

7.10.2 Have any introduced marine organisms (including micro-organisms) been identified at or near the dredging location?

☒ Yes ☐ No

If "Yes", please provide details.

If "No", go to question 8.0.

No introduced marine species have been reported for the Port of Weipa since the survey of 1999. During the detailed baseline survey, no invasive species were found however two introduced species were identified (Hoedt *et al*. 2001): one recognised introduced algal species, *Caulerpa racemosa*, was identified, but was not abundant, suggesting it is not impacting native biota; and one cryptogenic species, the barnacle *Balanus amphitrite*, which has been previously identified in Australian waters was also identified (Hoedt *et al.* 2001).

No Asian green mussels (*Perna viridis*) or other non-indigenous species have been detected since targeted monitoring using larval settlement plates began in 2006 (SKM 2009).

7.10.3 Has the potential for these organisms to be transported in the dredged material been assessed?

☒ Yes ☐ No

If "Yes", please provide details.

No introduced marine organisms have been identified within the Port of Weipa in the past five years. No introduced species were observed in sediments to be dredged during field surveys using drop video camera apparatus or during sediment sampling for contaminant assessment. Their presence is highly unlikely within the sediments to be dredged and placed at the existing Albatross Bay spoil ground.

The potential for their transportation, if they were present, would be similar to that for routine maintenance dredging operations at the Port of Weipa.

7.10.4 Has the potential for these organisms to become established at the disposal site been assessed?

☐ Yes ☒ No

If "Yes", please provide details.

**8.0 Contamination Management**

8.1 Provide details of any recent contamination management audit(s) undertaken to identify the potential source(s) of contamination at or near the dredging or excavation location. Include an evaluation of the:

- types, amounts and cumulative physical impacts of contaminants generated;
- point and diffuse sources of contaminants to which material is exposed; and
- feasibility of strategies to prevent further contamination.

Sediment characterisation has not identified any contaminants in the sediments of the proposed dredge areas. Furthermore, NQBP has undertaken extensive sediment characterisation in the Port of Weipa and has not identified any contaminants (NQBP 2011), having obtained a 10 year approval for maintenance dredging. Therefore no contamination audits have been undertaken for the proposed dredging locations.

# PART F - DESCRIPTION OF DISPOSAL SITE AND PROCEDURES

## 9.0 Dredging or loading procedures

Briefly describe the dredging procedure, or for excavation, the loading procedure. In doing so you should provide details of the type of dredger or equipment to be used and the date, time period or stages over which dredging or excavation will take place.

The dredging contractor has yet to be appointed so final details are not available at this time.

Dredging is anticipated to be undertaken using either a barge-mounted backhoe/dipper dredge, with a bucket up to approximately 13m$^3$ or a Cutter Suction Dredger (CSD). Dredge spoil would either be transferred to a Split Hopper Barge (SHB) or redeposited and picked up using a Trailing Suction Hopper Dredger (TSHD) for transport to the Albatross Bay spoil ground. The method will be confirmed following engagement of the dredging contractor and included in the final DMP.

A typical sequence of operation is as follows:

- The dredge and attendant plant are moved to the work site.
- Either:
    - A SHB is brought alongside the dredger and the dredged material is pumped (CSD) or tipped (backhoe) into the barge; or,
    - The CSD discharges the material on the seabed for a short duration before it is dredged by a TSHD.
- Once the SHB or TSHD has filled its hopper the sediments will be transported to the Albatross Bay spoil ground.
- Upon entering the designated area for dumping, the dredge would typically slow whilst material is being placed, however, a minimum steaming speed is required to maximise agitation within the hopper and clear dredged material, which would not otherwise be effected if the dredge were to remain stationary. Spoil would be discharged below keel level to minimise turbidity generation.

Dredging is likely to take only one to two weeks at the Humbug terminal, two to four weeks at the Hey River terminal and three to five weeks at the Hornibrook terminal, and involve only minor dredge volumes. This dredging period does not allow for any delays such as for breakdowns or maintenance or adverse weather, which would extend the duration of dredging but also interrupt suspended sediment plume generation. Refer to Section 3.8.2 of the Commonwealth EIS (RTA 2013) for further details.

## 10.0 Description of Proposed Disposal Site

10.1 Location of site

Attach a suitably scaled map of the proposed disposal site, including WGS84 co-ordinates and showing bathymetric contours, the boundaries of the disposal site and distance from land.

The material is proposed to be disposed of in the existing Port of Weipa spoil ground in Albatross Bay (refer to Figure 4). The disposal ground is located approximately 5km northwest of the seaward end of the South Channel.

The Albatross Bay spoil ground is defined by a 2000 m radius, centred on the following WGS84 coordinates: S12° 39’ 34.7’’ E141° 39’ 24.1”.

**Figure 4: Location of Port of Weipa spoil ground in Albatross Bay**

Has approval previously been granted for disposal at this site?

☒ Yes ☐ No

If "Yes", provide sea disposal permit number(s).

The last permit issued for dredge spoil disposal at this site was Permit No. SD2008/0722.

It was issued to the Ports Corporation of Queensland (now known as North Queensland Bulk Ports), by a delegate of the Minister for the Environment, Heritage, and the Arts on 21 April 2008.

10.2 Position fixing

Describe method to be used in positioning the disposal vessel.

Position would be determined using on-board GPS with an accuracy of at least 10m.

10.3 Is the disposal site located within the boundaries of or in the vicinity of a Marine Protected Area?

For the purpose of this application form, 'Marine Protected Area' refers to waters declared to be marine parks, aquatic reserves or any other type of zoning or planning for the purpose of management, protection and development of marine resources or areas including wildlife and their habitats and for scientific, educational, or recreational purposes. Typically, Marine Protected Areas are declared under legislation enacted by the Commonwealth (e.g. the *Environment Protection and Biodiversity Conservation Act 1999; Great Barrier Reef Marine Park Act 1975),* or a State or Territory Government.

☐ Yes ☒ No

If "Yes", provide details.

10.4 Describe any sensitive areas in the vicinity of the proposed disposal site. Sensitive areas include, but are not limited to, seabed communities within which algae (e.g. macroalgae, turf and benthic microalgae), seagrass, mangroves, corals or mixtures of these groups are prominent components.

Seagrass meadows are located in the mouth of the Embley and Mission Rivers, approximately 17km east of the Albatross Bay spoil ground. Modelling by GHD (2005) for NQBP reports that the sediment plumes from the Albatross Bay spoil ground have a net southerly movement with no movement east-north-east.

10.5 Provide information on the physical and any other relevant characteristics of the disposal site. Include the:

- water depth;
- sea-bed topography;
- sediment characteristics;
- biological characteristics;
- information as to whether the site is expected to be dispersive or retentive; and
- other relevant information.

### Water Depth, Sea Bed Topography and Benthic Habitats

The Albatross Bay spoil ground is approximately 7-11m LAT in depth, and increases in depth moving from east to west. It is unvegetated and generally comprised of silts and sands.

### Tidal Currents and Plume Modelling

Plume modelling in Albatross Bay immediately following disposal of dredge material identified that the highest turbidity recording was 1m below the surface immediately following disposal and that this elevated turbidity level fell to less than a tenth within an hour of disposal. It was also suggested that while a small fraction of dredge spoil may settle slowly over a wide area, the vast majority would be deposited within the spoil ground (GHD, 2005).

Modelling by GHD (2005) identified that during the dry season current direction and magnitude in Albatross Bay is tidally driven, with residual currents showing a stationary or northward trend. During the dry season minimal sediment re-suspension occurs. In comparison, during the wet season storm events a substantial amount of sediment is remobilised and transported in a southerly direction.

### Water Quality

Salinity and pH within the Albatross Bay spoil ground is consistent throughout the water column and over the extent of the spoil ground with salinity averaging approximately 35 and pH averaging 8.25.

Temperature throughout the spoil ground is consistent being just over 28°C. There is a trend in temperature decreasing throughout the water column; however the change in temperature from the surface to the bottom is less than 0.5°C.

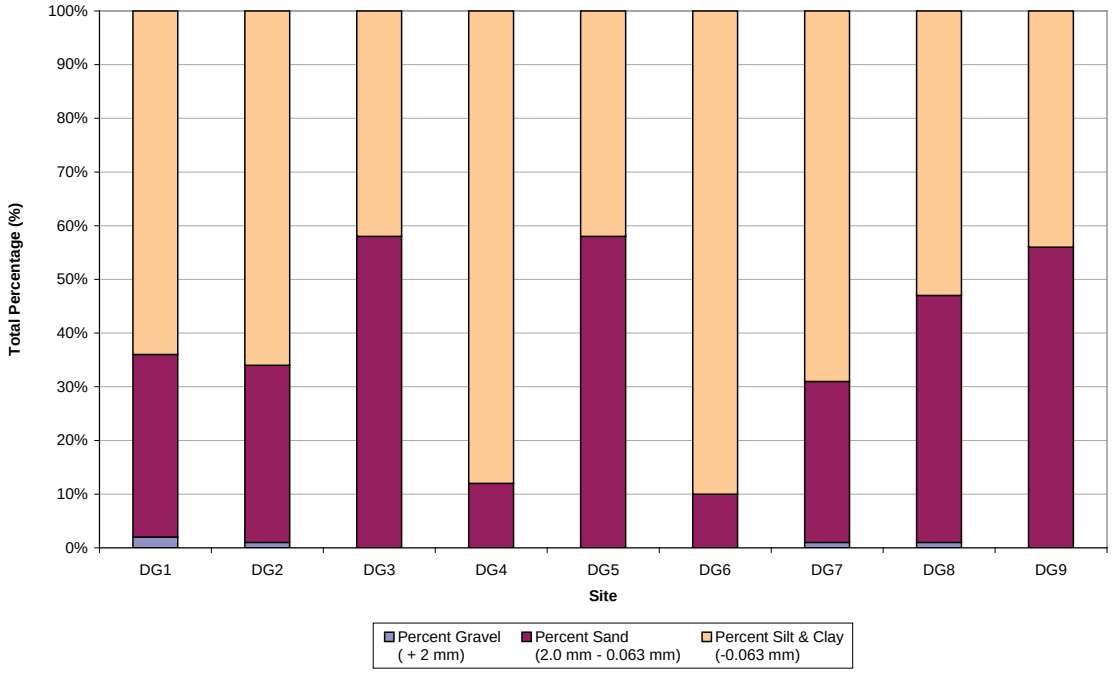
GHD (2005) reported that the ambient turbidity within the disposal ground ranged between 5 – 12 NTU in the dry season and 10 – 15 NTU in the wet season. Elevated turbidity during weather events in both seasons is around 40 NTU.

## Sediment Quality

### *Physical Characteristics*

Nine sediment samples were collected within the Albatross Bay spoil ground using a Van-Veen sediment grab and were analysed for particle size distribution (Worley Parsons 2012). A graphical summary of the PSD results is presented in Figure 5. Surface sediments are dominated by silt-clay (62%) and sand fractions (37%). Gravel comprises only about 1% of sediments.

**Figure 5: Particle size distribution results for the Albatross Bay spoil ground**




### *Chemical Characteristics*

Monitoring of contaminant levels in sediments within the Albatross Bay spoil ground has not been undertaken previously. However, it is an active spoil ground and would receive only sediments that have been identified as suitable for sea dumping. Sediment characterisation of sediments from the Albatross Bay spoil ground was not completed as part of the studies for the Project because:

- the volumes to be placed there are small in comparison to other annual loads being deposited from routine maintenance dredging at the Port of Weipa, approximately 10%; and,
- the physical and chemical characteristics may change due to further routine Port of Weipa maintenance dredging prior to the dredging at the barge/ferry terminal locations in the Embley and Hey Rivers.

### Reefs or other sensitive environmental receptors

There are no reefs or other sensitive environmental receptors near the Albatross Bay spoil ground. No seagrass has been recorded within this approved spoil ground. Seagrass beds are typically present in the more sheltered areas of Albatross Bay, including the lower reaches of the Embley and Mission rivers and Pine River Bay, approximately 17km east and north-east, and are largely restricted to shallow sand and mud banks of less than 4m below mean sea level. The closest mapped seagrass beds to the Albatross Bay spoil ground are located at Duifken Point, over 10km to the north (McKenna and Rasheed, 2010).

### Benthic Infauna

Long and Poiner (1994) examined the macrobenthic infaunal assemblage in sub-tidal areas of the Gulf of Carpentaria. Species assemblages consisted primarily of overlapping species distributions rather than highly structured, discrete communities with well-defined groups that are characteristic of the community. Polychaete worms were identified as the numerically dominant group of animals, followed by crustaceans and bivalve molluscs. The benthic infauna assemblage has been impacted for many years by prawn trawl operations.

The structure of macrobenthic assemblages were surveyed for the Project at six locations at the existing disposal ground in Albatross Bay using a benthic grab to collect four replicate samples and sieving them using a 1mm mesh sieve. The results identified that the Albatross Bay spoil ground has an exceptionally high abundance of the small bivalve *Gouldia* sp., which made up approximately 90% of the total abundance. The high abundance of *Gouldia* sp. at the Albatross Bay spoil ground is most likely a direct response of the species rapidly colonising the area after dredge spoil deposition. Although available information is limited, a similar response by populations of this genus was recorded in the United States in response to dredge disturbance and spoil deposition (Iversen and Beardsley 1974).

The majority of taxa surveyed at the site were previously recorded by Long and Poiner (1994).

### Fish and Other Fauna

A number of other marine species occur in the area and broadly include species from sea snakes, bony fish and nektobenthic marine invertebrates groups (RTA 2013).

With respect to sea snakes, a total of 16 species have been recorded in the Weipa region. These include *Acalyptophis peronei, Aipysurus duboisii, Aipysurus laevis, Aipysurus eydouxii, Astrotia stokesii, Disteira kingie, Disteira major, Enhydrina schistose, Hydrelaps darwiniensis, Hydrophis coggeri, Hydrophis elegans, Hydrophis inornatus, Hydrophis ornatus, Hydrophis pacificus, Lapemis curtus, Lapemis hardwickii* and *Acrochordu granulatus*. Species from the sea snake group are not likely to be impacted by spoil disposal activities as sea snakes typically occur in shallow waters. Refer Section 12.2.3.1 of the Commonwealth EIS (RTA 2013) for more information.

Albatross Bay supports diverse fish assemblages with 344 fish species being recorded. Although not well studied, the reef habitats in Albatross Bay support a diverse assemblage of demersal and pelagic species. Three species of sygnathids (pipefish and seahorses) that are listed marine species under the EPBC Act (section 248) *Hippichthys heptagonus* (Big Belly Seahorse), *Hippocampus kuda* (Spotted Seahorse) and *Hippocampus whitei* (White's Seahorse) are confirmed to occur in Albatross Bay. As the distribution and abundance of sygnathids are poorly known, it is highly likely that other species of sygnathids also occur in Albatross Bay.

Albatross Bay is also known to be an important nursery area for the juvenile tiger and banana prawns that are the principal target species in the Northern Prawn Fishery area. Banana prawns migrate from estuarine areas into the Gulf of Carpentaria for spawning from September to November and March to May. At low tide, juvenile and sub-adult prawns are most abundant in small tidal creeks and gutters that drain from mangrove forests.

The Brown Tiger Prawn (*Penaeus esculentus*) and the Grooved Tiger Prawn (*Penaeus semisulcatus*) are abundant in the Gulf of Carpentaria. Brown Tiger Prawns spawn throughout the year, with peak spawning occurring from August to September.

Grooved Tiger Prawn spawning peaks between August and October, with a minor peak in the months of January and February. Juvenile tiger prawns are generally associated with vegetated habitats (particularly large seagrass beds) in the vicinity of estuaries. Other prawn species that occur in abundance in Albatross Bay are Endeavour Prawns (*Metapenaeus endeavouri* and *Metapenaeus ensis*) and Eastern King Prawns (*Penaeus plebejus*).

The cephalopod (squid and cuttlefish) assemblage in the Gulf of Carpentaria is diverse and abundant, with at least 21 species. The numerically dominant species of squid and cuttlefish recorded are *Photololgo chinensis* and *Photololgo edulls*, and *Sepia elliptica* and *Sepia pharaonis* respectively. There are no specific studies that have examined the squid and cuttlefish assemblage at the sites of the proposed marine infrastructure. Mud crabs are common in the creeks and rivers of Albatross Bay.

An assessment of potential impacts concluded the impact on fish and other fauna to be negligible (RTA 2013).

**Marine turtles and marine mammals**

The area does not represent preferred habitat for marine turtles and marine mammals but they may transit the disposal site but would be expected to generally avoid impacted areas for the duration of dredging activities (approximately eleven weeks in total). Management measures would be implemented through the approved DMP in order to reduce the possibility of capture or injury to marine turtles and marine mammals.

10.6 Describe the history of the disposal site if previously used for sea disposal of dredged, excavated and/or other waste material. If the site is retentive and has been used previously for sea disposal, provide an estimate of the remaining capacity at the disposal site.

The current approved Albatross Bay spoil ground was commissioned in 1998. Since that time it has received capital and maintenance dredge material from operations within the Port of Weipa. Quantities of material dredged and placed at the Albatross Bay spoil ground between 2002 and 2008 are shown in Table 4 (NQBP 2011).

**Table 4: History of Disposal at the Albatross Bay spoil ground (2002-2008)**

| Year of Dredging | Type of Dredging | Volume of In-situ Material ($m^3$) |
|---|---|---|
| 2002 | Maintenance | 976,585 |
| 2003 | Maintenance | 463,513 |
| 2004 | Maintenance | 621,650 |
| 2005 | Maintenance | 803,098 |
| 2006 | Capital and Maintenance | 2,976,868 |
| 2007 | Maintenance | 796,848 |
| 2008 | Maintenance | 779,599 |

Given the current NQBP dredging programs, NQBP will require a new disposal site within 13 to 18 years (NQBP 2011.)

## 11.0 Disposal Procedures

11.1 Describe the anticipated period and frequency of sea disposal operations and the quantities of dredged and/or excavated material involved for each.

Approximately 110,580$m^3$ of capital dredge material would be placed at the Albatross Bay spoil ground during a single campaign. Dredging is likely to take only one to two weeks at the Humbug terminal, two to four weeks at the Hey River terminal and three to five weeks at the Hornibrook terminal, and involve only minor dredge volumes. These dredging periods do not allow for any delays such as for breakdowns or maintenance, which would extend the duration of dredging but also interrupt suspended sediment plume generation.

A return trip to the dredge area is expected to take approximately 3-4 hours.

Any future requirements for maintenance dredging would be undertaken via a separate Sea Dumping Permit.

| Period of Proposed Sea Disposal | Number of Runs | Average quantity of dredged material to be disposed of per Run | Quantity of excavated material to be disposed o per Run |
|---|---|---|---|
| Up to 11 weeks | Approx 80 (SHB) | Approx 1500$m^3$ SHB | Approx 1500$m^3$ (SHB) |

Note: For the purpose of question 11.1, 'number of runs' means the total number of vessel movements from the loading point to the disposal site.

11.2 Describe the route from loading to the disposal site.

The route from loading to the Albatross Bay spoil ground is a direct line north-west from the end of the South Channel. There are no obstacles or hazards along this route.

11.3 Provide details of how the material will be disposed of at sea, in doing so you must provide information on the rate and duration of the disposal, the proposed method of disposal, the intended heading and speed of the vessel.

Material would be disposed of at the Albatross Bay spoil ground via a SHB or TSHD. The barge would typically dump the material in an arc within the spoil ground as it turned to return to the dredging site. Placement of spoil material at the spoil ground would be completed so as to achieve a relatively uniform cover. Disposal would be undertaken at a speed of approximately three to eight knots, typical for such a disposal operation. The duration of each dumping event within the Albatross Bay spoil ground would be approximately 15-25 minutes with a return trip from the dredge area being approximately 3-4 hours.

To minimise potential turbid plume impacts at the Albatross Bay spoil ground, the following practical measures to reduce loss of bulk material into the marine environment during dredging operations will be considered:

- hopper door seals must be in good condition;
- taking loaded hopper barges or hopper dredge to the spoil disposal area and discharging material as soon as possible to minimise clays settling and adhering to the hopper lining. Removing the settled clays within a hopper barges lining generally requires sailing the barge with higher speed across the spoil grounds when disposing, causing unwarranted turbidity; and,
- developing a spoil dumping plan to manage the even distribution of material over the spoil grounds.

# PART G - IMPACT HYPOTHESIS

## 12.0 Projected Impact of Disposal

12.1 Describe the projected physical, chemical and biological impacts on the disposal site and surrounding areas (see Section 4.3 of the NAGD).

- Predict the turbidity levels and dispersal of disposed material in the water column;
- Delineate the area of sea bed that will be substantially impacted (the zone of impact) and the movement of disposed dredged material;
- Assess physical impacts such as smothering of biota, change in substrate, light attenuation for sea grasses;
- Assess the severity of impacts on marine life, including possible translocation of species, increased predation and loss of available habitat. Also consider the existence and cumulative impacts of other disposal at the site or other nearby disposal sites;
- Assess changes in the concentration of nutrients, oxygen depletion, and any increased bio-availability of contaminants; and
- Assess possible effects on other users of the area.

The material to be dredged from the barge/ferry terminals has physical characteristics similar to Weipa shipping channel (South Channel) sediments. GHD (2005) has previously carried out an impact assessment study in relation to capital dredging of the shipping channel and placement of the material at the Albatross Bay spoil ground. The study examined impacts from a capital dredging campaign involving a much larger volume (greater than 3,000,000$m^3$) of maintenance and capital material. It concluded that the impacts to sensitive areas, such as seagrass meadows to the east-north-east, from migration of material would be negligible because the material is predicted to migrate south towards the South Channel. Modelling of turbidity plumes identified that turbidity generated at the Albatross Bay spoil ground following release would travel a maximum of 3km within 11 hours of placement and that this would not extend to sensitive areas.

The combined volume to be dredged from the Embley and Hey River under this application would only be 2% of the earlier capital dredging campaign in the South Channel and less than one-tenth the average Port of Weipa maintenance dredging volumes. In addition, the material to be placed at the Albatross Bay spoil ground would likely migrate towards the existing shipping channel and plumes would not extend to sensitive habitats. Based on these factors it is concluded that the potential for impact on sensitive habitats is negligible. Refer to Section 7.3.5.1 of the Commonwealth EIS (RTA 2013) for more information.

Results of the SAP showed that there would be no impact on water quality resulting from release of potential contaminants in dredge material from the proposed river facilities (Worley Parsons, 2012). The sediments are not organic rich (approximately 1% total organic carbon (TOC)) and given there are no anthropogenic sources of nutrients at the proposed dredge sites it is expected that nutrient levels would be at natural background levels.

NQBP (2009) have assessed that although the abundance of benthic fauna at the Albatross Bay spoil ground would temporarily decrease post dredging, the area affected by material relocation is a relatively small area in the context of the total area of habitat available within Albatross Bay and the spoil ground is already used annually for disposal of maintenance dredged material, since 1998. The nature of the benthic habitat at the Albatross Bay spoil ground will change during and after dredging. Previous sampling has indicated that the spoil ground's ability to support a benthic fauna community will not alter although the community composition may initially not be the same.

The Albatross Bay spoil ground has been in use since 1998 with no known adverse effects on trawling and/or fishing activities in Albatross Bay.

12.2 Describe and provide details of any intended investigations or studies of the possible impacts on the environment of the proposed action.

No investigations are proposed due to the short duration of the capital dredging campaign and small volume of dredge material to be disposed at the Albatross Bay spoil ground and resultant negligible impacts. An assessment of the potential impacts associated with dredging and spoil disposal for the River facilities can be found in Section 7 of the Commonwealth Environmental Impact Statement (RTA 2013) and Section 6 of the Queensland EIS (RTA 2011).

# PART H - MONITORING

## 13.0 Proposed Monitoring Program

It is essential that monitoring programs have clearly defined and stated objectives.

13.1 Within the predicted zone of impact, describe your proposed monitoring program to determine the actual extent of change. In doing so you must address the specific effect(s) on the benthic community. You must also include boundary measurements that demonstrate the reliability of your impact hypothesis with respect to the impact on the zone of impact.

Your proposed monitoring program(s) should detail both your compliance and effects monitoring programs.

13.2 Outside the predicted zone of impact, describe any proposed monitoring program to determine whether:

- the actual zone of impact is as predicted; and
- the projected extent of change is within the scale projected.

Due to the short nature of the dredge campaigns and relatively small dredge volume (compared with previous capital dredging projects and annual maintenance dredging at the Port of Weipa) it is anticipated that there will be no impacts to the existing Albatross Bay spoil ground beyond those that already exist, which is the smothering of benthic infauna within the spoil disposal site.

Marine fauna observers would monitor the dredging operations and to facilitate the implementation of the following Queensland Government Coordinator-General's conditions:

- Mobile dredging operations:
    - must not commence if Dugongs, marine turtles, or cetaceans are observed within 300 metres of the dredge.
    - where underway, must alter course if Dugongs, marine turtles, or cetaceans are likely to be struck or captured.
- Stationary dredging operations:
    - must not commence if Dugongs, marine turtles, or cetaceans are observed within 300 metres of the dredge.
    - must cease if Dugongs, marine turtles or cetaceans are observed within 50 metres of the dredge head.

Marine turtle monitoring would also be carried out as follows:

- Daily monitoring for impacted marine turtles would be undertaken at the dredge and at the shoreline down-current from the dredging operation.
- If monitoring indicates that more than two marine turtles are killed within a 24 hour period as a result of dredging, the dredge will relocate from the area until an

incident investigation has been carried out and relevant preventative actions implemented.

- NQBP currently monitor Photosynthetically Available Radiation (PAR) within the Embley and Hey River Estuaries as part of their ongoing seagrass monitoring programme. RTA would utilise the PAR data to monitor the impact of dredging and has entered a data sharing agreement with NQBP to obtain relevant data.

The current water quality monitoring program implemented by NQBP within the Embley and Hey River Estuaries would be utilised to monitor water quality in the vicinity of capital dredging activities in the Hey and Embley Rivers. The NQBP program utilises Photosynthetically Active Radiation (PAR) in monitoring impacts on seagrass meadows.

The NQBP seagrass monitoring program includes continuous temperature and PAR monitoring, every 15 mins, at three sites within seagrass meadows in the Embley and Hey Rivers. There are no trigger values or control sites as such as there is long term seagrass monitoring data (annual since 2000) which allows a before and after approach using seagrass species composition, areas and biomass.

Monitoring results will contiune to be maintained by NQBP and provided to RTA under a data sharing agreement.

# PART I – MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

**14.0 Referring Actions under the EPBC Act**

14.1 Has the proposed action been referred to the Commonwealth Environment Minister under the EPBC Act?

☒ Yes ☐ No

If 'Yes, please provide the EPBC identification number.

The ferry and barge terminals form part of the broader South of the Embley bauxite mine extension and port Project (EPBC 2010/5642).

14.2 Has a decision on this proposed action been reached?

☐ Yes ☒ No

If 'Yes, please provide details of the decision.

Rio Tinto Aluminium (RTA) referred the South of the Embley bauxite mine extension and Port Project to the then Minister for Sustainability, Environment, Water, Population and Communities (DSEWPaC) for a decision as to whether the Project constituted a controlled action under the provisions of the EPBC Act. On 2 October 2008, the Project was declared a "controlled action" (Referral No. 2008/4435).

Following changes to the proposed Port design to accommodate larger bulk carriers, and at the advice of DSEWPaC assessment officers, RTA withdrew Referral No. 2008/4435.

On 13 September 2010, RTA submitted the revised Project design to the Minister for a decision as to whether the Project constituted a controlled action (Referral No. 2010/5642).

On 29 October 2010, a delegate of the Minister determined that the proposal was a controlled action under Chapter 4 of the EPBC Act and that the proposed action be assessed by Environmental Impact Statement (EIS) in accordance with Tailored EIS Guidelines issued by the Minister's office.

On 23 February 2011, RTA notified the Minister of a change of person proposing to undertake the SoE Project, transferring the Project to RTAW.

RTAW published and made available for public consultation a draft EIS from 1 August 2011 to 12 September 2011.

In November 2011, the Minister received a request to reconsider the referral decision on the basis of new information presented in the draft EIS related to shipping activities through the Great Barrier Reef.

On 15 March 2012, the Environment Minister revoked the referral decision of 29 October 2010 and substituted it with a new one. Under this decision the Project is a controlled action under the EPBC Act for the following controlling provisions:

- World Heritage properties;
- National Heritage places;
- Listed threatened species and ecological communities;
- Listed migratory species;
- Commonwealth marine areas; and
- Great Barrier Reef Marine Park.

On 11 May 2012, the delegate to the Environment Minister approved RTAW's variation request to incorporate shipping activities associated with the Project as part of the action to be assessed under the provisions of the EPBC Act.

Following the new controlled action decision for the project, new EIS Guidelines were issued by the Minister in July 2012. RTAW submitted a draft Commonwealth EIS to DSEWPaC in November 2012 (RTA 2012b) which was placed on public exhibition between 22 November and 19 December 2012. The EIS has subsequently been finalised, taking account of and summarising comments received within the submission period, and stating how such comments are addressed in this "final EIS" (RTA 2013).

14.3 Will the dredging, excavation, disposal or a related activity significantly impact upon:

☐ a declared World Heritage property
☐ a declared Ramsar wetland
☐ a Commonwealth marine area
☐ Great Barrier Reef Marine Park
☐ a listed threatened species
☐ a listed threatened ecological community
☐ a listed migratory species
☐ a national heritage place

The assessment presented in the Commonwealth Environmental Impact Statement (RTA 2013) concludes that there would be no significant impacts on any matters of National Environmental Significance.

# PART J - CONSULTATION

## 15.0 Consultation with advisory bodies

Applicants should consult with relevant stakeholders prior to submitting an application. Section 3.6 of the NAGD outlines the guidelines for stakeholder consultation.

15.1 List the organisation or parties that you have consulted with on your proposed sea disposal activity.

Community and stakeholder consultation has been and will continue to be undertaken for the whole of the South of the Embley Project including consultation for the terminal developments, dredging and placement of dredge spoil at sea (RTA 2013).

To date the consultation has involved the following stakeholder groups:

- Government Agencies and Service Providers;
- Local Government;
- Community Groups and Organisations;
- Traditional Owners and Other Aboriginal Groups;
- Recreational and Professional Fishing Groups;
- Industry, Local Businesses and Service Providers;
- General Public and Residents of Local Communities; and,
- Regional Landholders.

The extensive consultation already undertaken with relevant stakeholders is documented in the project's Commonwealth EIS (RTA 2013).

15.2 Attach any record of consultation and any responses received.

Information about the proposed dredging activities for the Project were included in the Queensland Environmental Impact Statement (EIS) (RTA 2011), which was prepared to meet the assessment requirements for the Project under the *State Development and Public Works Organisation Act 1971* (Qld). Submissions in response to the Queensland EIS were received in relation to dredging, and these were documented in Appendix A of the Supplementary Report to the Queensland EIS (RTA 2012a). Appendix A of the Supplementary Report also provides a response to the issues raised.

Responses to the EIS, relating to dredging, were received from the following submitters:

- Department of Transport and Main Roads – Rail, Ports, and Freight;
- Western Cape York Turtle conservation Project;
- Western Cape Chamber of Commerce;
- Two separate Private submitters;
- Queensland Seafood Industry Association;
- Department of State Development and Infrastructure Planning (formerly DEEDI); and
- Department of Environment and Heritage Protection (formerly DERM).

Information about the proposed dredging activities for the Project were also included in the Draft Commonwealth EIS (RTA 2012b), which was place on public exhibition between 22 November and 19 December 2012 and prepared to meet the assessment requirements for the Project under the EPBC Act and the Sea Dumping Act. Submissions in response to the Draft Commonwealth EIS were received in relation to dredging, and these are documented in Appendix 2D of the Final EIS (RTA 2013). Appendix 2D of the Final EIS (RTA 2013) also provides a response to the issues raised.

Responses to the Draft Commonwealth EIS (RTA 2012b), relating to dredging, were received from the following submitters:

- Weipa Town Authority;
- Gulf of Carpentaria Commercial Fishermen; and,
- The Wilderness Society (noise only).

## PART K – DECLARATION

I declare that to the best of my knowledge the information I have given on, or attached to, this form is complete, current and correct. I understand that giving false or misleading information is a serious offence.

**Signed:**

**Name:**

**Date:**

## References

ANZECC/ARMCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. National Water Quality Strategy. Australian and New Zealand Environment Conservation Council and Agricultural Resource Management Council of Australia and New Zealand, Canberra.

Commonwealth of Australia (2009). National Assessment Guidelines for Dredging. Commonwealth of Australia, Canberra, 2009.

GHD (2005). Port of Weipa Capital Dredging: Draft Environmental Impact Statement. Report prepared by GHD for Ports Corporation Queensland. March 2005.

McKenna, S.A. and Rasheed, M.A.. (2010) Port of Weipa Long Term Seagrass Monitoring September 2009. DEEDI Publication. Fisheries Queensland, Cairns, 25pp.

NQBP (2009) Port of Weipa Environmental Management Plan.

NQBP (2011) Port of Weipa – Long Term Environmental Management Plan (LTDMP) Maintenance Dredging.

RTA (2011). Environmental Impact Statement for South of Embley Project. Rio Tinto Alcan.

RTA (2012a). South of Embley Project Supplementary Environmental Impact Statement.

RTA (2012b). South of Embley Project draft Commonwealth Environmental Impact Statement.

RTA (2013). South of Embley Project Commonwealth Environmental Impact Statement.

Worley Parsons (2012). Sediment Characterisation Report – South of Embley Project Barge/Ferry Terminals. Report for Rio Tinto Alcan.

## Attachment 1: Exemption notices

**Australian Government**

**Department of Sustainability, Environment, Water, Population and Communities**

Mr Laurie Hicks
Project Director
South of the Embley Project
Rio Tinto - Technology and Innovation
443 Queen Street
Brisbane QLD 4000

Dear Mr Hicks

**Exemption request from further sediment sampling for the South of the Embley Project**

The department has reviewed your request for an exemption from further sediment sampling dated 31 October 2011 for the change in the alignment of the proposed new port, the change in the area and volume of the Humbug terminal, the change in the area and volume of the Hey River terminal.

An exemption from further sediment sampling for the above locations as outlined in your letter of 31 October 2011 has been granted by the Department.

Please note that this exemption does not affect obligations to comply with any other laws of the Commonwealth, state or territory that are applicable to the action. If you require any further information please contact, Ms Eszter Szabo on 02 6274 2171 or eszter.szabo@environment.gov.au.

Yours sincerely

Michael Ward
Director
Ports and Marine Section
20 January 2012

GPO Box 787 Canberra ACT 2601 Phone (02) 6274 1111 Fax (02) 6274 1666 Internet: www.environment.gov.au

**Australian Government**
**Department of Sustainability, Environment, Water, Population and Communities**

Mr Laurie Hicks
Project Director
South of the Embley Project
Rio Tinto - Technology and Innovation
443 Queen Street
Brisbane QLD 4000

Dear Mr Hicks

**Exemption request from further sediment sampling for the South of the Embley Project**

The department has reviewed your request for an exemption from further sediment sampling dated 27 June 2012, for the change in footprints for the Hornibrook Ferry and Tug terminal and the Humbug terminal. An exemption from further sediment sampling for the above locations as outlined in your letter of 27 June 2012 has been granted by the department.

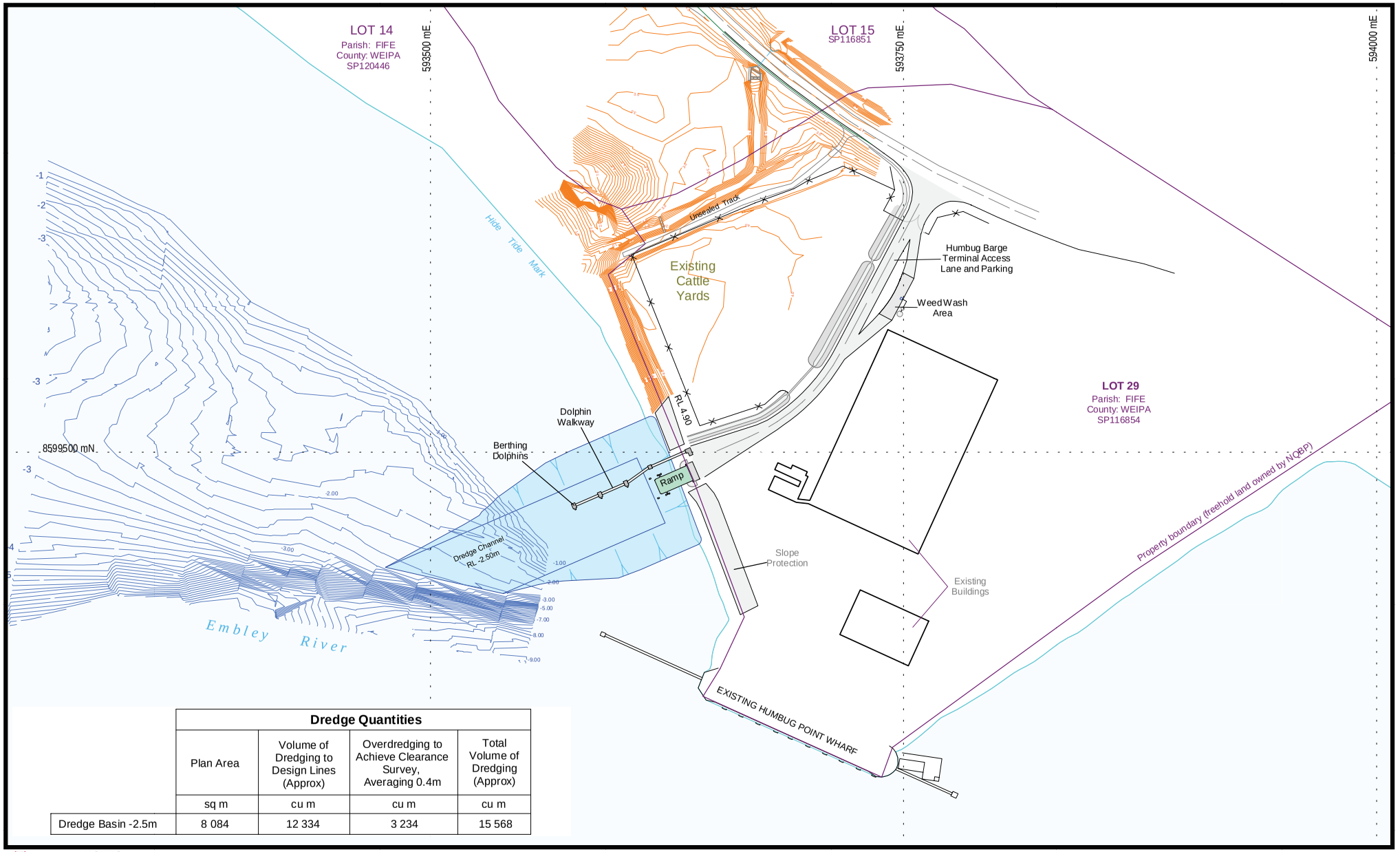
Please be aware that under the *National Assessment Guidelines for Dredging 2009* existing chemical and toxicity data for sediment has a maximum currency of five years, as long as contamination status has not changed in that time. I note that sampling for the Hornibrook, Hey River and Humbug terminals was undertaken in October and November 2008 and July 2009.

In addition, this exemption does not affect obligations to comply with any other laws of the Commonwealth, state or territory that are applicable to the action. If you require any further information please contact, Ms Eszter Szabo on 02 6274 2171 or eszter.szabo@environment.gov.au.

Yours sincerely

Karina McLachlan
A/g Director
Ports and Marine Section
20 July 2012

**Attachment 2: Plans**




| Dredge Quantities | | | | |
|---|---|---|---|---|
| | Plan Area | Volume of Dredging to Design Lines (Approx) | Overdredging to Achieve Clearance Survey, Averaging 0.4m | Total Volume of Dredging (Approx) |
| | sq m | cu m | cu m | cu m |
| Dredge Basin -2.5m | 8 084 | 12 334 | 3 234 | 15 568 |

**NOTES**

1. VERTICAL DATUM:
   Depths are in metres and are reduced to Chart Datum (CD).
   Which is approximately the level of lowest Astronomical Tide (LAT).
   CD (LAT) is 1.752m below AHD.

2. HORIZONTAL DATUM:
   Coordinates are to MGA/GDA94 Zone 54

Dredged area

Reclaimed area

N

0 50m

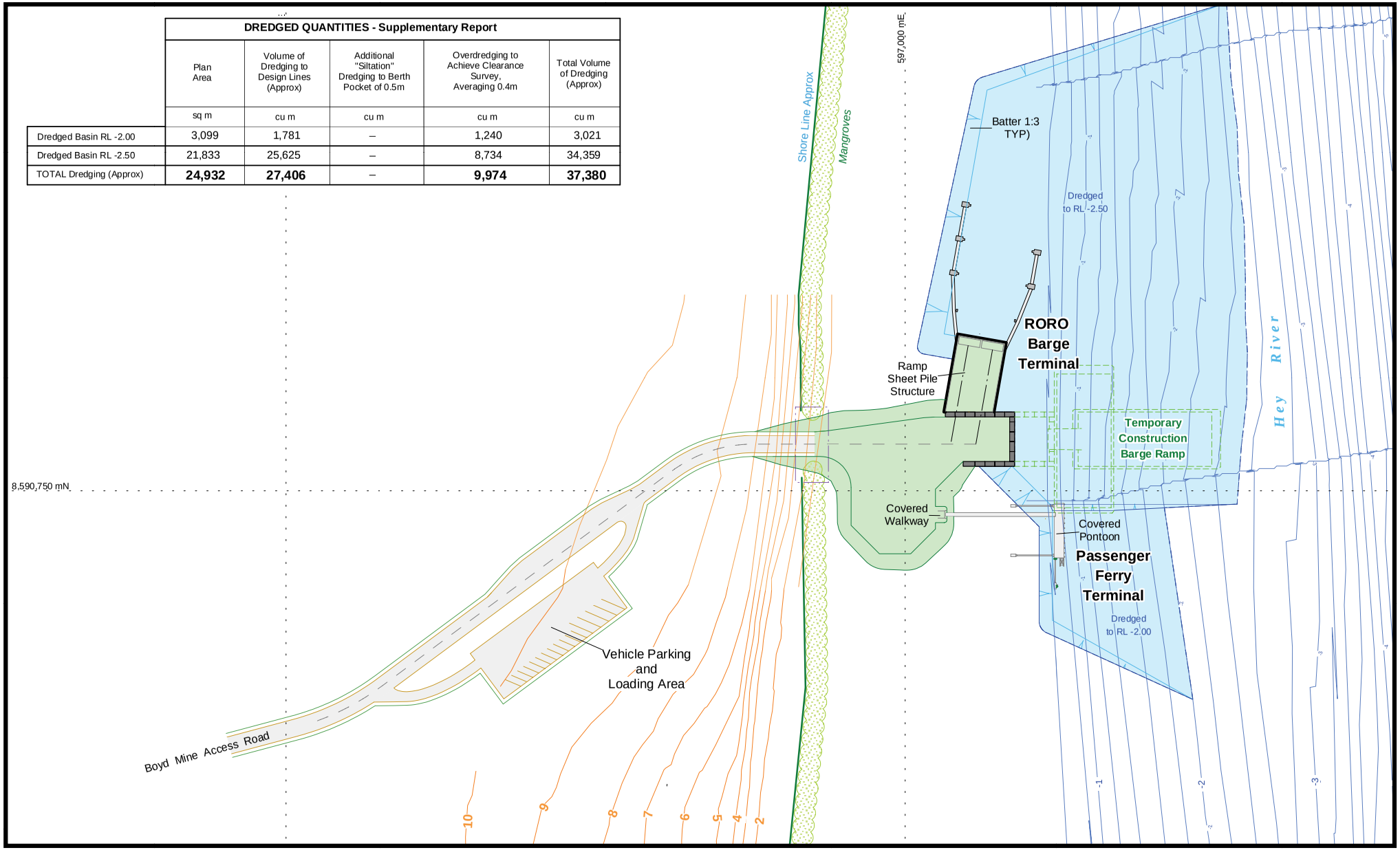
**South of Embley Project**

# Humbug Barge Terminal

Datum/Projection: GDA94/MGA Zone 54 Date: 17/09/2012

**DREDGED QUANTITIES - Supplementary Report**

| | Plan Area | Volume of Dredging to Design Lines (Approx) | Additional "Siltation" Dredging to Berth Pocket of 0.5m | Overdredging to Achieve Clearance Survey, Averaging 0.4m | Total Volume of Dredging (Approx) |
|---|---|---|---|---|---|
| | sq m | cu m | cu m | cu m | cu m |
| Dredged Basin RL -2.00 | 3,099 | 1,781 | – | 1,240 | 3,021 |
| Dredged Basin RL -2.50 | 21,833 | 25,625 | – | 8,734 | 34,359 |
| TOTAL Dredging (Approx) | **24,932** | **27,406** | – | **9,974** | **37,380** |




**NOTES:**

Vertical Datum:
Depths are in metres and are reduced to chart datum (CD) which is approximately the level of lowest astronomical tide (LAT).
CD (LAT) is 1.752m below AHD.

Reclaimed area

Dredged area

Data Source: SKM Drawing S0-1630-00001.dxf

N

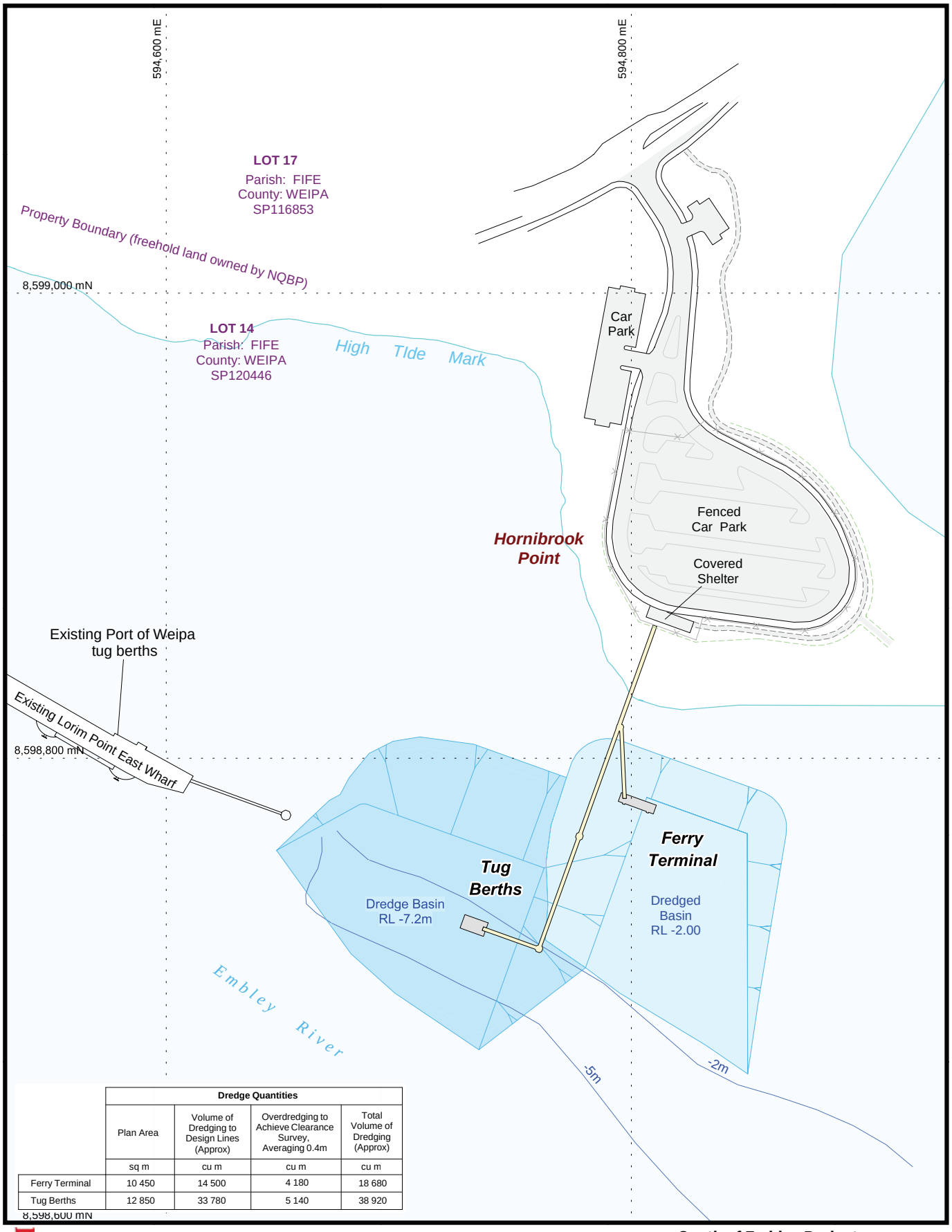
0 50m

RioTintoAlcan

**South of Embley Project**

# Hey River Barge / Ferry Terminal

Datum/Projection: GDA94/MGA Zone 54 Date: 17/09/2012




| | Dredge Quantities | | | |
|---|---|---|---|---|
| | Plan Area | Volume of Dredging to Design Lines (Approx) | Overdredging to Achieve Clearance Survey, Averaging 0.4m | Total Volume of Dredging (Approx) |
| | sq m | cu m | cu m | cu m |
| Ferry Terminal | 10 450 | 14 500 | 4 180 | 18 680 |
| Tug Berths | 12 850 | 33 780 | 5 140 | 38 920 |

Dredged area - Ferry Terminal

Dredged area - Tug Berths

NOTES

1. VERTICAL DATUM:
   Depths are in metres and are reduced to Chart Datum (CD) which is approximately the level of Lowest Astronomical Tide (LAT). CD (LAT) is 1.752m below AHD.
2. HORIZONTAL DATUM:
   Coordinates are to MGA/GDA94 Zone 54

Rio Tinto Alcan

**South of Embley Project**

# Hornibrook Ferry Terminal

N

0 50m

Datum/Projection: GDA94/MGA Zone 54 Date: 17/09/2012