



South of Embley Project

**DREDGE MANAGEMENT PLAN – PORT
(INITIAL CAPITAL DREDGING)**

November 2015

DOCUMENT CONTROL

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ACRONYMS

Term	Definition
AAS	Advanced Analytical Services
AFS	International Convention on the Control of Harmful Anti-fouling Systems on Ships 2001
AIS	Automatic Identification System
ALS	Australian Laboratory Services
AMSA	Australian Maritime Safety Authority
AQIS	Australian Quarantine Inspection Service
BPDTAG	Boyd Port Dredging Technical Advisory Group
BHD	Backhoe Dredge
CCIMPE	National Consultative Committee on Introduced Marine Pest Emergencies
CHEMP	Communities, Heritage and Environmental Management Plan
CMSMP	Construction Marine and Shipping Management Plan
CSD	Cutter Suction Dredge
CPCe	Coral point count
DAE	dilute acid extraction
DAF	Department of Agriculture and Fisheries (Queensland)
DAFF	Department of Agriculture, Fisheries and Forestry (Commonwealth)
DEHP	Queensland Department of Environment and Heritage Protection
DoE	Department of Environment
DMP	Dredge Management Plan
DPPV	Dedicated Post Panamax Vessels
DSD	Western Australian Government Department of State Development
DTMR	Department of Transport and Main Roads
EA	Environmental Authority
EIS	Environmental Impact Statement
EMS	Environmental Management System
EMP	Environmental Management Plan
EP Act	Queensland Environmental Protection Act 1994
EPBC	Environmental Protection and Biodiversity Conservation Act
EPCM	Engineering, Procurement and Construction Management
GBRMP	Great Barrier Reef Marine Park
GED	General Environmental Duty
GPS	Global Positioning System
HSE	Health, Safety and Environment
IMDG	International Maritime Dangerous Good Code
IMO	International Maritime Organization
LNG	Liquefied Natural Gas
MARPOL	International Convention for the Prevention of Pollution from Ships 73/78
Mdptpa	million dry product tonnes per annum
MEPC	Marine Environment Protection Committee
MFO	Marine Fauna Observer
mg/L	Milligrams per litre

Term	Definition
ML	Mining Lease
MSQ	Maritime Safety Queensland
NAGD	National Assessment Guidelines for Dredging
NATPLAN	National Plan for Maritime Environmental Emergencies
NPF	Northern Prawn Fishery
NQBP	North Queensland Bulk Ports
NTU	Nephelometric turbidity units
OH&S	Operational Health and Safety
PAR	Photosynthetically active radiation
POLREP	Marine Pollution Report
PSD	Particle size distribution
QA/QC	Quality Assurance/ Quality Control
QCCAP	Queensland Coastal Contingency Action Plan
RSPCA	Royal Society for Protection of Cruelty to Animals
ROV	Remote Operated Vehicle
RPA	Regional Partnership Agreement
RTA	Rio Tinto Alcan
RTAW	Rio Tinto Alcan Weipa Pty Ltd
SAP	Sampling and Analysis Plan
SDPWO	Queensland State Development and Public Works Organisation Act 1971
SEIS	State Environmental Impact Statement
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SHB	Split Hopper Barge
SoE	South of Embley
SOPEP	Shipboard Oil Pollution Emergency Plan
TBT	tri-butyl tin
TMR	Department of Transport and Main Roads
TSS	Total Suspended Solids
TSHD	Trailing Suction Hopper Dredge
TOMP	Transport Operations (Marine Pollution) Act 1995
WCCCA	Western Cape Communities Co-existence Agreement

1 INTRODUCTION

The South of Embley (SoE) Project involves the construction and operation of a bauxite mine and associated processing and Port facilities to be located near Boyd Point on the western side of Cape York Peninsula. The SoE Project would be developed and operated by RTA Weipa Pty Ltd, which is a wholly-owned subsidiary of Rio Tinto Aluminium Limited. A detailed description of the Project is provided in the SoE Project's Queensland Environmental Impact Statement (EIS) (RTA 2011), the Supplementary Report to the Queensland EIS (RTA 2012), and the Commonwealth Environmental Impact Statement (RTA 2013).

The SoE Project requires the construction and operation of a new Port facility located between Boyd Point and Pera Head (refer **Figure 1**). The marine works will include construction of a jetty, wharf and ship loaders, requiring dredging for berth pockets and approach/departure channel.

The initial capital dredging and spoil disposal program will involve the removal and relocation of a maximum of 2.6 million cubic metres of marine sediments to the proposed new spoil ground location indicated in **Figure 1**. The program is currently scheduled to occur over 24 weeks between March and September 2016 with the maximum dredge outline and volumes displayed in **Figure 2**.

The purpose of this Dredge Management Plan (DMP) is to provide details on the environmental management aspects of the initial capital dredging and spoil disposal activities to be undertaken as part of the this Port development. It details the environmental management and monitoring that would be implemented throughout the initial capital dredging and spoil disposal program to be undertaken by RTA for the Port as part of the SoE Project. Dredging operations will not commence until the dredge management plan is approved.

1.1 Commonwealth and State Approvals

The Project was declared a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth; EPBC Act) on 29 October 2010. This decision was revoked and substituted on 16 March 2012 and new *Tailored Guidelines for the preparation of the Draft Environmental Impact Statement* (the 'Tailored EIS Guidelines') were issued in July 2012.

The Commonwealth *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) regulates the loading and dumping of spoil from dredging operations in Australian waters. In accordance with Section 160 of the EPBC Act, the Minister has determined that an assessment under Part 8 of the EPBC Act is required in relation to the issuing of a permit under the Sea Dumping Act. The Department of the Environment (DoE; formerly DSEWPac) advised that, for the purposes of efficiency, the Commonwealth EIS was to be scoped so that it meets the requirements of the Sea Dumping Act, such that one assessment was required.

RTA submitted an application for a Sea Dumping Permit for Stage 1 of the Port facility (up to 6.5 million cubic metres) to DSEWPac in October 2010 and amended it on 31 October 2011 for the realignment of the dredge channel. The Commonwealth EIS (RTA 2013) reflects a reduced initial capital dredge approval volume of 2.6 million cubic metres. A Sea Dumping Permit was granted to RTA Weipa Pty Ltd under the Environment Protection (Sea Dumping) Act 1981 – South of Embley Bauxite Mine and Port Development, Weipa Qld (SD2010/1762) on 14 May 2013 for a period of 3 years. A 12 month extension to the Sea Dumping Permit was granted on 29 July 2015.

Detailed sediment characterisation reports have been provided separately to DoE and the Queensland Department of Environment and Heritage Protection (EHP). Separate Sea Dumping Permit applications will be sought in the future, if required, for subsequent capital and / or maintenance dredging of the Port.

The Project has been declared a "significant project" for which an EIS was required pursuant to section 26(1;a) of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO) Act. Following assessment of the information provided in the Queensland EIS and Supplementary Report and in consultation with the relevant referral agencies, the Queensland

Coordinator-General released a report (the 'CG's Report') on 23 May 2012 (Queensland Government 2012). The CG's Report sets the framework within which other Queensland Government approvals are to be sought and the conditions for the prevention, minimisation and management of environmental impacts.

Development Approval is required for dredging under the *Coastal Protection and Management Act 1995* and *Sustainable Planning Act 2009* (Qld) for any section of the departure channel for the Port which is outside the mining lease and inside the coastal waters of Queensland. An Environmental Authority, required under the *Environmental Protection Act 1994*, for the South of Embley project, including dredging on the mining lease, was issued on 27 November 2014. The Queensland Coordinator General stated conditions and Sea Dumping permit require a Dredge Management Plan to be developed.

This DMP addresses Conditions in the Commonwealth and State approvals:

- Sea Dumping Permit: SD2010/1762 – 14 May 2013 (Commonwealth);
- EPBC Act approval: EPBC 2010/5642 – 14 May 2013 (Commonwealth);
- Queensland Coordinator General's stated conditions in South of Embley project – Coordinator –General's report on the environmental impact statement May 2012; and,
- Environmental Authority: EPML00725113 (Queensland Department of Environment and Heritage Protection) – 27 November 2014.

Figure 1 Port, Spoil Ground and Mooring Locations

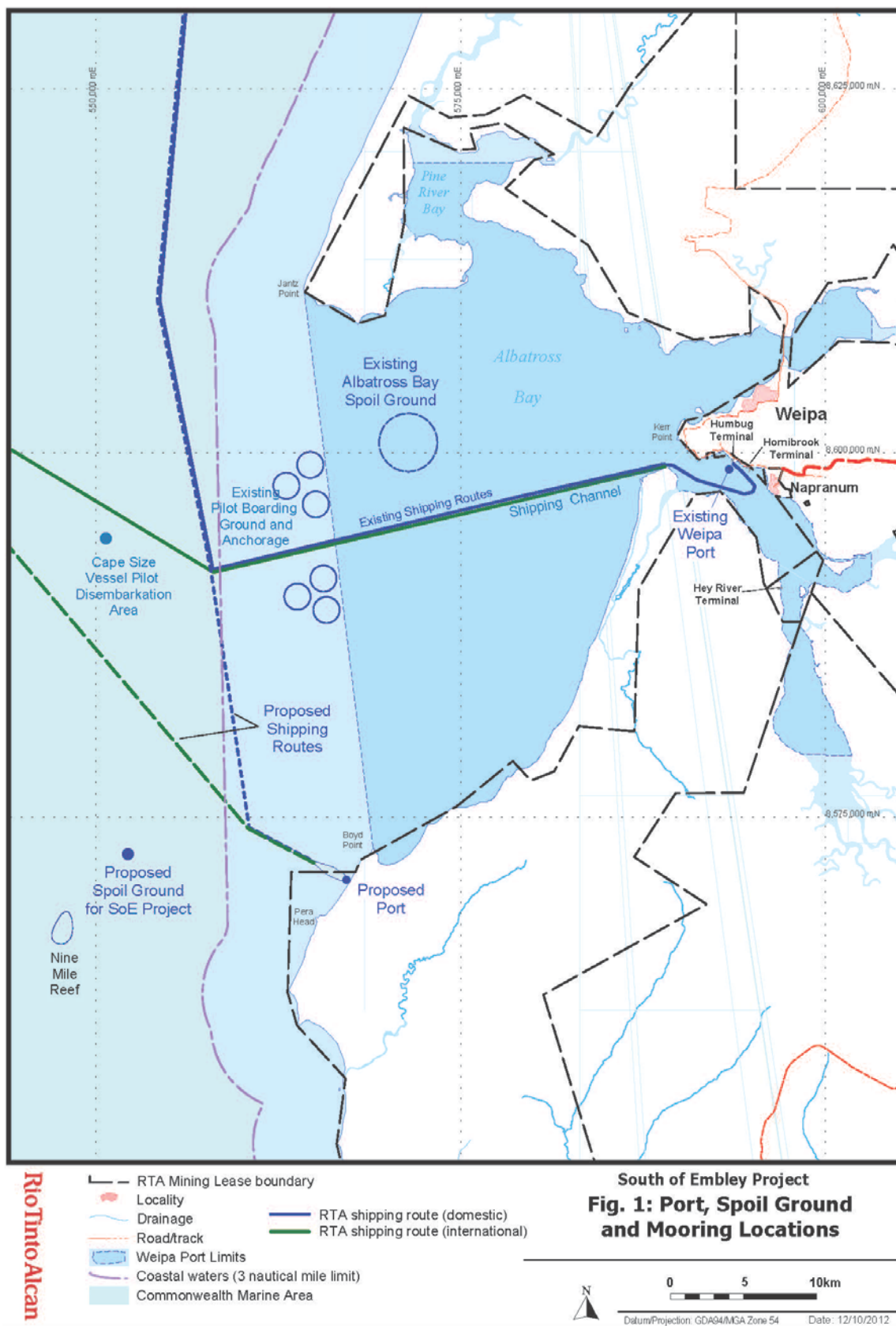
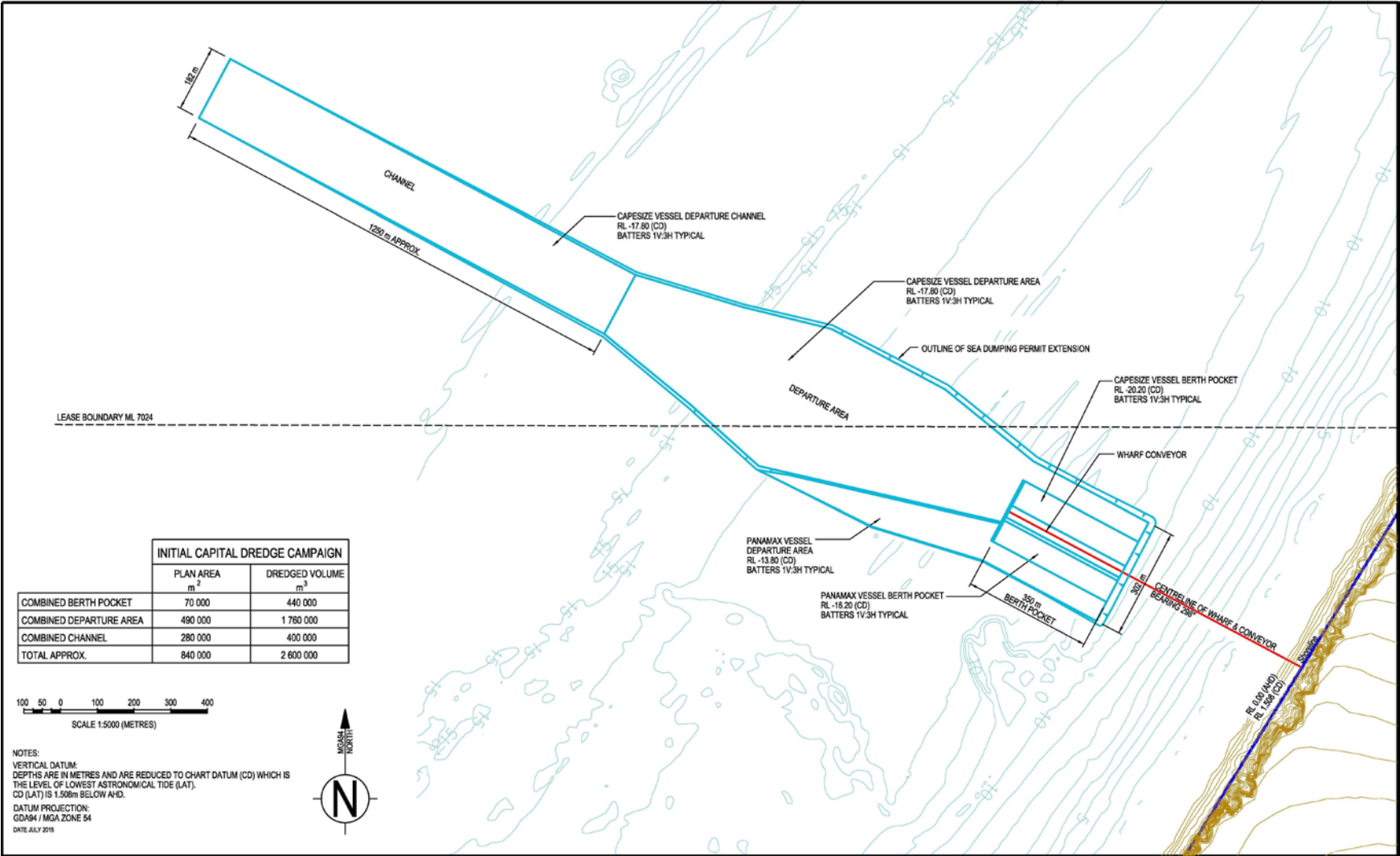


Figure 2 Port layout –Initial capital dredge campaign for a maximum of 2.6 million cubic meters



1.2 Project Approval Conditions

The then Minister for Sustainability, Environment, Water, Population and Communities (the Minister) approved the SoE Project (EPBC 2010/5642) with conditions on 14 May 2013. The approval (varied on 3 June 2014) requires a Boyd Port Capital Dredge Management Plan to be prepared and submitted to the Minister for approval prior to commencing dredging operations

The SoE Project entailing mining on ML7024, shipping of bauxite south of the Embley River and construction of associated infrastructure was approved with conditions by the Queensland Coordinator General on 23 May 2012. Two subsequent amendments to the existing Environmental Authority (EA) were approved under the Queensland Environmental Protection Act 1994 (EP Act) on 26 March 2014 and 4 December 2014 (EPML00725113).

The Commonwealth and State approval conditions relating to dredging and disposal management and where they are addressed in this document are outlined in **Table 1**.

Table 1 Commonwealth and Queensland Governments Approval Conditions

Conditions	Where Addressed in this Plan
Commonwealth EPBC Act Approval Conditions (EPBC 2010/5642)	
Port and River Dredge Management Plans 14. The approval holder must submit to the Minister for approval a Capital Dredge Management Plan/s for capital dredging activities associated with the south of Embley Project. The Capital Dredge Management Plan must be prepared in accordance with the Australia Government National Assessment Guidelines for Dredging (2009), or their most current versions, to avoid and mitigate impacts on: <ul style="list-style-type: none"> i. Commonwealth Marine Area ii. Listed turtle species iii. Listed dolphin species; and iv. Dugong (<i>Dugong dugon</i>) and Bryde's Whale (<i>Balaenoptera edeni</i>) 	Section 1
15. Capital dredging activities cannot commence until the Capital Dredging Management Plan at condition 14 has been approved	Section 1
18. The approved Plans at condition 14 and condition 16, and or their subsequent revisions must be implemented	Section 1
19. The approval holder must comply with the requirements of any permit/s obtained under the Environment Protection (Sea Dumping) Act 1981, including any conditions attached to the permit/s.	Section 1.2
41. The approval holder must consult with Indigenous people in accordance with the process under the Indigenous Land use Agreement (known as the Western Cape Communities Coexistence Agreement) during preparation of management plans and strategies specified in this approval.	Section 11
42. The approval holder must identify employment opportunities (e.g. under an Indigenous Land and Sea Program or seed collection associated with rehabilitation activities) for Indigenous persons to facilitate the implementation of the conditions specified in this approval.	Section 10
59. Unless otherwise agreed in writing by the Minister the approval holder must publish, for the life of the project including decommissioning, all current approved program/s, plan/s, review/s (including Independent Peer Reviews) or strategies referred to in these conditions of approval on their website. Each of the approved program/s, plan/s or strategies (including revised versions) must be published on the approval holder's website within one (1) month of approval.	Section 8

Conditions	Where Addressed in this Plan
<p>60. Unless otherwise agreed in writing by the Minister program/s, plan/s, or strategies specified in the conditions must be independently peer reviewed prior to submission to the Minister for approval. The approval holder must nominate an Independent Peer reviewer to the Minister. The person/organisation/technical committee conducting the independent peer review must be approved by the Minister, prior to the commencement of the review. The independent peer review criteria must be agreed to by the Minister and any reviews undertaken must address the criteria to the satisfaction of the Minister.</p> <p>61. The reviews undertaken for Condition 60 must include an analysis of the effectiveness of the avoidance and mitigation measures in meeting the objectives, targets or management measures identified in the program/s, plan/s or strategies being reviewed.</p> <p>62. Unless otherwise specified in these conditions or notified in writing by the Minister, the approval holder must provide to the Minister, a copy of all advice and recommendations made by the independent peer reviewer for program/s, plan/s or strategies, and an explanation of how the advice and recommendations will be implemented, or an explanation of why the approval holder does not propose to implement certain recommendations.</p>	Section 8.1
<p>68. Within (3) months of every 12 month anniversary of commencement of the action the approval holder must publish a report on their website, for the duration of the project including decommissioning, addressing compliance with the conditions of this approval over the previous 12 months, including implementation of any management plan/s or strategies as specified in the conditions. Non-compliance with any of the conditions of this approval must be reported to the department at the same time as the compliance report is published. Within five (5) days after publication, the person taking the action must provide the Minister with a copy of the report/s.</p>	Section 87
Sea Dumping Permit (SD2010/1762)	
<p>3. RTAW must submit for the Minister's approval dredge management plans for dumping activities for the new port and river facilities, which are to be based on the Draft DMP-Port and Draft DMP-River. Dumping activities must not commence until the dredge management plans are approved by the Minister.</p>	Section 1
<p>7. Following commencement of the dumping activities for the new port, the DMP-Port must be reviewed annually by the BPD TAG until expiry of the permit or completion of the dumping activities (whichever is earlier). Where applicable, RTAW must provide to the Minister a copy of all comments made by the BPD TAG and an explanation of how the comments have been addressed in the revised DMP-Port or an explanation of why RTAW does not propose to address certain comments.</p>	Section 8.2
<p>11. RTAW must ensure that dredge material which is loaded from the new South of the Embley port facility and dumped comprises only up to 2.6 million cubic metres of capital dredged seabed material as specified in Part E of the Application, and is dumped at the disposal site specified at Condition 13.</p>	Section 2
<p>13. RTAW must only dump material from the South of the Embley Port facility capital dredging campaign within the spoil ground defined by a 1000 metre radius, centred on the WGS84 coordinates: S12° 54' 46.3" E141° 28' 52.7".</p>	Section 6.8
<p>14. RTAW must ensure that each load of dredge material is dumped so that the dumped material is distributed evenly over the area of the disposal site defined in Condition 13.</p>	Section 2.2
<p>15. RTAW must establish by GPS that, prior to dumping, the vessel is within the appropriate disposal site defined in Condition 13.</p>	Section 2.2
<p>16. If requested by the Department, at least two nominee of the Department must be afforded access to witness, inspect, examine or audit any part of the operations including any dumping or monitoring activity, the vessel or any other equipment, or any documented records, and must be provided with any necessary assistance to carry out their duties.</p>	Section 8

Conditions	Where Addressed in this Plan
<p>17. Before beginning dredging and dumping activities, RTAW must check, using binoculars from a high observation platform on the vessel, for marine mammals and/or marine turtles within the monitoring zone.</p> <p>18. If any marine mammals and/or marine turtles as specified in Condition 17 are sighted in the monitoring zone:</p> <p>(a) dredging/dumping activities must not commence in the monitoring zone until twenty minutes after the last marine mammal and/or marine turtle is observed to leave the monitoring zone; or</p> <p>(b) the vessel is to move to another area of the dredge/disposal site to maintain a minimum distance of 300 metres between the vessel and any marine mammals and/or marine turtles identified in Condition 17.</p>	Section 6.3
<p>19. If, at any time during the course of the dumping activities, an environmental incident occurs or an environmental risk is identified, all measures must be taken immediately by RTAW to mitigate the risk or the impact. The situation is to be reported in writing within 24 hours to the Department, with details of the incident or risk, the measures taken, the success of those measures in addressing the incident or risk and any additional measures proposed to be taken.</p>	Section 8
<p>20. RTAW must document any environmental incidents which occur in the course of the dumping activities that result in injury or death to any marine mammals, marine turtles or EPBC Act listed species. The time and nature of each incident and the species involved, if known, must be recorded.</p>	Section 6.3 and Section 8
<p>22. RTAW will keep records comprising of weekly plotting sheets or a certified extract of the vessel's log which detail:</p> <p>(a) The times and dates of when each dumping run is commenced and finished;</p> <p>(b) The position (as determined by GPS) of the vessel at the beginning and end of each dumping run, with the inclusion of the path of each dumping run; and</p> <p>(c) The volume of dredge material (in cubic metres) dumped and quantity in dry tonnes for the specified operational period, with a comparison of these quantities with the total amount permitted under the permit on a daily basis.</p> <p>These records will be retained by RTAW for verification and audit purposes.</p>	Section 6.8, Table 9 and Section 8
<p>23. A bathymetric survey of the disposal site referred to in Condition 12 must be undertaken by RTAW:</p> <p>(a) prior to the commencement of dumping activities under this permit at the disposal site; and</p> <p>(b) within one month of the completion of all dumping activities authorised under this permit at that disposal site, unless otherwise agreed with the Department.</p>	Section 2.2
<p>24. Within two months of the final bathymetric survey being undertaken RTAW will provide a digital copy of the bathymetric survey to the Royal Australian Navy Hydrographer, Locked Bag 8801, South Coast Mail Centre, NSW 2521.</p>	Section 8
<p>25. RTAW will provide a report on the bathymetry to the Department of Environment within two months of the final bathymetric survey being undertaken. The report will include a chart showing the change in sea floor bathymetry as a result of dumping and include written commentary on the volumes of dumped material that appear to have been retained within the disposal site.</p>	Section 8
<p>26. RTAW will provide a report to the Department of Environment on the Form "Sea Dumping Permit International Report Requirements" or in a format as approved by the Department of Environment from time to time:</p> <p>(a) Following commencement of dumping activities, by 31 January each year until expiry of the sea dumping permit or completion of the dumping activities (whichever is earlier); and</p> <p>(b) Upon expiry of the sea dumping permit or completion of dumping activities (whichever is earlier).</p>	Section 8

Conditions	Where Addressed in this Plan
Queensland Government Environmental Authority Conditions (EPML00725113)	
<p>(J1) In carrying out dredging activities, the release of contaminants (including any release caused by extraction of material from the bed and banks of waters) must:</p> <ul style="list-style-type: none"> (c) only occur from the permitted areas identified in the plan(s) referred to in Condition (J22). (d) only occur in accordance with conditions of this environmental authority. (e) be carried out taking all practical measures necessary to minimise the concentration of suspended solids released during the loading of the vessel. 	Section 6.8, Table 9
<p>(J5) The administering authority must be advised in writing at least (5) business days prior to the date of commencement of a capital or maintenance dredging campaigns.</p>	Section 6
<p>(J6) The administering authority must be advised in writing within ten (10) days following completion of the capital or maintenance dredging campaigns.</p>	Section 6
<p>(J7) All persons engaged in the conduct of dredging activities including but not limited to employees and contract staff must be:</p> <ul style="list-style-type: none"> (a) trained in the procedures and practices necessary to: <ul style="list-style-type: none"> i. comply with the conditions of this environmental authority; and ii. prevent environmental harm during normal operation and emergencies, or (b) under the close supervision of a trained person. 	Section 9
<p>(J8) Any dredging activities must be conducted using equipment that is in survey and registered and, in relation to environmental performance, is equal to or superior to the following equipment:</p> <ul style="list-style-type: none"> (a) Trailing Suction Hopper Dredge that is equipped, at a minimum, with: <ul style="list-style-type: none"> i. below keel discharge of tail waters via an anti-turbidity control valve; ii. on-board systems for determining solids to water ratio or density of dredged material; iii. electronic positioning and depth control system for defining the location and depth of dredging activities; and iv. dredge heads capable of, and where appropriate, depth control and fitted with marine wildlife protection or fauna exclusion devices (e.g. turtle deflector, deflector plates, tickler chains or drag heads) prior to and during operation. (b) Cutter Suction Dredge that is equipped, at a minimum, with: <ul style="list-style-type: none"> i. electronic positioning and depth control system for defining the location and depth of dredging activities ii. a system or process to ensure the delivery system integrity is maintained at all times; and systems for determining solids to water ratio or density of dredged material during operations iii. dredge heads capable of, and where appropriate, depth control and fitted with marine wildlife protection or fauna exclusion devices (e.g. turtle deflector, deflector plates, tickler chains or drag heads) prior to and during operation. (c) Grab Dredge that is equipped, as a minimum, with: <ul style="list-style-type: none"> i. electronic positioning system for defining the location and depth of dredge activities. 	Section 6
<p>(J9) Where trailer suction dredging is carried out, an effective turtle exclusion device must be fitted to the dredge head. Evidence that this device has been installed and used on the dredge for the entire period of the dredging activity must be provided to the administering authority on request.</p>	Section 6; Section 6.3
<p>(J11) Dredging can only be carried out when the final dredge management plans are approved by the administering authority</p>	Section 1
<p>(J12) All dredging must be undertaken in accordance with a dredge management plan/s (DMP/s) based on the draft DMP/s in the Supplementary Report to the EIS approved by DEHP</p>	Section 1

Conditions	Where Addressed in this Plan
prior to dredging commencing	
<p>(J13) The final Initial Capital Dredge Management Plan for Boyd Port must be consistent with the conditions of the environmental authority and must:</p> <p>(a) Include results of 3D modelling, or alternative methodology as agreed with the administering authority, to:</p> <ul style="list-style-type: none"> i. Estimate sediment plumes generated by capital dredging and spoil disposal operations for Boyd Port; ii. Details the turbidity through the water column iii. Defines the Zones of Influence of the dredging and spoil disposal sediment plumes; iv. Identify high, moderate and low risk periods for Key Concern Sites (ie where sensitive receptors are situated); v. Inform where key Concern Site monitoring locations should be situated; and vi. Provides risk estimated that are based on key water quality parameters, specifically increases in turbidity, sedimentation rates, and reduction in photosynthetically active radiation (PAR), for the key concern sites <p>(b) Establish turbidity-based trigger values, that</p> <ul style="list-style-type: none"> i. Considers, and is informed by the findings of all relevant published studies, including available water quality guidelines, trigger values from other comparable dredging programs ii. Considers the most sensitive receptor type and the most relevant water quality parameters (eg turbidity, PAR, sedimentation rate and the reported impacts of turbidity on coral health from the literature and other dredging programs in areas with near shore coral reefs; iii. Includes season-specific turbidity trigger values iv. Considers sediment plume intensity, duration and frequency of occurrence in establishing trigger values v. Considers the additive impact of multiple stressors; and vi. Considers the effect of depth and water column variation as predicted from the 3D modelling <p>(c) Implement a water quality monitoring program that includes, as a minimum, telemetered monitoring of turbidity at Reference and Concern Sites, and details:</p> <ul style="list-style-type: none"> i. The appropriateness of established Reference Sites to specific key Concern sites based on demonstrated similarity of physicochemical parameter trends; and ii. Relationship between turbidity PAR and sedimentation rate from baseline data at each of the Boyd Port key Concern sites <p>(d) Includes the telemetered monitoring system being operated and maintained for 3 months before dredging operations commence, during dredging operations, and for a period after dredging operations cease, to demonstrate that turbidity concentrations have returned to ambient levels</p> <p>(e) Include a QA/QC procedure that validates and records the telemetered systems' state of calibration when performing routine maintenance, including as a minimum the measurement of turbidity and total suspended solids.</p> <p>(f) Develop and implement a coral health monitoring program that includes:</p> <ul style="list-style-type: none"> i. Routine monitoring, and reactive monitoring based on exceedance trigger levels as identified ii. Establishing indicator(s) that are capable of detecting adverse change in health of assemblages; iii. A monitoring methodology that includes the use of diver-less technology appropriately reporting on the selected coral health indicators, that maximise the data quality and provide an appropriate level of statistical power to detect change in coral health indicators; and iv. A methodology that ensures that coral monitoring assessments are not 	<p>Section 5.1</p> <p>Section 5.1</p> <p>Section 5.1</p> <p>Section 5.1</p> <p>Section 6.1</p> <p>Section 6.1</p> <p>Section 6.1.2</p> <p>Section 6.1.2</p> <p>Section 6.1.2</p> <p>Section 6.1.2</p> <p>Section 6.1.2</p> <p>Section 6.2</p>

Conditions	Where Addressed in this Plan
<p>compromised due to dredging operations active at the time of monitoring</p> <p>(g) Implements adaptive management processes and measures as detailed in the dredge management plan in:</p> <ul style="list-style-type: none"> i. Water Quality Management Process; ii. Coral Health Management Process iii. Turtle and Marine Mammal Management Procedures (Dredging); and iv. Turtle and Marine Mammal Management Procedures (Disposal). <p>(h) Include reporting and review by the BPD TAG (as per condition J31)</p>	<p>Figure 12</p> <p>Figure 13</p> <p>Figure 14</p> <p>Figure 15</p> <p>Section 8</p>
<p>(J17) If dredge monitoring trigger levels are exceeded as a result of the dredging activity:</p> <p>(a) The administering authority must be advised within 24 hours of the event of the corrective action that has or will be implemented</p> <p>(b) Measures must be implemented in accordance with corrective actions specified in the approved dredge management plan.</p>	<p>Section 6.1</p>
<p>(J18) The administering authority and the Department of Agriculture, Fisheries and Forestry must be consulted during preparation of all final Dredge Management plan</p>	<p>Section 6</p>
<p>(J20) All dredging activities must be undertaken in accordance with the relevant approved final dredge management plan</p>	<p>Section 1</p>
<p>(J23) The maximum volume of material to be removed as a result of the Boyd Port – Stage 1 Capital Dredging is 6,500,000 cubic metres</p>	<p>Section 1</p>
<p>(J24) Unless otherwise authorised, dredge spoil must not be disposed of on the mining lease</p>	<p>Section 6</p>
<p>(J25) Dredge spoil must not be disposed of on land unless otherwise authorised</p>	<p>Section 6</p>
<p>(J26) Dredging activities must not start until provision has been made to lawfully place or dispose of the dredge spoil material. Evidence of applicable approvals must be made available to the administering authority on request</p>	<p>Section 6</p>
<p>(J27) The transport of dredge material must be carried out such that the dredge material is kept wet at all times</p>	<p>Section 6.1</p>
<p>(J29) A monthly monitoring report must be prepared and submitted to the administering authority throughout the period that initial capital dredging and spoil disposal works are being undertaken. This report must include:</p> <ul style="list-style-type: none"> (a) a summary of results of all monitoring required by the environmental authority and dredge management plan, with raw data provided in and electronic format appendix (i.e. spreadsheet); (b) an evaluation and explanation of the data from these monitoring programs; (c) a daily summary of dredge movements (specifying the boundaries of the dredged area by GPS coordinates and disposal activity; (d) details of turtle captures by the dredge and species involved; (e) details of any complaints received including investigations undertaken, conclusions formed and action taken; (f) a summary of significant equipment failures or events that have potential environmental management consequences; (g) an outline of corrective actions that will or have been taken to minimise or reduce environmental harm, and (h) the quantity (volume in cubic metres) and location of dredging material removed and disposed of; or (i) different details and frequency of reporting as agreed to by the administering authority. 	<p>Section 8</p> <p>Section 6.1.2</p> <p>Section 6.1.2</p>

Conditions	Where Addressed in this Plan
(J30) The holder of this environmental authority must establish a Boyd Port Dredging Technical Advisory Group (BPDTAG) which must include a representative from the Administering authority and the Department of Agriculture Fisheries and Forestry (DAFF) for dredging at Boyd Port	Section 6
(J31) The holder of this environmental authority must report to the BPDTAG on proposed dredging activities for Boyd Port and implementation of the DMP including monitoring results, management triggers and response actions.	Section 6
(J36) Mobile dredging operations: (a) Must not commence if dugong turtle or cetaceans are observed within 300 m of the dredge (b) When underway, must alter the course if dugongs, turtles or cetaceans are observed within 50m of the dredge head	Section 6.3
(J37) Stationary dredging operations: (a) Must not commence if dugong turtle or cetaceans are observed within 300 m of the dredge (b) When underway, must alter the course if dugongs, turtles or cetaceans are observed within 50m of the dredge head	Section 6.3
(J38) Daily monitoring for impacted turtles must be undertaken at the dredge and at the shoreline down current from the dredging operations. If monitoring indicates more than two (2) turtles are killed within a 24 hour period as a result of dredging. The dredge must relocate from the area until an incident investigation has been carried out and relevant preventative measures implemented	Section 6.3
(J39) Operating procedures must be developed prior to the commencement of dredging activities that minimise the risk of turtle capture by the dredge head and the risk from all activities of injury to marine species of conservation significance	Section 6.3
(J40) The administering authority must be immediately notified of any turtle captures by the dredge or injury to any marine species of conservation significance	Section 6.3
(J41) all reasonable and practicable measures must be undertaken to minimise the impact of dredging activities on marine fauna	Section 6.3

2 DREDGING AND SPOIL DISPOSAL DESCRIPTION

2.1 Location and Proposed Volumes of Dredging and Spoil Disposal

The proposed Port site is 40km south of Weipa between Boyd Point and Pera Head on RTA mining lease ML7024. The proposed shipping channel would extend outside the mining lease into the coastal waters of Queensland (**Figure 1**). The proposed new spoil ground is approximately 17km offshore from the proposed Port near the 25m depth contour (**Figure 1**). The spoil ground is defined by a 1,000m radius within the Commonwealth marine area, centred on the WGS84 coordinates: S12°54'46.3" E141°28'52.7".

In the EIS it was proposed to remove and dispose approximately 2.6 million cubic meters for the development of the wharf facilities, including berth pockets (2), swing basin and departure channel (**Figure 2**).

2.2 Dredging and Spoil Disposal Methodology and Equipment

Dredging is currently scheduled to commence in March 2016 following receipt of relevant Project approvals. The dredging for 2.6 million cubic metres will occur over an approximately 24 week period depending on methodology. The timeframe does not allow for any delays that may occur due to breakdowns or stand-downs for adverse weather conditions.

Dredging and disposal method will depend on the equipment availability and suitability and will consist of one of the methods below:

1. Trailing Suction Hopper Dredge (TSHD) – A TSHD may be used to dredge fine materials for the footprint. The TSHD uses suction tubes (up to 2) driven by powerful pumps to remove sediment from the bottom and are placed in the vessel's own cargo hopper. The loaded TSHD would transport dredged material to the offshore spoil ground for marine disposal. The TSHD will have "green valve" allowing overflow discharge during loading to occur at the keel level of the vessel.
2. Cutter Suction Dredge (CSD) – A CSD may be required to dredge either part (hard clays and siltstones) or the entire dredge footprint. A CSD uses a rotating cutter head to extract and cut material. This material may be suctioned by the CSD via a pump through the delivery line and placed in a split hopper barge (SHB) for disposal. Alternatively the material may be redeposited directly onto the seabed and picked up by a TSHD.
3. Backhoe dredge (BHD) – A BHD may be required to dredge part (hard material) or the entire footprint. The BHD works like an excavator with the bucket lowered to the seafloor, the bucket excavates the seafloor material and loads into a SHB for disposal.
4. Split Hopper Barge (SHB) – A SHB may be used for disposal of dredge material. Sediment is loaded into the SHB by the dredge, with overflow discharge occurring at keel level due to the "green valve". Once fill is complete the SHB motors (or is towed) to the approved spoil ground to dispose of material. The SHB splits in two and deposits materials in the relevant disposal area.

During the EIS two methods, a CSD with TSHD and a CSD with SHBs, were considered for the 2.6 million cubic metres dredging volume and were modelled to identify the potential turbidity plume. While BHD was not modelled or assessed in the EIS, the plume and impacts associated with BHD are less than those associated with the TSHD or CSD (Chevron 2014, PIANC 2010). BHD are considered to only produce minor disturbance to benthic habitats and produce much smaller fine sediment plumes than CSD or TSHD (PIANC 2010) that are localised and diminish quickly (INPEX ND). Monitoring of BHD plumes at various dredge sites across Australia has shown them to be much smaller than those produced by TSHD and CSD (Chevron 2014, SKM 2012, CEE 2012).

A bathymetric survey of the disposal site will be undertaken by RTAW:

- a) Prior to the commencement of dumping activities at the disposal site; and
- b) Within one month of the completion of all dumping activities as authorised under the sea dumping permit at the disposal site, unless otherwise agreed with the Department of the Environment.

Disposal operations using either the TSHD or SHB will be similar. Once the vessel is filled with dredged material the vessel would then relocate to the proposed new spoil ground. The volume of each load of dredged material will be logged by the Contractor and will be dumped so that the dumped material is distributed evenly over the area of the disposal site. Prior to dumping the vessel will establish by GPS that it is inside the disposal site before commencing dumping.

Upon entering the designated area for disposal, the vessel would slow whilst material is being placed. A minimum steaming speed is required to maximise agitation within the hopper to clear the dredged material, which would not otherwise be effected if the dredge were to remain stationary. Once the vessel has been emptied and cleared of dredged material the vessel would return to the dredge site to collect the next load. Disposal for both a TSHD and SHB was considered in the EIS and turbidity plume modelling was completed for both.

The dredge and spoil disposal methods will be confirmed following engagement of the dredging contractor with methods managed to ensure compliance with relevant turbidity trigger levels.

Post dredging bed levelling operations may be necessary to remove any peaks or troughs generated from dredging operations to enable safe passage. Bed levelling operations are not expected to extend over two weeks in length with timing dependent on the nature of the

material. Bed levelling operations produce minimal to no plume shifting previously dredged material and will not result in the release of contaminants given sediment characterisation in the port area has shown the sediments are not contaminated.

2.3 Schedule

The current schedule for the capital dredging and disposal program of a maximum of 2.6 million cubic metres is currently estimated for works to occur over approximately 24 weeks between March and September 2016, depending on the methodology. Should bed levelling operations be required this is expected to take two weeks during this time period.

3 SEDIMENT CHARACTERISATION

Sediment sampling and analyses has been completed at the Port facility location (Worley Parsons 2012). The assessment of dredged material is consistent with the assessment guidance described in National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia 2009), Annex 2 of the London Protocol, and the Waste Specific Guidelines for Assessment of Dredged Material (IMO 2000).

As discussed above since 2007 the plan for the proposed port has changed numerous times. On 19 September 2007 RTA submitted a sampling and analysis plan (SAP) to DoE (formerly DSEWPaC) for the proposed Port. Sampling was completed in October 2007 and a sediment characterisation report was supplied to DSEWPaC in February 2008.

In 2009, RTA modified the proposed wharf design and footprint of the dredge area at the Port site to accommodate dedicated Post Panamax Vessels, generic Panamax, smaller river class vessels and tug berth facilities for two pull tugs. Following from these amendments, a supplementary SAP was submitted to DSEWPaC and approved on 27 July 2009. The supplementary SAP detailed the need for further sediment sampling required as a result of the increased dredge footprint, dredge depth and volume. Sampling was completed in June 2009.

Following further feasibility study of the Project, RTA proposed to further develop the Port to accommodate Cape size vessels, loaded to a draft of up to 18.1m (up to 6.5 million cubic metres of dredging). As a result, a SAP was prepared for the extended dredge area and submitted to DoE. This SAP was approved on 8 June 2010 and implemented on 18 June 2010.

In 2011 the Project realigned the wharf structure so that it remains within the boundary of the mining lease. The realignment shifted the wharf two degrees south of the area originally assessed. Essentially this relocates the seaward end of the shipping channel south by approximately 250m but did not impact on the design (i.e. dredge volumes, areas, etc.). In light of these changes, in a letter dated 31 October 2011, RTA sought an exemption from DoE for further sediment sampling and this exemption was granted on 20 January 2012. The sediment characterisation report was updated to incorporate the changes and address comments from DoE.

In 2015 the design of the dredge footprint slightly changed with a small area of the departure channel outside previous footprint. RTA sought an exemption from further sampling and a 12 month extension and was granted on 29 July 2015

The number of locations sampled within the dredging area was determined with regard to the volume of 'potentially contaminated' sediments (i.e. sediments that could contain contaminants above background) within the dredge footprint. For capital dredging projects this is typically based on the volume of material within the top 1m of sediment over the dredge area. Previous surveys in the area have identified that there is a thin silt surface layer of 0.1-0.5m overlying firm clays. As anthropogenic contaminants would not likely be able to penetrate the stiff underlying clays the depth of 'potentially contaminated' material has been limited conservatively to 0.5m. Given the previously proposed dredge footprint of 1,460,062m² for 6.5 million cubic metres, this equates to a volume of 730,031m³ of 'potentially contaminated' material for which **Table 6** of the *National Assessment Guidelines for Dredging* (NAGD; Commonwealth of Australia, 2009) requires a minimum of 17 sample locations, based on halving the number of sampling locations due to the known "clean" status of the site. The sampling program has exceeded this criterion, collecting sediments at 20 locations. Sampling was also completed at the proposed new spoil ground to provide background concentrations prior to disposal activities. Seven sample locations were randomly selected in accordance with the minimum requirements of the NAGD. Samples were only collected for the surface sediments (0 - 0.1m).

According to the approved SAP, sample material for laboratory analyses was to be taken from the following horizon depths 0.0-0.5m; 0.5-1.0m; 1.0-2.0m; 2.0-3.0m, and 3.0-4.0m. Refusal of the vibrocore on stiff substrate limited the number of horizons submitted for laboratory analyses to one, 0.0 – 0.5m. Samples within the dredge area were collected using a boat deployed vibrocorer; with an internal diameter of 50mm and an internal barrel length of 4m. At each location, one to three vibrocores were taken to obtain the necessary sample volume for

chemical and physical analysis. In the event that vibrocore penetration into the sediments was limited, a stainless steel van-Veen grab sampler was deployed to collect additional surface material. Sediments within the proposed new spoil ground were collected using the van-Veen grab sampler.

Sediment samples were transported under refrigerated conditions to the primary laboratory Australia Laboratory Services (ALS) and to the secondary analytical laboratory Advanced Analytical Australia (AAA), within relevant holding times. All sediments were analysed for particle size distribution (PSD), moisture content, metals and metalloids (Ag, Al, As, Cd, Cu, Co, Cr, Fe, Mn, Pb, Hg, Ni, Sb, Se, V and Zn).

Study results showed that inshore sediments were characterised as being dominated by silt and clay fractions (84%). At a distance of approximately 4km from shore, the sediments become dominated by the sand fraction (66%). The depth of unconsolidated surface silts overlaying consolidated clays is on average 0.25m thick (range 0.05 – 0.54m).

Utilising the assessment framework provided in the NAGD (Commonwealth of Australia, 2009) the analytical results for all contaminants and their 95% UCLs of the mean were found to be below the relevant NAGD screening levels. There were no concentrations that exceeded any of the NAGD screening levels at individual sampling locations.

In addition, elutriate and dilute acid extraction (DAE) analyses were conducted in parallel with the screening level assessment for each sample collected within the Port dredge area due to previous data that identified values outside NAGD screening levels. DAE analysis shows that all metal and metalloid contaminants tested were below NAGD screening levels at each sampling location, indicating that contaminants are not readily bioavailable and are acceptable for unconfined disposal at sea.

Based on the assessment completed, dredged material is considered chemically suitable for unconfined disposal at sea.

4 EXISTING ENVIRONMENT

4.1 Past and Current Uses

The Port development site is a remote and undeveloped area and as such there are few, if any, potential contaminant sources either from shipping activity or land use. No anthropogenic contaminants were recorded in the sediments to be dredged and concentrations represent natural background levels.

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

4.2 Water Quality

4.2.1 Proposed Port Area

Previous background turbidity monitoring has been completed in the region with collection occurring in:

- wet season - November 2007 to March 2008;
- wet season – February 2012 to April 2012; and,
- dry season – June to September 2010.

Table 2 presents a summary of the background turbidity and TSS at a number of sites surrounding the proposed port including the Boyd Port, Pera Head, Thud Point and False Pera Head. Turbidity and total suspended solids (TSS) concentrations were considerably higher in the wet season than the dry season. The Boyd Port area recorded higher turbidity concentrations than those experienced at Pera Head in both the wet (2008) and dry (2010) seasons. **Figure 3** and **Figure 4** display the background turbidity concentrations recorded in the wet and dry season, respectively. Periods of high turbidity (and TSS) result in corresponding periods of photosynthetically active radiation (PAR) below detection limits (effectively zero). TSS has been calculated based on a calibration coefficient where 1.5mg/L TSS equals 1 NTUe (NTU equivalent measured on James Cook university loggers).

Table 2 Summary of Background Water Quality, Turbidity (NTUe) and TSS (mg/L) near the Proposed Port

Location	Season	Parameter	Median	80 th Percentile	95 th Percentile	Minimum	Maximum
Boyd Port area	Wet season	Turbidity	14.2	39.7	88.4	<0.1	503
		TSS	21.3	59.6	32.6	<1	755
	Dry season	Turbidity	5.7	11.0	20.8	<0.1	79
		TSS	8.6	16.5	31.2	<1	119
Pera Head	Wet season	Turbidity	2.2	25.9	64.1	<0.1	339
		TSS	3.3	38.9	96.2	<1	509
	Dry season	Turbidity	1.2	2.1	3.5	<0.1	22
		TSS	1.8	3.2	5.3	<1	33
Boyd Pt (Chalco data)	Wet season	Turbidity	14	39	Nd*	0.2	225
		TSS	18	56	nd	<1	338
	Dry season	Turbidity	2.4	nd	nd	<0.1	103

Location	Season	Parameter	Median	80 th Percentile	95 th Percentile	Minimum	Maximum
	2007	TSS	3.6	nd	nd	<1	154
Boyd Point (I1)	Wet Season (2010)	Turbidity	1.6	3.2	27.0	<0.1	129
Thud Point (I4)	Wet Season (2010)	Turbidity	2.8	5.0	20.7	<0.1	248
North of Boyd Port (R1)	Wet Season (2010)	Turbidity	3.6	8.4	78.5	0.2	815
False Pera Head (R2)	Wet Season (2010)	Turbidity	3.1	7.0	63.7	<0.1	419

*nd=no data

Figure 3 Background Dry Season Turbidity

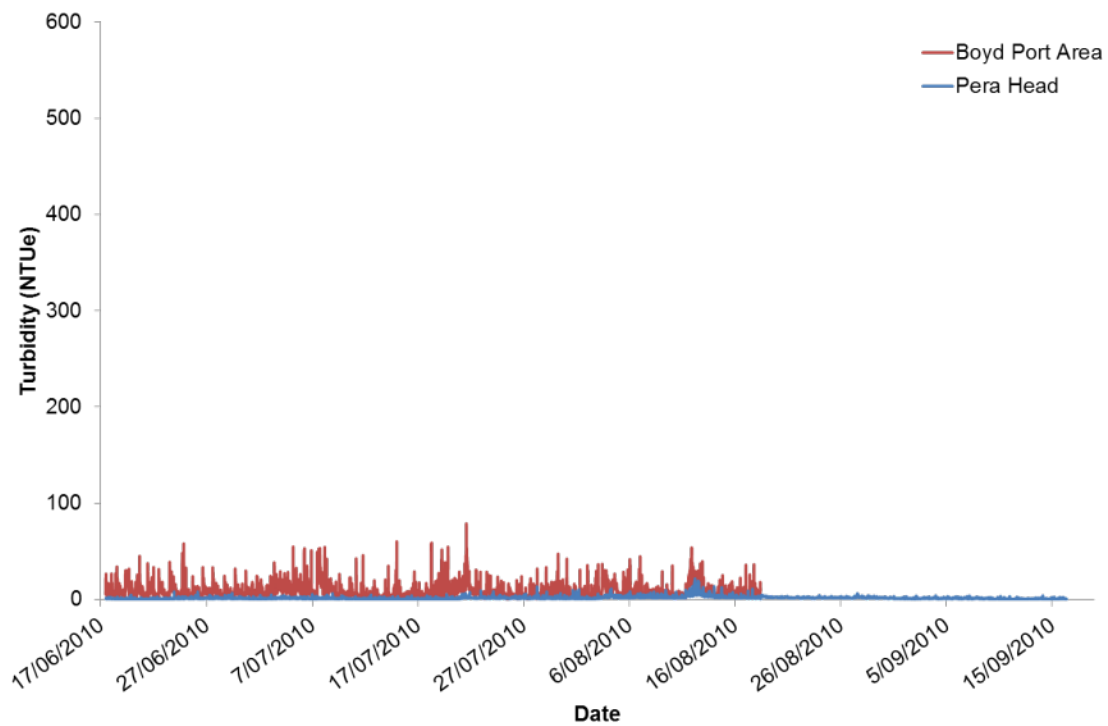
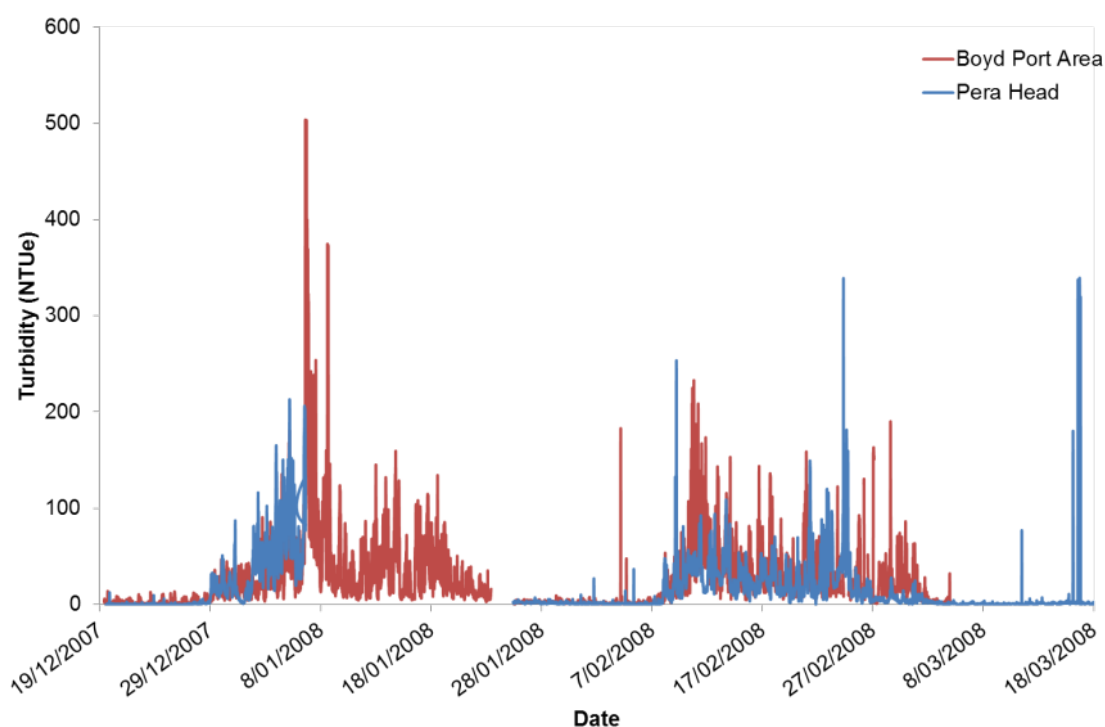


Figure 4 Background Wet Season Turbidity



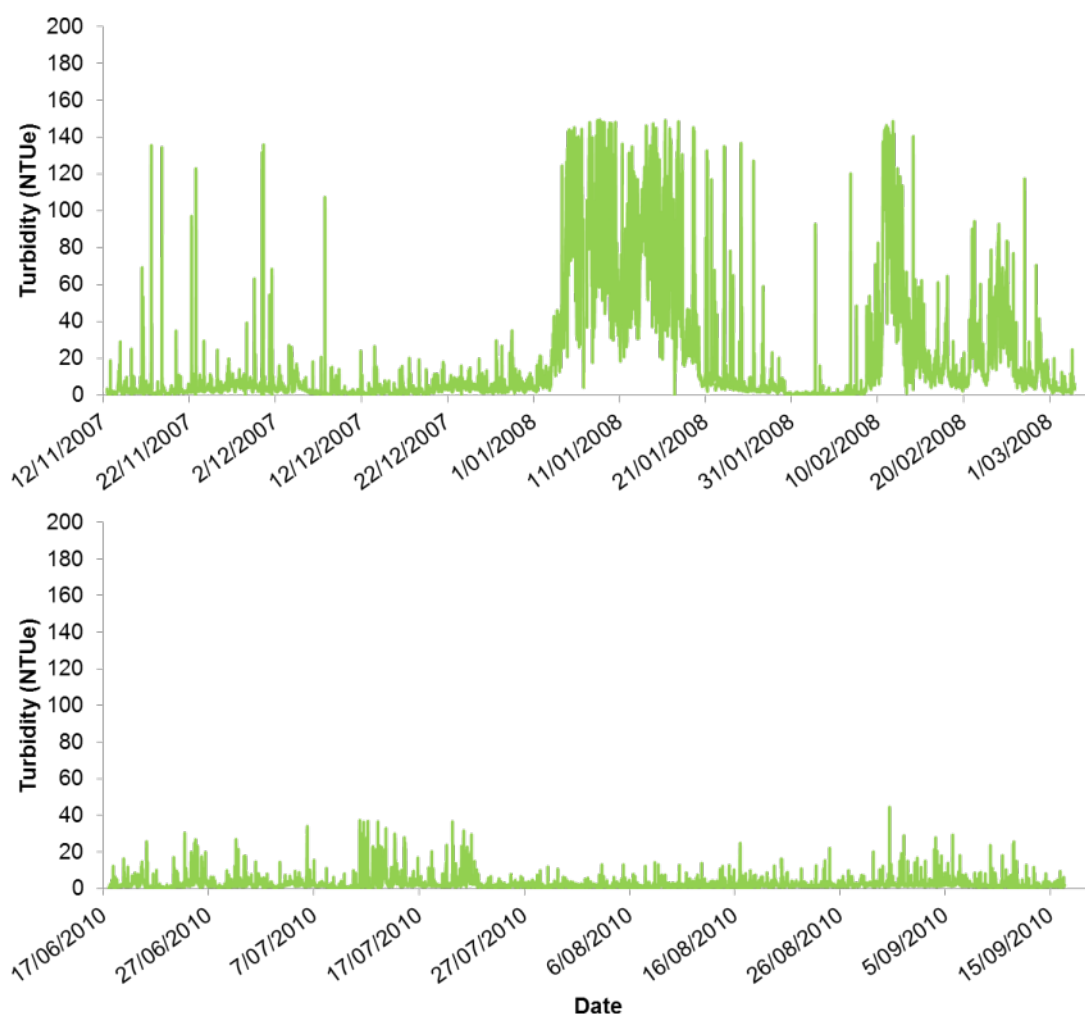
4.2.2 Proposed Spoil Ground

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 1 NTUe. **Table 3** shows the background turbidity and TSS is lower under dry season conditions compared to wet season conditions as recorded for the Port locations. **Figure 5** displays the wet and dry season background turbidity.

Table 3 Summary of Background Water Quality Turbidity (NTUe) and TSS (mg/L) at the Proposed New Spoil Ground

Season	Parameter	Median	80 th Percentile	95 th Percentile	Minimum	Maximum
Wet (Nov 2007- Mar 2008)	Turbidity	4.8	27.2	104.8	<0.1	149
	TSS	7.9	40.8	157.3	<1	224
Dry (Jun – Sep 2010)	Turbidity	1.4	2.5	6.4	<0.1	44
	TSS	2.1	3.7	9.7	<1	66

Figure 5 Background Wet (top) and dry (bottom) Season Turbidity at new spoil ground



4.3 Inshore and Offshore Marine Habitats

Section 6.3 of the Queensland EIS (RTA 2011), Section 6.1 of the Supplementary Report of the Queensland EIS (RTA 2012), and Section 7.2 of the Commonwealth EIS (RTA 2013) details the key benthic marine reef habitats in the Port development and 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 Coastal turbid-zone reefs include low profile reefs comprising of soft coral and sponge assemblages and rocky reefs containing hard corals. **Figure 6** and **Table 4** show the reefal areas between Boyd Point and Pera Head.

The reef areas at Boyd Point and Pera Head have outcrops of hard substrate sparsely covered in algae, soft corals, sponges and hard corals. Hard coral cover at Boyd Point and Pera Head Survey Area was sparse with area cover approximately 4% and 6%, respectively. Within the Survey Area coral cover ranged from 5% to 100% The patchy hard coral communities are dominated by small to medium sized colonies of corals of the families Dendrophylliidae, Faviidae and Poritidae (refer Commonwealth EIS (RTA 2013): Section 7.2.3.1). The genera and species in these three families are typical of hard corals that grow in environments that experience extremes in turbidity and sedimentation (K. Anthony, pers comm; Erftemeijer *et al.*, 2012).

The dredging and spoil disposal assessment of the Browse LNG Precinct by the Western Australian Government Department of State Development (DSD, 2010) states “there are no

clearly defined universal turbidity levels or sedimentation rates that can be used to determine whether anthropogenic pressures will stress corals beyond their threshold." However, the data and literature that is available shows that corals on nearshore coral reefs are adapted to relatively high turbidity and sedimentation rates. Larcombe *et al* (2001) reported that nearshore coral reefs can withstand turbidity and sedimentation rates within the ranges of 15 to >40mg/L and 5 to 120mg/cm²/day, respectively. Similarly, corals on nearshore reefs at James Price Point in Western Australia are exposed to turbidity and sedimentation rates of <5 to >25NTU and 16.5 to 87.4mg/cm²/day, respectively (DSD, 2010).

Turbinaria mesenterina is one of the more common species found on reefs near the proposed Port and its high-sediment tolerance has been investigated by Sofonia and Anthony (2008). This study showed that the coral is physiologically tolerant of very high sediment loads (up to 100mg cm⁻²) due to an ability to rapidly clear themselves of sediment and to utilise sediment as an energy and nutrient source. The high concentrations of suspended particulate matter on near shore reefs represent a significant food source for a range of coral species contributing to significantly higher lipid stores in near shore coral species (Sofonia and Anthony, 2008).

Erftemeijer *et al.* (2012) reviewed the available published literature, including peer-reviewed scientific literature, "grey" literature in the form of environmental impact assessments, consultancy and technical reports, and additional information obtained from members of Working Group 15 of the Environmental Commission of the World Association for Waterborne Transport Infrastructure, on the sensitivity of corals to turbidity and sedimentation. This review concluded that the sensitivity of a coral reef to dredging impacts depend on its resilience and ambient conditions normally experienced. The review presents a range of data that shows corals that are naturally exposed to high and variable background conditions of turbidity and sedimentation will show higher tolerances to increases in turbidity and sedimentation caused by dredging. "Coastal turbid-zone reefs" occur in water with turbidity over 100NTU (approximately 220mg/L suspended solids) often resulting from wave-induced resuspension. Many coral species and reefs survive sedimentation rates as high as 100mg/cm²/day for several days to weeks without any major negative effects with some nearshore reefs experiencing sedimentation rates well over 200mg/cm²/day. Nearshore fringing reefs in the Great Barrier Reef region have long term mean sedimentation rates of 50-110mg/cm²/day (Erftemeijer *et al.* 2012).

Corals of the Favid family, a dominant group of corals on the reefs north and south of the proposed Port, are robust and able to survive in seemingly atypical reef environments (Collins, 1994; Ferns, 1995; Scoffin *et al*, 1997).

Antwertinger (2011) investigated the effect of light and suspended particulate matter on the growth of two favid species, *Goniastrea aspera* and *Platygyra sinensis*, in a turbid, macrotidal estuary, Darwin Harbour. The fringing reefs of Darwin Harbour would be considered harsh environments for coral growth with annual average sea surface temperature of 29°C, often reaching 32°C in the wet season, and turbidities >80NTU. These fringing reefs also receive high levels of freshwater and sediment runoff during the wet season monsoon. The growth characteristics, average annual extension, average annual density and average annual calcification, of the two favid species, *G. aspera* and *P. sinensis*, were similar to those from open water reef systems with very low turbidity, including Heron Island on the Great Barrier Reef. This result showed these species are well adapted to the extreme fringing reef environment which is attributed to the fact that favids are efficient heterotrophs when light limited as a result of high turbidity (Anthony, 1999; Anthony, 2000; Anthony and Fabricius 2000).

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.

The development footprint for the Port facility has been confirmed by field surveys with drop cameras 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. These areas can also contain diverse and abundant assemblages of macrobenthic infauna. No seagrass was recorded in this area, (refer Section 7.2.7.1 in the Commonwealth EIS (RTA 2013)).

The proposed new spoil ground contains unvegetated soft sediments and is not considered sensitive marine habitat.

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

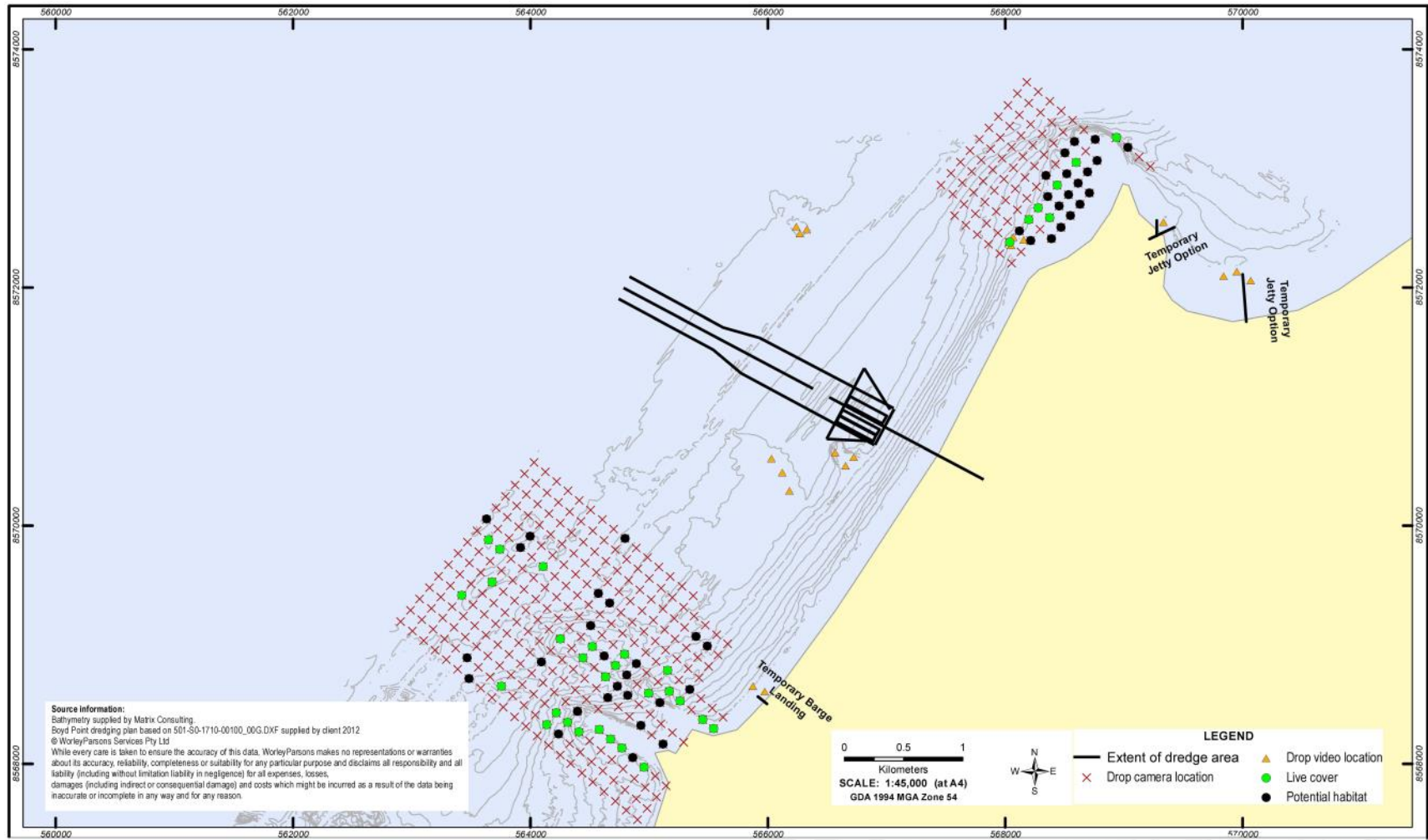
Table 4 Inshore Reef Areas and Extent of Dominant Benthic Assemblages

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	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). Refer Section 6.1.2 of the Queensland EIS (RTA 2011) 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.

Figure 6 Reefal habitat between Boyd Point and Pera Head¹



1 – Dredge Footprint displayed on map is for 2.6 million cubic metres

5 POTENTIAL IMPACTS

5.1 Turbidity Plume Generation

At the proposed Port site and the proposed new spoil ground, a turbid plume would eventuate as material is released to the water column during the dredging and disposal operation. The potential impacts of dredging and spoil disposal on water quality, through assessment of TSS concentration and sedimentation was achieved through utilisation of 3-dimensional numerical models of hydrodynamic and coastal processes (Worley Parsons 2013; in Commonwealth EIS (RTA 2013), Appendix 7-A).

The modelling for the proposed 2013 dredge campaign modelled the entire initial capital dredging campaign of 2.6 million cubic meters over 24 weeks. Modelling was completed for typical tide, wind and wave conditions, all of which was realistically varied in time and space, to coincide with those most likely to be experienced during the dry and transition (spring) seasons predicted to be encompassed during the dredging operation. Dredge plume modelling during extreme weather conditions, monsoonal activity and cyclones, was not considered necessary as dredging would not be undertaken under such conditions due to safety issues.

The details of the hydrodynamic, sediment plume and sedimentation modeling are presented in Worley Parsons (2013) in the Commonwealth EIS (RTA 2013), Appendix 7-A.

5.1.1 Proposed Port Area

Modelling completed for both scenarios indicate the turbid plume generated by the 2.6 million cubic metres demonstrate the similar dispersal and sedimentation patterns. 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). TSHD and CSD produced greater plumes than SHB indicating TSHD and CSD is the worst case scenario. This is expected with studies indicating plumes produced by TSHD are generally greater than other forms of dredging (Chevron 2014, SKM 2012, CEE 2012).

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.

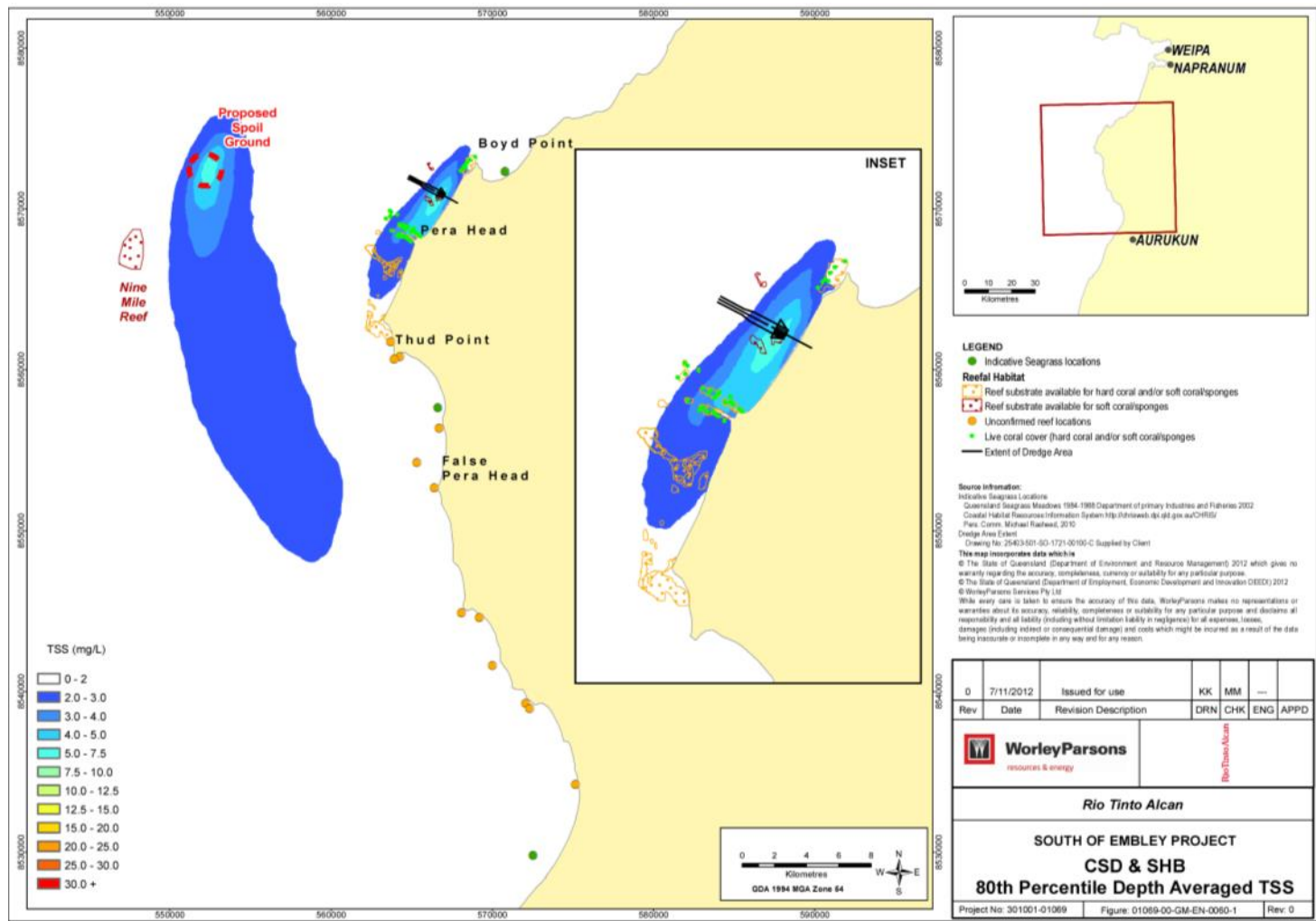
The modeling for the 2.6 million cubic meters dredging predicts that the 80th percentile of TSS above background at Boyd Point and Pera Head, over the entire dredge campaign, would be 2 and 3mg/L, respectively for the CSD and SHB case and 5 and 7.5mg/L, respectively for the CSD and TSHD case (**Figure 7** and **Figure 8**, respectively).

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 winds in this area.

Areas between Pera Head and Boyd Point are expected to experience the highest deposition rates under both dredging options for 2.6 million cubic meters, with rates outside of this area expected to be negligible compared to the background rates at Pera Head of 17mg/cm²/day and 63mg/cm²/day in the dry and wet seasons, respectively (**Figure 9** and **Figure 10**). The sedimentation is predicted to be lower under the CSD and SHB dredging option (**Figure 13**).

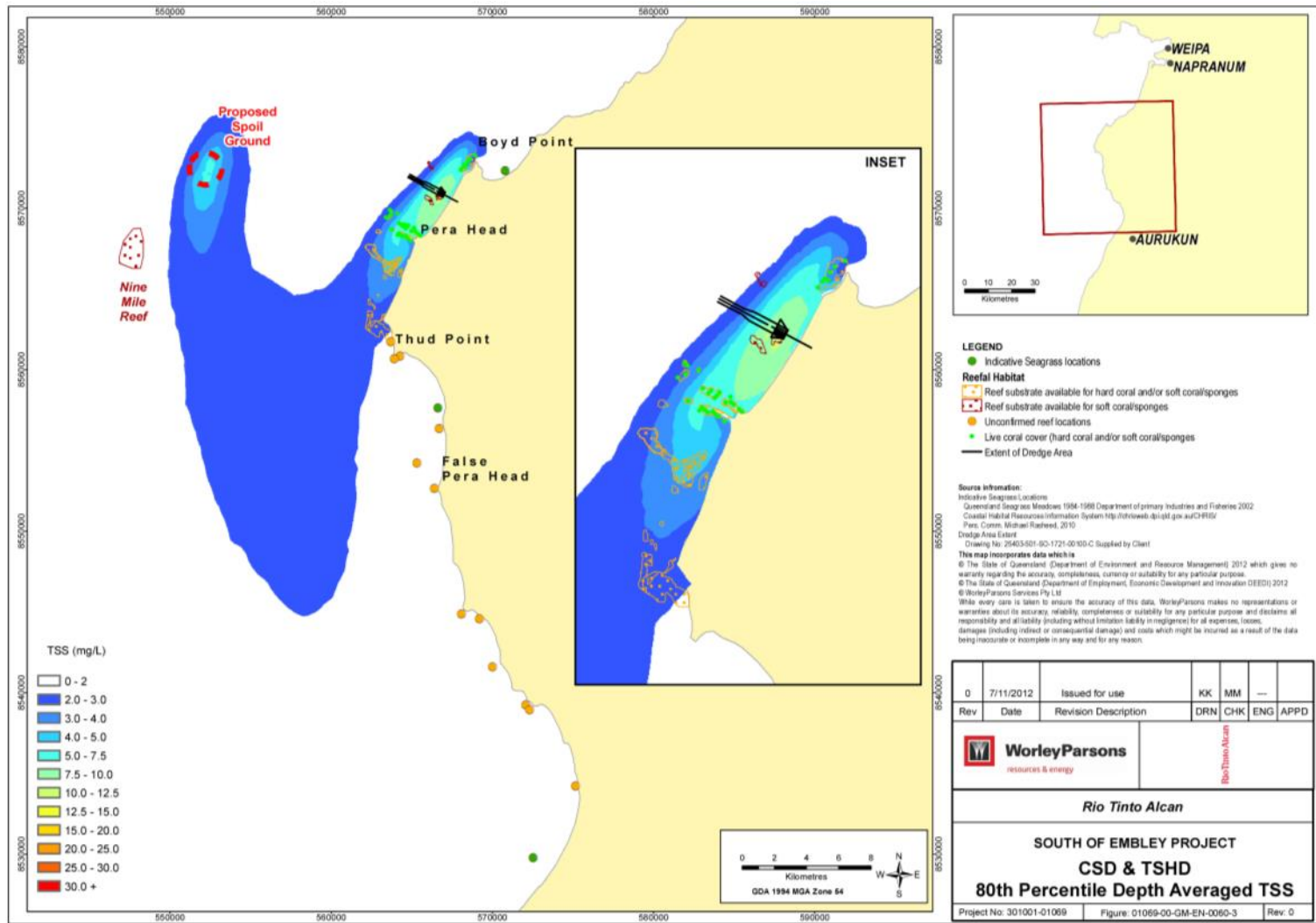
The 2.6 million cubic meters model predictions near the reef areas immediately offshore from Pera Head show the median above background deposition as less than 2.0mg/cm²/day under the CSD and TSHD case, and less than 0.8mg/cm²/day under the CSD and SHB case. The highest deposition rates, in excess of 7.5mg/cm²/day above background for the CSD and TSHD case, are in the immediate vicinity (within 500m) of the dredge footprint. The highest rate under the CSD and SHB case is 5.0mg/cm²/day.

Figure 7 CSD & SHB 80th Percentile Depth Averaged TSS²



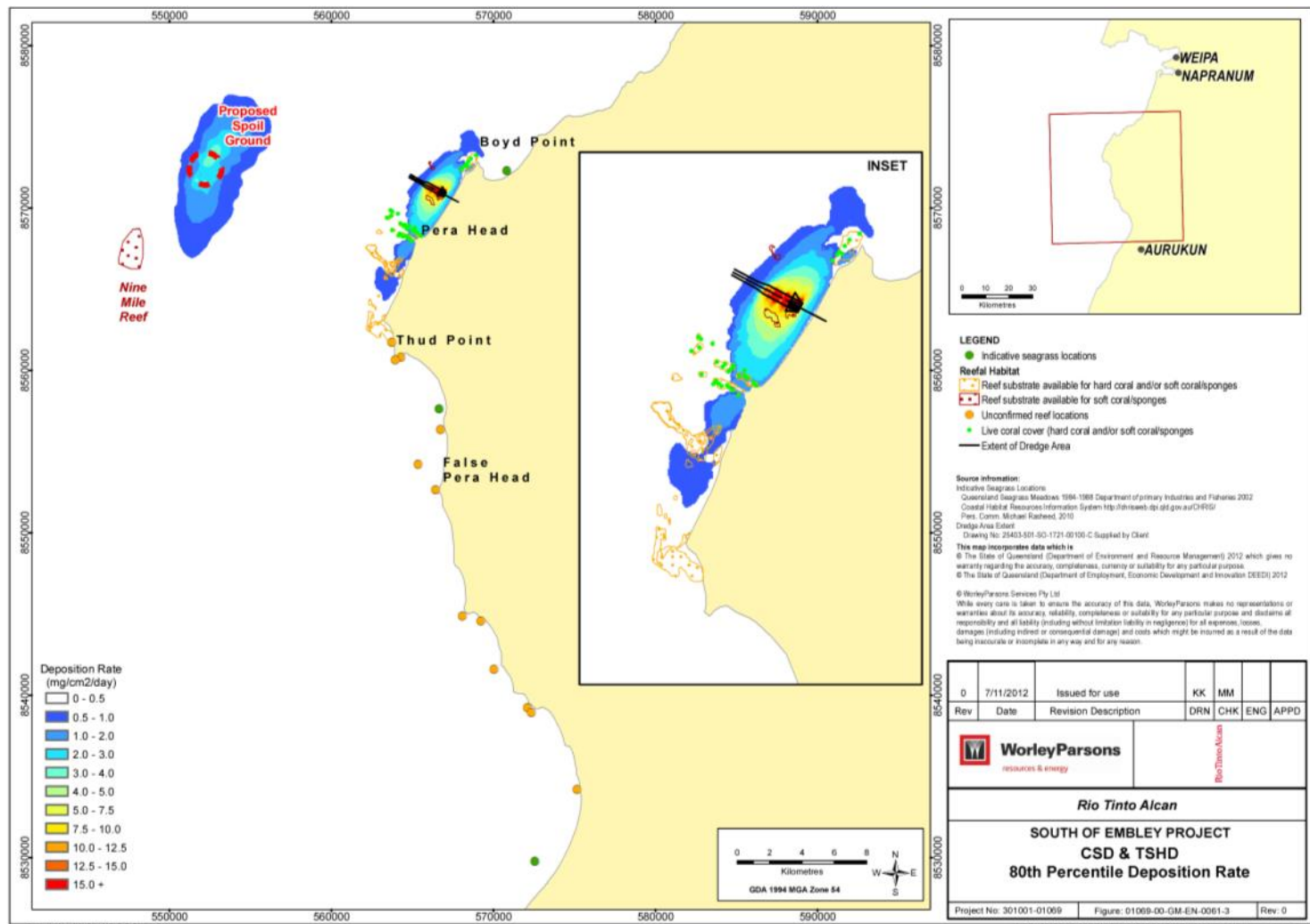
2 – Modelling presented is for 2.6 million cubic metres dredge campaign over 24 weeks

Figure 8 CSD & TSHD 80th Percentile Depth Averaged TSS²



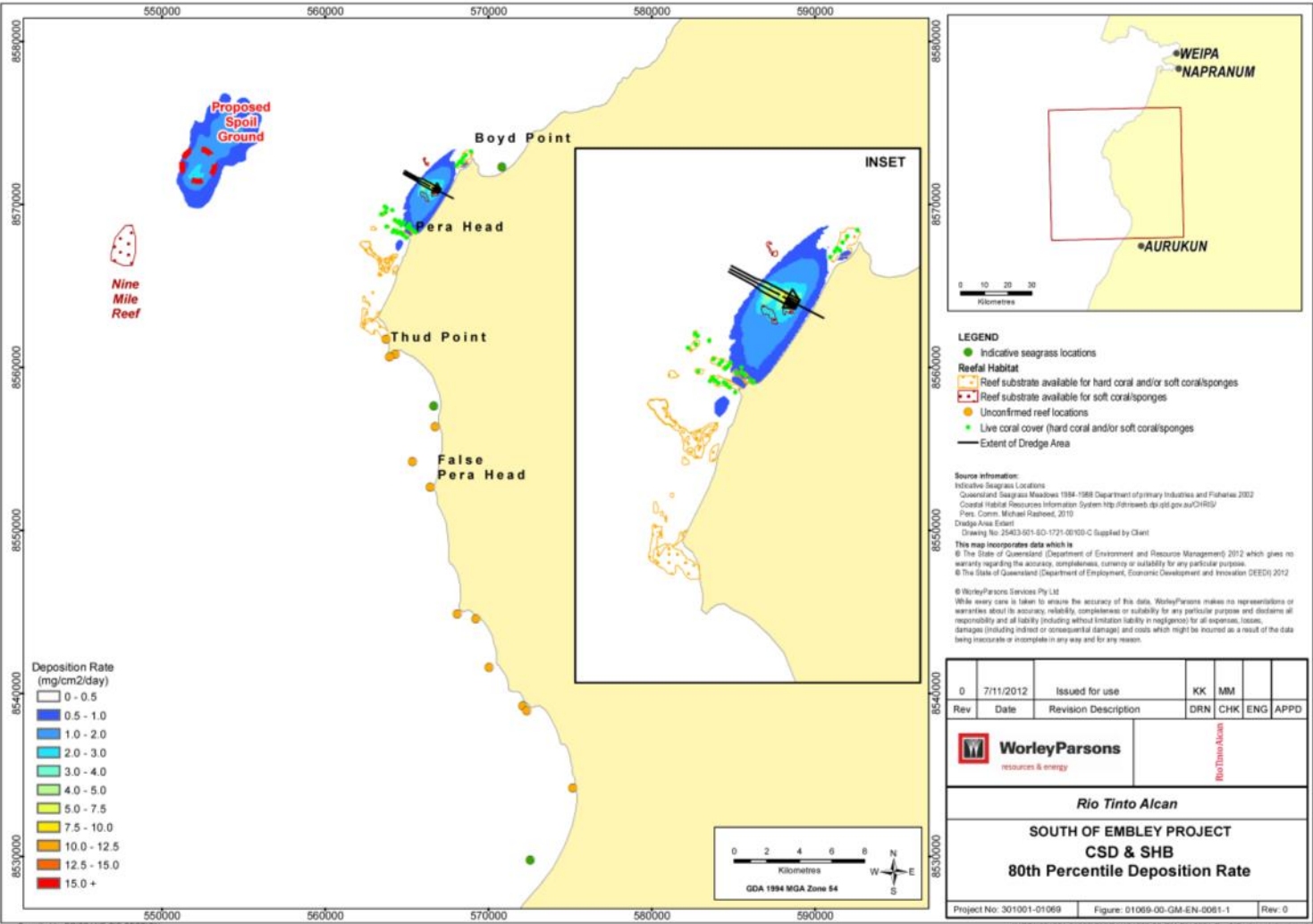
2 – Modelling presented is for 2.6 million cubic metres dredge campaign over 24 weeks

Figure 9 CSD & TSHD 80th Percentile Deposition Rate²



2 – Modelling presented is for 2.6 million cubic metres dredge campaign over 24 weeks

Figure 10 CSD & SHB 80th Percentile Deposition Rate²



2 – Modelling presented is for 2.6 million cubic metres dredge campaign over 24 weeks

5.1.2 Proposed New Spoil Ground

The dredge spoil disposal would result in smothering of benthic infauna within the proposed new spoil ground footprint. Modelling for the 2.6 million cubic metre dredge campaign indicate deposition rates above background (0.5 to 2mg/cm²/day) would not extend beyond 4km outside the proposed new spoil ground area for either disposal methodologies (**Figures 12 and 13**). 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/cm²/day and 31mg/cm²/day for dry and wet season, respectively. Further management and monitoring measures for the impacts from dredge and spoil disposal activities on coral assemblages are provided in **Section 6.2**.

5.2 Marine Megafauna and Significant Species

Section 6.6 of the Queensland EIS (RTA 2011), Section 6.3 of the Supplementary Report to the EIS (RTA 2012), and Sections 4, 7 and 9 of the Commonwealth EIS (RTA 2013) provides a detailed assessment of the threatened and migratory marine species that occur or potentially occur in the Project area. Further management and monitoring measures for the impacts to marine mammals and marine turtles are provided in **Section 6.4**.

A number of threatened and migratory species are transient and/or forage and/or nest in the proposed Port area (Commonwealth EIS (RTA 2013): Section 4.4.2.3, Table 4-5 and Table 7-7 details the likelihood of threatened species occurring in the Project area and Table 4-7 details likelihood of non-avian migratory species occurring. In summary:

- Dugongs occur along the Western Cape and may traverse coastal waters in the vicinity of the proposed Port while moving between seagrass meadows, albeit there are no seagrass meadows within the proposed Port footprint (Commonwealth EIS (RTA 2013): Section 9.4.1 and Table 9-9);
- Australian Snubfin and Indo-Pacific Humpback Dolphins occur in the vicinity of the proposed Port (Commonwealth EIS (RTA 2013): Sections 9.5.1.1 and 9.5.1.2, respectively; impacts in Section 9.6.1, Table 9-15; GHD 2015);
- Bryde's Whale may occur in the vicinity of the proposed port and other coastal areas, however there have been no recorded sightings in the area (Commonwealth EIS (RTA 2013): Section 9.5.1.3);
- Green Turtles may forage in the proposed Port area but prefer seagrass beds; no nesting reported in the area (Commonwealth EIS (RTA 2013): Section 7.3.2.1);
- Hawksbill Turtles may feed on reef areas at Boyd Point, Pera Head and between Pera Head and Thud Point. They are also known to nest on the beach in the vicinity of the proposed Port site (Commonwealth EIS (RTA 2013): Section 7.3.2.2);
- Flatback Turtles may forage in the shallow rocky reef areas and sedimentary habitats around the proposed Port and are known to nest on the beach between Boyd Point and Pera Head (Commonwealth EIS (RTA 2013): Section 7.3.2.3);
- Olive Ridley Turtles may forage in the shallow coastal unvegetated habitats around the proposed Port area, and may nest infrequently in the area (Commonwealth EIS (RTA 2013): Section 7.3.2.5);
- Leatherback Turtles may forage in the area but are principally oceanic (Commonwealth EIS (RTA 2013): Section 7.3.2.6); and,
- Loggerhead Turtles may be transient in the area and may forage in the reef areas (Commonwealth EIS (RTA 2013): Section 7.3.2.4).

Vessels and vessel movements associated with dredging could potentially impact these species by (1) vessel strike, (2) area avoidance, (3) turtle entrainment in dredge head and (4) marine pollution

1. *Vessel strike*. Collisions between marine fauna and vessels associated with dredging are unlikely to occur. While they are possible the likelihood of collision is influenced by factors such as location, species, vessel speed and depth (Todd *et al.* 2015). Vessels associated with dredging operations are likely to be moving at slower speeds and will occur in mostly deeper waters in the project area reducing the risk of vessel strike;
2. *Area avoidance*. Area avoidance is unlikely for any of the listed species with dredging operations unlikely to increase vessel traffic to levels high enough to result in area avoidance. All listed species have been previously recorded in busy ports throughout Australian waters;
3. *Turtle entrainment*. Turtle entrainment during dredging operations is unlikely to occur. While there is potential for entrainment when using a TSHD, management methods require dredge heads to be fitted with fauna exclusion devices. Exclusion devices have been found to be effective to minimise any impacts on turtles. No other dredge type to be used for the project are likely to result in entrainment (API 2010; Dickerson *et al.* 2004); and,
4. *Marine pollution*. It is unlikely marine pollution will impact marine fauna with thorough management methods required for all vessels operating on the project. Vessels must comply with all relevant legislation and the additional management methods outlined in this Plan.

The sediment plumes and/or sedimentation from the proposed Port initial capital dredging could potentially impact these species by causing: (1) avoidance of foraging areas, (2) loss of foraging habitat or (3) reduction in marine turtle nesting.

1. *Avoidance of foraging areas*: It is unlikely sediment plumes will impact marine fauna as modelled TSS rates immediately north and south are within background levels. Suspended sediment concentrations in the wet season are up to two orders of magnitude higher than those modelled for dredging activities. Sediment plumes from dredging and disposal are less significant than those generated from storms and strong winds, in which dolphins, marine turtles and dugong would normally swim. The species in question occur in naturally turbid environments and are not likely to be adversely affected by localised and short term increases in turbidity (DSD, 2010, Bayliss and Freeland, 1989; Marsh *et al.*, 2008).
2. *Loss of foraging habitat, in particular reef areas at Boyd Point, Pera Head and Thud Point*: Foraging habitat in these areas is unlikely to be impacted as the turbidity plumes in the immediate area are within natural turbidity levels for the area. Additionally the species found within the near shore areas are known to have high turbidity and sedimentation rate thresholds (Larcombe *et al.* 2001, Sofonia and Anthony, 2008; Erftemeijer *et al.* 2012). Impacts on reefs will be monitored through a coral monitoring program, however no impacts to significant species is expected.

The reef areas at Boyd Point and Pera Head have outcrops of hard substrate sparsely covered in algae, soft corals, sponges and hard corals. The estimated hard coral cover at Boyd Point and Pera Head was approximately 4% and 6%, respectively, of the estimated substrate available for reefal colonisation, 49ha and 72ha, respectively. The patchy hard coral communities are dominated by small to medium sized colonies of corals of the families Dendrophylliidae, Faviidae and Poritidae (refer Commonwealth EIS (RTA 2013): Section 7.2.3.1). The genera and species in these three families are typical of hard corals that grow in environments that experience extremes in turbidity and sedimentation (K. Anthony, pers comm; Erftemeijer *et al.*, 2012).

Corals have the ability to acclimatise to reduced light, which may result from elevated suspended solids, through changes in zooxanthellae and chlorophyll *a* concentrations (Philipp and Fabricius, 2003; Gilmour *et al.*, 2006) and/or shifts to heterotrophic mode of "feeding" (Anthony and Fabricius, 2000).

The coral species assemblages present at the proposed Port reef areas; the ambient background conditions, spatial and temporal turbidity, TSS and sedimentation; sediment plume and sedimentation modelling and literature data, strongly suggests the predicted

sediment plumes and sedimentation from both proposed dredge methodologies would have, at most, a minor impact on the reef areas at Boyd Point, Pera Head and Thud Point. It is therefore not expected that dredge plumes and sedimentation would result in the loss of foraging habitat.

The proposed Port dredge footprint would result in the loss of approximately 0.18km² (initial capital dredging) of sedimentary habitat. This is unvegetated habitat and constitutes approximately 0.01% of similar Western Cape York coastal sedimentary habitat and therefore would have a negligible impact on foraging by threatened or migratory species.

3. *Reduction in marine turtle nesting:* The beach area between Boyd Point and Pera Head is not considered a high density marine turtle nesting beach, with reports of 0.018 to 1.172 marine turtle tracks per kilometre per day (Guinea 2014) with peak nesting occurring from August to September. If initial capital dredging spans the marine turtle nesting season it is unlikely that sediment plumes from dredging would prevent marine turtles from coming ashore to nest on the beach between Boyd Point and Pera Head.

Altered light regimes from dredging operations would only eventuate during dredging campaigns, and so would be short term. Given the relatively low level of lighting required for dredging operations which occur offshore and the low to medium density of marine turtle nesting in the vicinity of initial capital dredging operations for the Port, the potential unmitigated impacts of lighting specifically related to the initial capital dredging activities would be negligible.

5.3 Marine Pests

Marine pest species may be introduced through the following mechanisms:

- use of vessels, including dredges, at the Port site as a result of hull fouling or ballast water; and/or,
- disposal of spoil material from initial capital dredging through pests originating in-situ or introduced by the dredger or other vessels.

No pest species are known to occur within the undisturbed footprint of the proposed Port or within the Port of Weipa area. Capital dredging for the proposed Port will require sourcing dredges from outside the local area which could potentially result in incursions of marine pests.

While no targeted marine pest surveys have been completed for the proposed Port, no marine pests are known to occur in the Port of Weipa area. Targeted marine pest surveys were completed at the Port of Weipa in 1999 with no marine pests identified during this survey (Hoedt et al 2001). Larval settlement plates have been used to monitor marine pests since 2000 at the Port of Weipa. The plates target the black striped mussel since its detection at the Port of Darwin in 1999 and 2000 and also the Asian green mussel since its detection in Cairns in 2006.

North Queensland Bulk Ports (NQBP) currently manages the Port of Weipa and carries out maintenance dredging and spoil disposal at the existing Albatross Bay spoil ground. No incursions of marine pests have been recorded using larval monitoring plates (NQBP, pers comms).

The introduction of marine pests could result in changes to the local biodiversity and foraging zones. To minimise the risk the Project requires all vessels to undergo a risk assessment process prior to mobilisation and marine pest monitoring will be incorporated in the Boyd Port area. The risk assessment process is outlined in Section 6.4.

5.4 Other Potential Marine Impacts

Fish Assemblages and Fisheries

Although fish species are able to move away from any local areas affected by a disturbance (e.g. dredging and dredge spoil deposition), physical disturbance to the dredge sites, deposition of spoil, and the re-suspension of disturbed and deposited sediment may have impacts of minor

magnitude on sharks and rays, including sawfishes, and bony fishes at the proposed Port facility and the proposed new spoil ground.

The Project area is included in the area where the Northern Prawn Fishery (NPF), the Gulf of Carpentaria Commercial Inshore Finfish Fishery and the Gulf of Carpentaria Commercial Line Fishery operate. Recreational fishers and guided fishing tour operators also utilise the Project area including the "Three Mile" recreational fishing area. There would be a temporary impact on fish assemblages in the vicinity of the Port and proposed new spoil ground due to turbidity generated by initial capital dredging and disposal of sediment, however following dredging activities, the impacts are anticipated to be minor (Section 6.9.4.5 of the Queensland EIS (RTA 2011)).

Underwater Noise

Dredging is at the lower end of the scale with regards to emitted sound pressure levels in aquatic environments (CEDA 2011 in Section 15.3.2 of RTA 2013). The main noise anticipated during dredging operations would be the noise from TSHD and CSD (CEDA, 2011).

It is unlikely that underwater noise from dredging operations would cause injury to cetaceans, based on the assessment of continuous noise impacts from Southall *et al.* (2007) (CEDA, 2011). Comparison of species hearing thresholds indicates that injury to other listed threatened estuarine and marine fauna and non-avian migratory species from dredging operations would be unlikely.

Underwater noise has the potential to impact listed threatened estuarine and marine fauna and non-avian migratory species feeding, transiting, or nesting (marine turtles) in the vicinity of initial capital dredging operations. There may be some behavioural responses for some species to avoid the area of dredging operations although this is expected only at close range to the source (Nedwell *et al.*, 2003). There is also a possibility that many species may become habituated to the noise and remain within the vicinity (Smolowitz and Weeks, 2006).

At the Port avoidance behaviour due to underwater noise from dredging could impact foraging or nesting behaviour of marine turtles in the immediate area.

Marine Pollution

Shipping activities associated with dredging have the potential to introduce marine pollution into the environment. Pollution has the potential to impact local marine flora and fauna. Management measures associated with Marine Pollution are outlined in Section 6.7.

Physical Disturbance

Dredging activities will result in direct physical disturbance of the seabed with removal of sediments and associated habitats. This is an unavoidable impact of dredging activities. Management measures for physical disturbance are outlined in Section 6.7

6 MANAGEMENT AND MONITORING

Dredging and spoil disposal would be undertaken in accordance with the conditions of the Queensland CG's Report (and any subsequent conditions imposed through the Environmental Authority and Development Approval), the Commonwealth Sea Dumping Permit and EPBC Act approval. RTA has established the Boyd Port Dredging Technical Advisory Group (BPDTAG) which includes representatives from the following organisations:

- RTA;
- DAF – Biosecurity;
- DAF – Fisheries;
- DEHP (QLD);
- DoE;
- MSQ;
- NQBP; and,
- WCCCA.

RTA will report to the BPDTAG on proposed dredging activities for the Port and implementation of the DMP(s), including monitoring results, management triggers and response actions. The group would assist in the establishment, where appropriate, of longer term management for the maintenance dredging program (which would be covered by a separate DMP).

RTA will submit plans for dredging activities, certified by a Registered Professional Engineer of Queensland, to EHP prior to commencement of dredging. Dredging activities will be confined to the removal of initial capital dredge material at the location shown on the plan(s). Prior to the commencement of initial capital dredging, hydrographic surveys of the bed levels of the area to be dredged will be completed.

Dredge spoil will not be disposed of into Queensland waters that are within the limits of the State, unless otherwise authorised. Dredge spoil material will not be disposed of into Australian waters, the sea or on land unless otherwise authorised. Dredging material will be disposed of in the approved disposal ground identified in the Sea Dumping Permit (SD2010/1762) obtained for the project.

Initial capital dredging activities will not start until provision has been made to lawfully place or dispose of the dredge spoil material. Evidence of applicable approvals would be made available to the regulatory authority on request. A Sea Dumping Permit, SD2010/1762, for disposal of dredge material has been granted until May 2017 (as per Variation approved 29 July 2015 by Department of the Environment) and operations will comply with permit requirements.

EHP will be advised in writing at least five (5) business days prior to the date of commencement of the initial capital dredging campaign and within ten (10) days following completion of the initial capital dredging campaign.

Initial capital dredging activities will be conducted using equipment that is in survey and registered and, in relation to environmental performance, is equal to or superior to the following equipment:

- TSHD that is equipped, at a minimum, with:
 - below keel discharge of tail waters via an anti-turbidity control ("green") valve;
 - systems for determining solids to water ratio or density of dredged material;
 - electronic positioning and depth control system for defining the location and depth of dredging activities; and,
 - dragheads capable of, and where appropriate, depth control and fitted with marine wildlife protection or fauna exclusion devices (e.g. turtle deflector, deflector plates, tickler chains on dredge heads) prior to and during operation.
- CSD that is equipped, at a minimum, with:

- electronic positioning and depth control system for defining the location and depth of dredging activities;
 - a system or process to ensure the delivery system integrity is maintained at all times;
 - systems for determining solids to water ratio or density of dredged material during operations; and,
 - cutter heads with depth control and where appropriate or required fitted with marine wildlife protection or fauna exclusion devices prior to and during operation.
- Grab or Backhoe Dredger that is equipped, as a minimum, with:
 - electronic positioning system for defining the location and depth of dredging activities.

RTA would:

- install all measures, plant and equipment necessary to ensure compliance with the conditions of relevant approvals;
- maintain and calibrate such measures, plant and equipment in an efficient condition and keep records of the maintenance; and,
- operate such measures, plant and equipment in an efficient manner.

All persons engaged in conducting initial capital dredging activities including but not limited to employees and contract staff would be:

- trained in the procedures and practices necessary to:
 - comply with the conditions of the relevant regulatory approvals ; and,
 - prevent environmental harm during normal operation and emergencies, or,
- under the close supervision of a trained person.

6.1 Water Quality

Background

The generation of dredge-induced turbidity plumes generally results from the suspension of fine sedimentary material during dredging and spoil disposal activities. High levels of turbidity limit the light available to light dependent communities, including coral assemblages. If increased turbidity is of sufficient intensity, duration and/or frequency, the tolerance levels of coral assemblages may be exceeded, resulting in stress and/or mortality. Coral species at the proposed Port reef areas are predicted to show high levels of tolerance to high and variable suspended solids and sedimentation rates (refer **Section 5.2**).

In order to manage any potential impacts a water quality and coral health monitoring program has been designed and will be implemented during dredging and disposal activities.

6.1.1 Management Measures

A range of measures will be implemented to manage water quality and impacts to coral assemblages, these measures are outlined below.

General Management Measures

In carrying out the activity, initial capital dredging will:

- only occur in the permitted areas specified on approved plans;
- only dredge sediment suitable for unconfined ocean disposal when assessed in accordance with the National Assessment Guidelines for Dredging;
- not be conducted in unsuitable conditions (eg storm surges)
- not produce any slick or other visible evidence of oil or grease, nor contain visible floating oil, grease, scum, litter or other objectionable matter; and,

- be carried out taking all practical measures necessary to minimise the concentration of suspended solids released during the loading and pump-out of the vessel.

The following mitigation measures would be implemented to reduce the impacts on water quality related to the creation of a turbidity plume from dredging and offshore spoil disposal activities:

- mechanical devices, such as turbidity-reducing valves in the overflow on the TSHD would be used;
- hopper doors would be kept in good condition to minimise loss of sediment during transport;
- the TSHD would be equipped with below keel discharge of tail waters via an anti-turbidity control ("green") valve;
- operator of the backhoe dredge would be aware at all times and operate the bucket to minimise sediment loss throughout the water column;
- track plots would be provided by the dredging company to demonstrate that no dredging occurs outside the designated areas;
- accurate positioning systems would be used on dredges to ensure direct impacts are restricted to the approved dredging areas;
- accurate positioning of vessels to ensure disposal of spoil is within the footprint of the proposed new spoil ground;
- safest and shortest sailing routes to and from the proposed new spoil ground would be selected to minimise the impact of propeller wash;
- current and forecasted meteorological and oceanographic information, water quality and coral health data would be considered in the daily work plan; and,
- the transportation of dredge material would be carried out such that the dredge material is kept wet at all times.

Adaptive Management Measures

The following management measures would be considered for initial capital dredge and spoil disposal operations. The measures implemented would be contingent on the level of Management Trigger exceedance and would be selected based on the outcome into the investigation of the exceedance in a process shown in **Figure 12**

Dredge-specific Management Measures

Water quality monitoring will be conducted using telemetered loggers measuring turbidity, and compared against turbidity trigger levels for the Zones of Concern. Any exceedance of the trigger levels would trigger the implementation of the Water Quality Management process, including investigation into the cause and adaptive management. The Zones of Concern are the areas predicted to have sediment plumes with TSS >2mg/L above background TSS as shown in **Figures 10, 11 and 18**.

Adaptive management measures would be implemented as required depending on the level of impact and may include:

- moving the dredge operations and vessels to other areas within the development footprint to reduce potential impacts on the affected corals;
- reducing or ceasing overflow during periods when the dredge plume is considered likely to lead to further impacts; or,
- reducing dredging activities from 24 hours a day to a period timed to reduce impacts (e.g. to 12 hours/day or night).

Spoil Ground-specific Management Measures

Optimisation of the disposal location based on meteorological and ocean conditions.

6.1.2 Water Quality Monitoring

A water quality monitoring program has been developed to monitor the impacts of dredging on local water quality. The monitoring program includes baseline and dredging program (includes pre-dredging, during dredging and post dredge monitoring).

The objective of the water quality monitoring program is to provide continuous water quality data to assist in the management of initial capital dredging and spoil disposal activities. Water quality data at concern and reference sites would be collected to:

- monitor the spatial extent of turbidity in relation to predicted plumes;
- adaptively manage the risk of impacts to coral in the Zones of Concern from increases in turbidity;
- provide “early warning indicator” of potential impacts on coral health; and,
- validate the appropriateness of coral health Reference Sites. Water quality monitoring will confirm they have not been impacted by increased turbidity or sediment deposition from dredging and spoil disposal activities.

Baseline Monitoring

Prior to the commencement of initial capital dredging and spoil disposal activities baseline monitoring will be conducted for six months. This data will be used to finalise the season specific trigger levels for the wet and dry seasons. In wet-dry tropical areas such as Weipa that are influenced by strong seasonal events, separate trigger levels for the wet and dry seasons are required (ANZECC/ARMCANZ, 2000).

It is proposed to monitor turbidity at key habitats during initial capital dredging and spoil disposal activities and the monitoring sites have been chosen based on sediment plume modelling and baseline data collected previously. The proposed sites are shown in **Figure 11**.

Concern sites would be established at four sites: Boyd Point (I1), Pera Head (I2), reefal area between Pera Head and Thud Point (I3) and Thud Point (I4). These sites are within the potential Zone of Concern as identified from the plume modelling (**Figure 7** and **Figure 8**). Reference sites would be located outside the Zone of Concern, north of Boyd Point (R1) and at False Pera Head (R2) approximately 11km south of Thud Point. A third reference site would be located immediately north-north-east of Nine Mile Reef (R3).

Baseline water quality monitoring will be completed at these locations using telemetered loggers. Loggers will measure turbidity (all sites), PAR (concern sites) and sedimentation rates (concern sites) with readings logged at 15 minute intervals and updated daily. Data will be transferred at least once daily after which data will be quality controlled to remove unreliable data. The loggers will act as dumb logger should the telemetry system fail with data record internally for download on retrieval.

Water Quality Trigger Levels

Water quality within the Zones of Concern is predicted, by 3-D dredge plume modelling, to remain within acceptable limits for coastal turbid-zone reefs (220 mg/L TSS). Modelling predicts the 80th percentile to record a maximum TSS of 15 mg/L within the Port footprint. Consequently, no net loss of coral is anticipated within these Zones.

While no net loss is anticipated site specific trigger levels must be established for the site. When developing the trigger levels a number of factors were considered, including:

- comparable dredging program – impacts from dredging projects in tropical and subtropical Australia that were comparable in length or volume were examined (Ports Australia, 2014). Similar or larger programs include projects completed in Gladstone and Port Hedland utilised percentiles and rolling medians to determine the trigger values. Both programs use a tiered management approach with initial management actions for both programs using the 80th percentile for internal notification and the 95th percentile as the initial external trigger level.

- water quality trigger methods – review of successful dredging programs and the trigger levels applied. As per the EA, intensity, duration and frequency should be considered when developing trigger levels. The western basin dredging and disposal is a Queensland project where this framework was used successfully using internal and external alert levels based on percentiles trigger levels. However, this was a significantly larger dredge program by several orders of magnitude (Aurecon 2013).
- sensitivity of local habitats – identification of local sensitive habitats and review of existing data to determine turbidity levels that these species can live within (Section 4.3); and
- other stressors –
 - *other anthropogenic impacts* in the area will be limited to runoff associated with land based construction activities. These will be managed on site to minimise any negative impacts on water quality. No other developments occur in the area; and
 - *adverse weather* such as cyclones and monsoonal activities is expected to have the largest influence on local water quality. Dredging will not occur during these times.

Site specific trigger levels will establish internal alert levels and external trigger levels reporting requirements for the program. These alert levels will be based on the 80th (internal alert) and 95th (external trigger level) percentiles with levels determined for both the wet and dry season. The use of dry and wet season trigger levels is considered good practice (SKM 2013) and has been used extensively for dredging programs around Australia.

The 80th percentile and 95th percentiles will be determined using telemetered data collected for the site during the wet and dry season. Table 5 presents the draft trigger levels developed using data collected using telemetry loggers during the Wet (December 2006 to March 2007; December 2007 to March 2008; February to May 2012) and Dry (April to July 2007; June to August 2010) seasons. As identified above more recent data will be collected six months prior to dredging (2015-2016) this data will be used to finalise the trigger levels prior to dredging.

Table 5 Draft Initial Boyd Port Capital Dredge Monitoring: Water Quality Trigger Levels

Monitoring Location	Quality Characteristic	Unit	Internal Alert Level		Trigger Level		Frequency
			Wet Season	Dry Season	Wet Season	Dry Season	
Concern Sites*	Turbidity (NTUe) ¹	NTUe	7.7	6.1	23.8	14.3	Continuous, Telemetered, Logged at 15 minute intervals

*Sites I1, I2, I3 and I4 in Figure 12.

Dredge Monitoring: Water Quality Monitoring Method

Telemetered water quality loggers would be deployed at each of the concern and reference sites (**Figure 11**). The telemetered loggers will be equipped with turbidity (NTU) sensors and have remote data transfer capabilities. Readings will be recorded at 15 minute intervals and uploaded at least daily. Data would be digitally logged in the unit and then transmitted using satellite telemetry to base station receivers for storage, display and analysis.

¹ Note draft trigger levels are in NTUe actual trigger values used for the project will be in NTU.

The telemetered loggers would provide as close as reasonably practicable “real-time” water quality data during dredging and spoil disposal activities. The monitoring would capture the spatial extent of the dredge and spoil disposal plumes in relation to coral communities located north and south of initial capital dredging activities and Nine Mile Reef, south-west of the proposed new spoil ground.

The spatial extent of the dredge plume will also be monitored daily using MODIS imagery. Water quality monitoring logger sites that are likely being impacted by the dredge plume based on the imagery will be noted daily. This data will assist in determining whether exceedances are likely to be naturally driven or caused by dredging activities. It is important to note that while MODIS imagery is provided twice daily this is weather dependent and may not always be useable, no other imagery will be sought in the event this occurs. **Data Analysis and Interpretation**

Water quality (turbidity) data collected from the telemetered loggers would be analysed daily against the turbidity trigger levels set for the Zones of Concern to provide early warning of potential coral impacts associated with initial capital dredging and/or spoil disposal plumes.

- Internal Alert Levels – An Internal Alert would be triggered if the Alert level was exceeded by the five day rolling average of the daily medians for each site on three consecutive days. An investigation to determine if the impact is dredging related, whether turbidity rates are likely to continue and identify if methods or location should change to minimise impacts.
- Exceedance External Trigger Level - It is proposed that a five day rolling average of the daily medians at each of the influence and reference sites would be compared to the corresponding turbidity trigger levels and would be reported on a site-by-site basis. If trigger levels are exceeded on three consecutive days the Water Quality Management Process is triggered (Figure 12).

In the event of an exceedance(s) of the turbidity trigger levels, an analysis of the available information would be required to establish the likelihood that the decline in water quality is due to initial capital dredging and spoil disposal activities rather than other causes.

This would include an assessment of the following factors:

- correct data logger operation;
- data analysis/entry correct;
- QA/QC procedures followed;
- assess location of dredging and/or spoil disposal activities in relation to affected site(s);
- extent of the visible dredge plume in relation to the affected site(s) using MODIS imagery;
- meteorological and ocean conditions preceding and during the exceedance(s) (e.g. wind, tide, wave and swell state);
- effects of extreme weather events in the region (e.g. storms, cyclones);
- number and spatial extent of affected site(s); and,
- exceedance(s) were consistent with turbidity at reference sites.

Figure 11 Water Quality Logger and Coral Monitoring Locations

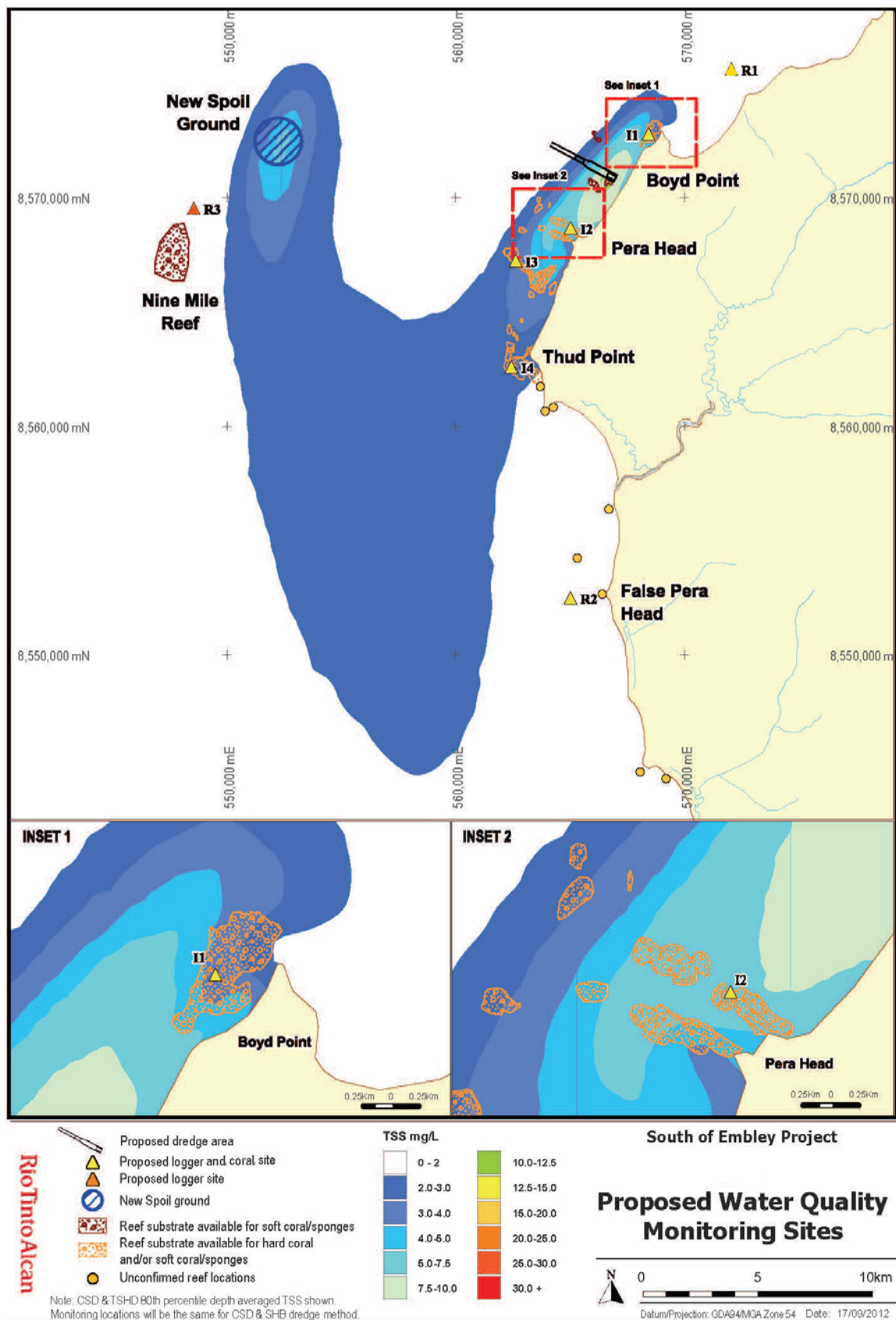
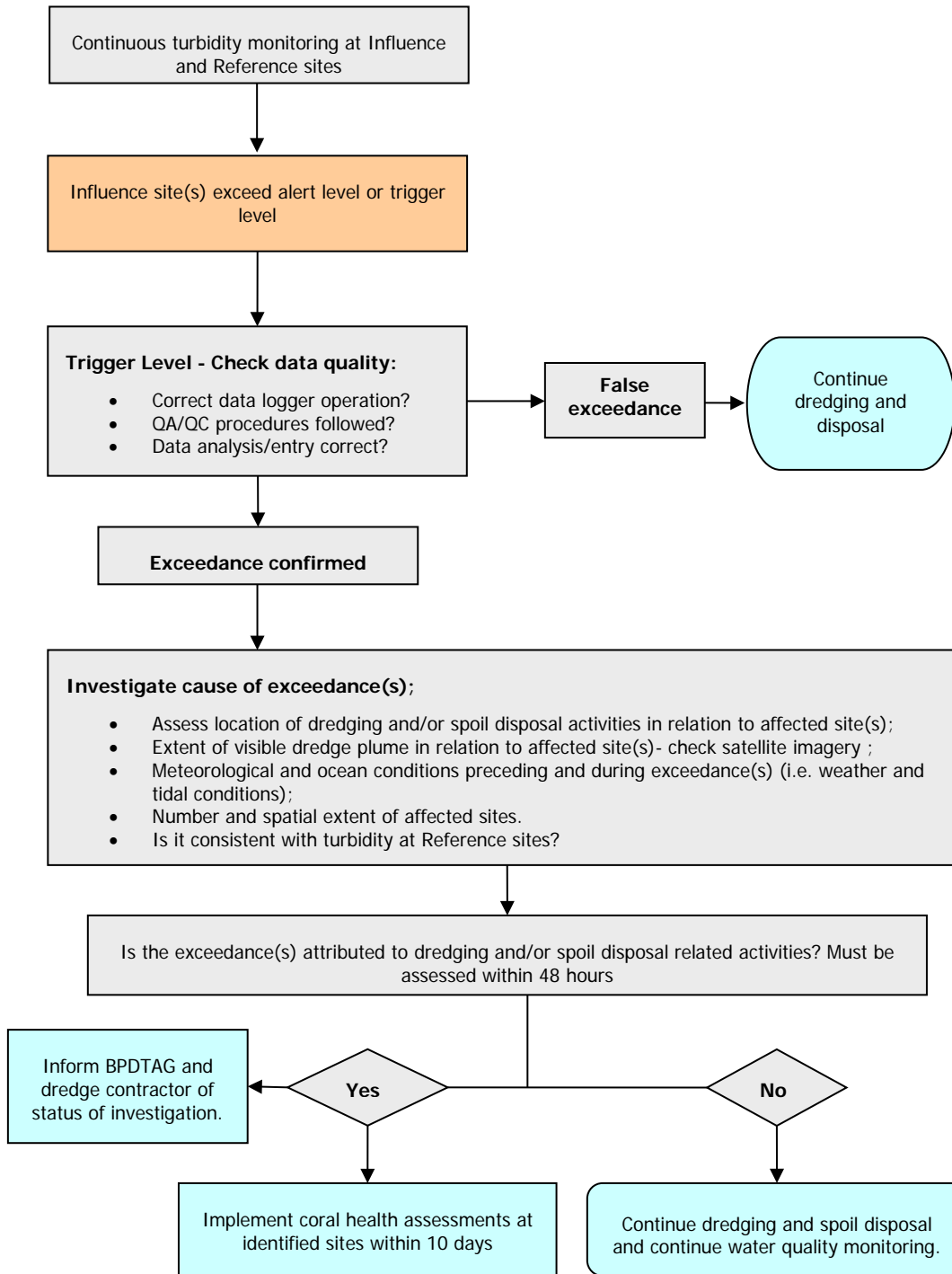


Figure 12 Water Quality (Turbidity) Management Process



If turbidity trigger levels are exceeded at one or more of the telemetered water quality loggers and there are no likely alternative explanations for the exceedance other than initial capital dredging and spoil disposal activities, targeted coral health monitoring would be triggered.

Note that during the course of initial capital dredging and spoil disposal activities, an adaptive management process would be adopted and the process for investigation of exceedances would be updated through experience and lessons learned.

Quality Assurance/Quality Control (QA/QC)

Standard Operating Procedures and Quality Assurance/Quality Control (QA/QC) Protocols for monitoring methods, site and field instrument maintenance and data capture, analysis and interpretation will be implemented and include:

- training for personnel;
- pre-deployment and deployment checks of loggers;
- regular servicing and calibration checks for loggers;
- protocols for field data checks of loggers;
- protocols for the download of data and raw data filtering and correction; and,
- protocols for data management, data security and data audit.

Due to the potential for biofouling in tropical coastal waters, the telemetered systems will be serviced at approximately four weekly intervals, which would include preventative maintenance and calibration. Turbidity data, and samples for total suspended solids, will be collected during servicing of each telemetered system to validate the state of calibration.

If there is evidence of significant loss of data during initial capital dredging operations the system would be checked within seven days and if necessary replaced.

In the event of the failure of a telemetered logger, boat based *in situ* monitoring will be conducted until the logger is repaired or replaced.

6.2 Coral Health

The coral health monitoring program has been designed to provide a quantitative measure of coral health (percent bleaching and/or mortality) which can be assessed against management triggers as shown in the Coral Health Management Process (**Figure 10**).

The coral health monitoring program is designed to identify and measure changes in coral health that are attributable to initial capital dredging and spoil disposal activities and that are greater than changes occurring naturally in corals at the reference Sites.

Proposed Monitoring Sites

The locations of the coral health influence and reference sites would be coincident with the telemetered water quality sites (**Figure 11**), or as close as practically possible. Concern sites will be established at four sites: Boyd Point (I1), Pera Head (I2), reefal area between Pera Head and Thud Point (I3) and Thud Point (I4). Reference locations will be established outside the Zone of Concern North of Boyd Port (R1) and False Pera Head (R2). The reference site would be used to assess natural changes in coral health during the initial capital dredging and spoil disposal program.

Investigative surveys will be completed at both reference locations prior to the baseline surveys to confirm suitability. Additionally prior to the baseline surveys statistical analysis will be completed to confirm the number of reference locations and sample size are adequate, otherwise additional reference location(s) will be added if necessary.

Monitoring Frequency

Monitoring will be conducted pre-dredging to establish transects at each site. During initial capital dredging, coral monitoring would be conducted at approximately six weekly intervals.

If the turbidity trigger levels are exceeded at telemetered concern water quality sites and the exceedance is attributable to initial capital dredging and/or spoil disposal activities a program of targeted coral health monitoring would be triggered (refer **Figure 13**). Sites to be targeted for monitoring would depend on the spatial pattern of any exceedance of the turbidity trigger levels, the trajectory of the turbidity plume and the forecast meteorological and ocean conditions.

Targeted coral health monitoring will occur at sites that experience water quality exceedances which are attributable to dredging activities or those based on the plume trajectory and water quality data are likely to experience exceedances. For all events monitoring will be completed at the reference locations to assist in determining the cause of variability. The targeted monitoring program would include the reference site, as well as sites in the area determined to be at risk from the water quality exceedance.

To allow for lag effects on coral health, monitoring is required post dredging to enable assessment against Coral Health Management Triggers after dredging ceases. It is proposed to conduct monitoring one and two months post-dredging in the initial capital program.

Coral Monitoring Procedures

Coral health monitoring would be undertaken using Remote Operated Vehicles (ROV) and/or towed video and/or drop cameras at reference sites and concern sites. Reference sites lie outside the Zone of Concern and concern sites lie entirely within the Zone of Concern as defined by the modelling results. These diver-less methods are required due to a range of OH&S issues identified by RTA, including, presence of Estuarine Crocodiles, low visibility and the remote nature of the site.

Initial baseline surveys would include the establishment of survey transects at concern and reference sites and an assessment of the statistical power of the methodology. Concern and reference sites are shown in **Figure 11**. It is expected that changes of approximately 15% can be detected with high power.

Proposed monitoring sites would be surveyed initially using a ROV or towed video to select locations with higher coral cover to establish transects. Four transects of approximately 30m would be established at each site. Each transect would be marked with start and end buoy; however the accuracy of the ROV and towed video (+/- 1-2m) means these are not truly fixed transects.

Quality Assurance/Quality Control (QA/QC)

Standard Operating Procedures and QA/QC protocols for monitoring methods, site maintenance, and data capture, analysis and interpretation would be implemented. This would include:

- training for personnel prior to mobilisation for field surveys to ensure that stringent methods are employed for towed video and/or ROV field work;
- trained scientist on board each survey vessel to oversee data collection and QA/QC collected images;
- regular maintenance of sites, re-establishing transect buoys as necessary;
- procedures to ensure consistency in collection of imagery and quality of imagery; and
- protocols for data management, data security and data audit.

Data Analysis and Interpretation

Coral health would be assessed by analysis of imagery from the ROV and/or towed video. Quantitative processing of imagery would be conducted using coral point count (CPCe) or similar analysis methods, by image analysts with experience in scoring coral health, with frequent cross-referencing and testing to ensure consistent classification.

Interpretation of data would include testing for a change between the “before dredging” and “during dredging” periods at Zones of Concern, and reference sites over the same period.

The proposed methodology will allow adequate an appropriate level of statistical detection. The final number of stills and counts per still will be established during the pre-dredging monitoring to enable statistical detection based on coral cover.

Management Trigger Levels

Coral health data would be assessed against the following Management Triggers at the Zones of Concern:

Level 1: Detectable adverse change in health of coral assemblages directly attributable to dredging operations with change greater than 15%

Level 2: Detectable net mortality of coral directly attributable to dredging operations greater than 10%.

Key indicators of changes in coral health would include, bleaching, mucus production and/or sediment deposition.

Coral Health Monitoring

Where the exceedance of the turbidity trigger level is determined to be likely to be attributable to dredging and/or spoil disposal activities, coral health monitoring would be carried out at identified sites and reference sites. Where available, satellite imagery will be used to understand the extent of the dredge and disposal plumes, to support decisions on the location of potential impacts, and identify the reference sites to be monitored.

The implementation of a targeted coral health monitoring effort in areas where exceedances are detected would allow for sufficient spatial resolution to characterise any changes in coral health.

Timing for the implementation of targeted coral health monitoring is shown in **Table 6**.

Table 6 **Schedule for Implementation of Targeted Coral Health Monitoring**

Timing	Activity
0 to 48 hours	Determine whether exceedance of the turbidity trigger was likely to be attributable to dredging and/or spoil disposal activities and whether targeted coral health monitoring should be implemented (as per Figure 14)
3 to 10 days	Implement targeted coral health monitoring at identified sites if there are no likely alternative explanations for the exceedance other than dredging and/or spoil disposal activities. If the exceedance is significant and ongoing, targeted coral health monitoring would be implemented more rapidly, where practicable
>10 days	Conduct a further coral health monitoring survey approximately two weeks after the targeted coral health monitoring.

6.2.1 Coral Health Response Procedure

Adaptive Management

In the event of an exceedance of a Coral Health Management Trigger, Level 1 or Level 2, the coral health management process as presented in **Figure 13** would be implemented. This procedure includes the investigative approach to determine the likely cause of exceedance. As noted for the water quality management process an adaptive management approach would be adopted such that during the course of the dredging and spoil disposal activities, the process for investigation of exceedances may be updated through experience and lessons learned. Adaptive management would be implemented based on the two coral health trigger levels. Where an identified exceedance is attributed to initial capital dredging and/or spoil disposal activities, the following actions would be implemented for each trigger level:

Level 1

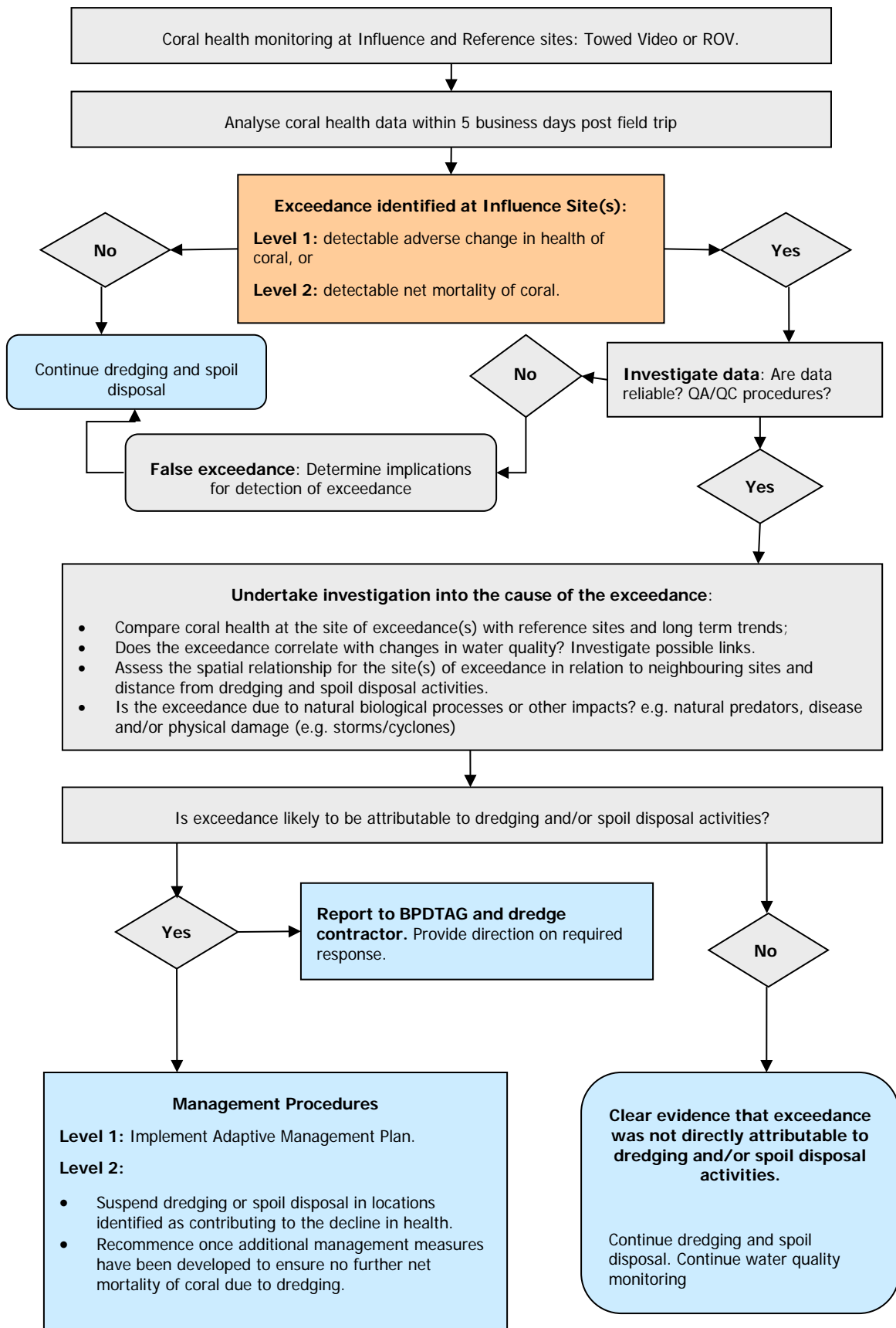
- inform the BPD TAG and dredge contractor of the adverse change in coral health;
- undertake further investigations into the cause of the exceedance; and,
- identify potential management measures to be implemented if further adverse coral health identified.

Level 2

In the event that net mortality of coral is identified at Zones of Concern as a result of initial capital dredging and/or spoil disposal activities the following management procedure would be implemented:

- notify BPD TAG and dredge contractor and suspend dredging and/or spoil disposal activities in locations identified as contributing to the coral mortality within 48 hours;
- implement management measures to ensure no further net mortality of coral due to dredging and/or dredge spoil disposal activities;
- undertake further investigations into the cause of the exceedance, including:
 - identifying the dredging and/or spoil disposal activities and meteorological and ocean conditions that caused the exceedance;
 - the results of the most recent coral health monitoring for all influence and reference sites; and,
 - the results of the most recent water quality monitoring at influence and reference sites.
- dredging and/or spoil disposal activities would recommence once management measures have been implemented and turbidity trigger levels are met at the impacted sites.

Figure 13 Coral Health Management Process



Management Measures

The management measures that may be implemented should initial capital dredging and/or spoil disposal activities result in coral health triggers being exceeded would depend on the extent and nature of the impact and location of the impacted site(s).

Adaptive management measures would be implemented as required depending on the level of impact and may include:

- moving the dredge operations and vessels to other areas within the development footprint to reduce potential impacts on the affected corals;
- reducing or ceasing overflow during periods when the dredge plume is considered likely to lead to further impacts;
- reducing dredging activities from 24 hours a day to a period timed to reduce impacts (e.g. to 12 hours/day or night); or,
- temporary cessation in dredging activities in areas contributing to decline in coral health.

6.3 Marine Mammals and Turtles

Background

The marine fauna of potential concern during initial capital dredging and spoil disposal activities are marine turtles and migratory species including the Indo-Pacific Humpback Dolphin (*Sousa chinensis*), Australian Snub-fin Dolphin (*Orcaella heinsohni*), Bryde's Whale (*Balaenoptera edeni*) and Dugong (*Dugong Dugon*). An assessment of "significance of impact" for threatened and migratory fauna likely or known to occur in the Project area is detailed in Section 6.9.5 of the Commonwealth EIS (RTA 2013).

The objective of the marine mammal and marine turtle management program is to detect and minimise any avoidable impacts to marine mammals and marine turtles resulting from initial capital dredging and spoil disposal activities.

Management Measures

Section 6 of the Queensland EIS (RTA 2011) and Sections 7 and 9 of the Commonwealth EIS (RTA 2013) provides details of potential impacts on threatened and migratory marine species and proposed management measures. The following are the range of management measures for identified potential impacts on marine mammals and marine turtles which would be implemented for initial capital dredging and spoil disposal following the processes shown in **Figure 14** and **Figure 15** respectively:

6.3.1 Disturbance from vessel activities (boat strikes turtle capture)

- the TSHD would have dragheads with depth control, and where appropriate, fitted with marine wildlife protection or fauna exclusion devices (e.g. turtle deflector, deflector plates, tickler chains on dragheads prior to and during operation). Evidence that this device has been installed and used on the dredger for the entire period of dredging activity would be provided to the administering authority on request;
- prior to the commencement of initial capital dredging and spoil disposal activities, selected crew from the dredge and barge vessel(s) would be trained as Marine Fauna Observers (MFOs) in marine turtle and marine mammal behaviour and the actions to be taken in the event of marine fauna sightings, injury or mortality;
- during daylight hours, operators of specified vessels would be required to maintain a MFO on watch during dredging operations;
- a log would be maintained on dredge and barge vessels detailing marine mammal and marine turtle sightings during operation;
- mobile dredging operations:

- must not commence if Dugongs, marine turtles, or cetaceans are observed within 300 metres of the dredge; and,
- 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; and,
 - must cease if Dugongs, marine turtles or cetaceans are observed within 50 metres of the dredge head.
- spoil disposal operations:
 - must not commence if Dugongs, marine turtles, or cetaceans are observed within 300 metres of the barge prior immediately prior to disposal
- marine turtle monitoring would 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; and,
 - if monitoring indicates that more than two marine turtles are killed within a 24 hour period as a result of dredging, the dredge would relocate from the area until an incident investigation has been carried out and relevant preventative actions implemented;
- operating procedures that minimise the risk of marine turtle capture by the dredge head, and the risk from all activities of injury to marine species of conservation significance, would be developed prior to the commencement of dredging activities; and,
- EHP is to be immediately notified of any marine turtle captures by the dredge or injury to any marine species of conservation significance.
- all dredging vessels will be contractually required to comply with applicable parts of
 - AMSA Marine Notice 12/2011;
 - Division 8.1 of the EPBC Regulations 2000 regarding vessel interactions with cetaceans; and,
 - the requirements of this Plan.
- vessels will be required to maintain a lookout for marine fauna when underway, and when these species or other marine fauna are sighted to consider reducing the vessel's speed or making safe course corrections consistent with Division 8.1 of the EPBC Regulations 2000;
- in accordance with Condition 6f of the EPBC approval, vessel speed will be restricted to a maximum of 6 knots in water depths less than 2.5m;
- vessels will follow established transit lanes;
- marine fauna observers will observe for dead or injured fauna around the dredge vessel and check the TSHD hopper and drag heads.
- any injury or death of marine turtle, dugong, dolphin or whale will be reported to the DEHP-designated marine stranding hotline through the RSPCA Queensland on 1300 ANIMAL. A Queensland Parks and Wildlife Service officer will then be contacted to determine the relevant response. Any stranding or incident that may be attributable to Project dredging activities will be investigated in cooperation with the relevant authorities to determine appropriate corrective action as part of adaptive management; and,
- All injuries of protected species will be made to the necessary contact within DoE. Notification to DoE for cetacean death or injury within seven days of resulted activity (1800 803 732 or protected.species@environment.gov.au) will also occur if required.

The marine turtle and marine mammal management procedures flowcharts for initial capital dredging and spoil disposal are shown in **Figure 16** and **Figure 17**, respectively.

6.3.2 Water Quality

Water quality (and therefore its potential impacts on marine turtles and mammals) would be managed through the water quality management process presented in **Section 6.1**.

6.3.3 Impacts from Artificial Lighting

Artificial lighting has the potential to disorientate nesting female and hatchling turtles. To minimise the impacts of lighting on nesting females and turtle hatchlings, the following management measures will be implemented where practicable:

- light levels from the initial capital dredging works would be minimised to those lights that are necessary for the safe operation of the vessels; and
- should multiple marine turtle hatchlings be recorded surrounding a vessel a review of the lighting procedures on that vessel will be immediately initiated and any unnecessary lights will be turned off.

6.3.4 Marine Turtle and Marine Mammal Dredging and Disposal Adaptive Management Process

Background

This section details the incident response strategy to be implemented during initial capital dredging and spoil disposal activities. Adaptive management responses that relate to marine turtle incidents (injury or mortality) associated with initial capital dredging and spoil disposal activities would follow an incident investigation and action process aligned with a series of tiered response principles.

Figure 14 Marine Turtle and Marine Mammal Management Procedure (Dredging)

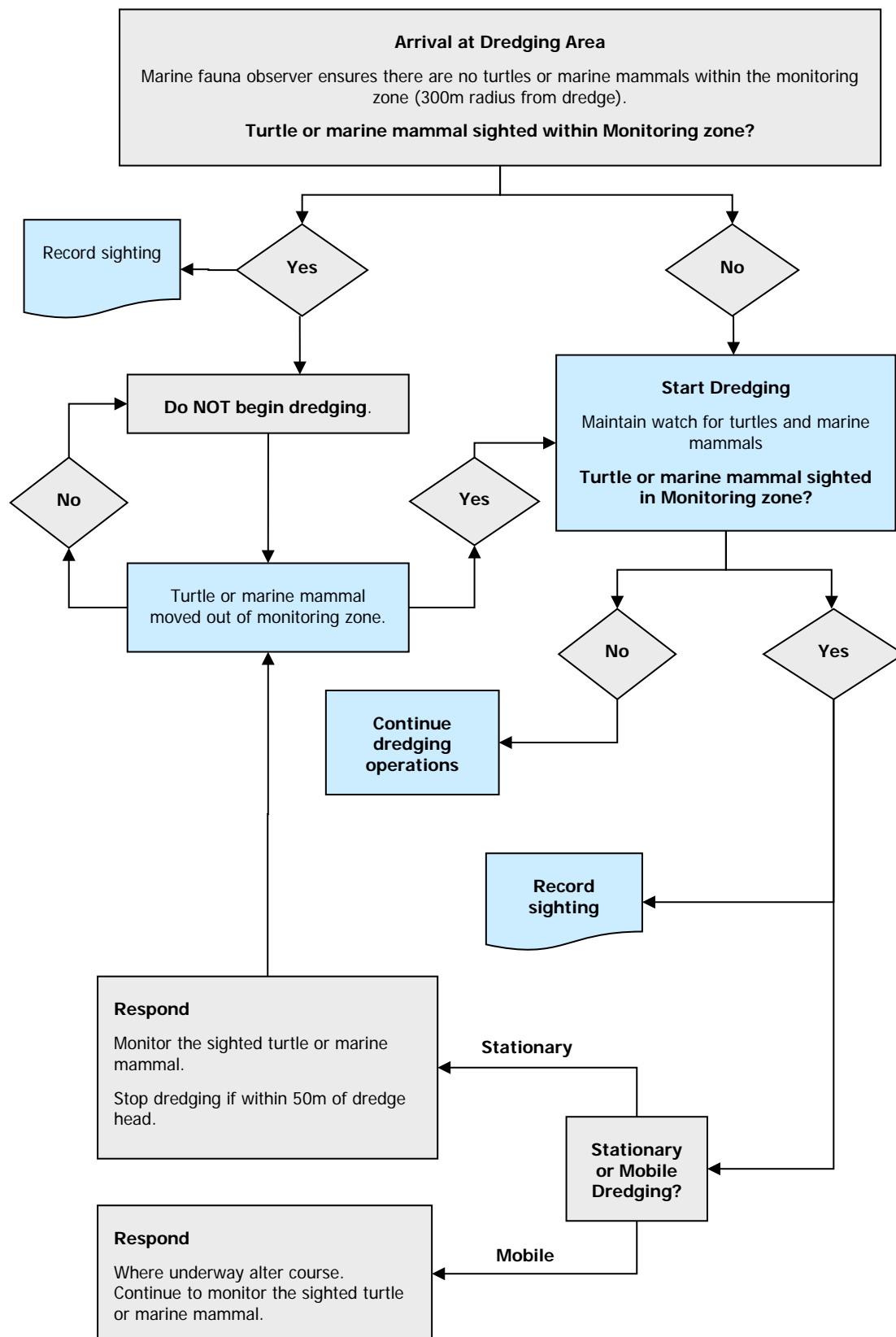
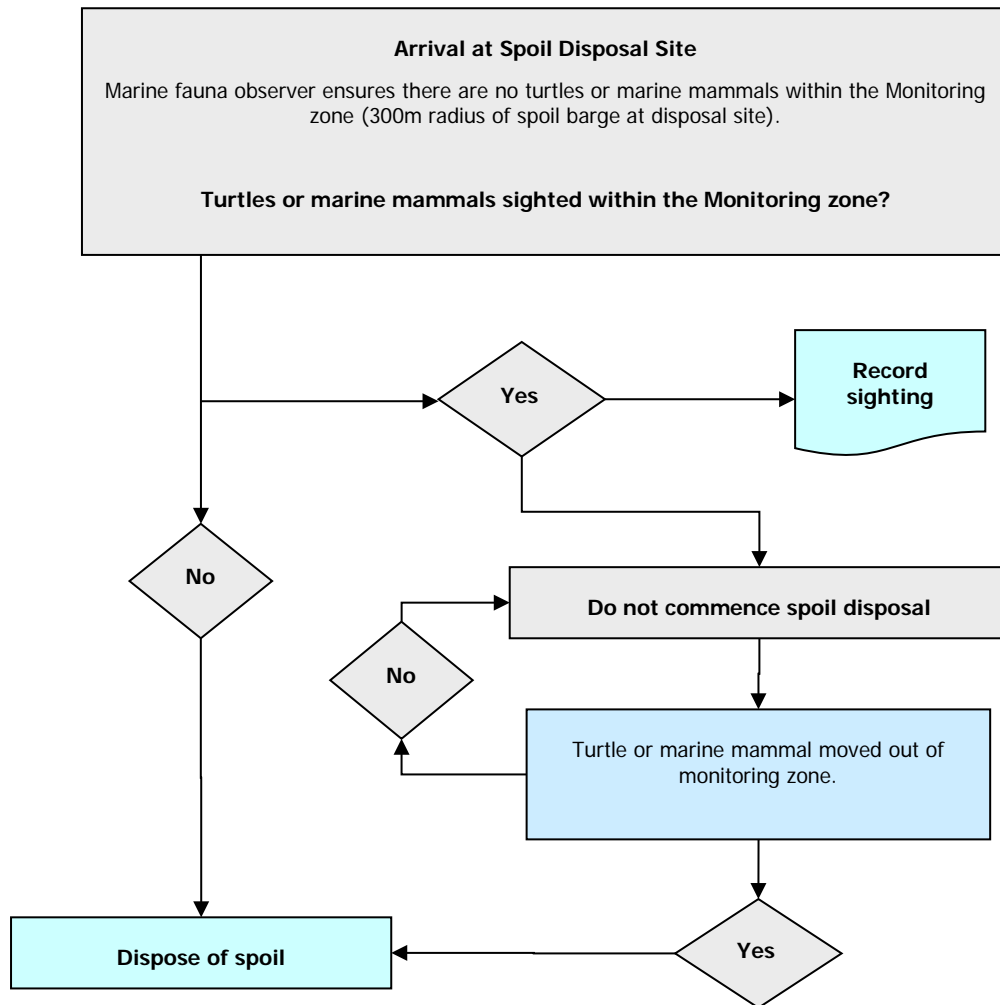


Figure 15 Marine Turtle and Marine Mammal Management Procedure (Spoil Disposal)



In the event of marine turtle injury or mortality, attributed to initial capital dredging and/or spoil disposal activities, RTA would undertake an investigation. The investigation would inform the implementation of three trigger levels to guide the management response.

Management Trigger Levels

Level 1

An injured or dead marine turtle is found and is attributable to initial capital dredging and/or spoil disposal activities:

Should it be determined that current management measures were not being followed, appropriate action would be taken to correct this deficiency. If management measures were being followed, an increased level of "off dredge" observation for further injured or dead marine turtles would be implemented over the following week. For example, additional monitoring of beaches or the reclamation area as appropriate.

Level 2

Three injured or dead marine turtles attributable to initial capital dredging and/or spoil disposal activities are found per seven day period, or six per 28 day period.

RTA would undertake a review of current management measures to identify alternative or additional practicable management measures that could be undertaken. At the same time

interim management measures would be implemented to prevent possible sources of harm, where practicable, to reduce the risks of further marine turtle injury or mortality.

Level 3

Four injured or dead marine turtles attributable to initial capital dredging and/or spoil disposal activities are found per seven day period, or nine per 28 day period or more than two marine turtles killed within 24 hours attributable to dredging and/or spoil disposal.

Immediate action would be taken to implement alternative and/or additional management measures to prevent likely sources of harm, including temporary relocation or suspension of activities. A review of management measures would be undertaken by RTA to identify longer-term alternative or additional management measures to reduce the risks of further marine turtle injury or mortality.

Following the implementation of management action or actions associated with an event, the effectiveness of the process and actions taken shall be reviewed periodically. The results of the review would guide adaptive management decisions and further actions as required.

6.4 Marine Pests

Background

Marine pests have the potential to be transported to site as biofouling or ballast water. To prevent the incursion of marine pests on site all dredge and dredge support vessels will be subject to marine pest risk assessment.

Management Measures

Ballast water management in Australia is detailed in Seaports Program: Australian Ballast Water Management Requirements (Commonwealth of Australia, 2013 or latest version).

Mandatory ballast water management requirements are enforced by AQIS and require exchange of ballast water at sea. All vessels entering Australian waters are required to submit a ballast water management summary with their quarantine pre-arrival form to AQIS. Approval to discharge ballast water in Australian waters will not be given unless the vessel demonstrates ballast water exchange at sea. There are no Queensland requirements for management of ballast water taken up in Australian waters in other states. Management requirements for ballast water

- comply with the ballast water exchange requirements of the Quarantine Act (1908); or
- if the vessel has an on-board ballast water treatment system, with the treatment requirements of the IMO Ballast Water Management Convention, where approved by the Quarantine Act (1908).

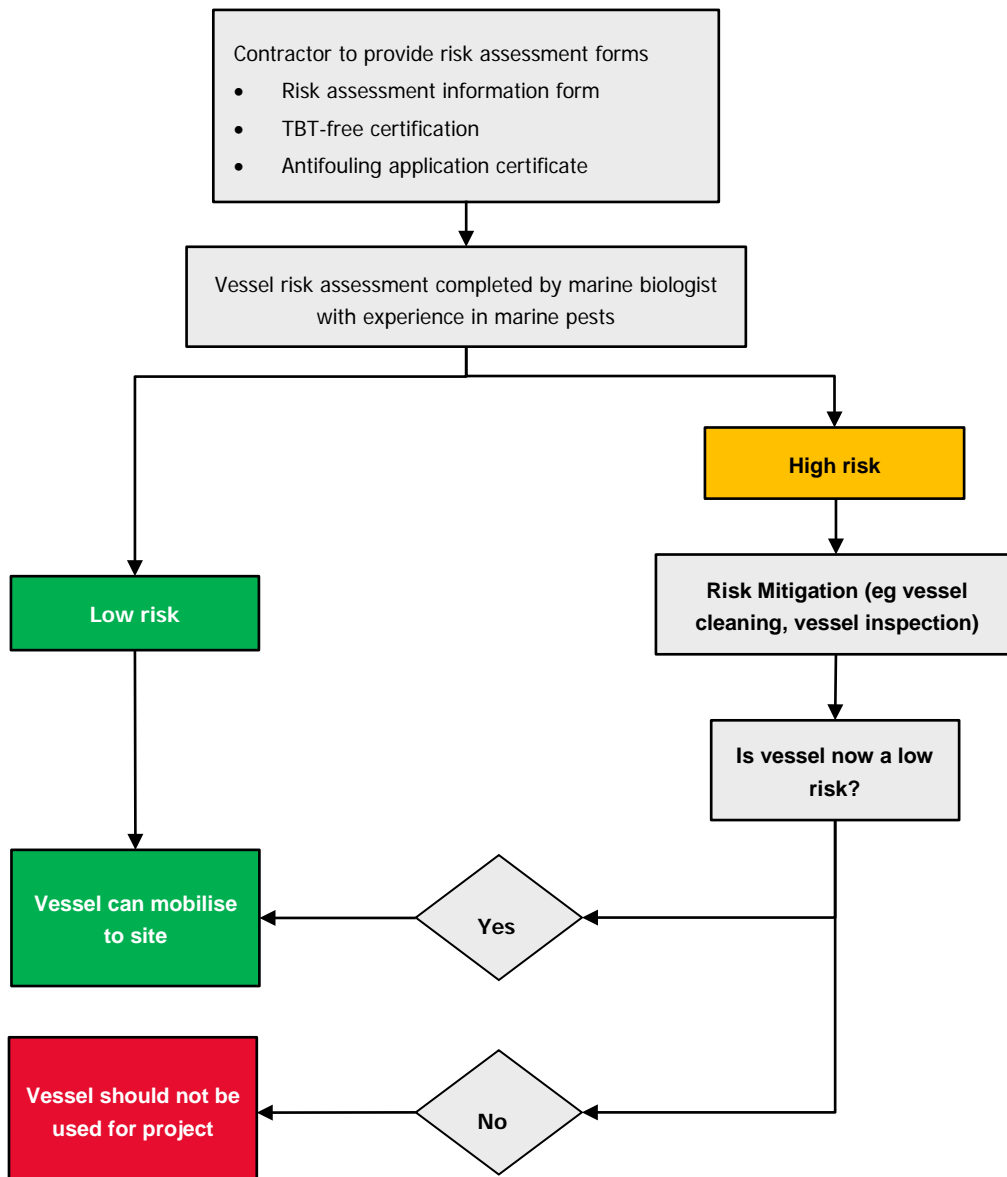
IMO has produced guidelines for biofouling management (IMO, 2011). IMO's biofouling management guidelines are voluntary. Australia's National Biofouling Management Guidelines/Guidance for commercial vessels, non-trading vessels and the petroleum industry (NSPIMP 2009a, 2009b, 2009c) under the National System for the Prevention and Management of Marine Pest Incursions (National System) are also voluntary. The guidelines recommend the application of antifouling coatings (including in niche areas), internal seawater system treatment and cleaning of all submersible surfaces to remove biofouling. Management requirements for biofouling include:

- application, maintenance and certification of antifouling coatings on all wet surfaces (including in niche areas).
- prior to mobilisation to site all vessels (including dredgers, barges and support vessels) and submersible equipment (eg moorings, piping), excluding new submersible equipment, will have a marine pest risk assessment completed by a marine biologist who has experience is marine pests. The assessment will consider:
 - vessel type;

- cleaning and marine pest inspection history;
 - the presence, age and suitability of antifouling coating;
 - the type and treatment history of internal seawater systems;
 - previous areas of operation (including climatic region, and the presence of marine pests of concern) since the last documented cleaning and/or marine pest inspection, and the duration the vessel spent in those areas;
 - activities in areas with known records of marine pests;
 - residual Sediment;
 - the nature of previous vessel operations;
 - time to be spent on site (less than 48 hours)/vessel stand-off; and,
 - any periods spent out of water immediately prior to mobilisation;
- all vessels rated a high risk will be required to implement risk mitigation measures such as:
 - hull and niche space cleaning;
 - internal seawater systems treatment;
 - physical marine pest inspection by personnel with qualifications and experience in marine pest management and,
 - additional management methods must be detailed and the vessel must be cleared as free of biofouling or low risk prior to mobilisation to site;
 - vessel contractors will be contractually required to provide the documentation and information necessary to conduct the risk assessment; and,
 - in-water cleaning of vessels will be prohibited while the vessel is under contract, in accordance with the Australian Anti-fouling and In-water Cleaning Guidelines (DAFF and SEWPaC, 2013). This reduces the risk that marine pests will be physically released from the vessel into the environment in the event that the vessel does harbour undetected marine pests.

If marine pests are recorded in an area the project will implement the management measures recommended by responding government departments (eg DAF) and Emergency Response Teams (eg investigation and eradication). Marine pest risk assessments will consider all components of the marine pest risk assessment (as detailed above) and determine the individual level of risk for the vessel or submersible equipment. For example a vessel that comes from a high risk area such as south-east Asia where marine pests are known to occur is potentially a high risk. The risk associated with that vessel would reduce if it had recently spent two weeks out of water, underwent recent cleaning, antifouling application, appropriate internal seawater system treatment and left waters within seven days of refloating and would potentially be low risk. This method is consistent with previous assessment methods completed for Queensland projects (BMA 2014) and WA Fisheries entry requirements (Vessel Check; DoF 2015; DoD 2014; DoF ND.). The process for marine pest risk assessment is shown in **Figure 16**.

Figure 16 IMS Vessel Risk Assessment Procedure



In addition to vessel risk assessments and inspections the Construction Marine and Shipping Management Plan (CMSMP) requires marine pest monitoring. Monitoring will be conducted before, during and after operations using larval settlement plates and before and after operations using targeted marine pest surveys.

Should a marine pest listed on the CCIMPE Trigger List of marine pest species be detected, the Project will notify DAFF and the Queensland Department of Agriculture and Fisheries (DAF) as soon as practicable. Relevant government agencies will then initiate a response in accordance with the Australian Emergency Marine Pest Plan (EMPPPlan) Control Centre Management Manual (DAFF, 2006). All contracted vessels will be required to comply with requests from the regulatory authorities implementing the emergency marine pest response.

6.5 Underwater Noise

The following mitigation measures will be implemented to reduce the impacts on listed threatened marine fauna and non-avian migratory species related to underwater noise associated with initial capital dredging activities and offshore spoil disposal:

- all vessel equipment and machinery will receive regular maintenance while engaged on the Project; and
- where possible, leaving vessel engines, thrusters and auxiliary plants in stand-by or running mode unnecessarily will be avoided.

With the implementation of these mitigation measures, residual impacts to listed threatened estuarine and marine fauna and non-avian migratory species in the vicinity of the Project from underwater noise associated with initial capital dredging activities and offshore spoil disposal would be negligible.

6.6 Vessel Traffic

Project-related vessel movements during the construction phase have the potential to impact marine flora and fauna both directly and indirectly, measures to manage risks include:

- vessels will be contractually required to comply with all relevant legislation and operate safely and use authorised shipping routes for all travel;
- installation of navigation aids in Boyd Area;
- all vessels will have adequate lighting for safe navigation;
- vessels will comply with all requests from MSQ or the relevant harbour master unless it is unsafe to do so;
- in water depths less than 2.5m, vessel speed will be restricted to a maximum of 6 knots;
- vessel Master will implement bridge management systems including fatigue management for safe operation; and
- vessel Tracking Systems, including Automated Identification Systems (AIS) will be used in accordance with legislation and Port requirements.

6.7 Marine Pollution

Numerous waste materials will be generated on site and may include which may include oil, sewage, garbage, steel scrap, aluminium, electrical cables, maintenance parts, sewage and other liquid wastes. These have the potential to impact the environment including posing a health risk to animals (eg ingestion and entanglement), marine habitats such as seagrass (smothering) and to water quality.

Waste reception services will be provided by the project for reception of vessel wastes, excluding quarantine waste. Waste generated on onshore will be appropriately segregated into appropriate bins with lids. Waste generated on vessels will also be appropriately segregated. Waste will be transferred to a vessel or directly to wharf facilities for holding or disposal at Evans Landing Waste Facility. Waste that cannot be disposed of at the local facility will be placed in appropriate containers or tanks and transported (eg barged) to appropriate recycling, reuse or waste facilities as per the facilities management practices.

Quarantine waste cannot be accepted with the existing waste management facilities at Port of Weipa (NQBP 2012). International vessels that arrive directly at Weipa or Boyd Port will undergo an AQIS inspection where all international waste will be bagged and marked appropriately. Vessels will be contractually required to keep waste on-board the vessel until it can be disposed of in accordance with methods approved by AQIS.

Sewage will be delivered or transferred to a barge or tug for delivery to Humbug where waste will be transferred by an appropriate waste management company for disposal at Lorim Point sewage treatment plant or an appropriate sewage treatment facility.

All waste will be disposed at an appropriate facility. The following pollution prevention and waste management measures will be implemented:

- segregation of waste into scrap steel, oily wastes, recyclable wastes (paper, cardboard, aluminium cans) and general wastes;
- waste skips and bins will be fitted with lids;
- all bins shall be clearly labelled including waste oil storage tanks;

- all wastes shall be removed from site by the use of a licensed operator; and
- contractors will provide a documented inspection and maintenance schedule for all equipment and vessels mobilised to the Project. The maintenance schedule will include:
 - specified schedule for inspection and maintenance;
 - daily visual pre-starts; and,
 - regular inspection of hydraulic hoses and fittings by qualified personnel.

6.7.1 Vessel Discharge and Waste Management

Some specific provisions that will be applied to vessels with regard to the MARPOL pollution categories are as follows:

MARPOL Annex I: Oil

- all discharges of oil, oil residues and oily mixtures from vessels will be contractually banned within the Weipa Port Limits;
- outside of these limits any discharge of oil from vessels must be in strict compliance with MARPOL, the PS(PPS) Act and the Transport Operations Marine Pollution Act and Regulation (i.e. <15ppm oil content in any discharge of oily water from machinery spaces only);
- all vessels will be contractually required to comply in full with the construction, equipment and operational requirements of MARPOL Annex I and to have the relevant MARPOL-mandated documentation such as Oil Record Book and SOPEP, as applicable to the vessel type and size. Waste oil will be held in segregated waste containers on each vessel;
- all waste oil received from vessels will be managed in accordance with relevant legislation (Queensland Environment Protection Act & Environment Protection (Waste Management) Regulation); and,
- all bunkering of vessels will be conducted in accordance with the Project's Bunkering Management Plan.

MARPOL Annex II: Noxious liquid substances carried in bulk

It is not anticipated that any liquid substances other than fuel and oil will be carried in bulk during construction. Should this occur, all vessels will be contractually required to comply with all relevant Australian and Queensland legislation for the transport, handling, transfer and disposal of the substance in question.

MARPOL Annex III: Harmful Substances in Packaged Form (Dangerous Goods)

- any harmful substances carried in packaged form by vessels will be packaged, labelled, loaded, carried, offloaded, stored and disposed of in compliance with MARPOL Annex III, the IMDG Code and the implementing Australian and Queensland legislation;
- vessels will be contractually required to comply with the prohibition on discharges of harmful substances carried in packaged form, including discharge of packages themselves and leakage from packages; and,
- vessels will be contractually required to carry and to submit the relevant MARPOL-mandated documentation for harmful substances carried in packaged form, such as Stowage Plan and Harmful Substances Manifest.

MARPOL Annex IV: Sewage

- all discharges of sewage from vessels will be contractually banned within the Weipa Port Limits;
- outside of these limits any discharge of sewage from vessels must be in strict compliance with MARPOL, the PS(PPS) Act and the TOMP Act and Regulation;
- all vessels will be vetted to confirm they have adequate sewage treatment, management and/or holding facilities prior to contracting;

- sewage will be pumped from the vessel to a waste management tug or direct to vacuum truck at Evans Landing or Humbug Point to be disposed of by a waste management company at Lorim Point Sewage Treatment Plant or a suitable Sewage Treatment Facility; and,
- any sewage not treated on board or received by the waste reception services in Weipa will be retained on board until it can be disposed of in accordance with MARPOL, Australian and Queensland legislation.

MARPOL Annex V: Garbage

- all discharges of MARPOL-defined garbage from vessels will be contractually banned within the Weipa Port Limits;
- outside of these limits any discharge of garbage from vessels must be in strict compliance with MARPOL, the PS(PPS) Act and the TOMP Act and Regulation (i.e. zero discharges <3nm from nearest land, only food waste ground to <25mm >3nm from nearest land and only food waste (not ground) >12nm from nearest land);
- vessels will be contractually required to have the relevant MARPOL-mandated documentation such as Garbage Management Plan and Garbage Record Book as applicable to the vessel type and size;
- waste will be held in segregated waste bins on board the vessel. The waste will then be transported to a barge, tug or waste management area for transport to Humbug or Evans Landing wharves for disposal by a waste management company at Evans Landing Landfill;
- all garbage received from vessels will be managed in strict accordance with relevant legislation (Queensland Environment Protection Act & Environment Protection (Waste Management) Regulation); and,
- all garbage received from international vessels will be treated as quarantine waste and will be managed in strict accordance with the Quarantine Act under the project's Biosecurity Management Plan.

MARPOL Annex VI: Air Emissions

All vessels will be contractually required to comply in full with the requirements of MARPOL Annex VI as applicable to the vessel type and size.

Training and awareness

All employees and contractors involved in the handling, transfer, storage, and disposal of oil and hazardous substances will be trained in the relevant regulatory requirements, the Project's management plans, systems, processes, and procedures, and their responsibilities.

6.7.2 Anti-fouling emissions

Anti-fouling emissions are regulated through the AFS Convention and the Australian *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006*. All vessels will be contractually required to comply with these, in particular a ban on the use of anti-fouling paints containing organo-tin compounds and the provision of a TBT Free Certificate or AFS Declaration, as relevant to the vessel type and size, prior to mobilisation to site. In addition:

As part of the marine pest risk assessment process (Section 6.4), vessels will be required to provide a certificate showing date and location of the most recent application of an antifouling coating. Antifouling coatings older than their working life are likely to result in a marine pest risk rating that requires the application of new antifouling. This will reduce the risk of emissions because aging antifouling coatings have a higher risk of flaking or chipping into the environment.

All domestic vessels will be required to use an antifouling coating registered for use in Australia in the Public Chemical Registration Information System (PubCRIS; <https://portal.apvma.gov.au/pubcris>).

In-water cleaning of vessels will be prohibited while the vessel is under contract, in accordance with the Australian anti-fouling and in-water cleaning guidelines (DAFF and SEWPaC, 2012). This eliminates the risk of particles of antifouling coating being released from the vessel to the environment during cleaning.

Any re-application of antifouling coating needed while the vessel is under contract will be done at a shore-based maintenance facility. There are no such facilities at the Boyd Port site or the Port of Weipa.

6.7.3 Spill Management

Spill Management Controls

Operational spill management controls to prevent oil and other spills into the marine environment during construction include:

- daily inspection logged for excessive oil and grease from cutter and drag heads;
- complying with vessel traffic management controls (Section 6.6);
- bunkering in accordance with the Bunkering Management Plan;
- compliance with AMSA Marine Order 32 (Cargo handling equipment 2011) or current version with clearly identified roles and responsibilities;
- regular and documented maintenance of all vessels and equipment;
- vetting of vessels for condition, maintenance and survey history prior to contracting;
- relevant employees and contractors involved in the storage, handling, transfer and disposal of fuel and other materials will be trained to ensure they are aware of their responsibilities and the Project systems, processes and procedures;
- relevant contractors will be required to undertake spill response training and appropriate training exercises in accordance with their plans;
- secondary containment will be used to reduce the risk of spills occurring from accidental rupture or leaks at transfer points at Boyd Port and Aurukun;
- an oil spill response plan will be prepared for the barge carrying fuel tanks to Boyd Port;
- properly trained and certified crew;
- bridge management and fatigue management systems;
- ship security plan;
- AIS, as required; and,
- regular drills and exercises for crews.

Spill Response

While the occurrence of spills is unlikely and the measures outlined in Section 6.6, 6.7 and the operational controls are designed to prevent marine pollution they have the potential to significantly impact on local flora and fauna. A Spill Management and Response Plan will be developed specifically for dredging operations in the Boyd Port area by the dredging contractor. The plan will be based on the Australia's National Plan for Maritime Environmental Emergencies (NATPLAN), the Queensland Coastal Contingency Action Plan (QCCAP) and the South of Embley Spill Management and Response Plan. RTAW will ensure the Spill Management Plan is compliant with all relevant legislation using the "*Technical Guidelines for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities*" (AMSA, 2013) and the information outlined in this document. MSQ will be the Statutory and Combat Agency and the Boyd Port Dredging Contractor will be the first-strike agent

The NATPLAN arrangements provide for a "tiered" response to marine oil and chemical spills:

Individual ports, terminals and marine facilities: Relevant operator is responsible for maintaining a "first strike" response capability and site-specific plan

State (spills within 3nm): Relevant State authority is responsible for coordinating the response. In Queensland this is MSQ through the QCCAP).

National (spills beyond 3nm or within 3nm that are too large for State to manage): AMSA is responsible for coordinating the response with support from other parties under the NATPLAN.

The NATPLAN (AMSA, ND) and OCCAP (DTMR, 2014a) and local plans identify the following key roles in the event of a spill in Queensland waters:

- Statutory Agency: In Queensland, MSQ is the designated government agency with responsibility to verify that ports have adequate spill response plans, capability and enforce other requirements. In the event of a spill, MSQ is responsible to verify that a satisfactory response is implemented. MSQ is also responsible for prosecutions and recovery of clean-up costs on behalf of all participating agencies. MSQ also assumes the Combat Agency role in coastal waters outside port limits to 3 nautical miles offshore, including in the GBRMP;
- Combat Agency: the agency that directs and manages the spill response, with response assistance able to be provided by other parties under Combat Agency direction. Combat Agencies have the operational responsibility to take action to respond to an oil spill in the environment in accordance with the relevant contingency plan. Combat Agencies within Port Limits are generally port authorities;
- First Strike Response Agent: local spill-response plans designate the appropriate first-strike response agent who is responsible for initiating and carrying out first-strike response operations. The first-strike agent assesses the time and resources required to effectively manage an incident and requests assistance as necessary if the response is likely to be prolonged or outside the first-strike response capability;
- Vessel Masters are responsible for taking prompt and effective action to ensure the safety of the vessel and cargo and notifying MSQ of the situation; and,
- Environmental and Scientific Coordinator: Nominated by the Queensland Government to provide environmental input to planning and decision-making, and providing advice regarding the likely environmental effects of a spill event.

RTA already maintains a “first strike” response capability at the Port of Weipa and this will be used to respond to any spills from SoE vessels within the port. For the Boyd Point area the construction contractors will be required to develop a Spill Management and Response plan which includes the “first strike” response plan. They will maintain the first-strike response capability, including necessary equipment. The RTA spill response resources at Weipa will also be available to supplement the construction contractors’ plan if required. The Boyd Point Spill Management and Response Plan will be developed in accordance with AMSA (2013) Technical Guidelines for the Preparation of Marine Pollution Contingency Plans for Marine & Coastal Facilities.

The roles and responsibilities of different parties, and the applicable response plan and arrangements, vary depending on whether the spill occurs in the Port of Weipa, the Boyd Area, or elsewhere. These are summarised in

Figure 17 and Table 7 below:

Figure 17 Roles and Responsibilities in the Event of an Oil Spill identifying Lines of Communication

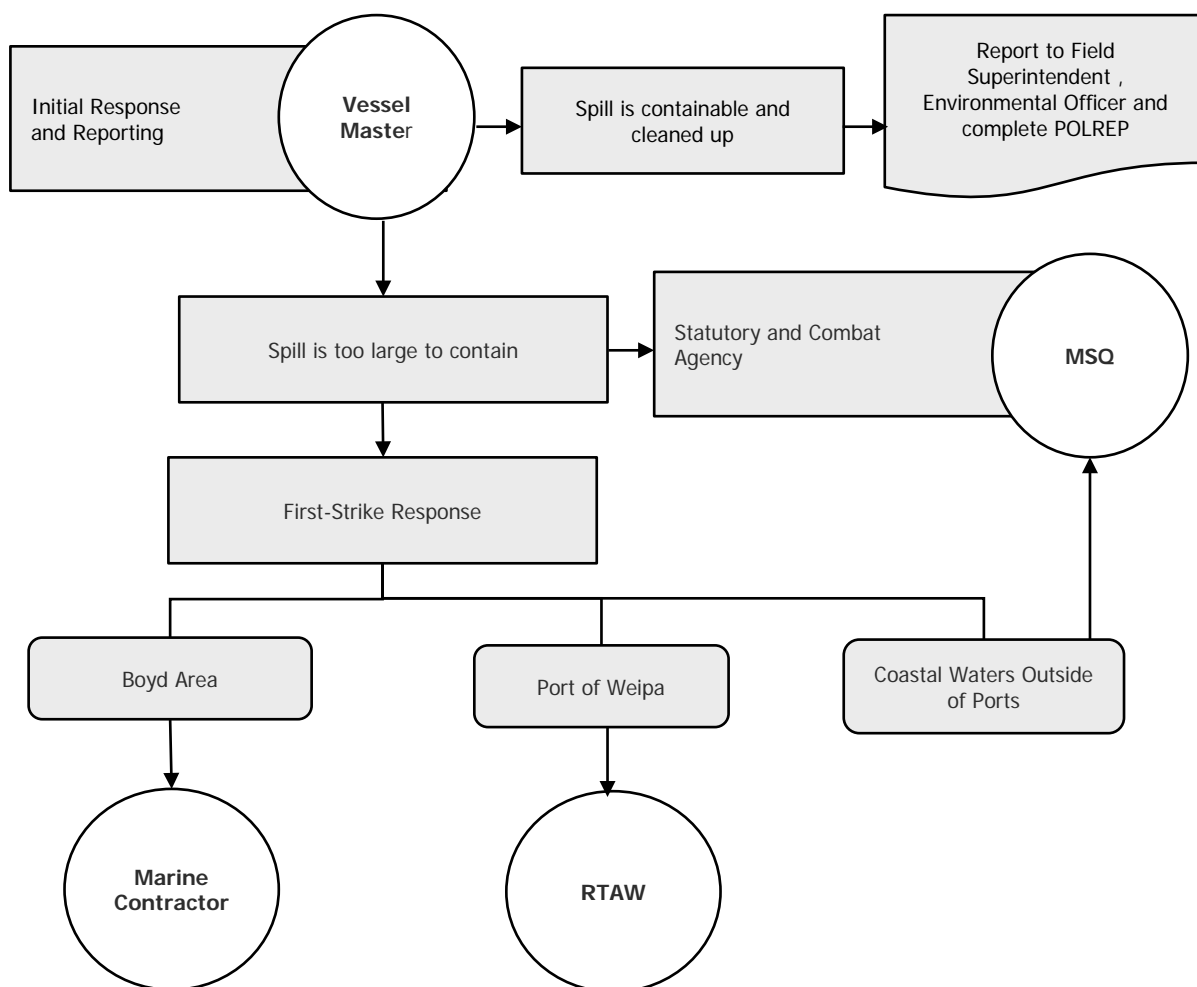


Table 7 Roles and Responsibilities in the Event of an Oil Spill.

Responsibility	Agency		
	Boyd Port	Port of Weipa	Elsewhere in QLD
MSQ is Statutory and Combat Agency and is the pre-designated Incident Controller for spills that impact Queensland coastal waters.	MSQ	MSQ	MSQ
Ensuring adequate first-strike response is maintained	RTAW	NQBP	MSQ
First-strike response agent in the event of a spill	Contractor	RTAW	MSQ
Initial response in the event of a discharge of oil or substantial threat of discharge of oil – actual or probable. As soon as practicable the contact must be made with MSQ and first – strike response agent; message to MSQ commences “POLREP” then vessel name, IMO number and call sign of vessel.	Vessel Master	Vessel Master	Vessel Master

Spill Response in the Port of Weipa

Oil spill response in the Port of Weipa is outlined in the Port of Weipa First Strike Oil Spill Response Plan, a supplement to the QCCAP (DTMR 2014a). MSQ is both the Statutory and Combat Agency. RTAW is the first-strike response agent. Further details are provided in the following documents:

- Port of Weipa First-strike Oil Spill Response Plan (DTMR, 2014b); and,
- RTAW Emergency Response Plan - Port of Weipa (RTAW 2015, or most current version).

Spill Response in the Boyd Area

Oil spill response in the Boyd Area will be detailed in the Boyd Area Spill Management Plan to be produced by the Boyd Port Dredging Contractor. RTAW will ensure the Spill Management Plan is compliant with all relevant legislation using the "*Technical Guidelines for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities*" (AMSA, 2013) and the information outlined in this document. The Manual on Oil Spill Risk Evaluation and Assessment of Response Preparedness (IMO 2010) may also be used as a guidance document. The project will work with MSQ to review and develop plans. MSQ will be the Statutory and Combat Agency and the Boyd Port Marine Contractor will be the first-strike agent.

Spill Response outside the Port of Weipa and Boyd Area

Spill response may also be required outside of the Port of Weipa or Boyd Area, such as in the Gulf of Carpentaria or the GBRMP. In such an incident, vessels will be required to apply the relevant response plan, commencing with the vessel's SOPEP, and following the response plan identified in the QCCAP, or NATPLAN for the spill location. Vessel Masters are responsible for initiating a first response and reporting the spill to MSQ. MSQ will be the Statutory Agency and Combat Agency. The first-strike agent will depend on the location.

Shipboard Oil Pollution Emergency Plan (SOPEP)

In addition to the site-specific plans, vessels will have SOPEPS as required by Annex I of MARPOL and the implementing Australian and Queensland legislation.

Marine Pollution Reporting (POLREP)

POLREPs are required for any illegal vessel discharge to the marine environment. Discharges will be reported to the relevant authority which may be MSQ or AMSA, depending on the location. Any vessel discharges in Queensland of any size to the marine environment will be reported to MSQ using Marine Pollution Report form (POLREP). This can be accessed online <http://www.msq.qld.gov.au/Marine-pollution/Contingency-plans.aspx> and will be submitted by email to MSQ. Discharges outside Queensland waters will be reported to AMSA.

6.8 Physical Disturbance

Direct physical disturbance is an unavoidable consequence of dredging. Physical disturbance to the marine environment has been minimised by locating the dredge area away from sensitive habitats as far as practicable. Management methods will also include:

- removal of material is restricted to authorised area of disturbance (dredging footprint);
- quantity of material removed is restricted to approved quantity; and
- disposal restricted to the approved spoil ground.

6.9 Monitoring Programs

The receiving habitat monitoring programs incorporate both routine and reactive monitoring components to support the management measures described in **Section 6.1**. The reactive monitoring provides a risk based approach to management of capital dredging and spoil disposal activities.

The monitoring programs are designed to provide timely information to minimise potential impacts to receiving habitats. These habitats include near shore reefal habitats between Boyd Point and Thud Point and offshore habitats at Nine Mile Reef.

The monitoring program applies sub lethal indicators which allow management processes to be implemented in order to prevent more substantial impacts occurring. This approach minimises delays in dredging and construction schedules and minimises environmental impact.

The proposed monitoring programs are summarised in **Table 8** Telemetered turbidity monitoring would commence three months before initial capital dredging operations commence and would continue for at least one month after initial capital dredging operations cease to demonstrate that turbidity has returned to ambient levels.

Table 8 Proposed Monitoring Programs

Monitoring program	Pre-dredge	Dredging				Post dredge	
		P1*	P2	P3	P4	1 month	2 month
Water quality loggers Turbidity	X	X	X	X	X	X	
Coral Health	X	X	X	X	X	X	X
Marine Pest Targeted surveys	X						X
Marine Pest Settlement plates	X	X	X	X	X	X	X

*P = approximately six weekly monitoring period

6.10 Summary of Environmental Issues, Potential Impacts Management and Monitoring Methods

Table 9 identifies the works to be completed, the related environmental issues, potential impacts and the mitigation, management and monitoring measures to be implemented to manage environmental issues and potential impacts.

Table 9 Activities, Environmental Issues, Potential Impacts and Mitigation, Management and Monitoring Measures

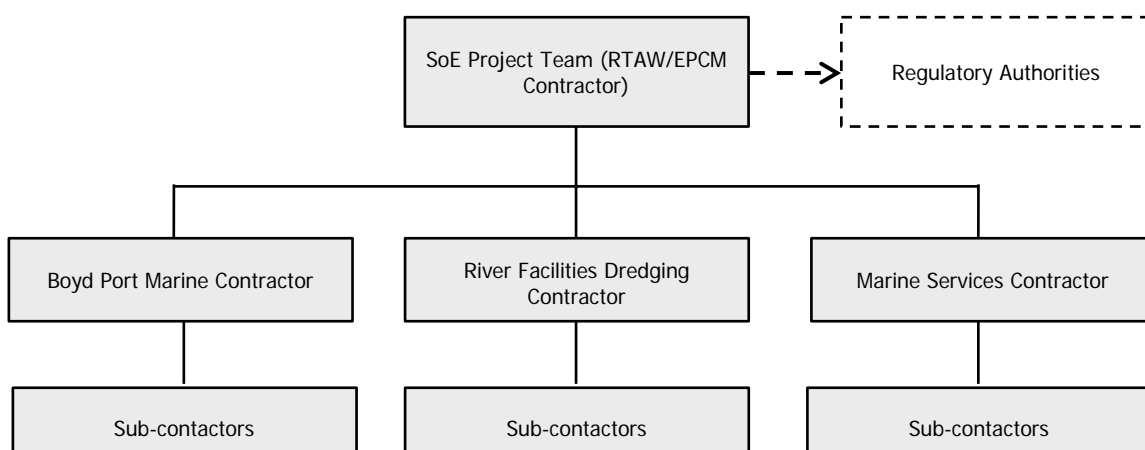
Potential Impact	Avoidance, Mitigation and Management Measures	Monitoring	Benchmark/ Baseline/ Goals	Performance Indicators	Timeframe implemented	Corrective Actions	Responsibility
Turbidity Plume Generation – dredging reducing water quality	Management measures are detailed in Section 6.1.1	Water quality monitoring will be conducted in accordance with Section 6.1.2. This will include the use of telemetered loggers.	Reference sites water quality. No significant impacts to water quality from dredging activities.	Number of water quality exceedance through duration of the dredging program	Three month prior, during dredging activities and at least two weeks following dredging activities	Implementation of the management process identified in Figure 12 to be implemented. Breaches to be investigated and appropriate corrective actions implemented.	Dredging Contractor SoE Project Team Project Manager Environmental Specialists
Turbidity Plume Generation impacting coral	Management measures are detailed in Section 6.1.1	Water quality and coral health monitoring will be conducted in accordance with Section 6.1.2 and 6.2	Existing environment (baseline data) No significant coral loss due to dredging activities	Decrease in coral cover related to dredging activities	Prior to , during and following completion of dredging activities	Implementation of management process identified in Figure 13 to be implemented. Breaches to be investigated and appropriate corrective actions implemented.	Dredging Contractor SoE Project Team Project Manager Environmental Specialists
Marine Pest	Management methods as outlined in Section 6.4 including the completion of vessel risk assessments and inspections as necessary.	Marine pest monitoring including baseline, during and completion monitoring	No marine pests established in the Boyd Port as a result of dredging activities. Zero non-compliance with Quarantine Regulations 2000. No marine pest incursions during the dredging phase of the SoE Project.	Number of marine pests species established in the Boyd Port as a result of dredging activities Number of non-compliances with Quarantine Regulations 2000.	During dredging activities	Any incidents to be reported and appropriate corrective actions implemented as per Section 6.4. Review current marine pest assessment practices and amend as necessary. Increase training and awareness if required.	Dredging Contractor SoE Project Team Project Manager Environmental Specialists
Noise - Underwater Noise – Vessel	Management methods are detailed in Section 6.5 and include: Vessels contracted will have service and maintenance histories that meet MSQ requirements, regular vessel maintenance, vessel engines, thrusters and auxiliary plant will not be left in standby where possible, vessel speeds restrictions, use of transit lanes	Random inspections by HSE team.	Contracts requirements. All dredging-related shipping has the appropriate mitigation measures applied to reduce underwater noise. Contracted dredging-related shipping has appropriate underwater noise mitigation measures included in their contract.	Number of dredging-related shipping that has the appropriate mitigation measures applied to reduce underwater noise. Number of contracted dredging-related shipping that are appropriately vetted for appropriate underwater noise mitigation and measures included in their contract	During dredging activities	Check regular maintenance is being conducted on dredging-related shipping. Breaches to be investigated and appropriate corrective actions implemented.	Dredging Contractor Vessel Master SoE Project Team Project Manager
Marine Pollution	Implement management measures in Section 6.7	Daily inspection completed by supervisor. Weekly inspections by HSE Advisor.	All waste disposed of in accordance with national and international regulations	Number of non-conformances No visible waste washed from site	During dredging activities	Any breaches identified are to be investigated and appropriate corrective actions implemented	Team Members Dredging Contractor SoE Project Team
Marine Pollution - Vessels and waste	Implement management measures outlined in Section 6.7.1	Daily inspection completed by supervisor. Weekly inspections by HSE Advisor.	All waste management and disposal in accordance with project management plan, MARPOL, Commonwealth and State regulations No waste disposed of incorrectly and any spilled debris removed	Number of non-conformances Areas disturbed due to waste	During dredging activities	Any breaches identified are to be investigated and appropriate corrective actions implemented	Team Members Dredging Contractor SoE Project Team
Marine Pollution – antifouling emissions	TBT-free certification for all vessels, within their working life to prevent flaking, domestic vessels antifouling must be registered for use in Australia, in water cleaning prohibited	Antifouling certifications reviewed by HSE Team	All antifouls TBT free and within working life, no in-water cleaning and antifoul registered for use in Australia	Number of vessels that meet goals	During dredging activities	Any breaches identified are to be investigated and appropriate corrective actions implemented (eg removal from project)	Dredging Contractor SoE Project Team Project Manager
Marine Pollution - Spills	Implementation of measures identified in Section 6.7.3	Inspections of work area and equipment occurring during working hours. Daily inspection completed by supervisor. Weekly inspections by HSE Advisor.	No spills Zero non-compliance with waste regulations If a spill occurs, all oil spills are contained and are responded to and cleaned up in a timely manner.	Number and quantity of vessel discharges from dredging-related shipping. Number and quantities of incidents Number of non-compliances with national and international regulations	During dredging activities	Implement appropriate spill response measures and comply with agency requests Any spills or discharges of wastes to be reported and appropriate corrective actions implemented. Breaches to be investigated and appropriate corrective actions implemented. Increase training and awareness if required.	Vessel Master Dredging Contractor SoE Project Team Project Manager
Vessel Strike or marine fauna or	Implementation of measures identified in Section 6.3.1	Monitoring of marine fauna by crew when vessel underway Monitoring of marine turtle and	Vessel Speed Requirements Specified Transit Lanes IMO Guidance document for	Zero marine fauna vessel strikes associated with dredging-related shipping. Number of non-compliances with vessel speed	During dredging activities	Implementation of Adaptive Management Process as identified	Vessel master Dredging Contractor SoE Project Team

Potential Impact	Avoidance, Mitigation and Management Measures	Monitoring	Benchmark/ Baseline/ Goals	Performance Indicators	Timeframe implemented	Corrective Actions	Responsibility
turtle entrainment or injury		marine mammals as identified in Section 6.3.1 and Section 6.3.4 and implementation of the adaptive management process	minimising the risk of ship strikes with cetaceans, MEPC.1/Circ.674, dated 31 July 2009. Zero marine fauna vessel strikes associated with dredging activities No records of marine turtles capture by dredging activities	requirements (including ferries and barges not slowing to 6 knots in water depths of 2.5m or less). Number of times ferries and barges do not follow specified transit lanes. Number of non-compliances of management process Figure 15 and 16		in Section 6.3.4 Any injured or dead listed species will be reported to marine stranding hotline through RSPCA Queensland on 1300 ANIMAL Notification to DoE contact for protected species injury or death. Any incidents to be reported and appropriate corrective actions implemented. Breaches to be investigated and appropriate discipline actions implemented. Increased training and awareness if required.	Project Manager
Impacts from Artificial Lighting	Light levels from the initial capital dredging works would be minimised to those lights that are necessary for the safe operation of the vessels where practicable. Should multiple marine turtle hatchlings be recorded surrounding a vessel a review of the lighting procedures on that vessel will be immediately initiated and any unnecessary lights will be turned off.	Visual monitoring of light levels from dredge associated vessels Visual identification of marine turtle congregation around dredging associated vessels	No records of marine turtles and/or their hatchlings aggregating around dredging-related shipping. No interference with nesting due to dredging activity	Incidence of marine turtles and/or their hatchlings aggregating around dredging-related shipping.	During dredging activities	Breaches to be investigated and appropriate corrective actions implemented. Increase training and awareness if required.	Vessel Master Dredging Contractor
Physical Disturbance	Physical disturbance restricted to dredge footprint and approved dredge quantity. Disposal restricted to the approved spoil ground.	Area to be surveyed to ensure compliance with designated footprint. Vessel logs (including date, time, dump paths and volumes for dredging)	Dredging and disposal as per that identified in this DMP.	Dredging remains within designated footprint Disposal restricted to approved spoil ground	During dredging activities	Any breaches identified are to be investigated, reported and appropriate corrective actions implemented	Dredging Contractor SoE Project Team

7 MANAGEMENT STRUCTURE

The SoE Project will be managed by both RTAW and the EPCM Contractor as a team, with tasks including managing subcontractors delegated among the team. A dredging contractor will be appointed for dredging of the port facilities. The Contractor will have operational responsibility for managing smaller sub-contractors, including vessel operators. Management for the project is clearly defined, with identified lines of authority and reporting. The overall management structure is outlined in **Figure 18**.

Figure 18 Overall Management Structure for the SoE Project



A number of key management roles have been identified for the Project, as summarised below. The role names are subject to change but the basic structure will remain the same.

SoE Project Team, Project Manager

- manages the Project and its execution, including providing adequate resources for environmental management requirements; and,
- liaises with Regulatory Authorities, in coordination with the SoE Project Team Environmental Manager.

SoE Project Team Line Managers

- report to the SoE Project Team Project Manager;
- day-to-day management of the Project, ensuring employees including subcontractors report to the Project Manager;
- monitor implementation of management plans including the Dredge Management Plan, refining procedures as necessary to ensure relevant management measures are implemented effectively and adaptive management/corrective action is taken in a timely manner; and,
- review and report on environmental incidents.

SoE Project Team Environmental Manager

- reports to the SoE Project Team Project Manager;
- supports the SoE Project Team Line Managers in day-to-day management of environmental performance;
- monitors environmental performance;
- reviews compliance with permits and management plans;
- monitors, investigates and reports on complaints, incidents of environmental non-compliance and environmental incidents;

- liaises with relevant regulatory authorities including providing monitoring results and reporting non-compliance and environmental incidents;
- ensures non-compliances and environmental incidents are followed up and corrective actions are implemented within reasonable timeframes;
- ensures environmental monitoring is completed in accordance with approved management and monitoring plans;
- arranges regular environmental audits;
- reviews contractor environmental management plans;
- ensures all contractors are trained in environmental awareness, site issues and the requirements of environmental management plans; and,
- ensures environmental management plans and procedures are updated as necessary.

Marine Contractor Project Managers

- responsible for day-to-day management of construction activities under the direction of the SoE Project Team Project Manager and Environmental Manager;
- ensure all staff are trained in environmental awareness, site issues and the requirements of environmental management plans;
- monitor environmental compliance and reports non-compliance to the SoE Project Team Environmental Manager;
- assist in developing corrective actions for complaints, non-compliances and environmental incidents and ensures they are implemented;
- facilitate regular environmental audits by the SoE Project Team Environmental Manager to monitor compliance; and,
- on-site monitoring as provided for in management plans and procedures.

Employees, contractors and sub-contractors

- conduct all activities in accordance with the River Dredge Management Plan, including water quality monitoring and marine mammal and marine turtle monitoring;
- regularly report on the dredging works to RTAW; and,
- report any non-compliances to their line manager.

8 REPORTING

RTA would report to the BPD TAG on proposed initial capital dredging activities for Boyd Port and implementation of the DMP for the Port, including monitoring results, management triggers and response actions.

RTAW will provide reports to Department of Environment as required by the Conditions in the Sea Dumping Permit:

Condition 19 If at any time during the course of the dumping activities an environmental incident occurs or environmental risk is identified, all measures will be taken immediately by RTAW to mitigate the risk or the impact. The situation will be reported in writing within 24 hours to the Department of Environment with details of the incident or risk, the measures taken, the success of those measures in addressing the incident or risk and any additional measures proposed to be taken.

Condition 20 RTAW will document any environmental incidents which occur in the course of the dumping activities that result in injury or death to any marine mammals, marine turtles or EPBC Act listed species. The time and nature of each incident and the species involved, if known, will be recorded.

- Condition 22** RTAW will keep records comprising of weekly plotting sheets or a certified extract of the vessel's log which detail:
- a) The times and dates of when each dumping run is commenced and finished;
 - b) The position (as determined by GPS) of the vessel at the beginning and end of each dumping run, with the inclusion of the path of each dumping run; and
 - c) The volume of dredge material (in cubic metres) dumped and quantity in dry tonnes for the specified operational period, with a comparison of these quantities with the total amount permitted under the permit on a daily basis.
- These records will be retained by RTAW for verification and audit purposes.
- Condition 24** Within two months of the final bathymetric survey being undertaken RTAW will provide a digital copy of the bathymetric survey to the Royal Australian Navy Hydrographer, Locked Bag 8801, South Coast Mail Centre, NSW 2521.
- Condition 25** RTAW will provide a report on the bathymetry to the Department of Environment within two months of the final bathymetric survey being undertaken. The report will include a chart showing the change in sea floor bathymetry as a result of dumping and include written commentary on the volumes of dumped material that appear to have been retained within the disposal site.
- Condition 26** RTAW will provide a report to the Department of Environment on the Form "Sea Dumping Permit International Report Requirements" or in a format as approved by the Department of Environment from time to time:
- a) Following commencement of dumping activities, by 31 January each year until expiry of the sea dumping permit or completion of the dumping activities (whichever is earlier); and
 - b) Upon expiry of the sea dumping permit or completion of dumping activities (whichever is earlier).

Additionally if requested RTAW will facilitate site access and assistance to DoE to witness, inspect, examine or audit operations and provide appropriate documentation to support as requested.

A monthly monitoring report would be prepared and submitted to EHP throughout the period that initial capital dredging and spoil disposal works are being undertaken. This report would include:

- a summary of results of all required monitoring with raw data provided in an electronic format appendix (i.e. spreadsheet);
- an evaluation and explanation of the data from the monitoring programs;
- a daily summary of dredge movements (specifying the boundaries of the dredged area by GPS coordinates and disposal activity);
- details of marine turtle and/or marine mammal captures by the dredge and species involved;
- details of any complaints received including investigations undertaken, conclusions formed and action taken;
- a summary of significant equipment failures or events that have potential environmental management consequences;
- an outline of corrective actions that would or have been taken to minimise or reduce environmental harm; and,
- the quantity (volume in cubic metres) and location of dredging material removed and disposed of.

The DMP will be published on the RTA website in accordance with Condition 59 of the EPBC Act approval. The RTA website address is:

http://www.riotintoalcan.com/ENG/ourproducts/1818_south_of_embley_project_reports_and_publications.asp

In accordance with Condition 68 of the EPBC Act approval RTA will publish a report on this web site addressing compliance with the Dredge Management Plan over the previous 12 months within (3) months of every 12 month anniversary of commencement of the action.

8.1 Independent Peer Review

Consistent with Condition 60 of the EPBC Act Approval an independent peer review of the DMP has been performed by an independent marine scientist with recognised expertise in dredge management plans and an understanding of matters of national environmental significance in the marine environment. The review will include the analysis and effectiveness of management measures and recommendations and advice of the peer reviewer will be provided to the Minister.

8.2 DMP Review

This plan and the performances pertaining to it will be reviewed annually and updated when audits or reviews identify improvements that should be incorporated. This review process will enable work methods to be updated when deemed to be ineffective and will also facilitate continuous improvement of environmental management.

Annually the BPDTAG will review the DMP Port until completion of dredging activities and provide a copy of all comments and how these have been addressed and revised in the DMP.

9 TRAINING

All employees involved in dredging operations will be appropriately qualified and trained or under appropriate supervision. All employees related to dredging operations will undergo environmental training and awareness through the induction program at a minimum this will include:

- roles and responsibilities – General Environmental Duty (GED), WHO to contact and WHEN to contact them when an environmental issue is identified;
- general site requirements – EMS elements such as policy, objectives & targets, general aspects and "environmental awareness" in everyday duties, and particularly good housekeeping;
- marine Pollution Prevention requirements;
- spills Prevention and Response procedures and reporting;
- general emergency response, incident identification/classification and reporting/notifications;
- marine fauna identification and reporting procedures; and
- easily identifiable marine pests and reporting procedures.

10 TRADITIONAL OWNER EMPLOYMENT OPPORTUNITIES

RTA has committed to working collaboratively with Traditional Owners, through the relevant Western Cape Communities Co-existence Agreement (WCCCA) Sub-Committees and the WCCCA Coordinating Committee to further increase representation of local Aboriginal people, and in particular, the Wik & Wik Waya Traditional Owners across the workforce. For this reason, focussed work, in collaboration with Traditional Owners and the Members of the WCCCA Employment, Training, Environment and Heritage Sub-Committee will be undertaken, to understand the current challenges, the outcomes achieved to date and the development of strategies specific to the needs of this community.

In addition, RTA Weipa as a signatory to the Western Cape Regional Partnership Agreement (RPA) is actively working with the RPA working group on employment and training to identify

opportunities where industry, Governments and local Aboriginal people can strategically partner to develop relevant skills and employment pathways prior to and during the construction phase of the SoE Project.

Traditional Owner employment opportunities associated with capital dredging in the Hey and Embley Rivers will be available in the following Land and Sea Management Programmes, which are part of the Communities, Heritage and Environmental Management Plan (SoE Communities, Heritage and Environment Working Group, 2014):

- Marine Mammal Observations.

In addition, through the existing Indigenous Land Use Agreement, opportunities for employment of Traditional Owners are identified through an employment and training plan. This plan identifies work opportunities and roles within these work opportunities that may be filled by Traditional Owners. Traditional Owners that may be capable of filling these roles are then identified with RTAW supporting identified candidates to become appropriately skilled to fill the identified roles. RTAW supports the employment of Traditional Owners if they are appropriately skilled and qualified in all areas of the business.

As part of RTAW's reporting obligations under the Indigenous Land Use Agreement, quarterly review reports on Indigenous employment and training obligations are made to Traditional Owners.

11 INDIGENOUS CONSULTATION

Indigenous people were consulted in accordance with the process under the Indigenous Land Use Agreement during the preparation of this Plan. This consultation involved the following:

- the Plan was lodged with the Western Cape Communities Coexistence Agreement (WCCCA) South of Embley Sub-Committee in May 2014. No specific comments regarding the dredge activities, mitigations or management actions within the Plan were received from Traditional Owners during the Sub-Committee meeting;
- the Plan was subsequently presented to a meeting of the Communities, Heritage and Environment Management Plan (CHEMP) Working Group. Queries raised at this meeting included confirmation that the spoil disposal location was at the new proposed spoil ground and not the existing Albatross Bay spoil ground. ;
- the Plan was lodged with the WCCCA Coordinating Committee in June 2015 which formally noted that the management plan had been presented to the Sub-Committee.

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APPENDIX A – DEPARTMENT OF ENVIRONMENT APPROVAL NOTICE



Australian Government
Department of the Environment

Our reference: 2010/5642

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Mr Paul Dewar
General Manager Health, Safety and Environment
Rio Tinto Alcan - Bauxite and Alumina
123 Albert Street
Brisbane, QLD 4000

Dear Mr Dewar,

EPBC 2010/5642 – South of Embley Bauxite Mine and Port Development, - Approval – *Dredge Management Plan – Port (Initial Capital Dredging) October 2015*

I refer to your email of 2 November 2015 to the Department requesting approval of the Dredge Management Plan – *Port (Initial Capital Dredging)* in accordance with condition 14 of the approval granted under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and condition 3 of the Sea Dumping Permit issued under the *Environment Protection (Sea Dumping) Act 1981*.

Officers of the Department have reviewed the Dredge Management Plan – *Port (Initial Capital Dredging)* and found that it meets the requirements of approval condition 14 of the EPBC Act approval and condition 3 of the Sea Dumping Permit. On this basis, and as delegate of the Minister for the Environment, I have decided to approve the *Dredge Management Plan – Port (Initial Capital Dredging) October 2015*. You must now undertake the action in accordance with the approved plans. If you have any enquiries please contact Matthew Plunkett on 02 6275 9453.

Yours sincerely

Shane Gaddes
Assistant Secretary
Compliance & Enforcement Branch

16/11/ 2015