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2025 – 2029 Capital Dredge Management Plan

Amrun (Boyd) Port, November 2025



Amrun (Boyd) Port

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Acronyms

Term	Definition
AFS	International Convention on the Control of Harmful Anti-fouling Systems on Ships 2001
AGM	Asian Green Mussel
AHO	Australian Hydrographic Office
AIS	Automatic Identification System
ALS	Australian Laboratory Services
AMSA	Australian Maritime Safety Authority
AQIS	Australian Quarantine Inspection Service
BACI model	Before After Control Impact model
BPDTAG	Boyd Port Dredging Technical Advisory Group
BHD	Backhoe Dredge
CCIMPE	National Consultative Committee on Introduced Marine Pest Emergencies
CG	Queensland Coordinator General
CHEMP	Communities, Heritage and Environmental Management Plan
CMSMP	Construction Marine and Shipping Management Plan
CSD	Cutter Suction Dredge
DA	Development Approval (Queensland)
DAF (now DPI)	Department of Agriculture and Fisheries (Queensland)
DAFF	Department of Agriculture, Fisheries and Forestry (Commonwealth)
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DES	Department of Environment and Science (now DETSI)
DETSI	Department of Environment, Tourism, Science and Innovation (Queensland)
DMP	Dredge Management Plan
DMPA	Dredge Material Placement Area
DoEE	Department of Energy and Environment (now DCCEEW)
DPI	Department of Primary Industries (DPI)
DPPV	Dedicated Post Panamax Vessels
DSD	Western Australian Government Department of State Development
DTMR	Department of Transport and Main Roads
DWT	Deadweight Tonnage
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

LCL	Light Cape Loading
LNG	Liquefied Natural Gas
LSMP	Land and Sea Management Programme (which employs Traditional Owners to help monitor and manage cultural heritage, plants and land and marine wildlife)
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/MSO	Marine Fauna Observer / Marine Species Observer
mg/L	Milligrams per litre
MIA	Mine Infrastructure Area
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
RHM	Regional Harbour Master
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 (now DCCEEW)
SHB	Split Hopper Barge
SoE	South of Embley (Later changed to Amrun and ‘Amrun project’ through consultation with Traditional owners)
SOPEP	Shipboard Oil Pollution Emergency Plan
TBT	tri-butyl tin
The Project	Refers to Amrun, Boyd Port and South of Embley previous naming terminology.
TMR	Department of Transport and Main Roads
TSS/TSM	Total Suspended Solids / Total Suspended Matter
TSHD	Trailing Suction Hopper Dredge
TOMP	Transport Operations (Marine Pollution) Act 1995
WCCCA	Western Cape Communities Co-existence Agreement

1 Introduction

The Amrun Project, (formerly known as South of Embley (SoE) Project) involved the construction and (current) operation of a bauxite mine and associated processing and port facilities located near Boyd Point on the western side of Cape York Peninsula, Queensland. The Amrun Project was developed and is currently operated by RTA Weipa Pty Ltd, which is a wholly-owned subsidiary of Rio Tinto Aluminium Limited.

As part of the Amrun Project, the Amrun Port was constructed in 2017-18 and involves the operation of an export wharf facility located between Boyd Point and Pera Head (refer **Figure 1**). The port infrastructure includes a wharf and ship loader, with dredged berth pocket and an approach/departure apron. The current wharf and footprint of the berth pocket allows loading of bauxite on a mix of panamax, dedicated post-panamax and mini-cape vessels (to ~110,000 tonnes DWT).

The initial capital dredging was completed in April 2016 with removal and relocation of 202,416 m^3 of marine sediments to the Amrun dredge material placement area (DMPA), location indicated in **Figure 1**. Wharf construction commenced in May 2017 with port facility commissioning and first ore shipment in late 2018. The primary purpose of the port is the export of bauxite from the Amrun mine.

Since 2018, maintenance dredging and bed-levelling has been undertaken to maintain berth pocket and apron design depths and widths. Annual maintenance dredging volumes range from 29,000 to 51,000 m^3 of sediment per year, although in 2020, 2021 and 2025 only bed-levelling was required to re-establish declared depths.

RTA Weipa is proposing to increase the capacity of the Amrun Port to provide dual Cape Class vessel berths – refer to **Figure 2** and **Figure 3** for existing and proposed dredging footprints respectively. To accommodate necessary berth, apron and channel depths, capital dredging of up to 3.2 million cubic metres (Mm^3) is required. These volumes are consistent with the initial Sea Dumping Permit (SD2010/1762) and 'South of Embley' Project EIS – 2.6 to 6.5 Mm^3. This capital dredging is currently scheduled to occur in two stages in the 2026 and 2028 dry seasons.

The purpose of this 2025 – 2029 Capital Dredge Management Plan (DMP) is to provide details on the environmental management and monitoring aspects of the proposed capital dredging program and sediment relocation activities to be undertaken as part of this Port development. Dredging operations will not commence until this Capital DMP is approved.

1.1 Commonwealth and State Approvals

The Project was declared a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (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 then Minister for Sustainability, Environment, Water, Population and Communities (the Minister) approved the South of Embley Bauxite Mine and Port Project (EPBC 2010/5642) with conditions on 14 May 2013.

The Commonwealth *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) regulates the loading and placement of sediment from dredging operations in Australian waters. RTA submitted an application for a Sea Dumping Permit for Stage 1 of the Port facility (up to 6.5 Mm^3) to Department of Environment and Energy (DoEE) 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 Mm^3. A Sea Dumping Permit was granted to RTA under *the Environment Protection (Sea Dumping) Act 1981* – South of Embley Bauxite Mine and Port Development (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. Initial capital dredging for Amrun Port in March / April 2016 was conducted in accordance with this Sea Dumping Permit which expired on 14 May 2016.

The Project was been declared a "significant project" for which an EIS was required pursuant to section 26(1a) 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. The Initial Capital Dredge footprint did not extend outside of the mining lease. An Environmental Authority (EA) (EPML00725113), required under the *Environmental Protection Act 1994* (EP Act), for the Amrun project, including for dredging on the mining lease, was issued on 27 November 2014. Subsequent amendments to the EA were approved under the EP Act.

This Capital DMP has been prepared to:

- Meet the conditions of existing Commonwealth (EPBC Act) and State (EA) approvals.
- Support new Commonwealth (Sea Dumping Permit) and State (Development approval) applications.
- Include the lessons learned from 2016 capital dredging, subsequent maintenance dredging and environmental monitoring.
- Include the lessons learned and environmental monitoring since the port commenced operation in 2018.
- Reference additional environmental risk assessments and studies undertaken as part of the sustainable sediment management assessment undertaken to support current annual maintenance dredging activities (SD2020/3999) for the period 2021 to 2031.

Capital dredging activities will not commence until all the below approvals have been received and this DMP approved by Commonwealth and State regulators.

This Capital DMP addresses Conditions in the Commonwealth and State approvals stated below, noting the last two approvals are related to the outer departure channel located in the mining off lease area:

- Sea Dumping Permit: SD2025/4075 (Commonwealth);
- EPBC Act approval: EPBC 2010/5642 – 14 May 2013 (Commonwealth);
- Environmental Authority: EPML00725113 (Queensland Department of Environment and Heritage Protection, now DETSI) – 21 May 2024.
- Environmental Authority: P-EA-101003951 (DETSI (Qld)) – XX XXX 2026.
- Development approval 2511-49156 SDA (DETSI (Qld)) - XX XXX 2026.



Figure 1: Amrun Port, DMPA and geographic locations

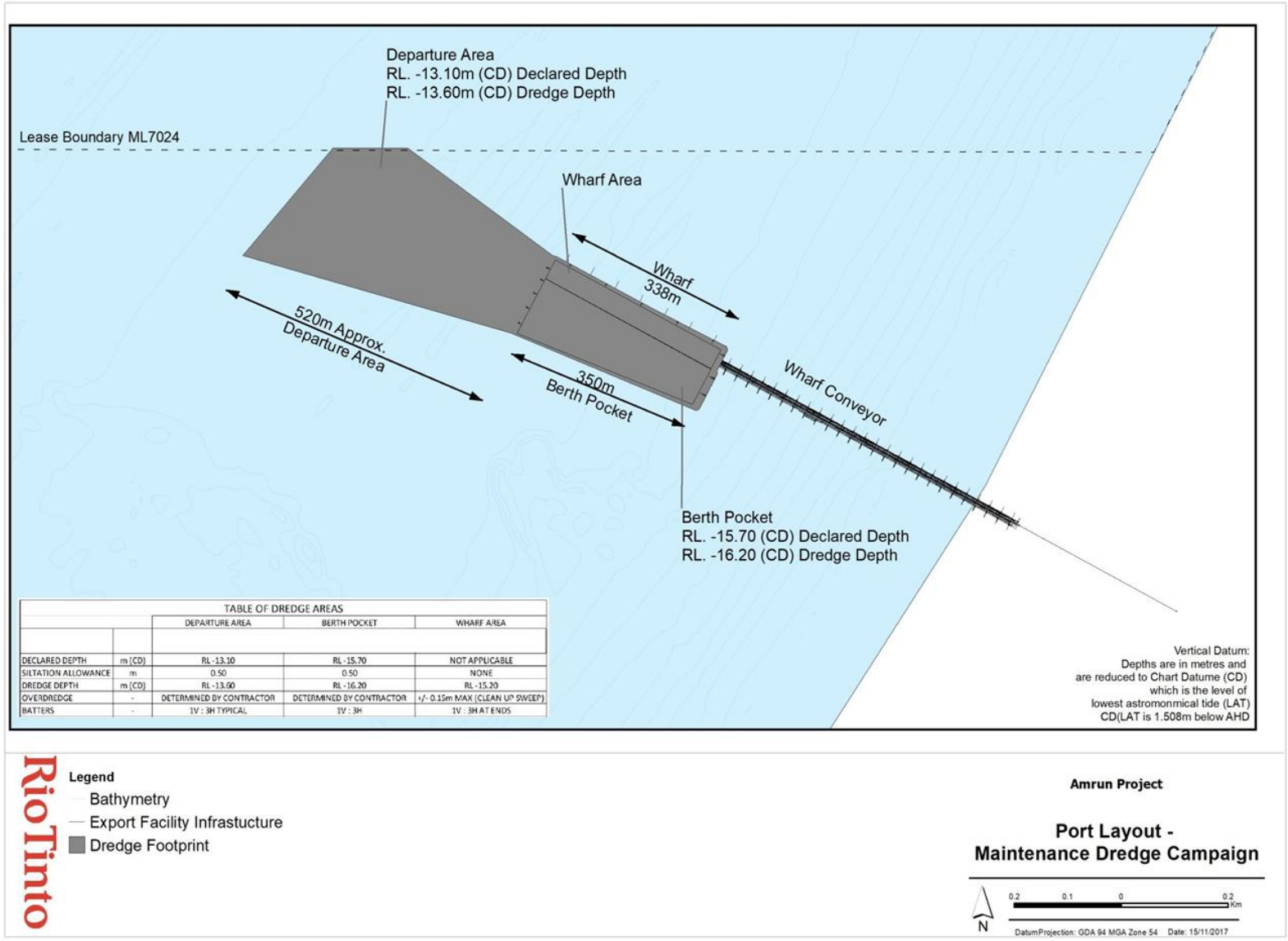
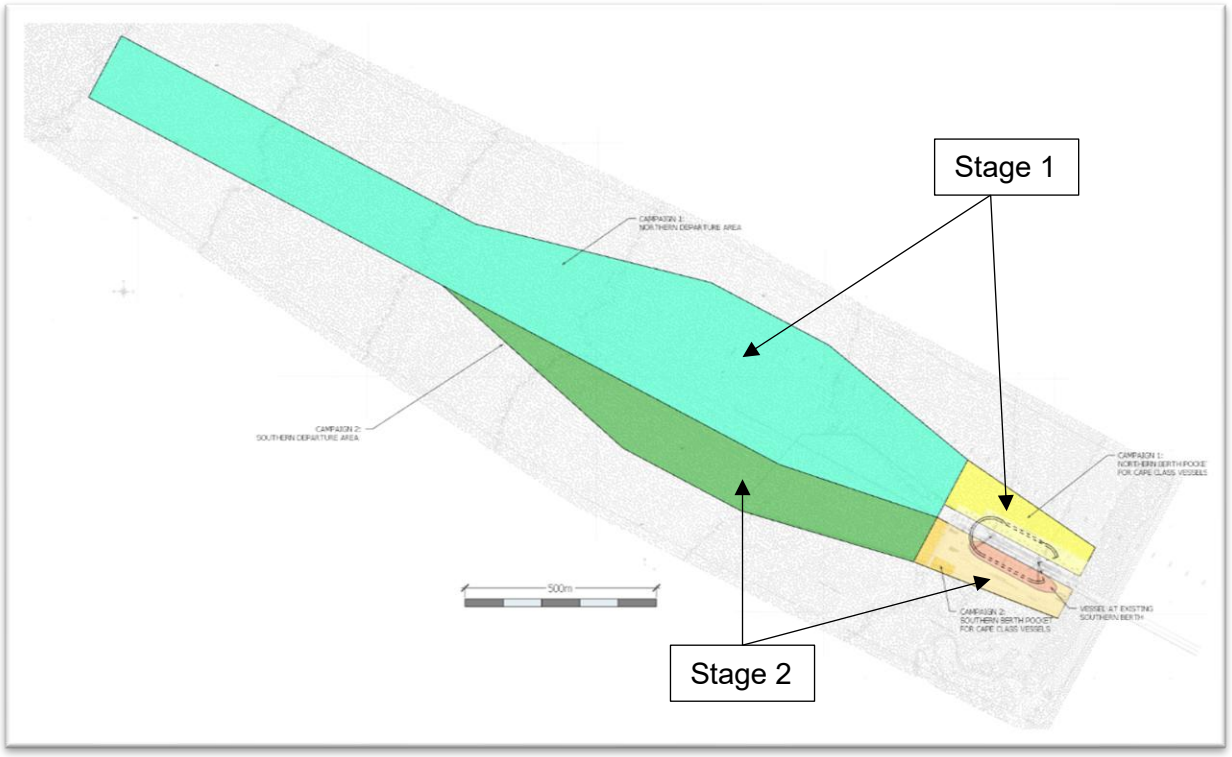


Figure 2: Port layout - existing dredge footprint

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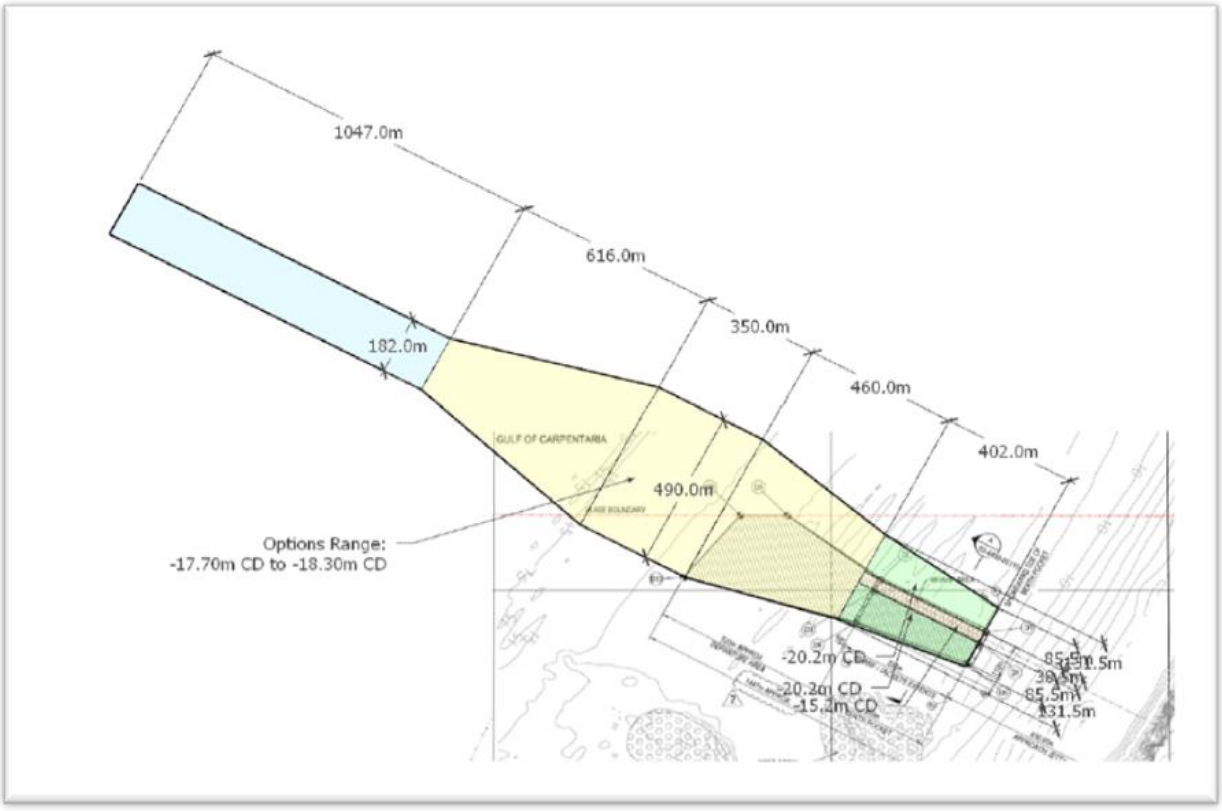


Figure 3: Proposed indicative capital dredging – Stage 1 (aqua, yellow) and Stage 2 (green, orange) (top image); proposed total capital dredge area to lengthen and widen existing berth pocket (bottom)

1.2 Project Approval Conditions

The EPBC Act approval EPBC 2010/5642, Sea Dumping Permit SD2025-4075, Environmental Authority EPML00725113 (on lease) and P-EA-101003951 (off lease) all require a Port capital DMP to be prepared for approval prior to commencing capital dredging operations. The Commonwealth and State approval conditions relating to capital dredging and material placement 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 (Amrun) 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: i. Commonwealth Marine Area ii. Listed turtle species iii. Listed dolphin species; and iv. Dugong (*Dugong dugon)* and Bryde's Whale (*Balaenoptera edeni*)	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 1.1 and 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 10
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 9
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 7.4
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.	Section 7.5 Appendix I
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.	Section 7.5

Conditions	Where addressed in this Plan
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.	Section 7.5
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.	Section 7
Sea Dumping Permit (SD2025/4075)	
1. The permit holder must ensure that all persons engaged in the dumping activities under this permit, including any owner and any person in charge of a vessel, comply with this permit and the requirements of the Act. The fulfilment of these conditions is, at all times while this permit is valid, the responsibility of the permit holder.	Section 7 Section 8
2. The permit holder must ensure that no more than 3.2 million cubic metres (in-situ) of material derived from capital dredging of the Amrun Port Facility managed port area at Weipa, Queensland is loaded and dumped, in accordance with methods specified in the application.	Section 1 Section 2.2
3. The permit holder must only dump within the disposal site shown in Figure 1 at Appendix 2.	Section 2.1 Appendix C & E
4. The permit holder must establish by GPS that, prior to dumping, the vessel is within the disposal site.	Section 2.3
5. The permit holder must ensure that the dredged material is dumped across the disposal site in a manner to prevent mounding.	Section 2.3
6. The permit holder must commence implementing the approved monitoring and management plan upon the commencement of dumping activities and notify the department within 5 days of the date on which dumping activities have concluded.	Section 7.7 Table 13
7. If the minister requires for the better protection of the environment, the permit holder to make specified revisions to the monitoring and management plan, the permit holder must submit a revised monitoring and management plan in accordance with the specified revisions for the minister's approval. If the minister approves a revised monitoring and management plan pursuant to this condition, the permit holder must implement the version of the monitoring and management plan most recently approved by the minister in writing from the date of its approval.	Section 7.7 Table 13
8. The permit holder may submit for the minister's approval a revised version of the monitoring and management plan. If the minister approves in writing a revised monitoring and management plan pursuant to this condition, the permit holder must implement the version of the monitoring and management plan most recently approved by the minister in writing, from the date of its approval.	Section 7.7 Table 13

Conditions	Where addressed in this Plan
9. The permit holder may make administrative changes to the monitoring and management plan without submitting it for the approval of the minister, if the taking of the action in accordance with the revised monitoring and management plan will not have a new or increased impact on the environment or reduce the public accessibility of information. If the permit holder makes this choice, they must: a) notify the department in writing that the monitoring and management plan has been revised and provide the department with an electronic copy of the revised plan showing the proposed changes in track mode, accompanied by a covering letter specifying the changes made and the reasons that the permit holder considers that taking the action in accordance with the revised plan would not be likely to have a new or increased impact on the environment and/or reduce the public accessibility of information. b) implement the revised monitoring and management plan no sooner than 14 days after the date of submission of the revised monitoring and management plan to the department unless the department informs the permit holder in writing that the revised monitoring and management plan requires submission under condition 8. c) for the life of this permit, maintain a record of the reasons the permit holder considers that taking the action in accordance with the revised monitoring and management plan would not have a new or increased impact on the environment and/or reduce the public accessibility of information.	For information Section 7.7 Table 13
10. Each version of the monitoring and management plan approved or adopted for implementation must be published on the website within 30 days of its approval or adoption for implementation, and must include: a) the date of this permit b) the date that a revised version of the monitoring and management plan is approved by the minister c) the date that a revised version of the monitoring and management plan may be implemented without the minister's approval in accordance with condition 9. The permit holder must ensure that each version of the monitoring and management plan remains published on the website until the end date of validity of the permit.	Section 7.7 Table 13 p2, Document Control table
11. The permit holder must ensure that at least one suitably qualified marine species observer is on duty on at least one vessel adjacent to or in the monitoring zone at least 30 minutes prior to, and throughout, any dumping activities. The permit holder must ensure that the marine species observer scans the entire monitoring zone, using binoculars from a suitable observation position on the vessel, for the presence of any marine species within the monitoring zone at least once every 30 minutes, commencing at least 30 minutes prior to, and continuing throughout, any dumping activities.	Section 6.4.1
12. If any marine species is/are sighted in the monitoring zone, the permit holder must not commence dumping activities, or if dumping activities has already commenced, must pause dumping activities as soon as safe and practicable to do so, until either: a) 30 minutes after the time when the last marine species has left the monitoring zone of its own accord b) the vessel has moved to another area of the disposal site where no marine species are within the monitoring zone of the vessel's new location. Note: It is an offence under the EPBC Act to interfere with a marine species or in any way attempt to deter it from entering the monitoring zone or cause it to leave.	Section 6.4.1 Figure 28

Conditions	Where addressed in this Plan
13. If, at any time during dumping activities, an environmental incident occurs or an environmental risk is identified, all reasonable measures must be taken immediately by the permit holder to minimise or mitigate the environmental risk and/or the impact of the environmental incident. The permit holder must provide a report on the environmental incident and/or environmental risk to the department within 72 hours of detecting any environmental incident and/or environmental risk and include in the report: a) details of the environmental incident and/or environmental risk, including the date, time, and location (GPS co-ordinates) b) the measures taken to minimise or mitigate the environmental risk and/or the impact of the environmental incident following detection c) the success of those measures in addressing the environmental incident and/or environmental risk d) any additional measures proposed to be taken.	Table 13 Section 6.4.3 Table 11 Table 12
14. The permit holder must document any detected injury to, or death of any marine species potentially associated with the operation of a vessel or dumping activities. The date, time, location (GPS co-ordinates) and nature of each detected injury to, or death of, the marine species and the species involved, if known, must be recorded, and reported to the department within 72 hours of detecting the injury to, or death of, the marine species.	Table 13 Section 6.4.3 Table 11 Table 12
15. If requested by the department, the permit holder must provide access, including to vessels, for at least 2 nominees of the department to witness, inspect, examine and/or audit any part of the operations, including any dumping activities, monitoring activities, equipment, and any records. The permit holder must provide all reasonable assistance to nominees of the department in carrying out their duties.	Section 7.4
16. The permit holder must make and retain records (which may comprise weekly plotting sheets or an extract of the ship's log certified by the vessel's captain) which must detail: a) the dates, times, and GPS co-ordinates of vessel movements for dumping activities b) the volume of dredged material (in-situ cubic metres) dumped and quantity in dry tonnes for the specified operational period, including the proportion that this amount represents of the total amount permitted under the permit for the dredging campaign c) the names and relevant training and experience of the person(s) who undertook the marine species observation required under condition 11, the marine species observed within the monitoring zone for each vessel movement, including, for each sighting, the date, time, species (or nearest identification), location (GPS co-ordinates) and approximate distance of the marine species from the vessel, and the action taken to comply with condition 12.	Section 7.7 Table 13 Section 6.4.1
17. The permit holder must retain the records required by conditions 13, 14 and 16 for the life of the permit, for verification and audit purposes.	Section 7.3
18. The permit holder must ensure that a suitably qualified person undertakes a bathymetric survey of the disposal site: a) prior to the commencement of dumping activities authorised under this permit b) within one month of the completion of all dumping activities authorised under this permit.	Section 2.3 Section 7.7 Table 13

Conditions	Where addressed in this Plan
19. Within 2 months of the final bathymetric survey being undertaken in accordance with condition 18.b), the permit holder must provide a digital copy of each of the bathymetric surveys to the Australian Hydrographic Office, Locked Bag 8801, Wollongong, NSW 2500 or via email at: datacentre@hydro.gov.au.	Section 2.3 Section 7.7 Table 13
20. The permit holder must provide a report on the bathymetry to the department within 2 months of the final bathymetric survey being undertaken. The report must include a chart showing the change in sea floor bathymetry as a result of dumping activities and include a reliable estimate of the volumes of dumped material that appear to have been retained within the disposal site.	Section 2.3 Section 7.7 Table 13
21. To facilitate annual reporting to the International Maritime Organization, the permit holder must report to the department by 31 January each year, including a final annual report on the day of the expiry of this permit or completion of all dumping activities under this permit, the information specified at Appendix 3 to this permit, in the format of Appendix 3 or as otherwise approved by the department.	Section 2.3 Section 7.7 Table 13
22. If the department believes that it is necessary or desirable to undertake an audit of the permit conditions, the permit holder must comply with any such request and must provide any necessary assistance to the department's representatives in carrying out their duties.	Section 7.4
Queensland Government Environmental Authority Conditions (EPML00725113) – On Lease Area	
(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: a) only occur from the permitted areas identified in the plan(s) referred to in Condition (J22). b) only occur in accordance with conditions of this environmental authority. c) be carried out taking all practical measures necessary to minimise the concentration of suspended solids released during the loading of the vessel.	Section 2.1 and Section 6.8
(J3) Bed levelling activities must not result in the release of contaminants to waters.	Section 2.3
(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.	Section 7.7
(J6) The administering authority must be advised in writing within ten (10) days following completion of the capital or maintenance dredging campaigns.	Section 7.7
(J7) All persons engaged in the conduct of dredging activities including but not limited to employees and contract staff must be: a) trained in the procedures and practices necessary to: 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 0
(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: a) Trailing Suction Hopper Dredge that is equipped, at a minimum, with: 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:	Section 6.1

Conditions	Where addressed in this Plan
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 iii. systems for determining solids to water ratio or density of dredged material during operations c) Grab Dredge or barge mounted backhoe that is equipped, as a minimum, with: i. electronic positioning system for defining the location and depth of dredge activities.	
(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.	Section 6.4
(J10) The following Dredge Management Plans must be provided to the administering authority for review no later than 6 months or any other period as agreed by the administering authority prior to dredging commencing: a) any capital dredge campaign at Boyd Port; b) any capital dredge campaign at Hey River terminal; c) any long term maintenance dredge program.	Section 1
(J11) Dredging can only be carried out when the final dredge management plans are approved by the administering authority	Section 1
(**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 DES prior to dredging commencing.	Section 1
(J16) All subsequent Capital Dredge Management Plans for Boyd Port must be consistent with the conditions of this environmental authority and must: a) consider results of modelling, or alternative assessment methodology as agreed, to: i. estimate the extent, duration and intensity of sediment plumes under a range of tidal and oceanic current conditions that are likely to be generated by dredging and spoil disposal operations for Boyd Port; ii. provide risk estimates relevant to sensitive receptors that are based on the key water quality parameters, specifically increases in turbidity, sedimentation rates, and reduction in photosynthetically active radiation (PAR), for the key Concern Sites (i.e. where sensitive receptors are situated); and iii. define the Zones of Influence of the dredging and spoil disposal sediment plumes; b) implement a Water Quality Monitoring Program, as informed by the Initial Capital Dredge Management Program and recommended by the BPDTAG (as per condition J31), with trigger values as shown in Table J2 - Boyd Port Subsequent Capital Dredge Monitoring: Water Quality Trigger Levels; c) implement a Coral Health Monitoring Program, as informed by the Initial Capital Dredge Management Program and recommended by the BPDTAG (as per condition J31); and d) include reporting and review by the BPDTAG (as per condition J31).	Sections 5.1,5.2 Sections 6.1, 6.2, 6.3 and 6.11 Sections 7.4 and 7.6
(J17) If dredge monitoring trigger levels are exceeded as a result of the dredging activity: a) The administering authority must be advised within 24 hours of the event of the corrective action that has or will be implemented b) Measures must be implemented in accordance with corrective actions specified in the approved dredge management plan.	Section 6.1, 6.2 and 6.3
(J18) The administering authority and the Department of Agriculture, Fisheries and Forestry must be consulted during preparation of all final Dredge Management plan	Section 7.6
(J20) All dredging activities must be undertaken in accordance with the relevant	Section 1

Conditions	Where addressed in this Plan
approved final dredge management plan	
(J21) The holder of this environmental authority must not commence dredging activities at Boyd Port and the Hey River barge/ferry terminal unless the holder has submitted to the administering authority plans for dredging activities certified by a Registered Professional Engineer of Queensland.	Appendix E
(J22) Dredging activities must be confined to the removal of capital or maintenance dredge material at the location shown on the plan(s) referred to in Condition (J21).	Appendix E
(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	Section 1
(J24) Unless otherwise authorised, dredge spoil must not be disposed of on the mining lease	Section 2.3 and Section 6
(J25) Dredge spoil must not be disposed of on land unless otherwise authorised	Section 2.3 and Section 6
(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 administrating authority on request	Section 2.3 and Section 6
(J27) The transport of dredge material must be carried out such that the dredge material is kept wet at all times	Section 6.2 and 6.1
(J28) Prior to the commencement of the capital or maintenance dredging and prior to commissioning of the Port, hydrographic surveys of the bed levels of the area dredged must be completed.	Section 2.3 Table 13
(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: a) a summary of results of all monitoring required by the environmental authority and dredge management plan, with raw data provided in an 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.	Section 7.4
(**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	Table 13
(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.	Table 13
(J36) Mobile dredging operations: a) Must not commence if dugongs, turtles 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 6.4
(J37) Stationary dredging operations: a) Must not commence if dugongs, turtles or cetaceans are observed within 300 m of the dredge	Section 6.4

Conditions	Where addressed in this Plan
b) When underway, must alter the course if dugongs, turtles or cetaceans are observed within 50m of the dredge head	
(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 6.4
(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 6.4
(**J40)** The administrating authority must be immediately notified of any turtle captures by the dredge or injury to any marine species of conservation significance	Section 6.4 and Section 7.4
(J41) all reasonable and practicable measures must be undertaken to minimise the impact of dredging activities on marine fauna	Section 6.4
Queensland Government – Operational work for Tidal works (dredging works) (2511-49156 SDA) – Off Lease Area	
1. The dredging works must be carried out in generally accordance with the following plans: a) South of Embley Expansion Chith Export Facility – Port Expansion Dredging Extent Plans prepared by Rio Tinto dated 13/11/2025. Reference IW306300-JAC-0000-SKT-MS-0000, Preliminary Issue. b)	Section 2 and Appendix E
2. The construction of the dredge channel must be carried out generally in accordance with the report titled 2025 – 2029 Capital Dredge Management Plan – Amrun (Boyd) Port, November 2025, revision 2, dated 13 November 2025, in particular: a) Chapter 2: Dredging and material placement description where relevant to the dredging activity. b) Chapter 6: Management and monitoring where relevant to the dredging activity. c) Chapter 7: Environmental Management Framework where relevant to the dredging. d) Appendix E: Amrun Port – 2025-2029 Capital Dredging Plans where relevant to the dredging.	Through out.
3. Maintain the development in accordance with the plans referenced in condition AD01, and the requirements of any conditions included in this development approval.	Appendix E
4. For the dredging works only use clean material which are free from prescribed water contaminants.	Appendix D
5. a) In the event that the works cause disturbance or oxidisation of acid sulfate soil, the affected soil must be treated and thereafter managed in accordance with the current Queensland Acid Sulfate Soil Technical Manual: Soil management guidelines, prepared by the then Department of Science, Information Technology, Innovation and the Arts, 2014. b) Submit certification from an appropriately qualified person on acid sulfate soil, confirming that the affected soil has been neutralised or contained in accordance with (a) above, to palm@detsi.qld.gov.au] or mail to: Department of the Environment, Tourism, Science and Innovation Permit and License Management GPO Box 2454 Brisbane Qld 4001 *Note:* *Appropriately qualified person(s) means a person or persons who has professional qualifications, training, skills and experience relevant to soil chemistry or acid sulfate soil management and can give authoritative assessment, advice and analysis in relation to acid sulfate soil management using the relevant protocols, standards, methods or literature.*	Appendix D & Table 13
6. a) The volume of material disposed of in tidal water at the Amrun Dredge Material Placement Area must not exceed 1.7Mm^3 per annum. b) Submit documentation detailing the total volume of material disposed of in tidal water to palm@detsi.qld.gov.au or mail to: Department of the Environment, Tourism, Science and Innovation	Table 13

Conditions	Where addressed in this Plan
Permit and License Management GPO Box 2454 Brisbane Qld 4001	
7. a) Prepare a hydrographic survey plan. b) The hydrographic survey plan must be prepared by a registered surveyor in accordance with Standards for Hydrographic Surveys within Queensland Waters to Class A of the capital dredging and dredge material placement areas, and the immediate adjacent area likely to be affected by the capital dredging and dredged material placement. c) Submit the hydrographic survey plan to palm@detsi.qld.gov.au or mail to: Department of the Environment, Tourism, Science and Innovation Permit and License Management GPO Box 2454 Brisbane Qld 4001	Table 13
Material change of use for Environmentally relevant activity	
8. The dredging works must be carried out in generally in accordance with the following plans: c) South of Embley Expansion Chith Export Facility – Port Expansion Dredging Extent Plans prepared by Rio Tinto dated 13/11/2025. Reference IW306300-JAC-0000-SKT-MS-0000, Preliminary Issue. d) Pera Head Amrun Dredged Material Placement Area Post-dredge Hydrographic Survey prepared by Navigation Management Systems dated 25/05/2024.	Section 2 and Appendix E
9. The dredging is limited to a maximum of 1.7Mm^3 per year.	Section 2 and Appendix E
Queensland Government Environmental Authority Conditions (P-EA-101003951) – Off Mine Lease Area	
G1 Limitations of Permit Activities under this environmental authority must be conducted in accordance with the following limitations: a) The Capital dredging and Maintenance dredging activities must be conducted within the bounds and specifications of the following approved plans : • South of Embley Expansion Chith Export Facility – Port Expansion Dredging Extents Plan, prepared by Jacobs for Rio Tinto, dated 30 January 2026, Drawing Number: IW306300-JAC-0000-SKT-MS-0100. b) The dredged material must only be placed in the dredge material placement area (DMPA) marked by the following approved plans: • Pera Head Amrun Dredged Material Placement Area Post-dredge Hydrographic Survey, prepared by Navigation Management Systems, dated 25 May 2024. • South of Embley Expansion Chith Export Facility – Port Expansion Dredging Extents Plan, prepared by Jacobs for Rio Tinto, dated 30 January 2026, Drawing Number: IW306300-JAC-0000-SKT-MS-0100. c) The total maximum Capital dredge volume must not exceed 4,100,000t. d) The total maximum Maintenance dredge volume must not exceed 2,400,000t per year	Section 2 and Appendix E
G2 At least 5 business days prior to commencing a new dredging activity, written notification must be provided to the administering authority of the following: e) Commencement date of the dredge operation; and f) Footprint of the area subject to the dredge operation; and g) Quantity of material (in tonnes) subject to the dredge operation; and h) Expected end date of the dredge operation.	Table 13
G3 At least 10 days following completion of the Capital or Maintenance dredging campaigns, written notification must be provided to the administering authority.	Table 13
G4 All reasonable and practicable measures must be taken to prevent or minimise environmental harm caused by the activities.	Table 11
G5 Any breach of a condition of this environmental authority must be reported to the administering authority as soon as practicable within 24 hours of you becoming aware of the breach. Records must be kept including full details of the breach and any subsequent actions taken.	Table 12

Conditions	Where addressed in this Plan
G6 Within 14 days of providing the notification under condition G5, or a longer period agreed to in writing by the administering authority, an investigation must be completed into any contravention of a condition of the environmental authority to determine: a) the potential circumstances and actions that may have contributed to the contravention; and b) the environmental impact of the contravention; and c) reasonable measures that could be implemented to address the cause of the contravention to prevent future contraventions of this nature.	Table 13
G7 Measures identified under condition G6(c) must be implemented within: a) 28 days of the investigation required by condition G6 being completed; or b) a longer period agreed to in writing by the administering authority.	Table 13 and section 6
G8 The following details must be recorded for all contraventions of conditions within the environmental authority: a) date and time the contravention occurred; and b) nature and details of the contravention; and c) investigations carried out in response to the contravention as required by condition G6; and d) the results of investigations; and e) measures taken under condition G6(c).	Table 12
G9 Other than as permitted by this environmental authority, the release of a contaminant into the environment must not occur.	Table 11
G10 Environmental monitoring results, all other information, and records that are required by the conditions of this environmental authority must be kept for a minimum of 15 years. All information and records required by the conditions of this environmental authority must be provided to the administering authority, or nominated delegate upon request, within the required timeframe and in the specified format.	Table 13
G11 An appropriately qualified person(s) must monitor, record and interpret all parameters that are required to be monitored by this environmental authority and in the manner specified by this environmental authority.	Section 7
G12 All analyses required under this environmental authority must be carried out by a laboratory that has National Association of Testing Authorities (NATA) certification, or an equivalent certification, for such analyses. Exceptions for this condition are in-situ monitoring and any analyses for which such certification is not available.	Section 6.2
G13 When required by the administering authority, monitoring must be undertaken in the manner prescribed by the administering authority, to investigate a complaint of environmental nuisance arising from the activity. The monitoring results must be provided within 10 business days to the administering authority upon its request.	Table 13
G14 The following details must be recorded for all environmental complaints received: a) date and time the complaint was received; and b) if authorised by the person making the complaint, their name and contact details; and c) nature and details of the complaint; and d) investigations carried out in response to the complaint as required by condition G13; and e) the results of investigations; and f) measures taken under condition G15.	Table 13
G15 An investigation must be undertaken within 28 days (or a longer period agreed to in writing by the administering authority) into all complaints received to determine: a) the potential circumstances and actions on site that may have contributed to the basis of the complaint; and b) reasonable measures that could be implemented to address the complaint.	Table 12
G16 Measures identified under condition G15 must be implemented within: a) 28 days of the investigation required by condition G15 being finalized; or b) a longer period agreed to in writing by the administering authority.	Table 13 & section 6
G17 The dredging activity must not commence unless the lawful disposal of the dredged material has been authorised under an authority, licence or other permit issued by the Commonwealth or Queensland governments. Evidence of all necessary approvals must be provided to the administering authority upon request.	Appendix B & D
G18 Dredged material must not be placed at sea except at a designated place authorised under an authority, licence or other permit issued by the Commonwealth or Queensland governments.	Appendix B & D
G19 The operator must: a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority; and	Table 11

Conditions	Where addressed in this Plan
b) maintain and calibrate such measures, plant and equipment in an efficient condition and keep records of the maintenance; and c) operate such measures, plant and equipment in an efficient manner.	
G20 Prior to the commencement of the Capital dredging activity, a Dredge Management Plan (DMP)[1] for the activity must be developed and implemented, and the DMP must contain the following: 1. Clearly stated aims and objectives. 2. Description of dredging operation including: a) type of equipment to be used in dredging; b) volume of dredged material to be removed, and duration and timing of the dredging campaign; c) methods to be utilised for transporting dredged material; and d) dredged material disposal methods. 3. Maps or plans showing: a) legend, north arrow and scale; b) boundaries of dredging operation; c) estimated or modelled zone of influence of sediment plumes; d) location of designated disposal sites; e) location of sensitive receptors; and f) all monitoring locations. 4. A detailed description of sediment plume-associated monitoring program including: a) sampling regime and methods; and b) monitoring sites. 5. A detailed description of the assessment methodology to provide data in relation to trigger values that will define alert levels. 6. Clearly set out data handling and evaluation procedures that demonstrate how exceedance of alert levels will be determined. 7. Management actions to be initiated if alert levels are exceeded. *[1] Note: The Dredge Management Plan is subject to review and amendment as required by changing regulation, monitoring results, or Technical Advisory Group recommendation*	This Document
G21 The Dredge Management Plan (DMP) must be submitted to the administering authority at least 20 days prior to the commencement of dredging and amended in accordance with any comments made by the administering authority. The Dredge Management Plan may be provided to the administering authority at either of the addresses below: PALM@detsi.qld.gov.au; or Department of the Environment, Tourism, Science and Innovation Permit and License Management GPO Box 2454 Brisbane Qld 4001	Table 13
G22 The long-term Maintenance Dredge Management Plan must be consistent with the conditions of this environmental authority and must: consider results of modelling, or alternative assessment methodology as agreed with the administering authority, to: a) estimate sediment plumes that may be generated by maintenance dredging and sediment disposal operations; i. provide risk estimates relevant to sensitive receptors that are based on the key water ii. quality parameters, for the key Concern Sites (i.e. where sensitive receptors are situated); and iii. define the zones of Influence of the dredging and disposal sediment plumes. b) implement a water quality monitoring program, as informed by previous dredging campaigns c) in considering the maintenance dredging schedule consider any potential adverse effects on: i. coral spawning and outcome of any associated management actions; and ii. marine turtle nesting.	NA
G23 If the Capital Dredge Management Plan or long-term Maintenance Dredge Management Plan is amended, it must be provided to the administering authority at least 20 business days prior to commencing activities under the amended Dredge Management Plan.	Table 13
G24 Any comments made by the administering authority on either the amended Capital Dredge Management Plan or the long-term Maintenance Dredge Management Plan in	NA

Conditions	Where addressed in this Plan
accordance with condition G23 must be addressed to the satisfaction of the administering authority prior to implementing the amended Dredge Management Plan.	
G25 Conditions G23 and G24 apply each time the Capital Dredge Management Plan or the long-term Maintenance Dredge Management Plan are amended.	NA
G26 The Capital dredging activity must be undertaken in accordance with the Dredge Management Plan required in condition G20.	This document
G27 The Maintenance dredging activity must be undertaken in accordance with the long-term Maintenance Dredge Management Plan required under condition G22.	NA
G28 The Capital Dredge Management Plan and the long-term Maintenance Dredge Management Plan must not be implemented or amended in a way that contravenes or is inconsistent with any condition of this authority.	This document
G29 Chemicals and fuels in containers of greater than 15 litres must be stored within a secondary containment system.	Section 6.8
WT1 This authority permits the release of bed sediments necessarily disturbed as a result of dredging provided that the release of those bed sediments is within the location described in condition G1 in which disturbance has been authorised.	Section 6.2
WT2 Where the zone of influence of a sediment plume generated by the activity encroaches upon a sensitive receptor, slightly disturbed or high ecological value waters, sediment plume-associated monitoring (SPAM) is to be undertaken and must include: • Monitoring at concern sites and control sites during dredging, with a baseline collection phase (baseline-based assessment with control site-based checking). • include management actions against trigger levels to ensure the requirements of Condition WT1 will be met.	Appendix F
WT3 Management actions as described in approved Dredge Management Plan must be implemented while water quality monitoring results show an exceedance of trigger values that is directly attributable to the dredging activity.	Section 6.2
WT4 In addition to WT1, the release to waters must not: a) Have any other properties at a concentration that is capable of causing environmental harm. b) Produce any slick or other visible evidence of oil or grease, nor contain visible floating oil, grease, scum, litter or other visually objectionable matter.	Section 6.2
WT5 For Capital dredging a report summarising the results of the Coral Monitoring Plan (Coral Monitoring Plan Report) must be prepared by an appropriately qualified person and submitted to the administering authority.	Table 13
WT6 The Coral Monitoring Plan Report required by condition WT5 must include: a) a summary of the previous 12 months monitoring data obtained under the Coral Monitoring Plan in the relevant financial year; and b) an evaluation of all relevant data obtained under the Coral Monitoring Plan, including graphical representations showing baseline data and a comparison of data trends against the Coral Monitoring Plan and associated water quality monitoring trigger values; and c) a description of all actions taken to minimise the environmental risk in response to data or other information obtained during from the Coral Monitoring Plan, including actions taken where associated water quality monitoring trigger values were reached; and d) the results of the management actions.	Table 13 and Appendix G
WT7 The Coral Monitoring Plan Report required by condition WT5 must include analysis and interpretation of the data and other information obtained through the implementation of the Coral Monitoring Plan that determines: a) how the Coral have been impacted by the activity.	Appendix G
WT8 The Coral Monitoring Plan Report required by condition WT5 must include recommended actions to mitigate any adverse impacts caused, or likely to be caused, by the activity.	Appendix G
WT9 The actions required under condition WT8 in the Coral Monitoring Report must be undertaken: a) as soon as practicable, but no more than 10 business days after receiving the Coral Monitoring Plan monitoring report; or b) another period agreed to in writing by the administering authority.	Table 13
WT10 At all times during dredging, an appropriately qualified person must undertake monitoring for the presence of marine megafauna.	Section 6.4
WT11 If marine megafauna are observed within 300m of the dredging: 1. Works are not to commence until the marine megafauna are observed to have moved beyond the 300m observation distance; or a 30 minute period has passed since any	Section 6.4

Conditions	Where addressed in this Plan
marine megafauna has been observed in the 300m observation zone by the appropriately qualified person conducting monitoring required by condition WT10. 2. For stationary dredging vessels, dredging must cease if marine megafauna is within ~~50m of the dredge head~~. 300m of the dredge head (Condition 12, SD2025/4075) 3. For operating mobile dredge vessels, alter course to avoid marine megafauna by at least 300m.	
W1 All waste generated in carrying out the activity must be reused, recycled or removed to a facility that can lawfully accept the waste.	Section 5.8
A1 Odours or airborne contaminants must not cause environmental nuisance to any sensitive place or commercial place.	Appendix B
L1 Contaminants must not be released to land.	Appendix B
N1 Noise generated by the activity must not cause an environmental nuisance to any sensitive place or commercial place.	Appendix B
CD1 The characterisation of sediments and suitability of dredged material for the dredge material placement area must be determined no more than five years before a dredge operation is undertaken and must: a) be prepared by an appropriately qualified person(s); and b) be in accordance with the methodologies provided in the latest editions of the: i. National Assessment Guidelines for Dredging 2009, and/or ii. National Environment Protection (Assessment of Site Contamination) Amendment Measure 1999, and/or iii. Queensland Acid Sulfate Soil Technical Manual version 5.1; and c) Be submitted to the administering authority for comment prior to commencing the sampling program…and any other relevant guideline specified by the administering authority, at least 20 business days prior to the commencement of the dredging activity. Note: It is the responsibility of the operator to determine whether previous characterisation of sediments are suitable for assessing risks to environmental values associated with the dredging campaign to which this environmental authority relates. Sediment characterisation reports may be submitted at either of the addresses below: PALM@detsi.qld.gov.au; or Department of the Environment, Tourism, Science and Innovation Permit and License Management GPO Box 2454 Brisbane Qld 4001	Appendix D

2 Dredging and material placement description

2.1 Location and Proposed Volumes of Dredging and Material Placement

The Amrun Port site is 40km south of Weipa between Boyd Point and Pera Head on RTA mining lease ML7024. The proposed shipping channel will extend outside the mining lease into the coastal waters of Queensland (**Figure 1**). The current, approved DMPA for placement of annual maintenance dredged material and initial capital dredged material, is approximately 17km offshore from the Port near the 25m depth contour (**Figure 1** and **Figure 4)**. The Amrun DMPA is defined by a 1,000m radius within the Commonwealth marine area, centred on the WGS84 coordinates: S12°54.77'. E141°28.88'".

The Amrun DMPA was initially assessed within the Project EIS for capital dredging of up to 6,500,000 m^3 of dredged material for creation of channels, departure areas and wharfs (**Figure 3**). However, the initial capital dredging volume in 2016 was reduced to only 202,416 m^3. The DMPA was initially approved for a capacity of 2,600,000 m^3. A summary of historical volumes placed at the DMPA since 2016 is provided in **Table 2**.

Following the 2024 maintenance dredging program, approximately 400,180 m^3 or 15.4% of the original capacity will have been utilised. No maintenance dredging occurred in 2025. The proposed capital dredging of up to 3.2 million m^3 would represent an average depth increase of only 1.0 metre across the existing, approved DMPA.

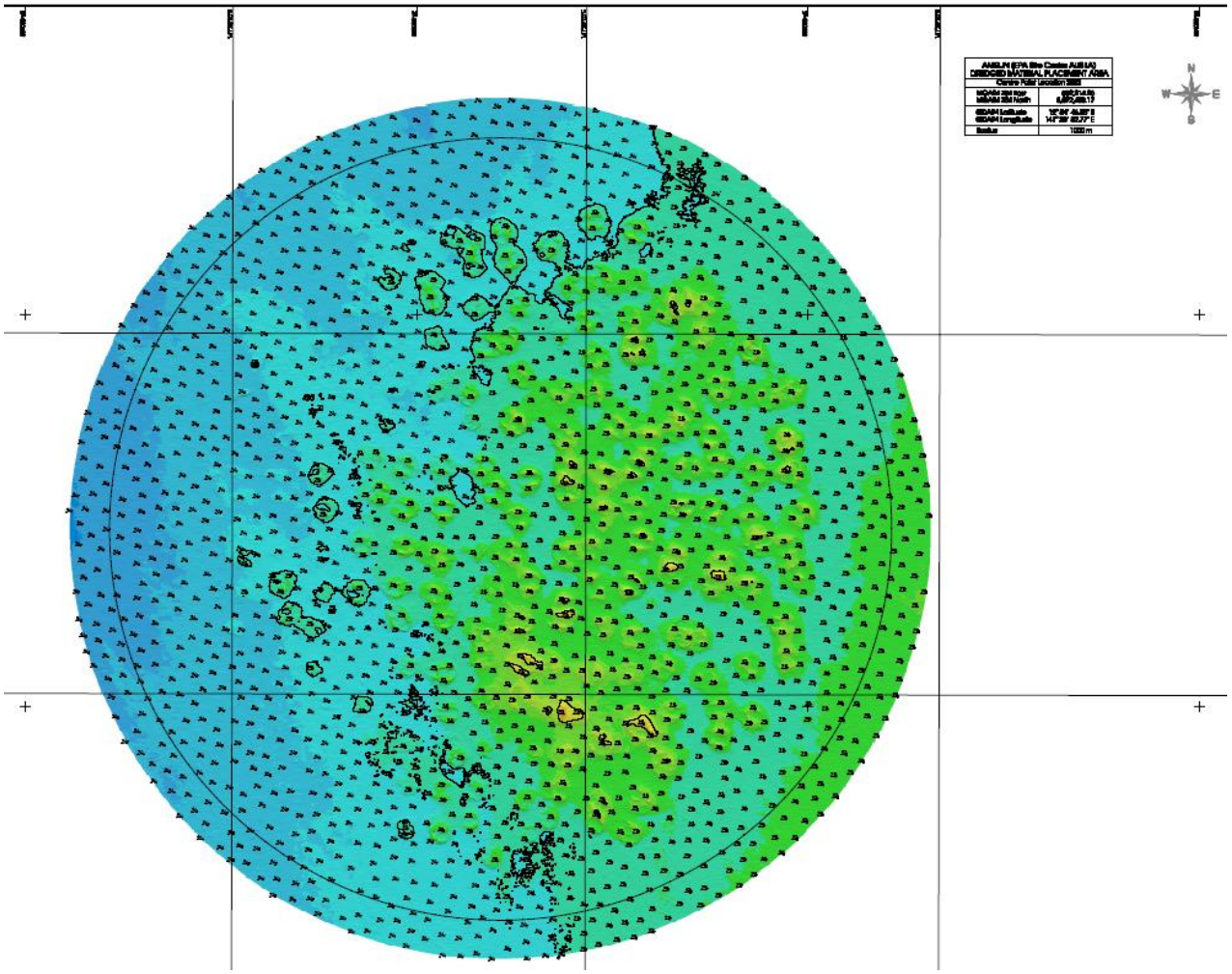


Figure 4: Amrun DMPA survey 23-24 May 2024

Table 2: Amrun DMPA historical placement volumes

Year	Capital or Maintenance	Volume
2016	Capital	202,416 m^3
2018	Maintenance	42,038 m^3
2019	Maintenance	40,826 m^3
2020	Maintenance	No dredging
2021	Maintenance	No dredging
2022	Maintenance	29,000 m^3
2023	Maintenance	34,600 m^3
2024	Maintenance	51,300 m^3
2025	Maintenance	No dredging
	Total	**400,180 m^3**

2.2 Schedule

This proposed capital dredging program is scheduled as follows:

- **Stage 1 – 2.2 Mm^3** including overdredging tolerance; northern berth pocket and departure channel
- **Stage 2 – 1.0 Mm^3** including overdredging tolerance; southern berth pocket and departure channel

Stage 1 is currently scheduled to occur between May and July 2026; and Stage 2 scheduled for the 2028 dry season (May to October).

Environmental monitoring, bathymetric surveys and vessel mobilisation and demobilisation will occur either side of this program duration period (i.e. pre- and post-dredging).

2.3 Dredging and Material Relocation Methodology

Capital dredging up to 3.2 million cubic metres (Mm^3) is required. Dredging and material relocation methodology will depend on the equipment availability and suitability and will consist of one of the previously approved (Condition J8, EA EPML00725113) methods below:

1. **Trailing Suction Hopper Dredge (TSHD)** – A TSHD may be used to dredge fine materials from the footprint. The TSHD uses suction tubes (up to 2) driven by powerful pumps to remove sediment from the seabed and pump into vessel's own cargo hopper. The loaded TSHD would transport dredged material to the offshore Amrun DMPA for material placement. 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 relocation and placement at the DMPA. 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) of the port footprint or along quaylines. 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 relocation and placement at the DMPA.
4. **Split Hopper Barge (SHB)** – A SHB (or number of) may be used for relocation of dredge material to the offshore Amrun DMPA. Once hopper filling is complete the SHB motors (or is towed) to the approved DMPA. The SHB then splits in two and deposits materials in the approved DMPA area.

During the initial EIS, two methods, a CSD with TSHD and a CSD with SHBs, were considered for the 2.6 Mm^3 dredging volume and were modelled to identify the potential worst case 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 (BMT 2016, Chevron 2014, SKM 2012, CEE 2012).

A bathymetric survey of the DMPA will be undertaken:

a) Prior to the commencement of placement activities at the DMPA; and
b) Within one month of the completion of all placement activities as authorised under the sea dumping permit at the DMPA, unless otherwise agreed with DCCEEW.
c) Forwarded to the Australian Hydrographic Office (previous Royal Australian Navy Hydrographer) within 2 months of survey.
d) Provide a report to DCCEEW on the bathymetry within 2 months of final survey
e) Provide a report to DCCEEW regarding international reporting requirements (at end of project or prior to 31 January each year).

The latest bathymetric surveys of Amrun Port and the DMPA are provided in **APPENDIX C** .

Disposal operations using either the TSHD or SHBs will be similar. Once the vessel is filled with dredged material the vessel will then relocate to the currently approved DMPA. The volume of each load of dredged material will be logged by the Contractor and will be deposited so that the placed material is distributed evenly over the area of the DMPA to prevent significant mounding. Prior to material placement the vessel will establish by GPS that it is inside the DMPA.

Upon entering the designated area for placement, the vessel will 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 affected if the dredge were to remain stationary. Once the vessel has been emptied and cleared of dredged material the vessel will return to the dredge site to collect the next load.

Disposal for both a TSHD and SHB was considered in the original EIS and turbidity plume modelling was completed for both. Material placement at the DMPA currently occurs annually (typically) with the TSHD *Brisbane* with no significant impacts to the environment.

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

Bed levelling operations may be necessary in parallel with, and following, capital dredging, to remove any peaks or troughs generated from dredging operations to enable safe passage. Bed levelling operations produce minimal 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.

2.4 Proposed Equipment

For Stage 1, the proposed equipment consists of a large CSD, large TSHD and auxiliary vessels for crew transfer, surveying and workboat assistance (**Figure 5**). Stage 2, may use this same equipment or return to use of a CSD and SHBs as per initial 2016 capital dredging program.

The general layout of the proposed TSHD and CSD are shown in **Figure 6** and **Figure 7** respectively.

A CSD will be used to pre-cut the harder and stiffer materials in order to achieve dredge design. An illustration of how CSD pre-cuts harder material is shown in **Figure 8**.

The TSHD will be used to remove unconsolidated surface sediments as well as material pre-cut by the CSD.

The proposed equipment will operate 24 hours a day.

CSD NICOLLÓ MACHIAVELLI



Length o.a.	138.5 m
Breadth	26 m
Draught	5.5 m
Dredging depth	35 m
Suction pipe diameter	900 mm
Discharge pipe diameter	900 mm
Barge loading pipe diameter	900 mm
Submerged pump power	4,250 kW
Inboard pump power	2 x 5,000 kW
Cutter power	7,000 kW
Propulsion power	2 x 3,500 kW
Total installed diesel power	23,520 kW
Speed	13 kn
Accommodation	46 persons
Built in	2011

TSHD JUAN SEBASTIÁN DE ELCANO



Hopper capacity	16,500 m^3
Deadweight	26,650 t
Length o.a.	157.5 m
Breadth	27.8 m
Draught loaded	11.1 m
Maximum dredging depth	54.5 m
Suction pipe diameter	1,100 mm
Pump power (trailing)	2 x 2,250 kW
Pump power (discharging)	9,500 kW
Propulsion power	2 x 8,400 kW
Total installed diesel power	17,880 kW
Speed	15.7 kn
Accommodation	42 persons
Built in	2002



Multicat Fiona F



Multicat DN207



CTV Broadsword



Survey Vessel Enrybo Kae

Figure 5: Example of proposed CSD (top), TSHD (middle) and auxiliary vessels (bottom)

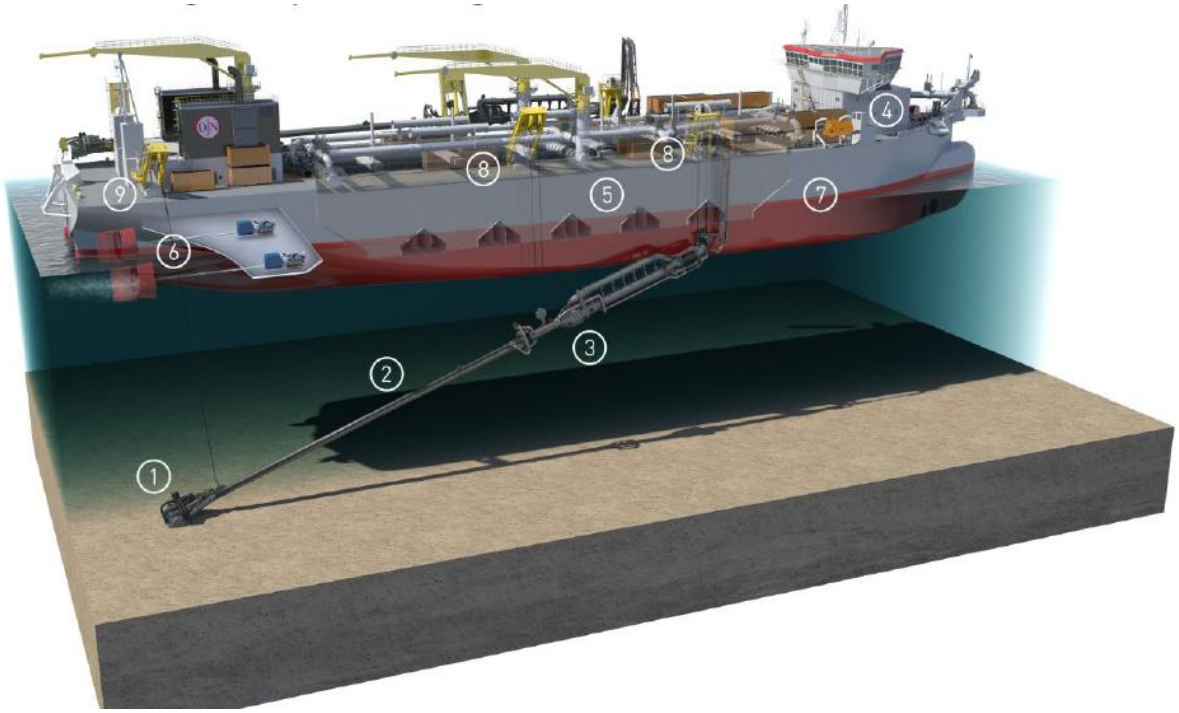


Figure 6: General layout of a TSHD with its drag head (1), suction pipe (2), underwater pump (3), bridge (4), hopper (5), propulsion system (6), hull (7) and gantries (8)

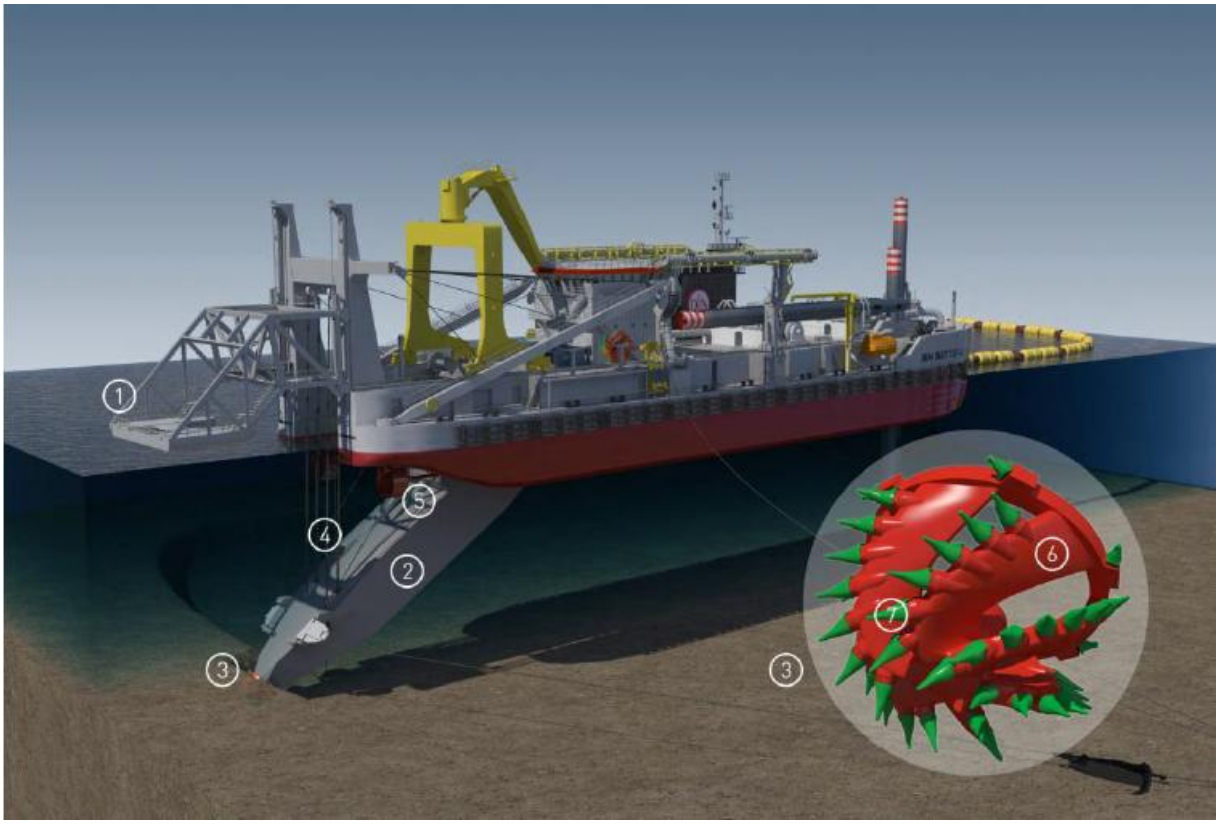


Figure 7: General layout of a CSD with the cutter platform (1), cutter ladder (2), cutter head (3), ladder wires (4), cutter shaft (5) and cutter head with cutter blades (6) and pick points (7)



Figure 8: CSD pre-cutting harder material and discharging via pipeline (1) back to the seabed (2)

3 Sediment characterisation

Several sediment characterisation studies have been undertaken at the Port as part of ongoing development activities, with the first undertaken in 2007/2008 as part of the initial EIS for Amrun Project and subsequent studies undertaken in 2009, 2010, 2012, 2017 and 2023. **Every sediment characterisation study undertaken confirmed sediment was suitable for unconfined ocean placement.**

A review of the sediment characterisation studies at Amrun Port from 2008 to 2023 (SQP 2024) is summarised below.

In September 2024, RTAW sought an exemption from further geochemical and physical analysis of sediments as part of sea dumping permit application for this capital dredging program. On 25 October 2024, DCCEEW granted an exemption for the program under Section 4.2.1 of the NAGD 2009 (**APPENDIX D**)

Summary of historical sediment characterisation studies

- Seven sediment characterisation studies comprising the assessment of potential contaminants (including metals and metalloids, organotins and hydrocarbons) have been completed from 2007 to 2023 over the course of the Port's lifetime including pre-construction, construction and operation. These studies have also included an assessment of PSD and on occasions included an assessment of ASS.
- Sediments are predominately comprised of clay and silt (73 to 94%) with sand (5 to 27%) and trace gravel (<1 to 3%). More detailed analysis in 2010 indicated inshore sediments are primarily clay /silt whilst offshore sediments are primarily course textured (up to 81% sand and gravel) with clay/silt and gravel.
- Some concentrations of metals including Ni, Sb, Cu and Co have exceeded NAGD screening levels on occasion; however, further analysis of bioavailability (DAE and elutriates) indicated concentrations of these metals and all other metals and metalloids analysed have been less than the respective NAGD screen levels and ANCEZZ / ARMCANZ 95% species protection water quality guideline criteria.
- The most recent sediment characterisation (completed in 2023) did not include organotins as:
  - Organotins have not previously been detected.
  - The Port commenced operations 10 years after the worldwide ban on TBT was implemented therefore organotins are not considered to be a legacy contaminant of concern at the Port.
- Conclusions of all seven sediment characterisations reviewed have all indicated sediments were suitable for unconfined ocean placement.
- In accordance with the NAGD, 2009 framework for exemptions from sediment testing requirements the following is considered to support an exemption of further sediment characterisation of chemical contaminants for proposed capital dredging:
  - Capital sediments to be dredged (i.e. outer channel) primarily comprise coarse textured sediments (up to 81% sand and gravel).
  - The Port is considered to be in a remote area removed from known existing and historical sources of pollution supported by previous sediment characterisation studies that concluded sediments were suitable for unconfined ocean placement.

4 Existing environment

4.1 Past and Current Uses

The Port is located in a remote and previously undeveloped area and as such there are few, if any, pre-existing potential contaminant sources either from shipping activity or land use. The Port construction commenced with the capital dredge program in March-April 2016, and Port construction commenced May 2017. The Amrun Mine Infrastructure Area construction commenced in March 2016 on land adjacent to the Port site. Mining extraction activities and operation of the Mine Infrastructure Area (MIA) commenced in late 2018. Water release points from the MIA within the site water management system are licensed through the EA (EPML00725113) and include sediment control structures at each release point. The licensed release points do not discharge directly to coastal waters or the marine environment. No contamination of the marine environment is expected due to operation of the Amrun Mine Infrastructure Area or extraction activities.

No anthropogenic contaminants were recorded in the sediments to be dredged during sediment characterisation for the capital dredge program in 2010, 2011 and 2012, or maintenance dredge programs in September 2017 and March 2023, and concentrations represented natural background levels. There have been no environmental incidents at the Port facility since construction commenced and no releases from the Mine Infrastructure Area.

The current approved dredged material placement area (DMPA) has now been used to place around 400,000 m^3 of dredged material over six (6) separate capital and maintenance dredging programs between 2016 and 2025. Annual maintenance dredging sediment volumes range from 0 m^3 to 51,000 m^3.

4.2 Summary of Environmental Values

The environmental values surrounding Amrun Port have been extensively examined over several studies for previous project approval processes and monitoring plans. This includes several studies undertaken for the nearby Port of Weipa; also located within Albatross Bay and operated by North Queensland Bulk Ports (NQBP). Both RTAW and NQBP also undertake non-project related monitoring that provides an ongoing understanding of the long-term baseline environmental conditions. This monitoring currently focuses on turtles, dolphins, sediments, water quality, seagrass (Albatross Bay) and marine pests.

Schedule 1 of the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP Water) lists the established Environmental Values (EVs) for specific waters. These EVs define the desirable qualities of a waterway for its aquatic ecosystems and human uses.

At present, the western side of Cape York is not yet covered under a site-specific document and therefore do not yet have prescribed environmental values. However, a comprehensive environmental values assessment has been undertaken for the Port of Weipa, Amrun and Albatross Bay area more broadly (GHD, 2019). This assessment identified several marine environmental values of importance, including:

- Fisheries
- Corals
- Seagrass
- Mangroves
- Marine fauna (notably turtles and dolphins)
- Catchments & estuaries.

A summary of the key environmental values surrounding Amrun Port is provided in **Figure 9.** This summary was based on the Environmental Risk Assessment (Eco Logical Australia, 2020) undertaken as part of the comprehensive sustainable sediment management assessment for Amrun port to support the long-term maintenance dredging and associated approvals (2021 – 2031).

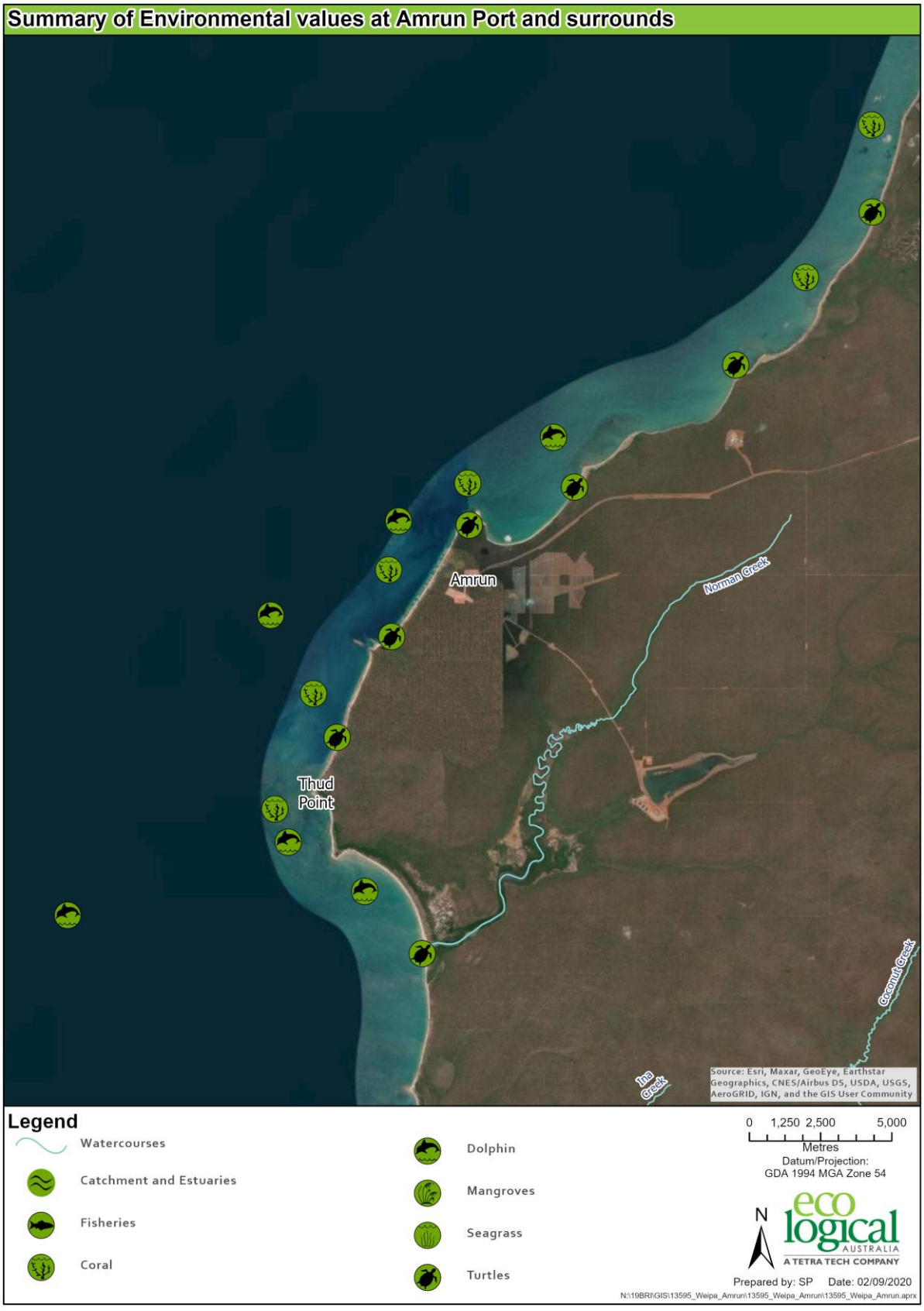


Figure 9: Marine environmental values in the area surrounding Amrun Port

4.3 Water Quality

Background water quality has been collated from several deployed logger investigations undertaken within the proposed dredge area and DMPA since 2007. Key monitored parameters have included turbidity (NTU) and photosynthetically active radiation (PAR). A summary of these programs is presented within **Table 3** with monitoring locations shown in **Figure 10**.

Consolidated monitoring locations established during baseline investigations were applied to the initial 2016 capital dredging monitoring program (202,416 m^3).

Additional monitoring was undertaken from March 2018 to September 2019 which included the 2018 and 2019 maintenance dredging programs. A single location (WQ3, -12.9466° S, 141.5956° E) was utilized approximately 3 kilometres SSW of Amrun port to align approximately with WQ monitoring location 'I2' from the initial capital dredging program.

Table 4 presents a summary of background turbidity data collected during 2007 - 2008. These data included the Amrun Port, Pera Head and Boyd Point. Median turbidity concentrations remain higher during the wet season with elevated concentrations driven by ambient events (eg storms). **Figure 11** demonstrates the occurrence of such events as recorded from Pera Head and Amrun Port during the 2007-2008 wet season. The wet season events observed during this period describe elevations in ambient turbidity rising from <5 NTU before the events and exceeding~200 NTU during the events. The duration of these events exceeded 20 days and report median turbidity concentrations in the order of 30-40 NTU.

Table 3: Implementation of data logger monitoring (2007-2019)

Parameter	Location	Wet season Nov 2007- Mar 2008	Dry season Jun-Sep 2010	Wet season Feb-Apr 2012	Dry season Sep-Nov 2015	Wet season Dec 2015 - Mar 2016	Dry season Mar- May 2016 Capital dredging	Dry season Mar-Oct 2018 Maint. dredging	Wet season Nov 2018 – Apr 2019	Dry season May-Aug 2019 Maint. dredging
Turbidity	Amrun Port area	✓	✓	✓	✓	✓	✓	✓	✓	✓
	DMPA	✓	✓		✓	✓	✓			
PAR	Amrun Port area				✓	✓	✓	✓	✓	✓
	DMPA				✓	✓	✓			

Table 4: Summary of background water quality near the Amrun Port and DMPA (2007-2008)

Location	Season	Parameter	Median	80th Percentile	95th Percentile	Min	Max
Amrun Port area	Wet	Turbidity (NTU)	14.2	39.7	88.4	<0.1	503
	Dry	Turbidity (NTU)	5.7	11	20.8	<0.1	79
Pera Head	Wet	Turbidity (NTU)	2.2	25.9	64.1	<0.1	339
	Dry	Turbidity (NTU)	1.2	2.1	3.5	<0.1	22
Boyd Point	Wet	Turbidity (NTU)	14	39	*	0.2	225
	Dry	Turbidity (NTU)	2.4	*	*	<0.1	103

* not reported.

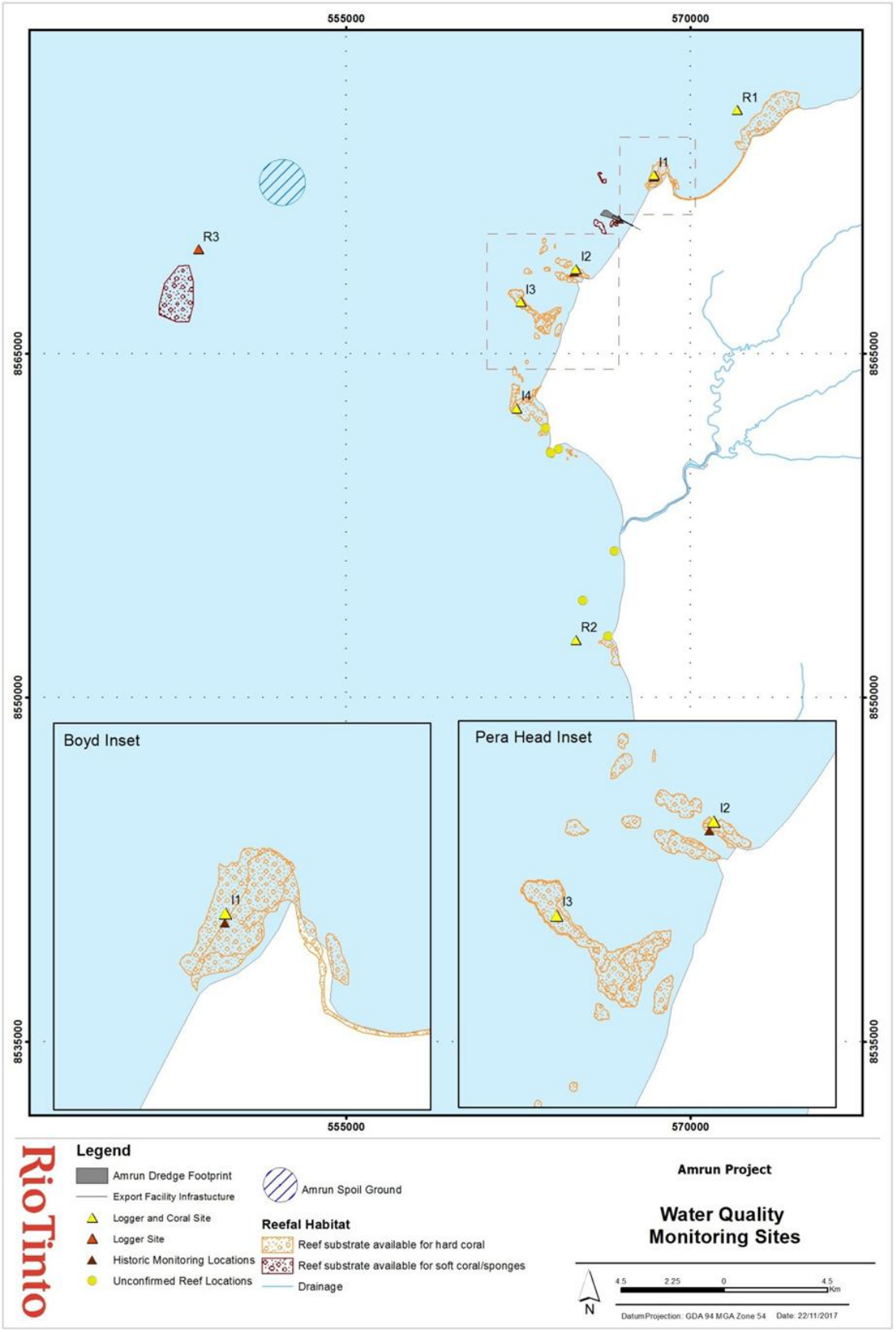


Figure 10: Initial (2016) capital dredge program water quality monitoring locations

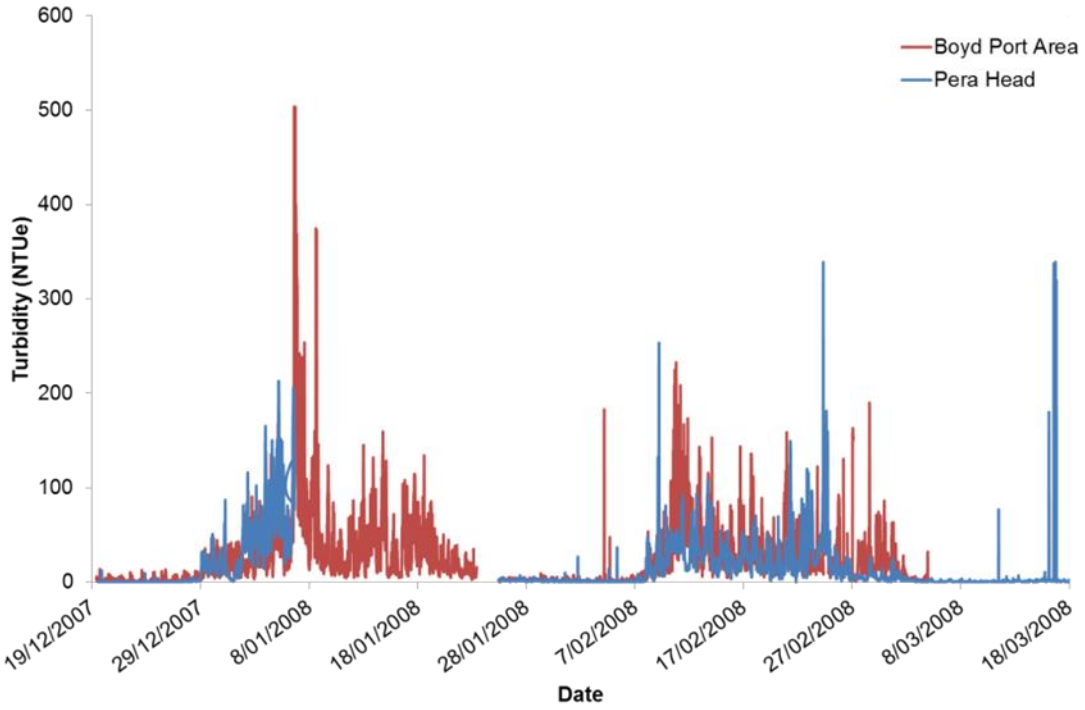


Figure 11: Background wet season turbidity (NTU) - December 2007 to March 2008

Prior to the initial 2016 capital dredging program RTA implemented a pre-construction monitoring program from August 2015 through to May 2016 with the dredge period excluded (**Table 5**). This data compares favourably to the 2007-2008 data, demonstrating increase in median turbidity during the wet season. Median dry season turbidity's range between 1.7 to 4.8 NTU, increasing during the wet season at 3.9 to 7.1 NTU. The influence of episodic event driven elevations is further demonstrated within **Figure 12** which outlines a distinct increase in the 80th percentile from each monitoring location during the wet season, ranging from 10 to 32 NTU.

Table 5: Summary of background turbidity (NTU) (2015-2016)

Location	Season	Parameter	Mean	Median	80^{th} %ile	95^{th} %ile	Min	Max
I1	Wet	Turbidity	20.3	5.8	30.1	88.6	0.9	224
	Dry	Turbidity	10.2	4.0	9.7	46	0.04	225
I2	Wet	Turbidity	9.8	3.9	11.8	42.6	0	192
	Dry	Turbidity	3.8	3.6	4.6	5.6	0	25.6
I3	Wet	Turbidity	16	7.1	17.2	69.2	0	222
	Dry	Turbidity	6.6	4.8	6.9	10.7	1	222
I4	Wet	Turbidity	12.3	4.5	14.5	54.7	0.3	208
	Dry	Turbidity	4.0	3.5	5.8	7.8	0.7	22.4
R1	Wet	Turbidity	20.4	7.1	32.0	82.1	0	223
	Dry	Turbidity	3.5	2.6	4.4	7.1	0.8	169
R2	Wet	Turbidity	12.7	5.4	16.9	50.8	0	222
	Dry	Turbidity	2.6	1.7	3.8	5.7	0	29.7
R3	Wet	Turbidity	14.6	4.4	9.9	81.6	0	224
	Dry	Turbidity	4.4	2.2	4.8	4.8	0	198

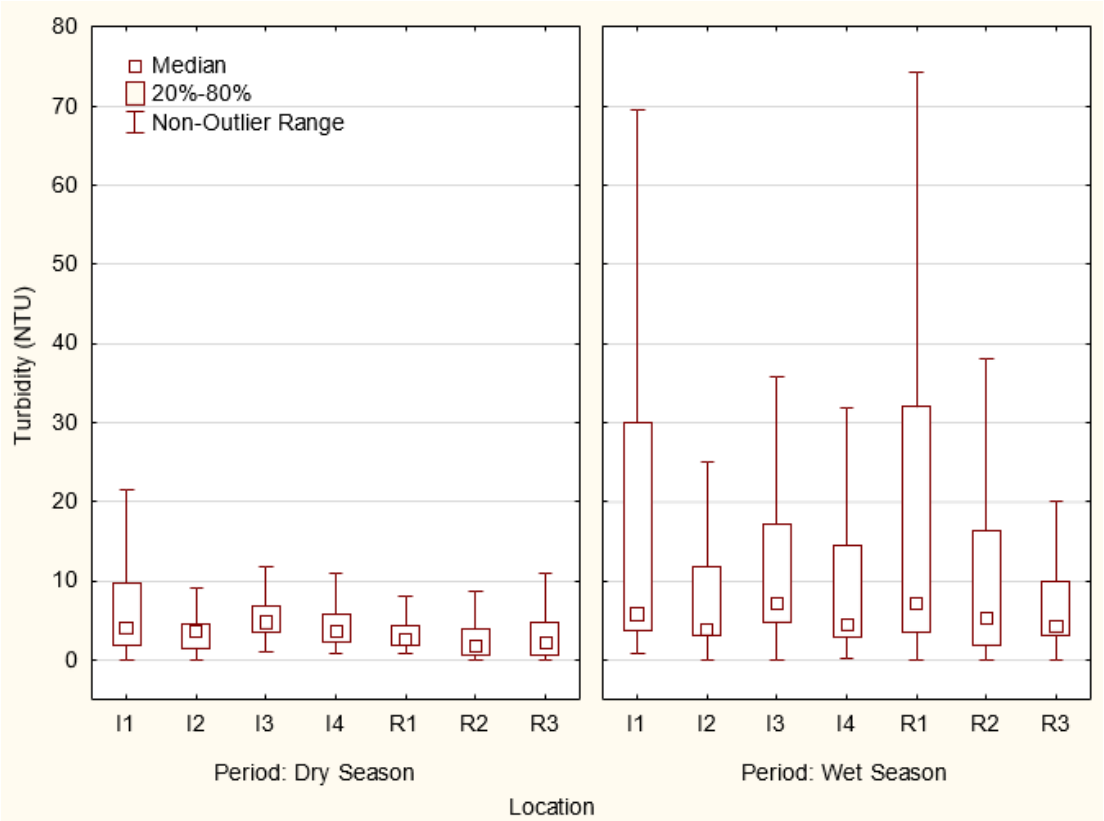


Figure 12: Turbidity - non-outlier plot (2015-2016)
Note: excludes the dredging period

To further explain these increases, mean daily turbidity data has been calculated from each monitoring location and presented as a timeseries. This plot incorporates significant wave height (H_s) obtained from Albatross Bay over the same period (DETSI, 2017). A strong temporal correlation is observed between elevations in turbidity and the increases in significant wave height (**Figure 13**). From this investigation, as significant wave height approaches 0.5m sediments begin to mobilise elevating ambient turbidity. Whilst the occurrence of such conditions are typically associated with the monsoon/wet season, these events can occur throughout the year. Again, this data outlines ambient events leading to elevated turbidity ranging from 10 days to over 20 days.

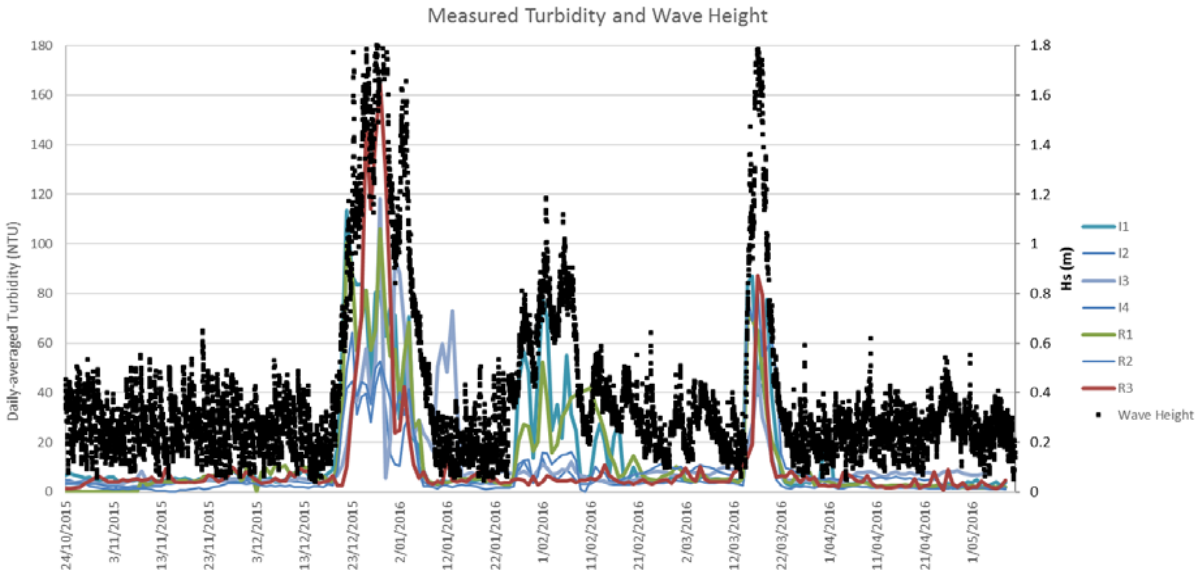


Figure 13: Mean daily turbidity and significant wave height (October 2015 to May 2016)
Note: Turbidity from impact and reference monitoring locations; significant wave height (Hs) recorded from Albatross Bay

Despite its offshore location and increased depth range, the 2015-2016 data also indicates that natural processes can readily mobilise sediments at the DMPA (R3) (**Figure 13**). Increases in turbidity at R3 are observed from two of the three wave event periods. Whilst wave heights remained above 0.5m for the second wave event, water depths appear to have precluded fines mobilisation. The inshore monitoring locations all responded with increasing turbidity.

In the build-up to the 2016 capital dredging program the study area experienced a significant swell and wave event between March 15 and 22. This event followed the passage of a tropical low through the southern Gulf over this same period (March 15-18). This weather system resulted in residual swell which impacted the Weipa region between March 14-22, increasing Hs from ~0.1m to over 2.0m (DSITI, 2017). Turbidity increased markedly during this event (**Figure 13**).

PAR data was also collected from September 2015 to May 2016. The relationship between turbidity and PAR was examined for both the dry and wet season. A statistically significant exponential relationship ($p<0.05$) was identified with PAR decreasing as turbidity increased (RTA 2017b).

A time series plot of turbidity at monitoring location WQ3 (same location as I2) is shown in **Figure 14**. WQ3 is located in a low turbidity environment with levels below 5 NTUe for large parts of the period shown. **Increased turbidity is driven by enhanced wave activity, with values increasing when significant wave heights at the Albatross Bay Waverider Buoy exceed approximately 0.6 m.**

Turbidity collected between 27 August 2018 and 11 September 2018 shows large peaks which are not correlated with wave activity. Following a service visit by James Cook University on 11 September 2018 the turbidity readings returned to more normal levels. The high turbidity readings during this period are therefore considered erroneous and have been removed from the analysis to avoid biasing the results.

The analysis (PCS, 2020) of all water quality monitoring from 2018-2019 show that the natural environment in the Amrun region experiences SSC more than 20 mg/L on a relatively regular basis during the wet season (between 50% and 20% of the time), while during the dry season the SSC exceeds 20 mg/L for around 1% of the time.

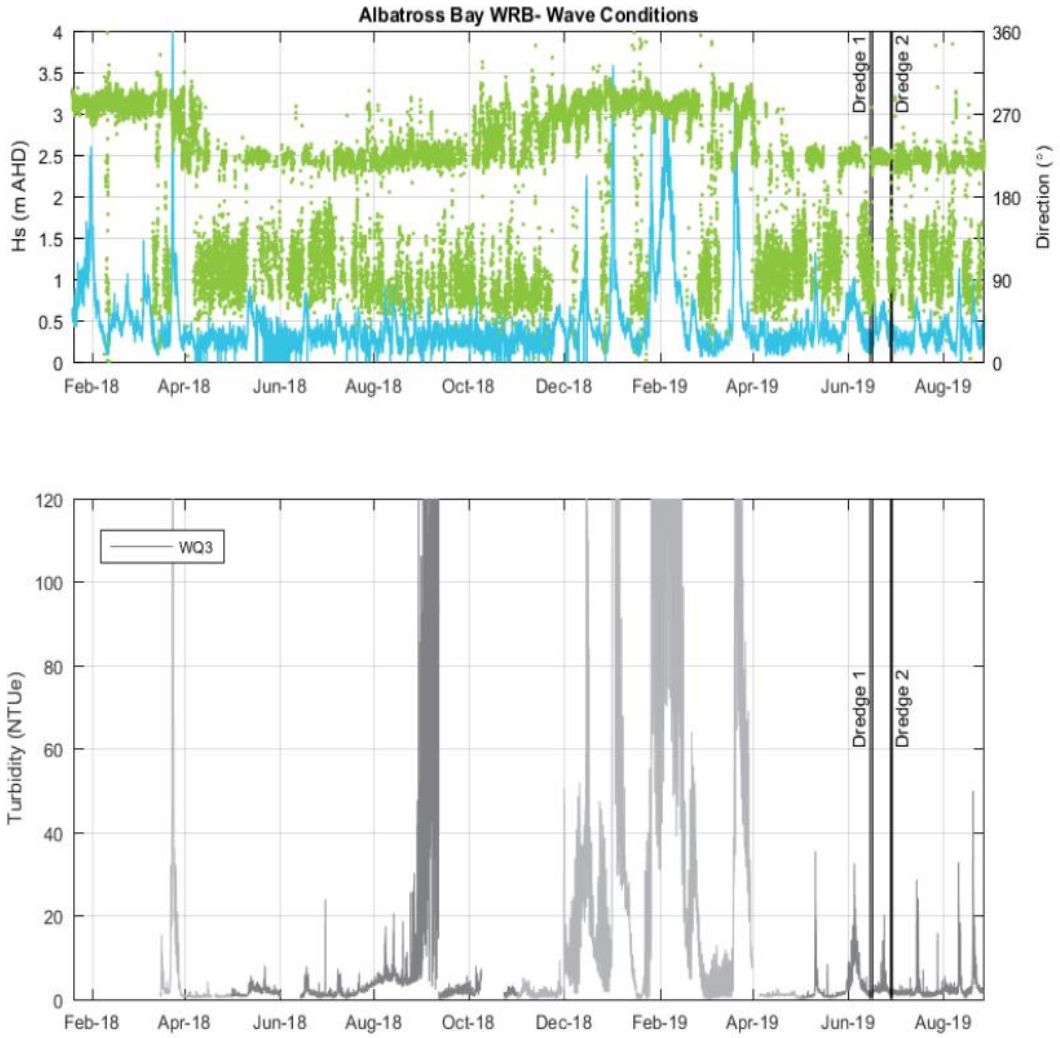


Figure 14: Turbidity - 2019 maintenance dredging (Note: erroneous data 27 August to 11 September 2018)
Note: For turbidity, data for the wet season is shown as lighter colour and data for the dry season in darker colour.

4.4 Inshore and Offshore Marine Habitats

The Amrun dredging and DMPA sites sit within the Gulf of Carpentaria which has several tropical and near shore environments including near shore fringing reef communities, seagrass and open sandy substrate and associated sparse macrobenthic communities. Baseline assessments for key areas that will be impacted have been completed (RTA 2011; RTA 2012; Worley Parsons 2016b, JCU 2025).

4.4.1 Reef

Near-shore fringing reef communities in the vicinity of the Port area occur at Boyd Point, Pera Head and between Pera Head and Thud Point (**Figure 16**). These Coastal turbid-zone reefs include low profile reefs comprising of soft coral and sponge assemblages and rocky reefs containing hard corals. The reef systems between Boyd Point and Thud Point may be considered of high importance in a regional context due to the resources they support that are of conservation, cultural, commercial and recreational importance. Surveys for the area were completed during the baseline assessment for the EIS (2007 – 2008 and 2010) and impact monitoring (2016). All surveys recorded reefs in the area consisted of outcrops of hard coral primarily forming over ironstone formations.

Baseline surveys estimated that substrate available for reefal colonisation covered an area of approximately 49ha at Boyd Bay and 72 ha at Pera Head (**Table 6**) of which approximately 4.2 and 6.2% of that is covered in hard coral cover. All surveys identified that

hard coral cover is of a depauperate and patchy nature. Reefs are dominated by small to medium sized colonies of corals of the families *Dendrophylliidae, Faviidae* and *Poritidae*. 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). Drop camera and video surveys completed for the area are shown in **Figure 16**.

Table 6: 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.

Coral monitoring surveys were completed in February, May and June 2016 at six locations (I1 to I4 and R1 and R2) (**Figure 16**):

- Survey 1: 24 and 25 February 2016 (pre-dredge)
- Survey 2: 19 May 2016 (1 month post capital dredging)
- Survey 3: 18 June 2016 (2 months post capital dredging) (Advisian, 2016b).

The seabed at all monitoring locations was dominated by sand, turf algae or macroalgae or combinations of these three groups.

The dominant hard corals found at each site were from the genera *Turbinaria spp* and *Porites spp* and from the *Faviidae* family; all are typically found in turbid inshore environments. The growth forms of the hard coral community differed at each site but were primarily dominated by encrusting, foliose and massive growth forms, also typical of growth forms found at inshore reefs. Branching Acropora colonies were occasionally found at sites I3 and R2.

Results are illustrated in **Figure 17, Figure 18** and **Figure 19**. Hard and soft coral bleaching was observed during all surveys and at all sites. The highest coral bleaching was recorded at the reference site R2. No sign of sediment was observed on any species of coral except *Turbinaria spp*. which is typical for species with a cup (or foliose) shaped growth form. No signs of mucous were observed. **Analysis of the results found no statistical difference (or change) in the hard coral cover at each site across the three surveys.** While low levels of coral bleaching was recorded this was observed to be higher at reference locations. Additionally, no sediment was observed on corals (with the

exception of *turbineria*) which is typical of coral colonies impacted by dredging operations. Accordingly capital dredging was not considered to be a causal factor of bleaching events. The temporal (February 2016 to June 2016) and spatial (all sites of concern and reference sites) scale of the coral bleaching recorded made it highly unlikely that the bleaching was in any way caused or exacerbated by the initial 2016 capital dredge-related activities. The bleaching appeared to be related to the wider sustained elevations of sea temperatures which were observed across northern tropical waters between February and April 2016 (BOM 2016); which was responsible for wide scale coral bleaching observed in the Northern GBR (Great Barrier Reef) (Advisian, 2016).

4.4.2 Seagrass

A small area of seagrass was recorded adjacent to the Boyd Bay beach (north of Boyd Point) consisting of *Halophila decipiens and Halophila uninervis* (McKenzie and Yoshida 2009). A small area of *Halodule uninervis* was confirmed in 2017 when completing surveys for the Amrun moorings (**Figure 16**).

This Boyd Point seagrass area was again recorded during a recent field survey on 25 August 2025 (JCU TropWater), with no seagrass found within the Boyd Point to Pera Head area with physical conditions, sediment and prevailing bathymetry unlikely to support seagrass in the proposed Port.

No seagrass was recorded in the proposed dredge footprint or adjacent survey buffer area (**Figure 15**).

4.4.3 Open substrate

The vast majority of the bay consists of open sandy and muddy substrates with occasional macroinvertebrates (RTA 2011; RTA 2012). The development footprints for the Port area and current DMPA have been confirmed through field inspections that consist primarily of soft open substrate that contain sparse epifaunal organisms such as sea pens and polychaetes which are common in the Gulf of Carpentaria (Post et al 2006).

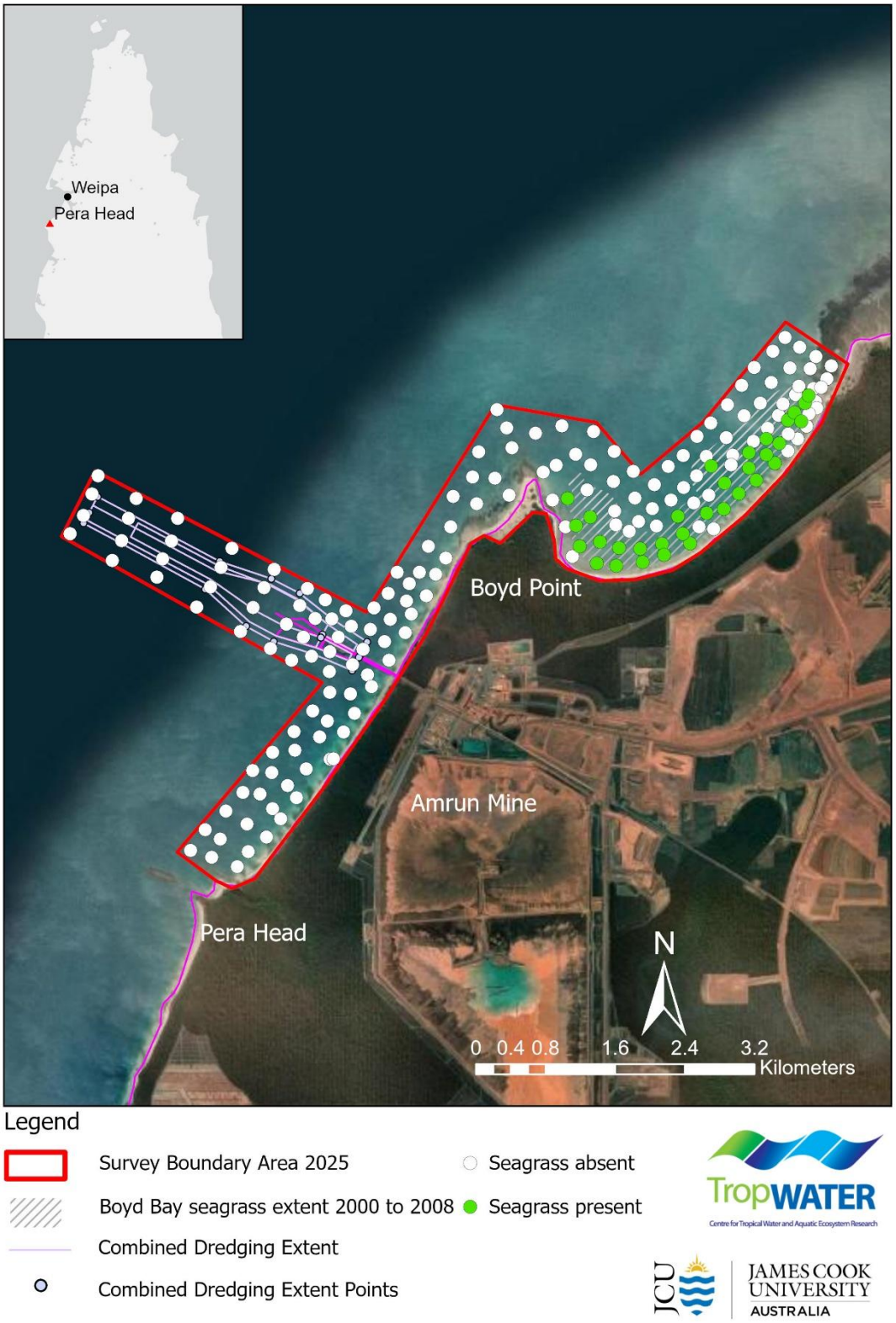


Figure 15:Seagrass survey (James Cook University, TropWater, 2025)

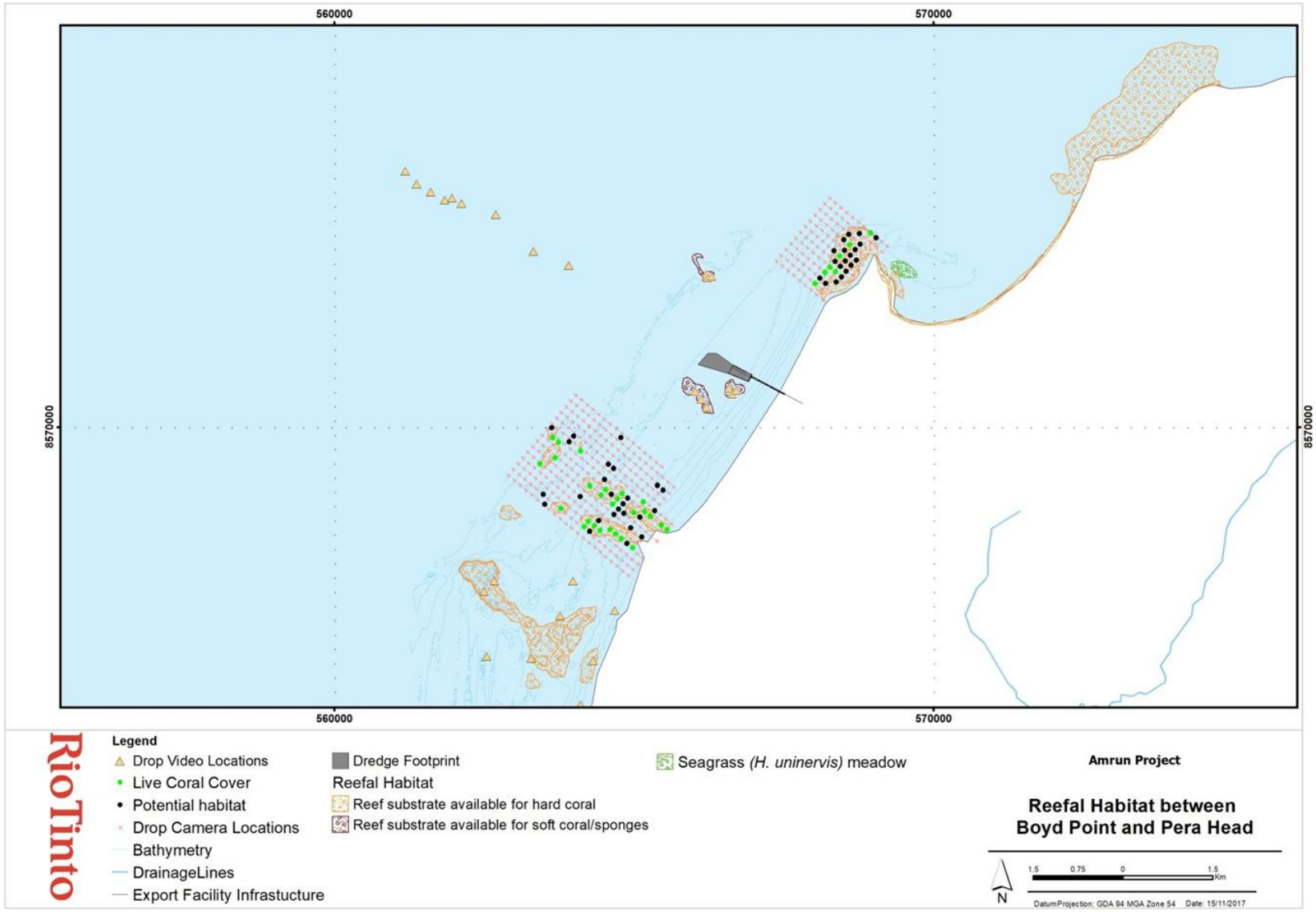


Figure 16: Sensitive ecological receptors between Boyd Point and Pera Head (Advisian 2016)

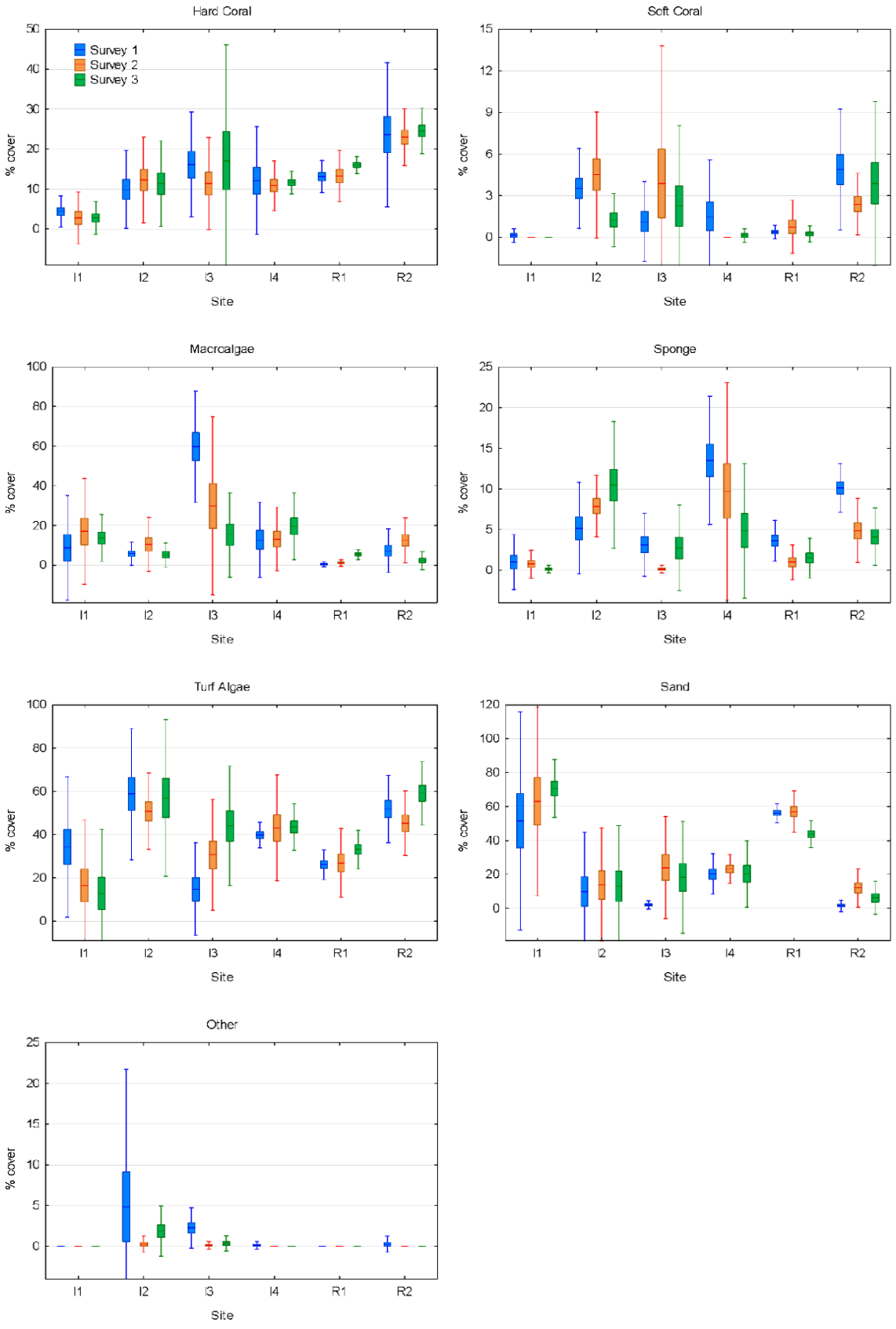


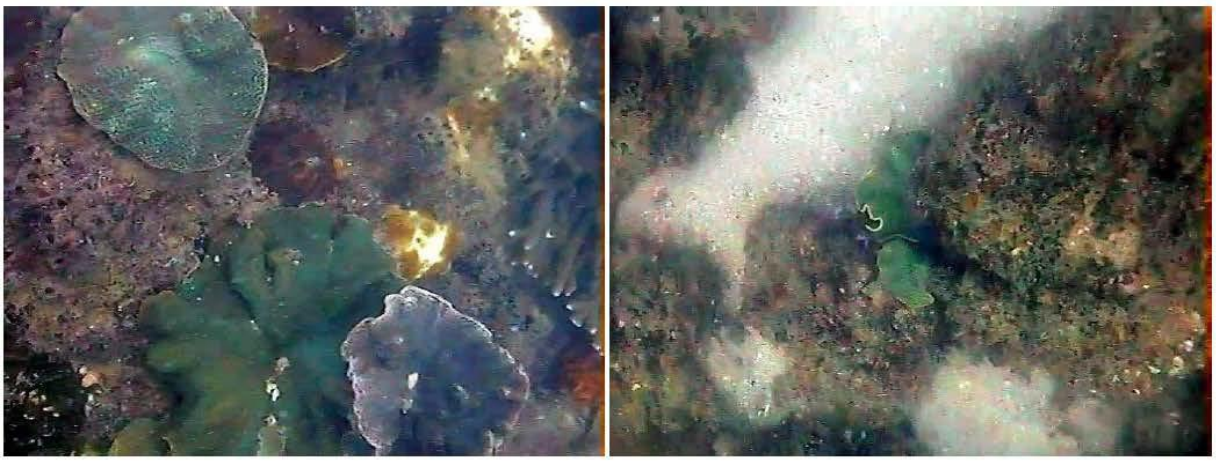
Figure 17: Reef monitoring results, showing percentage cover of the broad benthic groups at each site for each survey (source - Advisian (2016b))



Typical benthic community found at Concern **Site I1 –** large patches of sand with occasional hard corals and macroalgae



Typical benthic community found at Concern **Site I2** – large boulders covered in turf algae, sponges and macroalgae with occasional hard corals

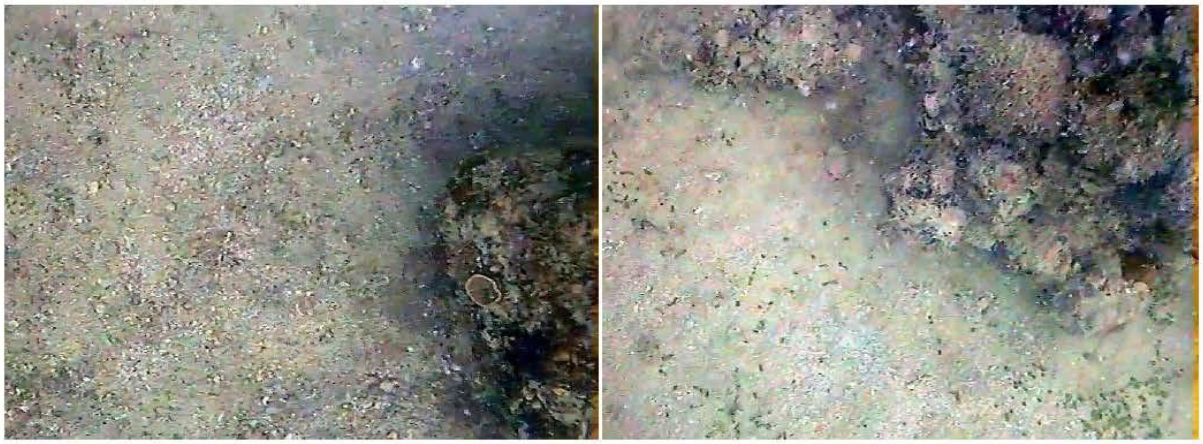


Typical benthic community found at Concern **Site I3** – undulating hard substrate covered in turf algae, sponge, hard corals and macroalgae, occasional patches of sand in the channels between hard substrate.

Figure 18: Examples of typical benthic communities at sites I1, I2 and I3 (source - Advisian (2016b))



Typical benthic community found at Concern **Site I4 –** low relief undulating hard substrate covered in turf algae, sponge, hard corals and macroalgae, occasional patches of sand in the channels between hard substrate.



Typical benthic community found at Concern **Site R1** – large patches of sand with occasional hard corals and macroalgae growing on small patches of low relief hard substrate



Typical benthic community found at Concern **Site R2** – low relief undulating hard substrate covered in turf algae, sponge, hard corals and macroalgae, occasional patches of sand in the channels between hard substrate. Some areas of high hard coral cover.

Figure 19: Examples of typical benthic communities at sites I4, R1 and R2 (source - Advisian (2016b))

4.5 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) provide a detailed assessment of the threatened and migratory marine species that occur or potentially occur in the Project area.

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

Summary of threatened and migratory species (Commonwealth EIS, RTA 2013)
Dugongs occur along the Western Cape and may traverse coastal waters in the vicinity of the Port while moving between seagrass meadows. There are no seagrass meadows within the Port footprint (Figure 7) ((Commonwealth EIS (RTA 2013): Section 9.4.1 and Table 9- 9).

Australian Snubfin and Indo-Pacific Humpback Dolphins are known to occur in the vicinity of the Port (Commonwealth EIS (RTA 2013): Sections 9.5.1.1. 9.5.1.2, and 9.6.1, Table 9-15; GHD 2015; BPM 2017).

Bryde's Whale may occur in the vicinity of the Port and other coastal areas offshore. Bryde's Whales have been observed offshore since construction of the port.

Green Turtles are known to occur in the area with nesting recently recorded (Guinea, 2014, Pendoley 2019). Preferred foraging habitats include sea grass beds (nearest beds located at Boyd Bay) however they may also forage at reef habitats at Boyd Point, Pera Head and between Pera Head and Thud Point.

Hawksbill Turtles are known to occur in the area and may forage 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 Amrun Port site (Commonwealth EIS (RTA 2013): Section 7.3.2.2, Guinea, 2014, Pendoley Environmental 2017).

Flatback Turtles are known to occur in the area and may forage in the shallow rocky reef areas and sedimentary habitats around the Amrun Port and are known to nest on the beach in the vicinity of the Amrun Port site (Commonwealth EIS (RTA 2013): Section 7.3.2.3); (Guinea, 2014; Pendoley Environmental 2017;).

Olive Ridley Turtles are known to occur in the area and may forage in the shallow coastal unvegetated habitats around the Amrun Port area. Nesting has been recorded in the vicinity of the Amrun Port site (Guinea, 2014, Pendoley Environmental 2017).

Leatherback Turtles may forage in the area but are principally oceanic (Commonwealth EIS (RTA 2013): Section 7.3.2.6).

Loggerhead Turtles may be transient in the area and may forage in the reef areas (Commonwealth EIS (RTA 2013): Section 7.3.2.4).

Marine fauna offset programs have been developed for Inshore Dolphins (Inshore Dolphin Offset Strategy (RTA 2015)) and Marine Turtles (Feral Pig Management Offset Strategy (RTA 2016a)) and Marine Turtle Offset Plan (RTA 2016b) in accordance with the Projects Commonwealth and State Approvals. The offset programs include survey and monitoring for these species within the Project area and findings to date have been included within the species descriptions above and have been considered in development of management and monitoring requirements within Section 6.4 of this capital DMP.

4.5.1 Inshore dolphins

Limitations on information regarding the status of inshore dolphins along Western Cape York led to the development of an offset program involving inshore dolphin monitoring over a period of thirteen years, commencing in 2014 (GHD, 2015), then subsequent surveys in 2016, 2017, 2018 and 2019 (BPM, 2017, 2017, 2019 and 2021). The program aims to provide a better understanding of the distribution, habitat use and abundance of Australian snubfin *Orcaella heinsohni* and Australian humpback dolphins *Sousa sahulensis* within the vicinity of the Amrun project area. The research also contributes towards the 'co-ordinated research framework to assess the national conservation status of Australian snubfin dolphins *Orcaella heinsohni* and other tropical inshore dolphins' (the National Inshore Dolphin Strategy). The research based offset program is consistent with the Threat Abatement and Recovery actions as identified by both DETSI and DCCEEW.

Inshore dolphin survey results from 2014, 2016, 2017, 2018 and 2019 identified:

- Australian humpback dolphins and Indo-Pacific Bottlenose Dolphins were recorded in within the vicinity of the Port on each survey.
- Australian snubfin dolphins were recorded during each survey and specifically at Boyd Point in 2016 and 2018.
- Australian humpback dolphins and inshore bottlenose dolphins were found over a range of depths from shore out to 25 metres (limit of survey) with an average depth of 8.4 m and 12.9 m respectively.
- Australian snubfin dolphins were sighted on less occasions and were sighted in shallower waters with an average depth of 6.1m.
- It appears all for all three species, the study area may be part of a larger area over which the dolphins range.

The 2014 inshore dolphin survey found that the Weipa and Boyd Bay/Thud Point sites should be considered regional hotspots for both Australian humpback and Indo-Pacific bottlenose dolphins, where encounter rates in both sites were five to forty times higher than the highest encounter rates from other regions studied in Northern Australia. Having successfully completed surveys and met the Strategy objectives in 2014, 2016, 2017, 2018 and 2019, the combined datasets and analyses from this study provide an important contribution to knowledge about humpback, bottlenose and snubfin dolphins in the region, in particular that the sampling area is part of larger systems for all three species.

4.5.2 Marine Turtles

Marine turtle nesting monitoring was completed between February and October 2013 (Guinea, 2014 and then annually since 2016 within the peak nesting period for the region as identified in the 2013 surveys. The primary objective of the monitoring was to obtain sufficient data to detect long-term trends in turtle nest predation by feral pigs. Marine turtle nesting habitat in proximity to the Amrun project was assessed, including all accessible nesting beaches on the Amrun Project mining lease north (approximately 27 km of nesting beach) and south (approximately 32 km of nesting beach) of the Port.

Four nesting turtle species have been identified to date including flatback (*Natator depressus)*, hawksbill (*Eretmochelys imbricate)*, olive ridley (*Lepidochelys olivacea*) and green (*Chelonia mydas*) turtles. Surveys to date have confirmed low density turtle nesting occurs on the beaches between Winda Winda Creek and Ina Creek (RTA 2013, Guinea 2014, Pendoley Environmental 2017; 2018; 2019; 2020 and unpublished data).

The *Recovery Plan for Marine Turtles in Australia 2017 – 2027* was released in July 2017 (Commonwealth of Australia 2017). The long-term recovery objective for marine turtles is to minimise anthropogenic threats to allow for the conservation status of marine turtles to improve so that they can be removed from the EPBC Act threatened species list. All six of Australia's threatened or endangered turtle species may occur near Amrun Port with the four confirmed nesting species identified above.

The recovery plan has identified nesting and interesting buffer (up to 20km seaward of nesting habitat) habitat critical to the survival of marine turtles for each turtle species. The beaches adjacent to the Port are regarded as habitat critical to the survival of two turtle species, Olive Ridley Turtles (Western Cape York genetic stock) and Flatback Turtles (Arafura Sea genetic stock).

RTAW has implemented a Feral Pig Offset Strategy that has seen a considerable reduction in turtle nest predation and has eradicated 4,457 feral pigs between 2016 to 2024 (RTA Weipa, August 2025).

4.5.3 Marine Pests

Marine pests are marine biota that are translocated into waters outside their natural geographic range and subsequently settle, survive and spread. Translocation and survival of these species in new areas can cause irreversible impacts to the local ecosystem by competing with and/or predating on native species, as well as introducing disease. The consequences include a combination of environmental, social and economic impacts.

A historical marine pests study at the Port of Weipa was completed in October 1999 by the CRC Reef Research Centre and James Cook University (Hoedt *et al.,* 2001). No marine pests were detected during this survey. 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, as well as the Asian green mussel since its detection in Cairns in 2006. NQBP currently manages the Port of Weipa and carries out maintenance dredging and material placement at the existing Albatross Bay DMPA.

Prior to capital dredging for development of the Amrun Port site, a baseline marine pest survey was completed at the Weipa Port and at the Amrun Port from 16 to 21 December 2015 (Biofouling Solutions, 2016). The objective of the survey was to identify the presence of any established marine pest populations listed on the National Monitoring Strategy Target Species List (NMTSL). No marine pests on the restricted NMTSL were detected in the Weipa Port area or the Amrun Port area during the 2015 baseline survey.

In February 2016, a marine pest settlement plate monitoring program was implemented (Biofouling Solutions, 2017). The settlement plates were used to target eight marine pests, including two high priority mussels. Monitoring was conducted quarterly at four sampling locations – two situated approximately 150 m north and south of the designated jetty alignment, one in Boyd Bay and one northwest of Pera Head.

One individual specimen of an Asian green mussel *P. viridis* was found at the Amrun Jetty No. 2 site during the May 2017 monitoring event. As per the *Biosecurity Act 2014*, RTA notified the Department of Agriculture and Fisheries (DAF). The specimen was confirmed as Asian Green Mussel (AGM) by the Curator of Molluscs at the Museum and Art Gallery of the Northern Territory.

RTA worked closely with DPI to assist with the investigation to potentially identify the causal vessel and with the investigation and surveillance to delimit the area of the incursion. Since identification of *P. Viridis,* surveillance methods including beach walks, ROV, infrastructure inspections, vessel inspections, plankton tows and continuation of settlement plate monitoring have been implemented, with no additional marine pest specimens identified in the area.

It is unknown how the mussel arrived in Australia and is not thought to be associated with any project vessels. Biosecurity Queensland commended RTA for the proactive measures implemented in accordance with the *Biosecurity Act 2014* and continues to work closely with Rio Tinto and NQBP while they maintain an AGM surveillance program.

Review of the installation of a marine pest settlement plate program to utilise the Queensland's Seaports eDNA Surveillance (Q-SEAS) Program is underway. Previous installation attempts have identified several safety and operational issues associated with installation. The currents are also identified as impacting the success of the arrays to remain upright. This process is being worked through.

Since 2019, visual surveys for Asian green mussel (*Perna viridis*; AGM) are conducted along beach shores and accessible intertidal rocky reef areas. Suspected shells are collected and provided to a marine biologist for identification. Areas explored are limited to between Boyd Bay and Pera Head which is near the export facility. Beach wrack surveys are ongoing through the year while completing turtle surveys and no marine pests were identified on the beach throughout this year.

In September 2024, three AGM were detected on a vessel that had been operating in Weipa but was found to be impacted shortly after it arrived in Cairns for maintenance. The three mussels on the vessel were small and appear to have been immature, indicating they were likely the result of a spawning event in the Weipa region.

Two further AGM were detected on cyclone moorings in the Hey River in December 2024. The two mussels detected in December were 72mm and 76mm in length and considered to be mature. It is currently unknown how the mussels arrived in Australia. It is also understood there has been a recent AGM detection of a fishing vessel in the region in 2025 and the identification of Didemnum perlicidum in 2020.

RTAW is working with DPI and other stakeholders to increase awareness and conduct surveillance for the pest. Activities include settlement plate and vessel inspections, and underwater inspections of wharves, pylons and moorings, using remotely operated vehicles.

4.5.4 Bryde's Whale

There are two forms of Bryde's (pronounced Broo-dess) Whales; coastal and offshore. The coastal form of Bryde's whale appears to be limited to the 200m depth contour, moving along the coast in response to availability of suitable prey (Best et al. 1984). The SPRAT database states that it is likely that Australian inshore stocks of Bryde's Whale will be small, possibly of similar size to those off South Africa (estimated at 582 +/-184 animals: Best et al. 1984), and therefore it is unlikely that significant numbers will occur in the vicinity of the Project area.

There is no evidence of large-scale migrations of the inshore form of Bryde's Whales. The offshore form is found in deeper water (500 to 1,000m). The following listed threatened and migratory species were recorded on the EPBC Act protected matters search as possibly occurring within the Project area; however, they are unlikely to be present due to a lack of suitable habitat: Humpback Whale, Killer Whale and Blue Whale (RTA, 2011). (Amrun port LMDMP 2021-31).

There are no species of whale known to regularly occur in the waters around Amrun. Bryde's Whales are considered to be a species that may sporadically inhabit the area, although no preferred habitat is present in the project area (Figure 20).

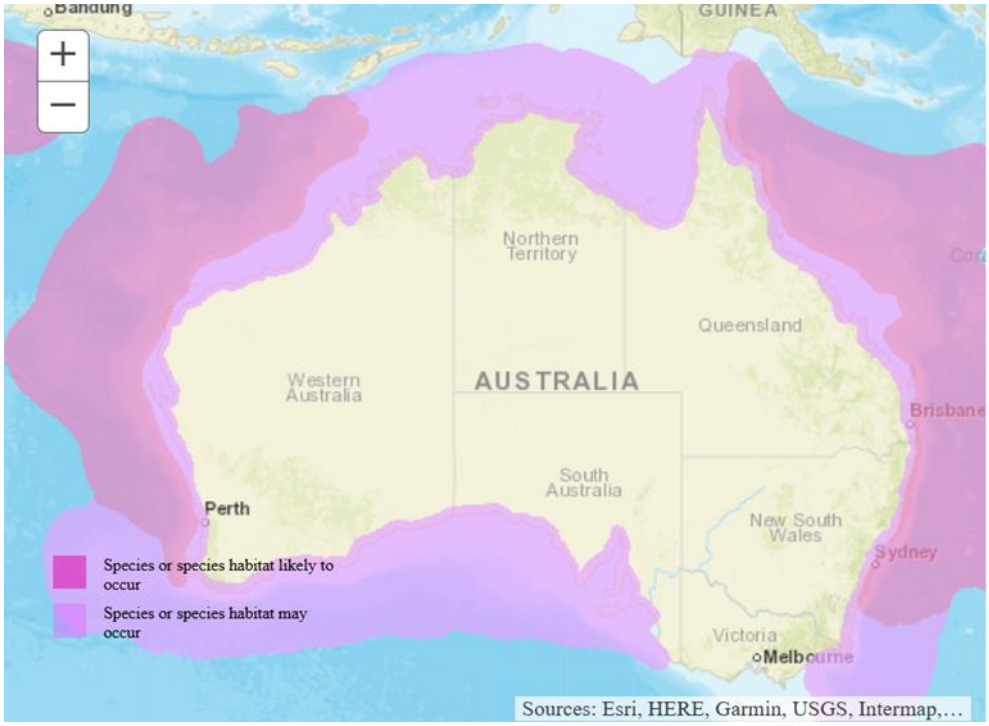


Figure 20: Bryde's Whale species habitat map (source: DCCEEW)

4.5.5 Dugong

A significant proportion of the world's dugong population is known to occur in Australia's northern waters. It was estimated in 2002 that there are approximately 80,000 dugongs in Australian waters, with surveys in 1994 estimating that the population in the Gulf of Carpentaria coast was around 23,000 (National Oceans Office, 2004, GHD 2019).

Amrun Port does not support an ecologically significant proportion of dugong or important habitat for the species as there are no major feeding grounds and no resident population. While no foraging areas for dugong occur in the area of the Amrun Port, it is likely dugong traverse as they travel between seagrass resources.

With respect to the Amrun river facilities, Humbug and Hey, the seagrass beds in the Embley and Hey Rivers potentially constitute feeding habitat for dugong; however it is noted that the long strap-like seagrass Enhalus acoroides, which dominates the seagrass beds of the Embley and Hey Rivers, is not a preferred species in the dugong diet (RTA, 2011).

Over construction and operation of the Amrun Project (since 2016), there have been no incidents involving dugong. (Amrun port LMDMP 2021-31).

4.6 Social values

An Environmental Values Assessment (GHD, 2019) was undertaken for the Port of Weipa and Amrun areas as part of the sustainable sediment management assessment which supported current long-term maintenance dredging approvals for both ports.

Social values was one of the headline categories that were assessed alongside, aquatic ecosystems, landform and biota, and air quality. The following subset of social values were further assessed against criteria including Matters of National and State Environmental

Significance (MNES); critical habitats and ecosystems, regional significance, national/state heritage registers, and traditional owner considerations:

- Tourism, recreation and public amenity
- Traffic management
- Fisheries
- Waste management
- Non-indigenous cultural heritage
- Indigenous cultural heritage

Commercial fishing in the Project Area is highly valued as it is an important component of the economic landscape that is largely reliant on mining. Commercial fishing is recognised in the Cape York Regional Plan as being an important economic value of the region as providing for a more diverse economy.

Indigenous cultural heritage has been determined to be a significant value. The area (Weipa and Amrun) is home to story places, shell middens, stone axes and a number of the woomera scarred trees with high archaeological significance.

5 Potential impacts

The closest port is Weipa Port, located approximately 40km away, no port related shipping or dredging impacts from Weipa Port are expected to impact on the local ecosystem and fauna at Amrun (Boyd Port). Operations on site are not permitted to dispose to waterbodies and appropriate erosion and sediment control must be in place around site.

The aspects that may be potentially impacted by the proposed capital dredging and material placement activities are summarised in **Figure 21**. The impact of dredging on each of these aspects will be risk assessed based on previous observations of the 2016 capital dredging program, similar dredging operations and appropriate literature.

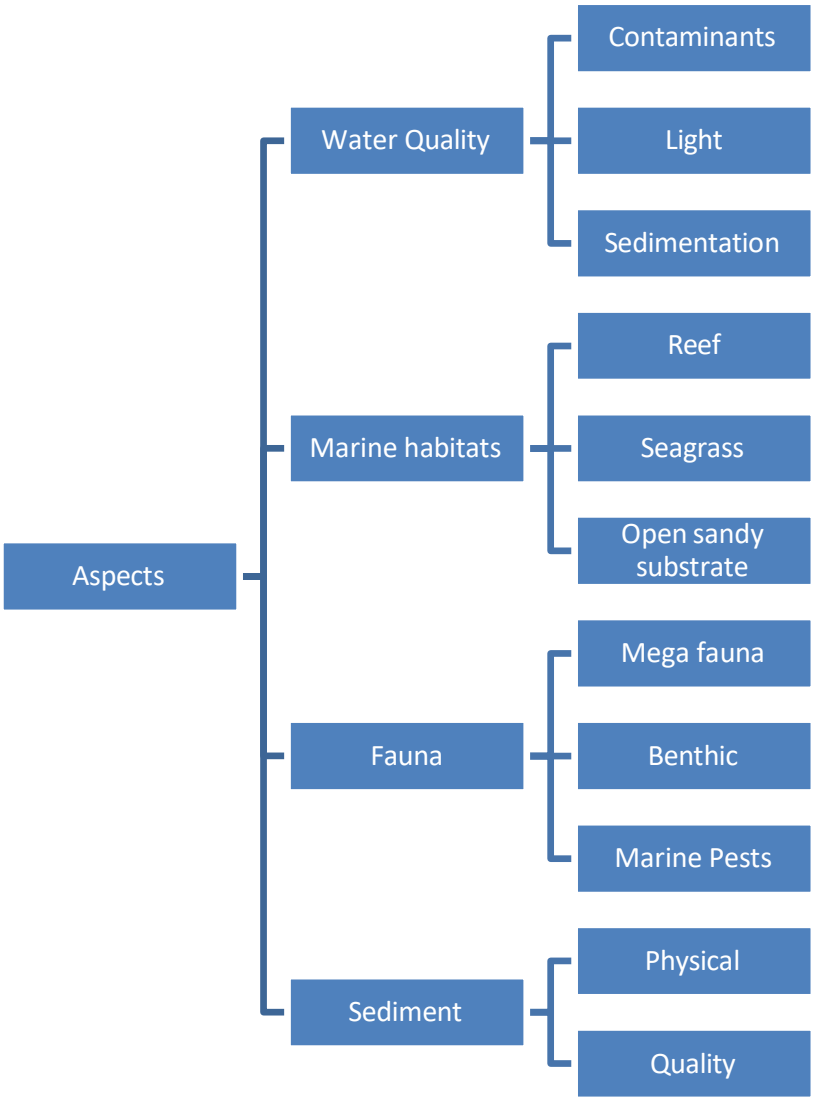


Figure 21: Potential impacts of capital dredging

5.1 Water Quality

At the Amrun Port and DMPA, dredging and material placement activities will create a turbidity plume with associated sedimentation as material is disturbed on the seabed or released through the water column. The release and removal has the potential to impact water quality of the local environment through:

- Dispersal of contaminants
- Reduction in light for flora and fauna communities
- Sedimentation smothering local flora and fauna communities

Dredge modelling was previously completed for the proposed initial capital dredging program which aimed to remove and relocate 2.6 million m^3 of sediment. Modelling was completed for typical tidal conditions during the dry season using 3-dimensional numerical models of hydrodynamic and coastal processes (Worley Parsons 2013; in Commonwealth EIS (RTA 2013), Appendix 7-A) for TSS and sedimentation. Modelling considered the proposed 2026 scenario where a Cutter-Suction Dredge (CSD) operated to loosen sediments (pre-cut) in conjunction with a TSHD which removed the loosened sediments.

5.1.1 Port Area

Contaminants

Analysis of the sediments to be dredged have not identified any contaminants present at levels that will cause environmental concern, accordingly consequences associated with transporting contaminants are negligible.

Light

Water quality monitoring of turbidity and PAR during the initial 2016 capital dredge program identified that the two parameters are directly correlated, where decreases in PAR coincided with increases in turbidity (RTA 2017b). Potential impacts to the light environment from the dredging operation are therefore assessed on the basis of elevated turbidity and associated TSS. At the Port area a relationship has been previously developed where TSS was calculated based on a calibration coefficient where 1.5 mg/L TSS equalled 1 NTUe (NTU equivalent measured on James Cook University loggers). Although this coefficient may vary depending on sediment types it can be used in the impact assessment for comparison purposes.

Dispersion plume modelling for the initial proposed 2.6 Mm^3 capital dredge program predicted that the 80^{th} percentile of TSS would be 5 and 7.5 mg/L (approximately 3.3 NTUe and 5 NTUe) above background at Boyd Point and Pera Head, respectively, for a scenario where CSD and TSHD vessels were operating concurrently. Predictions found that periods of elevated TSS concentrations generally coincided with the TSHD and CSD operating in the inshore area while dredging the top layer of sediments (which had a higher content of fines).

For reference, the initial 2016 capital dredging (202,416 m^3 in 2 weeks) was actually conducted by a CSD operating continuously with three split hopper barges. During the capital dredging activities, sediment plumes did not extend to Pera Head or Boyd Bay with no increases in turbidity recorded on the telemetered water quality logger located near these sites. Sediment plumes during the capital dredge program were monitored through visual observation from the dredge, satellite imagery and water quality loggers. Noting smaller volumes, **the sediment plume observations during the initial 2016 capital dredge program observed a much smaller plume than predicted by modelling.**

The plume was predominately localized around the vessel to the south east of the dredge and dissipating within 500m. Images of the plume are provided in **Figure 22**. No plume was observed on MODIS imagery during the monitoring indicating plumes were localized around the dredge and not intense enough to be differentiated from the background water quality. Near- field turbidity plume monitoring was also conducted throughout the 2016 capital program to determine the turbidity concentrations throughout the water column. The largest plume recorded dissipated to background levels within 800 m of the vessels throughout the entirety of the water column.



28/03/2016



29/03/2016 within 100 m of vessel



29/03/2016



30/03/2016



02/04/2016



04/04/2016

Figure 22: Initial 2016 capital dredge program plume observations

The above background turbidity concentrations recorded in 2016 during the initial capital dredging resulted in incremental increases in turbidity and minor impacts on water quality in the immediate vicinity around the dredge. The plume extent and concentration was well below those anticipated by the model predictions with turbidity at background levels within 800 m and no water quality impacts were recorded at any of the water quality monitoring locations. The plume was not observed at Boyd Point or Pera Head as anticipated by the plume modelling.

Sedimentation

The 2016 capital dredge plume sedimentation model predictions near the reef areas immediately offshore from Pera Head showed the median above background deposition as less than 2.0 mg/cm^2/day under the CSD and TSHD scenario. The highest deposition rates (in excess of 7.5 mg/cm^2/day above background for the CSD and TSHD), were predicted to occur in the immediate vicinity (within 500 m) of the dredge footprint. These predictions were consistent with turbidity monitoring that was completed during the initial 2016 capital dredge program, where sediment plumes were contained within 800 m of the dredgers. Elevated sedimentation is expected to be negligible compared to the background rates at Pera Head of 17 mg/cm^2/day and 63 mg/cm^2/day in the dry and wet seasons.

A pre-and post-dredging coral health monitoring program was implemented in 2016 to provide a quantitative measure of coral health (percent bleaching and/or mortality). The coral health monitoring program was designed to identify and measure changes in coral

health that were attributable to initial 2016 capital dredging activities, through comparison to changes occurring naturally in corals at the reference sites.

Results of the coral monitoring program (previously described in Section 4.4.1) did not find any visible signs of stress or sedimentation on coral colonies at any of the survey locations associated with dredging activities after completion of the capital dredging campaign (Advisian, 2016b). **No statistical difference (or change) could be found between coral cover before and after the 202,416 m^3 capital dredging in 2016.**

As previously described in the water quality trigger report for capital dredging (Advisian, 2016a) and the coral monitoring report (Advisian, 2016b), dominant reefal communities in the Boyd Point and Pera Head area are known to survive prolonged periods (weeks) of exposure without any major negative effects. Some nearshore reefs are known to experience sedimentation rates well over 200 $mg/cm^2/day$ (Erftemeijer et al. 2012). Consequences on reefal communities during the proposed capital dredging program at areas surrounding the Port area are therefore anticipated to be negligible.

Zone of Influence
A potential zone of influence has been defined to delineate the potential area within which sediment plumes may disperse. The zone of influence is used as a basis for impact assessment and delineation of a zone of capital dredging activities. It is expected that the zone of influence will be much greater than the zone of impact.

The zone of influence for the 2026 capital dredge program is considered to be equivalent to that of the modelled plume for the initial proposed 2.6 Mm^3 capital dredge program as shown in **Figure 23** and **Figure 24** for TSS and sediment deposition respectively.

Management and monitoring measures for the impacts from dredging and material placement activities are provided in Section 6.2.

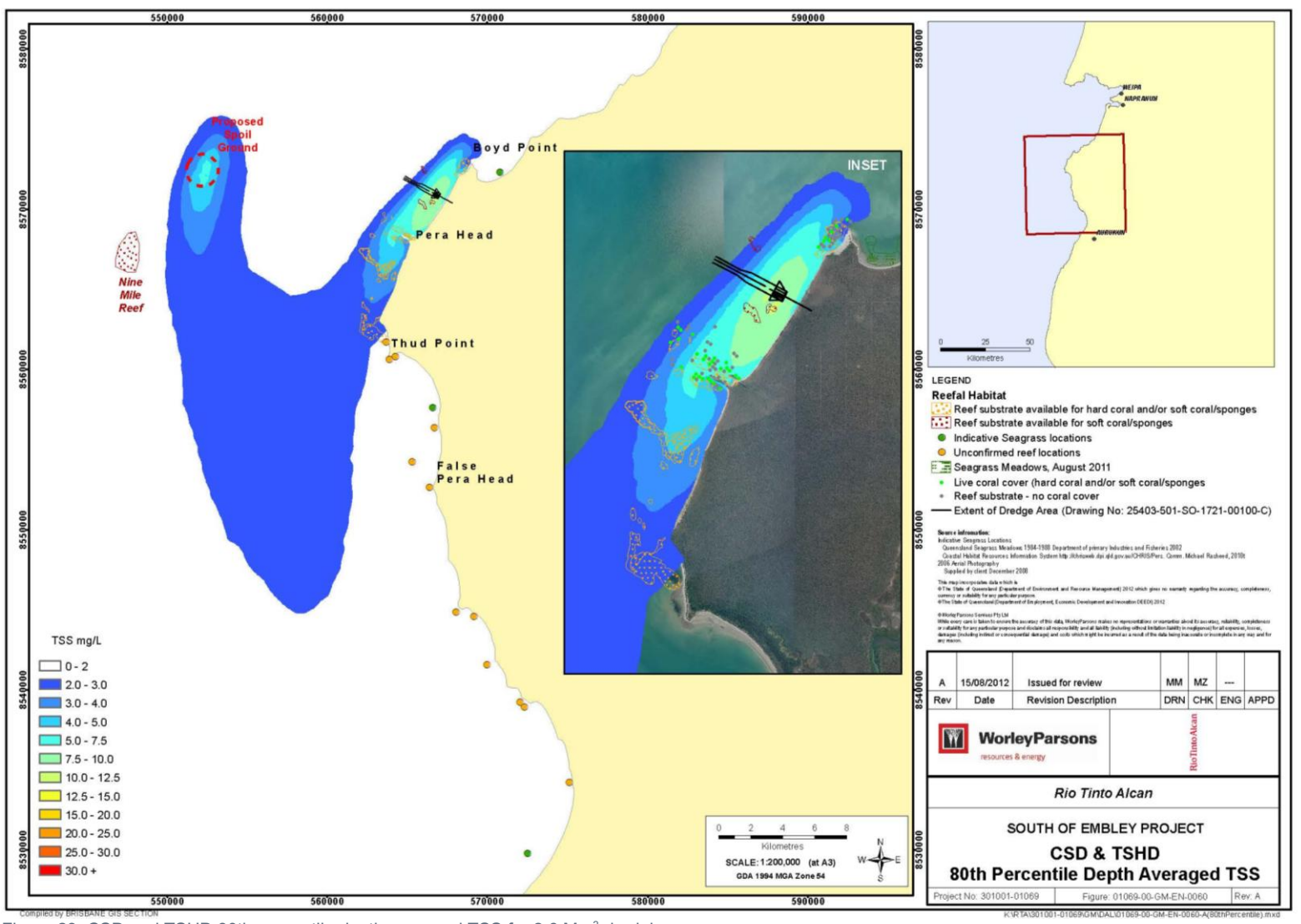


Figure 23: CSD and TSHD 80th percentile depth averaged TSS for 2.6 Mm^3 dredging program

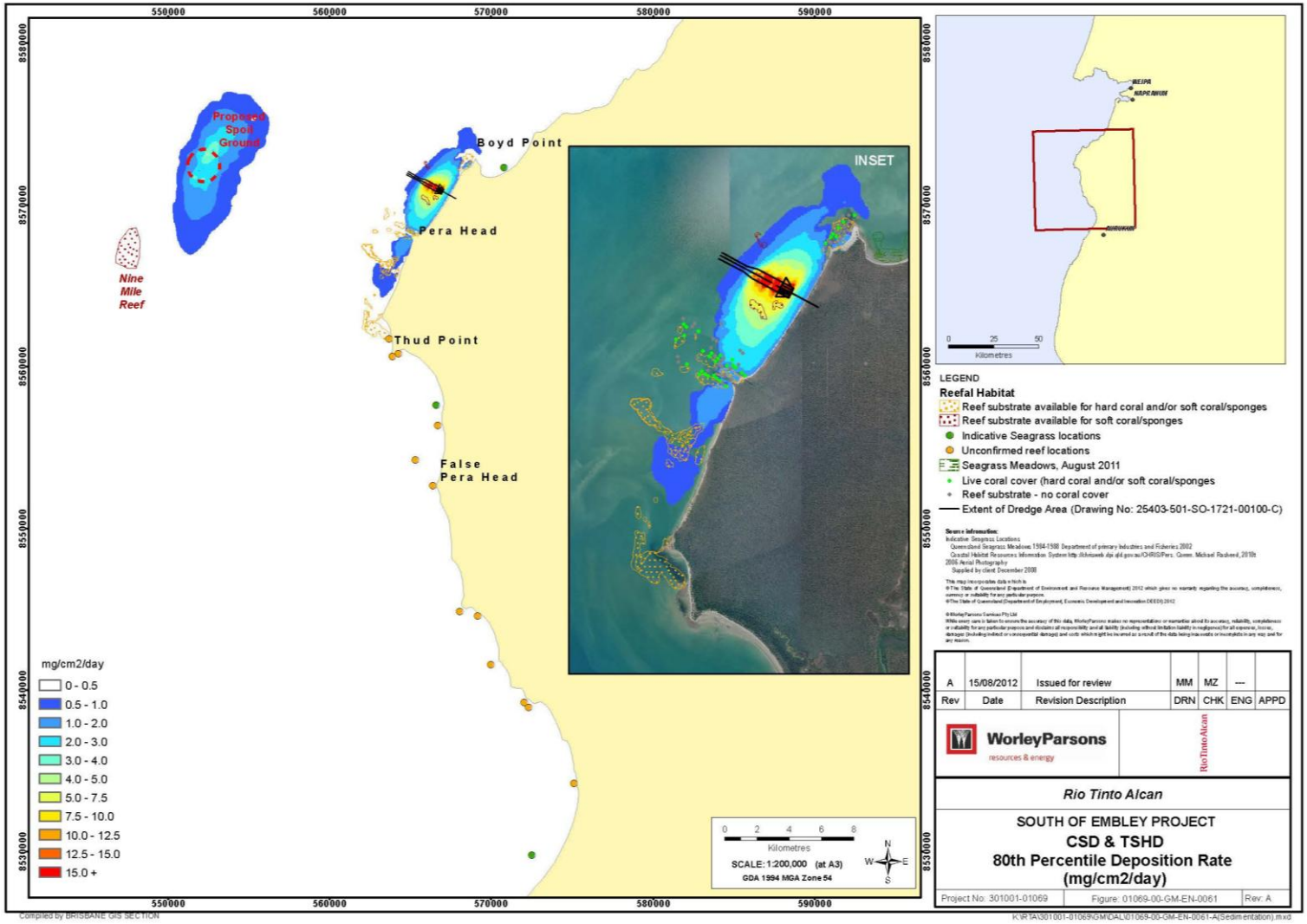


Figure 24: CSD and TSHD 80th percentile deposition rate for 2.6 Mm^3 dredging program

5.1.2 Amrun DMPA

Contaminants

The risk of introduction of contaminants to the DMPA is determined to be negligible and is not anticipated to cause contamination of water, benthic habitats or sediments on the basis of sediment sampling results from the dredge footprint, and the designation of dredged sediments as clean for offshore disposal. Consequences associated with contaminants are considered to be negligible.

Light

Dispersion plume modelling for the initial proposed 2.6 Mm^3 capital dredge program predicted that sediment plume would not extend over Nine Mile Reef located approximately 6km south-west from the DMPA. Predictions found that the highest periods of elevated TSS generally coincided with the TSHD disposal (**Figure 23)**. During the initial, smaller 2016 capital dredge material placement, sediment plumes did not extend to Nine Mile Reef with no increases in turbidity recorded on the telemetered reference water quality logger located near the site. Consequences associated with reduction in light in the vicinity of the DMPA are considered to be negligible.

Sedimentation

The proposed 2026 capital dredge material placement will inevitably result in smothering of any benthic organisms which have established at the DMPA since the initial capital dredging program, due to burial by dredged material. Annual maintenance dredging sediment volumes have also been placed at the DMPA as summarised in **Table 2**. Macrobenthic organisms can recover over time from impacts of material placements. Recovery at the Albatross Bay DMPA is considered rapid (GHD 2005) and due to the close proximity and similar nature of the areas it is likely to extend to the Amrun DMPA. A 2019 benthic infauna survey noted that the Amrun DMPA has a similar amount of individual species collected (292 Amrun, 178 Weipa) and number of morphological species (39 Amrun, 43 Weipa) compared to the existing Weipa (Albatross Bay) DMPA (Advisian, 2019).

The impacts of this program are likely to be negligible, given the proposed deposition of dredged material across a large area, and the sparse occurrence of epibenthic organisms that were previously known to inhabit the site. Regionally the consequences to microbenthic assemblages is negligible.

Dredge plume modelling from the initial capital dredge program (for 2.6 Mm^3 of material) indicated that deposition rates above background (0.5 to 2 mg/cm2/day) would not extend beyond 4 km outside the DMPA area. The increase in deposition outside the Amrun DMPA area was negligible compared to the mean background rates in the area of 47 mg/cm^2/day and 31 mg/cm^2/day for dry and wet season, respectively. Consequences associated with dredging plume are expected to be negligible.

Management and monitoring measures for the impacts from dredging and material placement activities are provided in Section 6.

5.2 Marine Habitats

As identified in Section 4.4 the marine habitats in the area are dominated by open sandy substrate and nearshore and offshore reefs comprising of sparse turbidity tolerant species.

The sparse macrobenthic organisms that reside in the open sandy substrates within the zone of influence are likely to be temporarily impacted by an increase in deposition. The environments experience regular natural increases in turbidity and sedimentation associated with storms and run off in the wet season of similar or greater duration and intensity than expected from the proposed capital dredging and accordingly the impacts are expected to be negligible to low. In the event that sediment plume from capital dredging extends to nearby inshore or offshore reefs at Pera Head, Boyd Point or Nine Mile Reef it is important to note the reefs in question can withstand prolonged periods (weeks) of elevated turbidity and increased sedimentation.

The growth forms of the three most dominant coral families found near Boyd Point and Pera Head are those growth forms which have a high (foliose or laminar) or intermediate (massive or dome shaped) tolerance to suspended solids. This suggests that extended periods of TSS values of 40mg/L (27 NTU) may have sub-lethal impacts on corals of these growth forms, partial mortality impacts to coral colonies may not occur until these colonies are exposed to prolonged periods (several weeks) of TSS in the water column of 100mg/L (67 NTU) or more (Advisian, 2017).

A pre-and post-dredging inshore coral health monitoring program was implemented in 2016 to provide a quantitative measure of coral health (percent bleaching and/or mortality). The coral health monitoring program was designed to identify and measure changes in coral health that were attributable to initial 2016 capital dredging activities, which were greater than changes occurring naturally in corals at the reference sites.

Results of the coral monitoring program (previously described in Section 4.4.1) did not find any visible signs of stress or sedimentation on coral colonies at any of the survey locations associated with dredging activities after completion of the 2016 capital dredging program (Advisian, 2016b). No statistical difference (or change) could be found between coral cover before and after the 202,416 m^3 dredging.

The coral species present at reefal habitat in the vicinity of the Port and DMPA are known to have a high tolerance to sedimentation. Impacts on reefal communities during the proposed 2026 capital dredging program at areas surrounding the dredging and material placement sites are therefore anticipated to be negligible.

A small area of seagrass *Halodule uninervis* has previously been recorded in Boyd Bay in 2009 and recently confirmed again on 25 August 2025 (2025, JCU TropWater) (Refer **Section 4.4.2**. While the plume is not expected to extend towards the seagrass beds it is important to note the seagrass in question is sediment tolerant. As identified in Collier et al (2016) H. *uninervis* can experience reduced light conditions for over 4 weeks in tropical waters without significant shoot loss. Previous modelling and previous monitoring do not anticipate any plume extending into Boyd Bay and no impacts on seagrass are anticipated.

Management and monitoring measures for the impacts of dredging and placement activities on marine and coral habitats are provided in Section 6.3.

5.3 Marine Pests

The marine pests risk associated with capital dredging operations is primarily associated with movement of new vessels in the area, which could introduce marine pests and with the removal and relocation of dredged material, which could potentially disperse or translocate any marine pests to the DMPA. The introduction or translocation of marine pests may impact on other marine species and/or habitats in the area through competition and/or predation.

Sources of biosecurity risk arising from dredging can simplistically be conceptualised in relation to a ‘chain of events’ occurring in three main stages involving the transport and introduction of marine pests from other areas (primary introduction), subsequent establishment, and secondary spread from the point of first introduction. Marine pest species may be introduced through the following primary introduction mechanisms:

- Dredge area: Use of vessels, including dredges, at the Port site as a result of hull fouling or ballast water; and/or,
- DMPA: Disposal of dredged material from dredging through pests introduced by the dredger or other vessels (both Project, 3rd party commercial or recreational vessels).

The introduction of marine pests could potentially result in adverse changes to the local ecology and biodiversity of the environment. To minimise this risk, the Amrun Project requires all vessels to undergo a rigorous risk assessment process prior to mobilisation. Targeted marine pest surveys have been completed during development of the Port, including a baseline marine pest survey outlined in Section 4.5.3 (Biofouling Solutions,

2016) and ongoing marine pest settlement plate monitoring (RTA, 2017a). The risk assessment process is outlined in Section 6.5.

The risk of resuspension or translocation of marine pests from dredged material is considered to be low, particularly given the exposed seabed sediment composition which is comprised primarily of fine silts and clay.

Prior to mobilisation the dredges (and associated) vessels will undergo a marine pest risk assessment as outlined in Section 6.5.

Consequences associated with the unmitigated introduction of marine pests will be considered high. Management and monitoring measures to reduce the likelihood of occurrence and reduce the risk associated with marine pest introduction from the capital dredge program are detailed in Section 6.5.

5.4 Marine Megafauna and Significant Species

As identified in Section 4.5, several marine megafauna species are known to occur in the area. Potential impacts to marine fauna from vessels and vessel movements during capital dredging are identified below:

1. **Vessel strike:** during the capital dredging operation, a potentially large number of vessel movements will be required. 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 (TSHD) or quasi-stationary (CSD) (allowing for observation of marine fauna to occur and for evasive action to be taken in most instances) and will occur in mostly deeper waters in the project area reducing the risk of vessel strike. Inshore dolphin and marine turtle species which frequent the Port area are highly mobile within deeper waters and will be able to temporarily move from the slow-moving vessels to avoid collision. Accordingly, the consequences associated with vessel strike from dredging operations are considered negligible. Noting also that a CSD is effectively stationary during dredging operations with only the TSHD transiting to and from the DMPA. Other support vessels – crew transfer, survey, multicat workboat – will also be present during operations in the vicinity of the port.
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 and recent dolphin surveys have not recorded a reduction in megafauna with the increased traffic associated with the Port development. Accordingly, the consequences associated with area avoidance is negligible
3. **Turtle entrainment**: turtle entrainment during dredging operations is unlikely to occur. While there is potential for entrainment if 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 (API 2010; Dickerson et al 2004). Accordingly, the consequences associated with turtle entrainment is negligible
4. **Nesting and hatchling disorientation:** artificial lighting has the potential to disorientate nesting females and turtles hatchlings. The beach area between Boyd Point and Pera Head is a low density marine turtle nesting beach, with 0.29 marine turtle nests per kilometre per day recorded during the peak August – September period (Guinea, 2014). Marine turtle nesting surveys in September 2016 recorded between 0.13 marine turtle nests per kilometre per day (Pendoley, 2017) and results of 0.18, 0.14 and 0.07 turtle nests per kilometre per day for surveys conducted in 2017, 2018 and 2019 respectively (Pendoley, 2019). Altered light regimes from dredging operations will only eventuate during dredging programs. Given the relatively low level of lighting required for dredging operations, avoidance

of peak turtle nesting periods identified from baseline monitoring (August/September) is not considered necessary. Accordingly, consequences associated with lighting are considered minor.

5. **Marine pollution**: It is unlikely marine pollution (waste or spills) will impact marine fauna due to the implementation of thorough management procedures, which are required for all vessels operating on the project. All vessels must comply with the relevant legislation and the additional management methods outlined in this Plan (Section 6.8). Accordingly, the consequence associated with marine pollution from dredging activities is negligible.

The sediment plumes and/or sedimentation from the proposed capital dredging could potentially impact these species as identified below:

1. **Avoidance of foraging areas**: it is unlikely sediment plumes will impact marine fauna as sediment plumes from dredging and material placement 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 accordingly 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:** as discussed in Section 5.2 foraging habitat (eg reefs at Boyd Point and Pera Head and seagrass in Boyd Bay) are unlikely to be impacted as the turbidity plumes in the immediate area are expected to be 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; Advisian, 2016a, Advisian, 2016b).
3. **Reduction in marine turtle nesting**: the beach area between Boyd Point and Pera Head is a low density marine turtle nesting beach, with 0.29 marine turtle nests per kilometre per day recorded during the peak August – September period (Guinea, 2014). Marine turtle nesting surveys in September 2016 recorded between 0.13 marine turtle nests per kilometre per day (Pendoley, 2017) and surveys in September 2017 recorded 0.18 marine turtle nests per kilometre per day (unpublished data). Turtles nesting were still observed throughout the entirety of the initial 2016 capital dredge and maintenance programs indicating sediment plumes are unlikely to prevent marine turtles from coming ashore to nest.

The *Recovery Plan for Marine Turtles in Australia* (Commonwealth of Australia 2017) has identified Olive Ridley Turtles as a priority for management action on the basis that they are in decline or likely to be in decline due to multiple, continuing threats occurring on a substantial scale. This species has only small nesting aggregations in Australia, which have been affected by up to 90 per cent nest predation at some beaches for multiple decades. In addition, they are likely to be heavily impacted by ghost nets in the Arafura-Timor Seas and the Gulf of Carpentaria. Other key threats to the Olive Ridley Turtles are identified as climate change and variability and domestic fisheries bycatch. The proposed capital dredging program will not increase the key threat to Olive Ridley Turtles.

The Flatback Turtles nesting in the Project area are not identified in the recovery plan as a priority species for management action however the nesting beaches are identified as habitat critical to the survival of the genetic stock. Key threats to this species are identified as marine debris entanglement (ghost nets), climate change and variability, terrestrial predation and indigenous egg collection. The proposed 2026 capital dredging program will not increase the key threats to Flatback Turtles.

The recovery plan identified several other key threats which are relevant during the proposed 2026 capital dredging program including:

- Marine debris ingestion;
- Chemical discharge;
- Light pollution;
- Dredging;

- Vessel disturbance; and
- Noise interference.

Overarching actions have been developed to address the key threats to turtle species, and those which are applicable during the dredging program include:

- Reduce the impacts from marine debris;
- Minimise chemical and terrestrial discharge;
- Minimise light pollution; and
- Address the impacts of coastal development/infrastructure and dredging and trawling.

The key threats are consistent with the potential impacts to marine turtles as identified above. The dredging activity is not anticipated to impact ongoing biologically important behaviours for marine turtle stocks within the vicinity of the Port and the recovery of marine turtle stocks and the functionality of their habitat is not likely to be adversely affected by the dredging activities. The dredging activity is therefore considered to be consistent with the overarching action to address the impacts of dredging within the *Recovery Plan for Marine Turtles in Australia* (Commonwealth of Australia, 2017). The consequences associated with dredging and disposal activities on marine megafauna are considered to be negligible.

Management and monitoring requirements to address each of these threats, considerate of the overarching actions, are identified in Section 6.4, Section 6.6, Section 6.7 and Section 6.8.

Marine fauna offset programs for Inshore Dolphins (RTA 2015) and Marine Turtles (RTA 2016a) and (RTA 2016b) were developed to offset the impacts of the Amrun Project, which include the potential impacts from maintenance dredging activities. The Feral Pig Management Offset Strategy and Marine Turtle Offset Plan include feral pig control activities on all accessible nesting beaches on the Amrun Project mining lease north (approximately 27 km of nesting beach) and south (approximately 32 km of nesting beach) of the Port. The offset program has been adaptively changed since its commencement in 2016 to optimise the monitoring approach (RTA 2023), its continued implementation directly contributes to the measure of success for the Olive Ridley Turtles which is to understand the trends in nesting turtle abundance for this stock.

5.5 Fish Assemblages and Fisheries

Although fish species are able to move away from any local areas affected by a disturbance (e.g. dredging and dredged material deposition), physical disturbance to the dredge sites, material placement, and the re-suspension of disturbed and deposited sediment may have impacts of minor magnitude on sharks, rays, sawfish and bony fishes at the Amrun Port facility and the DMPA.

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 will be a temporary impact on fish assemblages in the vicinity of the Port and DMPA due to turbidity generated by capital dredging, however following dredging activities the animals will return to the area, accordingly the consequences associated are considered negligible.

5.6 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; SA DIT, 2023). The main noise anticipated during dredging operations will be the noise from the TSHD or CSD.

It is unlikely that underwater noise from dredging operations will 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 will 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 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) and for short duration. Management measures for underwater noise are outlined in Section 6.6**.** Consequences associated with underwater noise are considered to be negligible.

5.7 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. The consequence associated with this is expected to be negligible. Sediments are considered clean for unconfined ocean disposal and accordingly no contamination is likely and the consequences are considered negligible. Management measures for physical disturbance are outlined in Section 6.9.

5.8 Marine Pollution

Shipping activities associated with dredging have the potential to introduce marine pollution into the environment. It is unlikely marine pollution will impact the local environment due to the implementation of thorough management procedures, which are required for all vessels operating on the project. All vessels must comply with the relevant legislation and the additional management methods outlined in Section 6.7 of this plan. Based on the vessel and activity the consequences associated with a marine pollution spill would be considered moderate. Management measures associated with Marine Pollution are outlined in Section 6.8.

5.9 Cumulative Impacts

Cumulative impacts from the capital dredging activities and other natural events or operations within the region could impact reef, seagrass and marine megafauna. Potential cumulative stressors and the likelihood of impact are summarised in **Table 7**.

5.10 Cultural and European Heritage

A search of the Australian Heritage Database centred around Boyd Point found no places of heritage value in the Commonwealth marine area, such as historic shipwrecks. Several shipwrecks are known to occur in the general vicinity but not within proposed dredge footprint and shipping route areas.

No Cultural or European heritage artefacts have been identified during the following:

- Geotechnical seismic profiling undertaken in 2009
- Geotechnical and sediment sampling undertaken between 2007 to 2023
- Capital dredging in 2016
- Maintenance dredging between 2018 to 2025
- 2025 bathymetric survey of the proposed dredge footprint and surrounding buffer area (**APPENDIX C**)

5.11 Impacts to other users

Commercial fisheries utilise a range of areas including shallow coastal areas, inshore areas and deeper offshore areas for larger species. Maintaining healthy fisheries is of importance to the Weipa region due to their significant economic contribution.

Key areas for commercial fisheries include inshore mangrove and seagrass habitats that provide spawning and nursey areas for prawns and target fish species. Impacts to seagrass and mangrove communities are not considered likely. Importantly, routine

maintenance dredging of much larger volumes has regularly been undertaken at the nearby Port of Weipa without having any significant impact on sensitive environments important to commercial fisheries. In addition to this, capital dredging has been undertaken at Amrun with no discernible impact on fisheries (Ecological Australia, 2020).

Annual routine maintenance dredging volumes at nearby Port of Weipa typically range between 400,000 to 800,000 m^3 per year. In 2019, 2,400,000 m^3 of maintenance dredged material was relocated to the Albatross Bay DMPA without significant impact to marine users and commercial fisheries.

Following a detailed analysis of impacts, a formal risk assessment (Ecological Australia, 2020) was undertaken and considered likelihood and consequence of each potential impact. The method applied was based on the Great Barrier Reef Marine Park Authority (GBRMPA) Risk Assessment – Permission System (GBRMPA 2017). While Amrun Port is located outside of the GBRMP, there is value in applying a consistent approach to dredging across Queensland, and the framework provides a robust approach to protecting marine environmental values.

For Amrun, the impact on marine users (fishing, tourism) due to the dredge program was rated ‘Low’ with a negligible impact due to dredging confined to a small area or interest group that is not vulnerable. While it is noted that this assessment was for an annual maintenance dredging volumes of 60,000 m^3 at Amrun, the same risk assessment rating of ‘Low’ was assigned to nearby Port of Weipa based on the monitoring results and marine user impacts during 2,500,000 m^3 of actual maintenance dredging with two (TSHD) dredges in a 6-week period in 2019. As such a similar conclusion of ‘Low’ impact is expected for the proposed capital dredging.

Table 7: Cumulative stressors and impacts

Stressor	Current known status in area	Potential to impact	Cumulative impact likely
Intense weather (eg cyclone)	Dredging will be required during the 2026 and 2028 dry seasons to ensure safe shipping operation, mooring and manoeuvring. If dredging was to occur during the wet season, this would be during the naturally high turbidity levels for extended periods of time.	Reef Seagrass	No
Other dredging	The next closest dredge program is the annual Weipa program which is 40km north and the sediment plume from either operation will not disperse to the same sensitive habitats. No displacement for marine fauna is anticipated for Amrun operations.	Reef Seagrass Megafauna	No
Port operations and other shipping	Shipping operations will be limited to a small number of movements per day in the channel with dredging operations likely to bring two dredges (CSD & TSHD) and ~3 smaller auxiliary vessels (survey, crew transfer, multicat workboat) to the area. Current Bauxite shipping movements with support from tug and pilots' vessels. Inshore dolphin and marine turtle species which frequent the area have continued to use the Port area during the much busier construction period and accordingly additional vessel movements in the area are unlikely to result in behavioural changes for local species	Megafauna	No

5.12 Summary of Potential Impacts – Risk Assessment

A summary of the potential impacts of the initial risk without any additional management measures is summarised in **Table 8**.

Table 8: Potential impacts risk assessment

Aspect	Consequence	Likelihood	Risk	Comment
Water quality contaminants – in zone of influence	Negligible	Rare	Low	
Water quality light – in zone of influence	Negligible	Likely	Moderate	There will be a light reduction in the zone of influence. The management measures in **Section 6.2** and **Section 6.2.1** will provide mitigation of potential impacts through minimising the extent of the zone of influence.
Water quality sedimentation – zone of influence	Negligible	Likely	Moderate	Sedimentation will occur in the zone of influence. The management measures in **Section 6.2** and **Section 6.2.1** will provide mitigation of potential impacts through minimising the extent of the zone of influence.
Water quality contaminants – sensitive habitats	Negligible	Rare	Low	
Water quality light – sensitive habitats	Negligible	Unlikely	Low	In the event plumes extended to the sensitive habitats concentrations will be within natural variation in concentration and duration (days).
Water quality sedimentation – in sensitive habitats	Negligible	Unlikely	Low	In the event plumes extended to the sensitive habitats concentrations will be within natural variation in concentration and duration (days).
Marine habitats – reef	Negligible	Unlikely	Low	
Marine habitats – seagrass	Negligible	Unlikely	Low	
Marine habitats – open substrate – zone of influence	Negligible	Likely	Moderate	Open substrate will be impacted in the zone of influence, however the impact will be within natural variation in intensity and duration. The management measures in **Section**

Aspect	Consequence	Likelihood	Risk	Comment
				6.2 and **Section 6.2.1** will provide mitigation of potential impacts through minimising the extent of the zone of influence.
Marine habitats – open substrate	Negligible	Unlikely	Low	
Marine pests – ecosystem change	High	Unlikely	Critical	Introduction of marine pests while unlikely would have a significant impact on the environment. Accordingly additional management actions have been identified in **Section 6.5** to enable early detection and reduce risk of translocating any specimens to the area.
Megafauna – vessel strike	Negligible	Unlikely	Low	
Megafauna – vessel avoidance	Negligible	Rare	Low	
Megafauna entrainment	Negligible	Possible	Low	Even in the event a small number of turtles were entrained this will still not result in a detectable change in population size.
Megafauna – nesting and hatchling disorientation	Minor	Possible	Moderate	The potential for hatchling disorientation if lighting impacts were unmitigated may result in a detectable change in population size during the capital dredging program. Accordingly additional management actions have been identified in **Section 6.4.2** to minimise likelihood and severity of potential impacts upon turtle hatchings.
Megafauna - pollution	Negligible	Possible	Low	
Megafauna – loss of foraging habitat due to dredge plume	Negligible	Rare	Low	
Megafauna – avoidance of foraging habitat	Negligible	Rare	Low	

Aspect	Consequence	Likelihood	Risk	Comment
due to dredge plume				
Megafauna – reduction in nesting due to dredge plume	Negligible	Rare	Low	
Fish assemblage avoidance	Negligible	Unlikely	Low	
Underwater noise – dredging operations on megafauna	Negligible	Unlikely	Low	
Physical disturbance – benthic habitats	Negligible	Almost certain	Moderate	This is unavoidable in the dredge footprint but will impact less than 1% of the bay and is approved for direct disturbance. The management measures in **Section 6.9** will provide mitigation of potential impacts through minimising the extent of the zone of impact.
Marine pollution – waste	Negligible	Possible	Low	
Marine pollution – spills	Moderate	Possible	High	Shipping activities associated with dredging have the potential to spill hydrocarbons; however the thorough management measures identified in **Section 6.7** and **Section 6.8** will minimise the likelihood and severity of potential impacts from marine spills.
Impacts to other users	Negligible	Possible	Low	

6 Management and monitoring

Dredging and material relocation will be undertaken in accordance with the conditions of all State and Commonwealth approvals stated in **Sections 1.1** and **1.2**.

RTA has established the Boyd Port Dredging Technical Advisory Group (BPDTAG) which includes representatives from the following organisations:

- Rio Tinto Ltd
- RTA Weipa Pty Ltd
- Queensland Department of Primary Industries – Biosecurity
- Queensland Department of Primary Industries – Fisheries
- Commonwealth Department of Climate Change, Energy, the Environment and Water – Sea Dumping
- Queensland Department of Environment, Tourism, Science and Innovation
- Maritime Safety Queensland
- North Queensland Bulk Ports Corporation
- Members of the Western Cape Communities Co-existence Agreement (WCCCA).

RTA will report to the BPDTAG on proposed capital dredging activities (previously 28/11/2024) for the Port and implementation of this DMP, including monitoring results. The BPDTAG already provides input into RTA's 10-year long term maintenance dredging program.

RTA will submit plans for capital dredging activities, certified by a Registered Professional Engineer of Queensland (**Appendix E**), to DETSI prior to commencement of dredging. Dredging activities will be confined to the removal of capital dredge material at the location shown on the plan(s). Prior to the commencement of proposed 2026 capital dredging, hydrographic surveys of the bed levels of the area to be dredged will be completed.

Dredged material will not be disposed of into Queensland waters that are within the limits of the State, unless otherwise authorised. Dredged material will not be disposed of into Australian waters, the sea or on land unless otherwise authorised. Dredged material is proposed to be placed in the approved DMPA for current maintenance dredging, which is identified in the pending Sea Dumping Permit application (SD2025/4075) sought for this project.

Evidence of applicable approvals will be made available to the regulatory authority on request.

A Sea Dumping Permit, SD2025/4075, for disposal of this capital dredge material has been granted until 2029 and operations will comply with all permit requirements.

DETSI will be advised in writing at least five (5) business days prior to the date of commencement of the proposed 2026 and 2028 capital dredging program and within ten (10) days following completion of each proposed capital dredging program.

6.1 Dredge equipment and operators

In accordance with Condition J8 (EA EPML00725113), these 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 will:
- 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 capital dredging activities including but not limited to employees and contract staff will 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.

6.2 Water Quality and Sediment Plumes

A Water Quality Monitoring Plan (WQMP) has been developed for implementation during the proposed 2026 capital dredging program. The WQMP will be implemented across baseline, pre-, during and post- dredging phases of the capital dredging program.

6.2.1 Management Measures

A range of measures will be implemented to manage water quality and impacts to nearby sensitive receptors (e.g. coral assemblages). These measures include:
- Implementation of the WQMP
- Implementation of the Contractor's Environmental Management Plan
- Dredging and disposal will:
  - only occur in the permitted areas specified on approved plans and with material approved for unconfined ocean disposal;
  - 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.
- Mechanical devices, such as turbidity-reducing ("green") valves in the overflow on the TSHD will be used;
- Hopper doors will be kept in good condition to minimise loss of sediment during transport;
- Track plots will be provided by the dredging company to demonstrate that no dredging occurs outside the designated areas;
- Accurate positioning systems will be used on dredges to ensure direct impacts are restricted to the approved dredging areas;
- Accurate positioning of vessels to ensure placement of sediment within approved DMPA;
- Safest and shortest sailing routes to and from the DMPA will be selected to minimise the impact of propeller wash;
- Current and forecasted meteorological and oceanographic information will be considered in the daily work plan;
- The transportation of dredge material will be carried out such that the dredge material is always kept wet.

6.2.2 Monitoring Measures

Baseline water quality monitoring was undertaken over a three-month period during the 2025 dry season. Monitoring equipment was deployed on 16 July 2025 and retrieved on 9 October 2025, and the baseline data is summarised in **Appendix F**. The purpose of this baseline monitoring was to:

- Fill a dry season data gap as there is a lack of data collected in the area between June and August, and limited surface water quality data (monitoring buoys) collected previously.
- Collect concurrent benthic and surface turbidity data at one site to confirm correlation between the two. This will allow previous historical benthic turbidity data to be used to set surface trigger values.
- Allow testing of the monitoring framework, including suitability of monitoring sites and equipment.
- Testing and/or refinement of dry season trigger values.

- **Pre-dredging** – the monitoring system is to be deployed at least 2 weeks immediately before dredging commences. This is to collect pre-dredge data, test equipment and allow rolling medians to be calculated using pre-dredging data.
- **During dredging** – equipment to remain deployed for the duration of dredging and placement activities.
- **Post-dredging** – approximately 2–3 weeks following cessation of dredging to allow ambient water quality to baseline conditions.

Water quality monitoring will be undertaken at seven monitoring sites as follows:

- **Concern (compliance) sites** – four dredge plume monitoring sites (D1 to D4) (referred to as Concern sites in the EA) within the modelled zone of influence of dredge plumes (refer to **Figure 23**). These sites will be used to assess compliance with trigger values. The sites are located in similar water depths near the 5–10 m Lowest Astronomical Tide (LAT) depth contour.
- **Reference sites –** two dedicated Reference sites out of the modelled zone of influence of dredge plumes, including R1 located north of Boyd Point and R2 located south of Thud Point. This will represent ‘background’ turbidity. Plume monitoring sites upwind of prevailing weather to act as temporary reference sites if required.
- **Placement site –** one placement monitoring site (P1) located near to Nine Mile Reef to the south of the DMPA. This will comprise monthly water quality depth profiles supported by satellite imagery to monitor plumes extending from the DMPA.

Water quality monitoring equipment will be deployed at the monitoring locations listed in **Table 9** and shown in **Figure 25**. Any required analysis will be completed at a NATA certified laboratory with the exception of in-situ monitoring and analysis without certification.
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Table 9: Water quality monitoring sites

Site	Description	Type	Previous Monitoring Site (2016)	Water Depth (m LAT)	Coordinates	
					Latitude	Longitude
Concern (Compliance) Sites						
D1	Coral reef at Boyd Point, north of dredge area	Surface	I1	5–10 m	-12.908401	141.629653
D2	Coral reef at Pera Head, south of dredge area	Surface	I2	5–10 m	-12.947615	141.599513
D3	Coral reef between Pera Head and Thud Point, south of dredge area	Surface	I3	5–10 m	-12.957640	141.578156
D4	Coral reef at Thud Point, south of dredge area	Surface	I4	5–10 m	-13.002609	141.575766
Placement Site						
P1	Northside toe of Nine Mile Reef, south of DMPA	Profiles	R3	~25 m	-12.940123	141.447780
Reference Sites						
R1	Reference site located north of Boyd Point, representing background conditions	Surface	R1	5–10 m	-12.885811	141.664401
R2	Reference site located south of Thud Point, representing background conditions	Surface	R2	5–10 m	-13.094037	141.600002

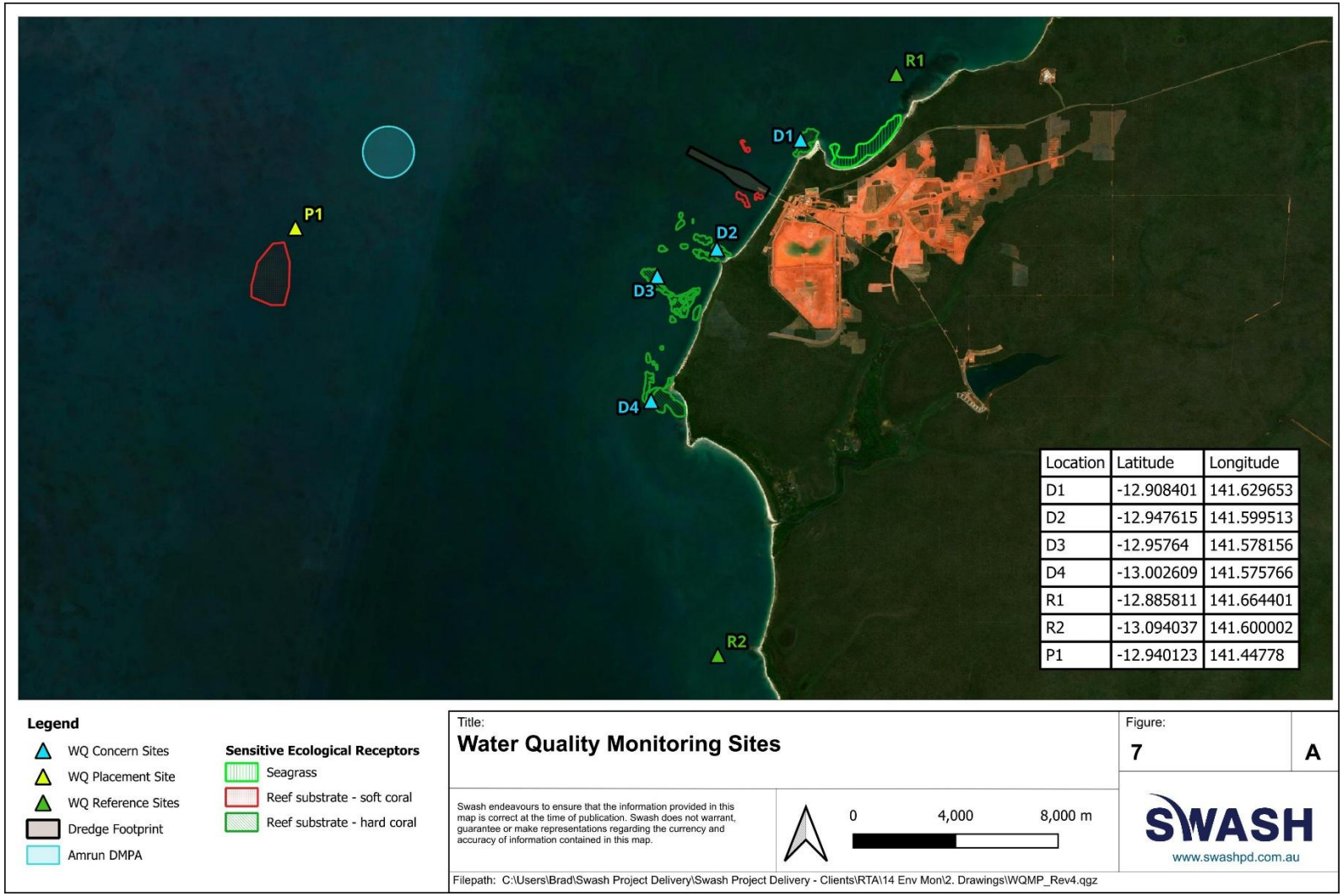


Figure 25: Water quality monitoring sites

Daily visual monitoring will be undertaken of sediment plumes but also for oil, grease, scum litter or any other objectional matter.

The extent and width of the plume will be monitored daily through satellite imagery and satellite derived turbidity imagery. This monitoring is currently undertaken by NQBP at the nearby Port of Weipa where 405,000 m^3 of maintenance dredged material was relocated in 2025 and more than 2,400,000 m^3 of emergency maintenance dredging occurred in 2019.

An example of this satellite imagery for the *TSHD Brisbane* performing maintenance dredging at Amrun port (10:47 am, 9 May 2023) is shown in **Figure 26**. The *TSHD Brisbane* was towards the end of dredging its second load from the Amrun berth at this time (dredging commenced at 10:14 and finished at 10:59). The plume is approximately 600 m in length and 150 m wide and has a maximum total suspended matter (TSM) of just under 20 mg/l while the natural background TSM is 2-3 mg/L.

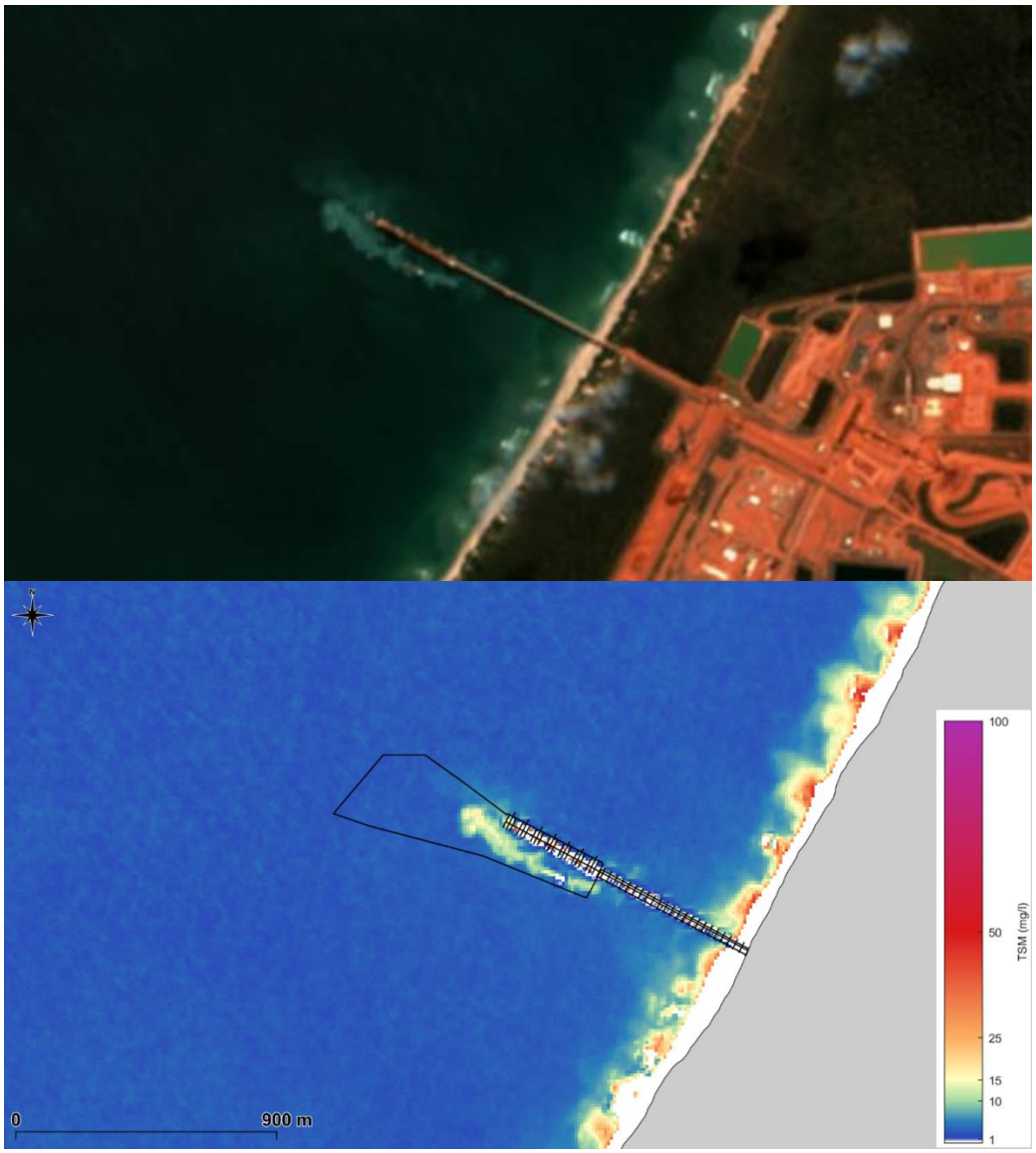


Figure 26: True and turbidity-derived satellite imagery (Amrun maintenance dredging, 9 May 2023)

6.2.3 Adaptive Management Measures

As detailed in the WQMP, adaptive management trigger levels will be implemented during the dredging program. These trigger levels will be based on turbidity (NTU) values, based on data collected from previous and similar studies and the data to be collected during the baseline phase (July to October 2025) of water quality monitoring for this proposed 2026 to 2028 capital dredge program.

There will be two levels of trigger values, as follows:

- Alert level – internal trigger to provide warning of increasing turbidity approaching upper range of natural variability.
- Alarm level – external trigger to indicate turbidity has reached upper range of natural variability and impacts to sensitive ecological receptors could begin to occur if management actions are not implemented.

Consistent with previous capital dredging programs, a 14-day rolling mean will be used to assess compliance with trigger levels. If exceedance of trigger levels occur, adaptive management measures detailed below will be implemented if the cause of the exceedance is dredging-related.

- Avoidance of concurrent turbidity generating activities that might cause an accumulated impact.
- Equipment, technology and methods will be used to reduce the sediment plume, sediment spillage and the creation of suspended sediments at the seabed (routine control);
- Well-maintained and properly calibrated dredging equipment will be utilized (routine control);
- Moving the dredge operations and vessels to other areas within the development footprint to reduce potential impacts on nearby receptors;
- Temporarily suspend one or both dredgers;
- Use of “green-valve” (anti-turbidity valve) during overflow operations of the dredger (routine control);
- Reducing or ceasing overflow if deemed required to further reduce the impact;
- Turbidity originating from propeller wash will be limited by optimising vessel speed;
- The mitigation measures will be clearly indicated to all relevant vessels during the prestart meetings and enforced by the Operational Superintendent on-board (routine control); and
- Strategically schedule vessel maintenance (i.e. cutter head checks, pause dredging).

Refer to the WQMP (Appendix F) for detailed information.

A summary water quality and sediment plume report will be prepared, based on water quality data and satellite images collected; as well as metocean data and nearby Port of Weipa water quality monitoring data.

Data from this monitoring program will be used to inform continuous improvement opportunities and identify requirements for future capital dredge monitoring programs.

6.3 Marine and Coral Habitats

As previously described in Section 5.2 sensitive habitats in the area can survive weeks of prolonged increases in turbidity. The turbidity and sedimentation levels will not be elevated for a longer period than experienced naturally. Additionally, any consequences would affect less than 1% of the population and the impact is likely to be low.

Coral monitoring was undertaken by RTAW as part of the initial 2016 capital dredging program to determine any potential impacts to coral communities around the Port. Coral cover, health (bleaching and mucous) and sediment deposition were monitored at six

locations pre and post dredging (one and two months post capital dredging) in 2016 (Advisian 2016).

The results of this monitoring survey found:

- A variety of hard coral genera are present in the area, with the most common species being those typically found in environments of high turbidity and temperature (Porites and Favia).
- Coral cover is patchy with up to 6.3% of available substrate covered by hard coral.
- Some species were observed undergoing more flattened growth, with less branching, indicating an adaption to low light conditions.
- Coral bleaching (hard and soft coral) was observed at all survey sites and appeared to be a result of the sustained increase in sea temperatures between February and April of 2016.

No difference in hard coral cover, coral health or sediment deposition was observed between pre and post dredging surveys (Advisian 2016).

6.3.1 Monitoring Measures

A **Coral Health Monitoring Program (CHMP)** (in accordance with condition J16 (c) and J13 (f) of EA EPML00725113) will be implemented for the proposed 2026 and subsequent 2028 capital dredge program to determine any potential impacts to coral communities around the Port. Pre-dredging (baseline) and post-dredging coral surveys will be undertaken as detailed in the CHMP (sub-plan).

Reactive monitoring during dredging will consist of rapid visual assessments to be done if water quality monitoring 'Alarm' trigger values are exceeded. These trigger values are detailed in the WQMP. If required, reactive monitoring surveys will focus on sites where water quality exceedances occur.

The objectives of the coral monitoring program are to:

- Detect potential changes in health of hard coral and associated reef assemblages, and;
- Identify whether any potential changes in hard coral assemblages or health are attributable to the dredging works.

The following indicators of coral health and change will be enumerated:

- Live hard coral (% cover)
- Coral bleaching (% cover and number of colonies)
- Coral mortality (% cover)

Supporting measures:

- Macroalgae (% cover)
- Algal turf (% cover)
- Crustose coralline algae (% cover)
- Sponges and Ascidians ((% cover)
- Combined sessile biota (% cover)
- Coral disease (% cover)
- Sediment (% cover)

The optimal statistical analyses designed to detect an impact due to dredging activities will utilise a Beyond-BACI model comprising the following times of sampling Before dredging activities vs After dredging activities and Control (absence of dredging) vs Impact (presence of dredging). The basic model is shown in **Table 10**

Table 10; however, it may need to be adjusted depending on available time and access to sampling sites.

Table 10: BACI experimental design to be used for the analysis of photo locations

Design	Factors	Sample Replication
Time (temporal)	Before	B1 B2
	After	A1 A2
Location (spatial)	Control / Reference	R1 R2 R3 R4
	Potential Impact	I1 I2 I3 I4 I5

The four control/reference locations (R1, R2, R3, R4) and five potential impact locations (I1, I2, I3, I4, I5) are shown in **Figure 27** below.

Up to six (6) sites will be sampled at each location using an ROV with downward facing high-definition camera. Each site will consist of a circular areas of approximately 10m raidus around a central point, which will be located via differential GPS (accuracy <1m).

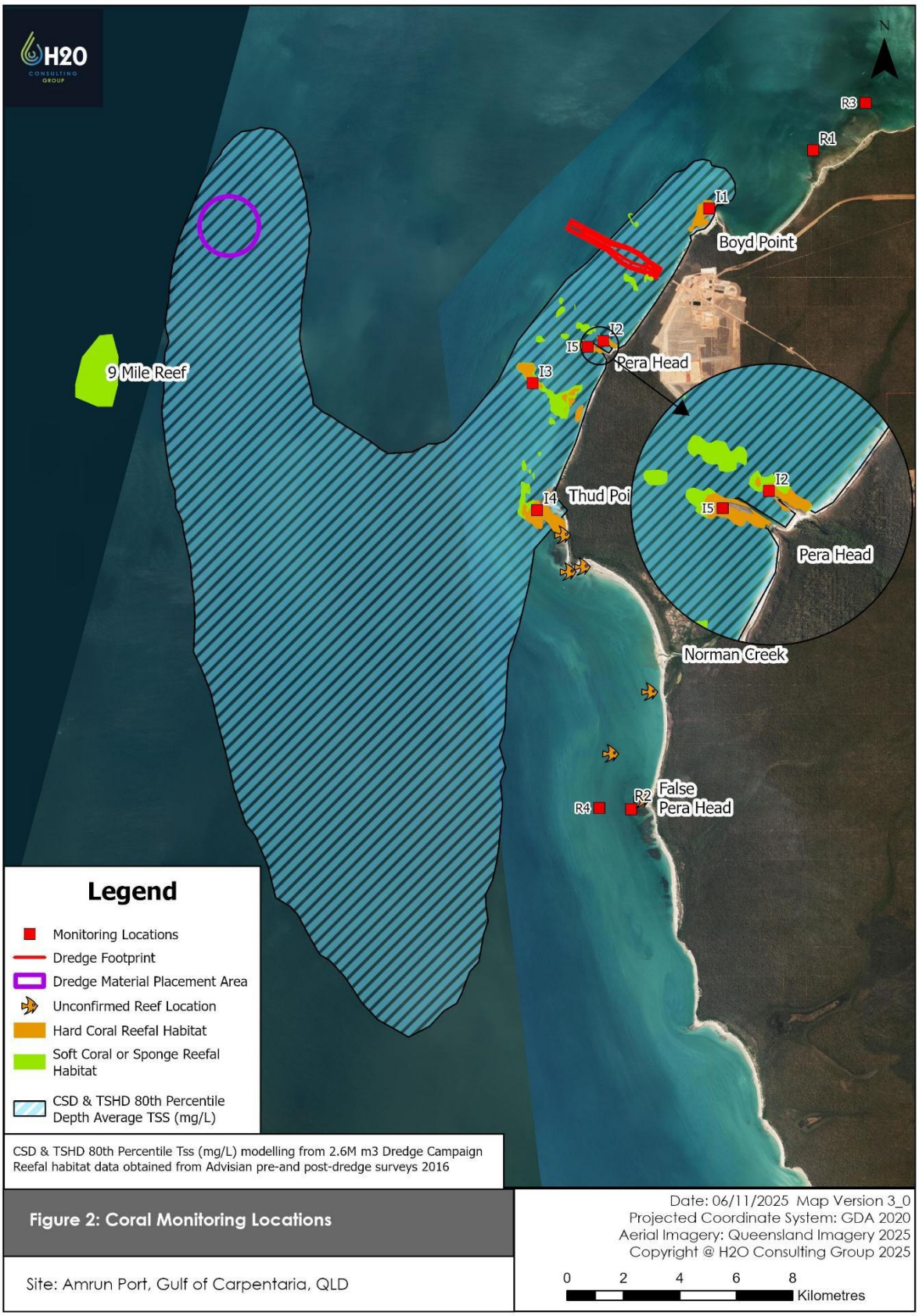


Figure 27: Coral monitoring sites

6.4 Marine Mammals and Turtles

As outlined in Section 4.5 and Section 5.4, there are several threatened species which occur in the area which have the potential to be impacted by dredging and material placement operations. The following range of management measures identified to mitigate potential impacts on marine mammals and marine turtles will be implemented for dredging and material placement.

6.4.1 Disturbance from vessel activities (boat strikes and turtle entrapment)

The following management measures will be implemented during dredging and material placement activities:

- The TSHD (if utilized) will have dragheads with depth control fitted with turtle exclusion devices. Turtle exclusion devices will be used at all times as a standard operational specification to ensure the risk of injury to turtles during dredging is minimised.
- Prior to the commencement of capital dredging and material placement activities, selected crew from the dredges will 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. MFOs will scan the 300m observation zone at least once every 30 minutes, commencing at least 30 minutes prior to, and continuing throughout, any dumping activities. Records will be kept detailing dates, times, co-ordinates, MFO on duty, species observed, distance from vessel and action taken.
- During daylight hours, and where practicable under available lighting, a MFO must be on watch during dredging and placement operations. This has been successful for previous dredge programs worldwide and in northern Queensland and is considered appropriate for the level of risk.
- A log will be maintained on dredge and barge vessels detailing marine mammal and marine turtle sightings during operation.
- The CSD and TSHD dredge pumps must only be turned on when the cutter head or drag head is close to the seabed ready to commence cutting/dredging. The pumps will then be turned off once clearing of the seabed is complete (within safety and operational constraints).

Mobile (TSHD) dredging operations:

- must not commence if marine species (including dugongs, marine turtles, or cetaceans (e.g. Bryde's whales)) are observed (using binoculars) within 300 metres of the dredge, and
- where underway, must pause dredge activities as soon as safe and practicable to do so if marine species (including dugongs, marine turtles or cetaceans (e.g. Bryde's whales)) are observed within 300m zone.

Sediment placement operations:

- must not commence if marine species (including dugongs, marine turtles, or cetaceans (e.g. Bryde's whales)) are observed (using binoculars) within 300 metres of the TSHD immediately prior to placement; or the TSHD can move to another part of the DMPA for placement operations.

Marine turtle monitoring will be carried out as follows:

- daily monitoring for impacted marine turtles will be undertaken at the dredge work front through operational monitoring of equipment and by the designated Marine Fauna Observers in surrounding waters and,
- at the accessible shoreline down current from the dredging operation between Boyd Point and Pera Head. Rio Tinto's Land and Sea Management Programme (LSMP) team will undertake daily beach monitoring using a side-by-side buggy to drive the shoreline. The LSMP team employs Traditional Owners to help monitor and manage cultural heritage, land management and marine wildlife (including implementation of the Marine Turtle Offset Plan)
- if monitoring identifies impacts to Marine turtles the management response defined in section 6.4.3 will be followed.

All dredging vessels will be contractually required to comply with applicable parts of:

- Australian Maritime Safety Authority (AMSA) Marine Notice 12/2011; and
- Division 8.1 of the EPBC Regulations 2000 regarding vessel interactions with cetaceans (eg distance, speeds).

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. 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 2.5 m.

Any injury or death of marine turtle, dugong, dolphin or whale will be reported to:

- The DETSI hotline (1300 130 372, option 1) or via the QWildlife app. 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.
- DETSI is to be notified of any marine turtle captures by the dredge or injury to any marine species of conservation significance.
- All injuries of protected species will be made to the necessary contact within DCCEEW. Notification to DCCEEW 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 dredging and material placement are shown in **Figure 28** and **Figure 29** respectively. It is noted that these procedures only work effectively for daytime operation to reduce the risk of impact to marine fauna. The risk associated with dredging operations is still considered low with the addition of turtle deflection devices (where applicable, i.e. TSHDs). Daily inspections from the beach and/or water will be conducted within the vicinity of the dredge footprint to identify any injured or dead turtles.

6.4.2 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, daily beach inspections between Boyd Bay to Pera Head to identify any potential nests that may successfully hatch during the dredge program.
- Light levels from the dredging activities will be minimised to those lights that are necessary for the safe operation of the vessels (refer also Table 5 and Table 6 of *National Light Pollution Guidelines for Wildlife* (DCCEEW, 2023); 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.

The marine turtle offset programs (RTA 2016a) and RTA (2016b) were specifically developed to offset potential impacts of lighting at the Port on marine turtles nesting within the vicinity of the Port.

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

Background

This section details the incident response strategy to be implemented during dredging and material placement activities. Adaptive management responses that relate to marine turtle incidents (injury or mortality),or marine mammals (Bryde's whales, dugongs) associated with dredging and material placement activities will follow an incident investigation and action process aligned with a series of tiered response principles.

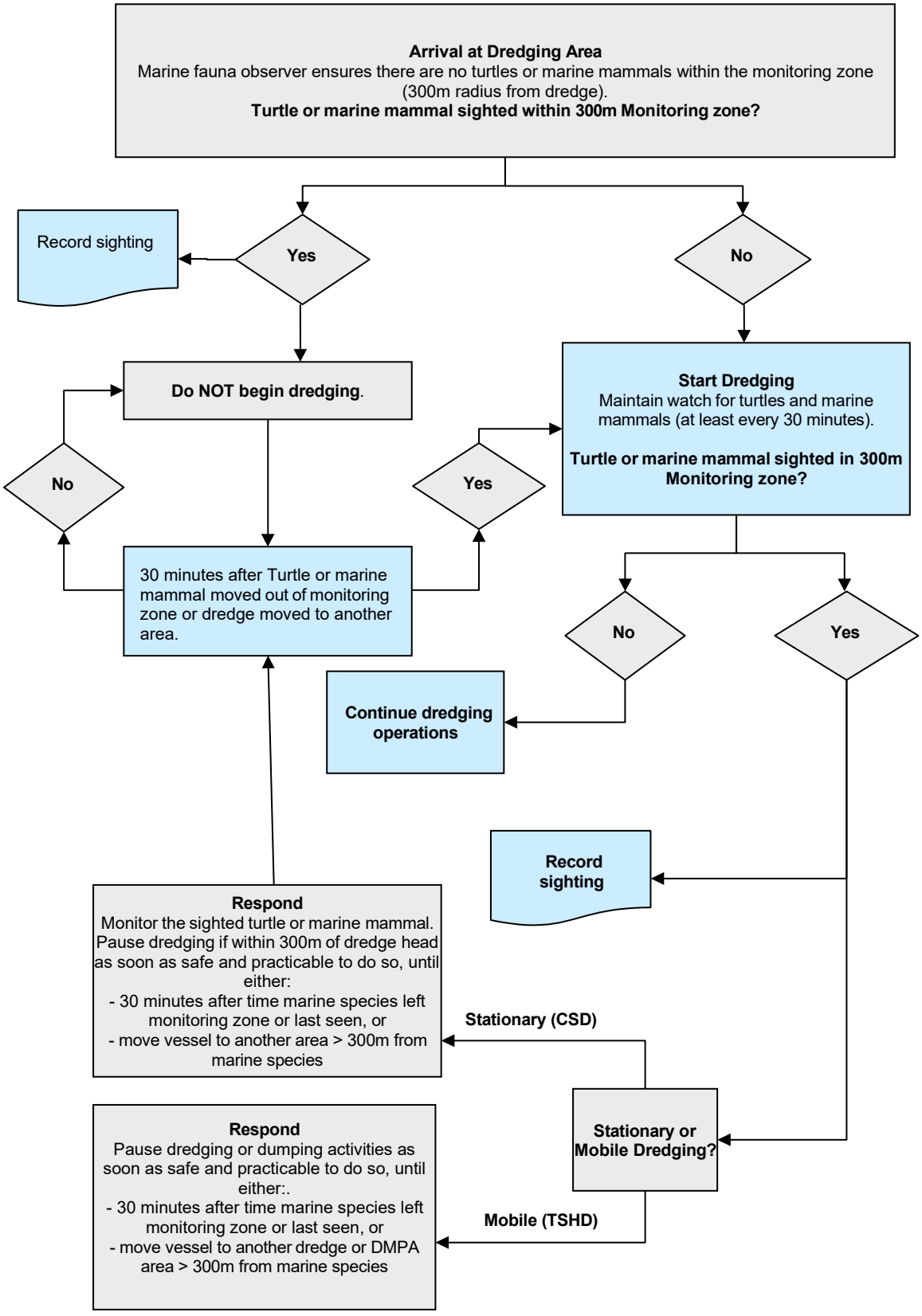


Figure 28: Marine turtle and marine mammal management procedure (dredging)

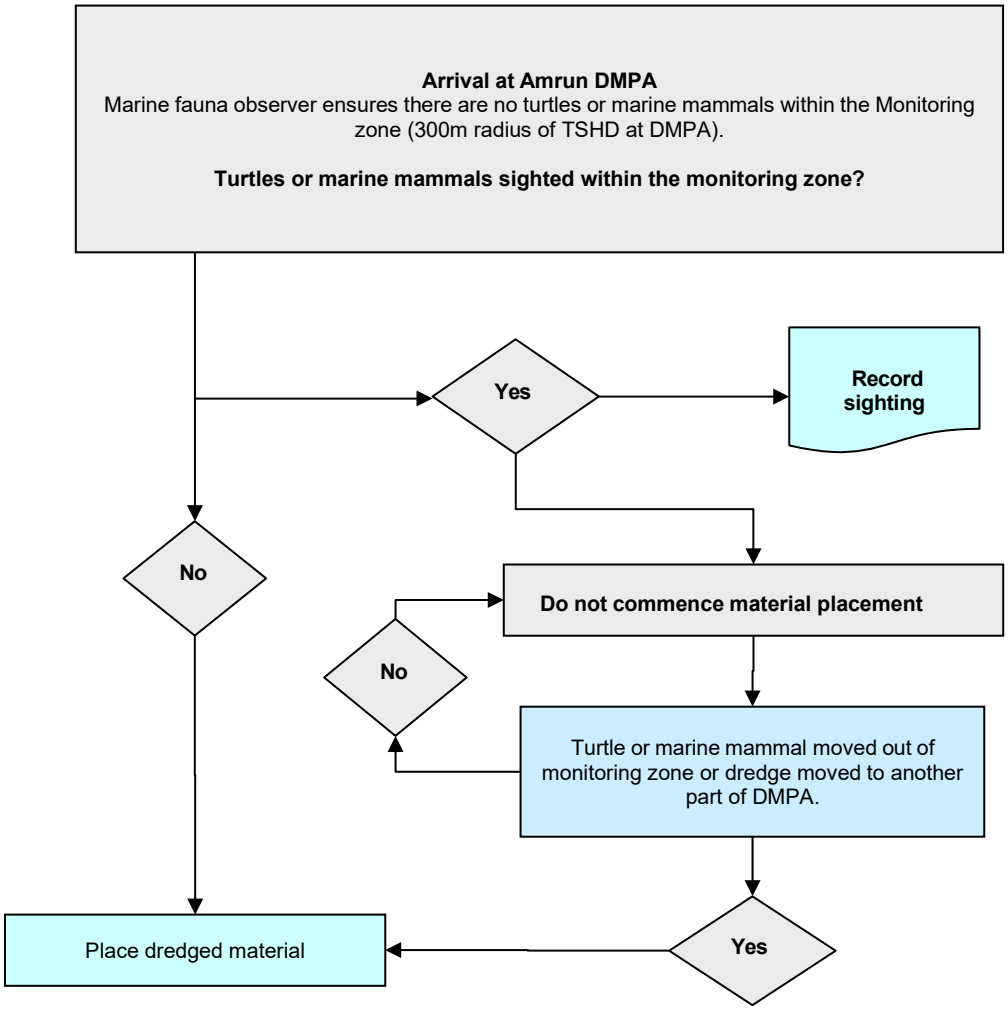


Figure 29: Marine turtle and marine mammal management procedure (DMPA)

In the event of marine turtle or mammal (i.e. Bryde's whales, dugongs) injury or mortality, attributed to capital dredging and/or material placement activities, The project will undertake an investigation and capture in an incident reporting system. The investigation will be undertaken within 72 hours (condition 13 SD2025-4075) and 14 days (condition A15 EA EPML00725113; condition G6 P-EA-101003951) and will include location (GPS coordinates estimate), nature of injury/death and species involved if known. This will also 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 capital dredging and/or material placement activities:
  - Should it be determined that current management measures were not being followed, appropriate action will 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 will be implemented over the following week. For example, additional monitoring of beaches.

- Level 2
  - Three injured or dead marine turtles attributable to this capital dredging program and/or material placement activities are found per seven-day period, or six per 28-day period.
  - RTA will undertake a review of current management measures to identify alternative or additional practicable management measures that could be undertaken. This review would be undertaken as soon as possible noting logistics'

constraints accessing the location (Anticipated within 5 days of a Level 2 management trigger occurring). Where the review identifies additional action to be implemented (from those previously identified following investigations), these will be formalised in an incident and action system with time frames prioritised to reduce risk as soon as practical noting, remote location and nature of action to be defined. This would include a meeting between the dredging contractor, RTA, and Bechtel (as the project management consultant) .
  - At the same time interim management measures will be implemented to prevent possible sources of harm, where practicable, to reduce the risks of further marine turtle injury or mortality. Interim measures will be specific to the identified causal factors (eg heightened turtle abundance in area).

- Level 3
  - Four injured or dead marine turtles attributable to this capital dredging program and/or material placement activities are found per seven-day period, or nine per 28-day period or more than two marine turtles killed within 24 hours (Condition J38 EA EPML00725113) attributable to dredging and/or material placement.
  - Immediate action will 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 will be undertaken by RTA to identify longer- term alternative or additional management measures to reduce the risks of further marine turtle injury or mortality. Additional measures will be specific to the identified causal factors (eg heightened turtle abundance in area).
  - Further short-term actions may be required within 1 to 14 days to allow either return of dredge to a particularly location or re-commencement of dredging activities. The actions will depend on the nature of the investigation findings and will reduce potential impacts.
  - Long-term management measures would be investigated as part of the Stage 1 project close out reporting and implement prior to Stage 2 capital dredging currently scheduled for 2028.

Turtle injury or mortality where there are missing appendages or cut in half are likely the result of dredge activities. Boat strike injury symptoms that may be associated with dredge works, operational shipping or recreational boats include acute shell damage, parallel lacerations from engine prop. Other non-dredge symptoms of injury or death include no physical damage, excessive growths, or debris entanglement. It is noted that commercial fishing operations (trawling) also occurs in the vicinity of the port and DMPA. A specialist turtle ecologist will be engaged to provide advice on cause if undetermined during incident investigation.

As described in section 6.4.1 in the event of Marine Turtle mortality RTA Weipa will be in communication with DETSI and will share the adaptive management measures to be implemented.

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 will guide adaptive management decisions and further actions as required.

Informal ongoing monitoring and effectiveness of actions implemented will be discussed at daily project meetings. This information will be used to inform management measures for Stage 2 capital dredging at part of continuous improvement opportunities. Key findings will be shared with the Boyd Port Dredge Technical Advisory Group.

6.5 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 Biofouling Management Requirements (DAFF, 2023) set out vessel operator obligations for the management of biofouling when operating vessels under biosecurity control within Australian territorial seas. These requirements apply to all operators of vessels subject to biosecurity control and provide guidance for vessel operators on best practice biofouling management.

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 the following which is also included in Section 7.2 and Figure 9 of the *Amrun (SoE) Project – Operations Marine and Shipping Management Plan*:

- 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
- any periods spent out of water immediately prior to mobilisation

All vessels rated a high risk may 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
- 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 30.**

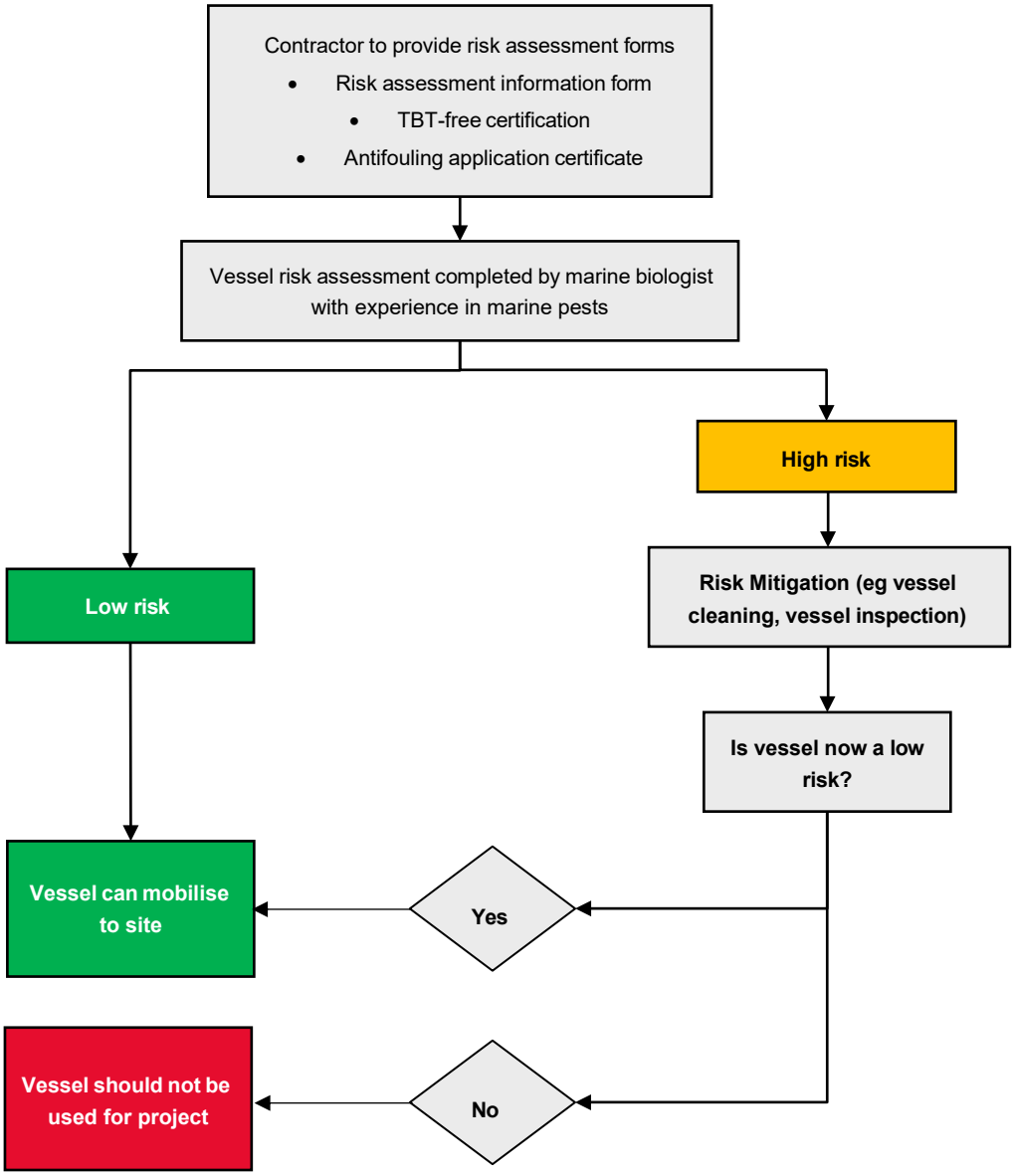


Figure 30: IMS vessel risk assessment procedure

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 (EMP Plan) 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.

6.6 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 this capital dredging program including material placement at the DMPA:

- 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 this capital dredging program including material placement will be negligible.

6.7 Vessel Traffic

Project-related vessel movements during this capital dredging program 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;
- all vessels will have adequate lighting for safe navigation;
- vessels will comply with all requests from MSQ or the Regional 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.

With the implementation of these mitigation measures, impacts of dredging operations on fauna are expected to be low.

6.8 Marine Pollution

Numerous waste materials will be generated on site 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. Some of these wastes are classified as regulated wastes, as listed in the Queensland *Environmental Protection Regulation 2019* and requires appropriate storage, transport, disposal and tracking.

All chemical substances used on the dredge must be recorded in a chemical register, which identifies the chemical properties of the substance, storage and handling requirements and any potential for environmental harm. Chemical and fuels in containers of greater than 15 litres must be stored within a secondary containment system.

Waste reception services will be provided by the project for reception of vessel wastes, excluding quarantine waste. Waste generated 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, Weipa. 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.

All waste or sewage will be disposed at an appropriate facility and in accordance with MARPOL and, if disposed locally, in accordance with Queensland legislative requirements. 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 received at site shall be removed from site for disposal at a landfill or recycling. Regulated wastes shall be transported and received by a licensed operator under the relevant state applicable legislation (eg QLD operator will have approved Environmental Authority)
- 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.
- 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.

6.8.1 Vessel discharge and waste management

Some specific provisions that will be applied to vessels regarding 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 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 *Environmental Protection Act 1994* and *Environmental Protection Regulation 2019*); 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 Port Limits.
- Outside of these limits any discharge of sewage from construction 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.
- 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 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 *Environmental Protection Act 1994* and *Environmental Protection Regulation 2019*); 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 Maritime Arrivals Reporting System (http://www.agriculture.gov.au/biosecurity/avm/vessels/mars#mars-benefits).

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.

6.8.2 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. The type of antifouling used for project vessels will be checked prior to mobilisation to site.

In addition, as part of the marine pest risk assessment process (Section 6.5), 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.

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 2024). 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 Amrun port site.

6.8.3 Spill management

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

- Operational inspections for excessive oil and grease from cutter and drag heads;
- complying with vessel traffic management controls
- 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 Amrun 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.

6.8.4 Spill response

While the occurrence of spills is unlikely and the vessel management measures 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 Amrun 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 Pan (QCCAP) and the Amrun Spill Management and Response Plan. RTA 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, 2015 (last updated 2023)) and the information outlined in this document. MSQ will be the Statutory and Combat Agency and the Amrun Port Dredging Contractor will be the first-strike agent.

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 or spill to the marine environment. Discharges will be reported to the relevant authority which may be DETSI and MSQ/RHM 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.

6.9 Physical disturbance

Direct physical disturbance is 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); and
- dredged material placement restricted to the approved Amrun DMPA.

6.10 Cultural and European Heritage

RT maintains ongoing engagement with WCCCA as detailed in Sections 9 and 10.

RT will engage experienced dredging contractors with unexpected finds procedures in place.

RT will communicate and notify relevant agencies in accordance with the Unexpected Finds Protocol provided in **APPENDIX H.** This is in line with Section 40 of the Underwater Cultural Heritage Act 2018 and associated Guidelines.

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

Table 11 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 11: Activities, environmental issues, potential impacts and mitigation, management and monitoring measures

Potential Impact	Avoidance, Mitigation and Management Measures	Monitoring	Residual Risk (consequence / likelihood risk)	Management Objective	Performance Indicators	Timeframe (Activity)	Corrective Actions	Responsibility
Plume generation (contaminants, light and sedimentation) - within zone of influence	Management measures are detailed in Section 6.1, 6.2 and 6.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 6.2). Modis satellite imagery will also be reviewed daily.	Negligible / Likely – Moderate	Water quality impacts are restricted to the zone of influence identified	Number of times sediment plumes are observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera Head.	During dredging and placement activities	Implementation of the management process identified in Sections 7.8 and 7.9 of the WQMP (DMP Section 0) to improve water quality. Adaptive management measures stated in the Contractor's Environmental Management Plan (to be approved by RTA).	Dredging Contractor Amrun Project Team
Plume generation (contaminants, light and sedimentation) on sensitive habitats	Management measures are detailed in Section 6.1, 6.2 and 6.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 6.2). Satellite imagery will also be reviewed daily.	Negligible / Unlikely – Low	No significant impacts to water quality, with potential to impact sensitive habitats (reefal areas) from dredging activities.	Number of times sediment plumes are observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera.	During dredging and placement activities	Implementation of the management process identified in Sections 7.8 and 7.9 of the WQMP (DMP Section 0) to improve water quality. Adaptive management measures stated in the Contractor's Environmental Management Plan (to be approved by RTA).	Dredging Contractor Amrun Project Team
Marine habitats – reef	Management measures are detailed in Section 6.2 and 6.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 6.2). Modis imagery will also be reviewed daily	Negligible / Unlikely – Low	Nil impact to marine habitats reef from dredging or placement activities	Number of times sediment plumes are observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera.	During dredging and placement activities	Implementation of the management process identified in Sections 7.8 and 7.9 of the WQMP (DMP Section 0) to improve water quality. Adaptive management measures stated in the Contractor's Environmental Management Plan (to be approved by RTA).	Dredging Contractor Amrun Project Team Aquatic Ecologist Contractor (for monitoring)
Marine habitats – seagrass	Management measures are detailed in Section 6.2 and 6.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 6.2). Modis imagery will also be reviewed daily.	Negligible / Unlikely – Low	Nil impact to seagrass habitats from dredging activities	Number of times sediment plumes are observed to disperse to sensitive seagrass communities near Boyd Beach	During dredging and placement activities	Implementation of the management process identified in Sections 7.8 and 7.9 of the WQMP (DMP Section 0) to improve water quality. Adaptive management measures stated in the Contractor's Environmental Management Plan (to be approved by RTA).	Dredging Contractor Amrun Project Team Aquatic Ecologist Contractor (for monitoring)
Marine habitats – open substrate outside area of influence	Management measures are detailed in Section 6.2 and 6.3	Dredge plume generation will be monitored through the water quality monitoring program (Section 6.2). Modis imagery will also be reviewed daily	Negligible / Unlikely – Low	Impacts restricted to area of influence.	Sediments plumes are restricted to predicted area of influence	During dredging and placement activities	Implementation of the management process identified in Sections 7.8 and 7.9 of the WQMP (DMP Section 0) to improve water quality. Adaptive management measures stated in the Contractor's Environmental Management Plan (to be approved by RTA).	Dredging Contractor Amrun Project Team Water Quality Consultant (for monitoring)
Marine Pests establishment	Management methods as outlined in Section 6.5 including the completion of vessel risk assessments and inspections as necessary.	Marine pest monitoring including baseline, during and completion monitoring	Major / Rare - High	No marine pests established in the Amrun Port as a result of dredging activities. Zero non-compliance with *Quarantine Regulations 2000*. No marine pest incursions during the dredging phase of the Amrun Project.	Number of marine pests species established in the Amrun Port as a result of dredging activities. Number of non-compliances with Quarantine Regulations 2000.	Managed during mobilisation and demobilisation. Monitoring before during and after the dredging campaign.	Any incidents to be reported and appropriate corrective actions implemented as per Section 6.5. Review current marine pest assessment practices and amend as necessary. Increase training and awareness if required.	Dredging Contractor Amrun Project Team Project Manager HSE Biosecurity Specialist Consultant

Potential Impact	Avoidance, Mitigation and Management Measures	Monitoring	Residual Risk (consequence / likelihood risk)	Management Objective	Performance Indicators	Timeframe (Activity)	Corrective Actions	Responsibility
Megafauna – vessel strike and vessel avoidance	Implementation of measures identified in Section 6.4.1	Monitoring of marine fauna by crew when vessel underway	Negligible / Rare - Low	Vessel Speed Requirements IMO Guidance document for 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	Number of marine fauna vessel strikes associated with dredging-related shipping. Number of non-compliances with vessel speed requirements (including ferries and barges not slowing to 6 knots in water depths of 2.5m or less).	During Travelling	Any injured or dead listed species will be reported to marine stranding hotline through 1300 130 372 (option 1). Notification to DCCEEW contact for protected species injury or death. Any incidents or near miss to be reported and appropriate corrective actions implemented. Breaches to be investigated and appropriate discipline actions implemented. Increased training and awareness if required.	Vessel master Marine fauna observer Dredging Contractor Amrun Project Team Project Manager LSMP team (onshore beach monitoring)
Megafauna – entrainment	Implementation of measures identified in Section 6.4.	Monitoring of marine turtle and marine mammals as identified in Section 6.4.3 and implementation of the adaptive management process.	Negligible / Rare - Low	No marine turtles capture by dredging activities	Number of animals caught in dredge Number of incidence where pumps were not turned on or off in accordance with management Number incidence where turtle exclusion devices were not utilised. Number of non-compliances of management process **Figure 28 and Figure 29.** Number of turtle hatchlings not observed congregating around vessel	During dredging activities	Implementation of Adaptive Management Process as identified in Section 6.4.3. Any injured or dead listed species will be reported to marine stranding hotline 1300 130 372 (option 1). Notification to DCCEEW contact for protected species injury or death. Any incidents to be reported and appropriate corrective actions implemented. Increased training and awareness if required.	Vessel master Marine fauna observer Dredging Contractor Amrun Project Team Project Manager LSMP team (onshore beach monitoring)
Megafauna – pollution	Implement management measures outlined in Section 6.8	Daily inspection completed by supervisor. Weekly inspections by HSE Advisor.	Negligible / Unlikely – Low	All waste management and placement 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 Total area disturbed due to waste	Throughout the dredging program	Any breaches identified are to be investigated and appropriate corrective actions implemented	Team Members Dredging Contractor Amrun Project Team HSE Environment Coordinator (or delegate) Port Construction Manager
Megafauna – loss or avoidance of foraging habitat	Management measures are detailed in Section 6.1, 6.2 and 6.3.	Dredge plume will be monitored by marine fauna observer and if identified extending towards sensitive environments water quality monitoring data will be reviewed.	Negligible / Unlikely – Low	Nil impact to marine habitats reef from dredging or placement activities	Number of time sediment plumes are observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera Head. Foraging in area observed during dolphin surveys and zone inspections (LSMP).	During dredging activities	If plume extends to sensitive reef environment water quality monitoring data will be reviewed. Implementation of the management process identified in Sections 7.8 and 7.9 of the WQMP (Section 0). Adaptive management measures stated in the Contractor's Environmental Management Plan.	MFO HSE Aquatic Ecologist Contractor Water Quality Consultant
Megafauna – reduction in nesting due to dredge plume	Management measures are detailed in Section 6.1, 6.2 and 6.3	Nest inspections daily during dredging	Negligible / Unlikely – Low	No reduction in nesting levels during dredge program	Nesting similar to levels previously recorded for the time of year	During dredging activities	In the event of a Level 2 water quality alert trigger value exceedance, RTA commit to reviewing turtle nesting monitoring data. If reduced nesting rates compared to previous years is evident and distribution aligns with sediment plumes attributable to dredge works, we will reduce Level 2 trigger value at exceedance site by 10% as containment and complete additional monitoring of beach and affected neighbouring beaches to further assess	MFO HSE Manager LSMP Aquatic Ecologist Contractor Water Quality Consultant

Potential Impact	Avoidance, Mitigation and Management Measures	Monitoring	Residual Risk (consequence / likelihood risk)	Management Objective	Performance Indicators	Timeframe (Activity)	Corrective Actions	Responsibility
Megafauna – nesting and hatchling disorientation	Light levels from the dredging works will be minimised as described in Section 6.4.2.	Visual monitoring of light levels from dredge associated vessels Visual identification of marine turtle congregation around dredging associated vessels	Minor / Unlikely - Low	No records of marine turtles and/or their hatchlings aggregating around dredging- related shipping. No interference with nesting due to dredging activity	Number of 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 of dredge lighting management.	Vessel Master Dredging Contractor HSE Environmental Coordinator (or delegate) Port Construction Manager
Fish assemblage – area avoidance	Management measures are detailed in Section 6.1, 6.2 and 6.3.	Dredge plume generation will be monitored through the water quality monitoring program (Section 6.2). Modis satellite imagery will also be reviewed daily	Negligible / Unlikely – Low	Water quality impacts are restricted to the zone of influence identified	Sediment plumes are not observed to disperse to sensitive habitats (reefal areas) near Boyd Point and Pera Head.	During dredging and placement activities	Monitoring data used to review dredge operations and monitoring requirements in subsequent years (Section 0).	MFO, Environmental Coordinator (or delegate) Water Quality Consultant
Noise - Underwater Noise – Vessel	Management methods are detailed in Section 6.6 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	Vessel inspections by HSE team.	Negligible / Unlikely – Low	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 Amrun Project Team Project Manager HSE
Physical disturbance – benthic habitats	Physical disturbance restricted to dredge footprint and approved dredge quantity. Placement restricted to the approved DMPA. See Section 6.9.	Area to be surveyed to ensure compliance with designated footprint. Vessel logs (including date, time, dump paths and volumes for dredging)	Negligible / Almost certain – Moderate	Dredging and placement as per that identified in this DMP.	Number of incidence where dredging was recorded outside the designate footprint. Placement restricted to approved DMPA.	During dredging and placement activities	Any breaches identified are to be investigated, reported and appropriate corrective actions implemented	Dredging Contractor Amrun Project Team Aquatic Ecologist Contractor
Marine Pollution - Vessels and waste	Implement management measures outlined in Section 6.8.	Daily inspection completed by supervisor. Weekly inspections by HSE Advisor.	Negligible / Possible – Low	All waste management and placement 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.	Throughout the dredging program	Any breaches identified are to be investigated and appropriate corrective actions implemented	Team Members Dredging Contractor Amrun Project Team HSE Environmental Coordinator (or delegate) Port Construction Manager
Marine Pollution - Spills	Implementation of measures identified in Section 6.8.	Inspections of work area and equipment occurring during working hours. Daily inspection completed by supervisor. Weekly inspections by HSE Advisor.	Minor / Unlikely – Low	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	Throughout the dredging program	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 Amrun Project Team Project Manager HSE Environmental Coordinator (or delegate) Port Construction Manager
Unexpected Cultural or European heritage finds	Implementation of measures identified in Section 6.10 and Appendix H.	Observe all works to identify any potential heritage items, for example artefacts from shipwrecks or sunken aircraft, Aboriginal objects, suspected human remains.	Negligible / Unlikely – Low	In the event that an unexpected heritage item is discovered, the unexpected finds protocol is followed.	All unexpected finds (Cultural and European) are actioned, reported, notified and documented in accordance with Table 14: Unexpected heritage finds protocol (Appendix H).	Throughout the dredging program	Implement actions as outlined in Table 14: Unexpected heritage finds protocol (Appendix H).	Vessel Master Dredging Contractor Environmental Coordinator (or delegate) and Weipa Cultural Heritage Superintendent

7 Environmental Management Framework

7.1 Management Structure

The 2025 – 2029 capital dredging program will be managed by RTA Weipa. A dredging contractor will be appointed for capital dredging of the Port. The Contractor will have operational responsibility for managing smaller sub-contractors, including vessel operators. Additional specialist dredging project management support may be implemented. Management for the project is clearly defined, with identified lines of authority and reporting. The overall management structure is outlined in **Figure 31**.

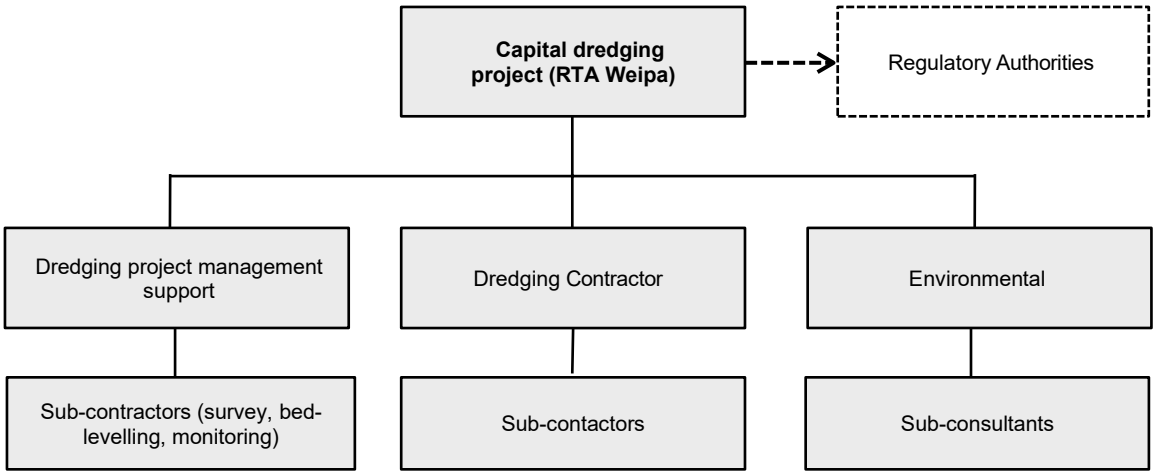


Figure 31: Overall management structure for the Kangwinan (Amrun) Project

Several 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.

Project / RTA Weipa Operations, General Manager

- Manages the Project construction or Operation, including providing adequate resources for environmental management requirements
- Liaises with Regulatory Authorities, in coordination with the Amrun Project Team Environmental Manager.

Amrun Project Area Managers / RTA Weipa Operations Manager

- Report to the Amrun 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
- Review and report on environmental incidents.

Amrun Project Team / RTA Weipa Operations, HSE Manager

- Reports to the Amrun Project Team Project Manager
- Supports the Amrun 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;
- Ensures environmental management plans and procedures are updated as necessary including annual review of the MDMP; and
- Ensures that an RTA representative is present at all BPDTAG meetings and that outcomes of the meetings are appropriately addressed.
- Review the MDMP in accordance with the Sea Dumping Permit once approved.

Dredging Contractor Project Managers

- Responsible for compliance with the requirements of this 2026 – 2029 Capital Dredge Management Plan and all relevant approval conditions (**Appendix B**).
- Responsible for compliance with the Water Quality Monitoring Plan (**Appendix F**) through various adaptive management measures as required throughout the dredging program.
- Responsible for day-to-day management of construction activities under the direction of the Amrun 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 Amrun 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 Amrun 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 MDMP, including water quality monitoring and marine mammal and marine turtle monitoring;
- Regularly report on the dredging works to RTA; and,
- Report any non-compliances to their line manager.

7.2 Non-compliance, inspections and audits

The Amrun Project and RTA Weipa Operations operate under environmental management systems (EMS) which conform to the requirements of ISO14001. The RTA Weipa Operations EMS is certified to ISO14001 Environmental Management System standard. The EMS's provide a systematic approach to continuous improvement of environmental management and performance.

RTA will ensure compliance with this capital DMP and in turn the EPBC Act approval, Sea Dumping Permit and EA through required reporting of non-compliance and routine inspection and auditing of mitigation and monitoring measures which include:

Audit and Inspections

Project worksite inspections and audits will be carried out on a routine basis during capital dredging activities. These inspections and audits will be documented and deficiencies recorded in a corrective action register, with a copy of the documented checklist submitted to the HSE Manager and Dredging Contractor Project Manager. The audit findings will be acted on by the Dredging Contractor Project Manager and implementation of corrective actions reported to HSE Manager. Relevant regulatory agencies and external stakeholders will be notified by the HSE Manager as required by the Project approvals.

Condition 69 of the EPBC Act approval requires that an independent audit of compliance with the conditions of approval, and by extension with this Plan, be conducted by an independent auditor approved by the Minister. Criteria for the audit must be approved by the Minister prior to the audit, and the audit report must address the criteria and be submitted to the Minister.

Third party auditing is also routinely completed in accordance with condition A22 of the Environmental Authority.

Incidents
Should any personnel become aware of an environmental issue associated with Port Operations or capital dredging activities that is causing, or may cause, environmental harm, the person must immediately advise their line manager, who will contact the HSE Manager. Incidents will be investigated and impacts assessed. Corrective actions will be developed as required and recorded in a corrective action register, with a copy of the documented checklist submitted to the HSE Manager and Dredging Contractor Project Manager. Corrective actions will be acted on by the Dredging Contractor Project Manager and implementation of corrective actions reported to HSE Manager. Relevant regulatory agencies and external stakeholders will be notified by the HSE Manager or Project Manager as required by the Project approvals.

7.3 Document and Data control

Dredging documents and records (electronic and hard copy) will be stored safely in accordance with the EMS's, and remain accessible to nominated personnel.

Standard Operating Procedures will be developed and implemented for monitoring methods, site maintenance, and data capture, analysis and interpretation, which include strict Quality Assurance and Quality Control (QA/QC) processes.

Records will be retained for the life of the Sea Dumping Permit SD2025/4075 and duration requirements of other State and Commonwealth Approvals as conditioned.

7.4 Reporting

RTA will report to the BPDTAG on capital dredging activities for Amrun Port and implementation of this capital DMP for the Port. Where comments from the BPDTAG are appropriate to assist with this capital dredging program the comments will be formally actioned.

RTA will provide reports to DCCEEW as required by the Conditions of the Sea Dumping Permit.

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

This capital DMP will be published on the RTA website within one (1) month of approval in accordance with Condition 59 of the EPBC Act approval. The RTA website address is: *http://www.riotinto.com/australia/reports-and-publications-16120.aspx.*

If this capital DMP is reviewed, all subsequent reviews will be published on the RTA website within one (1) month of approval in accordance with Condition 59 of the EPBC Act approval.

In accordance with Condition 57 all survey data, methodologies and related analysis of data associated with the Dredge Management Plan shall be published annually in August (or immediately after the dredging program is complete if occurring in or after August).

In accordance with Condition 68 of the EPBC Act approval RTA will publish a report on this website addressing compliance with this capital Dredge Management Plan over the previous 12 months annually in August. When published the annual report will be provided to DCCEEW along with reporting any non-compliance with any condition of the environmental authority.

In accordance with EA Condition J29 a monthly report will be prepared and reported to DETSI.

In accordance with EA Condition A13 any release of contaminants, not in accordance, or reasonably expected to be not in accordance with the EA, or any monitoring result which indicates an exceedance of an EA limit, shall be reported to DETSI within 24 hours.

A summary of incident/non-compliance reporting requirements associated with the proposed capital dredging activities is presented in **Table 12.**

Table 12: Incident and non-compliance reporting requirements

Incidents / Non-compliance	**Potential Impact Sources**	**Timeframe**	**Reporting Requirement**
Environmental Incidents	All potential impacts in Table 11	Immediately	Report to line manager, Line manager to report to HSE Manager (or delegate)
Release of contaminants not in accordance, or reasonably expected to be not in accordance with the EA or breach of a condition of EA	Marine Pollution - Vessels and waste Marine Pollution - Spills	Within 24 hours and follow up report in 14days	HSE Manager (or delegate) to report to DETSI with details as conditioned by EA Dredge contractor to report to Maritime Safety Queensland (POLREP) and RTAW
Community Complaints	All potential impacts in Table 11	Complete investigation are soon as practicable but within 28days unless agreed with the administering authority.	Complete incident report and stakeholder engagement in accordance with internal procedures. Provide follow up report in accordance with EA conditions.
Non-compliance with EPBC Act Approval condition	If dredging commences before approval of the DMP Approved DMP not implemented. Non-compliance with Sea Dumping Permit condition	Annually, in August	HSE Manager (or delegate) to report to DCCEEW
Marine Pest listed on the CCIMPE Trigger List identified from monitoring and in Biosecurity Act.	Marine Pest – Establishment	As soon as practicable	HSE Manager (or delegate) to report to DAF Biosecurity Queensland
Any stranding, injury or death of marine turtle, dugong, dolphin or whale	Megafauna – vessel strike and vessel avoidance Megafauna – entrainment Megafauna – pollution Megafauna – nesting and hatchling disorientation	As soon as practicable	HSE Manager (or delegate) to report to Queensland Parks and Wildlife Service on 1300 130 372 (Option 1) and to DETSI
Cetacean death or injury	Megafauna – vessel strike and vessel avoidance Megafauna – entrainment Megafauna – pollution Megafauna – nesting and hatchling disorientation	Within 72 hours of resulted activity	HSE Manager (or delegate) to report to DCCEEW: 1800 803 732, or protected.species@environment.gov.au

7.5 Independent Peer Review

In accordance with Condition 60 (and 61 & 62) of the EPBC Act Approval, an independent peer review of the initial Amrun Project dredge management plan – port (initial capital dredging) (2016) was undertaken by an independent marine scientist (Dr James Stoddart, MScience, August 2015). A further independent review of the associated Amrun port and river facilities long-term maintenance dredge management plan (LMDMP) was also undertaken by Dr Stoddart (May 2020). This revised capital DMP does not materially alter the basis upon which these previous peer reviews were assessed and approved. However, an updated review (October-November 2025) including the analysis and effectiveness of management measures and recommendations and advice of the peer reviewer has been undertaken and will be provided to the Minister (**Appendix I**).

7.6 DMP Review

The BPDTAG (including DCCEEW and DETSI) and WCCCA will review this capital DMP. Comments made by the BPDTAG and how these have been addressed and revised in the DMP will be provided to the Minister if requested.

Prior to 2026 and 2028 dredging commencement, a review of the proposed timing and plant will be undertaken by RT Weipa to confirm consistent with that outlined in Sections 2.2, 2.3 and 2.4 of this CDMP.

Following each stage of dredging RTA Weipa will provide feedback to the BPDTAG on the effectiveness of the management plan implementation including monitoring results, management triggers and response actions.

7.7 Reporting and obligations summary

A high level of reporting and obligations associated with the proposed capital dredging program is presented in **Table 13** below.

Table 13: Reporting and obligations summary

Obligation	Summary
Pre-dredging	
Regulator approval of all management plans	• To be approved prior to commencement • Ensure submission if minor changes or updates completed at least 20days prior to commencement in accordance with EA conditions.
Minister approval of independent auditor and audit criteria	• To be approved prior to commencement
Engage with WCCCA and BPTAG (incl. DCCEEW & DETSI)	• BPTAG pre-dredging meeting(s). • BPTAG may review capital DMP • WCCCA review of DMP and approvals applications.
SAP/Sediment Characterisation	• No additional assessment required. • Exemption under NAGD 2009 issued October 2024.
Marine and coral habitat monitoring	• To be completed prior to, and post dredging program. Will also be completed during dredging only if relevant water triggers are exceeded.
Water quality monitoring	• Baseline monitoring (dry season in the year preceding dredging, July to October 2025). • Pre-dredging monitoring to commence at least 2 weeks prior to dredging commencement.
Bathymetric Surveys (Dredge Areas and DMPA)	• Surveys to be completed prior to commencement of capital dredging program
Marine Pest Assessment of Dredge	• Assessed in consultation with dredging contractor and support vessels prior to site mobilisation

A program specific EMP by dredging contractor	• To be received from dredging contractor and approved by RTAW prior to site mobilization.
Ensure copy of DMP is on RTA website	• Available here https://www.riotinto.com/en/operations/australia/weipa
Notify DCCEEW, DETSI and RHM prior to program commencement	• Pre-dredge BPTAG and notification to administering authority in accordance with EA/Seadumping conditions prior to commencement (at least 5 days)
During dredging	
Update BPTAG on progress and when incidents occur	• To be completed regularly throughout program
Elasmobranch sightings	• In accordance with condition 6(i) of the EPBC approval notify within 5 days DCCEEW of any Dwarf Sawfish, Green Sawfish, Freshwater Sawfish or Spear tooth Shark.
Independent environmental audit	• To be completed in accordance with any DCCEEW conditions of approval.
Project worksite inspections and audits	• To be carried out during operations. • Outcomes communicated to RTAW, dredging contractor(s) and relevant external stakeholders as required.
Dredging operations and placement only to occur within approved areas	• Location of maintenance dredge areas and DMPA boundaries provided to dredging contractors. • To be confirmed during audit
Acid sulphate soils	• In the event of acid sulphate soil oxidation, manage and treat in accordance with Queensland technical manual and submit certification in accordance with EA conditions.
Water quality monitoring	• Continuous water quality monitoring in accordance with WQMP. • Adaptive monitoring trigger levels set out in WQMP monitored and actions implemented when required. • Daily assessment of satellite derived turbidity levels from dredging activities. • Visual monitoring of turbidity plumes
Marine mammals and turtles	• Appropriate exclusion devices to be installed on dredging plant and verified during audits. • Visual monitoring of 300m monitoring zone by MFO during daylight hours, adaptive actions to be taken as required and observations recorded in vessel logs. • Daily shoreline monitoring down-current from dredging location. • Daily beach inspection for nests during dredging.
Incident reporting – marine fauna / species	• Dredging contractor to notify RTAW immediately. • Reporting to DCCEEW within 72 hours of detecting an environmental incident and/or environmental risk (condition 13, SD2025-4075) and DETSI by RTAW.
Incident reporting – emergency incident or event	• Dredging contractor to notify RTAW immediately. • Reporting to DCCEEW and DETSI by RTAW within approved timeframes (refer to permit conditions).
Community complaints and reactive monitoring	• If required respond to community complaints including investigation, reporting and response. • Undertake monitoring as required to investigate complaints.
Records kept and available	• Weekly plot sheets, daily dredge logs (including insitu & hopper volumes and dry tonnes), marine fauna observations, beach inspections etc.
Post-dredging	

Notify BPTAG, DCCEEW, DETSI and RHM on completion	• Within 5 days of completion
Post dredge bathymetric survey of the DMPA	• Within 1 month of completion of dredging
Bathymetric survey of DMPA to Australian Hydrographic Office	• Within 2 months of the survey
Bathymetric survey of DMPA and Report – changes in seafloor bathymetry to DCCEEW	• Within 2 months of the survey
Review of monitoring programs and management plans	• Review outcomes provided to BPTAG • Ensure records of monitoring results retained for minimum 15years.
Water quality monitoring	• To continue for ~2-3 weeks post completion of dredging.
Marine and coral habitat monitoring	• To be completed post-dredging] • Coral Monitoring report to be submitted in accordance with EA conditions and action plan implement.
Summary water quality and sediment plume report	• Within 2 months of completion of water quality monitoring.
Post dredge BPTAG meeting on outcomes	• To be carried out once all post-dredging monitoring is completed and independent audit outcomes finalized.
Annual IMO reporting on dredge volumes	• By 31 January each year

8 Training

All employees involved in dredging operations will be appropriated 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, 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.

9 Traditional Owner employment opportunities

RTA has committed to working collaboratively with Traditional Owners, through the relevant WCCCA Sub-Committees and the WCCCA Coordinating Committee to further increase representation of local Aboriginal people within it's Western Cape based operations. For this reason, focussed work, in collaboration with Traditional Owners through the WCCCA Employment and Training Sub-Committee and the Environment and Heritage Sub- Committee will continue to be undertaken, to understand the current employment challenges, the outcomes achieved through existing employment programs and the development of mutually agreed strategies specific to the needs of Traditional Owners. This work is outlined in the Rio Tinto and WCCCA Employment and Training Strategy 2024 – 2026, which has been endorsed by the Western cape Communities Co-ordinating Committee, which includes representatives from 11 Traditional Owners groups, State Government, Rio Tinto and Western Cape local government entities.

Traditional Owner employment opportunities associated with dredging will be available through the Amrun Land and Sea Management Program (LSMP), which is responsible for environmental and rehabilitation management efforts in mining lease areas south of the Embley River. LSMP activities are informed by Wik-Waya traditional knowledge and practices, with the program made up of two teams of five Wik and Wik Waya Traditional Owners. Programs the team are responsible for includes:

- Marine mammal observations
- Sea management (turtle monitoring, coastal area management)
- Feral animal management
- Weed management
- Rehabilitation

Downstream observations and monitoring for impacted fauna that may be observed on the beach during dredge activities will be completed by the LSMP Team based at Amrun during the dredge program.

In addition, any major capital projects, such as the proposed Kangwinan (Amrun expansion) project, will be required to ensure employment opportunities for Traditional Owners as per the WCCCA and the endorsed process for local Aboriginal employment (Rio Tinto and WCCCA Employment and Training Strategy 2024 – 2026). Project specific employment efforts will identify work opportunities that may be filled by Traditional Owners. Traditional Owners that may be capable of filling these roles will be identified, with RTA supporting identified candidates to become appropriately skilled to fill the identified roles.

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

Implementation of Traditional Owner employment opportunities within this DMP will be reported annually within the EPBC Act approval annual compliance report. The annual compliance report is available at:
http://www.riotinto.com/australia/reports-and-publications-16120.aspx

10 Indigenous consultation

Indigenous consultation was conducted in accordance with the process under the WCCCA Indigenous Land Use Agreement during the preparation of this Plan. This consultation involved the following:

- Consultation and update on the DMP process (pre-submission) with Traditional Owners through WCCCA endorsed consultation activities in Q3 2024, Q4 2024 and Q2 2025.
- Consultation and update on the DMP process (pre-submission) with Traditional Owners through the WCCCA Environment and Heritage Sub-Committee in Q2 – Q4 2024 and Q1 – Q3 2025.
- Submission of the draft DMP in October 2025, for formal comment by the WCCCA Coordinating Committee, as per WCCCA clause 7.3.

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APPENDIX A – STATE and COMMONWEALTH APPROVAL of this CAPITAL DREDGE MANAGEMENT PLAN

DELIVERING FOR QUEENSLAND | Queensland Government

Department of the
Environment, Tourism, Science and Innovation

Ref: EPML00725113; 101/0008737

3 March 2026

Mr Timothy Deery
Principal Adviser – Environment
Rio Tinto Aluminium

Dear Mr Deery,

Re: Boyd Port Capital Dredge Management Plan revision 4

I refer to the Boyd Port Capital Dredge Management Plan revision 4 (BPCDMP) as submitted to the Department of the Environment, Tourism, Science and Innovation (the department) on 2 March 2026, to facilitate capital dredging works under environmental authority EPML00725113 (the EA).

Firstly, I would like to thank you and the team from RTA Weipa Pty Ltd (RTAW) for the significant time and effort invested in developing the BPCDMP, and constructive engagements with the department in reaching consensus on the final plan.

In accordance with EA condition J11, the department has decided to **approve** the BPCDMP, subject to the following additional commitments, including that RTAW will:

1. Endeavour to obtain amendments to Schedule J of the EA in order to more clearly define the approved dredging activities and associated management intent at Boyd Port within a reasonable timeframe.

2. Undertake the additional monitoring and associated actions as outlined in the final version of the BPCDMP, with regard to inclusion of Sedimentation Rate (SR) and Benthic Photosynthetically Active Radiation (BPAR) within the environmental monitoring program.

The department acknowledges RTAW's position that monitoring of SR and BPAR may not be necessary for assessing or responding to potential impacts from the capital dredge program. As previously articulated, the department is amenable to reconsidering the need for the additional monitoring beyond the stage 1 capital dredging works at Boyd Port, subject to review of all monitoring results and assessment of the veracity and any benefits arising from the additional monitoring (or otherwise).

I further acknowledge that the department has agreed to a shorter timeframe from submission of the BPCDMP pursuant to condition J10 of the EA, as previously communicated to RTAW on 11 November 2025. As such, RTAW is considered to have satisfied all requirements under the EA necessary to commence the proposed capital dredging program at Boyd Port.

PO Box 7230
Cairns QLD 4870
Telephone: 13 QGOV (137 468)
Website: www.detsi.qld.gov.au
ABN 46 640 294 485

Should you have any questions in relation to this letter, please contact Ms Grace Wilton of the department on (07) 4222 5374 or via email at Grace.Wilton@detsi.qld.gov.au

Yours sincerely,



Jacob Toe
Compliance Delivery Manager
Environmental Services and Regulation - Minerals and Northern Compliance
Department of the Environment, Tourism, Science and Innovation

Australian Government
Department of Climate Change, Energy, the Environment and Water

EPBC 2010/5642

Mr Timothy Deery
Principal Advisor Environment
RTA Weipa Pty Ltd
Email: timothy.deery@riotinto.com

Approval of Capital Dredge Management Plan for South of Embley Bauxite Mine and Port Development, Cape York, Queensland

Dear Timothy

Thank you for your email dated 14 November 2025 to the Department of Climate Change, Energy, the Environment and Water (the department), seeking approval of the 2025-2029 Capital Dredge Management Plan, Boyd Port (Amrun) 13 November 2025, in accordance with condition 14 of the above project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Officers of the department have advised me on the Capital Dredge Management Plan and the requirements of the conditions of the approval for this project. On this basis, and as a delegate of the Minister for the Environment and Water (the Minister), I have decided to approve the 2025-2029 Capital Dredge Management Plan, Boyd Port (Amrun) 13 November 2025.

Now this plan has been approved, it must be implemented.

As you are aware, the department has an active monitoring program which includes monitoring inspections, desk top document reviews and audits. Please ensure that you maintain accurate records of all activities associated with, or relevant to, the conditions of approval so that they can be made available to the department on request. Should you require any further information please contact Cath Cooney by email to PostApproval@dcceew.gov.au or telephone 0466 475 032.

Yours sincerely



Brendan Linton-Smith
A/g Branch Head
Environment Assessments (Vic and Tas) and Post Approvals
Environment Regulation Division

6 March 2026

Australian Government
Department of Climate Change, Energy, the Environment and Water

Our reference: SD2025-4075

Mr Timothy Deery
Principal Advisor – Environment
RTA Weipa Pty Ltd
155 Charlotte Street
BRISBANE 4000 QLD

Dear Mr Deery

Sea Dumping Permit Application – loading and disposal of capital dredged material derived from the Amrun Port Facility managed port area at Weipa, Queensland.

I refer to RTA Weipa Pty Ltd's (ACN: 137 266 285) application, received on 29 January 2025, for a permit under the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) to dispose of dredged material. The application is to load for the purpose of dumping, and to dump up to 3.2 million cubic metres (*in-situ*) of dredged material, derived from capital dredging of the Amrun Port Facility managed port area at Weipa, Queensland.

I have considered your application and supporting documentation received on 2 May 2025 and 14 November 2025 and can advise that, as a delegate of the Minister for the Environment and Water, I have:

- granted a permit valid until 30 November 2029 under Sections 19 and 21 of the Sea Dumping Act, subject to conditions
- approved the disposal site, located approximately 14 kilometres west of the Amrun Port Facility, Weipa, Queensland
- approved the *2025 – 2029 Capital Dredge Management Plan* revision 3, dated 6 February 2026, which must be implemented as per condition 6 of the Sea Dumping Permit.

I have included a copy of the permit, with conditions, with this letter for your information. Please carefully read your permit so you understand your obligations under the Sea Dumping Act. Also note additional reporting requirements under Appendix 3 of the permit.

Although an approval has been granted under the Sea Dumping Act, this approval does not relieve the person to whom it has been granted from an obligation to comply with any other law of the Commonwealth, state or territory that is applicable to the activity, nor does it provide right, title or interest that is required to access land or waters to conduct the activity.

The department has an active audit program for permits approved under the Sea Dumping Act. The audit program aims to ensure that there is a high degree of compliance with decisions. Please note that your permit may be selected for audit by the department at any time and all related records

and documents may be subject to scrutiny. Information about the department's compliance monitoring and auditing program is attached.

If you have any further questions, please contact Jessie Monshing by phone on (02) 5162 3207 or email at Jessie.Monshing@dcceew.gov.au (cc: seadumping@dcceew.gov.au).

Yours sincerely,



Heather Agnew
Director
Sea Dumping Section
12/02/2026

APPENDIX B – STATE and COMMONWEALTH APPROVALS

Permit

Environmental Protection Act 1994

Environmental authority EPML00725113

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

Environmental authority number: EPML00725113

Environmental authority takes effect on 6 February 2026.

Environmental authority holder(s)

Name(s)	Registered address
RTA WEIPA PTY LTD	155 Charlotte Street Aluminium Pacific Operations BRISBANE CITY QLD 4000

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Schedule 3 - 11 - Mining bauxite	ML6024, ML7024
Ancillary 08 - Chemical Storage - 3 - Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)	
Ancillary 14 - Electricity generation - 2(a) - Generating electricity by using a fuel, other than gas, at a rated capacity of 10MW electrical to 150MW electrical	
Ancillary 16 - Extraction and Screening - 1(d) - Dredging, in a year, the following quantity of material - more than 1,000,000t	
Ancillary 16 - Extraction and Screening - 2(a) - Extracting, other than by dredging, in a year, the following quantity of material - 5,000t to 100,000t	

Queensland Government

Environmentally relevant activity/activities	Location(s)
Ancillary 16 - Extraction and Screening - 3(a) - Screening, in a year, the following quantity of material - 5,000t to 100,000t	
Ancillary 31 - Mineral processing - 2(b) - Processing, in a year, the following quantities of mineral products, other than coke - more than 100,000t	
Ancillary 55 - Other waste reprocessing or treatment - 2(a) - Operating a facility for receiving and either reprocessing or treating, in a year, the following quantity of category 2 regulated waste - 5,000t or less	
Ancillary 60 - Waste disposal - 2(c) - Operating a facility for disposing of, in a year, the following quantity of waste mentioned in subsection (1)(b) - more than 5000t but not more than 10,000t	
Ancillary 62 - Resource recovery and transfer facility operation - 1(b) - Operating a facility for receiving and sorting, dismantling, baling or temporarily storing general waste	
Ancillary 62 - Resource recovery and transfer facility operation - 1(c) - Operating a facility for receiving and sorting, dismantling, baling or temporarily storing category 2 regulated waste	
Ancillary 63 - Sewage Treatment - 1(d) - Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 4000 but not more than 10,000EP	
Ancillary 64 - Water treatment - 3 - Treating 10ML or more raw water in a day	

Additional information for applicants

Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994* (EP Act).

Mobile and temporary activities

If you operate a mobile and temporary environmentally relevant activity (ERA), other than regulated waste transport, you are required to maintain a work diary. You must:

- use the approved form for a work diary (ESR/2015/1696);
- keep the work diary records for 2 years after the last entry;
- inform the administering authority within 7 days of the work diary being lost or stolen;
- record the information required in the work diary for each location within 1 day of leaving the location.

Contaminated land

It is a requirement of the EP Act that an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days)

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website www.qld.gov.au, using the search term 'duty to notify'.

Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority - on the nominated day; or

b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or

c) otherwise - on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the *Planning Act 2016* or an SDA Approval under the *State Development and Public Works Organisation Act 1971*), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

The anniversary day of this environmental authority is 30 August. The payment of the annual fee will be due each year on this day. An annual return will be due each year on 01 April.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading

information or operating without a valid environmental authority.

RAPettit	6 February 2026
Signature	Date

Robert Pettit
Department of the Environment, Tourism, Science, and Innovation
Delegate of the administering authority
Environmental Protection Act 1994

Enquiries:
Minerals Business Centre
PO Box 7230, CAIRNS, QLD. 4870
Phone: (07) 4222 5352
Email: ESCairns@detsi.qld.gov.au

Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

Other permits required

This permit only provides an approval under the *Environmental Protection Act 1994*. In order to lawfully operate you may also require permits / approvals from your local government authority, other business units within the department and other State Government agencies prior to commencing any activity at the site. For example, this may include permits / approvals with your local Council (for planning approval), the Department of Transport and Main Roads (to access State controlled roads), the Department of Resources (to clear vegetation), and the Department of Agriculture and Fisheries (to clear marine plants or to obtain a quarry material allocation).

Obligations under the *Mining and Quarrying Safety and Health Act 1999*

If you are operating a quarry, other than a sand and gravel quarry where there is no crushing capability, you will be required to comply with the *Mining and Quarrying Safety and Health Act 1999*. For more information on your obligations under this legislation contact Mine Safety and Health at www.resources.qld.gov.au, or phone 13 QGOV (13 74 68) or your local Mines Inspectorate Office.

Conditions of environmental authority

Location: ML6024, ML7024

Weipa.

This **environmental authority** incorporates the following schedules:

Schedule A – General

Schedule B – Air

Schedule C - Land and Rehabilitation

Schedule D - Regulated Dams

Schedule E - General and Regulated waste management

Schedule F - Evans Landing landfill

Schedule G – Noise

Schedule H – Water

Schedule I - Sewage Treatment

Schedule J – Marine

Schedule K - Definitions/Acronyms

Schedule L – Plans

Appendix 1 - Maximum Contaminant Levels in Regulated Waste.

The environmentally relevant activity(ies) conducted at the location as described above must be conducted in accordance with the following site-specific conditions of approval.

SCHEDULE A – GENERAL

Activity

(A1) This environmental authority authorises environmental harm caused by the carrying out of mining activities by the holder of this environmental authority, provided the mining activities are carried out in accordance with conditions herein. Where a condition in this environmental authority refers to environmental harm the condition is taken to authorise the environmental harm occurring in compliance with the condition. Where there is no condition or the authority is silent on a matter, the lack of a condition or silence shall not be construed as authorising harm.

(A2) The activities to be carried out under this environmental authority are the mining activities defined within Table A1 – Authorised Activities and identified in Schedule L Plan 1 – Weipa General Area Plan, Plan 2 – East Weipa and Andoom Operational Areas and Plan 3 – South of Embley Project Infrastructure and Conceptual Mine Plan.

Table A1 – Authorised Activities

Mining Activity / Domain	Mine Feature	Tenure	Maximum Surface Area of Disturbance (ha)	Coordinates (GDA94 MGA z54)	
				Northing	Easting
Extraction Areas	Mining Areas	ML7024	246,629	N/A	N/A
	Nanum Tawap Sand Quarry	ML7024	14.5	8595750 8595870 8596060 8596250	599248 599563 599068 599482
	Sand extraction areas	ML7024	200	8596526 8596518 8595605 8595549	598726 599640 598815 599599
	Boyd Port dredge extraction area	ML7024	78	8571105 8574142 8573560 8570525	567170 561485 561175 566860
	Hey River Terminal dredge extraction area	ML6024	3	8590950 8590950 8590665 8590665	597005 597140 597140 597005
Processing Activities	Weipa Beneficiation Plant	ML7024	2.1	8599830 8599820 8599690 8599700	594472 594636 594624 594458
	Andoom Beneficiation Plant	ML7024	1.8	8614370 8614320 8614210 8614230	590825 590986 590952 590830
	Boyd Beneficiation Plant (as part of total infrastructure area)	ML7024	270 (partial)	8570410 8570379 8570126 8570173	568284 568349 568232 568146
	Norman Creek Beneficiation Plant (as part of total infrastructure area)	ML7024	260 (partial)	TBD[2]	TBD[2]
Regulated Dams	East Weipa Tailings Storage Facility (EW)	ML7024	442	8600663 8600557 8602613 8602229	593810 596535 596691 594045
	East Weipa 1 Tailings Storage Facility (EW1)	ML7024	50	8600139 8599265 8599278 8600093	595866 595760 596343 596605

Mining Activity / Domain	Mine Feature	Tenure	Maximum Surface Area of Disturbance (ha)	Coordinates (GDA94 MGA z54)	
				Northing	Easting
	East Weipa 2 Tailings Storage Facility (EW2)	ML7024	65	8600096 8600037 8598967 8599063	596608 597208 597049 596274
	Andoom Tailings Storage Facility	ML7024	519	8617190 8616130 8614020 8614880	590732 593374 592696 589971
	Emergency Dam	ML7024	40	8600199 8600143 8599291 8599725	595254 595860 595750 594969
	West Weipa 2 (WW2)	ML7024	170	8601590 8602090 8600841 8600510 8600604	593810 591786 590547 591304 592197
	G & X Dam	ML7024	20	8600987 8600643 8600596 8601196	592356 592150 592717 592813
	G2 Dam	ML7024	40	8600416 8600564 8600048 8599803	592094 591318 591235 591735
	Torro Tailings Storage Facility	ML7024	1100	8569720 8569720 8565185 8565185	567195 569705 567195 569705
	Norman Creek Tailings Storage Facility	ML7024	1100	8560000 8560000 8555000 8555000	576000 581500 582550 576000
Water Supply Dam	Arraw Dam (formerly Dam C)	ML7024	780	8566275 8566890 8564570 8561490 8562600	574055 579665 581175 575595 574200
Waste Disposal / Treatment	Evans Landing Landfill	ML7024	37.8	8600165 8600821 8600142 8600308 8600220 8600463	590760 590805 591045 591087 591654 591693
	Awonga Point Sewage Treatment Plant	ML7024	6.5	8606290 8606290 8605800 8605810	597124 597223 597179 597012
	Camp in the area North of Weipa	ML7024	0.1	8688010 8688380 8688300 8687930	612220 612560 612700 612350
	Sewage Treatment Plant for temporary camps in the Area south of the Embley River	ML7024	N/A[1]	N/A[1]	N/A[1]
	Boyd Infrastructure Area Sewage Treatment Plant	ML7024	N/A[1]	N/A[1]	N/A[1]

Mining Activity / Domain	Mine Feature	Tenure	Maximum Surface Area of Disturbance (ha)	Coordinates (GDA94 MGA z54)	
				Northing	Easting
	Boyd Accommodation Village Sewage Treatment Plant	ML7024	N/A[1]	N/A[1]	N/A[1]
	Norman Creek Infrastructure Area Sewage Treatment Plant	ML7024	N/A[1]	N/A[1]	N/A[1]
Electricity Generation	Andoom Power Station	ML7024	0.3	8614190 8614190 8614150 8614150	590977 591045 591043 590976
	Lorim Point Power Station	ML7024	1.6	8600050 8600040 8599930 8599940	594039 594179 594167 594030
	Weipa Town Renewable Energy Facility (PV Solar Farm)	ML7024	20	8602040 8601790 8601530 8601625	592480 593275 593460 592590
	Boyd Infrastructure Area Power Station	ML7024	N/A[1]	N/A[1]	N/A[1]
	Amrun Renewable Energy Facility (PV Solar Farm)	ML7024	90	8571800 8571800 8570950 8570950	570550 572520 572520 570550
	Norman Creek Infrastructure Area Power Station	ML7024	N/A[1]	N/A[1]	N/A[1]
	Norman Creek Renewable Energy Facility	ML7024	60[2]	TBD[2]	TBD[2]
	Electrical Generators (Mobile)	ML6024 & ML7024	N/A[1]	N/A[1]	N/A[1]
Chemical Storage Areas	Andoom Power Station Fuel Storage	ML7024	0.1	8614060 8614060 8614090 8614090	590972 591000 590972 591000
	Weipa Airport	ML7024	0.2	8597870 8597830 8597810 8597850	600444 600508 600493 600430
	Andoom Fuel Farm (Service Bay)	ML7024	0.1	8613830 8613840 8613820 8613810	590368 590393 590407 590382
	East Weipa Fuel Farm (above ground)	ML7024	0.2	8599800 8599800 8599760 8599760	601718 601757 601757 601718
	East Weipa Fuel Farm (underground)	ML7024	0.2	8599880 8599880 8599850 8599850	601646 601707 601710 601647
	For Heavy Equipment in Mining Areas (Mobile/Temporary)	ML7024	N/A[1]	N/A[1]	N/A[1]
Chemical Storage Areas	Weipa Main Store	ML7024	2.9	8599920 8599910 8599750 8599760	594001 594177 594159 593984

Mining Activity / Domain	Mine Feature	Tenure	Maximum Surface Area of Disturbance (ha)	Coordinates (GDA94 MGA z54)	
				Northing	Easting
	Weipa Environmental Compound	ML7024	1.6	8602930 8602970 8602900 8602860	595322 595540 595556 595337
	Weipa Waste Oil Fuel Farm	ML7024	0.1	8599390 8599390	594843 594875
				8599340 8599350	594873 594841
	Temporary camps in the area south of the Embley River	ML7024	N/A[1]	N/A[1]	N/A[1]
	Camp in the area North of Weipa	ML7024	0.1	8688010 8688380 8688300 8687930	612220 612560 612700 612350
	Boyd Infrastructure Area	ML7024	N/A[1]	N/A[1]	N/A[1]
	Norman Creek Infrastructure Area	ML7024	N/A[1]	N/A[1]	N/A[1]
Motor Vehicle Workshops	Town and Industrial Area	ML7024	N/A[1]	N/A	N/A
	Andoom Heavy Equipment workshop	ML7024	8.1	8613610 8613570 8613310 8613350	589948 590255 590214 589907
	Andoom Contractor Workshop	ML7024	0.2	8613864 8613817 8613817 8613864	590459 590458 590421 590421
	East Weipa Heavy Equipment workshop	ML7024	9.6	8599920 8599700 8599700 8599920	601550 601550 601850 601850
	Light vehicle workshop	ML7024	0.5	8599720 8599650 8599650 8599720	594310 594310 594380 594380
	Lorim Point Contractor Workshop	ML7024	0.3	8600283 8600283 8600235 8600235	594426 594476 594476 594426
	Temporary Camp in the area North of Weipa	ML7024	0.1	8688010 8688380 8688300 8688730	612220 612560 612700 612350
	Boyd Infrastructure Area	ML7024	N/A[1]	N/A[1]	N/A[1]
	Arraw Dam vehicle workshop (formerly Dam C vehicle workshop)	ML7024	N/A[1]	N/A[1]	N/A[1]
	Norman Creek Infrastructure Area	ML7024	N/A[1]	N/A[1]	N/A[1]
Accommodation	Camp in the area North of Weipa	ML7024	3.6	8688010 8688380 8688300 8688730	612220 612560 612700 612350
	Temporary camps in the area south of the Embley River	ML7024 & ML6024	55	N/A[1]	N/A[1]

Mining Activity / Domain	Mine Feature	Tenure	Maximum Surface Area of Disturbance (ha)	Coordinates (GDA94 MGA z54)	
				Northing	Easting
	Boyd Bay Fly-camp	ML7024		8571458 8571458 8571661 8571661	570155 570076 570155 570076
	Amrun Accommodation Village (formerly Boyd Accommodation Village)	ML7024		8575795 8575795 8575060 8575060	577632 578343 577632 578343
Port / Ship Loading Facilities	Boyd Port	ML7024	10	8571220 8570465 8570410 8571170	566305 567725 567695 566275
Barge / Ferry Terminal	Hey River Terminal	ML6024	0.5	8590700 8590896 8590668 8590620	596760 597108 597101 596800
	Pera Head Temporary Seaborne Access (Barge Landing)	ML7024	0.5	TBD[2] TBD[2] TBD[2] TBD[2]	TBD[2] TBD[2] TBD[2] TBD[2]
	Boyd Point Temporary seaborne access (passenger jetty)	ML7024	TBD[2]	TBD[2] TBD[2]	TBD[2] TBD[2]
Water Treatment	Weipa Water Treatment Plant	ML7024	0.7	8603650 8603650 8603530 8603530	595565 595627 595626 595565
	Lorim Point Water Treatment Plant	ML7024	0.2	8599700 8599640	594448 594442
				8599640 8599700	594402 594406
	Water Treatment Plant for temporary camps in area south of the Embley River	ML7024	N/A[1]	N/A[1]	N/A[1]
	Amrun Mine Infrastructure Area Water Treatment Plant (formerly Boyd Infrastructure Area Water Treatment Plant)	ML7024	N/A[1]	N/A[1]	N/A[1]
	Amrun Accommodation Village Water Treatment Plant	ML7024	N/A[1]	8575795 8575795 8575060 8575060	577632 578343 577632 578343
	Norman Creek Infrastructure Area Water Treatment Plant	ML7024	N/A[1]	N/A[1]	N/A[1]
Transport Corridors	Transport Corridor	ML6024	Entire Mining Lease	N/A	N/A
	Haul Roads / Access Tracks	ML6024 & ML7024	N/A[1]	N/A	N/A
Town Activities	Weipa Township	ML7024	1079 (within the boundary of the township of Weipa)	As per the current boundary of the township of Weipa as approved by regulation	
Pipeline	Under Embley River Pipeline	ML6024 & ML7024	Linear pipeline	TBD[2] TBD[2]	TBD[2] TBD[2]

Mining Activity / Domain	Mine Feature	Tenure	Maximum Surface Area of Disturbance (ha)	Coordinates (GDA94 MGA z54)	
				Northing	Easting

[1] Maximum surface area of disturbance and location included in the total infrastructure area within the mining activity/domain identified as "Extraction Areas", "Processing Activities" or "Accommodation".
[2] To be determined and notified to the administering authority upon completion of final design.

Maintenance of Measures, Plant and Equipment

(A3) The holder of this environmental authority must:

(a) install measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority;

(b) maintain such measures, plant and equipment in a proper condition; and

(c) operate such measures, plant and equipment in a proper manner.

(A4) No change, replacement or alteration of any plant or equipment is permitted if the change, replacement or alteration increases, or is likely to increase the risk of environmental harm caused by the mining activities.

Monitoring & Reporting

(A5) Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this environmental authority must be reviewed for effectiveness in minimising the likelihood of environmental harm each time a Plan of Operations is prepared or amended, or otherwise in accordance with the relevant timeframe as specified in this environmental authority, and amended as promptly as necessary to meet that objective.

(A6) The holder of this environmental authority must record, compile, evaluate and keep for a period of five (5) years all monitoring results, records and documents required by this environmental authority and any complaints received about the mining activities, and make available for inspection all or any of these records upon request by the administering authority.

(A7) All monitoring referred to in this environmental authority shall be undertaken by a suitable competent person using monitoring equipment that is accurately calibrated and maintained in good working order and condition.

(A8) All analyses and tests required to be conducted under this environmental authority must be carried out by a laboratory that has NATA certification for such analyses and tests, except as otherwise authorised by the administering authority.

Financial Assurance

(A9) The environmental authority holder must provide a financial assurance of an amount determined by the administering authority in accordance with the administering authority's Guideline – *Financial assurance under the Environmental Protection Act 1994* and in a form acceptable to the administering authority. The financial assurance must remain in force until the administering authority is satisfied no claim on the assurance will be required.

Risk Management

(A10) The holder of this environmental authority must develop and implement a risk management system for mining activities which conforms to the Australian Standard for Risk Management (AS/NZS 31000:2009) or the latest edition of the Australian Standard for Risk Management:

(a) before 31 August 2012 in areas other than on land south of the Embley River before; and

(b) prior to commencement of significant construction work for land south of the Embley River.

Emergency Response/Contingency

(A11) An emergency response/contingency plan must be developed and implemented to respond to emergency events and incidents. This plan must be provided to the administering authority upon request.

(A12) The emergency response/contingency plan must be developed in accordance with the most recent version of ISO14001 standard and must include but not be limited to the following matters:

(a) response procedures which aim to minimise the extent and duration of environmental harm;

(a) procedures to investigate the cause of an emergency event or incident and remedial actions to be taken to prevent a recurrence;

(c) timely and accurate reporting of the circumstance and nature of an emergency event or incident to the administering authority;

(d) procedures for accessing monitoring points during an emergency event or incident; and

(e) procedures to notify any person who may be affected by the emergency event or incident within twenty-four (24) hours, with the following information to be provided at a minimum:
(i) the location of the emergency event or incident;
(ii) the date and time of the emergency event or incident;
(iii) the estimated quantity and type of any substances (if in available concentrations) involved in the emergency event or incident; and
(iv) the potential impacts to environmental values, livestock and public health caused by the emergency event or incident.

Notification of Emergencies, Incidents and Exceedances

(A13) The holder of this environmental authority must notify the administering authority by telephone, email or facsimile as soon as reasonably possible (but no later than twenty-four (24) hours after becoming aware of:

(a) any emergency event or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority; or

(b) any monitoring result that indicates an exceedance of any environmental authority limit.

(A14) The notification must include but not be limited to the following:

(a) the environmental authority number and name of the holder;

(b) the name and telephone number of the designated contact person;

(c) the location of the emergency event, incident or exceedance;

(d) the date and time of the emergency event, incident or exceedance;

(e) the time the holder of this environmental authority became aware of the emergency event, incident or exceedance;

(f) the estimated quantity and type of substances involved in the emergency event, incident or exceedance, if known;

(g) the cause of the emergency event, incident or exceedance if known;

(h) a description of the nature and effects of the emergency event, incident or exceedance including risks to the environment, public health or livestock, if known;

(i) immediate actions taken to prevent or mitigate any further environmental harm caused by the emergency event, incident or exceedance release; and

(j) details of any notification of persons who may be affected by the emergency event, incident or exceedance.

(A15) Within fourteen (14) days or as otherwise agreed following the initial notification of an emergency event, incident or exceedance or receipt of monitoring results, whichever is the latter, further written advice must be provided to the administering authority including the following:

(a) results and interpretation of any samples taken and analysed;

(b) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm; and

(c) proposed actions to prevent a recurrence of the emergency event, incident or exceedance.

Transition to New Standards

(A16) Where a condition requires compliance with a standard published externally to this environmental authority and the standard is amended or changed subsequent to issue, the holder of this environmental authority must, unless otherwise agreed with the administering authority:

(a) comply with the amended or changed standard within two (2) years, unless a different period is specified in the amended standard or relevant legislation; and
(b) until compliance with the amended or changed standard can be achieved, continue to remain in compliance with the standard that was current immediately prior to the relevant amendment or change.

Community

(A17) The holder of this environmental authority must establish, promote and maintain easily accessible lines of communication between residents and land owners to ensure that community impacts are identified and managed.

Regard for Comment

(A18) Where comments are provided by the administering authority with respect to any plans, systems or programs required to be developed by a condition of this environmental authority, the holder of this environmental authority must have due regard for these comments.

Town Activities

(A19) In carrying out the town activities the environmental authority holder must take all reasonable and practicable measures to minimise environmental harm caused by the town activity and otherwise comply with any specific condition of this environmental authority applicable to that activity.

Complaints

(A20) Records must be kept of all environmental complaints received about the mining activities including the following details and must be made available for inspection by the administering authority on request:

(a) name, address and contact number for complainant;
(b) time and date of complaint;
(c) reasons for the complaint;
(d) investigations undertaken;
(e) conclusions formed;
(f) actions taken to resolve complaint;
(g) any abatement measures implemented; and
(h) person responsible for resolving the complaint.

(A21) When requested by the administering authority, the holder of this environmental authority must undertake relevant specified monitoring within a timeframe agreed to by the administering authority to investigate any complaint of environmental harm considered in the opinion of an authorised officer not to be vexatious or frivolous. The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures implemented must be provided to the administering authority within fourteen (14) days of completion of the investigation.

Third Party Auditing

(A22) Compliance with the conditions of this environmental authority must be audited by an appropriately qualified third party auditor nominated by the holder of this environmental authority and accepted by the administering authority:

(a) before 31 August 2012 for areas other than land south of the Embley River; and

(b) within twelve (12) months from the commencement of significant construction work for land south of the Embley River; and

(c) then at regular intervals not exceeding once every three (3) years.

A copy of the final audit report must be submitted to the administering authority upon request.

(A23) The holder of this environmental authority must promptly respond to any findings arising from the audit and implement measures or take necessary action to ensure compliance with the conditions of this environmental authority.

Existing Structures

(A24) Structures existing on the date of commencement of this environmental authority that were designed and constructed in accordance with relevant practices applicable to the respective structures at the time of their construction are not required to be upgraded to a different standard after commencement. Such structures must be maintained to ensure their performance in accordance with their respective designs. This condition applies to, but is not intended to limit the following types of structures:

(a) railway infrastructure;

(b) bridges, roads, transport infrastructure;

(c) decommissioned Tailings Storage Facilities;

(d) water supply infrastructure;

(e) landfills other than the active Evans Landing landfill; and

(f) erosion control and bank stabilisation structures.

Note: This condition does not apply to the ecological rehabilitation of mined areas.

Exploration

(A25) Disturbance due to exploration activities in areas not scheduled to be mined must be rehabilitated in accordance with provisions detailed in the administering authority's *Code of Environmental Compliance for Exploration and Mineral Development Projects*.

END OF CONDITIONS FOR SCHEDULE A

SCHEDULE B - AIR

General

(B1) The release of dust, noxious or offensive odour or any other airborne contaminants resulting from the mining activities must not cause environmental harm at any sensitive place or commercial place.

(B2) The holder of this environmental authority must ensure that vehicles (including trains) used for transporting bulk materials from the mining lease, leave the mining lease with appropriate load preparation to minimise the spillage and / or loss of particulate matter and / or windblown dust during transport.

(B3) In the event of a complaint made to the administering authority (which in the opinion of an authorised officer is considered neither frivolous nor vexatious) about airborne contaminants generated in carrying out the authorised activity, dust and particulate matter must not exceed any of the limits identified in Table B1 – Ambient Air Quality Limits when measured at any sensitive or commercial place:

Table B1 – Ambient Air Quality Limits

Contaminant	Limit	Methodology
Particulate matter with an aerodynamic diameter of less than 10 micrometres (PM_{10}) suspended in the atmosphere	50 micrograms per cubic metre, averaged over twenty-four (24) hours	Monitored in accordance with the most recent version of the relevant Australian Standard for measuring 10 micrometres (PM_{10}) suspended Note: Five (5) days of exceedances allowed each year including natural causes
Particulate matter (TSP) suspended in the atmosphere	90 micrograms per cubic metre, averaged over one (1) year	Monitored in accordance with any method for measuring TSP as recommended in the most recent version of the relevant Australian Standard for measuring TSP

(B4) If monitoring indicates the airborne contaminants specified in Condition (B3) have been exceeded, the holder of this environmental authority must compare the results of the impacted site to that of the reference monitoring site. If the level of airborne contaminants at the impacted site does not exceed the reference monitoring site, then no action is to be taken and the contaminants will be regarded as not having been generated in the carrying out of the authorised activity.

(B5) If monitoring indicates the limits in Condition (B3) have been exceeded, the holder of this environmental authority must promptly implement dust abatement measures so that emissions of dust generated by the mining activities cease to exceed the limits in Condition (B3).

Ambient Air Quality Monitoring

(B6) Before 1 June 2012, the holder of this environmental authority must develop and implement an Ambient Air Quality Monitoring Program for monitoring particulate emissions at the locations identified in Table B2 – Location of Particulate Monitoring Stations and identified in Schedule L Plan 4 – Air Quality Monitoring Sites.

Table B2 – Location of Particulate Monitoring Stations

Site	Coordinates (GDA94 MGA z54)		Location
	Northing	Easting	
Compliance			
1	8602161	593928	Nanum
2	8599189	597145	Napranum
3	8604509	596646	Rocky Point
Reference			
4	8603081	616754	Scherger RAAF Base

(B7) Particulate monitoring stations can be put into care and maintenance mode on the receipt of 100 mm of rainfall in one calendar month at the Weipa Meteorological Station or the portable automatic meteorological station described in conditions B20. The Particulate Monitoring Stations must be reinstated by 1 May, or when less than 100 mm of rainfall is recorded in a calendar month, whichever occurs first.

Light

(B8) In the event of a complaint about light emissions from any mining activity that, after investigation is in the opinion of an authorised person causing a nuisance at a sensitive place, the administering authority may request the holder of this environmental authority to take appropriate action to mitigate the nuisance and the holder must take appropriate action (e.g. by screening or directing the light away from the sensitive place) within a time set by the administering authority.

(B9) Lighting management and monitoring must be implemented at Boyd Port and the seaborne access location associated with the temporary barge landing area north of Pera Head to minimise light horizon changes on and over the beach that negatively impact on turtles.

(B10) Low-pressure sodium vapour lamps or other lighting demonstrated to have a low impact on the relevant turtle species, that are shielded and appropriately directed to minimise light spill, must be used at Boyd Port and the seaborne access location associated with the temporary barge landing north of Pera Head to minimise impacts on nesting and hatchling turtles.

(B11) Lights must be positioned away from nesting shorebirds, unless otherwise required for the safe operation of vehicle and plant.

Point Source Releases to Air

(B12) Power station emissions must only be released to the atmosphere from the release points specified in Table B3 – Release Points.

(B13) Except during engine start up, maintenance and engine shut down, the release of contaminants at the locations specified in Table B3 – Release Points must be:

(a) directed vertically upwards with no impedance; and

(b) released in accordance with the minimum velocity, gas temperature and release height identified in Table B3 – Release Points; and

(c) released at a mass emission rate and concentration that does not exceed the limits stated in Table B3 – Release Points.

Table B3 - Release Points

Power Station	Release Point / Monitoring Location	Minimum Release Height (m)	Minimum Exit Gas Temperature (°C)	Minimum Efflux Velocity (m/s)	Contaminant Parameter	Mass Emission Rate (per stack unit)[4,5]	Frequency of Monitoring
Weipa (Lorim Point) Power Station	stacks 1 – 6	10	300	15	Carbon monoxide	1.2 g/s	Annually
					Oxides of nitrogen (expressed as NO_2)	16.7 g/s	
	stacks S1-S3	9	300	15	Carbon monoxide	0.9 g/s	
					Oxides of nitrogen (expressed as NO_2)	2.1 g/s	
Andoom Power Station	stacks 1 – 7	6	300	15	Carbon monoxide	TBD	
					Oxides of nitrogen (expressed as NO_2)	TBD	
Boyd Infrastructure Area Power Station	stack 1 – 22	8.5	300	15	Carbon monoxide	3 g/kw-hr	Annually
					Oxides of nitrogen (expressed as NO_2)	20 g/kw-hr	
					Total particulate matter	0.3 g/kw-hr	
Norman Creek Infrastructure Area Power Station	stack TBD[1]	TBD[1]	TBD[1]	TBD[1,2]	Carbon monoxide	TBD[1]	
					Oxides of nitrogen (expressed as NO_2)	TBD[1]	
					Total particulate matter	TBD[1]	

1. To be determined and notified to the administering authority upon completion of the final design plan for the power station.
2. Average velocity based on four (4) consecutive sampling events.
3. Contaminant limits are to be determined based on the results of the Stack Emission Monitoring Program completed at the Weipa (Lorim Point) and Andoom Power Stations in accordance with Condition (B15).
4. All determinations of point source emissions to air are to be taken from isokinetic sample results.
5. All determinations of point source emissions to air are to be corrected to Dry @ Standard Temperature & Pressure (273K, 101.3KPa).

(B14) The holder of this environmental authority must develop and implement a Stack Emission Monitoring Program (SEMP) to monitor and record the release of contaminants from the power stations and ensure that emissions generated by the power station do not exceed the limits identified in Table B3 – Release Points.

(B15) The SEMP must be developed and implemented by 28 February 2014 for existing power stations and upon commissioning of any new power stations and include but not be limited to the following tests performed and recorded for each sample taken at the release locations identified in Table B3 – Release Points:

(a) monitoring provisions for the release points must comply with the most recent edition of Australian Standard AS4323.1 *Stationary source emissions method 1: Selection of sampling provisions*;

(b) all determinations of contaminant releases to the atmosphere must be made in accordance with methods prescribed in the most recent version of the administering authority's *Air Quality Sampling Manual*. If monitoring requirements for specific contaminants are not described in the Air Quality Sampling Manual, monitoring protocols must be in accordance with a method as approved by New South Wales DEC/EPA, Victorian EPA or United States EPA;

(c) the following tests must be performed for each sample taken at each release point specified in Table B3 - Release points:
(i) gas velocity, volume and mass flow rate;
(ii) temperature and oxygen content; and
(iii) water vapour concentration (for non-continuous sampling).

(d) samples taken must be representative of the contaminants discharged when operating under maximum operating conditions; and

(e) during the sampling period the following additional information must be gathered:
(i) plants throughput rate at the time of sampling;
(ii) fuel type and consumption rate;
(iii) any factors that may influence odour and particulates emissions;
(iv) the odour and particulates treatment system operating, system status and flow rate; and
(v) reference to actual test methods and accuracies.

(B16) When requested by the administering authority, the density of smoke released from an exhaust stack at the Weipa (Lorim Point) and Andoom Power Stations must be monitored using the Ringelmann method to investigate any complaint of environmental nuisance at any sensitive place or commercial place. Smoke emissions are not considered to be environmental harm if monitoring shows the density of smoke from any exhaust stack serving a generator unit at the Weipa (Lorim Point) and Andoom Power Stations does not exceed Ringelmann 1 except for a two (2) minute period immediately after engine start-up, maintenance or engine shut down of the power station unit served by the release point.

(B17) The sulphur content of any fuel burned in the Weipa (Lorim Point) and Andoom Power Station units on the mining lease(s) must not exceed 0.5 percent by weight.

(B18) Any power generator must be designed, operated and maintained in accordance with the relevant Australian Standard.

Land Based Metal Surface Coating

(B19) The holder of this environmental authority must develop and implement an abrasive blasting and spray painting risk assessment and control plan which considers the following:

(a) coating selection with due regard to types and levels of contaminants within coatings to be removed/ applied;

(b) quantity of coating to be removed/ applied;

(c) type of abrasive blasting media to be used;

(d) sensitivity of receiving environment;

(e) the use of suitable shrouds, barriers, screen or other means of containment in a manner that will localise the collection of spent abrasive material and/or over spray;

(f) the collection and storage of wastes and resultant dusts and other materials from all surfaces as soon as practicable after completion of abrasive blasting and spray painting;

(g) the containment and treatment or disposal of any waters, including stormwater, that may become contaminated as a result of undertaking the activity;

(h) during the period of blasting and/or spray painting, maintenance of daily records that will identify the job particulars, dates and times of blasting and/or spray painting, description of wind conditions and name of the person(s) conducting the activity. Such daily reports are to be verified as correct by the signature of the person responsible for supervision of the activity; and

(i) ensuring that structures requiring abrasive blasting and metal surface coating are maintained regularly.

Meteorological Monitoring

(B20) Under circumstances where relevant wind, temperature and rainfall data cannot be provided to the holder of this environmental authority from the Weipa Meteorological Station operated by the Bureau of Meteorology, the holder must promptly deploy a portable automatic meteorological station to continuously measure and record wind speed and direction, temperature and rainfall data when and where these data measurements are required.

(B21) The portable automatic meteorological station referred to in Condition (B20) must be installed in accordance with the latest edition of the Bureau of Meteorology - Observation Specification No.2013.1 - *Guidelines for the siting and exposure of meteorological instruments and observing facilities*.

(B22) The holder of this environmental authority must record, compile, evaluate and keep all monitoring records obtained from the portable automatic meteorological station for a period of 5 years.

END OF CONDITIONS FOR SCHEDULE B

SCHEDULE C – LAND & REHABILITATION

General

(C1) Contaminants that will or may cause environmental harm must not be directly or indirectly released to land except as permitted under this environmental authority.

(C2) Any spillage of wastes, contaminants or other materials must be promptly cleaned up. Such spillages must be cleaned up using methods that minimise the release of wastes, contaminants or materials to any stormwater drainage system, roadside gutter or waters.

Disturbance to Land

(C3) When carrying out mining activities the holder of this environmental authority must:

(a) avoid, minimise or mitigate (in order of preference) any impacts on areas of sensitive vegetation or other areas of ecological value;

(b) minimise the risk of injury, harm, or entrapment to wildlife and stock;

(c) minimise disturbance to land that may otherwise result in land degradation;

(d) ensure that for land that is to be significantly disturbed by mining activities the topsoil layer is removed and handled in a manner that will minimise degradation of its biological, chemical and physical properties and is used for rehabilitation purposes (in accordance with Condition C21 & C22);

(e) prior to carrying out any disturbance activities, make all relevant staff, contractors or agents carrying out those activities, aware of the location of any Category A, B or C Environmentally Sensitive Area (ESA) and the relevant requirements of this environmental authority;

(f) if significant disturbance to land is unavoidable, clear vegetation in a way which minimises fragmentation; and

(g) manage cleared vegetation so that it is stockpiled in a manner that facilitates salvage, respreading or burning and does not impede vehicle, stock or wildlife movements.

Note: This environmental authority does not authorise the taking of protected animals or the tampering with an animal breeding place that is being used by a protected animal to incubate or rear the animal's offspring.

(C4) Subject to Condition (F8), the holder of this environmental authority may burn vegetation cleared in the course of carrying out extraction activities provided the activity does not cause environmental harm at any sensitive place or commercial place.

(C5) The holder of this environmental authority must ensure that mining activities are not conducted:

(a) in or within 200 metres of any listed Category A, B or C ESA;

(b) within 50m of any high bank of a watercourse with stream order 1 or 2;

(c) within 100m of any high bank of a watercourse with stream order 3 or 4;

(d) within 200m of any high bank of a watercourse with stream order 5 and above;

(e) within 100m of any natural wetland; and

(f) within 200m of any natural significant wetland.

(g) within 200 metres of any aquatic habitat where a potential new species of aquatic fauna in the areas south of Embley River has been identified unless otherwise expressly permitted by the administering authority.

Note: Activities which are ancillary to extraction activities such as exploration, the Port, stockpiles, barge and ferry terminals, haul and access roads, conveyors, bridges, loading ramps, pumps and pipelines and water management infrastructure may encroach upon buffer areas (all reasonable measures will be undertaken to minimise such disturbances) and these will be detailed in the Plan of Operations.

Land Use Management Plan

(C6) The holder of this environmental authority must develop, implement and submit to the administering authority a Land Use Management Plan (LUMP) before 31 August 2012 for areas other than land south of the Embley River and for land south of the Embley River, prior to significant construction work. The LUMP must include:

(a) plans and procedures for managing vegetation including buffer systems, pre-clearing surveys for any Category A, B or C ESA's and the presence of species classed as endangered, vulnerable, or near threatened under the *Nature Conservation Act 1992*;

(b) plans and procedures for the preparation and burning of vegetation cleared in the course of carrying out mining activities;

(c) plans and procedures for obtaining base line soils information covering the identification of soil units within areas to be disturbed by mining activities as nominated in the Plan of Operations at a scale of 1:100,000, in accordance with the "*Guidelines for Surveying Soil and Land Resources, 2nd Edition*" (McKenzie *et al*. 2008) or "*Australian Soil and Land Survey Handbook, 3rd Edition*" (National Committee on Soil and Terrain 2009) or "*The Australian Soil Classification*" (Isbell 2002) or similar recent guidelines;

(d) plans and procedures for managing acid sulphate soils so that when clearing in areas with acid sulphate soils (soils or potential acid sulphate soils), the holder of this environmental authority must develop and implement an acid sulphate soil environmental management plan prepared in accordance with the "*State Planning Policy 2/02 Guideline Planning and Managing Development Involving Acid Sulphate Soils*" and the administering authority's "*Queensland Acid Sulphate Soil Technical Manual*" (Version 2.2 September 2004) or more recent editions or supplements to these documents when these become available. The holder of this environmental authority must treat and manage acid sulphate soils in accordance with the latest edition of the administering authority's Instructions for the treatment and management of acid sulphate soils.

(e) plans and procedures for the carrying out of mining activities to prevent or minimise harm or the potential risk of causing harm to native fauna. The fauna management procedures must include training and awareness of staff and contractors, or access to appropriately qualified contractors trained in fauna handling, to ensure that any planned fauna handling is undertaken by an appropriately qualified person;

(f) for land south of the Embley River, a survey plan to determine the distribution of the potential new species of freshwater crab identified in Winda Winda Creek and the potential new species of stygofauna identified in the Ward River. In preparing the survey plan, the holder of this environmental authority must liaise with the Queensland Museum and the administering authority and have regard to comments made by those agencies.

Note: The holder of this environmental authority must make a recommendation to the administering authority on any proposed change to the setback distance identified in Condition (C5) (g) within two (2) months of the potential new species of freshwater crab identified in Winda Winda Creek and the potential new species of stygofauna identified in the Ward River being listed as endangered, threatened or near threatened under the Nature Conservation (Wildlife) Regulation 2006.

(g) plans and procedures for an effective pest management program that includes but is not limited to the following:

(i) identification of pest species and infestation areas;
(ii) prevents and/or minimises the introduction and/or spread of pests; and
(iii) control and management of pest outbreaks as a result of mining activities.

(h) where constructed access road crossings of Winda Winda Creek and the southern branch of Norman Creek require culverts, the design will ensure habitat continuity along the riparian corridor is maintained.

(C7) Prior to conducting mining activities that involve significant disturbance to land, an assessment must be undertaken in accordance with the LUMP to determine the type and ecological value of any vegetation in such areas where the activity is proposed to take place.

(C8) The assessment required by Condition (C7) must be undertaken by an appropriately qualified person and include the carrying out of field validation surveys, observations and mapping of any Category A, B or C ESA's and the presence of species classed as endangered, vulnerable or near threatened under the *Nature Conservation Act 1992*, in accordance with the LUMP.

Terrestrial Biodiversity Offset Plan

(C9) A final Terrestrial Biodiversity Offset Plan for the land south of the Embley River generally consistent with the requirements of the Queensland Biodiversity Offset Policy (BOP) and Queensland Government Environmental Offsets Policy (QGEOP) must be submitted to the administering authority for approval within twelve (12) months of the final investment decision for the South of Embley project.

(C10) The final Terrestrial Biodiversity Offset Plan for the land south of the Embley River must include the following elements and be consistent with the offset proposal submitted to the Coordinator-General on 5 April 2012.

(a) 2:1 ratio of riparian habitat comprising one or more of RE 3.3.5, RE 3.3.9, RE 3.3.21 (355.2 hectares), of which 110.6 hectares must be RE3.3.9;

(b) translocate and/or propagate 3.5 plants of Cooktown Orchid and Chocolate Tea Tree Orchid as well as any other listed flora species under the *Nature Conservation Act 1992* for each plant found within the footprint of disturbance and establish these within the offset area(s);

(c) the offset area(s) may be located on ML7024 subject to meeting ecological equivalence measures and agreement of Traditional Owners and relevant Government agencies; and

(d) the offset area(s) are to be managed *in accordance with the approved Terrestrial Biodiversity Offset Plan* to protect and enhance environmental values including ecologically appropriate fire protection and feral animal controls.

(C11) This condition continues to apply after the environmental authority has ended or ceased to have effect. The holder of this environmental authority must implement the approved Terrestrial Biodiversity Offset Plan until evidence is submitted in accordance with condition (C11-B) that the requirements of the approved Terrestrial Biodiversity Offset Plan have been achieved.

(C11-A) Any use of the offset area that is inconsistent with the requirements of condition (C11), relating to how the environmental offset is required to be managed, is a significant residual impact on the prescribed environmental matter.

(C11-B) The holder of this environmental authority must submit evidence to the administering authority demonstrating that the requirements of the approved Terrestrial Biodiversity Offset Plan in condition (C11) have been achieved, at least two (2) years prior to any surrender of the environmental authority.

(C11-C) The holder of this environmental authority must investigate an appropriate legal mechanism to secure the offset detailed in the approved Terrestrial Biodiversity Offset Plan:

a) every ten (10) years from 1 July 2020; or
b) if the holder of this environmental authority becomes aware of an appropriate legal mechanism at an earlier time, the earlier time.

(C11-D) The holder of this environmental authority must submit evidence to the administering authority demonstrating that an investigation in accordance with condition (C11-C) has been undertaken.

(C11-E) In the event that the administering authority and the holder of this environmental authority identify an agreed legal mechanism to secure the offset in accordance with condition (C11-C), the holder of this environmental authority must secure the offset under the identified agreed legal mechanism upon the granting of that legal mechanism.

Species Management Plan

(C12) The holder of this environmental authority must develop, implement and submit to the administering authority for approval a Species Management Plan for fauna species prescribed as endangered, vulnerable or near threatened under the *Nature Conservation Act 1992* and identified in the EIS as species where impacts may be likely or possible for land south of the Embley River, prior to any clearing of vegetation associated with significant construction work.

(C13) The Species Management Plan must satisfy the requirements of the *Nature Conservation (Wildlife Management) Regulation 2006* relating to tampering with animal breeding places.

(C14) The Species Management Plan must at a minimum address the Red Goshawk, Bare-rumped Sheathtail Bat, Palm Cockatoo, Estuarine Crocodile, Rufous Owl, Square-tailed Kite and Masked Owl.

(C15) The Species Management Plan must include:

(a) protection of riparian, wetland, estuarine, vine forest and coastal vegetation on sand from mining by an environmental buffer system. The buffer system must at a minimum comply with condition (C5);

(b) surveys must be carried out to define the boundaries of mapped sensitive vegetation types in the field prior to disturbance;

(c) surveys must be conducted for red goshawk, masked owl and squaretailed kite nests prior to undertaking significant disturbance to land located within 1km of permanent water supporting riparian gallery forest or paperbark wetland, seasonally inundated coastal wetlands, seasonal water courses supporting riparian gallery forest, or an estuary. If any active red goshawk, masked owl or square-tailed kite nests are found within mining areas, a 200m buffer around the nesting tree must not be mined until the end of the breeding season (being until fledglings no longer use the nest for habitat);

(d) relocation of mature crocodiles, if required due to safety concerns, in consultation with the administering authority; and

(e) for the Bare-rumped Sheathtail bat:

(i) undertake an additional targeted bat survey, using broad spectrum acoustic monitoring, prior to the commencement of significant construction works. The survey must relate to areas planned for initial infrastructure required prior to production;

(ii) support a research program being conducted by the Australian Bat Society which will aim to improve the quality of the reference call library for microbats of the Cape York region;

(iii) utilise the reference calls acquired by the research program to analyse the targeted survey results for the bare-rumped sheathtail bat and further define habitat preferences for the species. Should the species be identified through analysis of survey results, then in liaison with the administering authority, adaptive management measures to avoid and mitigate impacts from the project must be implemented based on the habitats within which it is found.

Note: The Species Management Plan may exist in isolation to or form part of the Land Use Management Plan required under Condition (C6).

Foreshore Access Management Plan

(C16) Prior to any clearing of vegetation associated with significant construction work, the holder of this environmental authority must prepare and implement a Foreshore Access Management Plan for the foreshore area between Ina Creek and Winda Winda Creek that restricts access to foreshore areas to permitted persons only in order to protect environmental and heritage values.

Note: The Foreshore Access Management Plan may exist in isolation to or form part of the Communities Heritage and Environment Plan or the Land Use Management Plan required in accordance with Condition (C6).

Rehabilitation Objectives

(C17) Land disturbed by mining activities as identified in Schedule L Plan 2 – East Weipa and Andoom Operational Areas and Plan 3 – South of Embley Infrastructure and Conceptual Mine Plan, must be rehabilitated in accordance with Table C1 – Rehabilitation Requirements and the objectives of the Rehabilitation Management Plan required under Condition (C23) and other requirements set out in this environmental authority.

(C18) Areas that are available for rehabilitation must be identified in the current Plan of Operations.

(C19) Rehabilitation must commence progressively as areas become available in accordance with the Plan of Operations.

(C20) Rehabilitation can be considered successful when:

(a) the site can be managed for its designated land-use (e.g. similar to that of surrounding undisturbed areas);
(b) no greater management input than for other land in the area being used for a similar purpose is required and there is evidence that the rehabilitation has been successful;
(c) the rehabilitation is carried out in accordance with the goals, objectives, indicators and completion criteria as specified in Table C1 – Rehabilitation Requirements; and
(d) written agreement is obtained from the landowner/holder and administering authority.

Table C1 - Rehabilitation Requirements

Mine Domain	Mine Feature Name	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
Land north of the Embley River					
TBD[1]	TBD[1]	All land subject to mining activities must be rehabilitated to meet the requirements of the administering authority's *Guideline - Rehabilitation Requirements for Mining Projects* and will be defined in the Rehabilitation Management Plan	TBD[1]	TBD[1]	TBD[1]
Land south of the Embley River					
TBD[1]	TBD[1]	All land subject to mining activities must be rehabilitated to meet the requirements of the administering authority's *Guideline - Rehabilitation Requirements for Mining Projects* and will be defined in the Rehabilitation Management Plan	TBD[1]	TBD[1]	TBD[1]

[1] Post mine land use, rehabilitation indicators and completion criteria are to be nominated in accordance with Condition C23

[2] Post mine land use, rehabilitation indicators and completion criteria are to be nominated in accordance with Condition C24

Topsoil

(C21) Topsoil and subsoils must be stripped separately and replaced directly in an area awaiting rehabilitation or else be stockpiled and subsequently used in rehabilitation.

(C22) Topsoil must be managed in accordance with the Rehabilitation Management Plan and stockpiled in a manner that ensures stability. Measures must include:

(a) vegetating topsoil stockpiled during the months 1 November to 1 May;

(b) optimising the height and footprint of stockpiles; and

(c) re-using stockpiles as soon as possible.

Rehabilitation Management Plan

(C23) The holder of this environmental authority must develop, implement and submit to the administering authority a Rehabilitation Management Plan before 31 August 2013 for areas other than land south of the Embley River and within three (3) years from commencement of bauxite extraction for land south of the Embley River that must include:

(a) schematic representation of final land form inclusive of drainage features;
(b) slope and cover designs;
(c) drainage design;
(d) erosion controls proposed on reformed land;
(e) revegetation methods inclusive of plant species selection, re-profiling, soil handling (including stockpiling), soil ameliorants/amendments, surface preparation and method of propagation;
(f) materials balance including available topsoil and low permeability capping material;
(g) geotechnical, geochemical and hydrological studies;
(h) chemical, physical and biological properties of soil and water;
(i) agreed post mining land and/or infrastructure use with the landowner/holder and the administering authority;
(j) rehabilitation goal, rehabilitation objective, indicators and measurable completion criteria for each agreed post mining land use within each domain that enables determination of rehabilitation success;
(k) description of experimental design for monitoring of reference and rehabilitated areas inclusive of statistical design;
(l) a rehabilitation monitoring program based on a statistically sound, mutually agreed sampling design;
(m) research program and associated milestones;
(n) programs for maintenance of rehabilitation as required to achieve the nominated rehabilitation objective; and
(o) on-site revegetation trials for the areas south of the Embley River which test:
    i. selected species,
    ii. seeding rates,
    iii. establishment methodologies, and
    iv. the feasibility of the use of felled timber for fauna refuge in rehabilitation areas is feasible.

Note: trials carried out north of the Embley may be utilised for the area south of the Embley River, where relevant.

(C24) An interim Rehabilitation Management Plan for land south of the Embley River must be prepared and submitted to the administering authority for consideration prior to commencement of significant construction work for the South of Embley project and must include rehabilitation goals, rehabilitation objectives, indicators and measurable completion criteria for each agreed post mining land use within each domain that enables determination of rehabilitation success. The plan must also address, as far as practicable, those other matters listed in Condition (C23).

(C25) The holder of this environmental authority must review and update the interim Rehabilitation Management Plan yearly thereafter until the final Rehabilitation Management Plan required in accordance with Condition (C23) and is developed, implemented and submitted to the administering authority.

Infrastructure

(C26) All infrastructure, mining equipment and plant erected and/or used for the mining activities must be removed from the licensed place prior to surrender except where agreed in writing by the administering authority and the landowner.

Post Closure Management Plan

(C27) A Post Closure Management Plan must be prepared eighteen (18) months prior to final ore processing on site and implemented for a nominal period of:

(a) at least thirty (30) years following final ore processing onsite; or,

(b) a shorter period if the site is proven to be geo-technically and geo-chemically stable and it can be demonstrated to the satisfaction of the administering authority that no release of contaminants from the site will result in environmental harm.

(C28) The Post Closure Management Plan must include, where necessary, the following elements:

(a) operation and maintenance of:
  (i) wastewater collection, treatment and reticulation systems;
  (ii) the groundwater monitoring network;
  (iii) final cover systems; and
  (iv) vegetative cover.
(b) monitoring of:
  (i) surface water quality;
  (ii) groundwater quality;
  (iii) erosion rates;
  (iv) the integrity and effectiveness of final cover systems; and
  (v) the health and resilience of vegetative cover.

Storage & Handling of Hazardous Materials

(C29) Before 31 August 2012, conduct an assessment of all explosives, hazardous chemicals, corrosive substances, toxic substances, gases, dangerous goods, flammable and combustible liquids stored and handled on areas other than land south of the Embley River to determine whether these substances are stored and handled in accordance with the relevant Australian Standard. Where this assessment finds an inconsistency between the current Australian Standard and the manner in which the substances are stored and handled, the environmental authority holder must implement actions to comply with the relevant Australian Standard before 27 February 2015.

(C30) Subject to Condition (C29) all explosives, hazardous chemicals, corrosive substances, toxic substances, gases, dangerous goods, flammable and combustible liquids must be stored and handled in accordance with the relevant Australian Standard where such is available. Where no relevant Australian Standard exists, store such materials within an effective on-site containment system in accordance with Condition (C31).

(C31) Notwithstanding the requirements of any Australian Standard, any hazardous materials stored on the licensed place that have the potential to cause environmental harm must be stored in or serviced by an effective containment system that is impervious to the materials stored and managed to prevent the release of liquids to waters or land. Where no relevant Australian Standard is available, the following must be applied:

(a) storage tanks must be bunded so that the capacity and construction of the bund is sufficient to contain at least 110% of a single storage tank or 100% of the largest storage tank plus 10% of the second largest storage tank in multiple storage areas; and,

(b) all transportable chemical containers must be stored within a bund, where the capacity of the bund is sufficient to contain 125% of the largest storage container.

(C32) All containment systems for chemicals and flammable or combustible liquids must be designed to minimise rainfall collection within the system.

(C33) Minimise the potential for contamination of land and waters by diverting stormwater around contaminated areas and facilities used for the storage of explosives, hazardous chemicals, corrosive substances, toxic substances, gases, dangerous goods, flammable and combustible liquids.

(C34) Spillage of any contaminant must be contained and land remediated to prevent environmental harm.

Release of Contaminants to Land

(C35) *The r*elease of contaminants to land from the licensed place must only occur at the release points specified in Schedu – Release Points.

Table C2 – Release Points

Release Point		Description of Releases	Description of Receiving Environment	Coordinates (GDA94 MGA z54)	
				Easting	Northing
Oil Water Separators – Andoom					
HEQ	Wash Pad	Treated water overflow	Bushland	590164	8613432
	Truck Body Wash		Bushland	590200	8613968
	Workshop		Bushland	590164	8613432
Rake Mover RM01			Ground adjacent to CPS unit	590990	8614124
Rake Mover RM02			Ground adjacent to CPS unit	590890	8614133
Service Bay (refuel pad)			Bushland	590200	8613984
Service Bay			Bushland	590470	8613910
Workshop (Q-Birt)			Bushland	590475	8613871
Power Station Tank Farm			Bushland	590972	8614097
Fuel Storage Area			Bushland	590475	8613825
Power Station			Bushland	590957	8614200
Oil Water Separators – Lorim Point					
Railway Workshop (loco refuel area)		Treated water overflow	Bushland	593724	8600615
Oil Water Separators – Lorim Point					
Rail Dump Station RM01		Treated water overflow	Ground adjacent to CPS unit	594659	8600537
Rail Dump Station RM02			Ground adjacent to CPS unit	594691	8600545
Apron Feeder 6&7			Bushland	594745	8600517
Truck Dump Station			Low lying sump area	595025	8600160
Tank 11 & 12			Bushland	594890	8599230
Waste Oil Farm			Bushland	594879	8599360
Greaser Shed			Bushland	594735	8599858
Workshop (Q Birt)			Ground adjacent to CPS unit	594444	8600280
Civil Workshop			Bushland	594266	8600208
Oil Water Separators – East Weipa					
HEQ	Wash Pad	Treated water overflow	Bushland	601569	8599812
	Truck Body Wash		Bushland	601550	8599908

Release Point	Description of Releases	Description of Receiving Environment	Coordinates (GDA94 MGA z54)	
			Easting	Northing
Workshop		Bushland	601569	8599812
Fuel Storage Area		Bushland	601775	8599774
Landfill Washdown Pad		Ground Adjacent to CPS Unit	590960	8600243
Airport Fuel Bund		Ground Adjacent to CPS Unit	600489	8597809
Oil Water Separators – General				
Regen Fuel Tank	Treated water overflow	Bushland	595525	8602950
Landfill Washdown Pad		Ground adjacent to CPS Unit	590960	8600243
Airport Fuel Bund		Ground adjacent to CPS Unit	600489	8597809
Bioremediation Area - Andoom				
Bioremediation Area	Stormwater overflow	Bushland	590164	8613432
Bioremediation Area – East Weipa				
Bioremediation Area	Stormwater overflow	Bushland	595405	8599500

[1] To be determined and notified to the administering authority upon final design.

Contaminated Land

(C36) Prior to making an application for Surrender or approval for Progressive Rehabilitation the holder of this environmental authority must undertake a contaminated land assessment / investigation of the relevant areas of the licensed place in accordance with the administering authority's *Guideline: Contaminated Land Professionals.*

Contaminated Site Register

(C37) For the area south of the Embley River, the environmental authority holder must develop and maintain a contaminated site register.

Bio-Remediation Areas

(C38) Soil and absorbent materials potentially contaminated with hydrocarbons must be treated on site in a designated bioremediation area. Treated material will not be used for any purpose unless contamination thresholds defined in Table C3 - TRH Thresholds in Treated Soils are achieved.

Table C3 - TRH Thresholds in Treated Soils

Recoverable Hydrocarbon Fraction	Maximum[1]
C6-C9	100 mg/kg
C10-14	100 mg/kg
C15 and greater	1000 mg/kg

Bulk Materials Handling and Management

(C39) Bulk storage and handling of materials for land south of the Embley River must be carried out in a manner which minimises the release of dust and particulate matter, prevents or minimises the contamination of land and stormwater.

(C40) The holder of the environmental authority must develop and implement an operating procedure for land south of the Embley River where bulk materials are handled, which must include, but not be limited to:

(a) the completion of periodic inspections of the mining lease where mining activities are carried out including all structures, plant, equipment and trafficked surfaces to identify and remove or stabilise exposed bulk materials that may be mobilised by wind, water or equipment movement and have the potential to impact sensitive receptors;

(b) an ongoing cleaning and maintenance schedule to minimise any potential release of bulk materials and to ensure there is no accumulation of bulk materials over time in areas where it may be mobilised and have the potential to impact sensitive receptors;

(c) placement of any removed materials in a designated storage area; and

(d) periodic review of the management and operation of bulk materials storage and handling activities including identification of options for continuous improvement.

END OF CONDITIONS FOR SCHEDULE C

SCHEDULE D – REGULATED DAMS (including structures containing mineral waste)

General

(D1) The consequence category of all dams must be assessed by a suitably qualified and experienced person at least once every two (2) years, based on documented evidence sufficient to define or confirm the current nature and extent of environmental consequences for potential failure of that dam.

(D2) The holder of this environmental authority must not commence construction of any regulated dam (i.e. dams determined to be in the significant or high consequence category) unless the location, hydraulic performance, size and purpose of that dam are specifically referenced in accordance with this environmental authority in the form of tabulated details as identified in Conditions (D4), (D5) & (D21).

(D3) Tailings must only be stored at the locations and within the parameters described in Table D1 – Location of Regulated Dams and Table D2 – Size and Purpose of Regulated Dams. This condition does not exclude the storage of water or tailings that otherwise comply with other applicable conditions of this environmental authority.

Location of Regulated Dams

(D4) The construction and operation of regulated dams listed in Table D1 - Location of Regulated Dams, must be located on the mining lease(s) within the polygonal area defined by the co-ordinates listed in Table D1 – Location of Regulated Dams.

Table D1 - Location of Regulated Dams

Name of Regulated Dams	Coordinates (GDA94 MGA z54)	
	Easting	Northing
East Weipa and Andoom		
East Weipa Tailings Storage Facility (EW)	593810	8600663
	596535	8600557
	596691	8602613
	594045	8602229
East Weipa 1 Tailings Storage Facility (EW1)	595866	8600139
	595760	8599265
	596343	8599278
	596605	8600093
East Weipa 2 Tailings Storage Facility (EW2)	596608	8600096
	597208	8600037
	597049	8598967
	596274	8599063
Emergency Dam	595254	8600199
	595860	8600143
	595750	8599291
	594969	8599725
West Weipa 2 (WW2)	593127	8601590
	591786	8602090
	590547	8600841
	591746	8600348
G2 Dam	592094	8600416
	591318	8600564
	591235	8600048
	591735	8599803
G & X Dam	592356	8600987

Name of Regulated Dams	Coordinates (GDA94 MGA z54)	
	Easting	Northing
	592717	8600596
	592150	8600643
	592813	8601196
Andoom Tailings Storage Facility	593576	8616217
	592791	8614046
	590173	8614851
	590431	8617165
South of Embley		
Torro Tailings Storage Facility	567195	8569720
	569705	8569720
	567195	8565185
	569705	8565185
Norman Creek Tailings Storage Facility	TBD[1]	TBD[1]
	TBD[1]	TBD[1]
	TBD[1]	TBD[1]
	TBD[1]	TBD[1]

[1] To be determined and notified to the administering authority upon completion of final design in accordance with Condition (D6).

(D5) The construction and operation of regulated dams must comply with Table D2 - Size and Purpose of Regulated Dams.

Table D2 - Size and Purpose of Regulated Dams

Regulated Dam	Consequence Category (Dam break unless otherwise noted)	Maximum Surface Area (Ha)	Maximum Volume (Mm^3)	Maximum RL[1] (m)	Purpose
East Weipa and Andoom					
East Weipa Tailings Storage Facility (EW)	High	380	104	40	Storage of tailings
East Weipa 1 Tailings Storage Facility (EW1)	Low	50	Non-operational		
East Weipa 2 Tailings Storage Facility (EW2)	Low	65	Non-operational		
Emergency Dam	Significant	40	8	40	
West Weipa 2 (WW2)	Significant	159	Non-operational		
G2 Dam	Very low	40	Non-operational		
G & X Dam	Very low	20	Non-operational		
Andoom Tailings Storage Facility	High	460	116	40	
South of Embley					
Torro Tailings Storage Facility	Low (Failure to High	1100	240	55	Storage of tailings

Regulated Dam	Consequence Category (Dam break unless otherwise noted)	Maximum Surface Area (Ha)	Maximum Volume (Mm^3)	Maximum RL[1] (m)	Purpose
	contain – seepage)				
Norman Creek Tailings Storage Facility	Significant	1100	260	80	

[1] RL represents a height above the Australian Height Datum (A.H.D.).

Regulated Dams - Certification and Operation

(D6) Every regulated dam must be constructed in accordance with a certified design plan that has been submitted to the administering authority and developed so that the resulting dam will deliver the performance identified in the submitted design plan and is compliant with this environmental authority.

(D7) The holder of this environmental authority must not commence construction of a regulated dam unless the holder has submitted to the administering authority two (2) electronic copies (including one (1) locked and one (1) working copy) of a design plan together with the certification of a suitably qualified and experienced person that the design of the regulated dam will deliver the performance stated in that submitted design plan and that dam is compliant with this environmental authority.

(D8) A containment used for the storage of tailings from the processing of bauxite must be designed and operated to minimise impact on the environment, including any potential impact on people and the community.

(D9) Where the hazard associated with a regulated dam involves a population at risk , within the meaning of the Guidelines on Acceptable Flood Capacity for Dams December 2019 or its successor pursuant to the *Water Supply (Safety and Reliability) Act 2008* (that Act), the holder must demonstrate to the satisfaction of the administering authority that adequate design, operational and emergency procedures have been put in place consistent with the requirements for that population at risk under that Act.

(D10) When construction or modification of any regulated dam is complete and prior to commencing operation of that dam, the holder must submit to the administering authority two (2) electronic copies (including one (1) locked and one (1) working copy) of 'as constructed' drawings, together with the certification of a suitably qualified and experienced person that the dam 'as constructed' will deliver the performance stated in the submitted design plan and that the dam is compliant with this environmental authority.

(D11) An operational plan must be kept current for each regulated dam, and cover all matters relevant to its operation and maintenance so as to be consistent with conditions in this environmental authority.

(D12) Where an operational plan covers decommissioning and rehabilitation, those operations are to be consistent with the design plan for the regulated dam and the rehabilitation requirements of this environmental authority.

(D13) Any operational plans and certified design plans for regulated dams on the licensed place must be consistent with the Erosion and Sediment Control Plan required in accordance with Condition (H25) & (H26).

Inspection of Regulated Dams

(D14) A suitably qualified and experienced person must inspect all regulated dams annually before 1 November each year and at any time when abnormal or otherwise unsatisfactory conditions are observed.

(D15) At each annual inspection, the condition and adequacy of each regulated dam must be assessed for dam safety and in terms of the necessary structural, geotechnical and hydraulic performance criteria.

(D16) At each annual inspection if a mandatory reporting level is required it must be determined and marked on each regulated dam.

(D17) A final assessment of the adequacy of available storage in each regulated dam must be based on a dam level observed within the month of October each year and result in an estimate of the level in that dam as at 1 November each year.

(D18) For each annual inspection, two (2) electronic copies (including one (1) locked and one (1) working copy) of a final report on the condition and adequacy of each regulated dam, certified by the suitably qualified and experienced person and including any recommended actions to be taken to ensure the integrity of each regulated dam, must be provided to the administering authority by 1 December each year.

(D19) The holder of this environmental authority must, upon receipt of the final annual inspection report, consider the report and its recommendations and within one month of receipt of the annual inspection report, formulate actions to ensure that each regulated dam safely performs to its intended functions. Taking into account the weather conditions at the time, the holder of this environmental authority must promptly implement the formulated actions where practicable.

(D20) All containment embankments within all regulated dams must be monitored for signs of embankment deterioration in accordance with the monitoring requirements of the design plan.

Hydraulic Performance Criteria

(D21) Regulated dams constructed on the mining lease(s) must comply with the hydraulic performance criteria shown in Table D3 - Hydraulic Performance Criteria for Regulated Dams.

Table D3 - Hydraulic Performance Criteria for Regulated Dams

Name of Regulated Dam	Design Storage Allowance (Dams other than levees) AEP	Spillway Capacity or Diversion Capacity (Levees) AEP	Mandatory Reporting Level[1] (Dams other than levees) AEP[2]
East Weipa and Andoom			
East Weipa Tailings Storage Facility	1 in 10 AEP, 2 month wet season plus other net inputs for the 2 month wet season, to be available on 1st November each year	PMF[3]	1 in 100 AEP, 72 hour duration rainfall event plus wave allowance
Emergency Dam	1 in 10 AEP, 2 month wet season plus other net inputs for the 2 month wet season, to be available on 1st November each year	1 in 100 AEP	1 in 100 AEP, 72 hour duration rainfall event plus wave allowance
West Weipa 2 (WW2)	N/A[4]	1 in 100 AEP	N/A[4]
G2 Dam	Non-operational	Non-operational	Non-operational
G & X Dam	Non-operational	Non-operational	Non-operational
Andoom Tailings Storage Facility	1 in 10 AEP, 2 month wet season plus other net inputs for the 2 month wet season, to be available on 1st November each year	1 in 1000 AEP	1 in 100 AEP, 72 hour duration rainfall event plus wave allowance

Name of Regulated Dam	Design Storage Allowance (Dams other than levees) AEP	Spillway Capacity or Diversion Capacity (Levees) AEP	Mandatory Reporting Level[1] (Dams other than levees) AEP[2]
South of Embley			
Torro Tailings Storage Facility	1 in 20 AEP, 2 month wet season plus other net inputs for the 2 month wet season, to be available on 1st November each year	1 in 1000 AEP	1 in 10 AEP, 72 hour duration rainfall event plus wave allowance
Norman Creek Tailings Storage Facility	1 in 20 AEP, 2 month wet season plus other net inputs for the 2 month wet season, to be available on 1st November each year	1 in 1000 AEP	1 in 10 AEP, 72 hour duration rainfall event plus wave allowance

1 Refers to the level below the spillway crest, required to contain both the AEP (design risk) 72hr storm and the AEP (design risk) wave allowance.
2 AEP means the Annual Exceedance Probability, which is the probability that at least one event in excess of a particular magnitude will occur in any given year.
3 PMF refers to the Probable Maximum Flood.
4 Not applicable as Dam is low consequence for overtopping.

(D22) The spillway for any regulated dam constructed within the operational land must be designed and maintained to withstand the peak flow from the critical design storm in Table D3 - Hydraulic Performance Criteria for Regulated Dams.

(D23) The holder of this environmental authority must notify the administering authority as soon as possible, but within twenty-four (24) hours, of the level in any regulated dam reaching the mandatory reporting level in Table D3 - Hydraulic Performance Criteria for Regulated Dams; and must promptly act to prevent or minimise the risk of environmental harm.

East Weipa Tailings Facility

(D24) Tailings must not be placed against the walls of Cell 2A until such time as either:

(a) the tailings storage capacity of Cell 2B has been filled to the authorised RL25 or,

(b) the placement procedure for tailings in Cell 2B has demonstrated to the satisfaction of the administrating authority that the tailings placed on beaches are non-flowable under all possible scenarios.

(D25) At least forty-eight (48) hours prior to the commencement of earthworks on Cell 2A & Cell 2B of the East Weipa Tailings Storage Facility, the holder of this environmental authority must complete a program of public notification for the Nanum community providing information on the works to be completed. Details must include but should not be limited to the following:

(a) the nature of the works to be completed;

(b) the date works are expected to begin and the timeframe for completion;

(c) the expected hours of operation of plant and machinery;

(d) where the works will and are likely to be conducted;

(e) the measures in place to mitigate impacts on the Nanum community from noise, vibration, dust or light nuisance; and

(f) a contact phone number to assist in recording and responding to community concerns.

Decommissioning of Regulated Dams – Objective

(D26) Regulated dams must be dealt with in accordance with the conditions of this environmental authority and must not be abandoned.

(D27) On cessation of operation of any regulated dam, that regulated dam must be maintained so as to avoid environmental harm until that regulated dam is decommissioned.

(D28) Prior to the cessation of mining activities, each regulated dam must be decommissioned such that it either:

(a) becomes a stable landform that safely confines flowable substances;

(b) is approved or authorised under relevant legislation for a beneficial use;

(c) is a void authorised by the administering authority to remain after decommissioning; or

(d) is compliant with the rehabilitation requirements of this environmental authority.

(D29) The holder of this environmental authority must, prior to surrender of the mining leases implement either:

(a) a plan for de-commissioning the regulated dams such that, amongst other things, the regulated dams and their contents will be structurally stable and resistant to erosion and any seepage or other emissions will not cause environmental harm; or

(b) a site management plan for the continued operation and maintenance of the regulated dams.

Decommissioning of Regulated Dams – Documentation and Compliance

(D30) Decommissioning activities for regulated dams must be documented. Where the detailed documentation is not already contained in the design plan for the dam the detailed documentation is considered to be an amendment to the design plan and must be submitted as an amendment to the design plan.

(D31) All engineering aspects, including but not limited to stability, cover and drainage design of the proposed land forms forming part of any decommissioning and rehabilitation, must be provided as a design plan and certified by a suitably qualified and experienced person.

(D32) The design plan for the Torro and Norman Creek Tailings Storage Facilities must include a plan for the decommissioning and rehabilitation of the regulated dam at the end of its operational life.

END OF CONDITIONS FOR SCHEDULE D

SCHEDULE E – GENERAL AND REGULATED WASTE MANAGEMENT

General & Regulated Waste Disposal

(E1) This schedule does not apply to the Evans Landing Landfill.

(E2) The following wastes may be disposed of on the mining lease at locations beyond the boundary of the Evans Landing Landfill in accordance with the requirements of this environmental authority:

(a) mine waste including green waste, waste bauxite and tailings; and

(b) sewage sludge in drying beds located at the Awonga Point Sewage Treatment Plant (STP), the Lorim Point STP, the STP for the temporary camps in the area south of the Embley River, and Boyd Infrastructure Area STP and Norman Creek Infrastructure Area STP.

(E3) General and regulated waste generated in the mining activity can be temporarily stored on site awaiting removal provided it is handled, stored and transferred to ensure there is minimal risk of causing fire or contamination to land or waters.

Waste Management Program

(E4) Before 28 August 2013 a Waste Management Program in accordance with Part 5 of the *Environmental Protection (Waste Management) Policy 2008* must be developed, implemented and maintained for all mining activities on the mining lease(s). The waste management program must include:

(a) a description of the mining activities that may generate waste;

(b) the types and amounts of wastes generated by the mining activities;

(c) a program for reusing, recycling or disposing of all wastes;

(d) how the waste will be dealt with in accordance with the waste and resource management hierarchy, including a description of the types and amounts of waste that will be dealt with under each of the waste management practices in the waste and resource management hierarchy (i.e. avoidance, reuse, recycling, energy recovery, disposal);

(e) how the waste will be stored, handled and transferred in a proper and effective manner;

(f) procedures for identifying and implementing opportunities to minimise the amount of waste generated, promote efficiency in the use of resources and improve the waste management practices employed;

(g) procedures for dealing with accidents, spills, and other incidents that may impact on waste management;

(h) details of any accredited management system employed, or planned to be employed, to deal with the waste;

(i)how often the performance of the waste management practices will be assessed;

(j)the indicators or other criteria on which the performance of the waste management practices will be assessed; and

(k) staff training and induction to the waste management program.

Regulated Waste

(E5) Regulated waste, other than that authorised to be disposed of onsite under this authority, must only be removed and transported from the site by a person who holds a current authority to transport such wastes to a facility that is lawfully able to accept the waste under the *Environmental Protection Act 1994*.

(E6) Each container of regulated waste stored awaiting movement off-site must be clearly marked to identify the contents.

END OF CONDITIONS FOR SCHEDULE E

SCHEDULE F - EVANS LANDING LANDFILL

Activity

(F1) General and regulated waste is authorised to be stored and disposed of at the Evans Landing Landfill located within the Cook Shire Local Authority Reserve identified as the Gonbung Refuse Tip on ML7024 and identified in Schedule L Plan 5 – Evans Landing Landfill, or can be removed to an alternative facility that can lawfully accept these wastes.

Site Development Plan

(F2) A Site Development Plan must be developed and implemented for the Evans Landing Landfill before 1 March 2012. The Site Development Plan must be revised every three (3) years and must include details of at least the following:

(a) dimensions of landfill units used for waste disposal or storage;

(b) an accurate level survey of any area to be utilised for the disposal or storage of wastes. The levels must be reduced to a common datum and related to contour plans;

(c) the dimensions of the active waste disposal face;

(d) location of any new site infrastructure or extensions such as a new waste disposal cell, leachate dam, pond, or pump well or other plant and equipment required for the leachate collection, storage and recirculation infrastructure installed to serve the new cell;

(e) location of any new stormwater drains, diversion embankments or settling ponds required to serve any new cell;

(f) location of any areas to be capped (both final and interim capping where the next stage on the completed cell will not commence within twelve (12) months), the proposed capped surface levels and contours, surface drainage system and species of vegetation to be planted as part of a rehabilitation program;

(g) location of any new groundwater monitoring or collection bores required to serve any new cell; and

(h) progressive recording of waste deposition such that the location of a deposited load can be readily identified.

Continual Improvement in Waste Management Practices

(F3) For the purpose of minimising the disposal of recyclable waste to the landfill (excluding commingled waste) in accordance with the waste management hierarchy and the principles of the *Environmental Protection (Waste Management) Policy 2008*, the holder of this environmental authority must implement a Waste Management Plan that addresses at least the following matters:

a) waste management practices that will ensure that recyclables are diverted from the landfill;

b) procedures for identifying and implementing opportunities to improve the waste management practices employed including information and education packages for waste generators to assist in maximising the diversion of recyclable materials from landfill;

c) details of any accredited management system employed, or planned to be employed, to implement the waste management practices;

d) training programs and guidance for waste transport contractors in the identification and source separation of recyclable materials;

e) procedures for auditing waste loads to identify material to be removed for recycling;

f) how often the performance of the waste management practices will be assessed (at least annually);

g) the indicators or other criteria taking into account economic, social and environmental factors on which the performance of the waste management practices will be assessed; and

h) submission to the administering authority on the date the annual return is due each year of operation, an annual report for the preceding financial year, on the implementation of the Waste Management Plan. This report must include the following:

i) any new measures adopted or materials newly diverted from landfill disposal; and

ii) a summary (expressed in tonnes/year wherever appropriate) of the following information including wastes received, recyclable material recovered, fate of recyclables (e.g. transported off site for reuse/recycling, reused/recycled on site or stored on site) and a calculated percentage diversion rate for the materials specified below:

- Amount of green and organic waste collected and recycled;
- Amount of green and organic waste disposed to landfill;
- Amount of biosolids collected and recycled;
- Amount of construction and demolition waste collected and recycled;
- Amount of construction and demolition waste disposed to landfill;
- Amount of commercial and industrial waste (including agricultural) recycled;
- Amount of commercial and industrial waste (including agricultural) disposed to landfill;
- Amount of electrical equipment collected for recycling;
- Amount of Tallow and Vegetable oil collected;
- Number of scrap tyres collected for recycling (Equivalent Passenger Units - EPUs);
- Number of batteries collected for recycling;
- Amount of waste oil recycled;
- Total amount of paper and cardboard recycled;
- Total amount of plastics recycled;
- Total amount of aluminium cans recycled;
- Total amount of steel recycled;
- Other types and quantities of recyclables (please specify) recycled;
- Amount of waste disposed to landfill;
- Amount domestic waste disposed to landfill; and
- Total amount of landfill cover material used.

Note: Recoverable buried storage of recyclable material on the licensed place is not regarded as landfill disposal for the purposes of this approval, where such burial and recovery is unlikely to cause any environmental harm

Security

(F4) Measures must be taken to prevent unauthorised access to the facility.

(F5) While the facility is open, staffing of the facility must provide for:

(a) controlling the reception, storage and removal of waste;

(b) maintaining the facility;

(c) controlling all employees working in the facility; and

(d) supervising all persons entering the facility.

Litter

(F6) Litter control methods must be implemented in order to effectively capture wind-blown litter within the active waste disposal area.

Waste Storage and Reprocessing Areas

(F7) All storage and reprocessing of wastes must only be carried out on a hard stand area(s):

(a) constructed of compacted clay or other low permeability material to minimise soil infiltration;

(b) graded to prevent rainwater ponding;

(c) bunded to contain the materials stored; and

(d) graded to facilitate the collection of leachates and contaminated stormwater runoff for discharge to first flush ponds.

Fire Management

(F8) The holder of this environmental authority must not:

(a) burn waste at or on the Evans Landing Landfill;

(b) allow waste to burn or be burnt at or on the Evans Landing Landfill; or

(c) remove waste (other than large items of green waste) and burn such waste elsewhere.

(F9) Clear access to the water supply must be provided for fire-fighting vehicles at all times.

(F10) An effective fire break must be provided and maintained around the boundary of the waste management facility.

Access Roads

(F11) The holder of this environmental authority must ensure all weather access roads are installed and maintained so that at all times whilst the site is open for receiving wastes, vehicles have access to any waste storage or treatment area or any active waste disposal area.

Storage of Tyres

(F12) Tyres stored must be stockpiled in stable stacks in volumes less than 3m in height and 200m^2 in area and at least 10m from any other tyre storage area or combustible or flammable material including vegetation.

Asbestos Disposal

(F13) All asbestos waste must be:

a) disposed to a designated asbestos landfill area:

i) that is separate to the active waste disposal area; and

ii) where no excavation will take place following the disposal of asbestos waste;

b) promptly covered after disposal with a minimum of 200 mm of consolidated earth or equivalent cover material; and

c) placed to ensure that a minimum distance of two (2) metres is achieved from both the surface and boundary of the landfill excluding any final cover system required by this approval.

Battery Storage

(F14) Waste wet cell batteries may only be temporarily stored for a period no longer than six (6) months in a covered enclosure that has been bunded to contain spillages and leakages.

Car Bodies

(F15) Car bodies must be drained of all fluids prior to compaction and must only be stored in the scrap steel storage and processing area. All fluids must be collected and appropriately managed for recycling and/or treatment.

Waste Acceptance Criteria

(F16) The following wastes may be disposed of at the Evans Landing Landfill:

(a) domestic waste;
(b) commercial waste;
(c) industrial waste;
(d) regulated waste in accordance with Condition (F19); and
(e) construction and demolition waste.

(F17) Segregated recyclable materials including tyres, scrap steel and aluminium, lead acid batteries and waste oil must not be disposed of in the landfill area but must be dealt with in accordance with the following hierarchy with the preference reducing down the list:

(a) reuse;
(b) recycling; or
(c) energy recovery.

(F18) Notwithstanding any condition of this environmental authority, the following waste materials (other than where the following materials are commingled in waste received) are not permitted to be disposed of in the landfill:

- hot ash;
- material that is smoldering or aflame;
- material containing a substance which is ignitable, corrosive, reactive or toxic (other than materials containing a toxic substance from domestic premises);
- radioactive wastes;
- explosives;
- ammunition, other than ammunition that no longer contains explosives, pyrotechnics or propellants apart from trace residues that are no longer capable of supporting combustion or an explosive reaction;
- cytotoxic wastes;
- tallow and vegetable oils unless rendered incapable of yielding free liquids;
- liquid or semi-liquid waste other than liquid or semi-liquid waste which has been generated on the Evans Landing Landfill;
- wastes yielding free liquid;
- sludges from acid, alkaline and solvent baths;
- waste oil and oil/water emulsions;
- tyres;
- filled or partly filled drums containing liquid wastes;
- waste pesticide containers or other drums which have not been triple rinsed, pressure rinsed or otherwise thoroughly cleaned;
- soluble chemical wastes;
- car bodies;
- wet cell batteries;
- nickel metal hydride or nickel cadmium batteries;
- waste pesticides;
- waste paints and solvents;
- gas bottles;
- treatment tank sludge or residues unless dewatered;
- biosolids (sewage sludges) unless dewatered;
- grease trap wastes unless dewatered; and
- green waste (other than mulch used for day cover).

(F19) A regulated waste (excluding commingled waste) must not be disposed of at the Evans Landing Landfill:

(a) if it exhibits any of the hazard characteristics listed in Table F1 – Hazard Characteristics; and

(b) unless the holder of this environmental authority effectively implements risk assessment practices and procedures for sampling and contaminant testing to ensure that the material accepted contains less than the maximum contaminant levels in Appendix 1 – Maximum Contaminant Levels in Regulated Waste; Table 1 – Maximum Contaminant Levels and/or the maximum leaching contaminant levels prescribed in Table 2 - Maximum Leaching Contaminant Levels or Table 3 - Maximum Contaminant Levels in Soils and Table 4 - Maximum Leaching Contaminant Levels in Soils.

Table F1 – Hazard Characteristics

Hazard Characteristic	Description of the Hazard Characteristic
Ignitability	Regulated wastes that are capable of causing a fire when ignited through friction, absorption of moisture, or spontaneous chemical changes under standard temperature and pressure.
Corrosivity	Regulated wastes which on dissolution exhibit a pH of 2 or less or 12.5 or greater.
Reactivity	Regulated wastes that have any of the following properties: • react violently with water; and/or, • form potentially explosive mixtures with water and other substances likely to be disposed of in the landfill facility; and/or, • generate toxic gases, vapours, or fumes dangerous to human health or the environment when mixed with water and other substances likely to be disposed of in the landfill facility; and/or, • contain substances which generate toxic gases, vapours or fumes when exposed to pH conditions between 2 and 12.5; and/or, • are capable of detonation or explosive reaction when subjected to a strong initiating source or if heated under confinement; and/or, • are readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
Toxicity	Regulated wastes that have: • contaminant concentrations in the waste exceeding the maximum contaminant levels in Appendix 1 – Maximum Contaminant Levels in Regulated Waste; Table 1 – Maximum Contaminant Levels; or, • leaching contaminant levels in the waste when measured in accordance with Toxicity Characteristic Leaching Procedure (TCLP), exceeding the concentrations prescribed in Appendix 1 – Maximum Contaminant Levels in Regulated Waste; Table 2 - Maximum Leaching Contaminant Levels. For any soil contaminated by radioactive material: • the gross alpha and gross beta activity concentration in the Toxicity Characteristic Leaching Procedure (TCLP) extracts from the material are no more than one hundred (100) times the concentrations for the screening of gross alpha and gross beta activity concentrations specified in the NHMRC/ARMCANZ Australian Drinking Water Guidelines, 2004.

(F20) Records of the volumes and type of waste accepted at the landfill facility must be kept and maintained and made available for inspection upon request by the administering authority.

Note: The submission of an annual report on these volumes for the local government's waste management strategic plan or otherwise required by the administering authority will be deemed to satisfy the reporting requirement of this condition.

Contaminated Soils and Bio-solids

(F21) Contaminated soils or aged bio-solids may be used for day cover material upon waste disposal cells if contaminated levels are less than the:

(a) maximum contaminant levels in Appendix 1 – Maximum Contaminant Levels in Regulated Waste; Table 3 – Maximum Contaminant Levels in Soils; and,

(b) maximum leaching contaminant levels prescribed in Appendix 1 – Maximum Contaminant Levels in Regulated Waste; Table 4 - Maximum Leaching Contaminant Levels in Soils.

Removal or Disposal of Prohibited Waste

(F22) In the event the holder of this environmental authority becomes aware of any prohibited waste being received at the Evans Landing Landfill, the holder must:

(a) cease depositing such waste if it is still occurring;

(b) remove the prohibited waste and store in a covered and bunded area; and

(c) arrange for a person who can lawfully transport such waste to promptly collect it after it being identified and remove it to a facility that can lawfully accept it.

(F23) If the holder of this environmental authority becomes aware that a person has removed regulated waste from the Evans Landing Landfill and/or disposed of regulated waste in a manner that is improper or unlawful or which is not authorised by this environmental authority, then the holder of this environmental authority must, as soon as practicable, notify the administering authority of all relevant facts, matters and circumstances known concerning the disposal.

Waste Oil Storage

(F24) Waste oil may be temporarily stored for a period no longer than six (6) months in drums or other containers provided that the drums or containers are:

(a) stored in a covered area designated for this purpose;

(b) bunded to contain spillages and leakages; and

(c) securely sealed when full to prevent spillage.

Equipment Containing Ozone Depleting Gases

(F25) Waste refrigerators, freezers, air conditioners or any other equipment containing ozone depleting gases received at the Evans Landing Landfill must be either degassed by an appropriately qualified person at the Evans Landing Landfill or, if degassed off site, accompanied by a degassing certificate signed by a qualified person.

Regulated Waste Loading and Unloading

(F26) All loading and unloading of liquid regulated wastes must only take place in bunded areas capable of containing and permit recovery of any spillage.

(F27) The holder of this environmental authority must ensure that sufficient equipment is available for the containment and recovery of spillages of liquid regulated waste.

Mixing of Regulated Wastes

(F28) The holder of this environmental authority must not cause or permit the mixing of incompatible regulated wastes.

Movement of Regulated Wastes

(F29) All vehicles used to transport regulated waste must be registered with the administering authority.

(F30) Where regulated waste is removed from the Evans Landing Landfill other than as permitted under another schedule of this environmental authority, the holder of this environmental authority must ensure that:

(a) the removal and transport of such wastes, where it constitutes an environmentally relevant activity under the *Environmental Protection Regulation 2008*, is carried out by a person licensed for carrying out this activity to a facility that is lawfully able to accept the waste under the *Environmental Protection Act 1994*; and

(b) records are kept of the following:

(i) the date, quantity and type of waste removed;
(ii) name of the regulated waste transporter(s) that removed the waste; and
(iii) the intended treatment/disposal destination of the waste.

Note: Records of documents maintained in compliance with a waste tracking system established under the *Environmental Protection Act 1994* or any other law for regulated waste will be deemed to satisfy this condition.

(F31) All vehicles (including load areas), containers and secondary containers used to transport regulated waste must be:

(a) maintained in a proper and efficient condition at all times to prevent spillage or leakage of waste;

(b) kept clean at all times whilst regulated waste is not being transported; and

(c) mounted securely, sealed and maintained in a condition that will prevent spillage or leakage of the waste.

(F32) Each container of regulated waste stored awaiting movement off site must be clearly marked to identify the contents.

(F33) Regulated waste is not permitted to be released from any vehicle or any container transported by that vehicle other than at the designated regulated waste disposal area located at the Evans Landing Landfill.

(F34) All asbestos transport must be:

(a) placed in bins/containers on the vehicle and double wrapped with 0.2mm thick polyethylene sheets and sealed with adhesive tape;

(b) labelled to indicate the presence of asbestos and the asbestos risk safety phrases;

(c) securely stored on the vehicle during transit in such way as not to cause the packaging to rupture;

(d) off loaded in such a manner as to not cause the packaging to rupture; and

(e) repackaged promptly if rupturing of the package(s) occurs.

Disposal of Clinical Waste

(F35) Untreated clinical waste must be disposed of under supervised burial in a designated area.

(F36) Promptly after disposal has taken place, untreated clinical waste must be covered with a layer of compacted waste or earth to a minimum depth of one (1) metre.

Clinical Waste Acceptance Criteria

(F37) Notwithstanding any condition of this environmental authority, the following clinical waste materials are not permitted to be disposed of in the landfill:

(a) cytotoxic;

(b) human body parts;

(c) pharmaceutical;

(d) radioactive; and

(e) chemical waste.

Landfill Liner Construction

(F38) A landfill liner system must be installed and maintained for any newly constructed waste cell at the Evans Landing Landfill in accordance with the administering authority's *Guideline – Landfill Siting, Design, Operation and Rehabilitation* to effectively prevent any release of contaminants to waters.

Leachate Management

(F39) Measures must be implemented to prevent hazardous leachate being directly or indirectly released or likely to be released as a result of any landfill activity to any groundwater or surface water.

(F40) A leachate collection system must be installed and maintained at the Evans Landing Landfill to effectively and efficiently:

(a) collect any leachate generated within the landfill footprint;

(b) deliver the collected leachate to a leachate storage or disposal facility; and

(c) for any newly constructed waste cell, control the leachate head on any leachate collection sump serving the landfill so that it does not exceed 0.3 metres.

(F41) Any leachate collection system or first flush pond must be maintained in an effective operating condition as per the design criteria and managed so that stored leachate or stormwater volumes are minimised following each rainfall event to reinstate holding capacity in readiness for the next rainfall event.

(F42) Leachate or contaminated stormwater intercepted by the leachate collection system may only be managed:

(a) by evaporation in a pond constructed on the Evans Landing Landfill;

(b) by recirculation back into the landfilled waste;

(c) by irrigation over exposed wastes on the Evans Landing Landfill; or

(d) by disposal to a sewage treatment plant.

(F43) All ponds used for the storage of leachate on the Evans Landing Landfill must be constructed to a standard no more permeable than $1x10^{-9}$ m/sec and $1x10^{-8}$ m/sec for all first flush stormwater ponds. All ponds must be maintained to prevent release of contaminated water through the bed or banks of the pond to any waters including ground water.

(F44) Leachate pumping stations must be fitted with pump-failure alarms as well as high-level alarms to warn of imminent pump station overflow. Backup pumps must be readily available on site in the event of pump system failure. All alarms must be able to operate without mains power if such a power failure occurs and when in operation, must notify the appropriate person to respond to the alarm.

Leachate Management and Monitoring

(F45) The holder of this environmental authority must develop and implement a leachate quality and quantity management and monitoring program for the leachate generated and recirculated at the Evans Landing Landfill that includes at least the following:

(a) measurement and recording of daily rainfall or rainfall events (if an event is longer than twenty-four (24) hours) at the Evans Landing Landfill;

(b) daily measurement and recording of the quantity of recirculated leachate during the wet season (1 Nov – 31 March) and weekly measurement and recording of the quantity of recirculated leachate during other periods;

(c) for any newly constructed waste cell, during the wet season (1 Nov – 31 March) weekly calculation of the volume of leachate in the landfill based on monitoring of the level of leachate at any leachate collection sump or monitoring well correlated to both AHD (Australian Height Datum) and the level of the top of the closest perimeter bund to the sump or monitoring well and monthly calculation during other periods;

(d) calculation of an annual water balance for the landfill that includes but is not necessarily limited to, incident rainfall, evapotranspiration and leachate recirculation rates;

(e) a sufficient number of monitoring locations to establish the composition and volume of leachate generated within the landfill;

(f) sampling of leachate (when present) from the landfill on at least a quarterly basis each year. If no leachate is present, the environmental authority holder must record that no leachate is present; and

(g) analysis of leachate samples for the quality characteristics identified for leachate in Table F3 – Monitoring Requirements.

Stormwater Management

(F46) Contaminated stormwater runoff from any waste handling, processing, storage or disposal area on the Evans Landing Landfill or any vehicle maintenance, washdown area or wheel washer must not be released directly or indirectly to any waters except as permitted under the conditions of this environmental authority.

Surface Water Monitoring

(F47) The release of contaminants from the landfill must only occur at the release points specified in Table F2 – Release Points.

Table F2 - Release Points

Release Point	Description of Water Released	Contaminant Source	Description & Nature of Receiving Waters	Coordinates (GDA94 MGAz54) Monitoring Location	
				Northing	Easting
Stormwater Ponds					
Spillway 1	Surface Area Drainage (SW1)	Surface of waste disposal cells	Bushland and Embley River	8600491	590797
Spillway 2	Surface Area Drainage (SW2)			8600277	590780
Spillway 3	Surface Area Drainage (SW3)			8600190	591055
Spillway 4	Surface Area Drainage (SW4)			8600344	591144
Spillway 5	Surface Area Drainage (SW5)			8600307	591264

(F48) The release of contaminants from the release points must be monitored at the monitoring locations listed in Table F2 – Release Points and at a frequency specified in Condition (F49).

(F49) The release of contaminants at the release points specified in Table F2 – Release Points, waters must be monitored for each quality characteristic specified for surface water in Table F3 – Monitoring Requirements. For any release, waters must be monitored if it is safe to do so:

(a) promptly and within twenty-four (24) hours of the commencement of release;

(b) daily during release for seven (7) days;

(c) weekly thereafter for one (1) month; and

(d) monthly for the remainder of the wet season.

Groundwater Monitoring

(F50) An effective groundwater monitoring program must be developed in accordance with the ANZECC (2000) methodology and submitted to the administering authority before 31 August 2012. The program must include:

a) installation of a groundwater monitoring network which:
   i) establishes the reference quality of groundwater up gradient of the landfill site;
   ii) are installed and maintained by a person possessing appropriate qualifications and experience in the fields of hydrogeology and groundwater monitoring program design to be able to competently make recommendations about these matters;
   iii) include a sufficient number of "compliance bores" to detect any impact on groundwater as a consequence of landfill operations, constructed in accordance with the "Minimum Construction Requirements for Water Bores in Australia" (Agricultural and Resource Management Council of Australia and New Zealand 1997), that are located not more than 150 metres from the landfill area or at the boundary of the landfill facility whichever is the closer; and
   iv) provides representative groundwater samples for the aquifers being sampled;
b) analysis of groundwater samples for at least the quality characteristics identified for groundwater in Table F3 – Monitoring Requirements;
c) collection of groundwater quality samples from groundwater bores at least quarterly; and
d) quarterly assessment of monitoring results to determine whether or not there has been any adverse change for each groundwater quality characteristic at locations hydraulically down gradient of the landfill unit when compared to reference values.

Table F3 – Monitoring Requirements

Quality Characteristic	Leachate	Surface Water	Groundwater
pH	X	X	X
electrical conductivity	X	X	X
Total dissolved solids	X	X	X
dissolved oxygen	X	X	
bicarbonate ($HC0_3$)	X		X
Nitrate	X	X	X
Ammonia	X	X	X
Calcium	X	X	X
Sulphate	X	X	X
Chloride	X	X	X
hexavalent chromium	X	X	
Cadmium	X	X	
Manganese	X	X	X
total iron	X	X	X
Copper	X	X	X
Lead	X	X	X
Zinc	X	X	X
pesticides (organochlorines and organophosphates)	X		
Polynuclear Aromatic Hydrocarbons (PAHs)	X		
Total Recoverable Hydrocarbons	X	X	X
BTEX (Benzene, Toluene, Ethyl Benzene and Xylene)	X		
Chemical Oxygen Demand (COD)	X	X	X
5-Day Biological Oxygen Demand (BOD_5)	X	X	
Total Organic Carbon (TOC)	X		

Receiving Environment Monitoring Program

(F51) A Receiving Environment Monitoring Program (REMP) must be developed and implemented by 1 July 2012 to monitor and record the effects of the release of contaminants on the receiving environment periodically and whilst contaminants are being discharged from the licensed place, with the aim of identifying and describing the extent of any adverse impacts on local environmental values and to monitor any changes in receiving waters (including groundwater). A copy of the REMP and any update or variation of the REMP following adoption of a new Plan of Operations must be provided to the administering authority prior to its implementation and due consideration given to any comments made on the REMP by the administering authority.

Note: For the purposes of the REMP, the receiving environment is the waters and connected waterways (including groundwater) downstream of any release associated with the Evans Landing Landfill.

(F52) The REMP must address (but not necessarily be limited to) the following:

(a) description of potentially affected receiving groundwaters and surface waters including key communities and reference water quality and sediment characteristics based on accurate and reliable monitoring data that takes into consideration any temporal variation (e.g. seasonality);

(b) description of applicable environmental values and water quality objectives to be achieved (i.e. as scheduled pursuant to the Environmental Protection (Water) Policy);

(c) any relevant reports prepared by other governmental or professional research organisations that relate to the receiving environment to which the REMP applies;

(d) water and sediment quality targets within the receiving environment to be achieved and clarification of contaminant concentrations or levels indicating adverse environmental impacts during the period upon which the REMP applies;

(e) monitoring for any potential adverse environmental impacts caused by a release;

(f) monitoring of stream flow or alternative estimation method to gain an understanding of the hydrology of the receiving waters and the circumstances under which releases occur;

(g) monitoring of toxicants that must consider the indicators specified in Table F3 – Monitoring Requirements to assess the extent of compliance of concentrations with water quality objectives and/or the ANZECC & ARMCANZ (2000) Guidelines for slightly to moderately disturbed ecosystems;

(h) monitoring of physical and chemical parameters including as a minimum those specified in Table F3 – Monitoring Requirements (in addition to dissolved oxygen saturation and temperature). The list of quality characteristics required to be monitored as per Table F3 - Monitoring Requirements will be reviewed once the results of the monitoring data become available. If it is determined that there is no need to monitor for certain individual quality characteristics then these can be removed from Table F3 - Monitoring Requirements;

(i) monitoring of biological indicators in accordance with the administering authority's monitoring and sampling manual using recognised standard methodology approved by the administering authority and monitoring metals/metalloids in sediments (in accordance with ANZECC & ARMCANZ (2000), Simpson et al (2005) *Handbook for Sediment Quality Assessment* and/or the most recent version of AS5667*.1 Guidance on Sampling of Bottom Sediments*);

(j) the locations of monitoring points (including the locations of reference/upstream and downstream potentially impacted sites for each release point). Reference sites must comply with the following criteria:

(i) be from the same bio-geographic and climatic region;
(ii) have similar geology, soil types and topography;
(iii) contain a range of habitats similar to those at the potentially impacted sites;
(iv) have a similar flow regime; and
(v) not be so close to the potentially impacted sites that any disturbance at the potentially impacted sites also results in a change at the reference site;

(k) a frequency or scheduling of sampling and analysis that is sufficient to determine water quality objectives and to derive site specific reference values within two (2) years (depending on wet season flows) in accordance with the *Queensland Water Quality Guidelines*. For ephemeral streams, this should include periods of flow irrespective of landfill or other discharges;

(l) specify sampling and analysis methods and quality assurance and control;

(m) any historical datasets to be relied upon;

(n) description of the statistical basis on which conclusions are drawn;

(o) any spatial and temporal controls to exclude potential confounding factors; and

(p) inclusion of additional monitoring points at least twelve (12) months prior to potential impact on the site as set out in the Plan of Operations.

(F53) A report outlining the findings of the REMP including all monitoring results and interpretations in accordance with Condition (F52) must be prepared and submitted in writing to the administering authority by 31 January 2015. This should include an assessment of reference water quality, any assimilative capacity for those contaminants monitored and the suitability of current discharge limits to protect downstream environment values and include recommendations to monitor appropriate quality characteristics.

Active Waste Disposal Cell Management

(F54) The holder of this environmental authority must ensure that waste disposal activities do not extend beyond the boundary of the active waste cell.

(F55) The holder of this environmental authority must ensure that all wastes accepted for disposal at the Evans Landing Landfill are not disposed of:

(a) outside any active waste disposal cell;

(b) into waters or leachate collected at the base of any active waste disposal cell; and

(c) beyond the catchment of any leachate collection drains installed as part of a leachate collection system.

(F56) All wastes must be deposited in lifts not exceeding a vertical height of four (4) metres.

(F57) Every lift of waste deposited in the active waste disposal cell must be effectively compacted in order to maximise waste density within the cell. Accurate boundary and topographic surveys must be completed prior to each lift.

(F58) Large items for disposal must be compacted before and/or after being deposited to minimise residual void space in the landfill.

(F59) Wastes deposited in any active waste disposal cell must be consolidated, compacted and covered with a layer of inert earthen material or mulch, as often as is necessary, but at least daily, to effectively minimise the quantity of wind-blown litter, odour and fly nuisance resulting from exposure of putrescibles waste.

Waste Disposal Cell Interim Cover

(F60) The holder of this environmental authority must apply interim cover on waste disposal cells. This cover is to be placed on areas that are inactive for a period of four months or greater and does not include the operational areas at the cell face. The interim cover must conform to the following criteria:

1. consists of at least 300 mm of compacted material; and,
2. to achieve a maximum permeability of 1 x 10^{-7} metres per second;
3. minimise infiltration of water into the waste and ponding of water on the surface of the cell; and
4. is resistant to erosion by surface water flows.

(F61) Material for day cover must be readily available at all times in a quantity sufficient for not less than two weeks normal operation of the waste disposal cell. Day cover is to be applied to operational areas of the cell face to conceal waste.

(F62) The holder of this environmental authority must ensure that any day cover on a cell is removed promptly prior to any subsequent waste disposal.

Landfill Capping

(F63) A trial capping program must be finalised at least twelve (12) months prior to the completion of waste receipt operations for the landfill. This program must include but should not be limited to the following:

(a) schematic representation of final land form inclusive of drainage features;

(b) slope designs;

(c) cover design;

(d) drainage design;

(e) erosion controls proposed on reformed land;

(f) description of experimental design for monitoring of analogue and rehabilitated areas inclusive of statistical design;

(g) proposed revegetation criteria including but not limited to:

(i) species diversity, abundance and composition,

(ii) projective cover, and

(iii) dry matter production;

(h) proposed revegetation methods inclusive of plant species selection, re-profiling, re-spreading soil, soil ameliorants/amendments, surface preparation and method of propagation;

(i) materials balance including available topsoil for all sites and low permeability encapsulation media; and

(j) research program and associated milestones.

Rehabilitation

(F64) Rehabilitation of disturbed areas must take place progressively as waste disposal cells are completed.

(F65) Access to areas awaiting rehabilitation or being rehabilitated must be restricted by suitable barriers to prevent disturbance of these areas.

Closure and Post Closure Care Plan

(F66) A Closure and Post Closure Care Plan must be submitted to the administering authority at least twelve (12) months prior to the completion of waste receipt operations for the landfill.

(F67) The Closure and Post Closure Care Plan for the Evans Landing Landfill must be implemented for a nominal period of:

(a) at least thirty (30) years after completion of waste disposal activities; or

(b) a shorter period such that the landfill unit and surrounding Evans Landing Landfill are geo-technically stable and it can be demonstrated to the administering authority that there will be no likely release of waste materials, leachate or other contaminants to the environment.

(F68) The post closure care element of the Closure and Post Closure Care Plan must include at least the following:

(a) monitoring of:
  (i) the leachate collection and recirculation system;
  (ii) the groundwater monitoring network;
  (iii) leachate quality;
  (iv) groundwater quality; and
  (v) surface water quality;

(b) maintenance of:
  (i) the leachate collection and recirculation system;
  (ii) the groundwater monitoring network; and
  (iii) the integrity and effectiveness of final cover systems.

END OF CONDITIONS FOR SCHEDULE F

SCHEDULE G – NOISE

General

(G1) Noise from any mining activity must not cause environmental harm at any sensitive place or commercial place.

(G2) In the event of a complaint made to the administering authority (considered in the opinion of an authorised officer to be neither frivolous or vexatious) about noise generated in carrying out the mining activity and the noise is considered by the administering authority to be an unreasonable noise, the holder of this environmental authority must take action to ensure that it is no longer an unreasonable noise.

Noise Monitoring

(G3) Ensure that noise generated by the mining activities (excluding public roads, railway and port) does not cause the limits of goals in Table G1 – Noise Limits to be exceeded.

Table G1 - Noise Limits

Noise Level dB(A) measured as:	Monday to Saturday			Sundays and Public Holidays		
	7am to 6pm	6pm to 10pm	10pm to 7am	9am to 6pm	6pm to 10pm	10pm to 9am
$L_{Aeq, adj, 1 hour}$	45	45	43	45	45	43
$L_{A1, adj, 1 hour}$	50	50	45	50	50	45

(G4) When requested by the administering authority, noise monitoring and recording must be undertaken within a timeframe nominated by the administering authority to investigate any complaint of environmental nuisance (considered in the opinion of an authorised officer to be neither frivolous or vexatious) at any sensitive place or commercial place and the results must be provided to the administering authority within fourteen (14) days following completion of monitoring.

(G5) Noise monitoring and recording must include the following descriptor characteristics and matters:

(a) $L_{Aeq,}$ and L_{A1} (where N equals the statistical levels of 1, 10 and 90 and T = 60 mins);

(b) background noise $L_{A90,}$;

(c) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels;

(d) atmospheric conditions including temperature, relative humidity and wind speed and directions;

(e) effects due to any extraneous factors such as traffic noise;

(f) location, date and time of monitoring;

(g) if the complaint concerns low frequency noise, Max $Lp_{LIN,T}$; and

(h) if the complaint concerns low frequency noise, one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range.

(G6) The method of measurement and reporting of noise levels must comply with the most recent edition of the administering authority's Noise Measurement Manual or the most recent version of *AS1055 Acoustics – Description and measurement of environmental noise.*

END OF CONDITIONS FOR SCHEDULE G

SCHEDULE H – WATER

General

(H1) Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters except as permitted under the conditions of this environmental authority.

(H2) The maintenance and cleaning of vehicles and any other equipment or plant must be carried out in areas and in a manner which minimises the potential for environmental harm.

(H3) All determinations of water quality must be:

(a) made in accordance with methods prescribed in the latest edition of the administering authority's *Monitoring and Sampling Manual*; and

(b) carried out on representative samples.

(H4) The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format when requested:

(a) the date and time upon which the sample was taken;

(b) the monitoring point at which the sample was taken;

(c) the measured or estimated daily quantity of the contaminants released from all release points identified in Table H1 – Release Points (point source release);

(d) where practicable flow rate at the time of sampling for each release point identified in Table H1 – Release Points (point source release);

(e) the results of all monitoring and details of any exceedances with the conditions of this environmental authority; and

(f) water quality monitoring data provided electronically in the specified format.

Contaminant Release to Waters

*(H5) The r*elease of contaminants to waters from mining activities must only occur:

(a) at the release points specified in Table H1 – Release Points (point source release); and

(b) from extraction areas specified in Table H2 – Release from Extraction Areas

Table H1 - Release Points (point source release)

Release Point	Description of Water Released	Contaminant Source	Description & Nature of Receiving Waters	Release Monitoring Locations	
				Northing (GDA94)	Easting (GDA94)
North of the Embley					
Andoom TSF Emergency Spillway	Tailings decant water	Andoom TSF Cells 1 - 4	Andoom Creek	8616705	590654
East Weipa TSF Emergency Spillway		East Weipa TSF Cells 1, 2A, 2B & 3	Trunding Creek	8602123	594652
East Weipa TSF (20MG) Reclaim Dam Spillway			Embley River	8600684	594977

Release Point	Description of Water Released	Contaminant Source	Description & Nature of Receiving Waters	Release Monitoring Locations	
				Northing (GDA94)	Easting (GDA94)
East Weipa 55 MG Process Water Dam	Process Water	East Weipa TSF Cells 1, 2A, 2B & 3, Shallow Aquifer & Artesian Aquifer	Embley River	8600178	594051
East Weipa Infrastructure Area	Tailings decant water East Weipa Processing area drainage Perry's Pond discharges	Emergency Dam Perry's Pond Plant Infrastructure	Embley River	8599182	595069
East Weipa 1&2 Spillway	Tailings decant water	East Weipa 1&2 TSF	Embley River	8599495	595414
Lake Mcleod and Lake Patricia Overflow Causeway	Stormwater runoff	West Weipa TSF G & X Dam & West Weipa 2	Mission River via Lake McLeod	8602097	591668
Andoom Processing Area – Kings Canyon	Processing Area Drainage	Plant Infrastructure	Saleng Tea Tree Swamp	8612996	589730
South of the Embley					
Torro TSF North Cell Spillway	Tailings decant water	Torro TSF	Norman Creek Tributary	8569004	569657
Torro TSF South Cell Spillway				8567457	569657
Torro Tailings Recovery Slot			Norman Creek Tributary	8567610	569950
Norman Creek TSF North Cell Spillway		Norman Creek TSF	Tributary of Norman Creek	TBD[1]	TBD[1]
South of the Embley					
Norman Creek TSF South Cell Spillway	Tailings decant water	Norman Creek TSF	Tributary of Norman Creek	TBD[1]	TBD[1]
Norman Creek Tailings Recovery Slot				TBD[1]	TBD[1]
Boyd Process Water Pond		Torro TSF	Gulf of Carpentaria via unnamed drainage	8569850[2]	568250[2]

Release Point	Description of Water Released	Contaminant Source	Description & Nature of Receiving Waters	Release Monitoring Locations	
				Northing (GDA94)	Easting (GDA94)
Boyd MIA Drainage Slot	Processing area drainage	Plant Infrastructure		8570981	568918
Boyd Northern Stockpile Sediment Pond	Stormwater runoff	Ore stockpiles		8570648[2]	567952[2]
Boyd Southern Stockpile Sediment Pond			Unnamed Creek near Pera Head	8568446[1]	566886[1]
Norman Creek Stockpile Sediment Pond			Gulf of Carpentaria via unnamed drainage	TBD[1]	TBD[1]
Norman Creek Process Water Pond	Tailings decant water	Norman Creek TSF	Norman Creek Tributary	TBD[1]	TBD[1]
Norman Creek MIA Drainage Slot	Processing area drainage	Plant Infrastructure		TBD[1]	TBD[1]

[1] To be determined and notified to the administering authority three (3) months prior to construction.
[2] If the release is directed via site drainage to the Boyd MIA Drainage Slot, and not directly to receiving environment, the Release Monitoring Location is the Boyd MIA Drainage Slot and monitoring is only required when a release occurs from the Boyd MIA Drainage Slot.

Table H2 – Release from Extraction Areas

Monitoring Location	Description of Water Releases	Contaminant Source	Description of Receiving Waters	Coordinates (GDA94 MGAz54) Monitoring Location	
				Northing	Easting
Downstream Sites					
Defined in Plan of Operations in accordance with the REMP	Release of contaminated stormwater via sediments dams	Extraction area	Streams, creeks, rivers and coastal environment in and adjacent to ML 7024 and ML 6024	As described in the current Plan of Operations in accordance with the REMP	As described in the current Plan of Operations in accordance with the REMP
Reference Sites					
Defined in Plan of Operations in accordance with the REMP	Release of stormwater uncontaminated by mining activities	NA	Streams, creeks, rivers and coastal environment in and adjacent to ML 7024 and ML 6024	As described in the current Plan of Operations in accordance with the REMP	As described in the current Plan of Operations in accordance with the REMP

(H6) The release of contaminants to waters from the release points must be monitored at the monitoring locations listed in Table H1 – Release Points (point source release) in accordance with the frequency specified in condition H8. The release of contaminants to waters from extraction areas must be monitored at the monitoring locations Table H2 – Release from Extraction Areas in accordance with the REMP.

(H7) The release of contaminants to waters from release points specified in Table H1 - Release Points (point source release) must not exceed the contaminant limit specified in Table H3 – Release Water Contaminant Limit.

(H8) Where there is a release to waters at the release points specified in Table H1 – Release Points (point source release) waters must be monitored for each quality characteristic specified in Table H3 – Release Water Contaminant Limit. For any release, waters must be monitored if it is safe to do so:

(a) promptly and within twenty-four (24) hours of the commencement of release;
(b) daily during release for seven (7) days;
(c) weekly thereafter for one (1) month; and
(d) monthly for the remainder of the wet season.

Table H3 – Release Water Contaminant Limit

Quality Characteristic	**Contaminant Limit**
Suspended Solids (mg/L)	70[1]
Dissolved Aluminium (µg/L)	320[2]
pH/EC/DO	For interpretation purposes

1. 99th percentile of three wet seasons of North of Embley Release Point data; excluding high suspended solids data from King Canal Sediment Dam
2. 99th percentile of three wet seasons of North of Embley Release point data; excluding data from King Canal and Lorim Point Polishing Pond.

(H9) The release of contaminants directly or indirectly to waters must not:

(a) produce any slick or other visible or odorous evidence of oil, grease or petrochemicals; or
(b) contain visible floating oil or grease.

(H10) Releases to waters from the mining activities must be undertaken so as not to cause erosion of the bed and banks of the receiving waters or cause a material build-up of sediment in such waters.

(H11) The authorised mining activities must not cause an exceedance of any limit for any quality characteristics as specified in Table H4 – Receiving Water Trigger Levels (Wet Season – December to April) (North of Embley) and Table H6 - Receiving Water Trigger Levels (Wet Season – December to April) (South of Embley).

If a release of contaminants to waters from extraction areas specified in Table H2 – Release from Extraction Areas exceed any limit for any quality characteristics as specified in Table H4 – Receiving Water Trigger Levels (Wet Season – December to April) (North of Embley) and Table H6 - Receiving Water Trigger Levels (Wet Season – December to April) (South of Embley) , the holder of this environmental authority must investigate the exceedance of the limit to determine if it is a result of the authorised mining activities in accordance with condition (H14).

Table H4 – Receiving Water Trigger Levels (Wet Season – December to April) (North of Embley)

Quality Characteristic	*Trigger Levels - freshwater*	Trigger Levels – estuarine waters	Limit type
pH (pH unit)	5.4 [1,3] (minimum) 6.3 [1,3] (maximum)	7.0 [4] (minimum) 8.5 [4] (maximum)	Median measured over the wet season
Turbidity (NTU)	21 [2,3]	37 [2,3]	Median measured over the wet season
Suspended Solids (mg/L)	8 [2,3]	30 [2,3]	Median measured over the wet season
Aluminium (µg/L)	90 [2,3]	104 [2,3]	Median measured over the wet season
Dissolved Oxygen (mg/L)	For interpretation purposes		
Temperature (°C)			
EC (µS/cm)			

[1] Trigger levels based on 80th percentile (maximum) and 20th percentile (minimum) of at least 10 reference site wet season samples derived using the DERM (2009) methodology.
[2] Trigger levels are based on the 80th percentiles of at least 10 consecutive reference site wet season samples, derived using the DERM (2009) methodology (Table D1, and section 3.4.3.1).
[3] Reference sites are to be determined in accordance with Condition (H17).
[4] Default trigger levels – from ANZECC (2000) trigger levels for aquatic ecosystems indicative of slightly disturbed tropical Australian estuarine ecosystems.
Note: Aluminium must be measured as total (unfiltered) and dissolved (<0.45µm filtered). Trigger levels for aluminium apply if dissolved results exceed trigger.

(H12) If there is an exceedance in accordance with condition H11 identified that will or has potential to cause environmental harm, the holder of the environmental authority must notify the administering authority in accordance with conditions A13, A14 and A15.

Receiving Waters Monitoring

(H13) Receiving waters must be monitored at the locations specified in Table H5 - Receiving Water Reference and Downstream Monitoring Locations monthly during the wet season (December to April) for each quality characteristic stated in Table H4 – Receiving Water Trigger Levels (Wet Season-December to April) (North of Embley) and Table H6 - Receiving Water Trigger Levels (Wet Season – December to April) (South of Embley).

Table H5- Receiving Water Reference and Downstream Monitoring Locations

Release Point	Description of Water Released	Contaminant Source	Description & Nature of Receiving Waters	Downstream Receiving Waters Monitoring Locations		Release Reference Monitoring Locations	
				Northing	Easting	Northing	Easting
				Coordinates (GDA94 MGAz54)			
North of Embley							
Andoom TSF Emergency Spillway	Tailings decant water	Andoom TSF Cells 1 - 4	Andoom Creek	8617302	591806	8616946	603924
						8614977	604598
						8598327	621077
						8597092	618804
East Weipa TSF Emergency Spillway		East Weipa TSF Cells 1, 2A, 2B & 3	Trunding Creek	8602725	594683	8616946	603924
						8614977	604598
						8598327	621077
						8597092	618804
			Embley River	8599804	592987	8593092	618204

Release Point	Description of Water Released	Contaminant Source	Description & Nature of Receiving Waters	Downstream Receiving Waters Monitoring Locations		Release Reference Monitoring Locations	
				Northing	Easting	Northing	Easting
				Coordinates (GDA94 MGAz54)			
East Weipa TSF (20MG) Reclaim Dam Spillway	Tailings decant water	East Weipa TSF Cells 1, 2A, 2B & 3				8608448	603973
East Weipa 55 MG Process Water Dam	Process Water	East Weipa TSF Cells 1, 2A, 2B & 3, Shallow Aquifer & Artesian Aquifer	Embley River	8599804	592987	8593092	618204
						8608448	603973
East Weipa Infrastructure Area East Weipa 1&2 Spillway	Tailings decant water Processing area drainage Perry's Pond discharges	Emergency Dam Perry's Pond Plant Infrastructure	Embley River	8598748	595061	8593092	618204
						8608448	603973
Lake Mcleod and Lake Patricia Overflow Causeway	Stormwater runoff	West Weipa TSF G & X Dam & West Weipa 2	Mission River via Lake McLeod	8603213	590670	8593092	618204
						8608448	603973
Andoom Processing Area – Kings Canyon	Processing Area Drainage	Plant Infrastructure	Saleng Tea Tree Swamp	8612758	588893	8616946	603924
						8614977	604598
						8598327	621077
						8597092	618804
South of Embley							
Tailings Storage Facilities							
Torro TSF North Cell Spillway	Tailings decant water	Torro TSF	Norman Creek Tributary	8565654	571316	8569300	575551
Torro TSF South Cell Spillway							
Torro Tailings Recovery Slot							
Norman Creek TSF North Cell Spillway		Norman Creek TSF	Tributary of Norman Creek	TBD[1]	TBD[1]	TBD[1]	TBD[1]
Norman Creek TSF South Cell Spillway				TBD[1]	TBD[1]	TBD[1]	TBD[1]
Norman Creek Tailings Recovery Slot				TBD[1]	TBD[1]	TBD[1]	TBD[1]

Release Point	Description of Water Released	Contaminant Source	Description & Nature of Receiving Waters	Downstream Receiving Waters Monitoring Locations		Release Reference Monitoring Locations	
				Northing	Easting	Northing	Easting
				Coordinates (GDA94 MGAz54)			
Beneficiation Plant/Infrastructure Areas							
Boyd Process Water Pond	Tailings decant water	Torro TSF	Gulf of Carpentaria via unnamed drainage	8571572	569128	8552876	570096
						8575100	581194
Boyd MIA Drainage Slot	Processing area drainage	Plant Infrastructure		8571572	569128	8552876	570096
						8575100	581194
Boyd Northern Stockpile Sediment Pond	Stormwater runoff	Ore stockpiles		8571572	569128	8552876	570096
						8575100	581194
Boyd Southern Stockpile Sediment Pond			Unnamed Creek near Pera Head	8567881	566097	8552876	570096
						8575100	581194
Norman Creek Stockpile Sediment Pond			Gulf of Carpentaria via unnamed drainage	TBD[1]	TBD[1]	TBD[1]	TBD[1]
Norman Creek Process Water Pond	Tailings decant water	Norman Creek TSF	Norman Creek Tributary	TBD[1]	TBD[1]	TBD[1]	TBD[1]
Norman Creek MIA Drainage Slot	Processing area drainage	Plant Infrastructure		TBD[1]	TBD[1]	TBD[1]	TBD[1]
Extraction Areas: North of Embley and South of Embley							
Defined in the Plan of Operations	Release of contaminated stormwater via sediment dams.	Extraction areas	Streams, creeks, rivers and coastal environments in and adjacent to ML6024 and ML7024.	TBD[1]	TBD[1]	TBD[1]	TBD[1]

[1] To be determined and notified to the administering authority within three (3) months prior to the completion of construction.
Note; a single reference monitoring location may apply to more than one release point and may be located in another sub-catchment.

(H14) If the wet season (December – April) median of the quality characteristics of the receiving water monitored at the downstream monitoring locations defined in Table H5 - Receiving Water Reference and Downstream Monitoring Locations exceed any of the trigger levels specified in Table H4 – Receiving Water Trigger Levels (Wet Season – December to April) (North of Embley) and Table H6 - Receiving Water Trigger Levels (Wet Season – December to April) (South of Embley), the holder of this environmental authority must:

a) notify the administering authority in accordance with conditions A13, A14 and A15.

b) complete an investigation in accordance with the ANZECC & ARMCANZ (2000) methodology into the potential for environmental harm and provide a written report to the administering authority outlining:

i. details of the investigation carried out; and

ii. assessment as to whether the exceedance caused environmental harm; and

iii. if the investigation determines the exceedance caused environmental harm, outline the details of investigations taken and actions taken to prevent environmental harm ; and

iv. report all values above the trigger levels.

Table H6 – Receiving Water Trigger Levels (Wet Season – December to April) (South of Embley)

Quality Characteristic	*Trigger Levels – freshwater*	Trigger Levels – estuarine waters	Limit type
pH	20th percentile[1, 2, 4, 6] of reference[3] or 6.0[7] (minimum), whichever is lower 80th percentile[1, 2, 4, 6] of reference[3] or 8.0[7] (maximum), whichever is higher	20th percentile[1, 2, 4, 6] of reference[3] or 7.0[8] (minimum), whichever is lower. 80th percentile[1, 2, 4, 6] of reference[3] or 8.5[8] (maximum), whichever is higher.	Median measured over the wet season
Turbidity	80th percentile[1, 2, 4, 6] of reference[3] or 15 (NTU)[7], whichever is higher	80th percentile[1, 2, 4, 6] of reference[3] or 20 (NTU)[8], whichever is higher	Median measured over the wet season
Suspended Solids	80th percentile[1, 2, 4, 6] of reference[3]	80th percentile[1, 2, 4, 6] of reference[3]	Median measured over the wet season
Aluminium (µg/L)	80th percentile[1, 2, 4, 6] of reference[3] or 27 [9], whichever is higher	80th percentile[1, 2, 4, 5, 6] of reference[3]	Median measured over the wet season
Total Nitrogen[10] (µg/L)	80th percentile[1, 2, 4, 6] of reference[3] or 200-300 [7], whichever is higher	N/A	Median measured over the wet season
Total Phosphorus[10] (µg/L)	80th percentile[1, 2, 4, 6] of reference[3] or 10 [7], whichever is higher	N/A	Median measured over the wet season
Ammonia-N[10] (µg/L)	80th percentile[1, 2, 4, 6] of reference[3] or 10 [7], whichever is higher	N/A	Median measured over the wet season
Dissolved Oxygen (mg/L)	For interpretation purposes.		
Temperature (°C)			
EC (µS/cm)			

[1] An interim trigger value can be derived from ≥ 8 but ≤17 consecutive reference site samples, derived using the DERM (2009) methodology (Table D1, and section 3.4.3.1).
[2] Trigger values are based on the 80th percentile of at least 10 consecutive reference site samples, derived using the DERM (2009) methodology (Table D1, and section 3.4.3.1).
[3] Reference sites are to be determined in accordance with Condition (H17).
[4] 80th percentiles are calculated using ANZECC (2000) methodology (section 7.4.4.1).
[6] To be determined based on Receiving Environment Monitoring Program.
[7] ANZECC 2000, default trigger value for tropical Australia for slightly disturbed ecosystems, lowland river.
[8] ANZECC 2000, default trigger value for tropical Australia for slightly disturbed ecosystems, estuaries and marine
[9] ANZECC 2000, default trigger value for tropical Australia for high conservation/ecological value systems, freshwater.
[10] Monitoring of this quality characteristic only applies to receiving freshwater monitoring locations associated with a release from the Boyd MIA Drainage Slot and/or Norman Creek MIA Drainage Slot.
Note: Trigger levels for aluminium apply if dissolved results exceed trigger.

(H15) The holder of this environmental authority must develop and adopt a suitable methodology to determine and record stream flows at the locations upstream of each release point as specific in Table H1 – Release point (point source releases) for any receiving water into which a release occurs.

Receiving Environment Monitoring Program

(H16) A Receiving Environment Monitoring Program (REMP) must be developed and implemented to monitor and record the effects of the release of contaminants on the receiving environment periodically and whilst contaminants are being discharged from the licensed place with the aim of identifying and describing the extent of any adverse impacts on local environmental values and to monitor any changes in the receiving water (including groundwater) by:

(a) 1 July 2012 for the area north of the Embley River; and
(b) prior to commencement of significant construction work for the area south of the Embley River.

A copy of the REMP and any update or variation of the REMP following adoption of a new Plan of Operations must be provided to the administering authority prior to its implementation and due consideration given to any comments made on the REMP by the administering authority.

For the purposes of the REMP, the receiving environment is the waters and connected waterways (including groundwater) downstream of any release associated with the following:

(a) release points specified in Table H1 – Release Points (point source release); and

(b) extraction areas specified in Table H2 – Release from Extraction Areas.

(H17) The REMP must address (but not necessarily be limited to) the following:

a) description of potentially affected receiving groundwaters and surface waters including key communities and reference water quality and sediment characteristics based on accurate and reliable monitoring data that takes into consideration any temporal variation (e.g. seasonality);
b) description of applicable environmental values and water quality objectives to be achieved (i.e. as scheduled pursuant to the *Environmental Protection (Water) Policy*);
c) any relevant reports prepared by other governmental or professional research organisations that relate to the receiving environment to which the REMP applies;
d) water and sediment quality targets within the receiving environment to be achieved and clarification of contaminant concentrations or levels indicating adverse environmental impacts during the period upon which the REMP applies;
e) monitoring for any potential adverse environmental impacts caused by a release;
f) monitoring of stream flow or alternative estimation method to gain an understanding of the hydrology of the receiving waters and the circumstances under which releases occur;
g) monitoring of toxicants that must consider the indicators specified in Table H3 - Release Water Contaminant Limits or H6 – Receiving Water Trigger Levels (Wet Season – December to April) (South of Embley) and to assess the extent of the compliance of concentrations with water quality objectives and/or the ANZECC & ARMCANZ (2000) Guidelines for slightly to moderately disturbed ecosystems;
h) monitoring of physical and chemical parameters including as a minimum those specified in Table H3 - Release Water Contaminant Limits or H6 – Receiving Water Trigger Levels (Wet Season – December to April) (South of Embley) (in addition to dissolved oxygen saturation and temperature). The list of quality characteristics required to be monitored as per Table H3 - Release Water Contaminant Limits and H6 – Receiving Water Trigger Levels (Wet Season – December to April) (South of Embley) will be reviewed once the results of the monitoring data become available. If it is determined that there is no need to monitor for certain individual quality characteristics then these can be removed from Table H3 - Release Water Contaminant Limits or H6 – Receiving Water Trigger Levels (Wet Season – December to April) (South of Embley);
i) monitoring of biological indicators in accordance with the administering authority's monitoring and sampling manual using recognised standard methodology approved by the administering authority and monitoring metals/metalloids in sediments (in accordance with ANZECC & ARMCANZ (2000), Simpson et al (2005) *Handbook for Sediment Quality Assessment* and/or the most recent version of AS5667*.1 Guidance on Sampling of Bottom Sediments*;
j) the locations of monitoring points (including the locations of reference/upstream and downstream potentially impacted sites for each release point). Reference sites must be as representative as possible of the following criteria:
    (i) be from the same bio-geographic and climatic region;
    (ii) have similar geology, soil types and topography;
    (iii) contain a range of habitats similar to those at the potentially impacted sites;

(iv) have a similar flow regime; and
(v) not be so close to the potentially impacted sites that any disturbance at the potentially impacted sites also results in a change at the reference site; and,

k) a frequency or scheduling of sampling and analysis that is sufficient to determine water quality objectives and to derive site specific reference values within two (2) years (depending on wet season flows) in accordance with the *Queensland Water Quality Guidelines*. For ephemeral streams, this should include periods of flow irrespective of mine or other discharges;
l) specify sampling and analysis methods and quality assurance and control;
m) any historical datasets to be relied upon;
n) description of the statistical basis on which conclusions are drawn;
o) any spatial and temporal controls to exclude potential confounding factors; and
p) inclusion of additional monitoring points at least twelve (12) months prior to potential impact on the site as set out in the Plan of Operations.

(H18) A report outlining the findings of the REMP including all monitoring results and interpretations in accordance with Condition (H16) must be prepared and submitted in writing to the administering authority:

(a) for the area north of the Embley River by 31 January 2015; and

(b) for the area south of the Embley River within two (2) years of the submission of the REMP.

This should include an assessment of reference water quality, any assimilative capacity for those contaminants monitored and the suitability of current discharge limits to protect downstream environment values and include recommendations to set appropriate contaminant limits for the purpose of Conditions (H11) and (H14).

Water Supply Dam (South of Embley)

(H19) Groundwater abstracted from artesian bores located on ML7024 must not be directed to the Water Supply Dam (Dam C).

(H20) Water may be released from the Water Supply Dam (Dam C) at the release point identified as Dam C valve or spillway.

Groundwater

(H21) Groundwater monitoring bores installed after 30 August 2011 must be constructed and operated in accordance with methods prescribed in the latest edition of the manual titled *Minimum Construction Requirements for Water Bores in Australia.*

(H22) Annual groundwater monitoring reports analysing groundwater chemistry and hydro-geological status of all sub-artesian groundwater bores and groundwater conditions must be prepared and submitted to the administering authority on request.

Groundwater Monitoring (South of Embley)

(H23) Groundwater level (surface RL[1]) and water quality must be monitored if it is safe to do so at the locations and frequencies specified in Table H7 - Groundwater Monitoring Locations (South of Embley).

Table H7 - Groundwater Monitoring Locations (South of Embley)

Monitoring Location	Coordinates (GDA94 MGA z54)		Quality Characteristic	Monitoring Frequency
	Northing	Easting		
GM1 (Boyd MIA)	8570992	568847	Surface RL[1] (m), Total P, Total N, Ammonia, pH, Electrical Conductivity	Quarterly
GM2 (Boyd MIA)	8570697	568414		
GM3 (Norman Creek MIA)	TBD[2]	TBD[2]		
GM4 (Norman Creek MIA)	TBD[2]	TBD[2]		
GM5 (Torro TSF North)	8569770	568507	Surface RL[1] (m), pH, Electrical Conductivity	
GM6 (Torro TSF East)	8568410	569696		
GM7 (Torro TSF South)	8565436	569696		
GM8 (Torro TSF West)	8567655	567152		
GM9 (Norman Creek TSF North)	TBD[2]	TBD[2]		
GM10 (Norman Creek TSF East)	TBD[2]	TBD[2]		
GM11 (Norman Creek TSF South)	TBD[2]	TBD[2]		
GM12 (Norman Creek TSF West)	TBD[2]	TBD[2]		
GM13 (upgradient of mining areas)	8569755	580485	Surface RL[1] (m), pH, Electrical Conductivity	Quarterly
GM14 (within mining areas)	8568664	573303		
GM15 (downgradient of mining areas)	8566726	572991		
GM16 (upgradient of mining areas)	8574092	580496		
GM17 (within mining areas)	8571720	573093		
GM18 (downgradient of mining areas)	8571564	571080		
Bore 1	8570666	573297		
Bore 3	8572656	576494		
MB01	8564656	567707		
MB02	8563676	570084		
MB03a	8569770	568507		
MB04	8566660	572490		
SOE10	8566680	565313		

[1] RL must be measured to the nearest 5cm from the top of the bore casing.
[2] To be determined and notified to the administering authority upon construction of the bore.
Note: Groundwater monitoring locations in the area north of the Embley River are identified in the REMP (in accordance with Condition H17)

(H24) The Environmental Authority holder may request, as a part of the report prepared under Condition (H22) that the Administering Authority reduce the frequency of monitoring or vary the water quality parameters monitored.

Stormwater, Sediment and Erosion Controls

(H25) An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of mining activities on the mining lease(s) to prevent or minimise erosion and the release of sediment to receiving waters and the contamination of storm water for:

(a) areas other than land south of the Embley River by 1 March 2013; and

(b) prior to commencement of significant construction work for areas south of the Embley River.

(H26) The Erosion and Sediment Control Plan must provide for at least the following stormwater management functions and be made available to the administering authority upon request:

(a) prevent or minimise the contamination of stormwater;

(b) diverting uncontaminated stormwater run-off around areas disturbed by mining activities or where contaminants or wastes are stored or handled;

(c) contaminated stormwater runoff, incident rainfall and leachate is collected; and treated, reused, or released in accordance with the conditions of this environmental authority;

(d) roofing where practicable or minimising the size of areas where contaminants or wastes are stored or handled;

(e) using alternate materials and or processes (such as dry absorbents) to clean up spills that will minimise the generation of contaminated waters;

(f) erosion and sediment control structures are placed to minimise erosion of disturbed areas and prevent the contamination of any waters;

(g) procedures to ensure that erosion and sediment control structures are maintained and adequate storage is available in sediment dams in accordance with design criteria; and

(h) training of staff that will be responsible for maintenance and operations of erosion and sediment control structures.

(i) for areas south of the Embley River the plan must also provide for:
  (i) restrict clearing to areas essential for mining and associated facilities;
  (ii) vegetation clearing and topsoil stripping will occur following the wet season where possible;
  (iii) backfilled pits will be revegetated as soon practicable;
  (iv) in the event that active or backfilled pits are not fully internally draining, storm water runoff must be directed via a sediment pond;
  (v) disturbed areas around construction sites must be rehabilitated promptly if not in an area subject to mining or infrastructure;
  (vi) sediment traps must be included as part of the drainage designs at points where haul roads cross watercourses; and
  (vii) relevant aspects of the engineering Guidelines for Queensland for Soil Erosion and Sediment Control will be followed.

(H27) Erosion protection and sediment control measures must be implemented and maintained to minimise erosion and the release of sediment and contamination of stormwater as described in the Erosion and Sediment Control Plan.

(H28) Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable to minimise the release of wastes, contaminants or materials to any stormwater drainage system or receiving waters.

(H29) Sediment dams identified in Table H1 - Release Points (point source release) in the area south of Embley River must be designed and constructed with a minimum volume equivalent to a 1 in 10 year Annual Exceedance Probability (AEP) 24-hour storm event and must be maintained above the maximum sediment deposition levels.

(H30) Sediment dams constructed in the area south of Embley River as part of erosion and sediment control measures that treat releases of water from extraction areas to surface waters or to a place that is reasonably expected to reach surface water are to be built at a minimum with a volume equivalent to a 1 in 10 year Annual Exceedance Probability (AEP) 24-hour storm event and must be maintained above the maximum sediment deposition levels.

Water Management Plan

(H31) A Water Management Plan must be developed and implemented for areas other than land south of the Embley River by 31 August 2012 and prior to commencement of significant construction work for areas south of the Embley River. The Water Management Plan shall provide for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of this environmental authority.

(H32) The Water Management Plan must include at least the following components:

(a) contaminant source study;
(b) site water balance and model;
(c) water management system;
(d) saline drainage prevention and management measures;
(e) emergency and contingency planning; and
(f) monitoring and review.

(H33) Each year the holder of this environmental authority must undertake a review of the Water Management Plan no later than 1 November to ensure that proper and effective *measures, practices or procedures are in place so that the mine is* operated in accordance with the conditions of this environmental authority and that environmental harm is prevented or minimised.

(H34) A copy of the Water Management Plan and/or a copy of the final review document of the Water Management Plan must be provided to the administering authority on request.

Vehicle Wash Down Bays (South of Embley)

(H35) Water from the heavy and light vehicle wash bays in the infrastructure areas south of the Embley River must be treated with oil water separators prior to release.

PFAS Sampling and Monitoring

(H36) The holder of this environmental authority must develop a PFAS Monitoring and Management Program to manage PFAS risks on site and monitor for, identify, and describe any impacts of PFAS to environmental values of the receiving environment.

(H37) The PFAS Monitoring and Management Program must be implemented by 01 December 2020.

(H38) The PFAS Monitoring and Management Program must at a minimum:

(a) include biannual monitoring of surface water and groundwater;
(b) Include annual monitoring of sediments; and
(c) document sampling and monitoring methodology in accordance with the *National Environmental Management Plan for PFAS* and the *National Environmental Protection (Assessment of Contaminated Land) Measure 1999*;
(d) ensure that monitoring and data analysis is undertaken to detect any change to PFAS contaminant levels as presented in the *PFAS Detailed Site Investigation (Revision 0, April 2019)*;
(e) assess the risk to the receiving environment in the event that an increase in PFAS contaminant levels is detected;
(f) document the arrangements for managing PFAS-contaminated soil and water on site;
(g) document remediation and management measures necessary for preventing or minimising impacts of PFAS to environmental values of the receiving environment.
(h) be consistent with the locations, compounds, and methodology identified in the *PFAS Sampling Analysis and Quality Plan (26 August 2019)* unless otherwise agreed with the administering authority.
(i) at a minimum monitor for each of the quality characteristics specified in Table H8– PFAS contaminant sampling.

Table H8 – PFAS contaminant sampling.

Media	Description	PFAS (Per- and poly-fluoroalkyl substances)
Groundwater	Drinking Water	PFOS
		PFOA
		Sum of PFHxS and PFOS
Surface water	Aquatic ecosystem	PFOA
		PFOS
	Recreational water	PFOS
		PFOA
		Sum of PFHxS and PFOS

PFOS - Perfluorooctane sulfonate
PFHxS - Perfluorohexane sulfonic acid
PFOA - Perfluorooctanoic acid

(H39) The PFAS Monitoring and Management Program must be described in a document, which must be provided to the administering authority upon request.

(H40) A report outlining the findings of the PFAS Monitoring and Management Program, including all monitoring results, interpretations and assumptions relied upon, must be prepared by an appropriately qualified person and submitted to the administering authority by 01 December 2021 and thereafter every twelve (12) months.

END OF CONDITIONS FOR SCHEDULE H

SCHEDULE I – SEWAGE TREATMENT

Awonga Point STP – General

(I1) The activity conducted under this environmental authority must not be conducted contrary to any of the following limitations:

(a) As a minimum, inflows up to 3.6 ML/day must be treated through the standard process of the plant; and

(b) Flows in excess of 3.6ML/day may be bypassed.

Note: The minimum treatment capacity of 3.6 ML/day is three (3) times the Design Average Dry Weather Flow (DADWF) of 1.2 ML/day.

Awonga Point STP - Release to Waters

(I2) Treated sewage effluent and bypass must only be released to surface waters at the release point identified in Table I1 – Release Point & Schedule L and Plan 6 – Awonga Point Sewage Treatment Plant Water Release & Water Quality Monitoring Sites.

Table I1 – Release Point

Description	Coordinates (GDA94 MGA z54)		Release Point
	Easting	Northing	
Awonga Point Sewage Treatment Plant submerged outfall	597148	8606812	Mission River - 60m offshore

(I3) Releases to waters:

(a) must be monitored at the location identified in Table I2 – Monitoring Location and Schedule L Plan 6 – Awonga Point Sewage Treatment Plant Water Release & Water Quality Monitoring Sites for each quality characteristic and at the frequency stated in Table I3 - Release Water Contaminant Limits; and

(b) excluding bypass releases covered by EA conditions (I7) must not exceed the contaminant limits stated in Table I3 – Release Water Contaminant Limits and the conditions of this environmental authority.

Table I2 – Monitoring Location

Description	Location
Awonga Point Sewage Treatment Plant outflow pipeline	Awonga Point Sewage Treatment Plant

Table I3 – Release Water Contaminant Limits

Quality Characteristic	Unit	Release Limit	Limit Type	Frequency
5 day Biochemical oxygen demand (BOD)	mg/L	30 10 5	Maximum 50th percentile short term 50th percentile long term	Weekly
Total Suspended Solids	mg/L	45 15 10	Maximum 50th percentile short term 50th percentile long term	
Total Residual Chlorine	mg/L	0.55	Maximum	
Dissolved Oxygen	mg/L	2	Minimum	
pH	pH units	6.0 - 8.5	Range	

Quality Characteristic	Unit	Release Limit	Limit Type	Frequency
Temperature	°C	<2% increase	Range	
Thermo-tolerant Coliforms	CFU / 100ml	1000	Maximum	Fortnightly
Ammonia	mg/L	6 2 1	Maximum 50th percentile short term 50th percentile long term	
Total Nitrogen	mg/L	10 5	Maximum 50th percentile long term	
Total Phosphorus	mg/L	2 1	Maximum 50th percentile long term	

(I4) Calculate and keep records of daily, median monthly and annual mass loads of total nitrogen and total phosphorus released to waters at the monitoring point identified in Table I2 – Monitoring Point. Mass loads must be calculated by the following formula:

(a) Daily Mass Load = Measured value[1] of contaminant (mg/L) x Daily Flow for release point;
(b) Monthly Mass Load = the sum of all the daily mass loads for that month; and
(c) Annual Load = the sum of the daily mass loads released for that calendar year

[1] The measured value being the value measured that day or on the most recent sampling occasion if not measured that day.

(I5) The daily volume of contaminants released to waters must be determined or estimated by an appropriate method, for example a flow meter and records kept of such determinations and estimates.

(I6) In addition to condition (I3) and excluding bypass releases, the release to waters must not produce any slick or other visible evidence of oil or grease, nor contain visible floating oil, grease, scum, litter, or other visually objectionable matter.

(I7) Bypass flows must be screened prior to redirection into the Awonga Point Stormwater Lagoon or release via the release point identified in Table I1 – Release Point.

(I8) The administering authority must be notified within 24 hours of any bypass release ceasing.

(I9) The following details must be recorded in relation to each bypass release:

(a) the start time, date and duration of the release;

(b) the estimated volume of the bypass release;

(c) the level of treatment at the sewage treatment plant prior to discharge;

(d) the cause of the release; and

(e) any monitoring of the water quality released.

Awonga Point STP - Receiving Waters

(I10) The quality of the receiving waters must be monitored at the locations specified in Table I5 - Receiving Water Reference Sites and Downstream Monitoring Points for each quality characteristic and at the frequency stated in Table I6 - Receiving Waters Contaminant Trigger Levels.

Table I5 - Receiving Water Reference Sites and Downstream Monitoring Points

Monitoring Points	Receiving Waters Location Description	Coordinates (GDA94 MGA z54)	
		Easting	Northing
Reference[1] Monitoring Points			
SW/MIS/UPS	Mission River	603973	8608448
SW/EMB/UPS	Embley River	618204	8593092
Downstream Monitoring Points			
SW/MIS/MID	Mission River	597137	8607542

Monitoring Points	Receiving Waters Location Description	Coordinates (GDA94 MGA z54)	
		Easting	Northing

[1] A minimum of two (2) sites must be nominated for reference monitoring points
[2] To be determined based on Receiving Environment Monitoring Program

(I11) If the quality characteristics of a downstream monitoring point exceed any of the trigger levels specified in Table I6 - Receiving Waters Contaminant Trigger Levels, the holder of this environmental authority must compare the results of the downstream monitoring site to the data from reference monitoring sites and:

(a) if the level of contaminants at the downstream site does not exceed the reference monitoring site data, then no action is to be taken; or
(b) if the level of contaminants at the downstream site is greater than the reference monitoring site data, complete an investigation in accordance with the ANZECC & ARMCANZ (2000) methodology into the potential for environmental harm and provide a written report to the administering authority within three (3) months outlining:
    (i) details of the investigations carried out; and
    (ii) actions taken to prevent environmental harm, if any actions have occurred.

Note: Where an exceedance of a trigger level has occurred and is being investigated in accordance with I11 (b) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic within the three month investigation period.

Table I6 - Receiving Waters Contaminant Trigger Levels

Quality Characteristic	Unit	Trigger Level	Trigger Type	Frequency
Dissolved Oxygen	mg/L	2.6mg/L	Minimum	Monthly
pH	pH units	7.0[1] (minimum) 8.5[1] (maximum)	Range *The median pH level of 12-month period should be within trigger level range.*	
Thermo-tolerant Coliforms	CFU / 100ml	1000	Maximum *The median bacterial content of a 12-month period should not exceed 1000 faecal coliform organisms/100mL.*	
Ammonia	µg/L	36	Maximum *A trigger for further investigation will be deemed to have occurred when the median concentration of samples taken over a 12-month period at a test site exceeds the trigger level.*	
Total Nitrogen	µg/L	310		
Total Phosphorus	µg/L	20		
Oil & Grease		No visible film	Observation during each sampling run.	
Temperature	For interpretation purposes only			

[1] Default trigger levels – from ANZECC (2000) trigger levels for aquatic ecosystems indicative of slightly disturbed tropical Australian estuarine ecosystems.

Awonga Point STP - Receiving Environment Monitoring Program

(I12) A Receiving Environment Monitoring Program (REMP) must be developed and implemented by 1 July 2012 to monitor and record the effects of the release of contaminants on the receiving environment periodically and whilst contaminants are being discharged from the mining lease(s) with the aim of identifying and describing the extent of any adverse impacts on local environmental values and to monitor any changes in the receiving water (including groundwater). A copy of the REMP and any update or variation of the REMP following adoption of a new Plan of Operations must be provided to

the administering authority prior to its implementation and due consideration given to any comments made on the REMP by the administering authority.

Note: For the purposes of the REMP, the receiving environment is the waters and connected waterways downstream (including groundwater) of any release associated with the Awonga Point Sewage Treatment Plant.

(I13) The REMP must address (but not necessarily be limited to) the following:

(a) description of potentially affected receiving groundwaters and surface waters including key communities and reference water quality and sediment characteristics based on accurate and reliable monitoring data that takes into consideration any temporal variation (e.g. seasonality);
(b) description of applicable environmental values and water quality objectives to be achieved (i.e. as scheduled pursuant to the *Environmental Protection (Water) Policy);*
(c) any relevant reports prepared by other governmental or professional research organisations that relate to the receiving environment to which the REMP applies;
(d) water and sediment quality targets within the receiving environment to be achieved and clarification of contaminant concentrations or levels indicating adverse environmental impacts during the period upon which the REMP applies;
(e) monitoring for any potential adverse environmental impacts caused by a release;
(f) monitoring of stream flow or alternative estimation method to gain an understanding of the hydrology of the receiving waters and the circumstances under which releases occur;
(g) monitoring of toxicants that must consider the indicators specified in Table I6 - Receiving Waters Contaminant Trigger Levels to assess the extent of the compliance of concentrations with water quality objectives and/or the ANZECC & ARMCANZ (2000) Guidelines for slightly to moderately disturbed ecosystems;
(h) monitoring of physical and chemical parameters including as a minimum those specified in Table I6 - Receiving Waters Contaminant Trigger Levels (in addition to temperature). The list of quality characteristics required to be monitored as per Table I6 - Receiving Waters Contaminant Trigger Levels will be reviewed once the results of the monitoring data become available. If it is determined that there is no need to monitor for certain individual quality characteristics then these can be removed from Table I6 - Receiving Waters Contaminant Trigger Levels;
(i) monitoring of biological indicators in accordance with the administering authority's monitoring and sampling manual using recognised standard methodology approved by the administering authority and monitoring metals/metalloids in sediments (in accordance with ANZECC & ARMCANZ (2000), Simpson et al (2005) *Handbook for Sediment Quality Assessment* and/or the most recent version of AS5667*.1 Guidance on Sampling of Bottom Sediments*;
(j) the locations of monitoring points (including the locations of reference/upstream and downstream potentially impacted sites for each release point). Reference sites must comply with the following criteria:
    (i) be from the same bio-geographic and climatic region;
    (ii) have similar geology, soil types and topography;
    (iii) contain a range of habitats similar to those at the potentially impacted sites;
    (iv) have a similar flow regime; and
    (v) not be so close to the potentially impacted sites that any disturbance at the potentially
    (vi) impacted sites also results in a change at the reference site;
(k) a frequency or scheduling of sampling and analysis sufficient to determine water quality objectives and to derive site specific reference values within two (2) years (depending on wet season flows) in accordance with the *Queensland Water Quality Guidelines*. For ephemeral streams, this should include periods of flow irrespective of mine or other discharges;
(l) specify sampling and analysis methods and quality assurance and control;
(m) any historical datasets to be relied upon;
(n) description of the statistical basis on which conclusions are drawn;
(o) any spatial and temporal controls to exclude potential confounding factors;
(p) inclusion of additional monitoring points at least twelve (12) months prior to potential impact on the site as set out in the Plan of Operations.

(I14) A report outlining the findings of the REMP including all monitoring results and interpretations in accordance with Condition (I13) must be prepared and submitted in writing to the administering authority by 31 January 2015. This should include an assessment of reference water quality, any assimilative capacity for those contaminants monitored and the suitability of current discharge limits to protect downstream environment values and include recommendations to set appropriate contaminant limits for the purpose of Condition (I13).

Awonga Point STP - Waste Management

(I15) Screenings, grit, sewage and wastewater treatment plant sludge generated by the sewage treatment process at the Awonga Point Sewage Treatment Plant must not be stored at the Awonga Point Sewage Treatment Plant for any period of time longer than necessary to dewater the screenings, grit and sludge and prepare it for transport and disposal at the Evans Landing Landfill.

(I16) Screenings, grit, sewage and wastewater treatment plant sludge's generated must be stored, managed and utilised so as not to cause environmental harm.

(I17) Sewage sludge generated on the mining lease(s) must be monitored at least annually to obtain the following information:

(a) the estimated annual quantity and nature of each sludge produced; and

(b) the current method(s) of pre-treatment or disposal.

Awonga Point STP - Sewage Pump Stations

(I18) Pump stations must be fitted with stand-by pumps and pump-failure alarms as well as high level alarms to warn of imminent pump station overflow. All alarms must be able to operate without mains power.

(I19) Plant and equipment must be designed to allow for continued operation during flood events and inundation of the site.

Awonga Point STP - Sewage Treatment Pond Conditions

(I20) The Awonga Point Sewage Treatment lagoon must be available to hold at least 10ML, excluding the freeboard allowance.

(I21) All ponds used for the storage or treatment of contaminants, sewage or wastes at the Awonga Point Sewage Treatment Plant must be constructed, installed and maintained:

(a) to minimise the likelihood of any release of effluent through the bed or banks of the pond to any waters (including ground water);
(b) so that a freeboard of not less than 300mm is maintained for all design conditions;
(c) to ensure the stability of the ponds' construction; and
(d) to prevent access to waters by all livestock and minimise access by native fauna.

Boyd and Norman Creek Mine Infrastructure Area (MIA) STP - Release to Waters

(I22) Treated sewage effluent must only be directly released to receiving waters from the release points identified in Table I7 – Release Points for the Boyd and Norman Creek MIA STP, and in accordance with the conditions of this environmental authority.

Table I7 – Release Points for the Boyd and Norman Creek MIA STP

Release Point	Description of Water Released	Contaminant Source	Description & Nature of Receiving Waters	Monitoring Location	Coordinates (GDA94 MGAz54)	
					Easting	Northing
Boyd MIA Drainage Slot spillway	Treated effluent mixed with other waters from the water management structures	Boyd MIA Sewage Treatment Plant	Gulf of Carpentaria via unnamed drainage.	Boyd MIA Sewage Treatment Plant	0568779	8570784
		Boyd Accommodation Village Sewage Treatment Plant		Boyd Accommodation Village Sewage Treatment Plant	577711	8575105
Norman Creek MIA Drainage Slot spillway		Norman Creek MIA Sewage Treatment Plant	TBD[1]	Norman Creek MIA Sewage Treatment Plant	TBD[1]	TBD[1]

[1] To be determined and notified to the administering authority upon commissioning.

(I23) Treated sewage effluent released to receiving waters must:

(a) be monitored at the location identified in Table I7 – Release Points for the Boyd and Norman Creek MIA STP;

(b) not exceed the contaminant limits stated in Table I8 – Release Water Contaminant Limits.

Table I8 – Release Water Contaminant Limits

Quality Characteristic	Unit	Contaminant Limit	Limit Type	Frequency
5 day Biochemical Oxygen Demand (BOD)	mg/L	30 20	Maximum Median	Weekly
Total Suspended Solids	mg/L	45 15 10	Maximum 50th percentile short term 50th percentile long term	
pH	pH units	6.0 - 8.5	Range	
Thermo-tolerant Coliforms	CFU / 100ml	1000[3] 10[2]	Maximum[3] Median [1,2]	Fortnightly

[1] Median value must be based on at least 5 but no more than 10 consecutive samples.
[2] Note: Based on Class A recycled water, as outlined under the Queensland Water Recycling Guidelines, December 2005, Table 6.2b.
[3] Note: Based on Class C recycled water, as outlined under the Queensland Water Recycling Guidelines, December 2005, Table 6.2b.

(I24) The release of contaminants to waters must not:

(a) produce any slick, discoloration of ambient waters or visible evidence of oil or grease;

(b) contain visible floating oil, grease, scum, litter or other objectionable matter; or

(c) have any other properties or contain any other contaminants in concentrations that may cause environmental harm.

Waste Management (South of Embley)

(I25) Upon decommissioning, screenings, grit and sewage treatment plant sludge in drying beds located at the Boyd Infrastructure Area Sewage Treatment Plant, the Norman Creek Infrastructure Area Sewage Treatment Plant, the Boyd Accommodation Village Sewage Treatment Plant and temporary camps in the south of the Embley River must be rehabilitated using a low permeability cap, or removed to a licensed facility. The cap must conform to the following criteria:

(a) consists of at least 300 mm of compacted material;

(b) achieve a maximum permeability of 1 x 10^{-7}metres per second;

(c) minimise infiltration of water into the waste and ponding of water on the surface of the site; and

(d) is resistant to erosion by surface water flows.

(I26) Screenings, grit, sewage and wastewater treatment plant sludge's generated at the Boyd Infrastructure Area Sewage Treatment Plant, the Norman Creek Infrastructure Area Sewage Treatment Plant, the Boyd Accommodation Village Sewage Treatment Plant and temporary camps in the area south of the Embley River must be stored, managed and utilised so as not to cause environmental harm.

(I27) Sewage sludge generated at the Boyd Infrastructure Area Sewage Treatment Plant and the Norman Creek Infrastructure Area Sewage Treatment Plant, the Boyd Accommodation Village Sewage Treatment Plant and temporary camps in the area south of the Embley River must be monitored at least annually to obtain the following information:

(a) the estimated annual quantity and nature of each sludge produced; and

(b) the current method(s) of pre-treatment or disposal.

(I28) Plant and equipment must be designed to allow for continued operation during flood events and inundation of the site.

Release to Land

(I29) Sewage effluent (including treated sewage effluent released to land within the nominated irrigation areas) must only be released to land within the areas identified in Table I9 – Release Points to Land and Schedule L Plan 7 - Release Points to Land (East Weipa) and Plan 8 - Release Points to Land (South of Embley).

(I30) Monitoring of the release of contaminants to land from sewage systems must be undertaken at the monitoring locations and in accordance with the monitoring frequency identified in Table I9 – Release Points to Land for the quality characteristics identified in Table I10 – Contaminant Release Limits to Land.

Table I9 – Release Points to Land

Release Point[1]	Description of Land Releases	Contaminant Source	Coordinates (GDA94 MGA z54)/ Monitoring Location		Monitoring Frequency
			Easting	Northing	
Sewage Systems – North of Embley					
Rail Workshop	Treated Effluent - Trench Discharge	Septic System	593687	8600564	N/A
Beneficiation Control Area			594613	8599711	
Occupational Training Centre			594720	8599781	
Heavy Equipment Workshop	Treated Effluent - Evapotranspiration Bed Discharge	Icon Septech System	601739	8599814	N/A
Domestic Airport	Treated Effluent - Trench Discharge	Septic System	TBD[1]	TBD[1]	
Sewage System – South of Embley					
Temporary camps in area south of Embley River	Treated Effluent - Irrigation Discharge to Irrigation Area	Package Sewage Treatment Plant	TBD[1]	TBD[1]	Fortnightly
			578224	8575242	

Release Point[1]	Description of Land Releases	Contaminant Source	Coordinates (GDA94 MGA z54)/ Monitoring Location		Monitoring Frequency
			Easting	Northing	
Boyd Accommodation Village	Treated Effluent - Irrigation Discharge to Irrigation Area	Boyd Accommodation Village Sewage Treatment Plant	577711	8575105	
Sewage System – North of Weipa					
North of Weipa camp	Treated Effluent – Trench Discharge	Septic System	TBD[2]	TBD[2]	N/A

[1] To be determined and notified to the administering authority upon final design.

[2] To be determined and notified to the administering authority on completion of installation.

(I31) The release of contaminants to land from the release points defined in Table I9 – Release Points to Land must not exceed the contaminant limits stated in Table I10 - Contaminant Release Limits to Land (for irrigation systems only).

Table I10 – Contaminant Release Limits to Land

Quality Characteristic	Unit	Release Limit	Limit Type
5 day Biochemical oxygen demand (BOD)	mg/L	20[1]	Maximum
Total Suspended Solids	mg/L	30	Maximum
Nitrogen	mg/L	30 10 5	Maximum 50th percentile short term 50th percentile long term
Phosphorus	mg/L	15 8 5	Maximum 50th percentile short term 50th percentile long term
E coli	Organisms/100ml	200	Maximum
		10[2]	95% of samples taken over 12 months[2]
Faecal Coliforms	CFU/100ml	1000[1]	Maximum
		10[2]	95% of samples taken over 12 months[2]
pH	pH units	6.0 - 8.5	Range

[1] Based on at least 5 but no more than 10 consecutive samples.

[2] Contaminant release limits and limit type applies only to the release point identified as the temporary camp in area south of Embley River in Table I9 – Release Points to Land.

Septic Systems

(I32) Septic systems specified in Table I9– Release Points to Land must be designed, operated and maintained in accordance with the relevant Australian standard.

Irrigation of Treated Sewage Effluent

(I33) Treated effluent release to land through an irrigation system identified in Table I9 – Release Points to Land must utilise a minimum area 1000m^2 of land, excluding any necessary buffer zones, for the irrigation of treated sewage effluent.

(I34) The daily volume of effluent released to land must be determined or estimated by an appropriate method, for example a flow meter and records kept of the volumes of effluent released.

(I35) Any sewage system with a total daily peak design capacity of less than twenty-one (21) equivalent persons must be designed, operated and maintained in accordance with the relevant Australian Standard.

(I36) Excluding the sewage treatment plant for the temporary camp in the area south of the Embley River, treated sewage effluent may only be released to land by irrigation in accordance with the following outcomes:

(a) efficient application of effluent;
(b) control of sodicity in the soil;
(c) minimal degradation of soil structure;
(d) control of the build-up of nutrients and heavy metals in the soil and subsoil from effluent and other sources;
(e) prevention of subterranean flows of effluent to waters;
(f) prevention of impacts on the groundwater resource through infiltration;
(g) prevention of the run-off of effluent or seepage from disposal areas by limitation of application rates and the use of structures such as bunds and catch dams;
(h) prevention of surface ponding; and
(i) prevention of damage to native vegetation;

(I37) Treated sewage effluent from the temporary camp in the area south of the Embley River may only be released to land by irrigation in accordance with the following outcomes:

(a) efficient application of effluent;
(b) prevention of subterranean flows of effluent to waters;
(c) prevention of impacts on the groundwater resource through infiltration;
(d) prevention of the run-off of effluent or seepage from disposal areas by limitation of application rates and the use of structures such as bunds and catch dams where required;
(e) prevention of surface ponding; and
(f) prevention of damage to native vegetation;

(I38) The holder of this environmental authority must take all measures to ensure that persons are not exposed to pathogens in treated sewage effluent released to land by irrigation as identified in Table I9 – Release Points to Land including, but not limited to:

(a) prevention of spraydrift or overspray from effluent disposal areas through the selection of irrigator equipment with low exposure risk;
(b) appropriate timing of irrigation;
(c) restriction of access to areas either being irrigated or that are freshly irrigated;
(d) buffers between irrigation areas and areas of human occupation; and
(e) provide prominent signage in areas irrigated with effluent and which are accessible, advising that effluent should not be consumed or used.

END OF CONDITIONS FOR SCHEDULE I

SCHEDULE J – MARINE

Release to Waters

(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:

(a) only occur from the permitted areas identified in the plan(s) referred to in Condition (J22).

(b) only occur in accordance with conditions of this environmental authority.

(c) be carried out taking all practical measures necessary to minimise the concentration of suspended solids released during the loading of the vessel.

(J2) Once a vessel has berthed, the use of the vessel's propulsion system must be minimised to the extent practicable and safe to reduce the risk of disturbance to the seabed during loading/unloading operations at the Hey River barge/ferry terminal ramp.

(J3) Bed levelling activities must not result in the release of contaminants to waters.

(J4) Treat and manage acid sulphate soils in accordance with the latest edition of the Queensland Acid Sulfate Soil Technical Manual.

Dredging - General

(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.

(J6) The administering authority must be advised in writing within ten (10) days following completion of the capital or maintenance dredging campaigns.

Trained/Experienced Operators

(J7) All persons engaged in the conduct of dredging activities including but not limited to employees and contract staff must be:

(a) trained in the procedures and practices necessary to:

(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.

Measures and Equipment

(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:

(a) Trailing Suction Hopper Dredge that is equipped, at a minimum, with:
(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:

(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

(iii) systems for determining solids to water ratio or density of dredged material during operations.

(c) Grab Dredge or barge mounted back hoe that is equipped, as a minimum, with:

(i) electronic positioning system for defining the location and depth of dredge activities.

(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.

Dredge Management Plans

(J10) The following Dredge Management Plans must be provided to the administering authority for review no later than 6 months or any other period as agreed by the administering authority prior to dredging commencing:

(a) any capital dredge campaign at Boyd Port;
(b) any capital dredge campaign at Hey River terminal;
(c) any long term maintenance dredge program.

(J11) Dredging activities can only be carried out when the final dredge management plans are approved by the administering authority.

(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 Environmental Impact Statement approved by DEHP prior to dredging commencing.

(J13) The final Initial Capital Dredge Management Plan for Boyd Port must be consistent with the conditions of this environmental authority and must:

(a) include results of 3D modelling, or alternative methodology as agreed with the administering authority, to:
    (i) estimate sediment plumes generated by capital dredging and spoil disposal operations for Boyd Port;
    (ii) details the turbidity through the water column;
    (iii) define the Zones of Influence of the dredging and spoil disposal sediment plumes;
    (iv) identify high, moderate and low risk periods for key Concern Sites (i.e. where sensitive receptors are situated);
    (v) inform where key Concern Site monitoring locations should be situated; and
    (vi) provide risk estimates that are based on the key water quality parameters, specifically increases in turbidity, sedimentation rates, and reduction in photosynthetically active radiation (PAR), for the key Concern Sites.
(b) establish turbidity-based trigger values as shown in Table J1 - Initial Boyd Port Capital Dredge Monitoring: Water Quality Trigger Levels, that:
    (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 with similar environmental conditions, and site specific baseline data;
    (ii) considers the most sensitive receptor type and the most relevant water quality parameters (e.g. 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 effect of multiple stressors; and
    (vi) considers the effect of depth and water column variation as predicted from the 3D modelling.
(c) implement a water quality monitoring program that includes, as a minimum, telemetered monitoring of turbidity at Reference and Concern Sites, and details:
    (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.
(d) include 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.

(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.
(f) develop and implement a coral health monitoring program that includes:
    (i) routine monitoring, and reactive monitoring based on exceedance of turbidity trigger values as identified in Table J1 Initial Boyd Port Capital Dredge Monitoring: Water Quality Trigger Levels;
    (ii) establishing indicator (s) that are capable of detecting adverse change in health of coral assemblages;
    (iii) a monitoring methodology that includes the use of diver-less technology appropriate for reporting on the selected coral health indicators, that maximises the data quality to provide an appropriate level of statistical power to detect change in coral health indicators; and
    (iv) a methodology that ensures that coral monitoring assessment results are not compromised due to dredging operations active at the time of monitoring.
(g) implement adaptive management processes and measures, as detailed in dredge management plans in:
    (i) Water Quality Management Process;
    (ii) Coral Health Management Process;
    (iii) Turtle and Marine Mammal Management Procedure (Dredging); and
    (iv) Turtle and Marine Mammal Management Procedure (Spoil Disposal).
(h) include reporting and review by the BPDTAG (as per condition J31).

(J14) The final Capital and Maintenance Dredge Management Plans for the Hey River facilities must be consistent with the conditions of this environmental authority and must include details of:
(a) water quality or PAR monitoring programs to be implemented or utilised;
(b) adaptive management measures; and
(c) reporting and review by the NQBP TACC in accordance with condition (J33).

Table J1 - Initial Boyd Port Capital Dredge Monitoring: Water Quality Trigger Levels

Monitoring Locations	Coordinates (GDA94 MGA z54)		Quality Characteristic	Unit	Trigger Level						Frequency
	Easting	Northing			Wet season			Dry season			
Reference Sites: TBA[3]	TBA[3]	TBA[3]	Turbidity (as a surrogate WQ parameter for PAR[1] and SR[2])	NTU	Site	85	95	Site	85	95	Continuous, Telemetered, Logged at 15 minute intervals
					I1	32	90	I1	5	9	
					I2	11	42	I2	4	6	
					I3	20	72	I3	5	6	
					I4	15	57	I4	6	8	
			PAR	Mol./m^2/d	N/A			N/A			TBD[5]
			SR	mg/cm^2/d	N/A			N/A			TBD[5]
Concern Sites: TBA[3]	TBA[3]	TBA[3]	Turbidity (as a surrogate WQ parameter for PAR and SR)	NTU	TBD[4]			TBD[4]			Continuous, Telemetered, Logged at 15 minute intervals
			PAR	Mol/m^2/d	N/A			N/A			TBD[5]
			SR	mg/cm^2/d	N/A			N/A			TBD[5]

[1] PAR means Photosynthetically Active Radiation.
[2] SR means Sedimentation Rate.
[3] To be advised based on results of modelling.
[4] To be determined in approved Dredge Management Plans: statistically derived turbidity trigger, based on site specific baseline data and trigger values from other dredging programs with similar environmental conditions together with literature on potential impacts of turbidity on coral health.
[5] To be determined in approved Initial Capital Dredge Management Plan.
Note: Trigger values may vary at different monitoring locations and the number of monitoring locations will be determined through DMP.

(J15) The long term maintenance Dredge Management Plans for Boyd Port must be consistent with the conditions of this environmental authority and must:

(a) consider results of modelling, or alternative assessment methodology as agreed with the administering authority, to:

(i) estimate sediment plumes that may be generated by maintenance dredging and spoil disposal operations for Boyd Port;
(ii) provide risk estimates relevant to sensitive receptors that are based on the key water quality parameters, specifically increases in turbidity, sedimentation rates, and reduction in photosynthetically active radiation (PAR), for the key Concern Sites(i.e. where sensitive receptors are situated); and
(iii) define the zones of Influence of the dredging and spoil disposal sediment plumes.

(b) implement a water quality monitoring program, as informed by previous dredging campaigns in consultation with the BPDTAG in accordance with condition (J31).

(c) in considering the maintenance dredging schedule consider any potential adverse effects on:

(i) coral spawning; and
(ii) marine turtle nesting.

(d) include reporting to and review by the BPDTAG in accordance with condition (J31).

(J16) All subsequent Capital Dredge Management Plans for Boyd Port must be consistent with the conditions of this environmental authority and must:

(a) consider results of modelling, or alternative assessment methodology as agreed, to:

(i) estimate the extent, duration and intensity of sediment plumes under a range of tidal and oceanic current conditions that are likely to be generated by dredging and spoil disposal operations for Boyd Port;

(ii) provide risk estimates relevant to sensitive receptors that are based on the key water quality parameters, specifically increases in turbidity, sedimentation rates, and reduction in photosynthetically active radiation (PAR), for the key Concern Sites (i.e. where sensitive receptors are situated); and

(iii) define the Zones of Influence of the dredging and spoil disposal sediment plumes;

(b) implement a Water Quality Monitoring Program, as informed by the Initial Capital Dredge Management Program and recommended by the BPDTAG (as per condition J31), with trigger values as shown in Table J2 - Boyd Port Subsequent Capital Dredge Monitoring: Water Quality Trigger Levels;

(c) implement a Coral Health Monitoring Program, as informed by the Initial Capital Dredge Management Program and recommended by the BPDTAG (as per condition J31); and

(d) include reporting and review by the BPDTAG (as per condition J31).

Table J2 - Boyd Port Subsequent Capital Dredge Monitoring: Water Quality Trigger Levels

Monitoring Locations	Coordinates (GDA94 MGA z54)		Quality Characteristic	Unit	Trigger Level		Frequency
	Easting	Northing			Wet season	Dry season	
Reference Sites: TBA[3]	TBA[3]	TBA[3]	Turbidity (as a surrogate WQ parameter for PAR[1] and SR[2])	NTU	N/A	N/A	Continuous, Telemetered, Logged at 15 minute intervals
			PAR	Mol/m^2/d	N/A	N/A	TBD[5]
			SR	mg/cm^2/d	N/A	N/A	TBD[5]
Concern Sites: TBA[3]	TBA[3]	TBA[3]	Turbidity (as a surrogate WQ parameter for PAR and SR)	NTU	TBD	TBD	Continuous, Telemetered, Logged at 15 minute intervals
			Any other parameters in accordance with (J15(b))				

[1] PAR means Photosynthetically Active Radiation.
[2] SR means Sedimentation Rate.
[3] To be advised based on results of modelling and initial capital dredging monitoring program.
[4] To be determined in approved Subsequent Capital Dredge Management Plans: statistically derived turbidity trigger, based on site specific baseline data, initial capital dredging data and trigger values from other dredging programs with similar environmental conditions together with literature on potential impacts of turbidity on coral health.
[5] To be determined in approved Subsequent Capital Dredge Management Plans

Note: Monitoring locations, quality characteristic, trigger levels and frequency will be determined in the approved subsequent Capital Dredge Management Plans which will be informed by results from the Initial Capital Dredge Management Program's Water Quality Monitoring Program.

(J17) If dredge monitoring trigger levels specified in Table J1: Initial Boyd Port Capital Dredge Monitoring: Water Quality Trigger Levels or J2 Boyd Port Subsequent Capital Dredge Monitoring: Water Quality Trigger Levels are exceeded as a result of the dredging activity:

(a) the administering authority must be advised within 24 hours of the event of the corrective action that has been or will be implemented.

(b) measures must be implemented in accordance with corrective actions specified in the approved dredge management plan.

(J18) The administering authority and the Department of Agriculture, Fisheries and Forestry must be consulted during preparation of all final Dredge Management Plans

(J19) North Queensland Bulk Ports must be consulted during preparation of the final Dredge Management Plan for Hey River.

(J20) All dredging activities must be undertaken in accordance with the relevant approved final dredge management plan.

Limit of Dredging Approved

(J21) The holder of this environmental authority must not commence dredging activities at Boyd Port and the Hey River barge/ferry terminal unless the holder has submitted to the administering authority plans for dredging activities certified by a Registered Professional Engineer of Queensland.

(J22) Dredging activities must be confined to the removal of capital or maintenance dredge material at the location shown on the plan(s) referred to in Condition (J21).

(J23) The maximum volume of material to be removed as a result of Boyd Port and Hey River capital dredging activities are identified in Table J3 - Volumes of Capital Dredged Material.

Table J3 - Volumes of Capital Dredged Material

Location	Volume of Capital Dredged Material (m^3)
Boyd Port – Stage 1[1]	6 500 000
Boyd Port – Stage 2[2]	2 400 000
Hey River	37 380

[1] Boyd Port – Stage 1 is Berths 1 & 2 of wharf and shipping channel. Capital dredge campaigns will be undertaken incrementally, with no campaign exceeding 2 600 000m^3

[2] Boyd Port – Stage 2 is Berths 3 & 4 of wharf and shipping channel

Disposal of Dredge Spoil Material

(J24) Unless otherwise authorised, dredge spoil must not be disposed of on the mining lease.

(J25) Dredge spoil material must not be disposed of on land unless otherwise authorised.

(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.

Dredging Operations

(J27) The transportation of dredge material must be carried out such that the dredge material is kept wet at all times.

(J28) Prior to the commencement of the capital or maintenance dredging and prior to commissioning of the Port, hydrographic surveys of the bed levels of the area dredged must be completed.

Monthly Report

(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:

(a) a summary of results of all monitoring required by the environmental authority and dredge management plan, with raw data provided in an 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.

Boyd Port Dredging

(J30) The holder of this environmental authority must establish a Boyd Port Dredging Technical Advisory Group (BPDTAG) which must include representatives from the Administering Authority and Department of Agriculture, Fisheries and Forestry (DAFF) for dredging at Boyd Port.

(J31) The holder of this environmental authority must report to the BPDTAG on proposed dredging activities for Boyd Port and implementation of the Dredge Management Plan(s) for the South of Embley port, including monitoring results, management triggers and response actions. The group will assist in the establishment, where appropriate, of longer term management for the maintenance dredging program.

Hey River Dredging

(J32) The administering authority, Department of Agriculture, Fisheries and Forestry and North Queensland Bulk Ports must be consulted during preparation of the final Dredge Management Plan for the Hey River.

(J33) The holder of this environmental authority must report on the implementation of the final Dredge Management Plan for the Hey River to the North Queensland Bulk Ports Technical Advisory and Consultative Committee for the Port of Weipa.

(J34) All reasonable and practicable measures must be taken to minimise the potential for turbidity plumes to cause environmental harm to seagrass meadows adjacent to the dredge site at the Hey River barge/ferry terminal.

(J35) The dredging campaign at the Hey River barge/ferry terminal must not occur for a period longer than fourteen (14) consecutive days. Dredging may extend over a longer time period, provided:

(a) there is a pause in dredging of at least three (3) days between periods of dredging at each dredging site in the river; or

(b) where turbidity monitoring is employed, turbidity levels have not increased significantly above background levels as defined in the final Dredge Management Plan.

Marine Fauna Management

(J36) Mobile dredging operations:

(a) must not commence if dugongs, turtles or cetaceans are observed within 300 meters of the dredge;
(b) where underway, must alter the course if dugongs, turtles or cetaceans are likely to be struck or captured.

(J37) Stationary dredging operations:

(a) must not commence if dugongs, turtles or cetaceans are observed within 300 metres of the dredge;

(b) must cease if dugongs, turtles or cetaceans are observed within 50 metres of the dredge head.

(J38) Daily monitoring for impacted turtles must be undertaken at the dredge and at the shoreline down-current from the dredging operation. If monitoring indicates that 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 actions implemented.

(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.

(J40) The administering authority must be immediately notified of any turtle captures by the dredge or injury to any marine species of conservation significance.

(J41) All reasonable and practicable measures must be taken to minimise the impact of dredging activities on marine fauna.

Marine Turtle Offset Plan

(J42) The holder of this environmental authority must prepare and submit to the administering authority a marine turtle offset plan for approval within six (6) months of the final investment decision for the South of Embley project. The final marine turtle offset plan must include the following, and be consistent with, the offset proposal submitted to the Coordinator General on 5 April 2012 and presented in the Coordinator-General's report dated 23 May 2012 as Appendix 5:

(a) annual control of feral pigs on ML7024 in the coastal zone between Ina Creek and Winda Winda Creek and associated riparian hinterland areas
(b) annual monitoring of beaches for turtle nesting and nest predation rates.

(J43) The holder of this environmental authority must implement the marine turtle offset plan referred to in condition (J42).

Marine Works - General

(J44) All Marine works (excluding dredging and site establishment works) must be undertaken in accordance with a marine works environmental management plan (marine works EMP) and be approved by the administering authority prior to any marine works commencing.

(J45) The marine works environmental management plan (marine works EMP) must include management strategies to minimise impacts on the receiving environment, including but not limited to:

(a) environmental commitments - a commitment by senior management to achieve specified and relevant environmental goals;
(b) identification of environmental issues and potential impacts (including stormwater management / erosion and sediment control measures, water, land disturbance and controls, waste, noise and air).
(c) the actual and potential release of all contaminants;
(d) the potential impact of these sources and contaminants;
(e) what actions will be taken to minimise the impacts on the receiving environment (including stormwater management / erosion and sediment control measures, water, land disturbance and controls, waste, noise and air).
(f) monitoring of contaminant releases including contaminant release locations and conducting environmental impact assessments, if relevant;;

(g) contingency plans including the practices and procedures to be employed to restore the environment or to mitigate impacts on the receiving environment;
(h) including emergency and notification procedures for emergency events, incidents to minimise the risk of environmental harm arising from emergency events
(i) organisational structure and responsibility;
(j) effective communication;
(k) staff training;
(l) periodic review of environmental performance and continual improvement.

(J46) The holder of this environmental authority must not commence construction of any marine works unless the holder has submitted to the administering authority design drawings certified by a Registered Professional Engineer of Queensland.

(J47) The holder of this environmental authority must construct the marine works in accordance with the certified design drawings referred to in Condition (J46).

(J48) A report from a Registered Professional Engineer of Queensland must be submitted to the administering authority within three (3) months of the date of commissioning of marine works certifying that:

(a) The marine works (including any other associated works) have been constructed in accordance with the drawings referred to in Condition (J46);

(b) The coastal works:

(i) are structurally adequate for the anticipated use

(ii) comply with all relevant codes including the administering authority's operational policy.

Note: This approval does not constitute a ruling on the structural safety of the coastal works. It is the responsibility of the holder of this environmental authority to ensure adequacy of the design, construction and ongoing maintenance of the works.

(J49) All temporary marine works associated with construction must be removed from the site at the completion of the works unless otherwise authorised by the administering authority and all wastes must be collected from the site by the holder of this environmental authority and reused or disposed of at a licensed waste facility.

(J50) All rock, stone, gravel, sand or other fill material used in construction must be:

(a) suitable for the purpose having regard to the location of the land and the proposed use of the land;

(b) free from contaminants that may cause environmental harm.

(J51) Acid sulphate soils must be managed so that contaminants are not directly or indirectly released to any waters.

(J52) The design, construction and ongoing maintenance of coastal works must maintain local and regional drainage and hydrological systems, other than to the extent provided for under the approved plans as required under condition (J46).

(J53) The holder of this environmental authority must remove any debris, other than material from the authorised activities that are deposited outside of the alignment of the coastal works shown on the approved plans as required under condition (J46) or any debris that falls or is deposited on tidal lands or into tidal waters during the construction of the works.

Marine Transport – Temporary Seaborne Access facility

(J54) The temporary seaborne access facility comprising a barge landing north of Pera Head and passenger jetty in Boyd Bay are to be removed following commissioning of the barge and ferry terminals in the Hey River and mine access road unless otherwise agreed to by the administering authority.

(J55) After removal of the temporary seaborne access facility, the surrounding land and marine environment are to be reinstated to the condition that existed previously to the satisfaction of the administering authority.

(J56) The temporary seaborne access facilities must be located in the area that minimise impact on seagrass, live coral and reef habitat, taking into account other factors, including stakeholder concerns.

(J57) Prior to construction the holder of the environmental authority must carry out a survey of the landform in the area to be disturbed by the temporary seaborne access facility.

(J58) The holder of the environmental authority must monitor erosion both within and outside the authorised disturbance area and localised repair work must be carried out if erosion caused by the works is detected.

(J59) The holder of this environmental authority must construct and maintain a defined pathway for the barge landing access to minimise disturbance to the adjacent beach and fauna.

(J60) The holder of this environmental authority must develop and implement a rehabilitation plan for the temporary seaborne access facility prior to decommissioning. The rehabilitation must ensure that:

(a) material placed in tidal waters is removed within six (6) months of decommissioning unless otherwise agreed with the administering authority;
(b) the area is re-profiled to match, as near as practicable, the land contours existing prior to disturbance within 12 months of decommissioning; and
(c) post rehabilitation, bathymetric, landform and revegetation surveys of the disturbed area must be carried out and corrective actions undertaken where necessary..

Note: The rehabilitation plan may exist in isolation to or form part of the interim Rehabilitation Management Plan required under Condition (C24).

Hey River Infrastructure

(J61) The holder of this environmental authority must report on the implementation of the marine works environmental management plan (marine works EMP) to the North Queensland Bulk Ports.

Pile Driving

(J62) Pile driving activities must be carried out in a manner that minimise impacts on the surrounding environment and must include the following:

(a) soft-start approach to disperse of any marine fauna in the vicinity of proposed works;
(b) monitoring by an observer prior to commencing and during normal pile driving activities; and
(c) normal pile driving operations:
i. must not commence if turtles, dugongs or cetaceans are within the exclusion zone specified under the marine works environmental management plan as required in Condition (J44);
ii. must cease if turtles, dugongs or cetaceans are within the exclusion zone specified under the marine works environmental management plan as required in Condition (J44)

Boyd Port Infrastructure

(J63) Catch tray(s) or similar equipment must be installed under the Boyd Port ship loader tripper to minimise spillage.

(J64) The holder of this environmental authority must capture and pump any contaminated runoff from the Boyd Port tripper catch tray, belt cleaning at the conveyor head pulley, and the sealed maintenance area at the end of the wharf at Boyd Port to the onshore to the sedimentation ponds or the mine infrastructure area.

(J65) Transfer of minerals and bulk materials to ships at the Boyd Port must be carried out in a manner that minimises the likelihood of any release of minerals or bulk materials to the atmosphere or waters.

END OF DEFINITIONS FOR SCHEDULE J

SCHEDULE K – DEFINITIONS/ACRONYMS

Key terms and/or phrases used in this document are defined in this section and **bolded** throughout this document. Applicants should note that where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

Interpretation - Word definitions/acronyms

"active waste disposal cell" means a cell currently being used for the disposal of wastes accepted under a condition of this approval and includes all or part of a disposal cell.

"administering authority" means the Department of Environment & Science or its successor.

"AEP" means the Annual Exceedance Probability, which is the probability that at least one event in excess of a particular magnitude will occur in any given year.

"ambient (or total) noise" at a place, means the level of noise at the place from all sources (near and far), measured as the Leq for an appropriate time interval.

"animal breeding place" means a bower, burrow, cave, hollow, nest or other thing that is commonly used by the animal to incubate or rear the animal's offspring.

"ANZECC" means the Australian and New Zealand Environment Conservation Council

"appropriately qualified person" means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods or literature.

"ARMCANZ" means Agriculture and Resource Management Council of Australia and New Zealand

"assess" by a suitably qualified and experienced person in relation to a hazard assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

(a) exactly what has been assessed and the precise nature of that assessment;
(b) the relevant legislative, regulatory and technical criteria on which the assessment has been based;
(c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
(d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.

"background noise" means the existing acoustic environment including both near and far noise sources under normal mining operations.

"beneficial use" in respect of dams means that the current or proposed owner of the land on which a dam stands, has found a use for that dam that is:

(a) of benefit to that owner in that it adds real value to their business or to the general community,
(b) in accordance with relevant provisions of the *Environmental Protection Act 1994*,
(c) sustainable by virtue of written undertakings given by that owner to maintain that dam, and
(d) the transfer and use have been approved or authorised under any relevant legislation.

"bypass" means when the standard treatment processes of the plant do not occur as a result of wet weather and inflows that are in excess of the peak design capacity for inflow resulting in the release of untreated or partially treated effluent from the sewage treatment plant to the environment.

"capital dredging" means dredging for navigation to enlarge or deepen existing channel and port areas or to create new channel and port areas and dredging for engineering purposes to create trenches for pipes, cables, immersed tube tunnels or to remove material unsuitable for foundations or overburden for aggregate extraction.

"capping" means the covering of a landfill with suitable material as outlined within this EA to inhibit penetration by liquids.

"certification", **"certifying"** or **"certified"** by a suitably qualified and experienced person in relation to a design plan or an annual report regarding dams, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

(a) exactly what is being certified and the precise nature of that certification.
(b) the relevant legislative, regulatory and technical criteria on which the certification has been based;
(c) the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
(a) the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

"clinical waste" means waste that has the potential to cause disease including, for example, the following:

- animal waste;
- discarded sharps;
- human tissue waste;
- laboratory waste.

"coastal works" means marine works.

"concern site" means a location relating to an environmental value, such as water quality, a coral reef, fishing ground, or other feature as defined in the Queensland Water Quality Guidelines that is likely to be affected by a disturbance caused by the proposed activity. The proposed activity has been identified to place the environmental value under some level of risk and therefore is termed a Concern Site. Specifically in relation to dredging activities to which this environmental authority relates, Concern Sites includes coral reef locations that have been identified to be at some level of risk of elevated turbidity, suspended solids and sedimentation rates through 3D modelling, and consequently, reduced photosynthetically active radiation. Concern Sites do not include areas that are expected to experience extreme levels of disturbance that are likely, or certain, to result in severe levels of impact which has been authorised under this environmental authority. Concern Sites are sometimes also referred to as Impact or influence sites.

"construction" or "constructed" in relation to a dam includes building a new dam and modifying or lifting an existing dam, but does not include investigations and testing necessary for purposes of preparing a design plan.

"commercial place" means a place used as an office or for business or commercial purposes, other than a place within the boundaries of the operational land.

"completion criteria" means the measures by which the actions implemented to rehabilitate the land are deemed to be complete. The completion criteria indicate the success of the decommissioning and rehabilitation outcomes or remediation of areas which have been significantly disturbed by the mining activities. Completion criteria may include information regarding:

- stability of final land forms in terms of settlement, erosion, weathering, pondage and drainage;
- control of geochemical and contaminant transport processes;
- quality of runoff waters and potential impact on receiving environment;
- vegetation establishment, survival and succession;
- vegetation productivity, sustained growth and structure development;
- fauna colonisation and habitat development;
- ecosystem processes such as soil development and nutrient cycling, and the re-colonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes;
- microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration;
- effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;
- resilience of vegetation to disease, insect attack, drought and fire;
- vegetation water use and effects on ground water levels and catchment yields.

"commingled waste" means waste that is mixed in such a way that it cannot be reasonably expected that the individual waste types can be segregated.

"consequence category" means a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the most recent version of the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933).

"dam" means a land-based structure or a void that is designed to contain, divert or control flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works. However; a dam does *not* mean a fabricated or manufactured tank or container designed to a recognised standard, *nor* does a dam mean a land-based structure where that structure is designed to an Australian Standard. In case there is any doubt, a levee (dyke or bund) is a dam, but (for example) a bund designed for spill containment to AS1940 is *not* a dam.

"dB" means decibel. The unit used to measure sound level.

"decommissioned" means plant, infrastructure or equipment that has been removed or retired from active service.

"design plan" is the documentation required to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, and the criteria to be used for operating the dam. The documents must include all investigation and design reports, plans and specifications sufficient to hand to a contractor for construction, and planned decommissioning and rehabilitation outcomes; so as to address all hazard scenarios that would be identified by a properly conducted hazard assessment for the structure. Documentation must be such that a 'suitable qualified and experience person' could conduct an independent review without seeking further information from the designer.

"design average dry weather flow (DADWF)" means the average dry weather flow of the treatment plant at the design horizon.

"design storage allowance" or **"DSA"** means an available volume, estimated in accordance with the Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland (DME 1995), that must be provided in a dam as at the first of November each year in order to prevent a discharge from that dam to a probability (AEP) specified in that guideline. The DSA is estimated based on 100% runoff of wet season rainfall at the relevant AEP, taking account of process inputs during that wet season, with no allowance for evaporation.

"dredge material" means mud, sand, coral, ballast, shingle, gravel, clay, earth and other material removed by dredging from the bed of Queensland tidal and non-tidal waters.

"dredging" means extraction of mud, sand, coral, ballast, shingle, gravel, clay, earth and other material from the bed of Queensland tidal and non-tidal waters. Dredging does not include the banks of a waterway.

"domain" means a parcel of land for which the same rehabilitation goal, rehabilitation objective, indicators and measurable completion criteria for each agreed post mining land use can be defined.

"EIS" means the Environmental Impact Statement for the South of Embley Project (August 2011) and the Supplementary report to the EIS for the South of Embley Project (February 2012).

"environmental authority" means an environmental authority granted in relation to a mining activity under the *Environmental Protection Act 1994*.

"environmentally sensitive areas" means areas as described in the codes of compliance for tenures relating to mining and Chapter 5A (*Environmental Protection Regulation 2008*) activities, towns and roads.

"equivalent passenger-tyre unit (EPU)" is equivalent to one passenger tyre from a normal sedan or station wagon.

"extraction areas" include any areas of ML6024 and ML7024 disturbed by mining activities associated with the extraction of bauxite or that facilitate the extraction of bauxite including but not limited to pits, haul roads, access tracks, pipelines and conveyors.

"flowable substance"" means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.

"hazard" in relation to a dam as defined, means the potential for environmental harm resulting from the collapse or failure of the dam to perform its primary purpose of containing, diverting or controlling flowable substances.

"high bank" of a watercourse is the level to which water rises during normal season peak flows and may include a flood plain area.

"hydraulic performance" means the capacity of a regulated dam to contain or safely pass flowable substances based on a probability (AEP) of performance failure specified for the relevant consequence category

in the most recent version of the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933).

"levee", "dyke" or "bund" means a long embankment that is designed only to provide for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from releases from other works, during the progress of those stormwater or flood flows or those releases; and does not store any significant volume of water or flowable substances at any other times.

"$L_{A90,T}$" *is the A-weighted sound pressure level exceeded 90% of the sample duration T.*

"land" in the 'land schedule' of this document means land excluding waters and the atmosphere.

"land capability" as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

"land suitability" as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

"land use" term to describe the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

"large items of green waste" means oversize items of green waste that are incapable of being processed by a tub grinder.

"leachate" means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the operational land which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

"leaching contaminant levels" means the results of the "Toxicity Characteristic Leaching Procedure (TCLP)" means the test described in "U.S. EPA: Toxicity Characteristic Leaching Procedure (TCLP)" Federal Register, 40 CFR, Vol. 51, No. 286, Appendix 2, Part 268, page 40643 or as modified to reflect non-acidic leaching procedures suitable for waste characteristic assessment where co-disposal with putrescible wastes will not occur.

"long term 50th percentile" means that not more than twenty-six (26) of the measured values of the quality characteristic are to exceed the stated release limit for any fifty-two (52) consecutive samples where:

- the consecutive samples are taken over a one (1) year period;
- the consecutive samples are taken at approximately equal periods; and
- the time interval between the taking of each consecutive sample is not less than three (3) days or greater than eleven (11) days.

"maintenance dredging" means dredging to ensure that channels, berths or other port areas are maintained at their designed dimensions.

"mandatory reporting level" or **"MRL"** means a warning and reporting level determined in accordance with the criteria in the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/193314) published by the administering authority.

"marine works" means all work (other than dredging activities) including construction and maintenance works being carried out over marine waters, on the beach and foreshore areas.

"measures" includes any measures to prevent or minimise environmental impacts of the activity such as bunds, silt fences, diversion drains, capping, and containment systems.

"MIA" means mine infrastructure area.

"**mining activities**" means an activity as described in section 110 of the *Environmental Protection Act 1994*.

Note: Mining activities authorised on ML6024 and ML7024 under the *Mineral Resources Act 1989* are those authorised under the *Commonwealth Aluminium Corporation Pty Ltd Agreement Act 1957*.

"mining related infrastructure" The facilities, structures and installations needed for mining including but not limited to mining transportation networks, processing plant, communications systems and tailings storage facilities.

"NATA" means National Association of Testing Authorities.

"natural flow" means the flow of water through waters caused by nature.

"noxious" means harmful or injurious to health or physical well-being, other than trivial harm.

“non-polluting” means having no adverse impacts upon the receiving environment.

"offensive" means causing reasonable offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive, other than trivial harm.

"operational plan" means a document that amongst other things sets out procedures and criteria to be used for operating a dam during a particular time period. The operational plan as defined herein may form part of a plan of operations or plan otherwise required in legislation.

"permeability" means a measure of the rate at which a fluid will pass through a medium. The coefficient of permeability of a given fluid is an expression of the rate of flow through unit area and thickness under unit differential pressure at a given temperature. Synonymous with hydraulic conductivity when the fluid is water.

“PFAS” means per- and poly- fluoroalkyl substances.

“PFAS Detailed Site Investigation (Revision 0, April 2019)” means the report submitted to the administering authority by the holder of this environmental authority on 30 April 2019 in accordance with the requirements of STAT1304.

"progressive rehabilitation" means rehabilitation (defined below) undertaken progressively OR a staged approach to rehabilitation as mining operations are ongoing.

"Queensland waters" means a stretch of water for which Queensland has jurisdictional powers. The limit of Queensland waters is defined by a line three nautical miles seaward of the territorial sea baseline.

“receiving environment” means all groundwater, surface water, land, and sediments that are not disturbed areas authorised by this environmental authority.

For the purposes of PFAS monitoring, the receiving environment means

- Andoom Creek including Sunrise Creek, Botchett and Saleng Tea Tree Swamps;
- Embley River, including the tidal creeks, foreshore, mangrove and mudflats of the Embley River and the tidal influence of the Embley River in the Hey River. Includes Beening Creek, Marmoss Creek, McLeod Lake, and Patricia Lake;
- Mission River including the tidal creeks, foreshore, mangrove and mudflats of the Mission River. Includes Trundling Creek, Pappan Creek;

and as depicted in Figure F1 of PFAS Detailed Site Investigation (Revision 0, April 2019).

- Groundwaters of the Bulimba Formation (Napranum Sand and Undifferentiated) and Trunding Clay within the Weipa and Andoom areas (also referred to as the Shallow Aquifer).

“receiving waters” means all groundwater and surface water that are not disturbed areas authorised by this environmental authority.

“Reference Site” means a location relating to an environmental value, such as water quality, a coral reef, fishing ground, or other feature as defined in the Queensland Water Quality Guidelines that will not be affected by a disturbance caused by the proposed activity. Where a proposed activity has been identified to place one or more environmental values under some level of risk, Reference Site(s) serve to indicate the state of the natural condition outside of the influence of the proposed activity. Reference sites are typically matched or correspond to one or more Concern Sites. Reference Sites are sometimes referred to as Control Sites when they do not strictly comply with the true definition of Reference Sites in the QWQG and ANZECC & ARMCANZ (2000).

“regulated dam” means any dam in the significant or high hazard category as assessed using the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams published by the administering authority.

"rehabilitation” the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the completion criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land.

"representative” means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

“Ringelmann method” refers to a chart that provides shades of grey by which the density of columns of smoke rising from stacks may be compared.

"self-sustaining” means an area of land which has been rehabilitated and has maintained the required completion criteria without human intervention for a period nominated by the administering authority.

"sensitive place” means:

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- an educational institution; or
- a medical centre or hospital; or
- a protected area under the Nature Conservation Act 1992, the Marine Parks Act 1992 or a World Heritage Area; or
- a public park or gardens; or
- a place used as a workplace, an office or for business or commercial purposes which is not part of the mining activity and does not include employees accommodation or public roads.

"short term 50th percentile" means not more than five (5) of the measured values of the quality characteristic are to exceed the stated release limit for any ten (10) consecutive samples for a release/monitoring point at any time during operation.

"significant construction works" means construction works to facilitate or support mining activities but does not include early site access works or activities to support exploration, site investigation or site establishment works where approvals are held.

“significant wetlands” are those designated under the Ramsar Convention as containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity. They are listed on the List of Wetlands of International Importance because of their ecological, botanical, zoological, limnological or hydrological importance.

“South of Embley” means the area on ML7024 and ML 6024 south of the Embley River.

"spillway" means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges form the dam, normally under flood conditions or in anticipation of flood conditions.

"stable" in relation to land, means land form dimensions are and will remain within tolerable limits now and in the foreseeable future. Issues to be properly considered in regard to whether or not the landform is stable include geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.

“stream order” denotes a stream classification system where a watercourse is given a classification according to the number of additional tributaries associated with the watercourse.

"suitably qualified and experienced person" in relation to dams means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the Professional Engineers Act 1988, OR registered as a National Professional Engineer (NPER) with the Institution of Engineers Australia, OR holds equivalent professional qualifications to the satisfaction of the administering authority for the Act; AND the administering authority for the Act is satisfied that person has knowledge, suitable experience and demonstrated expertise in relevant fields, as set out below:

(b) knowledge of engineering principles related to the structures, geomechanics, hydrology, hydraulics, chemistry and environmental impact of dams; and
(c) a total of five years of suitable experience and demonstrated expertise in the geomechanics of dams with particular emphasis on stability, geology and geochemistry, and
(d) a total of five years of suitable experience and demonstrated expertise each, in three of the following categories:
    - investigation and design of dams.
    - Construction, operation and maintenance of dams.
    - hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology.
    - hydraulics with particular reference to sediment transport and deposition, erosion control, beach processes.
    - hydrogeology with particular reference to seepage, groundwater.
    - solute transport processes and monitoring thereof.
    - dam safety.

"temporary seaborne access facility" means the temporary barge access and/or temporary passenger jetty.

"tolerable limits" means a range of parameters regarded as being sufficient to meet the objective of protecting relevant environmental values. For example, a range of settlement for a tailings capping, rather than a single value, could still meet the objective of draining the cap quickly, preventing ponding and limiting infiltration and percolation.

"**town activities**" means the activities carried out by the holder of this environmental authority pursuant to the Commonwealth Aluminium Corporation Pty Limited Agreement Act 1957 in connection with the operation of the township of Weipa.

"TRH" means total recoverable hydrocarbon.

"µS/cm" means micro Siemens per centimetre.

"void" means any constructed, open excavation in the ground.

"waters" - includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and banks of a watercourse, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater.

"**water release event**" means release of any waters that are or maybe contaminated by the mining activity.

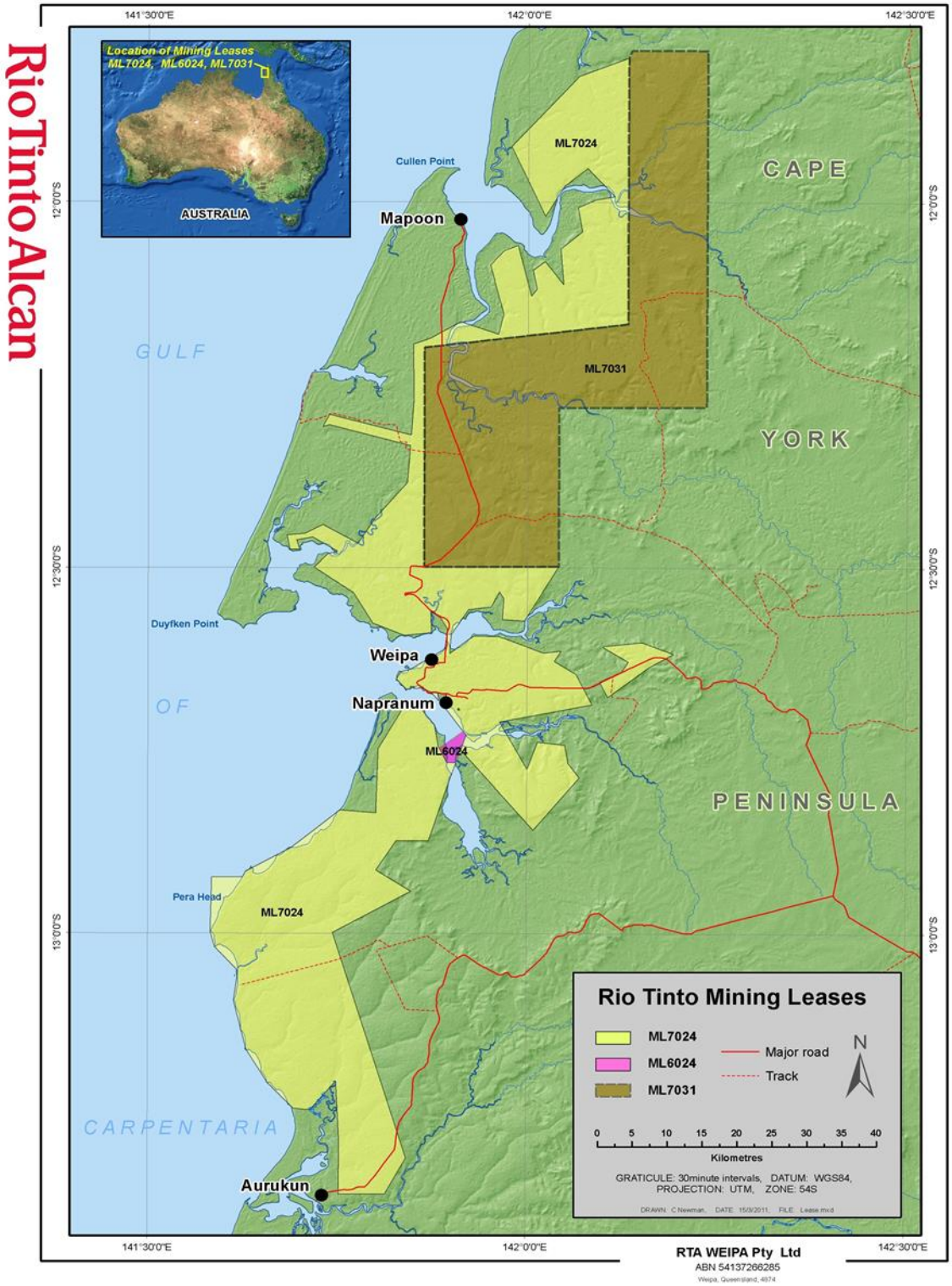
"wetlands" are areas of permanent or periodic/intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed 6 metres. To be classified as a wetland, the area must have one or more of the following attributes:

a) at least periodically, the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle, or
b) the substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers, or
c) the substratum is not soil and is saturated with water, or covered by water at some time.

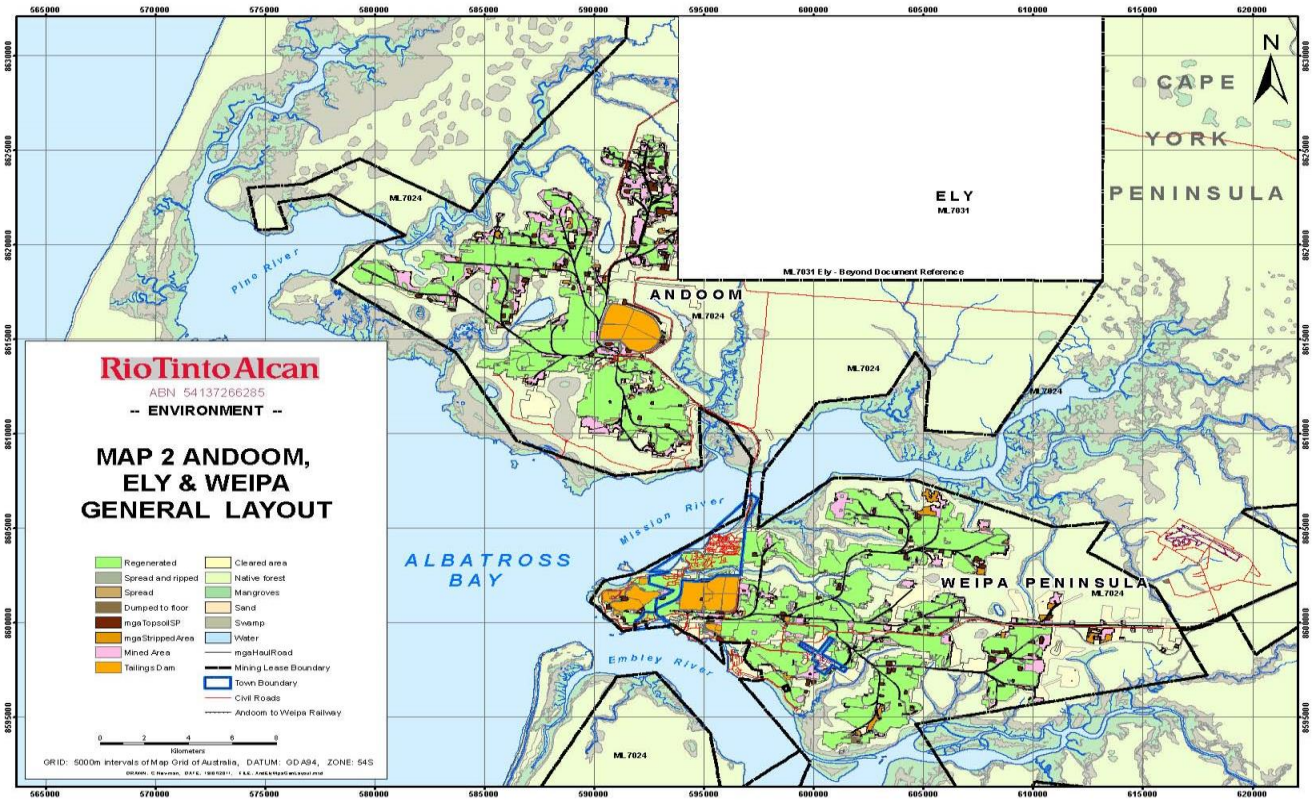
END OF DEFINITIONS FOR SCHEDULE K

SCHEDULE L – PLANS

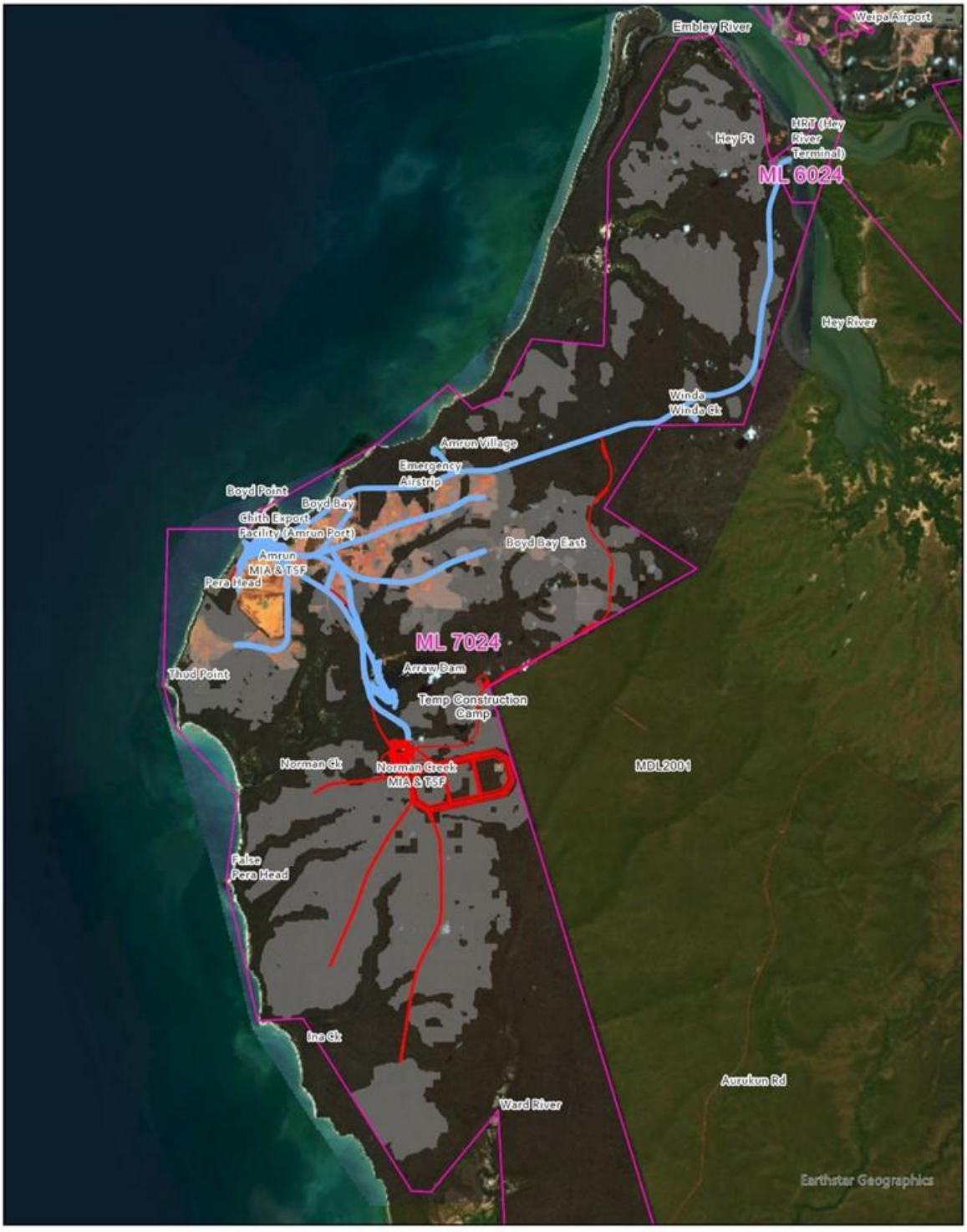
Plan 1 – Weipa General Area Plan



Plan 2 – East Weipa and Andoom Operational Areas



Plan 3 – South of Embley Infrastructure and Conceptual Mine Plan



Legend

- Conceptual Mine Areas years 1-40
- RTW Mine Lease GDA94
- Conceptual FS Norman Creek Expansion
- Amrun (Boyd) Infrastructure

South of Embley Project Conceptual Infrastructure and Mine Plan (Up to 40yrs)
EPML00725113 Plan 3

N

0 2.5 5 10 Kilometers

Datum Projection: GDA 94 MGA Zone 54

Date:1/12/2025

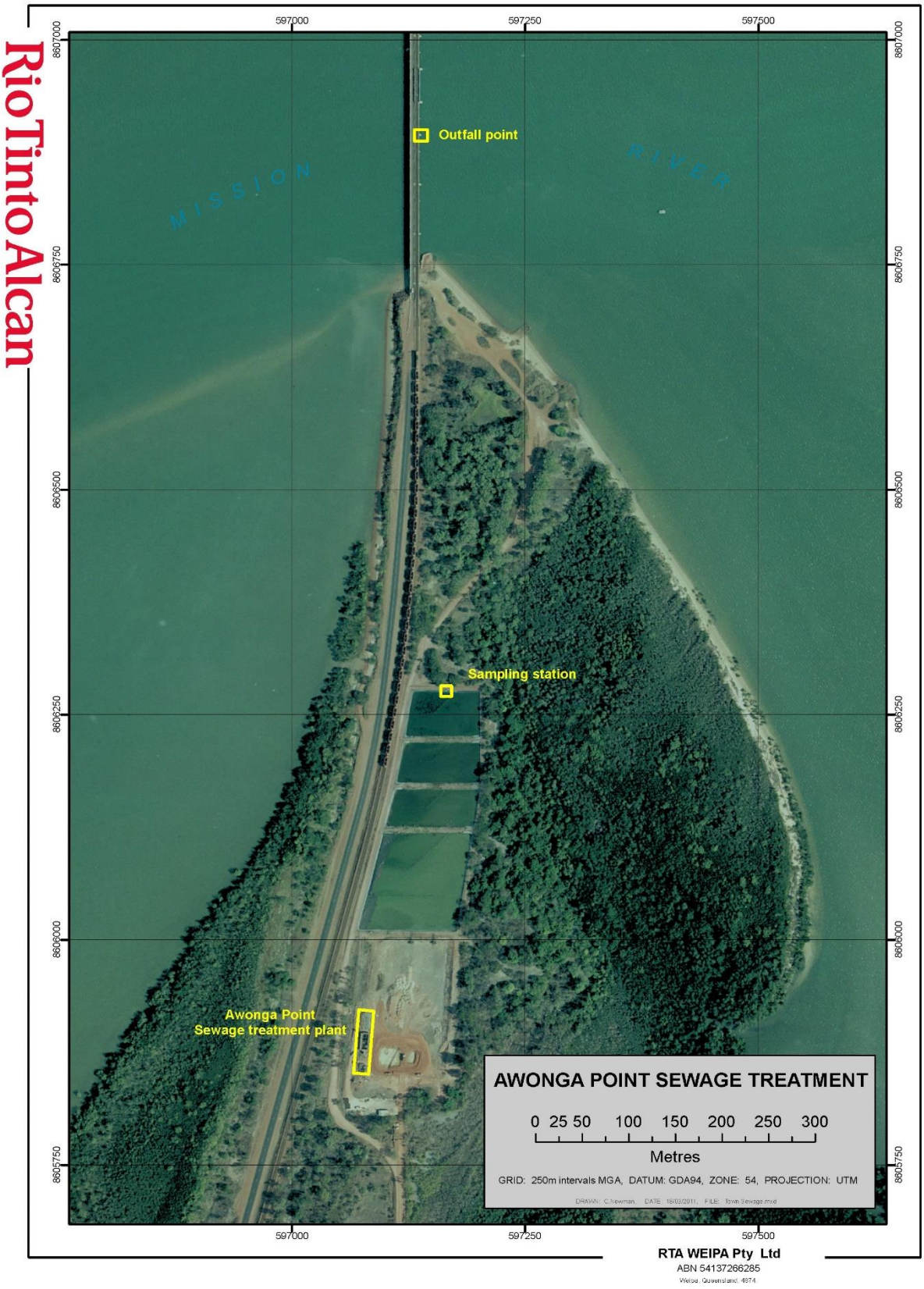
Plan 4 - Air Quality Monitoring Sites



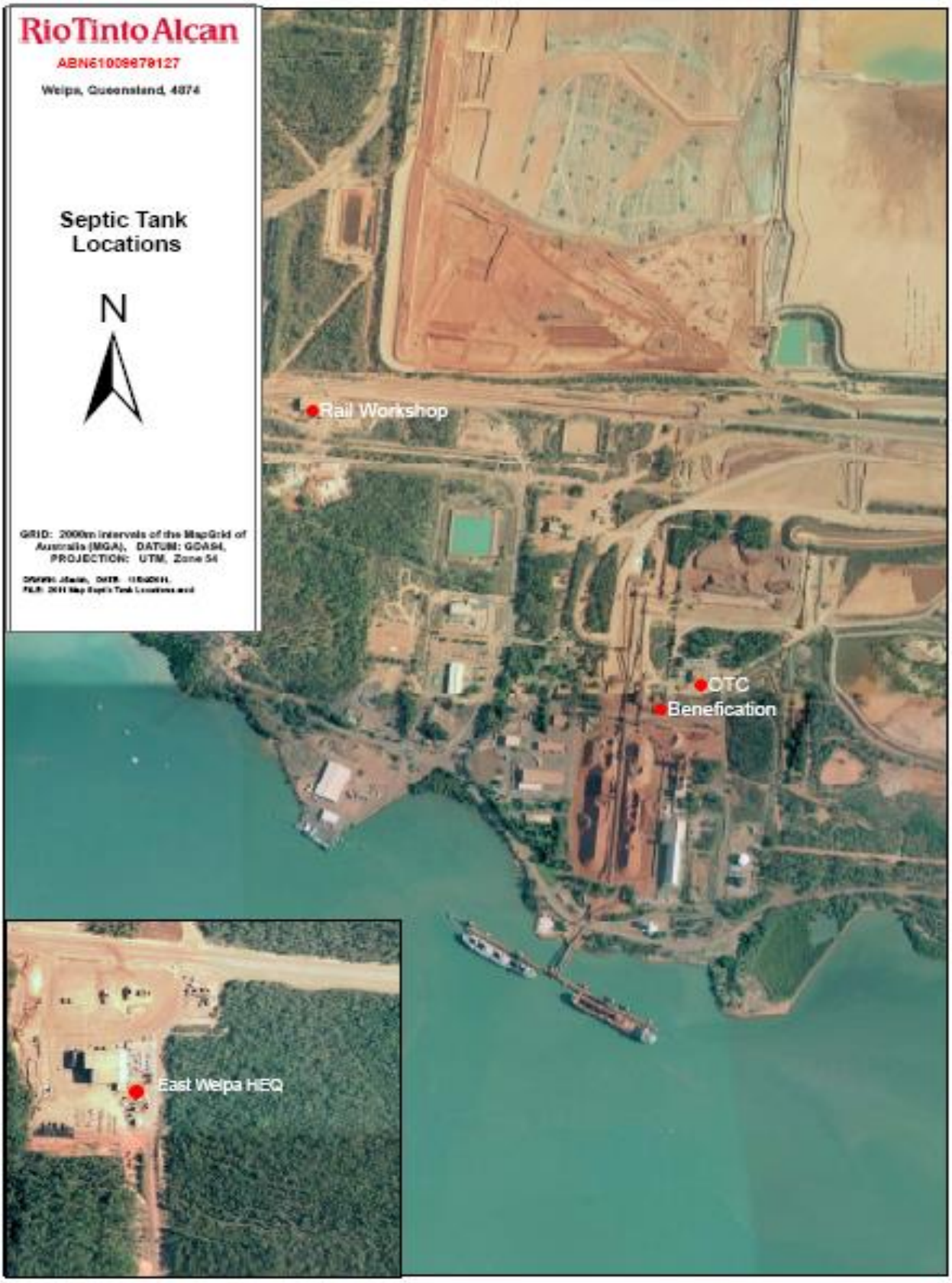
Plan 5 – Evans Landing Landfill



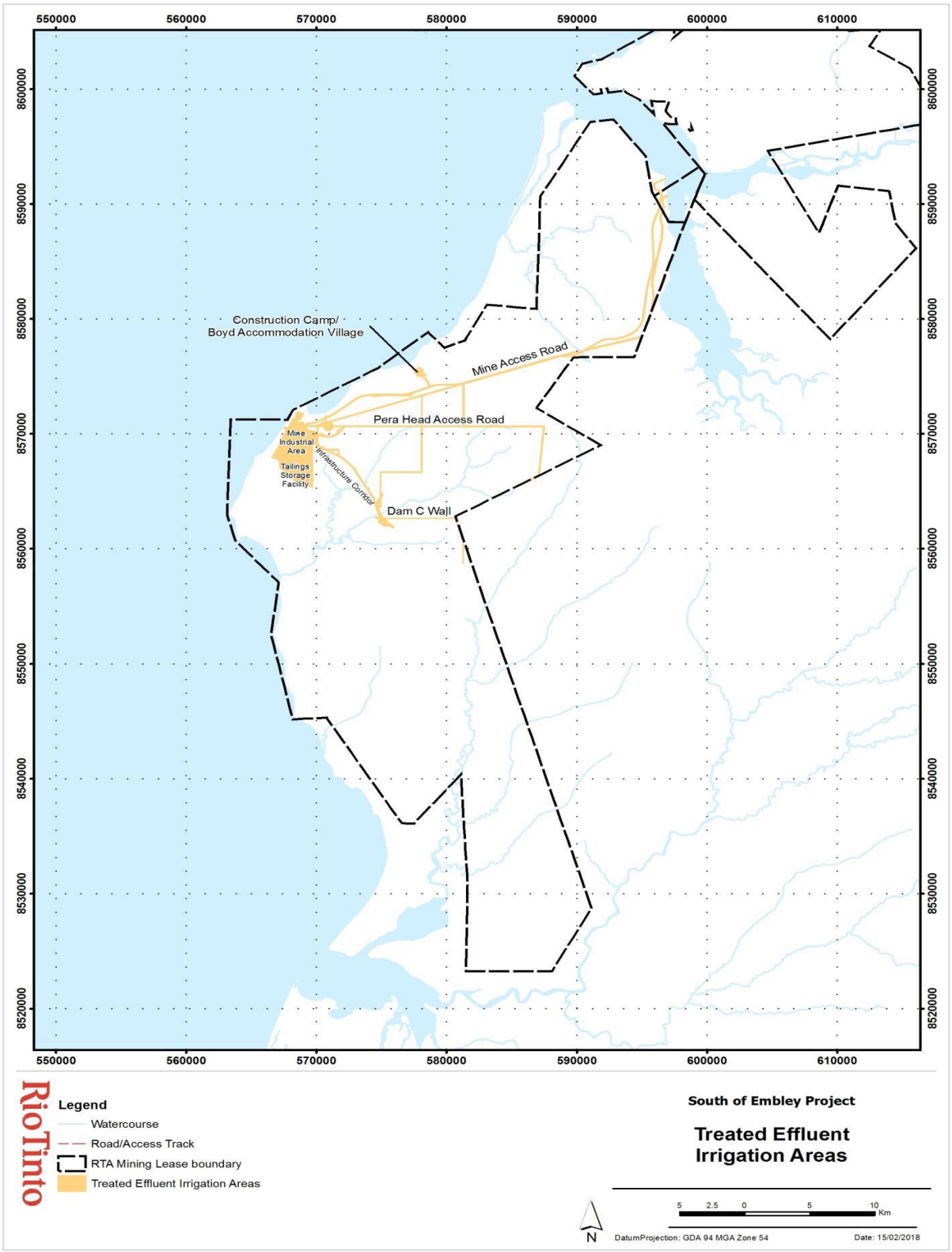
Plan 6 – Awonga Point Sewage Treatment Water Release & Water Quality Monitoring Sites



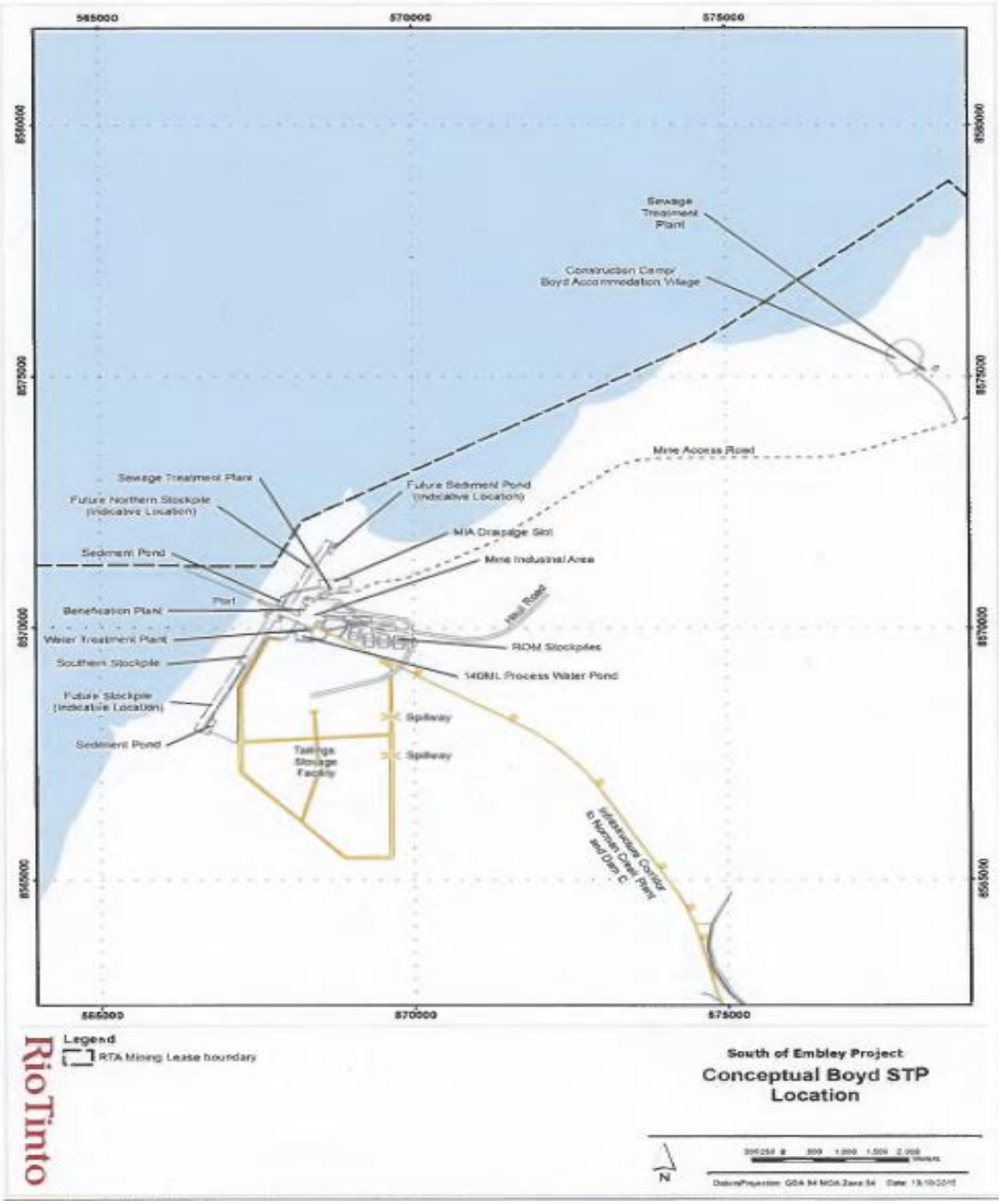
Plan 7 – Release Points to Land (East Weipa)


RioTinto Alcan
ABN61009679127
Weipa, Queensland, 4874
Septic Tank Locations
N
GRID: 2000m intervals of the MapGrid of Australia (MGA), DATUM: GDA94, PROJECTION: UTM, Zone 54
Rail Workshop
OTC
Benefication
East Weipa HEQ

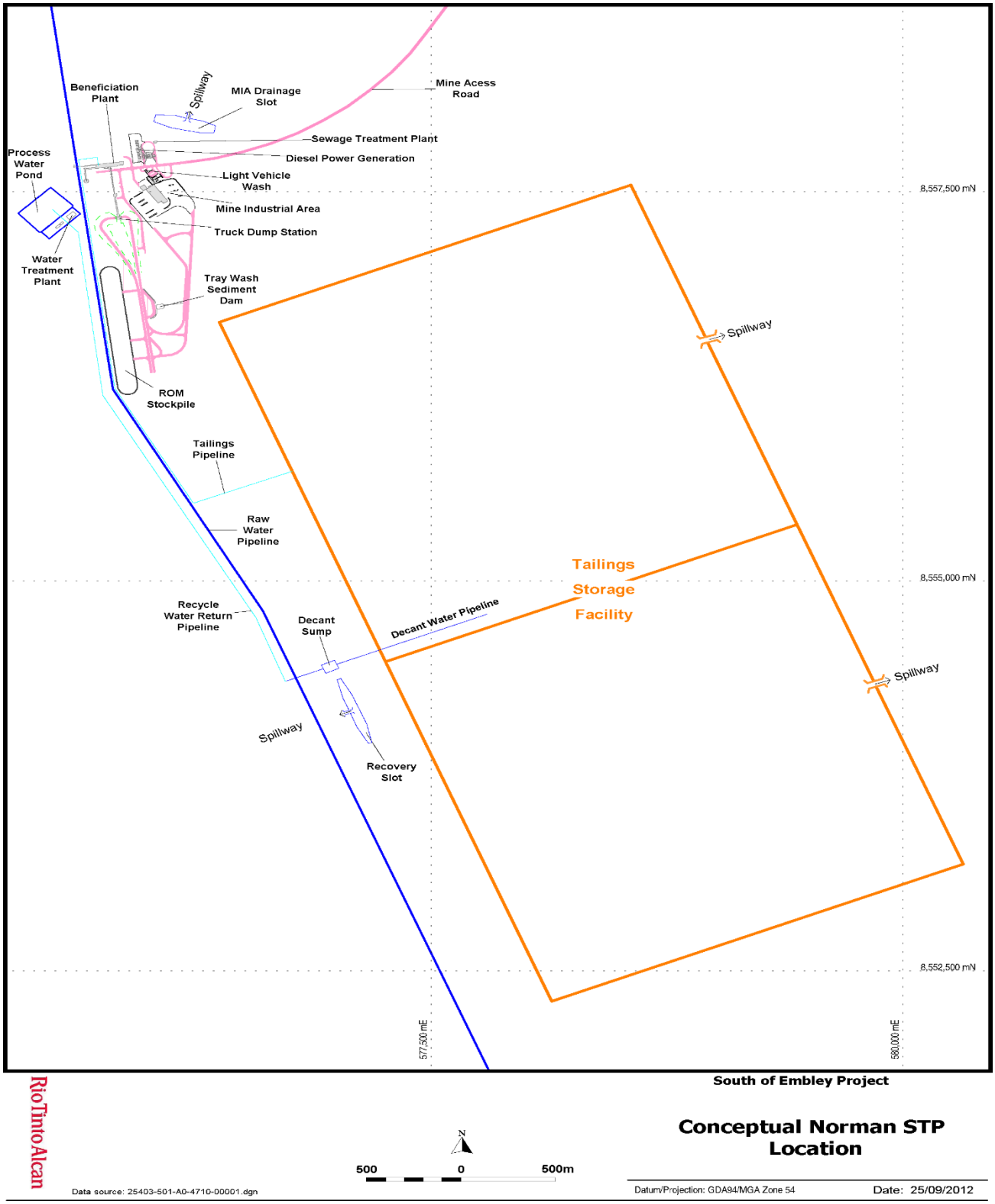
Plan 8 – Release Points to Land (South of Embley)



Plan 9 - Conceptual Boyd STP Location



Plan 10 - Conceptual Norman STP Location



Appendix 1 – Maximum Contaminant Levels in Regulated Waste

Table 1 – Maximum Contaminant Levels

Contaminant	Maximum Contaminant Level (mg/kg)
Monocyclic Aromatic Hydrocarbons(MAH)	
Benzene	20
Ethyl Benzene	1000
Toluene	600
Xylene	500
Total MAH	1 000
Polycyclic Aromatic Hydrocarbons(PAH)	
Total PAH	1 000
Phenolic Contaminants	
Non halogenated compounds:	
Phenol	250
m-cresol	500
o-cresol	500
p-cresol	500
Total non halogenated phenol	500
Halogenated phenol:	
Chlorophenol	5
Trichlorophenol	20
Pentachlorophenol	20
Total halogenated phenol	20
Chlorinated Hydrocarbons	
Chlorinated Aliphatic Compounds:	
Carbon tetrachloride	10
1,2 Dichloroethane	20
l,1 Dichloroethene	1
Tetrachloroethene	20
Trichloroethene	25
Total chlorinated aliphatic compounds	50
Chlorinated Aromatic Compounds:	
Chlorobenzene	200
Hexachlorobenzene	1
Total Chlorinated Aromatic compounds	200
Pesticides	
Total organochlorine	50
Total herbicides	50
Total carbamates	50
Total organophosphorus	50
Petroleum Hydrocarbons	
Total petroleum hydrocarbons(C6-C9)	1 000
Total petroleum hydrocarbons(C10-C14)	10 000
Total petroleum hydrocarbons(C15-C28)	50 000
Total petroleum hydrocarbons(C28-C36)	50 000
Non Scheduled Solid Polychlorinated Biphenyls (PCBs)	50

Table 2 - Maximum Leaching Contaminant Levels

Contaminant	Maximum Leaching Contaminant Levels (mg/L)
Non Specific Contaminants	
Biochemical Oxygen Demand	20 000
Total 0rganic Carbon	10 000
Petroleum Hydrocarbons	50
Metals/Non-Metals	
Antimony	5.0
Arsenic	5.0
Barium	100.0
Cadmium	0.5
Chromium	5.0
Cobalt	5.0
Copper	200.0
Lead	5.0
Mercury	0.1
Molybdenum	5.0
Nickel	5.0
Selenium	1.0
Silver	10.0
Thallium	1.0
Tin	3.0
Vanadium	5.0
Zinc	500.0
Inorganic Anions	
Bromide	50.0
Chloride	6 000
Cyanide (total)	8
Fluoride	150.0
Sulphate	50 000
Nitrate	5 000
Monocyclic Aromatic Hydrocarbon(MAH)	
Benzene	1.0
Ethyl benzene	50.0
Toluene	80.0
Xylene	60.0
Total MAH	80.0
Polycyclic Aromatic Hydrocarbons(PAH)	
Anthracene	0.7
Benz (a) anthracene	0.05
Benz (c) phenanthrene	0.05
Benzo (a) pyrene	0.02
Benzo (b) fluoranthene	0.05
Benzo (k) fluoranthene	0.05
Chrysene	0.1
Dibenz (a,h) anthracene	0.02
Dibenz (a,h) pyrene	0.1
Dimethylbenz (a) anthracene	0.05
Fluoranthene	0.2
Indeno (1,2,3-cd) pyrene	0.1
Naphthalene	0.7
Phenanthrene	0.1
Pyrene	0.7
Total PAH	1.0
Phenolic Contaminants	

Contaminant	Maximum Leaching Contaminant Levels (mg/L)
Non halogenated compounds:	
Phenol	10.0
m-Cresol	20.0
o-Cresol	20.0
p-Cresol	20.0
Halogenated phenols:	
Chlorophenol	0.1
Trichlorophenol	1.0
Pentachlorophenol	1.0
Chlorinated Hydrocarbons	
Chlorinated Aliphatic Compounds:	
Carbon tetrachloride	0.3
1,2 Dichloroethane	1.0
1,1 Dichloroethene	0.03
Tetrachloroethene	1.0
Trichloroethene	3.0
Chlorinated Aromatic Compounds:	
Chlorobenzene(total)	30.0
Hexachlorobenzene	0.02
Pesticides	
Organochlorine:	
Aldrin	0.03
Chlordane	0.1
Dieldrin	0.03
DDT	2
Endrin	0.03
Heptachlor	0.03
Lindane	2
Methoxychlor	30
Toxaphene	0.05
Herbicides:	
2,4-D	3
2,4-DB	2.0
MCPA	2.0
2,4,5 –T	10
Carbamates:	
Carbaryl	3
Carbofuran	1
Organophosphorus:	
Diazinon	0.3
Parathion	1
Methyl Parathion	10

Table 3 – Maximum Contaminant Levels in Soils

Contaminant	Maximum Contaminant Levels in Soils (mg/kg)
Arsenic (total)	200
Beryllium	40
Cadmium	40
Chromium (iii)	240 000
Chromium (vi)	200
Copper	2000
Lead	600
Manganese	3000
Methyl Mercury	20

Contaminant	Maximum Contaminant Levels in Soils (mg/kg)
Mercury (inorganic)	30
Nickel	600
Zinc	14000
Monocyclic Aromatic Hydrocarbons(MAH)	
Benzene	10
Ethyl Benzene	500
Toluene	300
Xylene	250
Total MAH	500
Polycyclic Aromatic Hydrocarbons(PAH)	
Total PAH	500
Phenolic Contaminants	
Phenol	100
m-cresol	250
o-cresol	250
p-cresol	250
Total non halogenated phenol	250
Chlorophenol	1
Trichlorophenol	5
Pentachlorophenol	5
Total halogenated phenol	5
Chlorinated Hydrocarbons	
Carbon tetrachloride	5
1,2 Dichloroethane	10
l,1 Dichloroethene	1
Tetrachloroethene	10
Trichloroethene	25
Total chlorinated aliphatic cpds	50
Chlorobenzene	100
Hexachlorobenzene	1
Total Chlorinated Aromatic cpds	100
Pesticides	
Total organochlorine	5
Total herbicides	25
Total carbamates	25
Total organophosphorus	10
Petroleum Hydrocarbons	
Total petroleum hydrocarbons(C6-C9)	500
Total petroleum hydrocarbons(C10-C14)	5 000
Total petroleum hydrocarbons(C15-C28)	10 000
Total petroleum hydrocarbons(C28-C36)	10 000

Table 4 - Maximum Leaching Contaminant Levels in Soils

Contaminant Analysis	Maximum Leaching Contaminant Levels in Soils (mg/L)
Non Specific Contaminants	
Biochemical Oxygen Demand	20 000
Total 0rganic Carbon	10 000
Petroleum Hydrocarbons	25
Metals/Non-Metals	
Antimony	0.5
Arsenic	0.5
Barium	10.0
Cadmium	0.05
Chromium	0.5

Contaminant Analysis	Maximum Leaching Contaminant Levels in Soils (mg/L)
Cobalt	0.5
Copper	10.0
Lead	0.5
Mercury	0.01
Molybdenum	0.1
Nickel	0.5
Selenium	0.1
Silver	0.5
Thallium	0.1
Tin	0.3
Vanadium	0.5
Zinc	50.0
Inorganic Anions	
Bromide	5.0
Chloride	6 000
Cyanide (total)	1.0
Fluoride	15.0
Sulphate	2 500
Nitrate	100.0
Monocyclic Aromatic Hydrocarbon(MAH)	
Benzene	0.1
Ethyl benzene	5.0
Toluene	3.0
Xylene	2.0
Total MAH	5.0
Polycyclic Aromatic Hydrocarbons(PAH)	
Anthracene	0.07
Benz (a) anthracene	0.005
Benz (c) phenanthrene	0.005
Benzo (a) pyrene	0.002
Benzo (b) fluoranthene	0.005
Benzo (k) fluoranthene	0.005
Chrysene	0.10
Dibenz (a,h) anthracene	0.002
Dibenz (a,h) pyrene	0.01
Dimethylbenz (a) anthracene	0.005
Fluoranthene	0.02
Indeno (1,2,3-cd) pyrene	0.01
Naphthalene	0.07
Phenanthrene	0.01
Pyrene	0.07
Total PAH	0.1
Phenolic Contaminants	
Non haloqenated compounds:	
Phenol	1.0
m-Cresol	2.0
o-Cresol	2.0
p-Cresol	2.0
Halogenated phenols:	
Chlorophenol	0.01
Trichlorophenol	0.1
Pentachlorophenol	0.1
Chlorinated Hydrocarbons	
Chlorinated Aliphatic Compounds:	
Carbon tetrachloride	0.03

Contaminant Analysis	Maximum Leaching Contaminant Levels in Soils (mg/L)
1,2 Dichloroethane	0.1
1,1 Dichloroethene	0.003
Tetrachloroethene	0.1
Trichloroethene	0.3
Chlorinated Aromatic Compounds:	
Chlorobenzene(total)	1.0
Hexachlorobenzene	0.002
Pesticides	
Organochlorine:	
Aldrin	0.001
Chlordane	0.006
Chlorpyrifos	0.01
Dieldrin	0.001
DDT	0.003
Endrin	0.001
Heptachlor	0.003
Lindane	0.1
Methoxychlor	0.1
Toxaphene	0.005
Herbicides:	
2,4-D	0.1
2,4-DB	0.2
MCPA	0.2
2,4,5 –T	0.002
Carbamates:	
Carbaryl	0.06
Carbofuran	0.03
Organophosphorus:	
Diazinon	0.01
Parathion	0.03
Methyl Parathion	0.006
Triazines:	
Atrazine	0.01
Simazine	0.01

END OF APPENDIX 1

END OF ENVIRONMENTAL AUTHORITY

Australian Government
Department of Agriculture, Water and the Environment

VARIATION OF CONDITIONS ATTACHED TO APPROVAL SOUTH OF EMBLEY BAUXITE MINE AND PORT DEVELOPMENT (EPBC 2010/5642)

This decision to vary conditions of approval is made under section 143 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Approved action

Person to whom the approval is granted	RTA Weipa Pty Ltd ABN: 54 137 266 285
Approved action	South of Embley Bauxite Mine and Port Development, Cape York Queensland (See EPBC Act referral 2010/5642)

Variation

Variation of conditions attached to approval	The variation is: Delete conditions 36 and 40 attached to the approval and substitute with the conditions specified in the table below
Date of effect	This variation has effect on the date the instrument is signed

Person authorised to make decision

Name and position	Kim Farrant Assistant Secretary Environment Assessments (Vic, Tas) and Post Approvals Branch
Signature	
Date of decision	3 December 2021

Date of decision	Conditions attached to approval
Original dated 14/5/2013	***Temporary Barge Plan*** 1. Unless agreed to by the **Minister** in writing, the approval holder must submit a Temporary Barge Plan to the **Minister** to manage, avoid and mitigate negative **impacts** to **listed turtle species**, including their breeding and foraging habitat, from the **construction**, **operation** and decommissioning of the temporary barge facility near Pera Head.
Original dated 14/5/2013	2. The Temporary Barge Plan must include surveying to ascertain whether active, or potentially active, nests for the **listed turtle species** are present in the area to be **impacted** by the temporary barge facility.
Original dated 14/5/2013	3. The Temporary Barge Plan must include adaptive management and mitigation measures to benefit **listed turtle species**, including as identified in the Final Environmental Impact Statement**.** The Temporary Barge Plan must include and address effective management strategies to mitigate each potential **impact** to **listed turtle species,** desired outcomes, benchmarks, performance indicators and goals, timeframes for reporting and implementation, corrective actions and contingency measures, and responsibility for implementing actions.
Original dated 14/5/2013	4. The Temporary Barge Plan must be submitted to the **Minister** for approval**.** Commencement of the temporary barge facility must not occur until the **Minister** has approved the Temporary Barge Plan. The approved Temporary Barge Plan must be implemented**.**
Original dated 14/5/2013	***Marine and Shipping Management Plan*** 5. The person taking the action must submit a Marine and Shipping Management Plan, covering all facets of the **construction** and **operation** of all marine related precincts for the South of Embley project including, but not limited to, the Boyd Port development, shipping activities, barge and ferry terminals, recreational use of beaches on Mining Lease (ML) 7024 by project workforce and the marine environment, anchoring, and underwater noise (excluding dredge management plans at condition 14 and condition 16) for the **Minister's** approval and must effectively define, avoid, manage and mitigate against **impacts** to the following **matters of national environmental significance:** a. the outstanding universal value of the Great Barrier Reef World Heritage Property; b. Great Barrier Reef National Heritage Place; c. Great Barrier Reef Marine Park; d. **Listed turtle species;** e. **Listed dolphin species;** and, f. Dugong (*Dugong dugon)* and Bryde's Whale (*Balaenoptera edeni).*
Original dated 14/5/2013	6. The Marine and Shipping Management Plan must incorporate avoidance and mitigation mechanisms for **impacts** to the outstanding universal value of the Great Barrier Reef World Heritage Property; Great Barrier Reef National Heritage Place: Great Barrier Reef Marine Park; **Listed turtle species; Listed dolphin species;** Dugong *(Dugong dugon)* and Bryde's Whale *(Balaenoptera edeni)*, including but not limited to:

Date of decision	Conditions attached to approval
	a. **impacts** to the marine environment that supports the above listed species traversing, foraging and/or breeding habitat including, seagrass, reefs and corals, **listed turtle species** nesting and/or foraging habitat; b. **impacts** from changes to coastal processes, including beach and/or shore erosion from the Boyd Port development, barge facilities and/or ferry facilities and ensure the action does not alter the beach gradients to such an extent that **listed turtle species** are prevented from and/or impeded in accessing the beach foreshore to nest or **listed turtle species** hatchlings are prevented and/or impeded from entering the marine environment; c. artificial light related **impacts** on **listed turtle species** (including hatchlings) nesting beaches and adjacent marine environment including, but not limited to, lighting from Boyd Port construction and operation, shipping, temporary passenger landing and barge facility between Pera Head and Boyd Bay, and anchored/moored vessels (but excludes operations within the Hey and Embley Rivers); d. measures to ensure shipping activities are undertaken in accordance with the *Great Barrier Reef Marine Park Zoning Plan (2003)*, or its most current version; e. mechanisms to implement best practice mitigation and management measures for ship loading and unloading, and all other aspects of shipping activities to minimise **impacts** on the marine environment (including bauxite and/or other contamination spills); f. **impacts** from vessel strike to **listed turtle species, listed dolphin species** or Dugongs including, but not limited to, restricting vessel speed limits to 6 knots in water depths of 2.5 metres or less; and, implementation of a transit lane in the Hey River and Embley River that follows the greatest water depths; g. **impacts** from underwater noise including, but not limited to, pile driving activities at Condition 12 and shipping; h. measures that minimise the risk of introduced marine pest species over the life of the project, including ballast water management. The marine pest monitoring program must be consistent with the Department of Agriculture, Fisheries and Forestry's *Australian Marine Pest Monitoring Manual (version 2.0),* or its most current version; i. **impacts** associated with recreational use by project employees of **listed turtle species** nesting habitat (including, but not limited to, implementation of a permit access system for the employees); j. if agreed by the **department** in writing, requirements of condition 1 to condition 4 may be incorporated into the Marine and Shipping Management Plan; k. **impacts** identified in the Environmental Management Plan Outlines at Appendix 7-E (Threatened estuarine and Marine species); Appendix 9-A (Non-avian Migratory Species); Appendix 11-A (Great Barrier Reef Marine Park, World Heritage Area and National

Date of decision	Conditions attached to approval
	Heritage Place); and, Appendix 10- A (Commonwealth Marine Area) in the **Final Environmental Impact Statement;** and, l. mechanisms to notify the **department** in writing within five (5) business days of any confirmed or suspected sighting/s and/or observation/s in the marine environment in and/or around the project area of the Dwarf Sawfish *(Pristis clavata*); Green Sawfish *(Pristis zijsron);* Freshwater Sawfish *(Pristis microdon);* or the Speartooth Shark *(Glyphis sp. A*).
Original dated 14/5/2013	7. The Marine and Shipping Management Plan must also include adaptive management strategies to benefit the outstanding universal value of the Great Barrier Reef World Heritage Property; Great Barrier Reef National Heritage Place; Great Barrier Reef Marine Park; **listed turtle species, listed dolphin species,** Dugong and Bryde's Whale. The Marine and Shipping Management Plan must include and address effective management strategies to mitigate each potential **impact**, desired outcomes, benchmarks, readily measurable performance indicators and goals, timeframes for reporting and implementation, corrective actions and contingency measures, and specify the persons/ roles with responsibility for implementing actions. The Marine and Shipping Management Plan must provide information detailing Traditional Owner opportunities for employment, and mechanisms for reporting the number of local indigenous person/s actually employed in the implementation of this Plan (consistent with condition 42).
Original dated 14/5/2013	8. The Marine and Shipping Management Plan may be submitted to the **Minister** in the following stages, but the respective stages must not commence until the **Minister** has approved each respective version of the plan: a. an initial plan related to **impacts** associated with **construction** activities, other than **Preliminary Works** and the pile driving operations carried out in accordance with condition 12 to condition 13; b. a subsequent plan to also reflect **impacts** associated with **operations** on the outstanding universal value of the Great Barrier Reef World Heritage Property; Great Barrier Reef National Heritage Place and Great Barrier Reef Marine Park; and, c. subsequent revisions in accordance with condition 10.
Original dated 14/5/2013	9. The subsequent Marine and Shipping Management Plan at condition 5 must be developed in consultation with relevant Commonwealth agencies, including the Australian Maritime Safety Authority and the Great Barrier Reef Marine Park Authority, and state agencies, including Maritime Safety Queensland.
Original dated 14/5/2013	10. Within two (2) years of **operations** commencing**,** the Marine and Shipping Management Plan must be reviewed, revised and submitted to the **Minister** for approval. The Marine and Shipping Management Plan must be reviewed, revised and submitted to the **Minister** for approval every three (3) years for the next nine (9) years and, unless otherwise agreed by the **Minister** in writing every five (5) years thereafter for the life of the project.

Date of decision	Conditions attached to approval
Original dated 14/5/2013	11. The approved Marine and Shipping Management Plan/s must be implemented.
Original dated 14/5/2013	***Pile Driving*** 12. The approval holder must ensure that the following measures related to any pile driving operations are implemented to minimise the **impacts** of underwater noise and disturbance on the following listed threatened species and/or listed migratory species: i. **Listed turtle species;** ii. **Listed dolphin species**; and iii. Dugong *(Dugong dugon)* and Bryde's Whale *(Balaenoptera edeni).* Those measures must include: a. pile driving operations must implement **soft start procedures.** The soft start procedures must not commence until the above listed species are observed to leave the **exclusion zone/s** or are not observed in the **exclusion zone/s** for at least 30 minutes**;** b. observations for the above listed species must be undertaken over the **observation zone** by a suitably qualified marine observer, for at least 30 minutes before the commencement of pile driving operations, and during pile driving operations; c. the **exclusion zone** must be no less than 100 metres from the pile driving operations and be implemented so as to ensure that the above listed species are not exposed to sound exposure levels of greater than or equal to 183 dB re 1µ Pa2.s; d. pile driving operations must cease if the species listed above are observed within the **exclusion zone**, and action to cease all pile driving operations within the **exclusion zone** must be taken within two minutes of the observation, or as soon as possible, if it is unsafe to cease pile driving operations within two minutes. Every 30 days during periods when pile driving operations are occurring, the approval holder must report the number of incidents where pile driving operations did not cease within two minutes; e. pile driving operations must not recommence until the species listed above observed within the **exclusion zone** are observed to leave the **exclusion zone** or are not observed to leave the **exclusion zone** for at least 30 minutes; and, f. only pile driving operations which have commenced prior to sunset or prior to a **period of low visibility** can continue between the hours of sunset and sunrise, unless pile driving operations are suspended for more than 15 minutes.
Original dated 14/5/2013	13. The criteria for a suitably qualified marine observer at condition 12b must be submitted to the **Minister** for approval and records must be kept of marine observers subsequently engaged**.** Pile driving operations cannot commence until the criteria has been approved.

Date of decision	Conditions attached to approval
Original dated 14/5/2013	***Port and River Dredge Management Plans*** 14. The approval holder must submit to the **Minister** for approval a Capital Dredging Management Plan/s for capital dredging activities associated with the South of Embley project. The Capital Dredging Management Plan/s must be prepared in accordance with the *Australian Government National Assessment Guidelines for Dredging (2009)*, or their most current versions, to avoid and mitigate **impacts** on: a. Commonwealth Marine Area; b. **Listed turtle species**; c. **Listed dolphin species;** and, d. Dugong (*Dugong dugon*) and Bryde's Whale (*Balaenoptera edeni)*.
Original dated 14/5/2013	15. **Capital dredging** activities cannot commence until the Capital Dredging Management Plan at condition 14 has been approved.
Original dated 14/5/2013	16. The approval holder must submit to the **Minister** for approval a Maintenance Dredging Management Plan/s for all maintenance dredging activities associated with the South of Embley Project. The Maintenance Dredging Management Plan/s must be prepared in accordance with the *Australian Government National Assessment Guidelines for Dredging (2009)* and the **department's** *Long Term Monitoring and Management Plan Requirements for 10 year Permits to Dump Maintenance Dredge Material at Sea (July 2012),* or their most current versions, to avoid and mitigate **impacts** for the **matters of national environmental significance** listed at condition 14.
Original dated 14/5/2013	17. Maintenance dredging activities cannot commence until the Maintenance Dredging Management Plan at condition 16 has been approved.
Original dated 14/5/2013	18. The approved Plans at condition 14 and condition 16, and/or their subsequent revisions, must be implemented.
Original dated 14/5/2013	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.
Original dated 14/5/2013	***Vegetation Clearing*** 20. The approval holder must not **clear vegetation** or remove more than 29,658 hectares of vegetation over the life of the project. The maximum **clearing of vegetation** for **mining areas** and **infrastructure** that can occur in any 12 month period is 4,000 hectares.
Original dated 14/5/2013	21. To mitigate **impacts** on Red Goshawk (*Erythrotriorchis radiates*) and Masked Owl (*Tyto novaehollandiae kimberli)*, **Listed flora species** and **Listed migratory species** the approval holder must provide vegetation buffer zones from **mining area/s** (in addition, to buffer zones required under state regulations) for the Environmental Features (as defined in the Queensland Department of Natural Resources and Mines *Regional Vegetation Management Code for Western Bioregions* (version 2.1, 30

<table>
<tr><th>Date of decision</th><th>Conditions attached to approval</th></tr>
<tr><td></td><td>November 2012)) described in following table. The vegetation buffer zones exclude areas of infrastructure.

<table>
<tr><th>Environmental feature</th><th>Vegetation buffer zones</th></tr>
<tr><td>Stream order one or two</td><td>100m to 200m** from edge of riparian vegetation</td></tr>
<tr><td>Stream order three or four</td><td>100m to 200m** from edge of riparian vegetation</td></tr>
<tr><td>Stream order five and above</td><td>200m from edge of riparian vegetation</td></tr>
<tr><td>Natural wetland</td><td>200m from edge of wetland vegetation</td></tr>
<tr><td>Natural significant wetland</td><td>200m from edge of wetland vegetation</td></tr>
<tr><td>Tidal areas and marine plants***</td><td>200m from boundary of feature</td></tr>
<tr><td>Vine forest, coastal vegetation on sand, estuaries</td><td>200m from edge of relevant vegetation type</td></tr>
</table>
** Set based on site specific factors following field survey.
*** Category B Environmentally Sensitive area as defined by the Environmental Protection Regulation 2008 (Qld).</td></tr>
<tr><td>Original dated 14/5/2013</td><td>Pre-disturbance Program

22. Prior to any clearing of vegetation (including for Preliminary Works), surveying must be undertaken to ascertain whether active, or potentially active, nests for the Red Goshawk (Erythrotriorchis radiates) and/or Masked Owl (Tyto novaehollandiae kimberli) are present in the area to be cleared. Surveying must be undertaken for the:

a. Red Goshawk – in areas located within one (1) kilometre of permanent water supporting riparian gallery forest or Paperback wetland; seasonally inundated coastal wetlands and seasonal water courses supporting riparian gallery forest, or an estuary; and,

b. Masked Owl – in areas within 200 metres of permanent water supporting riparian gallery forest of paperbark wetland, seasonally inundated Paperbark wetlands, seasonal watercourses supporting riparian gallery forest or an estuary.</td></tr>
<tr><td>Original dated 14/5/2013</td><td>23. The Pre-disturbance Program must include avoidance, mitigation or management measures (including those measures identified in the Final Environmental Impact Statement) if active, or potentially active, nests for the Red Goshawk or Masked Owl are found during surveying, including a 200 metre buffer zone around nest trees. The nest tree and buffer zone cannot be cleared or disturbed until the end of the breeding season (being until fledglings no longer use the nest for habitat).</td></tr>
<tr><td>Original dated 14/5/2013</td><td>24. Information obtained during the Pre-disturbance Program must be used to inform the Terrestrial Management Plan at condition 25.</td></tr>
</table>

Date of decision	Conditions attached to approval
Original dated 14/5/2013	***Terrestrial Management Plan*** 25. The approval holder must submit a Terrestrial Management Plan covering all of the land based activities associated with the **construction** and **operation** of the project for the **Minister's** approval to effectively define, avoid, adaptively manage and mitigate negative **impacts** to the following **matters of national environmental significance**: i. Red Goshawk *(Erythrotriorchis radiates*); Masked Owl (*Tyto novaehollandiae kimberli)*; and Bare-rumped Sheathtail Bat *(Saccolaimus saccolaimus nudicluniatus)* ii. **listed migratory bird species**; and, iii. **Listed flora species.**
Original dated 14/5/2013	26. The Terrestrial Management Plan must incorporate avoidance and mitigation measures for each **impact** associated with the project including, but not limited to: a. measures for water related **impacts** including, but not limited to, erosion, construction and operation of the dam; stormwater runoff, flood events, hydrocarbon spills, sewage, crude or process water, runoff from ore stockpiles, and downstream **impacts** on watercourses, streams and marine environment (including estuaries); b. measures for pests and weed management, dust management, and fire management; c. implementing the vegetation buffers zones at condition 21; and, d. measures identified in the Environmental Management Plan Outlines at Appendix 5-A (Threatened Flora Species); Appendix 6-C (Threatened fauna species); Appendix 8-A (Avian Migratory Species); and, Appendix 16-B (Water Monitoring and Management Conditions) in the **Final Environment Impact Statement.**
Original dated 14/5/2013	27. The Terrestrial Management Plan must also include adaptive management strategies to benefit the species listed at condition 25. The Terrestrial Management Plan must include and address effective management strategies to mitigate each potential **impact**, desired outcomes, benchmarks, readily measurable performance indicators and goals, timeframes for reporting and implementation, corrective actions and contingency measures, and, specify the person/s roles with responsibility for implementing actions. The Terrestrial Management Plan must provide information detailing Traditional Owner employment opportunities, and mechanisms for reporting the number of local indigenous person/s actually employed in the implementation of this Plan (consistent with condition 42).
Original dated 14/5/2013	28. The Terrestrial Management Plan must be informed by the most current information available to avoid, manage or mitigate **impact** associated with the project (including, but not limited to *National Water Quality Management Strategy, Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000) or most current version/s of these guidelines.
Variation dated 3/6/2014	29. The Terrestrial Management Plan must be submitted to the **Minister** for approval at least 6 months prior to **Commencement of the action**. The

Date of decision	Conditions attached to approval
	commencement of the action must not occur until the Terrestrial Management Plan has been approved by the Minister. The approved Terrestrial Management Plan must be implemented**.**
Original dated 14/5/2013	30. Within 60 days of the first anniversary of **operations** commencing, a revised Terrestrial Management Plan must be submitted to the **Minister** for approval. The Terrestrial Management Plan must be reviewed, revised and submitted to the **Minister** for approval every five (5) years (unless otherwise agreed by the **Minister** in writing) thereafter for the life of the project. The approved Terrestrial Management Plans, as revised, must be implemented.
Original dated 14/5/2013	***Bare rumped Sheathtail Bat*** 31. For the Bare-rumped Sheathtail Bat *(Saccolaimus saccolaimus nudicluniatus)* the approval holder must: a. undertake a targeted Bare-rumped Sheathtail Bat survey in the project area, using broad spectrum acoustic monitoring prior to the **commencement of the action**. The survey must cover, as a minimum, the area that was subjected to netting as part of the **Final Environmental Impact Statement**; b. support a research program being conducted by the Australian Bat Society which will aim to improve the quality of the reference call library for microbats of the Cape York region; c. utilise the reference calls acquired by the research program to analyse the targeted survey results for the Bare-rumped Sheathtail Bat (at minimum for those reference calls collected as part of the **Final Environmental Impact Survey**) and further define habitat preferences for the species; and, d. if the Bare-rumped Sheathtail Bat is identified, adaptive management measures to avoid and mitigate impacts from the project must be implemented in the Terrestrial Management Plan at condition 25 within six (6) months of the identification of the species.
Original dated 14/5/2013	32. The approval holder must notify the department in writing within five (5) business days of any confirmed or suspected observation/s (including for condition 31) in the project area of Bare-rumped Sheathtail Bat.
Variation dated 9/6/2021	***Rehabilitation Strategy*** 33. The approval holder must submit an adaptive **Rehabilitation Strategy**, covering the **construction** and **operation** of the project to ensure the rehabilitated areas are functionally equivalent to the pre-disturbance habitat to enable similar land use by the following **matters of national environmental significance**: a. Red Goshawk *(Erythrotriorchis radiates*); b. Masked Owl (*Tyto novaehollandiae kimberli*); c. Barn Swallow (*Hirundo rustica*); and, d. if identified as a result of implementing the requirements of conditions 31 and 32, the Bare-rumped Sheathtail Bat *(Saccolaimus saccolaimus nudicluniatus).*

Date of decision	Conditions attached to approval
Original dated 14/5/2013	34. The land area to be progressively rehabilitated over the life of the project must be no less than 28,880 hectares. Unless otherwise specified in the approved Rehabilitation Strategy at condition 33, rehabilitation works must commence within two (2) years: a. following mining in the area/s where it has been completed; or, b. following decommissioning and removal of any infrastructure, in each area where that infrastructure will not be retained at the end of the project.
Original dated 14/5/2013	35. The Rehabilitation Strategy must include adaptive management strategies to benefit the species listed at condition 33. The Rehabilitation Strategy must include measures outlined in the **Final Environment Impact Statement** and address effective management strategies to identify desired outcomes, benchmarks, readily measurable performance indicators and goals, timeframes for reporting and implementation, corrective actions and contingency measures, and, specify the person/s roles with responsibility for implementing actions. The Rehabilitation Strategy must provide information detailing Traditional Owner employment opportunities, and mechanisms for reporting the number of local indigenous person/s actually employed in the implementation of this Strategy (consistent with condition 42).
As varied on the date this instrument was signed	36. The Rehabilitation Strategy must be submitted to the **Minister** for approval by 12 December 2022, or as otherwise agreed in writing by the **Minister.** The approved Rehabilitation Strategy must be implemented.
Original dated 14/5/2013	37. Unless otherwise agreed to by the **Minister** in writing, every five (5) years from the first anniversary of the approval of the Rehabilitation Strategy at condition 33 a reviewed Rehabilitation Strategy must be submitted to the **Minister**. The approved Rehabilitation Strategy must be implemented.
Original dated 14/5/2013	38. If the rehabilitation objectives identified for species identified at condition 33 do not meet any of the success criteria for any of these species as described in the approved Rehabilitation Strategy at condition 33 after 10 years of rehabilitation commencing, or as otherwise agreed in the approved Rehabilitation Strategy, the approval holder must notify the **Minister** in writing within 20 business days of the area (hectares) over which the rehabilitation objectives and success criteria were not met.
Original dated 14/5/2013	39. Within six (6) months of notifying the **Minister** at Condition 38, the approval holder must submit to the **Minister** for approval an Offset Strategy outlining the offset to be provided for the **matters of national environmental significance** identified at condition 33. The related offset must be in accordance with the *Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy (October 2012*), or its most current version.
As varied on the date this instrument was signed	40. The approved Offset Strategy must be implemented**.**

Date of decision	Conditions attached to approval
Original dated 14/5/2013	***Indigenous consultation*** 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.
Original dated 14/5/2013	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.
Original dated 14/5/2013	***Feral Pig Management Offset Strategy*** 43. The approval holder must implement an adaptive Feral Pig Management Offset Strategy to reduce the annual level of feral predation on **listed turtle species** nests for the period of this approval.
Original dated 14/5/2013	44. The Feral Pig Management Offset Strategy must be implemented at a minimum, in the project area as described in Figure 7-23 of the **Final Environmental Impact Statement.**
Original dated 14/5/2013	45. The Feral Pig Management Offset Strategy must include surveying to develop significantly robust baseline data for **listed turtle species** nesting in the project area and desired outcomes, benchmarks, readily measurable performance indicators and goals, timeframes for reporting and implementation, corrective actions and contingency measures, and, specify the person/s roles with responsibility for implementing actions. The Feral Pig Management Offset Strategy must provide information detailing Traditional Owner employment opportunities, and the number of local indigenous person/s actually employed in the implementation of this Strategy (consistent with condition 42).
Original dated 14/5/2013	46. The Feral Pig Management Offset Strategy must adhere to the **department's** *Threat Abatement Plan For Predation, Habitat Degradation, Competition And Disease Transmission By Feral Pigs*, or their most current versions. The Strategy must also reflect current Commonwealth and/or State policies, codes of practice and/or guidelines relating to humane pest animal control, or their most current versions.
Original dated 14/5/2013	47. The findings from the Feral Pig Management Offset Strategy must be used to inform the Marine and Shipping Management Plan at condition 5 on an ongoing basis.
Variation dated 3/6/2014	48. The Feral Pig Management Offset Strategy must be submitted to the **Minister** for approval at least 6 months prior to **commencement of the action**. The **commencement of the action** must not occur until the Feral Pig Management Offset Strategy has been approved by the **Minister**.
Original dated 14/5/2013	***Inshore Dolphin Offset Strategy*** 49. The approval holder must implement an Inshore Dolphin Offset Strategy to inform knowledge about the distribution and abundance of local and regional populations of **listed dolphin species** in the Western Cape York area, and identification of habitat utilised by **listed dolphin species.**

Date of decision	Conditions attached to approval
Original dated 14/5/2013	50. The Inshore Dolphin Offset Strategy must be implemented at a minimum, in the marine environment between latitude 12.60^0S and latitude 13.35^0S and must include provision for the Inshore Dolphin Offset Strategy actions to be undertaken prior to **construction**, during **construction** and periodically after **construction** (for a minimum period of 13 years following the commencement of **construction,** but not necessarily every year) of the Boyd Port and river facilities.
Original dated 14/5/2013	51. The Inshore Dolphin Offset Strategy must contribute to independent research on **listed dolphin species**, and specify targeted outcomes, benchmarks, readily measurable performance indicators and goals, timeframes for reporting and implementation, and the person/s roles with responsibility for implementing actions. The Inshore Dolphin Offset Strategy must provide information detailing Traditional Owner employment opportunities, and mechanisms for reporting the number of local indigenous person/s actually employed in the implementation of this Strategy (consistent with condition 42).
Original dated 14/5/2013	52. The Inshore Dolphin Offset Strategy must be developed in consultation with the **department**.
Original dated 14/5/2013	53. The approval holder must fund the Inshore Dolphin Offset Strategy to a minimum of $800,000 (GST exclusive) and a maximum of $1,200,000 (GST exclusive).
Original dated 14/5/2013	54. The findings from the Inshore Dolphin Offset Strategy, including corrective actions and contingency measures relating to **operations**, must be used to inform the Marine and Shipping Management Plan at condition 5 on an ongoing basis.
Variation dated 3/6/2014	55. The Inshore Dolphin Offset Strategy must be submitted to the **Minister** for approval at least 6 months prior to **commencement of the action**. The **commencement of the action** must not occur until the Inshore Dolphin Offset Strategy has been approved by the **Minister**.
Original dated 14/5/2013	***Publication Requirements*** 56. All **survey data** and methodology collected for the project must be recorded in accordance with approved management plans. When requested by the **department**, the approval holder must provide to the **department** survey data and information related to **matters of national environmental significance.** This information must be provided within 30 business days of request, or in a timeframe agreed to by the **department** in writing. The **department** may use the survey data for other purposes. The approval holder must also provide the **survey data** and methodology, within 30 business days, to anyone who requests the **survey data** and methodology in writing. Notification of the availability of the **survey data** and methodology must be provided on the approval holder's website for the duration of this approval.

Date of decision	Conditions attached to approval
Original dated 14/5/2013	57. Every 12 months after the **commencement of the action**, unless otherwise agreed to in writing by the **Minister**, the approval holder must **publish** on their website, for the duration of the project (including decommissioning), all the survey methodology, reports and related analysis of **survey data** for current program/s, plan/s, strategies or other conditions specified in this approval for each individual **matter of national environmental significance**. The **department** must be notified within ten (10) business days of publication.
Original dated 14/5/2013	58. Within five (5) business days from this approval, the approval holder must publish the **Final Environmental Impact Statement** on their website for the duration of the project, including decommissioning.
Original dated 14/5/2013	59. Unless otherwise agreed to in writing by the **Minister** the approval holder must publish, for the life of the project including decommissioning, all current approved programs/s, plan/s, review/s (including the 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.
Original dated 14/5/2013	***Independent Review Requirements*** 60. Unless otherwise agreed in writing by the **Minister**, each 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**.
Original dated 14/5/2013	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.
Original dated 14/5/2013	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.
Original dated 14/5/2013	***Minimum timeframe for consideration*** 63. If the **Minister** is not satisfied that the final revised version of the plan/s, program/s or strategies specified in this approval adequately addresses the condition/s specified in the approval, the approval holder will be notified in writing by the **Minister** that they must update a plan/s, program/s or strategies to meet the condition/s that have not been adequately addressed.

Date of decision	Conditions attached to approval
Original dated 14/5/2013	64. For any plan/s and/or strategy specified in this approval that is to be approved by the **Minister**, the approval holder must ensure the **Minister** is provided at least 60 business days for review and consideration of the programs/s, plan/s, or strategies specified in this approval, unless otherwise agreed in writing by the **Minister**. This does not apply to urgent changes required to protect the environment or repair or mitigate any damage that may or will be, or has been, caused by the action to any matter protected by Part 3 of the EPBC Act for which the approval has effect.
Original dated 14/5/2013	65. To avoid duplication, the approval holder may provide the **Minister** with any plan/s, program/s or strategies prepared for the State provided the plan/s, program/s or strategies meets the conditions specified in this approval. The plan/s, program/s or strategies must include a cross reference table that clearly identifies: a. the condition specified in this approval for which the plan/s, strategy or program/s is being provided; and b. the relevant folder, chapter, section number and page number in the plan/s, program/s or strategies where the condition has been addressed.
Original dated 14/5/2013	***General*** 66. Within ten (10) days after the commencement of **preliminary works, construction, operation** and/or **commencement of the action**, the approval holder must advise the **Minister** in writing of the actual date of commencement.
Original dated 14/5/2013	67. The approval holder must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the plan/s or strategies as specified in these conditions and make them available upon request to the **department**. Such records may be subject to audit by the **department** or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the **department's** website. The results of audits may also be published through the general media.
Original dated 14/5/2013	68. Within three (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.

Date of decision	Conditions attached to approval
Original dated 14/5/2013	69. Every three years from the date of this approval, the approval holder must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister**. The independent auditor must be approved by the **Minister** prior to the commencement of the audit. Audit criteria must be agreed to by the **Minister** and the audit report must address the criteria to the satisfaction of the **Minister**.
Original dated 14/5/2013	70. For the purposes of reporting at Condition 68, where material required under condition 41 and Condition 42 is culturally sensitive and cannot be disclosed at the explicit and written consent of the relevant Indigenous people with rights, claims or interests in the area, the approval holder must advise the **department** of the extent to which it cannot comply with condition 41 and Condition 42 or that reason.
Original dated 14/5/2013	71. Where the conditions require the approval holder to submit a program/s, plan/s or strategies for the **Minister's** approval, the approval holder must maintain a register recording: a. the date on which each plan was approved by the **Minister**; b. if a plan has not been approved, the date on which it was, or is expected to be, submitted to the **Minister**; c. the dates on which reports on the outcomes of reviews have been approved by the **Minister**; and, d. the **dates** on which the subsequent reviews are due. The register must be submitted to the **department**, at the time the annual compliance report is **published**, but does not form part of the report.
Original dated 14/5/2013	72. If the approval holder wishes to carry out any activity otherwise than in accordance with a programs/s, plan/s or strategies as specified in the conditions**,** the approval holder must submit to the **department** for the **Minister's** written approval a revised version of that programs/s, plan/s or strategies. The varied activity must not commence until the **Minister** has approved the varied programs/s, plan/s or strategies writing. The **Minister** will not approve a varied programs/s, plan/s or strategies unless the revised programs/s, plan/s or strategies would result in an equivalent or improved environmental outcome over time. If the **Minister** approves the revised programs/s, plan/s or strategies they must be implemented in place of the plan/s or strategies originally approved.
Original dated 14/5/2013	73. If, at any time after the first five (5) year anniversary of the date of this approval, the approval holder has not **commenced the action**, then the approval holder must not **commence the action** without the written agreement of the **Minister**.
Original dated 14/5/2013	74. The financial cost of adhering to the conditions specified in this approval will be borne by the approval holder.

Date of decision	Conditions attached to approval
Original dated 14/5/2013	75. If the **Minister** believes that it is necessary or convenient for the better protection of World Heritage properties (sections 12 & 15A), National Heritage Place (section 15B &15C), Listed threatened species and communities (sections 18 & 18A), Listed Migratory Species (section 20 & 20A), Commonwealth Marine Area (sections 23 & 24a) and Great Barrier Reef Marine Park (sections 24B and 24C) to do so, the **Minister** may request that the approval holder make specified revisions to the programs/s, plan/s or strategies specified in the conditions and submit the revised programs/s, plan/s or strategies for the **Minister's** written approval. The approval holder must comply with any such request. The revised approved programs/s, plan/s or strategies must be implemented. Unless the **Minister** has approved the programs/s, plan/s or strategies then the approval holder must continue to implement the programs/s, plan/s or strategies originally approved, as specified in the conditions.
Original dated 14/5/2013	76. The approval holder must undertake the action in accordance with, and ensure persons that are under the direction or control of the approval holder for the South of Embley Bauxite Mine and Port Development project comply with, the approved plan/s, program/s or strategies to avoid, mitigate, manage and offset **impacts** to outstanding universal value of the World Heritage properties (sections 12 & 15A), National Heritage Place (section 15B &15C), Listed threatened species and communities (sections 18 & 18A), Listed Migratory Species (section 20 & 20A), Commonwealth Marine Area (sections 23 & 24a) and Great Barrier Reef Marine Park (sections 24B and 24C).

Date of decision	Definitions attached to approval
Original dated 14/5/2013	**Capital Dredging** – as defined in the *Australian Government National Assessment Guidelines for Dredging (2009)* being 'dredging for navigation, to enlarge or deepen existing channel and port areas or to create new ones. Dredging for engineering purposes, to create trenches for pipes, cables, immersed tube tunnels, to remove material unsuitable for foundations and to remove overburden for aggregate extraction, etc'.
Original dated 14/5/2013	**Commencement of the action / commenced the action** – any works that are required to be undertaken for **construction** (except exploration, site investigation and **preliminary works)**.
Original dated 14/5/2013	**Clearing of vegetation / clear vegetation** – the clearing or inundation by water of vegetation, for pest and weed control, or construction of any **infrastructure**.
Original dated 14/5/2013	**Construction** – any works that are required to be undertaken for the project including the beneficiation plant (including tailings storage facility); Boyd Port facility, and Hey and Embley River facilitates; dam construction; **clearing of vegetation**; and infrastructure facilities (including power station, roads, and fuels storage). Excludes **preliminary works**.
Original dated 14/5/2013	**Department** – the Australian Government department administering the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*.
Original dated 14/5/2013	**Exclusion zone** – a radius around pile driving operations of no less than 100 metres which must be visually observed at all times during pile driving operations.
Original dated 14/5/2013	**Final Environmental Impact Statement** – comprises the South of Embley Project Final Environmental Impact Statement (March 2013).
Original dated 14/5/2013	**Infrastructure –** operations or activities that are ancillary to **mining**, such as haul and access roads, conveyors, bridges, tailings storage facilities, loading ramps, pumps, pipelines and water management infrastructure, energy generation and transmission, exploration, Boyd Port, beneficiation plan, stockpiles, and the barge and ferry terminals.
Original dated 14/5/2013	**Impact/s / impacted** – as defined in section 527E of the EPBC Act.
Original dated 14/5/2013	**Independent/ly Peer reviewed/ Independent Peer Reviewer** – assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodologies, performance goals and performance criteria, and conclusions pertaining to the management plans/strategies/programs by a person/organisation/technical committee, independent of the approval holder and/or employed in any subsidiary company of the approval holder. This person/organisation/technical committee must have demonstrated expertise in the **matter of national environmental significance** being reviewed and be approved by the **Minister** prior to commencement of the review.
Original dated 14/5/2013	**Listed dolphin species** – listed migratory species under the EPBC Act, specifically Australian Snubfin Dolphin (*Orcaella heinsohni)*; and, Indo-Pacific Humpback Dolphin (*Sousa chinensis).*
Original dated 14/5/2013	**Listed flora species** – listed vulnerable threatened species under the EPBC Act, specifically Cooktown Orchid *(Dendrobium bigibbum*); Chocolate Tea Tree Orchid (*Dendrobium johannis (Cepobaculum johannis*)); and Beach nightshade (*Solanum dunalianum).*

Date of decision	Definitions attached to approval
Original dated 14/5/2013	**Listed migratory bird species** – listed migratory species under the EPBC Act, specifically as identified in Annexure A.
Original dated 14/5/2013	**Listed turtle species** – listed threatened species and/or listed migratory species under the EPBC Act, specifically Green Turtle (*Chelonia mydas),* Hawksbill Turtle (*Eretmochelys imbricate);* Flatback Turtle *(Natator depressus);* Loggerhead Turtle *(Caretta caretta);* Olive Ridley Turtle *(Lepidochelys olivacea);* and Leatherback Turtle (*Dermochelys coriacea)*;
Original dated 14/5/2013	**Maintenance Dredging** – as defined in the *Australian Government National Assessment Guidelines for Dredging (2009)* being 'dredging to ensure that channels, berths or other port areas are maintained at their designed dimensions'.
Original dated 14/5/2013	**Matter of national environmental significance** – those matters protected under the EPBC Act: World Heritage properties, National Heritage places, wetlands of international importance (Ramsar wetlands), listed threatened species and communities, listed migratory species, Commonwealth marine areas, Great Barrier Reef Marine Park, the environment where nuclear actions are involved (including uranium mines).
As corrected on 26/7/2013	**Mining / Mining area/s-** operations or activities connected with the extraction of bauxite ore or the location where operations or activities connected with the extraction of bauxite ore occur (excluding **infrastructure**).
Original dated 14/5/2013	**Minister** – the **Minister** administering the *Environment Protection and Biodiversity Conservation Act 1999* and includes a delegate of the **Minister**.
Original dated 14/5/2013	**Observation Zone** – a radius around pile driving operations (unless otherwise agreed to by the **department** in writing), as detailed in Annexure B and must be no less than the **exclusion zone**) which must be visually observed at all times during pile driving operations.
Original dated 14/5/2013	**Operation/s** – commencement of activities associated with bauxite **mining** and production, including shipping activities from the Boyd Port and facilitates in the Hey and Embley Rivers. This does not include activities associated with **construction** or **preliminary works**.
Original dated 14/5/2013	**Period of low visibility** – where continuous visual observations to a distance of 300 metres or the observation distance relevant for the diameter of the pile as identified in Annexure B**,** whichever is greater from the pile driving operations for the Boyd Port development, Humbug Terminal, Hornibrook ferry/tug terminal, Hey River terminal or for navigation aids, is not possible for a time period of greater than one hour.

Date of decision	Definitions attached to approval
Original dated 14/5/2013	**Preliminary Works** – includes activities associated with the upgrade of Beagle Camp and Pera Head Access Roads; establishment of exploration drill and seismic lines; **vegetation clearing** and construction of the mine access road (between Hey River terminal and Boyd mine infrastructure area); terrestrial **vegetation clearing** associated with temporary barge landing area near Pera Head; construction and operation of barge landing area located on Hey River; preparation of laydown areas at Humbug and Hornibrook terminals (existing disturbed areas); construction (including **vegetation clearing** of up to 30 hectares) and operation of a temporary accommodation camp (up to 200 persons) in the project area; installation and operation of ancillary infrastructure (including diesel fuelled power generation, laydown areas, package sewage treatment plants, waste storage and disposal facilities, fuel storage, offices and cribs, and access roads); construction and operation of an artesian bore including associated storage and treatment facilities and pipelines; and, installation of communications infrastructure.
Original dated 14/5/2013	**Publish/ed** – documentation available on the approval holder's website for the duration of the action (including decommissioning).
Original dated 14/5/2013	**Soft start procedures** – initiated at commencement of all marine piling activities by piling at low energy levels and then build up to full impact force. The first five **impacts** from the piling operation must be at no more than 50% of full hammer weight (e.g. a hammer with an adjustable stroke height of 1.2 metres should drop from a height of 0.6 metres at least 5 times during a 'soft start' procedure), to encourage animals to move away from the area of piling activities.
Original dated 14/5/2013	**Survey Data -** information obtained from monitoring and survey activities associated with plan/s and/or strategies specified by these conditions and where relevant must include, at minimum, the name of species (common and scientific), time and day of survey, GPS location, number of individuals located, age class (if known), habitat type, and EPBC Act listing status.

Date of decision	Annexures
Variation dated 9/6/2021	**Annexure A – Listed Migratory Bird Species for the South of Embley Project (EPBC2010/5642)**

Migratory Avian Group	Species
International Migratory Shorebirds	*Actitis hypoleucos* Common Sandpiper
	Calidris acuminata Sharp-tailed Sandpiper
	Calidris canutus Red Knot
	Calidris ferruginea Curlew Sandpiper
	Calidris ruficollis Red-necked Stint
	Calidris tenuirostris Great Knot
	Charadrius leschenaultia Great Sand Plover
	Charadrius mongolus Lesser Sand Plover
	Charadrius veredus Oriental Plover
	Limnodromus semipalmatus Asian Dowitcher
	Limosa lapponica Bar-tailed Godwit
	Limosa limosa Black-tailed Godwit
	Numenius madagascariensis Eastern Curlew
	Numenius minutus Little Curlew, Little Whimbrel
	Numenius phaeopus Whimbrel
	Pluvialis fulva Pacific Golden Plover
	Pluvialis squatarola Grey Plover
	Tringa nebularia Common Greenshank
	Tringa stagnatilis Marsh Sandpiper
	Xenus cinereus Terek Sandpiper
Waterbirds	*Acrocephalus stentoreus* Clamorous Reed-Warbler
	Ardea Alba Great Egret, White Egret
	Egretta Sacra Eastern Reef Egret
	Grus Antigone Sarus Crane

Migratory Avian Group	Species
	Plegadis falcinellus Glossy Ibis
Seabirds	*Fregata minor* Great Frigatebird
	Fregata ariel Lesser Frigatebird
	Sterna albifrons Little Tern
Raptors	*Haliaeetus leucogaster* White-bellied Sea-eagle
	Pandion cristatus Eastern Osprey
Woodland Birds	*Mylagra cyanoleuca* Satin Flycatcher
	Rhipidura rufifrons Rufous Fantail
	Monarcha melanopsis Black-faced Monarch
Barn Swallow	*Hirundo rustica* Barn Swallow
Aerial Species	*Apus pacificus* Fork-tailed swift
	Hirundapus caudacutus White-throated Needletail

Date of decision	Annexures
Variation dated 9/6/2021	**Annexure B – Pile Driving Observation Zones for the South of Embley project (EPBC 2010/5642)** Port Development

Species	Direction of noise propagation	**Pipe pile diameters**					
		1500mm	**1200mm**	**1050mm**	**750mm**	**355.6mm**	**1 x 1500mm and 2 x 1050mm**
		Minimum observation Distance (metres)					
Bryde's Whale	Towards shore	ESL	ESL	ESL	ESL	570	ESL
	Away from shore (all other directions)	1330	1210	930	790	570	1580
Dolphins and Dugong	n.r	400	360	270	230	170	500
Marine Turtle	n.r.	470	430	350	280	210	630

Note: ESL = Extends to shoreline from the end of the Stage 1 wharf; n.r. = not relevant

Humbug terminal

Species		**Sheet Pile**	**Pipe Piles**			
		600mm width	**1,050mm**	**900mm**	**750mm**	**600mm**
		Minimum observation Distance (metres)				
Dolphins and Dugong		<10	170	160	140	130
Marine Turtles		60	210	200	180	160

Note: The distances here have their maximum values in a westerly direction.

Hornibrook ferry/tug terminal

Species		**Pipe Piles**			
		1,050mm	**900mm**	**750mm**	**600mm**
		Minimum observation Distance (metres)			
Dolphins and Dugong		250	230	210	190
Marine Turtles		340	310	280	240

Note: The distances here have their maximum values in the south-easterly to south-westerly directions.

Hey River terminal

Species		**Sheet Pile**	**Pipe Piles**			
		600mm width	**1,050mm**	**900mm**	**750mm**	600mm
		Minimum observation Distance (metres)				
Dolphins and Dugong		<10	380	360	330	300
Marine Turtles		110	470	440	400	370

Note: The distances here have their maximum values in Northerly and Southerly directions.

Navigation Aids

Species		**Pipe Pile – 1050 diameter**
		Minimum observation Distance (metres)
Dolphins and Dugong		280
Marine Turtles		360

Note: The distances are equal in all directions.

ENVIRONMENT PROTECTION (SEA DUMPING) ACT 1981

SEA DUMPING PERMIT No. SD2025-4075

for

RTA Weipa Pty Ltd
(ACN: 137 266 285)

I, HEATHER AGNEW , a delegate of the Minister for the Environment and Water, acting under Sections 19 and 21 of the *Environment Protection (Sea Dumping) Act 1981*, hereby grant a sea dumping permit to RTA Weipa Pty Ltd, 155 Charlotte St, Brisbane, Queensland 4000 (ACN: 137 266 285), to load for the purposes of dumping, and to dump, up to 3.2 million cubic metres (*in-situ*) of dredged material, derived from capital dredging of the Amrun Port Facility managed port area at Weipa, Queensland.

This permit commences on the date of its signature and is valid until 30/11/2029, subject to the conditions specified in Appendices 1, 2 and 3.

DATE…….12th .....day of……February.....2026

.....
HEATHER AGNEW
Delegate of the Minister

This permit comprises nine (9) pages, including Appendices 1 - 3.

Appendix 1

CONDITIONS FOR THE LOADING, AND DUMPING AT SEA OF CAPITAL DREDGED MATERIAL DERIVED FROM THE AMRUN PORT FACILITY, WEIPA, QUEENSLAND

DEFINITIONS

In this permit:

Act	means the *Environment Protection (Sea Dumping) Act 1981*.
Application	means the application for a permit under the **Act** submitted by the **permit holder** and received by the **department** on 29 January 2025, with further information received on 2 May 2025 and 14 November 2025.
Department	means the Australian Government department responsible for administering the **Act**. For the purposes of this permit, any communication to the department should be sent by email addressed to: seadumping@dcceew.gov.au.
Disposal site	means the Amrun disposal area (site code: **AU0081A**), centred at the following co-ordinates (WGS84) with a radius of 0.53996 nautical miles (1,000 metres) and as shown in **Figure 1** (at Appendix 2).

Latitude	Longitude
-12.9128°	141.4813°

Dumping activities	means all activities associated with the dumping permitted under this permit, including: (i) the loading for the purpose of dumping of dredged material (ii) the dumping of the material at the prescribed **disposal site**.
Environmental incident	means any event that has the potential to, or does, **impact** on the environment other than the **dumping activities** for which this **permit** is granted.
Environmental risk	means any risk that has the potential to **impact** on the environment, other than the **dumping activities** for which this **permit** is granted.
EPBC Act	means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).
GPS	means Global Positioning System.
Impact	(verb) means to cause any measurable direct or indirect disturbance or harmful change as a result of any activity associated with **dumping activities**. (noun) means any measurable direct or indirect disturbance or harmful change as a result of any activity associated with **dumping activities**.
Marine species	means all marine cetaceans, pinnipeds, sirenians, elasmobranchs and reptiles.

Marine species observer	means a person who has demonstrated experience in **marine species** observation and recognition, distance estimation and reporting, can give reliable independent advice on **marine species** presence, identity, and distance from the observer and, while in the role of **marine species** observer, has no duties other than making and recording visual observations for **marine species**.
Minister	means the Australian Government Minister administering the **Act** and includes a Delegate of the Minister.
Monitoring and management plan	means the *2025 – 2029 Capital Dredge Management Plan, revision 3,* dated 6 February 2026, and approved by the **minister** from the date of signature of this permit, or a revised version of the *2025 – 2029 Capital Dredge Management Plan* approved by the **minister** in accordance with condition 7 or condition 8, or a version of the *2025 – 2029 Capital Dredge Management Plan* revised in accordance with condition 9.
Monitoring zone	means the area within a 300-metre radius of the **vessel**.
Mounding	means the accumulation of dredge material from **dumping activities** creating a high point from the sea floor within the **disposal site**.
Permit holder	means RTA Weipa Pty Ltd, 155 Charlotte St, Brisbane, Queensland 4000 (ACN: 137 266 285).
Suitably qualified	means a person who has professional qualifications, training (e.g., identification at sea of **marine species**), skills and/or experience related to the nominated subject matter and can give authoritative independent assessment, advice, and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature.
Vessel(s)	means any vessel or vessels used for or in connection with **dumping activities**.
Website	means a set of related web pages located under a single domain name attributed to the **permit holder** and available to the public.

Except so far as the contrary intention appears, terms used in the conditions of this permit have the same meaning as such terms in the **Act**.

CONDITIONS

1. The **permit holder** must ensure that all persons engaged in the **dumping activities** under this permit, including any owner and any person in charge of a **vessel**, comply with this permit and the requirements of the **Act**. The fulfilment of these conditions is, at all times while this permit is valid, the responsibility of the **permit holder.**

Material to be dumped

2. The **permit holder** must ensure that no more than 3.2 million cubic metres (*in-situ*) of material derived from capital dredging of the Amrun Port Facility managed port area at Weipa, Queensland is loaded and dumped, in accordance with methods specified in the **application**.

Disposal site

3. The **permit holder** must only dump within the **disposal site** shown in *Figure 1* at Appendix 2.
4. The **permit holder** must establish by **GPS** that, prior to dumping, the **vessel** is within the **disposal site**.
5. The **permit holder** must ensure that the dredged material is dumped across the **disposal site** in a manner to prevent **mounding**.

Monitoring and management plan

6. The **permit holder** must commence implementing the approved **monitoring and management plan** upon the commencement of **dumping activities** and notify the **department** within 5 days of the date on which **dumping activities** have concluded.
7. If the **minister** requires for the better protection of the environment, the **permit holder** to make specified revisions to the **monitoring and management plan**, the **permit holder** must submit a revised monitoring and management plan in accordance with the specified revisions for the **minister's** approval. If the **minister** approves a revised monitoring and management plan pursuant to this condition, the **permit holder** must implement the version of the **monitoring and management plan** most recently approved by the **minister** in writing from the date of its approval.
8. The **permit holder** may submit for the **minister's** approval a revised version of the **monitoring and management plan**. If the **minister** approves in writing a revised monitoring and management plan pursuant to this condition, the **permit holder** must implement the version of the **monitoring and management plan** most recently approved by the **minister** in writing, from the date of its approval.
9. The **permit holder** may make administrative changes to the **monitoring and management plan** without submitting it for the approval of the **minister**, if the taking of the action in accordance with the revised **monitoring and management plan** will not have a new or increased **impact** on the environment or reduce the public accessibility of information. If the **permit holder** makes this choice, they must:
    a. notify the **department** in writing that the **monitoring and management plan** has been revised and provide the **department** with an electronic copy of the revised plan showing the proposed changes in track mode, accompanied by a covering letter specifying the changes made and the reasons that the **permit holder** considers that taking the action in accordance with the revised plan would not be likely to have a new or increased **impact** on the environment and/or reduce the public accessibility of information
    b. implement the revised **monitoring and management plan** no sooner than 14 days after the date of submission of the revised **monitoring and management plan** to the **department** unless the **department** informs the **permit holder** in writing that the revised **monitoring and management plan** requires submission under condition 8

c. for the life of this permit, maintain a record of the reasons the **permit holder** considers that taking the action in accordance with the revised **monitoring and management plan** would not have a new or increased **impact** on the environment and/or reduce the public accessibility of information.

10. Each version of the **monitoring and management plan** approved or adopted for implementation must be published on the **website** within 30 days of its approval or adoption for implementation, and must include:

    a. the date of this permit

    b. the date that a revised version of the **monitoring and management plan** is approved by the **minister**

    c. the date that a revised version of the **monitoring and management plan** may be implemented without the **minister's** approval in accordance with condition 9.

    The **permit holder** must ensure that each version of the **monitoring and management plan** remains published on the **website** until the end date of validity of the permit.

Protection of marine species

11. The **permit holder** must ensure that at least one **suitably qualified marine species observer** is on duty on at least one **vessel** adjacent to or in the **monitoring zone** at least 30 minutes prior to, and throughout, any **dumping activities**. The **permit holder** must ensure that the **marine species observer** scans the entire **monitoring zone**, using binoculars from a suitable observation position on the **vessel**, for the presence of any **marine species** within the **monitoring zone** at least once every 30 minutes, commencing at least 30 minutes prior to, and continuing throughout, any **dumping activities.**

12. If any **marine species** is/are sighted in the **monitoring zone**, the **permit holder** must not commence **dumping activities**, or if **dumping activities** has already commenced, must pause **dumping activities** as soon as safe and practicable to do so, until either:

    a. 30 minutes after the time when the last **marine species** has left the **monitoring zone** of its own accord

    b. the **vessel** has moved to another area of the **disposal site** where no **marine species** are within the **monitoring zone** of the **vessel's** new location.

    Note: It is an offence under the **EPBC Act** to interfere with a **marine species** or in any way attempt to deter it from entering the **monitoring zone** or cause it to leave.

Environmental risk and incidents

13. If, at any time during **dumping activities**, an **environmental incident** occurs or an **environmental risk** is identified, all reasonable measures must be taken immediately by the **permit holder** to minimise or mitigate the **environmental risk** and/or the **impact** of the **environmental incident**. The **permit holder** must provide a report on the **environmental incident** and/or **environmental risk** to the **department** within 72 hours of detecting any **environmental incident** and/or **environmental risk** and include in the report:

    a. details of the **environmental incident** and/or **environmental risk**, including the date, time, and location (**GPS** co-ordinates)

    b. the measures taken to minimise or mitigate the **environmental risk** and/or the **impact** of the **environmental incident** following detection

    c. the success of those measures in addressing the **environmental incident** and/or **environmental risk**

    d. any additional measures proposed to be taken.

14. The **permit holder** must document any detected injury to, or death of any **marine species** potentially associated with the operation of a **vessel** or **dumping activities**. The date, time, location (**GPS** co-ordinates) and nature of each detected injury to, or death of, the **marine species** and the species involved, if known, must be recorded, and reported to the **department** within 72 hours of detecting the injury to, or death of, the **marine species**.

Access for observers

15. If requested by the **department**, the **permit holder** must provide access, including to **vessels**, for at least 2 nominees of the **department** to witness, inspect, examine and/or audit any part of the operations, including any **dumping activities,** monitoring activities, equipment, and any records. The **permit holder** must provide all reasonable assistance to nominees of the **department** in carrying out their duties.

Record-keeping and reporting

16. The **permit holder** must make and retain records (which may comprise weekly plotting sheets or an extract of the ship's log certified by the **vessel's** captain) which must detail:
    a. the dates, times, and **GPS** co-ordinates of **vessel** movements for **dumping activities**
    b. the volume of dredged material (*in-situ* cubic metres) dumped and quantity in dry tonnes for the specified operational period, including the proportion that this amount represents of the total amount permitted under the permit for the dredging campaign
    c. the names and relevant training and experience of the person(s) who undertook the **marine species** observation required under condition 11, the **marine species** observed within the **monitoring zone** for each **vessel** movement, including, for each sighting, the date, time, species (or nearest identification), location (**GPS** co-ordinates) and approximate distance of the **marine species** from the **vessel**, and the action taken to comply with condition 12.
17. The **permit holder** must retain the records required by conditions 13, 14 and 16 for the life of the permit, for verification and audit purposes.
18. The **permit holder** must ensure that a **suitably qualified** person undertakes a bathymetric survey of the **disposal site**:
    a. prior to the commencement of **dumping activities** authorised under this permit
    b. within one month of the completion of all **dumping activities** authorised under this permit.
19. Within 2 months of the final bathymetric survey being undertaken in accordance with condition 18), the **permit holder** must provide a digital copy of each of the bathymetric surveys to the Australian Hydrographic Office, Locked Bag 8801, Wollongong, NSW 2500 or via email at: datacentre@hydro.gov.au.
20. The **permit holder** must provide a report on the bathymetry to the **department** within 2 months of the final bathymetric survey being undertaken. The report must include a chart showing the change in sea floor bathymetry as a result of **dumping activities** and include a reliable estimate of the volumes of dumped material that appear to have been retained within the **disposal site**.
21. To facilitate annual reporting to the International Maritime Organization, the **permit holder** must report to the **department** by 31 January each year, including a final annual report on the day of the expiry of this permit or completion of all **dumping activities** under this permit, the information specified at Appendix 3 to this permit, in the format of Appendix 3 or as otherwise approved by the **department.**

Auditing

22. If the **department** believes that it is necessary or desirable to undertake an audit of the permit conditions, the **permit holder** must comply with any such request and must provide any necessary assistance to the **department**'s representatives in carrying out their duties.

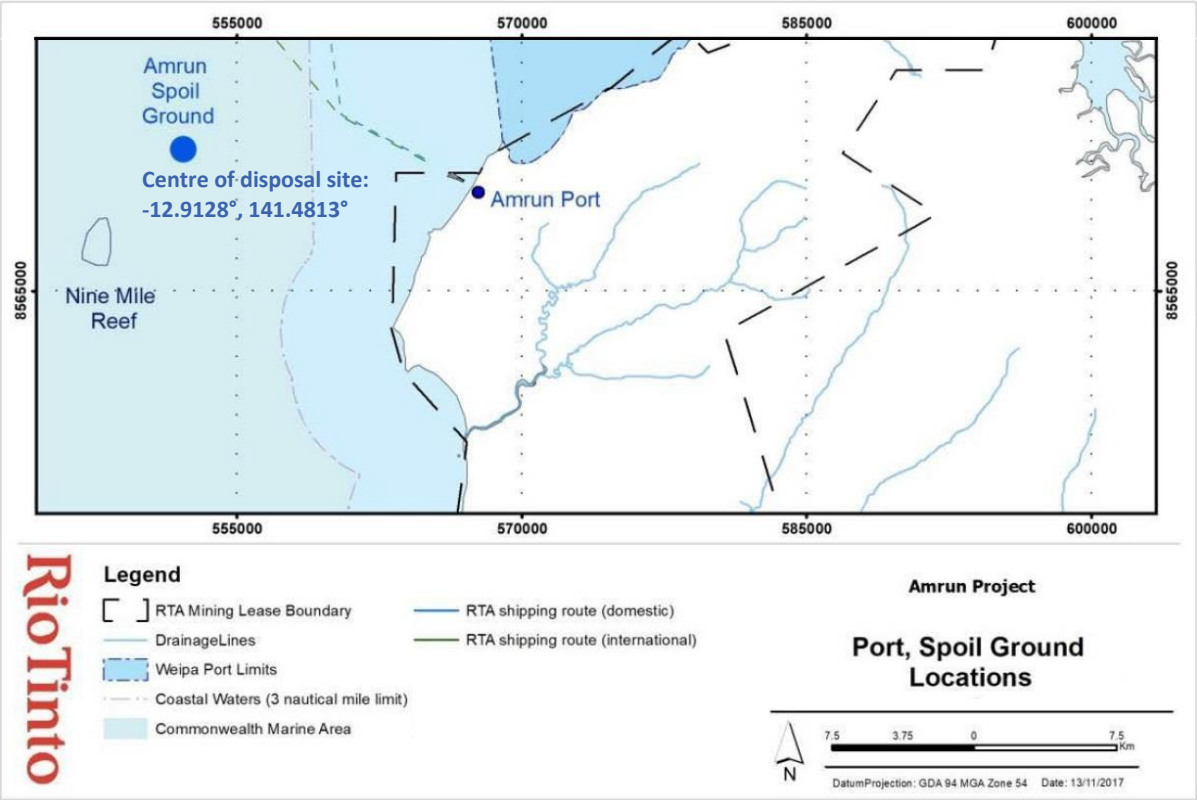


Figure 1: The **disposal site** ('Amrun Spoil Ground', denoted by a blue circle centred on coordinates -12.9128°, 141.4813° with a radius of 1,000 metres or 0.53996 nautical miles) approximately 14 kilometres (7.5594 nautical miles) west of the Amrun Port Facility, Weipa, Queensland.

Appendix 3

SEA DUMPING PERMIT ANNUAL INTERNATIONAL REPORTING REQUIREMENTS

Please fill in this form and return it by **email** to the **department by 31 January each year**. This information is required for Australia's reporting obligations to the International Maritime Organization under the London Protocol.

Email: seadumping@dcceew.gov.au and epbcmonitoring@dcceew.gov.au, quoting the permit reference number **SD2025-4075**.

Permit details

Sea Dumping Permit number:	**SD2025-4075**
Permit holder:	**RTA Weipa Pty Ltd**
Address:	**155 Charlotte St, Brisbane, Queensland, 4000**
Permit start date:	**12/02/2026**
Permit end date:	**30/11/2029**
Description of material**:**	**Capital dredge**
Total permit quantity (cubic metres):	**3.2 million m^3**

Annual report

Submitted by (name):
Phone:
Email: Date: *(DD/MM/YYYY)*

1) Specify the calendar year this report applies to: _____ *(Reporting period)*

2) Quantity of material permitted for dumping under this permit but not yet dumped at the beginning of the reporting period:

_____m^3

3) Quantity of material dumped during the reporting period (*please provide volume and weight*):

Geodetic Datum:

Disposal Site Code	**Disposal Site Latitude** *(North/South decimal degrees)*	**Disposal Site Longitude** *(East/West decimal degrees)*	**Volume** *(in-situ cubic metres)*	**Weight** *(dry weight tonnes)*
AU0081A	-12.9128°	141.4813°		

Briefly describe any conversion rates used for calculating disposal volumes:

_____

4) Quantity of material permitted for dumping under this permit but not yet dumped at the end of the reporting period: _____m^3

5) Was field monitoring of the disposal sites conducted during the reporting period? Yes ☐ No ☐

If yes, please complete questions 6-9 below.

Monitoring of the disposal site

6) When was field monitoring conducted? *(Please tick all boxes which apply.)*

Before dumping ☐, During dumping ☐, After dumping ☐, Other ☐

*If other, please explain:*_____

7) What type(s) of field monitoring was undertaken? *(Please tick all boxes which apply.)*

Biological ☐, Geological ☐, Chemical ☐, Physical ☐, Other ☐

*If other, please explain:*_____

8) Were any adverse impact(s) found beyond those that were predicted? Yes ☐, No ☐

*If yes, briefly describe the impacts (e.g., physical, chemical, or biological) and their spatial or temporal variation:*_____

9) Provide a website link/URL to Field Monitoring Reports, or any additional information:

_____

_____

RioTinto

Rio Tinto Aluminium
155 Charlotte Street
Brisbane
Australia
Tel: +614 351 57 572

Private & confidential
Sarah Dent
Department of Climate Change, Energy, the Environment and Water
Waste, Environmental Permits and Advice Branch
Environmental Permitting and Compliance Division
Ngunnawal Country, John Gorton Building, King Edward Terrace, Parkes ACT 2600 Australia
GPO Box 3090 ACT 2601

10 March 2026

Dear Sarah,

Re: Permit SD2025-4075 – Notification of Permit Update in Accordance with Condition 9

I am writing on behalf of RTA Weipa to formally notify the Sea Dumping team of updates made to the Approval Capital Dredge Management Plan in associated with Sea Dumping Permit SD2025-4075, in accordance with **Condition 9** of the permit. Implementation of the plan is in progress with monitoring works expected to commence in April ahead of dredging in May 2026.

These updates have been made at the request of the Department of Climate Change, Energy, the Environment and Water (DCCEEW) in connection with obligations under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and the relevant EPBC permit conditions applicable to the Weipa mine site operations. The changes will not have a new or increase impact on the environment or public access to information.

The specific updates made include additional implementation commentary in section 6.4.3. These amendments have been implemented to include specific commentary provided in response to DCCEEW review of the management plan to ensure continued compliance with both the Sea Dumping permit conditions and the requirements of the EPBC permit, as directed by DCCEEW. All updated documentation including a version with track changes has been submitted to a Post Approvals Sigbox (that I understand is internally available to Sea dumping) and will be maintained on site in accordance with the relevant record-keeping obligations. As previously confirmed with the Sea dumping team the interpretation condition 10 is only the most current version of plan will be published online at https://www.riotinto.com/en/operations/anz/weipa by the end of this week.

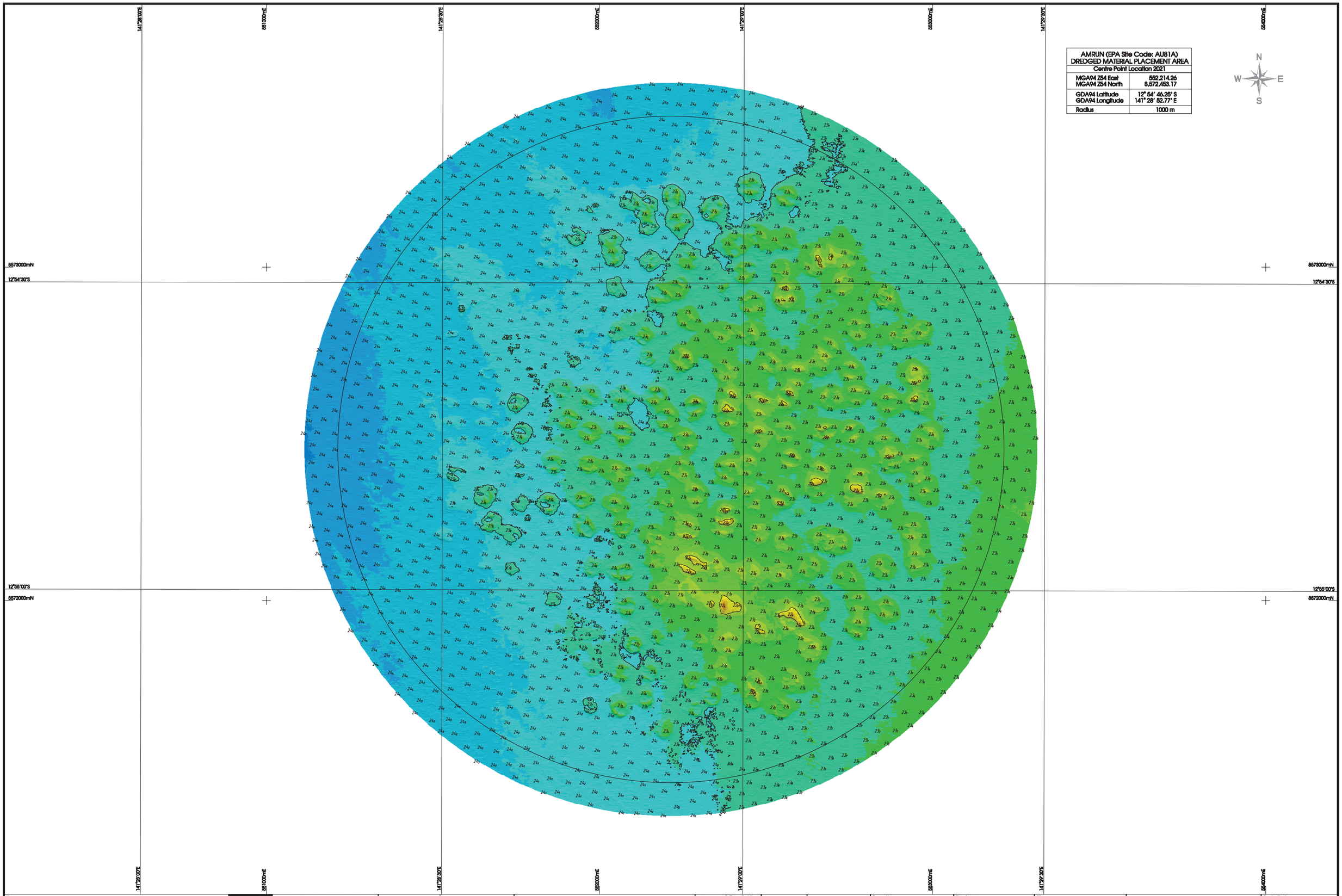
Should you require any further information or clarification regarding these updates, please do not hesitate to contact the undersigned.

Yours sincerely,

Tim Deery
Principal Advisor – Environment.

<RioTinto Company> <Registered Office Building, Street Number and Name, City, Country>
Registered in <Country>, Company No. <000000000>

APPENDIX C – AMRUN PORT and DREDGE MATERIAL PLACEMENT AREA BATHYMETRIC SURVEYS (2024 and 2025)



Notes:

1. This survey meets the mandatory class requirements as outlined in the following documents:
   Principles for Gathering and Processing Hydrographic Information in Australian Ports'
   Standards for Hydrographic Surveys within Queensland Waters v1.3'
2. Soundings are shoal biased (position preserved) based on a sort radius of 8 mm at plan scale and were generated from a 50cm GIBE surface and Designated Shoal Depths.
3. Seabed Coverage: Full (120%)
4. Contours computer generated from a 1 metre shoal biased depth BIN (position preserved). Soundings and contours colored for clearance purposes.
5. Hydrographic Method Statement: MS-NMS-MEPA May 2024.
6. This survey can only be considered valid for the period of sounding.

Horizontal Datum	GDA94 Projection: MGA94 Zone 54
RTK Base Station	Trimble R750 at TS162173 (TS6IH) E:567,611.641 N:8,571,381.660 EH:13.431
Sounding Datum	Lowest Astronomical Tide (LAT) TS162173 (TS6IH) LAT 9.941 m
	Soundings reduced to datum using RTK GNSS heights and GDA94 Ellipsoid to LAT separation model (EH-LAT = 62.245 m).
Depth Tolerance	0.20 m
Horizontal Tolerance	0.5 m
Weather	0.5hs-1m Sea

Vessel	FMG Sounds Pacific
Echo Sounder	R2 2022 MBES 400kHz
Motion compensation	POS-MV WaveMaster
Horizontal Positioning	POS-MV WaveMaster RTK
Data Collection / Processing	QinsyTerramodel
Tidal Reference Station	TS101285

Scale In Metres
0 50 250 500
SCALE 1 : 5000 on A1 Sheet
© Copyright NaMaSye Pty Ltd
Class of Survey C

Hydrographic Surveyor	Barry Smith AHSCP Level 1
Signature	
Surveyed By	James Allen
Drawn & Checked	Joshua Smith Barry Smith
Date of Survey	25-05-2024 to 29-05-2024

SOUNDINGS (m)	
2.5	below datum
0.7	above datum
LEVELS (m)	
0.9	above datum
1.33	below datum

DESIGN DEPTHS

DECLARED DEPTHS

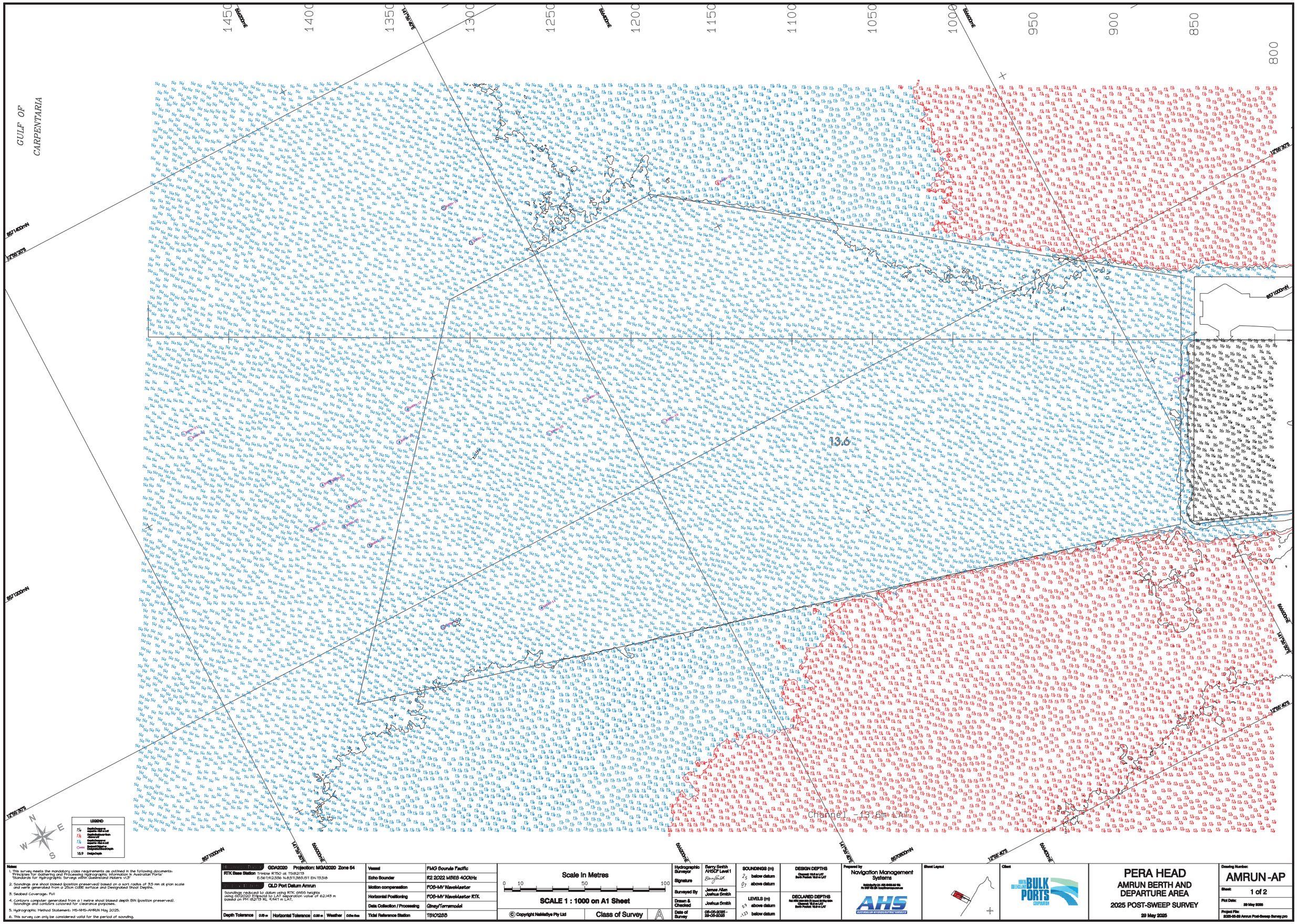
Prepared by
Navigation Management Systems
NaMaSye Pty Ltd ABN 48 605 632 976
PO Box 63, Bowen QLD 4805
Ph 0407 332 555 barry@navmanagement.com.au
AHS AUSTRALIAN HYDROGRAPHIC SERVICES

Sheet Layout

Client
NORTH QUEENSLAND BULK PORTS CORPORATION

PERA HEAD
AMRUN
DREDGED MATERIAL PLACEMENT AREA
POST-DREDGE HYDROGRAPHIC SURVEY
25 May 2024

Drawing Number:	AMRUN-SG
Sheet:	1 of 1
Plot Date:	29 May 2024
Project File:	2024-05-29 Amrun DMPA Post Survey.pro



Notes:

1. This survey meets the mandatory class requirements as outlined in the following documents: 'Principles for Gathering and Processing Hydrographic Information in Australian Ports' 'Standards for Hydrographic Surveys within Queensland Waters v1.3'
2. Soundings are shoal biased (position preserved) based on a sort radius of 3.5 mm at plan scale and were generated from a 25cm CUBE surface and Designated Shoal Depths.
3. Seabed Coverage: Full
4. Contours computer generated from a 1 metre shoal biased depth BIN (position preserved). Soundings and contours coloured for clearance purposes.
5. Hydrographic Method Statement: MS-NMS-AMRUN May 2025.
6. This survey can only be considered valid for the period of sounding.

Horizontal Datum	GDA2020 Projection: MGA2020 Zone 54
RTK Base Station	Trimble R750 at TS162173 E:567,412.536 N:8,571,383.151 EH:13.516
Vertical Datum	QLD Port Datum Amrun
	Soundings reduced to datum using RTK GNSS heights using GDA2020 Ellipsoid to LAT separation value of 62.143 m based on PM 182173 RL 9.441 m LAT.
Depth Tolerance	0.13 m
Horizontal Tolerance	0.35 m
Weather	0.05m Sea

Vessel	FMG Sounds Pacific
Echo Sounder	R2 2022 MBES 400kHz
Motion compensation	POS-MV WaveMaster
Horizontal Positioning	POS-MV WaveMaster RTK
Data Collection / Processing	QinsyTerramodel
Tidal Reference Station	TS101255

Scale In Metres

0 10 50 100

SCALE 1 : 1000 on A1 Sheet

© Copyright NaviSys Pty Ltd

Class of Survey A

Hydrographic Surveyor	Barry Smith AHSCP Level 1
Signature	
Surveyed By	James Allen Joshua Smith
Drawn & Checked	Joshua Smith
Date of Survey	08-05-2025 - 22-05-2025

SOUNDINGS (m)
2_5 below datum
0_7 above datum

LEVELS (m)
0^3 above datum
1^{23} below datum

DESIGN DEPTHS
Channel: 13.5 m LAT
Berth Pocket: 15.9 m LAT

DECLARED DEPTHS
As at 08-May-2025 Channel: 13.5 m LAT
Berth Pocket: 15.9 m LAT

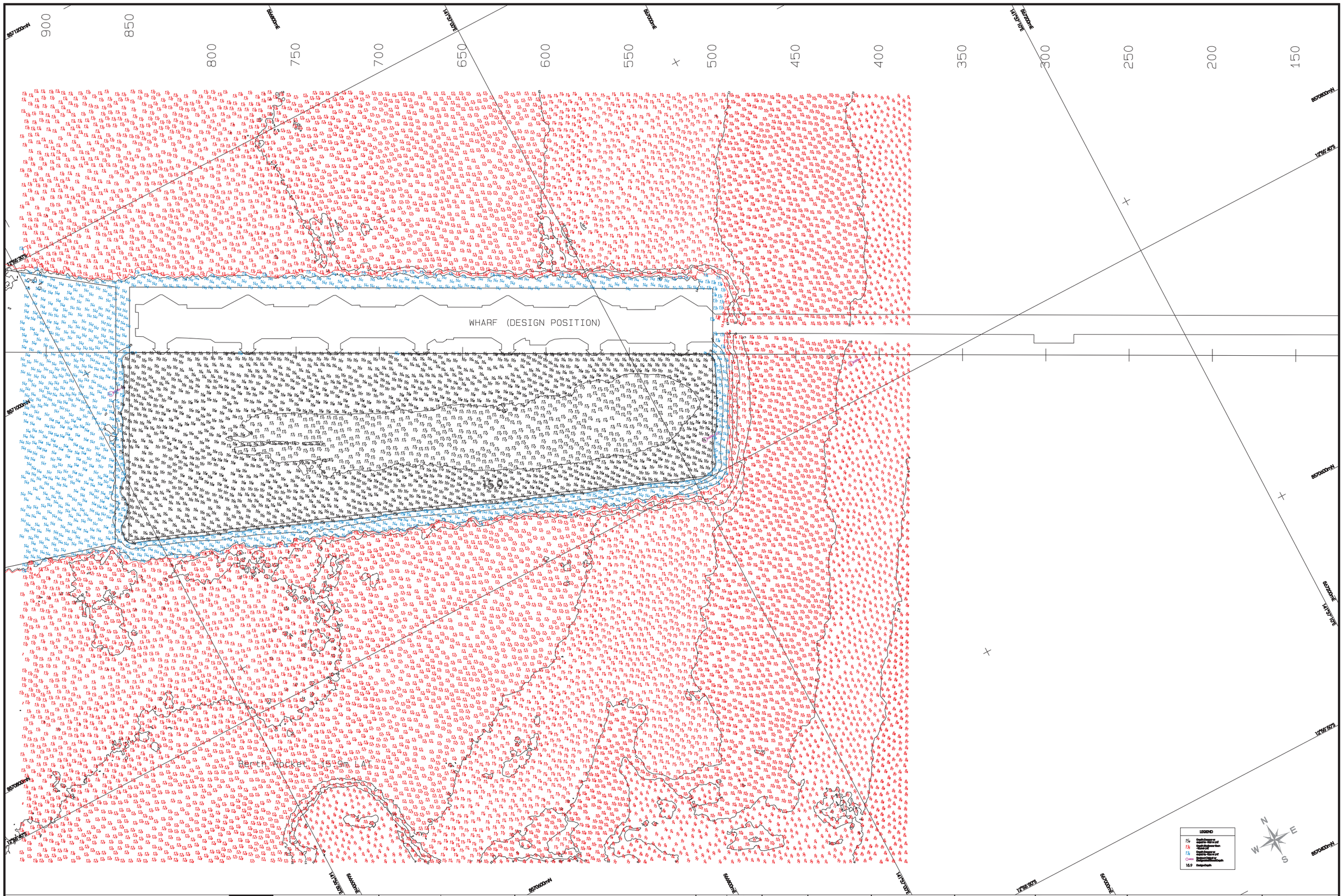
Prepared by
Navigation Management Systems
Australia Ph +61 (0)7 3102 4000 Fax +61 (0)7 3102 4001 info@navmanagement.com.au
AHS AUSTRALIAN HYDROGRAPHIC SERVICES

Sheet Layout

Client
NORTH QUEENSLAND BULK PORTS CORPORATION

PERA HEAD
AMRUN BERTH AND DEPARTURE AREA
2025 POST-SWEEP SURVEY
29 May 2025

Drawing Number: AMRUN-AP
Sheet: 1 of 2
Plot Date: 29 May 2025
Project File: 2025-05-29 Amrun Post-Sweep Survey.pro


WHARF (DESIGN POSITION)
Berth Pocket -13.3m LAT
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
8571200mN
8571000mN
8570800mN
8570600mN
8570400mN
8570200mN
8570000mN
6540000E
6560000E
6580000E
6600000E
6620000E
14757400E
14757600E
14757800E
14758000E
14758200E
14758400E
14758600E
14758800E
14759000E
14759200E
14759400E
14759600E
14759800E
14760000E
14760200E
14760400E
14760600E
14760800E
14761000E
14761200E
14761400E
14761600E
14761800E
14762000E
14762200E
14762400E
14762600E
14762800E
14763000E
14763200E
14763400E
14763600E
14763800E
14764000E
14764200E
14764400E
14764600E
14764800E
14765000E
14765200E

APPENDIX D – AMRUN PORT SEDIMENT EXEMPTION

Australian Government
Department of Climate Change, Energy, the Environment and Water

Our reference: SD-SAP2024-024

Mr Jayden Flint
Principal Advisor Environment
Aluminium Pacific Operations
RTA Weipa Pty Ltd
155 Charlotte Street
BRISBANE QLD 4000

Dear Mr Flint

Sampling and Analysis Plan – Request for exemption from further sediment assessment – Amrun Port (Qld) expansion capital dredging – Rio Tinto Aluminium Limited

I refer to your letter received on 31 August 2024 seeking an exemption from a Sediment Sampling and Analysis Plan (SAP) for further geochemical and physical assessment of sediments as part a proposed Amrun Port (Qld) expansion capital dredging project, due to extensive historic sediment sampling undertaken between 2007 and 2023.

The department has reviewed your request and agrees that based on the evaluation of existing information, an exemption from a SAP can be granted under Section 4.2.1 of the *National Assessment Guidelines for Dredging* 2009.

It is important to note that potential dredging and disposal impacts will still need to be considered as part of the future Sea Dumping Permit application.

If you have any further questions please contact Leo Rose, phone (02) 7262 5062 or email leo.rose@dcceew.gov.au (cc seadumping@dcceew.gov.au).

Yours sincerely,

Kaitlyn Bradey
Assistant Director
Sea Dumping Section
25 October 2024

RTA Weipa Pty Ltd
ACN 137 266 285
155 Charlotte Street
Brisbane Queensland 4000
Australia
T + 61 (0) 7 3625 3000

To: Director

Sea Dumping Section

Environmental Approvals Division

Department of Climate Change, Energy, the Environment and Water

GPO Box 3090

Canberra ACT 2601

Date: 29 August 2024

Number of pages (including this page): 4

Amrun Port (Qld) expansion capital dredging – Rio Tinto Aluminium Limited.

Dear Sarah and Kaity,

On 29 May 2024, Damian Snell (Swash) and I met with you both via an online Teams meeting. The purpose of this meeting was twofold:

1. Outline RTA intent to seek a new sea dumping permit for future capital dredging at Amrun Port.
2. Seek exemption from further geochemical and physical assessment of sediments as part this application due to extensive historical and current sediment sampling undertaken between 2008 – 2023.

Background

Sea Dumping Permits

The initial capital dredging sea dumping permit (SD2010/1762) for Amrun port construction was granted on 14 May 2013 for a period of 3-years and a dredge volume of 2.6 million m^3. A 12-month extension was granted on 12 July 2015 to facilitate initial port capital dredging in March/April 2016.

A 10-year sea dumping permit (SD2020/3999) is currently in place until 31 January 2031 to undertake annual maintenance dredging activities at the existing berth and apron area and relocate sediment to the approved placement area (DMPA).

A new sea dumping permit would be required for future capital dredging activities associated with the proposed expansion.

Other Approvals

RTA currently has two other Commonwealth and State approvals in place:

- EPBC Act approval: **EPBC 2010/5642** – 14 May 2013 (Commonwealth)
- **EA: EPML00725113** (Queensland Department of Environment and Heritage Protection) – latest amendment 19 June 2017.

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Proposed expansion

RTA is currently exploring three (3) options as part of a Pre-Feasibility Study (PFS) to improve flexibility at Amrun facility by facilitating navigable access and berthing arrangements for dual or larger vessels:

- Option 2P Dual mini-cape class vessel berths (varying channel depth)
- Option 1P1C Dual cape class vessel berths (berths varying depth; channel dredged to -17.7m)
- Option 2C Dual cape class vessel berths (berths and channel to various depths)

Capital dredging will be required to remove material to establish new, and deepen existing, berth pockets and departure path channel navigable areas. The volume of material to be removed for these three options is summarised in **Table 1** below, with 2C to -17.7m CD depicted in **Figure 1**.

Table 1: Amrun expansion – dredge volumes

Amrun expansion – PFS options	Volume of material to remove (m^3)	Comment
2P	133,000	
1P1C	1,835,000	
2C	2,678,000	(channel to -17.7 m CD)
	2,943,000	(channel to -18.0 m CD)
	3,173,000	(channel to -18.3 m CD)

Note: volumes to be removed based on 2022 post-maintenance dredge survey depths

	Section	Depth to dredge (m)	Area to dredge (m^2)	Volume to dredge (m^3)
Dual cape berth	Block A - northeast	-20.2m CD	57,712 m^2	365,526.36
	Block A - southwest	-20.2m CD	62,560 m^2	248,052.97
	Block B	-17.7m CD	589,002 m^2	1,893,938.34
	Block C	-17.7m CD	310,502 m^2	170,338.96

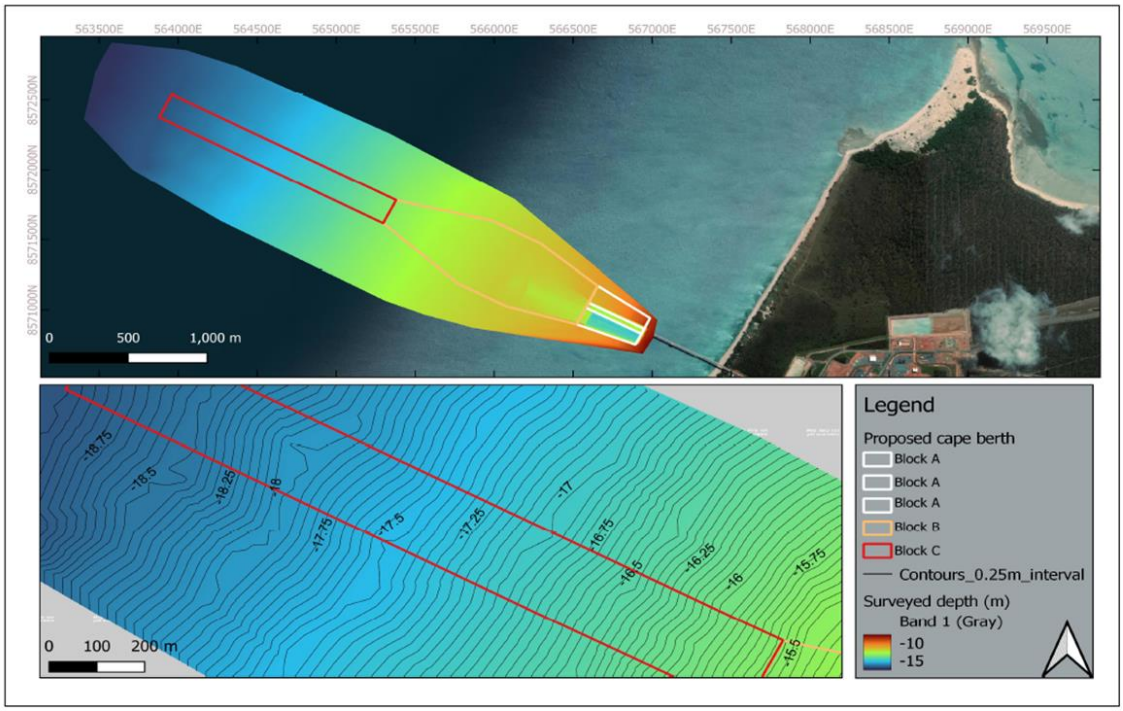


Figure 1 Option 2C Dredge Footprint to -17.7m CD

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Independent summary review of sediment characterisation studies (2008 – 2023)

RTA engaged Alex Kochnieff (CV attached) Principal Environmental Engineer of SQP Consulting Pty Ltd, to undertake a summary review of historical sediment characterisation studies at Amrun Port between 2008 to 2023 **(Attachment A)**.

The following conclusions have been made by SQP based on the review of available sediment characterisation reports:

- Seven sediment characterisation studies comprising the assessment of potential contaminants (including metals and metalloids, organotins and hydrocarbons) have been completed from 2007 to 2023 over the course of the Port's lifetime including pre-construction, construction and operation. These studies have also included an assessment of PSD and on occasions included an assessment of ASS.
- Sediments are predominately comprised of clay and silt (73 to 94%) with sand (5 to 27%) and trace gravel (<1 to 3%). More detailed analysis in 2010 indicated inshore sediments are primarily clay /silt whilst offshore sediments are primarily course textured (up to 81% sand and gravel) with clay/silt and gravel.
- Some concentrations of metals including Ni, Sb, Cu and Co have exceeded NAGD screening levels on occasion; however, further analysis of bioavailability (DAE and elutriates) indicated concentrations of these metals and all other metals and metalloids analysed have been less than the respective NAGD screen levels and ANCEZZ / ARMCANZ 95% species protection water quality guideline criteria.
- The most recent sediment characterisation (completed in 2023) did not include organotins as:
    - Organotins have not previously been detected.
    - The Port commenced operations 10 years after the worldwide ban on TBT was implemented therefore organotins are not considered to be a legacy contaminant of concern at the Port.
- Conclusions of all seven sediment characterisations reviewed have all indicated sediments were suitable for unconfined ocean placement.
- In accordance with the NAGD, 2009 framework for exemptions from sediment testing requirements the following is considered to support an exemption of further sediment characterisation of chemical contaminants for proposed capital dredging:
    - Capital sediments to be dredged (i.e. outer channel) primarily comprise coarse textured sediments (up to 81% sand and gravel).
    - The Port is considered to be in a remote area removed from known existing and historical sources of pollution supported by previous sediment characterisation studies that concluded sediments were suitable for unconfined ocean placement.
    - Further sediment characterisation will still be required in 2028 under the existing maintenance dredging sea dumping permit.

RTA additional comments

- PFAS testing was completed across Amrun in 2021 to confirm there was no contamination. PFAS testing has also been undertaken at nearby Port of Weipa (North Queensland Bulk Ports). Both ports recently undertook maintenance dredging in May to July 2024.
- The only fertilisers used across the Amrun mining site are those for rehabilitation works. There has been no farming on the land to create a contamination event.
- Tributyl-tin (TBT)
    - all Amrun vessels (with exception of large ships) undergo a review of the antifouling as part of the marine pest risk assessment, all vessels must have a TBT free antifouling paint applied. No in-water vessel cleaning is permitted at Port of Amrun.

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- In regard to large vessels, TBT has been banned since 2008 and vessels need be drydocked and surveyed every 5 years so theoretically no vessels should have been operational in area with TBT.
- Amrun Port has only been operational since late 2018.

Concluding comments

1. RTA is planning to submit a sea dumping permit application for capital dredging of ~3.2 million m^3 of sediment. This application will be submitted in Q4 2024 following consultation with traditional owners and the Boyd Port (Amrun) Dredging Technical Advisory Group. A 4-year sea dumping permit is proposed to be sought to facilitate potential dredging opportunities from 2025 to 2028.

2. RTA hereby seeks an exemption from further geochemical and physical analysis of sediments as part of this pending sea dumping permit application (refer supporting **Attachment A**).

Please do not hesitate to contact myself on 0412 003 701 should further information or clarification be required.

Kind Regards,

Jayden Flint

Principal Advisor Environment | Aluminium Pacific Operations
155 Charlotte Street, Brisbane, Queensland, 4000, Australia | **M** (+61) 0412 003 701

Attachment A - Summary review of historical sediment characterisation studies at Amrun Port between 2008 to 2023
Attachment B – CV Alex Kochnieff
Attachment C – Presentation from 29 May 2024

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SQP Consulting
The Cape 5/255 Varsity Parade
Varsity Lakes
Qld 4227

ABN: 47 653 467 568
ACN: 653 467 568
Our ref: 2024-056-SWASH_RTA_LTR_0001_Rev 0.docx
Your ref: : Amrun - sediment testing exemption letter and figure

19 August 2024

Jayden Flint
Principal Advisor Environment
Aluminium Pacific Operations
Rio Tinto Australia
155 Charlotte Street,
Brisbane Qld 4000

Dear Jayden,

SUMMARY REVIEW OF SEDIMENT CHARACTERISATION STUDIES AT PORT OF AMRUN FROM 2008 TO 2023

1 Introduction

SQP Consulting Pty. Ltd. (SQPC) were engaged by Rio Tinto Australia (RTA) Weipa to undertake a review of existing available sediment characterisation reports associated with dredging at the Port of Amrun (i.e., the Port) located in a remote area on the east coast of the Gulf of Carpentaria 40km southwest of Weipa.

The Port of Amrun and wharf facility is owned and operated by RTA Weipa with construction and operations commencing in 2016 and 2018 respectively. Although the initial Environmental Impact Statement (EIS) for the Port and wharf (i.e. formerly known as the South of Embley (SoE) Project) assessed a capital dredging volume of 6,500,000 m^3, only 202,416 m^3 of sediments were dredged as part of capital dredging construction works in 2016. Since becoming operational in 2018 no other capital dredging has been undertaken, however maintenance dredging of the berth pocket and apron has typically occurred annually since 2018.

As part of the Port and wharf development several sediment characterisation studies have been undertaken at the Port, first commencing in 2007/2008 as part of the initial EIS for SoE Project then in 2009, 2010, 2012, 2017 and most recently in 2023. Each sediment characterisation study confirmed sediment suitability for ocean placement. As such, RTA Weipa is seeking an exemption from further sediment characterisation studies associated with the proposed expansion of the Port. To support the exemption a summary of previous sediment characterisations is provided.

1.1 Objective

The objective of this letter report is to provide a summary of previous and available sediment characterisation reports associated with the development and operation of the Port of Amrun.

1.2 Scope

The agreed scope was presented via email dated 28 June 2024 with the subject Amrun - sediment testing exemption letter and figure. This proposal was accepted on 2 June 2024, included the following agreed scope of works:

- Summarise provided existing sediment characterisation reports

- Provide an overall summary review for a sediment characterisation exemption based on previous sediment characterisation reports in reference to NAGD[1] framework.

2 Summary of existing sediment characterisation reports

The following reports were used in the preparation of this letter. These are summarised in the sections below while a tabulated summary of the conclusions of each report are provided in Table 2-1. For the purpose of this letter, contaminants of concern included, metals and metalloids and organotins. Concentrations of nutrients and geotechnical properties (except particle size distribution (PSD)) are not considered in this letter as there are no NAGD or former NODGDM[2] screening levels for these parameters.

- 2007/2008: South of the Embley River Project – Sediment characterisation report. WorleyParsons
- 2009: South of the Embley Project – Supplementary sediment characterisation report for proposed port development capital dredging. WorleyParsons
- 2010/2012: South of the Embley Project – 185,000 DWT vessel port development plan – sediment characterisation report. WorleyParsons
- 2017: Amrun Project – Amrun Port: Sediment sampling characterisation report. RTA Weipa.
- 2018: Port of Weipa – Sustainable Sediment Management (SSM) Assessment for Navigational Maintenance ('The SSM Project'). Advisian, Brisbane
- 2019: Port of Weipa – Benthic infauna and sediment characterisation- Amrun sediment characterisation. Advisian, Brisbane
- 2023: Amrun Port and Weipa Facilities – Sediment Sampling and Analysis Plan Implementation Report. Australiasian Marine Associates (AMA).

2.1 2007/2008 WorleyParsons sediment characterisation

WorleyParsons completed a sediment sampling program in 2007 (reported in 2008) comprising five sampling locations to assess potential contaminants of concern within a proposed capital dredge volume of 250,000 m^3 to support a sea dumping permit associated with the development of the Port and wharf facility. The number of locations (refer to pink symbols in Figure 2-1) was based on 20% of the locations required (i.e. 22) for a large capital dredging project (223,000 to 264,000 m^3) in a remote location. A total of nine primary samples, collected to a depth of 1m using a vibracorer, were submitted for laboratory analysis. The results of the laboratory analysis indicated:

- Sediments are comprised of clay and silt (79%), sand (18%) and gravel (3%). Surface sediment (generally 0.0 to 0.1m) were generally silt and sand, while deeper sediments (generally 0.1 to 1m) were firm clay.
- Total concentrations and or 95% upper confidence levels (UCL) values of arsenic (As), cadmium (Cd), copper (Cu), lead (Pb), mercury (Hg), silver (Ag), aluminium (Al), cobalt (Co), chromium (Cr), iron (Fe), manganese (Mn), selenium (Se), vanadium (V), zinc (Zn) and organotins (tributyltin (TBT), dibutyltin (DBT) and mono-btyltin (MBT)) less than the respective NODGDM screening values.

[1] Commonwealth of Australia, 2009. National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia, 2009)
[2] Commonwealth of Australia, 2002. National Ocean Disposal Guidelines for Dredge Material (NODGDM)

- Some concentrations and the 95%UCL values of nickel (Ni) and antimony (Sb) were greater than the respective screening level. As such bioavailability analysis comprising dilute acid extraction (DAE) and elutriate analysis was completed for all metals and metalloids.
- Concentrations, and 95%UCL values, of all metals and metalloids analysed using DAE were less than the respective screening values.
- Concentrations of Al, Ag, As, Cd, Cr, Fe, Hg, Mn, Ni, Pb, Sb, Se, V, Zn in elutriates were less than the respective ANCEZZ / ARMCANZ[3] 95% species protection water quality guideline criteria. Concentrations of Co and Cu in elutriates were also less than the respective ANZECC / ARMCANZ 95% species protection water quality guideline criteria when a conservative dilution factor is applied.

Based on the results of the assessment it was concluded that sediments were suitable for unconfined ocean placement.

2.2 2009 WorleyParsons supplementary sediment characterisation

WorleyParsons completed a sediment sampling program in 2009 comprising 10 sampling locations (refer to red symbols in Figure 2-1) to assess potential contaminants of concern within the increased footprint of the wharf and a proposed capital dredging volume of 505,800 m^3. A total of 10 primary samples, collected to a depth of 0.5m using a grab sampler, were submitted for laboratory analysis. The results of the laboratory analysis indicated:

- Sediments are comprised of clay and silt (88%), sand (10%) and gravel (1.5%).
- Concentrations and or 95%UCL values of total Al, Ag, As, Cd, Cr, Cu, Co, Fe, Hg, Mn, Ni, Pb, Sb, Se, V, Zn and organotins were less than the respective NAGD screening values.
- Concentrations and or 95%UCL values of DAE Al, Ag, As, Cd, Cr, Cu, Co, Fe, Hg, Mn, Ni, Pb, Sb, Se, V, Zn were less than the respective NAGD screening values.
- Concentrations of Al, Ag, As, Cd, Cr, Cu, Co, Fe, Hg, Mn, Ni, Pb, Sb, Se, V, Zn in elutriates were less than the respective ANCEZZ / ARMCANZ 95% species protection water quality guideline criteria.
- Concentrations of net acidity (associated with acid sulfate soils (ASS)) were less than the QASSIT[4] action criteria.

Based on the results of the assessment it was concluded that sediments were suitable for unconfined ocean placement.

2.3 2010/2012 WorleyParsons sediment characterisation

WorleyParsons completed a sediment sampling program in 2010 comprising 20 sampling locations (refer to green symbols in Figure 2-1) to assess potential contaminants of concern within the increased footprint of the proposed wharf and associated proposed capital dredging volume of 730,031 m^3. A total of 10 primary samples, collected to a maximum depth of 0.63m using a vibracorer, were submitted for laboratory analysis. Note that laboratory analysis excluded organotins as these

[3] Australian and New Zealand Water Quality Guidelines for Fresh and Marine Water Quality 2000 published by Australian and New Zealand Environment and Conservation Council (ANZECC) and Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ)
[4] C.R. Ahern , M.R. Ahern and B. Powell, 1998. Guidelines for sampling and analysis of lowland acid sulfate soil (ASS) in Queensland revision 4.0. Queensland acid sulfate soil investigation team (QASSIT), Brisbane

had not been detected in previous sediment characterisation studies. The results of the laboratory analysis indicated:

- Inshore sediments are comprised of clay and silt (84%), sand (13%) and gravel (13%).
- Offshore sediments were comprised of clay and silt (19%), sand (66%) and gravel (15%).
- Concentrations and or 95%UCL values of total Al, Ag, As, Cd, Cr, Cu, Co, Fe, Hg, Mn, Ni, Pb, Sb, Se, V, Zn were less than the respective NAGD screening values.
- Concentrations and or 95%UCL values of DAE Al, Ag, As, Cd, Cr, Cu, Co, Fe, Hg, Mn, Ni, Pb, Sb, Se, V, Zn were less than the respective NAGD screening values.
- Concentrations of Al, Ag, As, Cd, Cr, Cu, Co, Fe, Hg, Mn, Ni, Pb, Sb, Se, V in elutriates were less than the respective ANCEZZ / ARMCANZ 95% species protection water quality guideline criteria. Concentrations of Zn in elutriates were also less than the respective ANZECC / ARMCANZ 95% species protection water quality guideline criteria when a conservative dilution factor is applied.

Based on the results of the assessment it was concluded that sediments were suitable for unconfined ocean placement.

Subsequent to the submission of the sediment characterisation report to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), RTA modified the wharf design, rotating it 2 degrees to the south of the original design. This change resulted in shift of the seaward portion of the wharf. Despite the design rotation, dredge volumes did not change as bathymetry was generally consistent and an exemption for further sediment sampling was granted in 2012 as such the sampling completed in 2010 was valid.

2.4 2017 RTA sediment characterisation

RTA completed a sediment sampling program in 2017 comprising 17 sampling locations (refer to purple symbols in Figure 2-1) to assess potential contaminants of concern within a proposed conservative maintenance dredging volume of 92,000 m^3. A total of 17 primary samples, collected to a maximum depth of 0.5m using a grab sampler, were submitted for laboratory analysis. The results of the laboratory analysis indicated:

- Sediments are comprised of clay and silt (86%), sand (13%) and gravel (1%).
- Concentrations and or 95%UCL values of total Al, Ag, As, Cd, Cr, Cu, Co, Fe, Hg, Mn, Pb, Sb, Se, V, Zn, organotins, total petroleum hydrocarbon (TPH) and polycyclic aromatic hydrocarbons (PAH) were less than the respective NAGD screening values.
- Some concentrations of Ni and the 95%UCL value was greater than the NAGD screening level as such bioavailability analysis comprising dilute acid extraction (DAE) and elutriate analysis was completed for all metals and metalloids.
- Concentrations, and 95%UCL values, of all metals and metalloids analysed using DAE were less than the respective screening values.

Based on the results of the assessment it was concluded that sediments were suitable for unconfined ocean placement.

2.5 2018 Advisian sediment characterisation for North Queensland Bulk Ports

Advisian, commissioned by North Queensland Bulk Ports (NQBP), completed a sediment sampling program in 2018 comprising six sampling locations (refer to blue symbols in Figure 2-1) to assess ASS, salinity, organic matter and geotechnical properties to support the potential beneficial reuse of the sediments. A total of six primary samples, collected to a maximum depth of 0.5m using a grab sampler, were submitted for laboratory analysis. The results of the laboratory analysis indicated:

- Sediments are generally comprised of clay and silt (73%), sand (27%) and gravel (<1%).
- Concentrations of net acidity (associated with ASS) were less than the QASSIT action criteria.
- Concentrations of salinity were considered to be high for onshore beneficial reuse purposes.
- Organic matter within sediments was considered to be low.

2.6 2019 Advisian sediment characterisation for North Queensland Bulk Ports

Advisian, commissioned by NQBP, completed a sediment sampling program (combined with a benthic infauna survey) in 2019 comprising eight sampling locations (refer to brown symbols in Figure 2-1) to assess potential contaminants of concern within a proposed maintenance dredging footprint as part of Sustainable Sediment Management assessment (including sediment properties for beneficial reuse opportunities) to inform long-term Sea Dumping Permit application. A total of eight primary samples, collected to a maximum depth of 0.5m using a grab sampler, were submitted for laboratory analysis. The results of the laboratory analysis indicated:

- Sediments are comprised of clay and silt (85%), sand (15%) and gravel (1%).
- Concentrations and or 95%UCL values of total Al, Ag, As, Barium (Ba), Beryllium (Be), Boron (B), Cd, Cr, Cu, Co, Fe, Hg, Mn, Ni, Pb, Sb, Se, V, Zn, organotins, TPH, benzene, toluene, ethylbenzene, xylene, naphthalene (BTEXN) and PAH were less than the respective NAGD screening values.

Concentrations, and 95%UCL values, of all metals and metalloids analysed using DAE were less than the respective screening values.

2.7 2023 AMA sediment characterisation

AMA completed a sediment sampling program in 2023 comprising 14 sampling locations (refer to yellow symbols in Figure 2-1) within existing berth pocket and apron areas to assess potential contaminants of concern within a proposed conservative maintenance dredging volume of 60,000 m^3. A total of 12 primary samples, collected to a maximum depth of 0.5m using a grab sampler, were submitted for laboratory analysis. The results of the laboratory analysis indicated:

- Sediments are comprised of clay and silt (94%), sand (5%) and gravel (1%).
- Concentrations and or 95%UCL values of total As, Cd, Cr, Cu, Ni, Hg, Pb, Sb, Zn, total recoverable hydrocarbon (TRH) and TPH were less than the respective NAGD screening values.

Note, AMA indicated that organotins were not included as part of the analysis suite as it was not previously detected and the Port commenced operations 10 years after the worldwide ban on TBT was implemented. As such, organotins are not considered to be a legacy contaminant of concern at

the Port. Based on the results of the assessment it was concluded that sediments were suitable for unconfined ocean placement.

Table 2-1: Summary of sediment characterisation data provided by Swash Pty Ltd

Amrun Port Status	Year	Dredging type	Sea Dumping Permit	Dredge volumes (m^3)	Sediment sampling dates	Sediment Characterisation report date	Sampling based on dredge volume (m^3)	No. of Port Primary sample locations	Sampling method	Sampling depth (m)	Particle size distribution results	Geochemical results	Conclusions
Pre-Construction	2007				Oct 2007	Feb 2008	250,000	5	Vibracorer	1	G 3% S 18% C/S 79%	Total contaminant concentrations and or 95%UCL values < NAGD screening levels Precautionary elutriate analysis of copper and cobalt < ANZECC/ ARMCANZ (2000).	Suitable for ocean placement
	2008				Nov 2008	Jun 2009	N/A	21	Geotech drilled boreholes	40			
	2009				Jun 2009	Oct 2009	505,800	10	Grab	0.5	G 2% S 10% C/S 88%	Total contaminant concentrations and or 95%UCL values < NAGD screening	Suitable for ocean placement
	2010				Jun 2010	Mar 2012	6,500,000	20	Vibracorer	0.63	G 8% S 34% C/S 58%	Total contaminant concentrations and or 95%UCL values < NAGD screening levels Precautionary elutriate analysis < ANZECC /ARMCANZ (2000).	Suitable for ocean placement
	2011												
	2012												
	2013												
	2014												
	2015												
Construction	2016	Capital	SD2010/ 1762	202,416									
	2017				Sep 2017	Dec 2017	92,000	17	Grab	0.5	G 1% S 13% C/S 86%	Total contaminant concentrations and or 95%UCL values < NAGD screening levels	Suitable for ocean placement
	2018	Maintenance	SD2017/ 3722	42,038	Feb 2018	Jul 2018			Grab	0.5	G <1% S 27% C/S 73%	Acid sulfate soils only: net acidity < QASSIT criteria	-
Operation	2019	Maintenance	SD2017/ 3722	40,826	Apr 2019	May 2019	N/A*	8	Grab	0.5	G <1% S 15% C/S 85%	Total contaminant concentrations and or 95%UCL values < NAGD screening levels	Suitable for ocean placement

Amrun Port Status	Year	Dredging type	Sea Dumping Permit	Dredge volumes (m^3)	Sediment sampling dates	Sediment Characterisation report date	Sampling based on dredge volume (m^3)	No. of Port Primary sample locations	Sampling method	Sampling depth (m)	Particle size distribution results	Geochemical results	Conclusions
	2020	Maintenance	SD2017/3722										
	2021	Maintenance	SD2020/3999										
	2022	Maintenance	SD2020/3999	29,000									
	2023	Maintenance	SD2020/3999	34,600	Mar 2023	Apr 2023	60,000	12	Grab	0.5	G 1% S 6% C/S 93%	Total contaminant concentrations and or 95%UCL values < NAGD screening levels	Suitable for ocean placement
	2024	Maintenance	SD2020/3999	51,300									
	2025		SD2020/3999										
	2026		SD2020/3999										
	2027		SD2020/3999										
	2028		SD2020/3999		Next SAPIR due								
	2029		SD2020/3999										
	2030		SD2020/3999										
Notes: G – gravel; S – sand; C/S – clay and silt; * sampling completed to support sustainable sediment management assessment and SD2020/3999 application													

Amrun Port Extension - Rio Tinto Australia, Weipa

Historical Sampling Locations - Proposed Dredge Extents

Sampling Locations

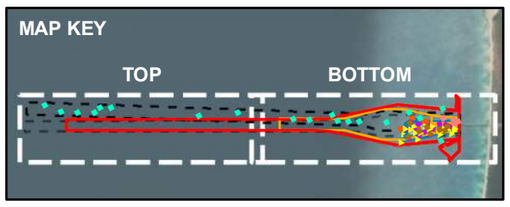
2008 · 2009 · 2010/2012 · 2017 · 2018 · 2019 · 2023

Proposed dredge extents *(Does not include batters to natural seabed level)*

2016 – 2024 dredge area

Previous designs

Dredge footprint (EIS)



Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 100 200
Metres

GDA 1994 MGA Zone 54

Date: 19/08/2024 **Drawn By: The Map Lass P/L** **Reviewed By: SQP/DS**

Document Location: D:\Projects\SQP Consulting\SQP 2024-056 - RTA Amrun\Output\SQP2024-056-0003-C (Amrun Port Proposed Dredge).mxd

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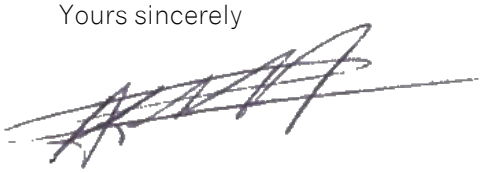
ABN 47 653 467 568 | ACN 653 467 568

3 Conclusions

The following conclusions have been made based on the review of available sediment characterisation reports:

- Seven sediment characterisation studies comprising the assessment of potential contaminants (including metals and metalloids, organotins and hydrocarbons) have been completed from 2007 to 2023 over the course of the Port's lifetime including pre-construction, construction and operation. These studies have also included an assessment of PSD and on occasions included an assessment of ASS.
- Sediments are predominately comprised of clay and silt (73 to 94%) with sand (5 to 27%) and trace gravel (<1 to 3%). More detailed analysis in 2010 indicated inshore sediments are primarily clay / silt whilst offshore sediments are primarily course textured (up to 81% sand and gravel) with clay/ silt and gravel.
- Some concentrations of metals including Ni, Sb, Cu and Co have exceeded NAGD screening levels on occasion; however, further analysis of bioavailability (DAE and elutriates) indicated concentrations of these metals and all other metals and metalloids analysed have been less than the respective NAGD screen levels and ANCEZZ / ARMCANZ 95% species protection water quality guideline criteria.
- The most recent sediment characterisation (completed in 2023) did not include organotins as:
  - Organotins have not previously been detected.
  - The Port commenced operations 10 years after the worldwide ban on TBT was implemented therefore organotins are not considered to be a legacy contaminant of concern at the Port.
- Conclusions of all seven sediment characterisations reviewed have all indicated sediments were suitable for unconfined ocean placement.
- In accordance with the NAGD, 2009 framework for exemptions from sediment testing requirements the following is considered to support an exemption of further sediment characterisation of chemical contaminants for proposed capital dredging:
  - Capital sediments to be dredged (i.e. outer channel) primarily comprise coarse textured sediments (up to 81% sand and gravel).
  - The Port is considered to be in a remote area removed from known existing and historical sources of pollution supported by previous sediment characterisation studies that concluded sediments were suitable for unconfined ocean placement.
  - Further sediment characterisation will still be required in 2028 under the existing maintenance dredging sea dumping permit.

Yours sincerely



Alex Kochnieff
Director
Principal Environmental Engineer
Suitably Qualified Person

References

Advisian, 2018. Port of Weipa - Sustainable Sediment Management (SSM) Assessment for Navigationa l Maintenance ('The SSM Project') – Sediment properties report, report number 301001-02056-00-EN-REP-0002. Advisian, Brisbane

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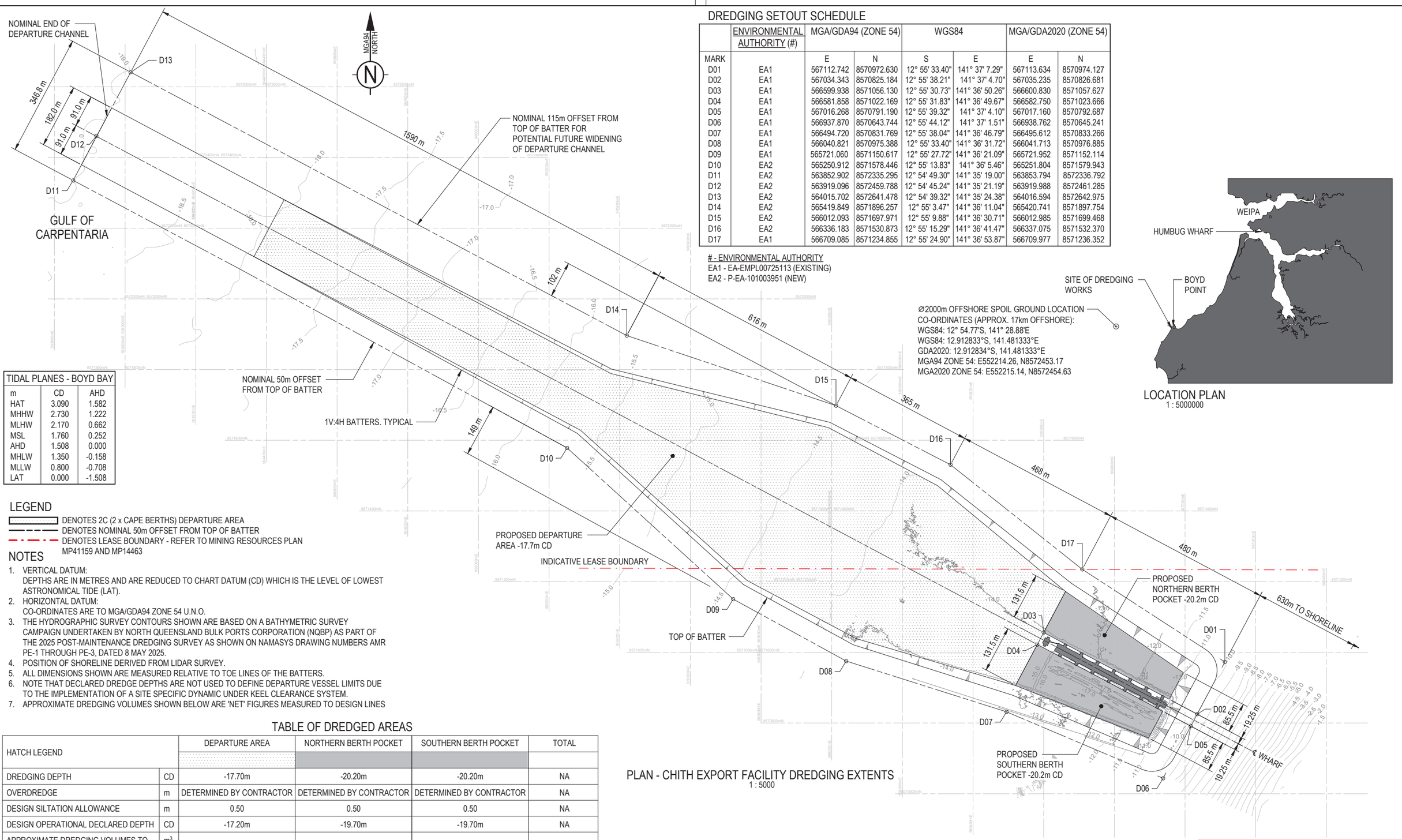
Statement of limitations

This report has been prepared by SQP Consulting Pty Ltd in response to and subject to the following limitations:

- The specific instructions received from Rio Tinto Australia.
- The work presented in this report is SQP Consulting Pty Ltd's response to the specific scope of works (refer Section 1.2 of this letter) requested by, planned with, and approved by the Rio Tinto Australia. It cannot be relied on by any other third party for any purpose except with our prior written consent. The client may distribute this report to other parties and in doing so warrants that the report is suitable for the purpose it was intended for. However, any party wishing to rely on this report should contact us to determine the suitability of this report for their specific purpose.
- The summary review of sediment characterisation studies at the Port of Amrun from 2008 to 2023 is based on a review of available and provided reports.
- Site data from public sources has been referred to in the document, where it is assumed that this data is suitably accurate.
- This report may not be relied upon by any third party not named in this report for any purpose except with the prior written consent of SQP Consulting Pty Ltd (which consent may or may not be given at the discretion of SQP Consulting Pty Ltd).
- This report comprises the formal report, documentation sections, tables, figures, and appendices as referred to in the index to this report and must not be released to any third party or copied in part without all the material included in this report for any reason.
- The report only relates to the Site referred to in the scope of works being the Port of Amrun located on the east coast of the Gulf of Carpentaria 40km southwest of Weipa.
- The report relates to the Port of Amrun as at the date of the provided reports as conditions may change thereafter due to natural processes and/or site activities.
- No warranty or guarantee is made regarding any other use than as specified in the scope of works and only applies to the depth tested and reported in this report.

APPENDIX E – AMRUN PORT – 2025 – 2029 CAPITAL DREDGING PLANS

DATE: 30/01/2026 12:38:46 PM
Autodesk Docs://AU-00000-Ammun Port Expansion /IW306300-JAC-0000-M3D-MS-9002_TENDER.rvt



PLAN - CHITH EXPORT FACILITY DREDGING EXTENTS
1 : 5000

DREDGING SETOUT SCHEDULE

	ENVIRONMENTAL AUTHORITY (#)	MGA/GDA94 (ZONE 54)		WGS84		MGA/GDA2020 (ZONE 54)	
MARK		E	N	S	E	E	N
D01	EA1	567112.742	8570972.630	12° 55' 33.40"	141° 37' 7.29"	567113.634	8570974.127
D02	EA1	567034.343	8570825.184	12° 55' 38.21"	141° 37' 4.70"	567035.235	8570826.681
D03	EA1	566599.938	8571056.130	12° 55' 30.73"	141° 36' 50.26"	566600.830	8571057.627
D04	EA1	566581.858	8571022.169	12° 55' 31.83"	141° 36' 49.67"	566582.750	8571023.666
D05	EA1	567016.268	8570791.190	12° 55' 39.32"	141° 37' 4.10"	567017.160	8570792.687
D06	EA1	566937.870	8570643.744	12° 55' 44.12"	141° 37' 1.51"	566938.762	8570645.241
D07	EA1	566494.720	8570831.769	12° 55' 38.04"	141° 36' 46.79"	566495.612	8570833.266
D08	EA1	566040.821	8570975.388	12° 55' 33.40"	141° 36' 31.72"	566041.713	8570976.885
D09	EA1	565721.060	8571150.617	12° 55' 27.72"	141° 36' 21.09"	565721.952	8571152.114
D10	EA2	565250.912	8571578.446	12° 55' 13.83"	141° 36' 5.46"	565251.804	8571579.943
D11	EA2	563852.902	8572335.295	12° 54' 49.30"	141° 35' 19.00"	563853.794	8572336.792
D12	EA2	563919.096	8572459.788	12° 54' 45.24"	141° 35' 21.19"	563919.988	8572461.285
D13	EA2	564015.702	8572641.478	12° 54' 39.32"	141° 35' 24.38"	564016.594	8572642.975
D14	EA2	565419.849	8571896.257	12° 55' 3.47"	141° 36' 11.04"	565420.741	8571897.754
D15	EA2	566012.093	8571697.971	12° 55' 9.88"	141° 36' 30.71"	566012.985	8571699.468
D16	EA2	566336.183	8571530.873	12° 55' 15.29"	141° 36' 41.47"	566337.075	8571532.370
D17	EA1	566709.085	8571234.855	12° 55' 24.90"	141° 36' 53.87"	566709.977	8571236.352

- ENVIRONMENTAL AUTHORITY
EA1 - EA-EMPL00725113 (EXISTING)
EA2 - P-EA-101003951 (NEW)

Ø2000m OFFSHORE SPOIL GROUND LOCATION
CO-ORDINATES (APPROX. 17km OFFSHORE):
WGS84: 12° 54.77'S, 141° 28.88'E
WGS84: 12.912833°S, 141.481333°E
GDA2020: 12.912834°S, 141.481333°E
MGA94 ZONE 54: E552214.26, N8572453.17
MGA2020 ZONE 54: E552215.14, N8572454.63

LOCATION PLAN
1 : 5000000

TIDAL PLANES - BOYD BAY		
m	CD	AHD
HAT	3.090	1.582
MHHW	2.730	1.222
MLHW	2.170	0.662
MSL	1.760	0.252
AHD	1.508	0.000
MHLW	1.350	-0.158
MLLW	0.800	-0.708
LAT	0.000	-1.508

LEGEND

DENOTES 2C (2 x CAPE BERTHS) DEPARTURE AREA
DENOTES NOMINAL 50m OFFSET FROM TOP OF BATTER
DENOTES LEASE BOUNDARY - REFER TO MINING RESOURCES PLAN MP41159 AND MP14463

NOTES

1. VERTICAL DATUM:
   DEPTHS ARE IN METRES AND ARE REDUCED TO CHART DATUM (CD) WHICH IS THE LEVEL OF LOWEST ASTRONOMICAL TIDE (LAT).
2. HORIZONTAL DATUM:
   CO-ORDINATES ARE TO MGA/GDA94 ZONE 54 U.N.O.
3. THE HYDROGRAPHIC SURVEY CONTOURS SHOWN ARE BASED ON A BATHYMETRIC SURVEY CAMPAIGN UNDERTAKEN BY NORTH QUEENSLAND BULK PORTS CORPORATION (NQBP) AS PART OF THE 2025 POST-MAINTENANCE DREDGING SURVEY AS SHOWN ON NAMASYS DRAWING NUMBERS AMR PE-1 THROUGH PE-3, DATED 8 MAY 2025.
4. POSITION OF SHORELINE DERIVED FROM LIDAR SURVEY.
5. ALL DIMENSIONS SHOWN ARE MEASURED RELATIVE TO TOE LINES OF THE BATTERS.
6. NOTE THAT DECLARED DREDGE DEPTHS ARE NOT USED TO DEFINE DEPARTURE VESSEL LIMITS DUE TO THE IMPLEMENTATION OF A SITE SPECIFIC DYNAMIC UNDER KEEL CLEARANCE SYSTEM.
7. APPROXIMATE DREDGING VOLUMES SHOWN BELOW ARE 'NET' FIGURES MEASURED TO DESIGN LINES

TABLE OF DREDGED AREAS

HATCH LEGEND		DEPARTURE AREA	NORTHERN BERTH POCKET	SOUTHERN BERTH POCKET	TOTAL
DREDGING DEPTH	CD	-17.70m	-20.20m	-20.20m	NA
OVERDREDGE	m	DETERMINED BY CONTRACTOR	DETERMINED BY CONTRACTOR	DETERMINED BY CONTRACTOR	NA
DESIGN SILTATION ALLOWANCE	m	0.50	0.50	0.50	NA
DESIGN OPERATIONAL DECLARED DEPTH	CD	-17.20m	-19.70m	-19.70m	NA
APPROXIMATE DREDGING VOLUMES TO DESIGN LINES	m^3	2 025 000	390 000	270 000	2 685 000
APPROXIMATE OVERDREDGE VOLUMES	m^3	461 000	27 000	27 000	515 000
APPROXIMATE GROSS DREDGING VOLUMES (INCLUDING OVERDREDGING)	m^3	2 486 000	417 000	297 000	3 200 000

NOT FOR CONSTRUCTION
PRELIMINARY ISSUE

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DRAWN	JM	30/01/2026
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DESIGNED	GS	30/01/2026
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RioTinto
RTA Weipa Pty Ltd
ABN 54 137 266 285

SOUTH OF EMBLEY EXPANSION
CHITH EXPORT FACILITY - PORT EXPANSION
DREDGING EXTENTS PLAN

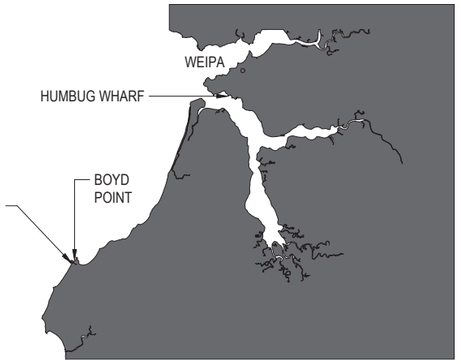
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RTA WEIPA DRAWING No.

A1

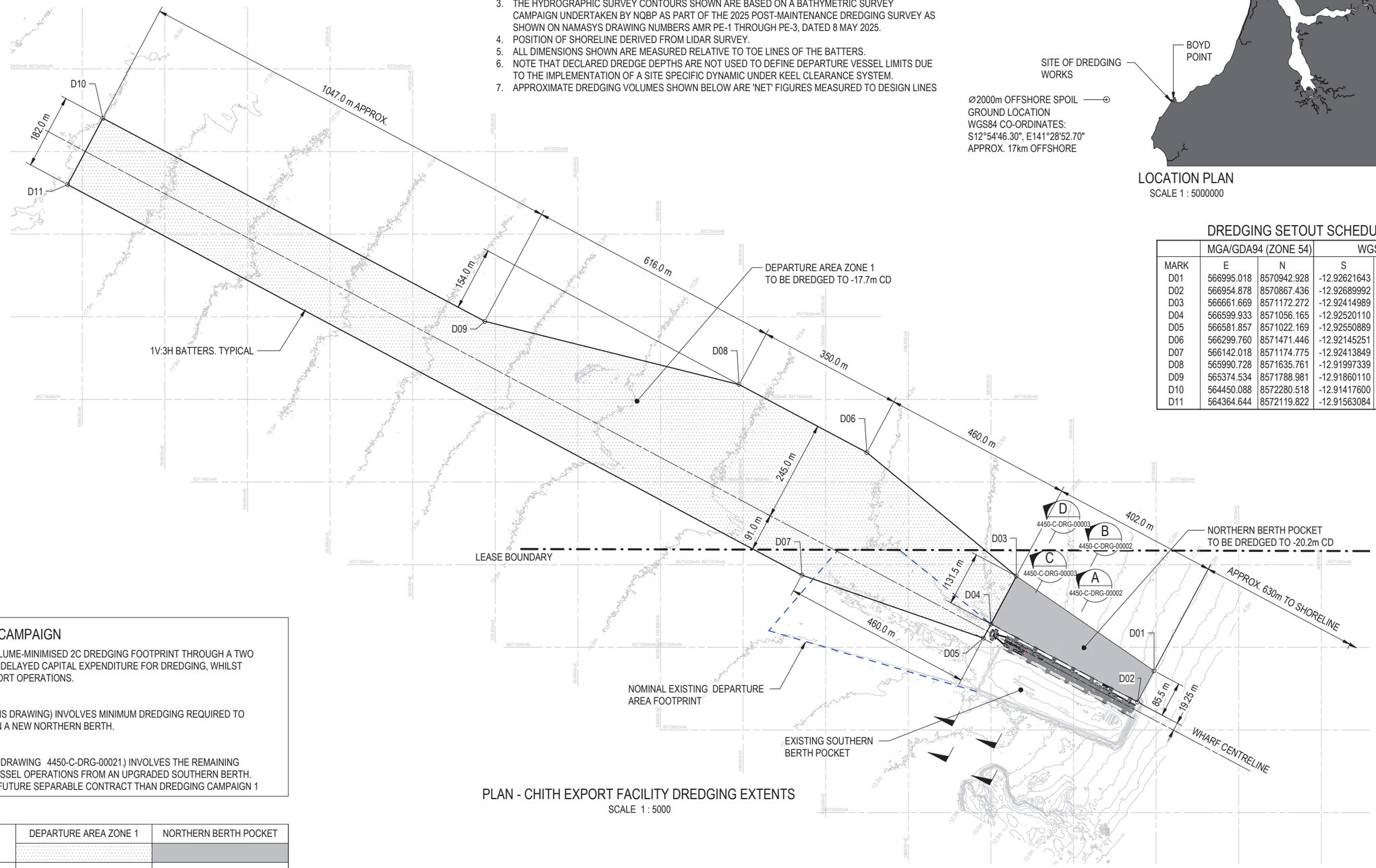
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1. VERTICAL DATUM:
   DEPTHS ARE IN METRES AND ARE REDUCED TO CHART DATUM (CD) WHICH IS THE LEVEL OF LOWEST ASTRONOMICAL TIDE (LAT).
2. HORIZONTAL DATUM:
   CO-ORDINATES ARE TO MGA/GDA94 ZONE 54 U.N.O.
3. THE HYDROGRAPHIC SURVEY CONTOURS SHOWN ARE BASED ON A BATHYMETRIC SURVEY CAMPAIGN UNDERTAKEN BY NQBP AS PART OF THE 2025 POST-MAINTENANCE DREDGING SURVEY AS SHOWN ON NAMASYS DRAWING NUMBERS AMR PE-1 THROUGH PE-3, DATED 8 MAY 2025.
4. POSITION OF SHORELINE DERIVED FROM LIDAR SURVEY.
5. ALL DIMENSIONS SHOWN ARE MEASURED RELATIVE TO TOE LINES OF THE BATTERS.
6. NOTE THAT DECLARED DREDGE DEPTHS ARE NOT USED TO DEFINE DEPARTURE VESSEL LIMITS DUE TO THE IMPLEMENTATION OF A SITE SPECIFIC DYNAMIC UNDER KEEL CLEARANCE SYSTEM.
7. APPROXIMATE DREDGING VOLUMES SHOWN BELOW ARE 'NET' FIGURES MEASURED TO DESIGN LINES



LOCATION PLAN
SCALE 1 : 5000000

GULF OF CARPENTARIA



PLAN - CHITH EXPORT FACILITY DREDGING EXTENTS
SCALE 1 : 5000

DREDGING SETOUT SCHEDULE

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D03	566661.669	8571172.272	-12.92414989	141.61452872
D04	566599.933	8571056.165	-12.92520110	141.61396219
D05	566581.857	8571022.169	-12.92550889	141.61379631
D06	566299.760	8571471.446	-12.92145251	141.61118597
D07	566142.018	8571174.775	-12.92413849	141.60973839
D08	565990.728	8571635.761	-12.91997339	141.60833367
D09	565374.534	8571788.981	-12.91860110	141.60265020
D10	564450.088	8572280.518	-12.91417600	141.59411809
D11	564364.644	8572119.822	-12.91563084	141.59333390

TIDAL PLANES - BOYD BAY		
m	CD	AHD
HAT	3.090	1.582
MHHW	2.730	1.222
MLHW	2.170	0.662
MSL	1.760	0.252
AHD	1.508	0.000
MHLW	1.350	-0.158
MLLW	0.800	-0.708
LAT	0.000	-1.508

MINIMISED INITIAL DREDGING CAMPAIGN

THIS IS DEFINED BY UNDERTAKING THE VOLUME-MINIMISED 2C DREDGING FOOTPRINT THROUGH A TWO STAGE DREDGING APPROACH, TARGETING DELAYED CAPITAL EXPENDITURE FOR DREDGING, WHILST MINIMISING INTERRUPTION TO ONGOING PORT OPERATIONS.

CAMPAIGN 1 :

THE FIRST CAMPAIGN (AS DEPICTED ON THIS DRAWING) INVOLVES MINIMUM DREDGING REQUIRED TO ENABLE CAPE VESSEL OPERATIONS WITHIN A NEW NORTHERN BERTH.

CAMPAIGN 2 :

THE SECOND CAMPAIGN (AS DEPICTED ON DRAWING 4450-C-DRG-00021.) INVOLVES THE REMAINING DREDGING REQUIRED TO ENABLE CAPE VESSEL OPERATIONS FROM AN UPGRADED SOUTHERN BERTH. THIS WILL BE UNDERTAKEN AS PART OF A FUTURE SEPARABLE CONTRACT THAN DREDGING CAMPAIGN 1

DREDGING CAMPAIGN 1

HATCH LEGEND		DEPARTURE AREA ZONE 1	NORTHERN BERTH POCKET
DREDGING DEPTH	CD	-17.70m	-20.20m
OVERDREDGE	CD	DETERMINED BY CONTRACTOR	DETERMINED BY CONTRACTOR
DESIGN SILTATION ALLOWANCE	m	0.50	0.50
DESIGN OPERATIONAL DECLARED DEPTH	CD	-17.20m	-19.70m
APPROXIMATE DREDGING VOLUMES TO DESIGN LINES	m^3	1,437,431	388,477

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REVISIONS									
REV	DATE	DESCRIPTION	DRN	CHK	EGS	PE	PEM	RPEQ
B	06.11.25	ISSUED FOR REVIEW	JM	MK	GS	JA		
A	12.09.25	ISSUED FOR STUDY	JM	GS	GS	JA		

APPROVALS	NAME	DATE
DRAWN	JM	12.09.2025
CHECKED	MK	12.09.2025
DESIGNED	GS	12.09.2025
DES. CHECKED	JA	06.10.2025
EGS	GS	06.11.2025
PE	JA	06.11.2025
PEM		

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KANGWINAN PROJECT
4450 - AMRUN PORT DREDGING
DREDGING EXTENTS PLAN - CAMPAIGN 1
SCALE: As indicated
DRAWING NUMBER A0031-4450-C-DRG-00001 REV B
PROJECT No.

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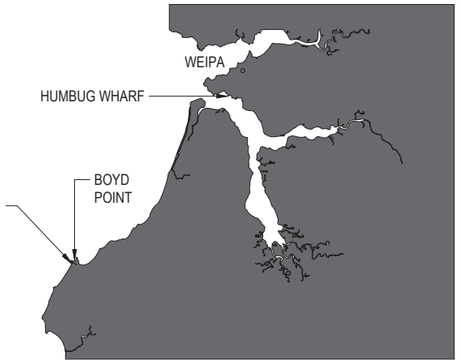
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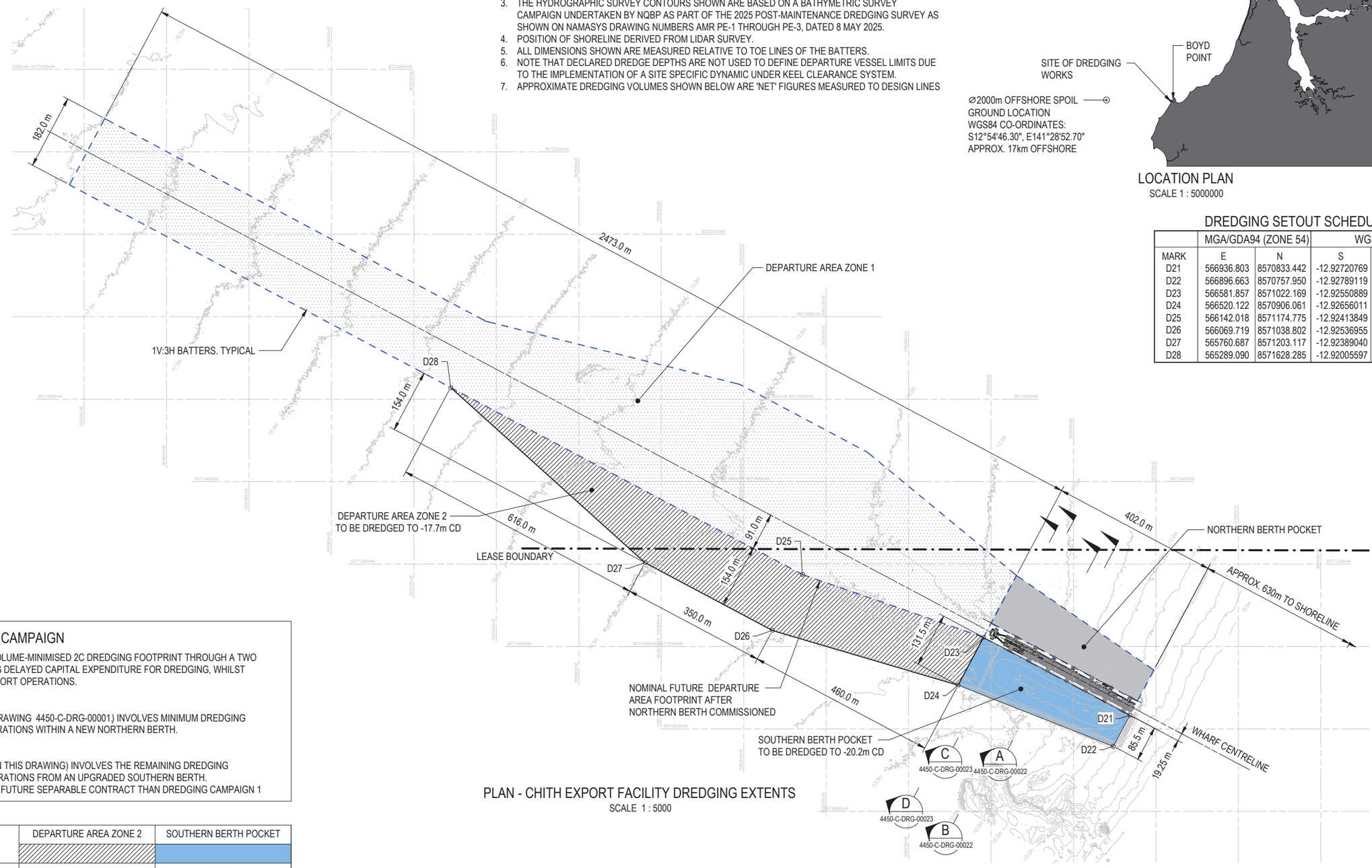


Ø2000m OFFSHORE SPOIL GROUND LOCATION
WGS84 CO-ORDINATES:
S12°54'46.30", E141°28'52.70"
APPROX. 17km OFFSHORE

LOCATION PLAN
SCALE 1 : 5000000

DREDGING SETOUT SCHEDULE

	MGA/GDA94 (ZONE 54)		WGS84	
MARK	E	N	S	E
D21	566936.803	8570833.442	-12.92720769	141.61707250
D22	566896.663	8570757.950	-12.92789119	141.61670415
D23	566581.857	8571022.169	-12.92550889	141.61379631
D24	566520.122	8570906.061	-12.92656011	141.61322978
D25	566142.018	8571174.775	-12.92413849	141.60973839
D26	566069.719	8571038.802	-12.92536955	141.60907490
D27	565760.687	8571203.117	-12.92389040	141.60622256
D28	565289.090	8571628.285	-12.92005597	141.60186605



PLAN - CHITH EXPORT FACILITY DREDGING EXTENTS
SCALE 1 : 5000

TIDAL PLANES - BOYD BAY

m	CD	AHD
HAT	3.090	1.582
MHHW	2.730	1.222
MLHW	2.170	0.662
MSL	1.760	0.252
AHD	1.508	0.000
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THIS WILL BE UNDERTAKEN AS PART OF A FUTURE SEPARABLE CONTRACT THAN DREDGING CAMPAIGN 1

DREDGING CAMPAIGN 2

HATCH LEGEND		DEPARTURE AREA ZONE 2	SOUTHERN BERTH POCKET
DREDGING DEPTH	CD	-17.70m	-20.20m
OVERDREDGE	CD	DETERMINED BY CONTRACTOR	DETERMINED BY CONTRACTOR
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DESIGN OPERATIONAL DECLARED DEPTH	CD	-17.20m	-19.70m
APPROXIMATE DREDGING VOLUMES TO DESIGN LINES	m^3	537,722	226,858

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SHEET SIZE: A1
REFERENCES

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A	12.09.25	ISSUED FOR STUDY	JM	GS	GS	JA		

APPROVALS

	NAME	DATE
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DES. CHECKED	JA	06.10.2025
EGS	GS	06.11.2025
PE	JA	06.11.2025
PEM		

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RTAW DOCUMENT NUMBER

KANGWINAN PROJECT
4450 - AMRUN PORT DREDGING
DREDGING EXTENTS PLAN - CAMPAIGN 2

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IW322800-JAC-4450-DRG-CI-000021
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APPENDIX F – AMRUN PORT – WATER QUALITY MONITORING PLAN

Water Quality Monitoring Plan - Amrun Port Capital Dredging

RTA Weipa Pty Ltd

6 November 2025



Document Control

Version	Details	Authorised by	Date
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1	Revised Draft	Brad Grant	28 April 2025
2	Revised Draft	Brad Grant	29 July 2025
3	Final	Brad Grant	18 September 2025
4	Revised Final	Brad Grant	6 November 2025

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1 Introduction

The Amrun Port (Chith Export) Facility (CEF) was constructed in 2016 as part of the Amrun Project (initially titled South of Embley Project). The facility is owned and operated by RTA Weipa Pty Ltd, which is a wholly-owned subsidiary of Rio Tinto Aluminium Limited.

The facility is located between Boyd Point and Pera Head and comprises a 650 m long jetty and a 350 m long export wharf that is capable of loading ships up to mini-cape size. RTA Weipa currently load bauxite on a mix of panamax, dedicated post-panamax and mini-cape vessels.

RTA Weipa is proposing to increase the capacity of the Amrun Port to provide dual Mini-Cape vessel berths or dual Cape Class vessel berths. To accommodate necessary berth depths and channel depths, capital dredging of up to 3.2 million m^3 (Mm^3) is required. This dredging will be undertaken over two programs (~2.2 Mm^3 (2026) and ~1.2 Mm^3 (2028)) during the dry season (May to October) when weather conditions in the Gulf of Carpentaria are typically more conducive to dredging.

To ensure potential impacts to sensitive ecological receptors are mitigated, water quality monitoring will be undertaken during the dredge program. This water quality monitoring plan (WQMP) outlines the framework for the monitoring program and has been developed to address Conditions J13 and J16 of RTA's Environmental Authority (EA) (EPML00725113).

1.1 Aims and objectives

The aim of this WQMP is to outline the water quality monitoring framework to be implemented during proposed capital dredging at Amrun Port. The specific objectives of this WQMP are to:

- Address requirements for the development and implementation of a WQMP in accordance with Conditions J13 and J16 of the EA.
- Describe the characteristics of the existing environment, including sensitive ecological receptors.
- Describe the potential dredging zones of influence based on previous modelling.
- Describe the methodology and procedures for water quality data collection and analysis.
- Describe the adaptive management framework, including trigger levels and any management actions required for exceedance of trigger levels.
- Describe the roles and responsibilities for key project stakeholders during implementation of the WQMP.

2 Site context

The Amrun Port is located on open coast at the southern end of Albatross Bay, in the Gulf of Carpentaria. This is on the northwest coast of Cape York Peninsula in Queensland. The Amrun Port is 40 km south of Weipa between Boyd Point and Pera Head on RTA mining lease ML7024. The shipping channel extends outside the mining lease into the coastal waters of Queensland. Refer to **Figure 1** for location of Amrun Port.

The climate of the Cape York Peninsula is tropical and monsoonal with a distinct wet season and dry season. The average annual rainfall for Amrun is approximately 1,900 mm, most of which occurs during the wet season (typically occurs between November and April). The highest rainfall occurs between January and March while the lowest rainfall occurs between June and September.

The region experiences wind predominantly from the east to south-east (55% of the time). During the dry season, winds are light to moderate from the east to southeast. Winds are more variable during the wet season, most commonly light tending moderate westerly or easterly. This variability is diurnal with easterly morning winds and westerly winds in the afternoon. The westerly winds during wet season occur due to the monsoonal trough moving south of the region (PCS 2018). Fresh winds occur more frequently during summer months with the potential for gale force winds during a tropical cyclone.

Amrun Port has predominantly diurnal tides with shorter periods of semi-diurnal tides during the neap tidal phase. Within the Gulf of Carpentaria there are seasonal fluctuations in sea level due to trade winds and forcing from the Arafura Sea, adjacent to the north-western entrance of the Gulf. This results in elevated predicted water levels during the wet season compared with the dry season (PCS 2018). Tropical cyclones can cause storm surges and strong wind-induced currents.

Generally, the wave climate at Amrun Port is relatively calm with wave heights of less than 0.5 m occurring 80% of the time and only exceeding 1 m less than 15% of the time. The larger waves are commonly produced by either monsoons or tropical cyclones during the wet season.

In terms of currents at Amrun Port, Worley Parsons (2012) reported that current speed near Amrun Port was relatively uniform over depth. Average peak spring tide currents were 0.25 m/s and average peak neap tide currents were 0.15 m/s. Currents were predominantly aligned with the coast, typically between 210° and 220°N during flood tides and between 30° and 40°N during ebb tides.

2.1 Environmental values

Schedule 1 of the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP Water) lists the established Environmental Values (EVs) for specific waters. These EVs define the desirable qualities of a waterway for its aquatic ecosystems and human uses.

At present, the western side of Cape York is not yet covered under a site-specific document and therefore do not yet have prescribed environmental values. However, a comprehensive environmental values assessment has been undertaken for the Port of Weipa, Amrun and Albatross Bay area more broadly (GHD, 2019). This assessment identified several marine environmental values of importance, including:

- Fisheries
- Corals
- Seagrass
- Mangroves
- Marine fauna (notably turtles and dolphins)
- Catchments & estuaries.

A summary of the environmental values in marine areas is shown in **Figure 2**.

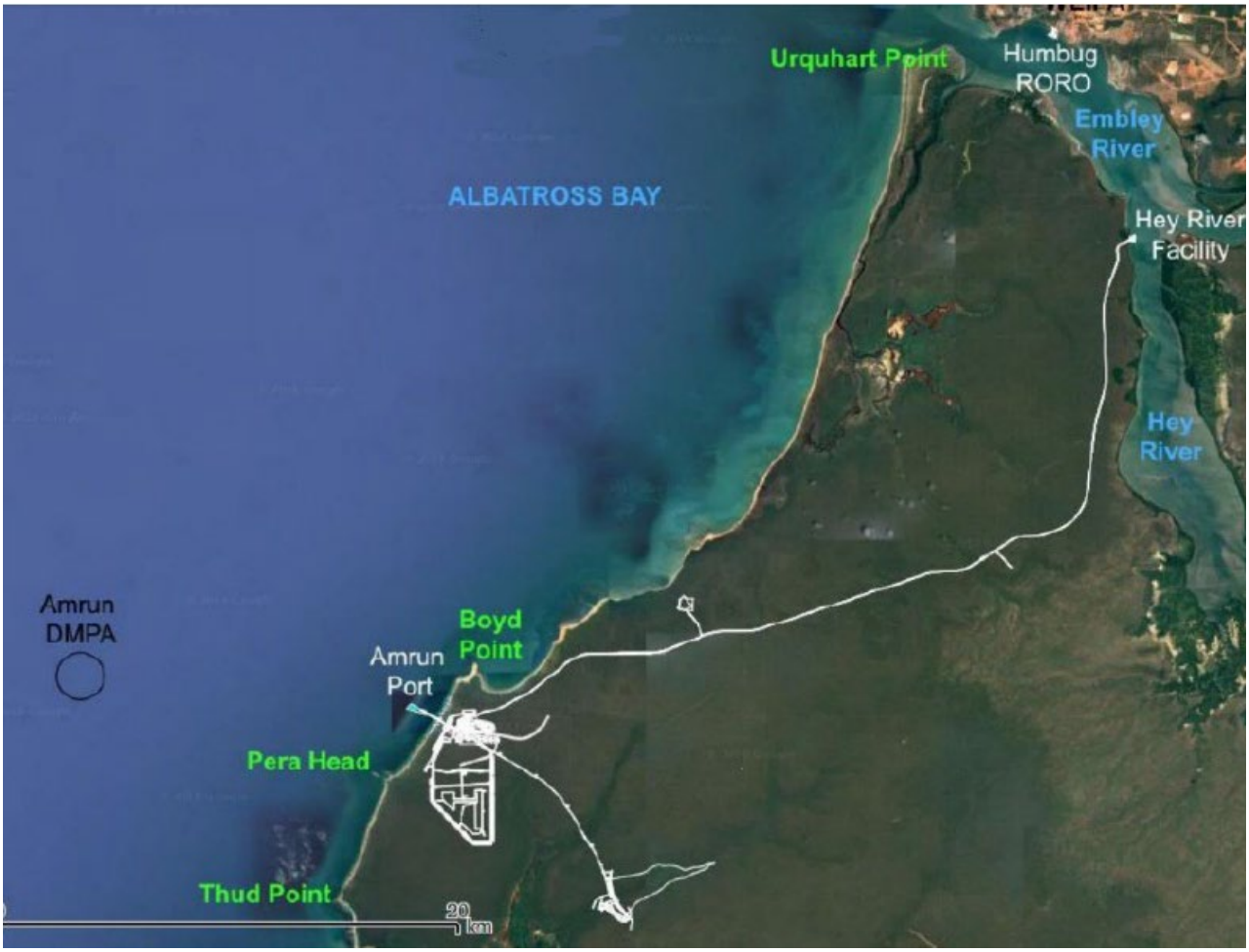


Figure 1. Location of Amrun Port

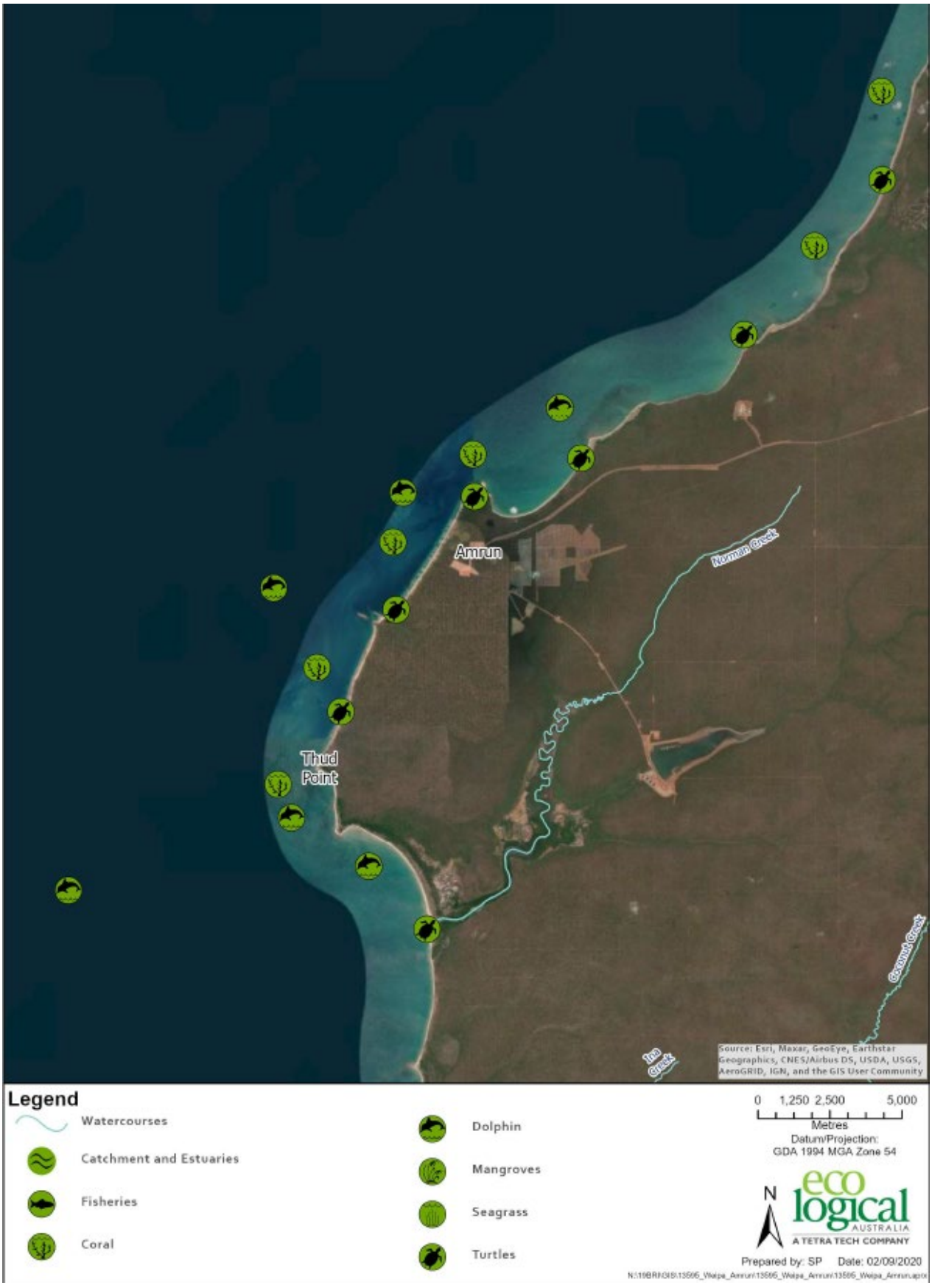


Figure 2. Marine environmental values in the area surrounding Amrun Port

2.2 Sensitive ecological receptors

Albatross Bay and the Amrun area are reflective of an inshore environment of the Cape York Peninsula. Water quality within the Port is naturally turbid due to sediment resuspension driven by wave energy and rainfall.

Habitats in the area include patchy coral reefs, benthic infauna communities, intertidal ephemeral seagrass communities, and coastal habitats including mangroves. There are several protected fauna species that are known to occur in the area, including marine turtles, sharks, in-shore dolphins, dugong and migratory shorebirds. The surrounding areas also have values for commercial fisheries, tourism, recreation and heritage.

Near-shore fringing reef communities in the vicinity of the Port area occur at Boyd Point, Pera Head and between Pera Head and Thud Point (**Figure 3**). These Coastal turbid-zone reefs include low profile reefs comprising of soft coral and sponge assemblages and rocky reefs containing hard corals. The reef systems between Boyd Point and Thud Point may be considered of high importance in a regional context due to the resources they support that are of conservation, cultural, commercial and recreational importance. Surveys for the area were completed during the baseline assessment for the EIS (2007 – 2008 and 2010) and impact monitoring (2016). All surveys recorded reefs in the area that consisted of outcrops of hard coral primarily forming over ironstone formations.

A small area of seagrass has been recorded adjacent to the Boyd Bay beach (north of Boyd Point) consisting of *Halophila decipiens* and *Halophila uninervis* (McKenzie and Yoshida 2009). A small area of *Halodule uninervis* was confirmed in 2017 when completing surveys for the Amrun moorings. No seagrass has been found within the Boyd Point to Pera Head area with physical conditions, sediment and prevailing bathymetry unlikely to support seagrass in the proposed Port.

In the vicinity of the Amrun dredge material placement area (DMPA), the nearest sensitive ecological receptor is Nine Mile reef, which consists of soft coral/sponge benthic habitat and is located approximately 6 km SSW of the DMPA. No other sensitive ecological receptors have been identified within the vicinity of the Amrun DMPA.

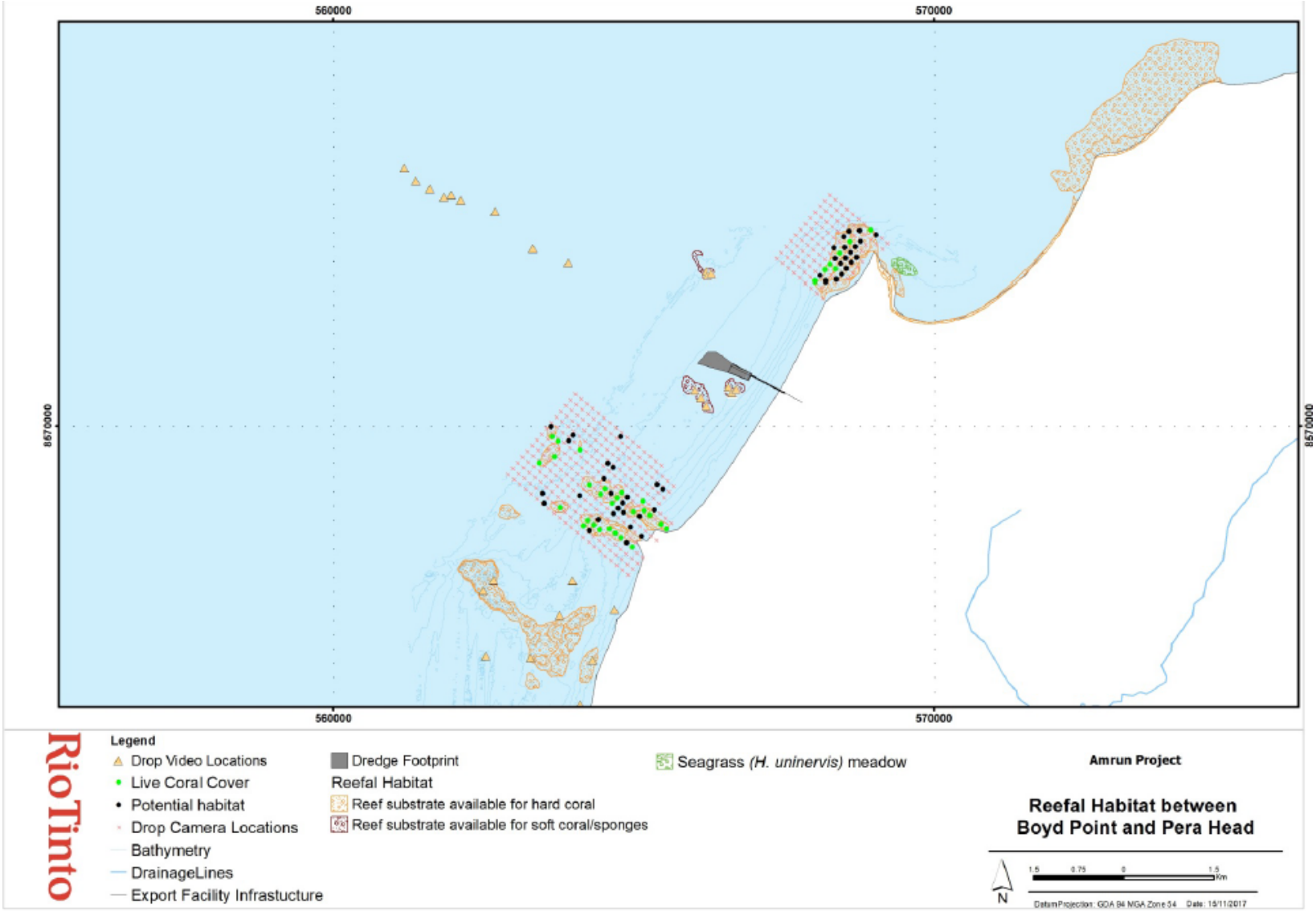


Figure 3. Sensitive ecological receptors between Boyd Point and Pera Head (based on Advisian 2016 surveys)

3 Proposed dredging activities

3.1 Dredging

To accommodate necessary berth depths and channel depths, dredging of up to 3.2 M m^3 is proposed. This dredging will be undertaken during the dry season (May to October), when weather conditions in the Gulf of Carpentaria are typically more conducive to dredging.

In 2016, capital dredging of 202,416 m^3 material was undertaken with a cutter suction dredge (CSD) and three split hopper barges (SHB) were used to transport material to the Amrun DMPA. For the proposed capital dredging, a CSD will be required to pre-crush harder underlying material. Once the harder material has been broken up by a CSD, a trailer suction hopper dredge (TSHD) would be used to remove material through suction heads (pipes), which entrain the sediment and transport the water/sediment mixture aboard into a central collection hopper. The TSHD would then steam to the Amrun DMPA. At the DMPA, the TSHD would typically slow whilst material is being placed, however a minimum steaming speed is required to maximise agitation within the hopper and clear dredge material. Dredge material would be discharged below keel level to minimise turbidity generation. Alternatively, a CSD would remove material and directly load SHBs. The SHBs would then transport material to and from the Amrun DMPA, and discharge below keel level in the same manner as a TSHD.

The route from loading (dredging) area to the Amrun DMPA is a direct line west from the Amrun port. There are no obstacles or hazards along this route. The TSHD or SHBs will take approximately 35 - 45 minutes to transit from the dredge footprint to the DMPA, and then approximately the same time to return after material placement is completed. Dredging is expected to take approximately 10–13 weeks to complete.

3.2 Dredge material placement area (DMPA)

The Amrun DMPA (currently approved for maintenance dredged material placement until 31 January 2031) is located approximately 14 km west of the Amrun port facility. The DMPA has a 1 km radius, covers an area of approximately 3 km^2 and is within the Commonwealth marine area. Water depths at the DMPA range from 23 – 25 m below lowest astronomical tide (LAT).

The Amrun DMPA was assessed within the Project EIS for placement of up to 6,500,000 m^3 of dredge material. The initially approved sea dumping permit (SD2010-1762) was for a volume of 2,600,000 m^3.. The 2025 pending sea dumping permit application is for a total volume of 3,200,000 m^3 (permit number SD2025-4075).

The DMPA was used for placement of initial capital dredge material of 202,416 m^3 in 2016. The DMPA has been used for placement of maintenance dredge material since 2018, and following the recent 2024 maintenance dredging program, approximately 401,980 m^3 or 15% of the original approved volume has been utilised.

The Amrun DMPA is dominated by sand (41%) and fine grain sediments (clays 27% and silts 25%). The seabed within the Port and DMPA predominantly consists of soft open substrate with infrequent occurrences of epifaunal and infaunal organisms. The Amrun DMPA is a predominantly retentive placement site (estimated 75% retentive), with the minor losses likely to be mainly the result of extreme events such as tropical cyclones.

A comprehensive Sustainable Sediment Management assessment was undertaken in 2019 as part of Amrun Port's long-term maintenance dredging strategy. As part of this assessment, three offshore and one onshore placement areas were assessed. The study concluded that offshore material placement at the existing Amrun DMPA was the preferred option.

4 Dredge material characteristics

Previous geotechnical testing indicates that the sediment profile at the proposed port area comprises a relatively thin, moist, silty surface layer (0.1m - 0.5m) overlying a mottled, firm, relatively dry clay layer. This clay layer grades into siltstone around 2-3m depth below the sediment surface and has a significantly reduced fines content. The underlying 'consolidated' sediments represent most of the material proposed to be dredged.

Seven sediment characterisation studies comprising the assessment of potential contaminants (including metals and metalloids, organotins and hydrocarbons) have been completed from 2007 to 2023 over the course of the Port's lifetime including pre-construction, construction and operation. While the dredge depth extends down to approximately 4 m depth below seabed, refusal of sampling equipment (vibracorer) on stiff substrate in 2007 and 2012 (Worley Parsons, 2012) limited the sample depth to around 0.5–1 m (surfaced sediments). Other sediment studies have been limited to surface sediment sampling using grab samplers. However, the underlying consolidated material is unlikely to be contaminated as per the National Assessment Guidelines for Dredging 2009 (NAGD).

The previous sediment studies concluded that sediments are predominately comprised of clay and silt (73 to 94%) with sand (5 to 27%) and trace gravel (<1 to 3%) also present. More detailed analysis in 2010 indicated inshore sediments are primarily clay /silt whilst offshore sediments are primarily coarse textured (up to 81% sand and gravel) with some clay/silt and gravel also present.

Some concentrations of metals including Ni, Sb, Cu and Co have exceeded NAGD screening levels on occasion, however further analysis of bioavailability (DAE and elutriates) indicated concentrations of these metals and all other metals and metalloids analysed have been less than the respective NAGD screen levels.

All seven sediment characterisation studies have concluded that dredge material was suitable for unconfined ocean placement in accordance with NAGD.

5 Previous water quality modelling

Water quality modelling was undertaken in 2012 as part of the investigations supporting capital dredging associated with development of the Amrun Port. Modelling was undertaken assuming two separate dredging methodologies: (i) CSD and SHB and (ii) CSD and TSHD. The latter is the likely dredging methodology to be used for the proposed capital dredging.

Note that the modelling was undertaken assuming a capital dredge volume of 2.6 M m^3.

80th percentile model outputs for the CSD and TSHD dredging methodology are shown in **Figure 4** (dredge plumes) and **Figure 5** (sediment deposition).

Key findings from the water quality modelling for a 2.6 M m^3 dredge program include the following:

- The turbid plume generated by proposed 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). The dredge plume is predicted to extend up to 27 km south of the proposed development at concentrations >2 mg/L total suspended solids (TSS) above background.
- 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 is predicted to experience 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.
- Offshore at Nine Mile Reef near the DMPA, concentrations are predicted to be consistently low, with the instantaneous depth-averaged TSS less than 5 mg/L, and daily average less than 3 mg/L.
- Areas between Pera Head and Boyd Point are predicted to experience the highest deposition rates, with rates outside of this area, and at distances greater than 5 km from the DMPA, predicted to be negligible compared to the mean ambient conditions.
- Model predictions near the reef areas immediately offshore from Pera Head show the median above-ambient deposition as less than 2.0 mg/cm^2/day.
- The highest sedimentation rates, in excess of 7.5 mg/cm^2/day above background, are in the immediately vicinity (within 500 m) of the dredge footprint.
- The reef colony immediately south of the dredge area (approximately 1 km to the southwest) is the only site expected to receive a daily sedimentation rate in excess of 5.0 mg/cm^2/day for more than 80% of the dredging operation.
- Sedimentation in the vicinity of the DMPA is predicted to be up to 3 mg/cm^2/day.
- Depth-variation in TSS is evident during periods of elevated TSS, with peak daily near-bed TSS concentrations often double those near the surface.

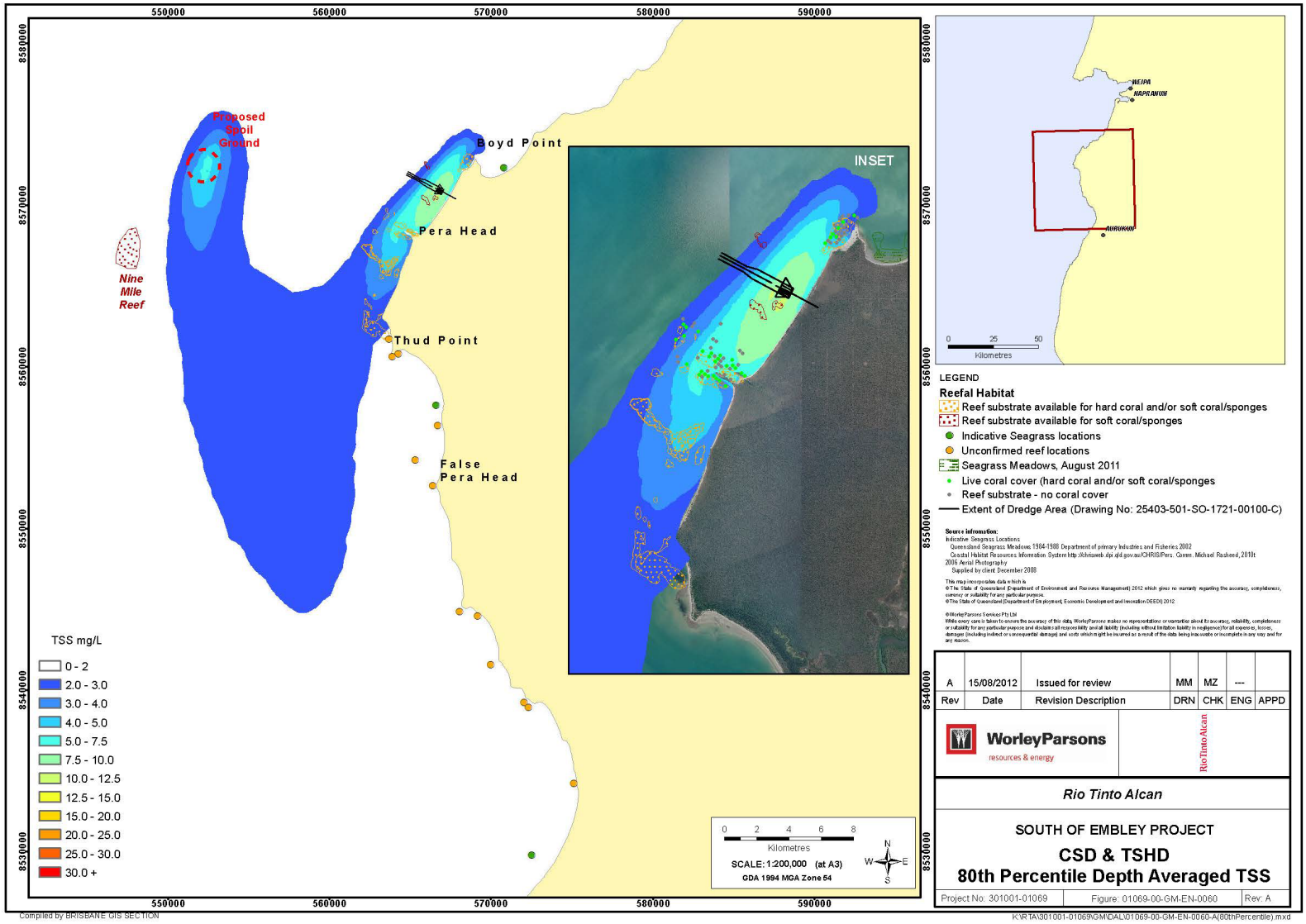


Figure 4. 80th percentile modelled depth-averaged TSS

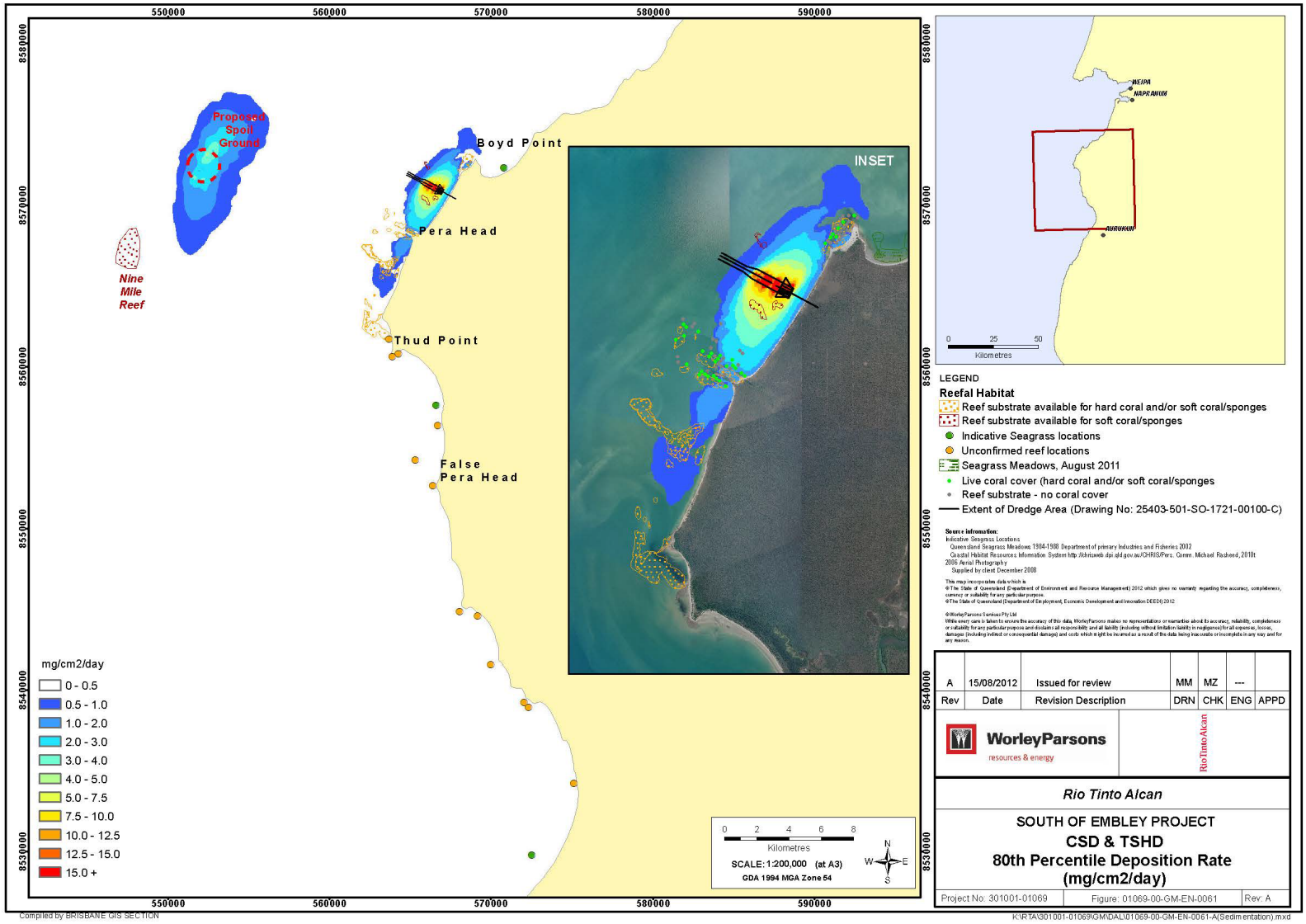


Figure 5. 80th percentile modelled sediment deposition rate

6 Previous water quality monitoring

6.1 Capital dredging – 2016

Capital dredging was undertaken between 25 March and 09 April 2016, with a total dredge volume of 202,416 m^3. To comply with environmental approvals, a water quality monitoring program was implemented to determine the impacts of dredging on sensitive ecological receptors.

The water quality monitoring program included two components: (i) *in-situ* water quality monitoring (primary monitoring method) and (ii) satellite imagery (secondary monitoring method). Monitoring was undertaken from September 2015 to May 2016 to deliver:

- Baseline dry season conditions (September to November 2015).
- Baseline wet season conditions (December 2015 to February 2016).
- Sufficient data for three months prior to initial capital dredging (26 December 2015 - 25 March 2016) as per Condition J13 (d) of the EA.
- Dredge monitoring (26 March – 09 April 2016).
- Four weeks after dredging (09 April – 08 May 2016) as per Condition J13 (d) of the EA.

In-situ water quality monitoring involved the following:

- Benthic turbidity and Photosynthetically Active Radiation (PAR) at seven sampling locations: four concern sites and three reference sites (**Figure 6**). Data was collected on sensors mounted on benthic frames and was telemetered using telemetry buoys.
- Sedimentation traps at four concern sites and one reference, conducted during baseline only.
- Monthly water quality sampling for TSS (laboratory analysis) and turbidity (*in-situ* turbidity probe), conducted during baseline only.

Satellite imagery assisted in determining if a dredge plume extended to potential sites of impact and determine if high turbidity values were region wide. No plume was observed on the imagery throughout the dredging.

The five-day rolling average of daily median turbidity data was compared to trigger values. Internal (80^{th} percentile) and external (95^{th} percentile) trigger values calculated in accordance with the DMP using the baseline data during the wet season (Dec 2015 – Feb 2016) and the dry season (Sep – Nov 2015) are shown in **Table 1**.

The five-day rolling average turbidity data during dredging in March/April 2016 is shown in **Table 2**, which shows that the data was well below the internal and external trigger levels. Based on the short duration of the dredging and low levels of turbidity at the monitoring sites, plume water quality impacts were assessed as nil to low.

Table 1. Wet and dry season turbidity (NTU) trigger values (RTA, 2017)

Site	Depth (m)	Dry Season		Wet Season	
		Internal Trigger Level (80th percentile)	External Trigger Levels (95th percentile)	Internal Trigger Level (80th percentile)	External Trigger Levels (95th percentile)
I1	8.7	5	9	32	90
I2	8.9	4	6	11	42
I3	9.4	5	6	20	72
I4	9.2	6	8	15	57
Reference					
R1	9.3	7	11	35	85
R2	10.4	3	5	16	46
R3	26.5	4	8	8	89

Table 2. Five day rolling average of the daily median turbidity (NTU) at each monitoring location (RTA, 2017)

Site	Site I1	Site I2	Site I3	Site I4	Site R1B	Site R2	Site R3
Wet Season Internal Alert Level	32	11	20	15	-	-	-
Wet Season External Trigger Level	90	42	72	57	-	-	-
26-Mar-16	3.5	1.8	4.8	4.7	5.3	9.3	4.3
27-Mar-16	3	1.7	4.5	3.7	5	7.8	4.5
28-Mar-16	3	1.8	4.4	3.3	5.8	7.2	4.4
29-Mar-16	2.8	1.7	4.3	2.8	5.6	6.3	4.4
30-Mar-16	2.7	1.7	4.3	2.5	5.4	5.8	4.1
31-Mar-16	3.3	2.1	4.5	2.7	4.8	5.5	3.9
1-Apr-16	2.9	2	4.5	2.7	4.2	5.1	3.1
2-Apr-16	2.7	2	4.6	2.7	3.5	4.9	2.6
3-Apr-16	2.7	2	4.5	2.8	3.4	4.8	1.9
4-Apr-16	2.8	1.8	4.3	2.8	2.9	4.7	2.2
5-Apr-16	2.4	1.5	4.5	2.9	2.6	4.9	2.5
6-Apr-16	2.5	1.5	4.8	3.3	2.5	5.2	3.1
7-Apr-16	2.7	1.6	5.4	3.5	2.5	5.4	3.4
8-Apr-16	3.2	1.8	6.1	3.6	2.8	5.6	3.6
9-Apr-16	3.5	1.9	6.9	3.7	3.2	5.7	3.3

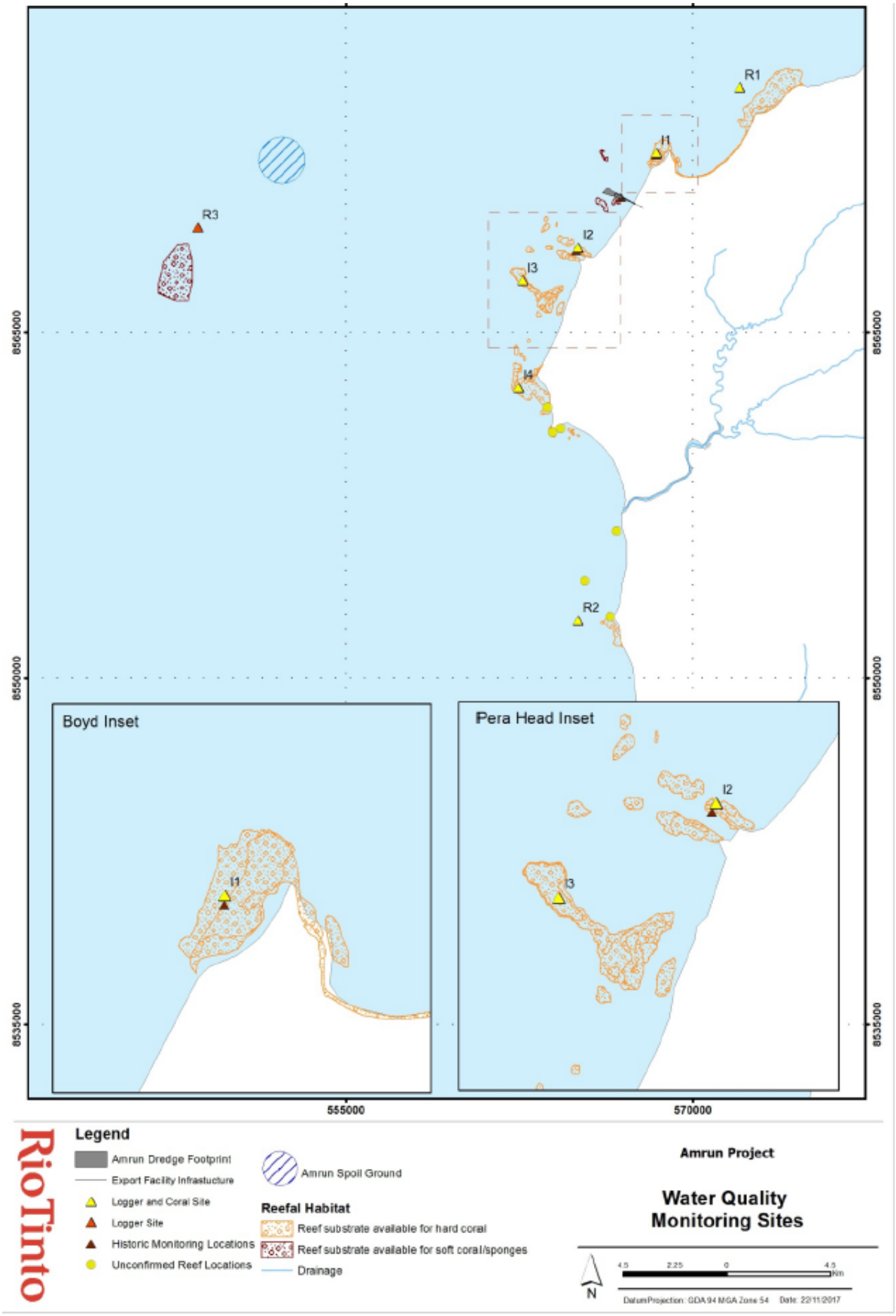


Figure 6. Water quality monitoring sites – 2016 capital dredging

6.2 Ambient monitoring (WQ3) – 2018/2019

In 2018, North Queensland Bulk Ports (NQBP) established the Port of Weipa Ambient Marine Water Quality Monitoring Program to characterise the natural variability in key water quality parameters within the adjacent sensitive habitats, and to identify potential impacts of operations at Amrun Port and the Port of Weipa on water quality.

As part of the program, water quality sensors were deployed on a benthic frame approximately 3 km to the south south-west of Amrun Port at a single location 'WQ3'. This site is the same location as site I2 shown in **Figure 6** and site D2 shown in **Figure 7**. Instrumentation on the benthic frame at site WQ3 recorded turbidity, benthic light and deposition at a ten-minute temporal resolution. PCS (2020) analysed the data from 2018–2019 at WQ3, which is summarised in **Table 3**, and found that:

- the median (50th percentile) turbidity was low being 3.1 NTUe[1] and 1.6 NTUe during the wet and dry season, respectively.
- during the wet season, 20-40 mg/L (15 to 30 NTUe) is representative of between the 50th and 80th percentile turbidity. This is the turbidity at which sublethal effects could begin to occur to coral communities (Erftemeijer *et al.*, 2012).
- during the dry season, 20-40 mg/L (15 to 30 NTUe) is representative of approximately the 99th percentile turbidity and above.

These results show that the natural environment in the Amrun region experiences suspended sediment concentrations (SSC) in excess of 20 mg/L on a relatively regular basis during the wet season (between 50% and 20% of the time), while during the dry season the SSC exceeds 20 mg/L for around 1% of the time. This highlights how the natural water quality varies seasonally and indicates that differing thresholds are applicable to each season.

Table 3. Turbidity percentiles for the Amrun Port monitoring (PCS 2020)

Site	Percentile Turbidity Intensity (NTUe)					Data Duration (days)	Turbidity to SSC conversion factor
	50th	80th	90th	95th	99th		
Wet Season							
WQ3	3.1	35.9	87.9	223.0	713.9	219	1.314
Dry Season							
WQ3	1.6	3.3	4.7	6.3	15.6	259	1.314
All Data							
WQ3	1.8	8.4	32.0	78.4	515.8	477	1.314

6.3 Port of Weipa – 2019

Turbidity data was collected during the emergency maintenance dredging program (2.4 million m^3) at the nearby Port of Weipa in 2019. Vision Environment collected surface turbidity data using telemetered monitoring buoys, while James Cook University (JCU) collected benthic turbidity data at three sites as part of their ambient monitoring program.

[1] The data in PCS (2020) are referred to in units of NTU equivalent (NTUe) due to the difference in turbidity sensors used (180 degree backscatter instead of 90 degree backscatter). PCS (2020) noted that comparison of concurrent turbidity data collected measuring NTU and NTUe at the Port of Hay Point found that there should be minimal difference between the NTU and NTUe.

Port and Coastal Solutions (PCS) analysed the data with findings presented in PCS (2019) with key findings as follows:

- The data showed that during the 2019 maintenance dredging program the turbidity around the Port of Weipa was generally controlled by the natural conditions (tidal currents and wind/wave conditions), with higher turbidity occurring during spring tides (due to their stronger tidal currents) and periods with larger waves.
- The maintenance dredging was found to have the potential to result in increases in the natural short-duration peaks in turbidity which occur at certain stages of the tide. These increases resulted in the turbidity thresholds being exceeded more regularly than would naturally have been expected. However, based on the natural variability in turbidity in the region, these short-duration increases in turbidity are unlikely to impact the natural environment.
- The data showed that following completion of the 2019 maintenance dredging program, the turbidity quickly (within days) returned to natural conditions with no remaining areas with elevated turbidity due to the maintenance dredging and placement activities.
- The Port of Weipa 2019 maintenance dredging program did not influence the regional turbidity in the area. The dredging only influenced the local turbidity close to the dredged areas of the Port and the Albatross Bay DMPA.

PCS (2019) compared benthic turbidity data with surface turbidity data. They concluded that the benthic and surface turbidity data were found to show similar patterns, albeit with higher peaks in the benthic turbidity. The duration of time that the benthic and surface turbidity intensity thresholds were exceeded were similar.

PCS (2019) also concluded that benthic data can be unreliable. There were peaks in turbidity at site WQ4 that were close to 3,000 NTU, which based on the turbidity at the other two sites (peaks generally less than 100 NTU) and previous data at WQ4 during comparable conditions, suggests that there was interference from localised process (e.g. seagrass blocking the turbidity sensor during certain stages of the tide resulting in artificially high turbidity values) which influenced the near-bed turbidity data.

7 Water quality monitoring framework

This section outlines the water quality monitoring framework that will be implemented during capital dredging to be undertaken at Amrun Port during the dry season.

7.1 Duration of monitoring

Baseline water quality monitoring was undertaken over a three-month period during the 2025 dry season. Monitoring equipment was deployed on 16 July 2025 and retrieved on 9 October 2025, and the baseline data is summarised in **Appendix A**. The purpose of this baseline monitoring was to:

- Fill a dry season data gap as there is a lack of data collected in the area between June and August, and limited surface water quality data (monitoring buoys) collected previously.
- Collect concurrent benthic and surface turbidity data at one site (D2) to confirm correlation between the two. This allows previous historical benthic turbidity data to assist with setting surface trigger values.
- Allow testing of the monitoring framework, including suitability of monitoring sites and equipment.
- Testing and/or refinement of dry season trigger values.

Subsequent to the baseline monitoring already undertaken, water quality monitoring will be undertaken during the following periods:

- **Pre-dredging** – the monitoring system will be deployed at least two weeks prior to commencement of dredging. This is to collect pre-dredge data, test equipment and allow rolling means to be calculated using pre-dredging data.
- **During dredging** – equipment to remain deployed for the duration of dredging and placement activities.
- **Post-dredging** – approximately 2–3 weeks following cessation of dredging to allow ambient water quality to baseline conditions.

7.2 Monitoring sites

Water quality monitoring will be undertaken at seven monitoring sites as follows:

- Concern (compliance) sites – four dredge plume monitoring sites (D1 to D4) (referred to as Concern sites in the EA) within the modelled zone of influence of dredge plumes (refer to **Figure 4**). These sites will be used to assess compliance with trigger values. The sites are located in similar water depths near the 5–10 m Lowest Astronomical Tide (LAT) depth contour.
- Reference sites – two dedicated Reference sites out of the modelled zone of influence of dredge plumes, including R1 located north of Boyd Point and R2 located south of Thud Point. This will represent 'background' turbidity. Plume monitoring sites upwind of prevailing weather to act as temporary reference sites if required.
- Placement site – one placement monitoring site (P1) located near to Nine Mile Reef to the south of the DMPA. This will comprise monthly water quality depth profiles supported by satellite imagery to monitor surface plumes extending from the DMPA.

Water quality monitoring equipment will be deployed at the monitoring locations listed in **Table 4** and shown in **Figure 7**. To supplement historical datasets, where possible the monitoring sites have been selected based on previous capital dredge monitoring undertaken by RTA in 2016. Note that site P1 near Nine Mile Reef was a reference site (R3) in 2016, however due to its proximity to the DMPA it will be a placement monitoring site in this WQMP.

To provide additional reference site data (if required), the proposed approach is for Concern sites to act as Reference sites when they are upwind of prevailing weather. For example, during sustained northerly winds, the Concern site at Boyd Point (D1) would act as an additional Reference site to supplement

Reference site R1. During sustained southerly winds, the Concern sites to the south of the dredge area (i.e. D2, D3 and D4) would act as Reference sites to supplement Reference site R2.

Monitoring will comprise the following:

- **Near-surface** (1 m below surface) – at the concern and reference monitoring sites (D1 to D4, R1 and R2), monitoring buoys with turbidity sensors will be used. Data will also be logged to sondes in each buoy for data redundancy. Buoys fitted with telemetry for real-time data feed, automatic processing of data and comparison to trigger levels, with alerts sent to notify of exceedances.
- **Water quality depth profiling** (manual readings surface to bed) – at the offshore placement monitoring site (P1), a turbidity sensor (logging data once per second) will be lowered from the water surface down through the water column to the seabed during monthly servicing trips. The profiling data will be complemented by satellite imagery to monitor surface plumes extending from the DMPA.

The use of near-surface monitoring equipment for nearshore sites is based on previous dredge monitoring undertaken at Weipa (PCS, 2019) and Adelaide (Epic Environmental, 2024). In both these monitoring programs, benthic turbidity and surface turbidity was collected concurrently at monitoring sites. Analysis of data collected by Epic Environmental (2024) during dredging in Adelaide indicated that near-surface turbidity provided a good representation of the turbidity regime throughout the water column, but was less susceptible to sensor interference from floating detritus and other benthic influences associated with benthic instruments. Similarly, PCS (2019) concluded that the benthic and surface turbidity data collected during dredging at Weipa were found to show similar patterns, albeit with higher peaks in the benthic turbidity.

Furthermore, water quality depth profiling data collected during the capital dredging in 2016 (Advisian, 2016) indicated that turbidity is generally homogenous through the water column, increasing slightly with depth. There were some exceptions which were likely due to depth profiling measurements being undertaken at peak of tidal flow potentially during the largest tidal ranges (spring tides) when the seafloor sediments are resuspended more readily leading to elevated turbidity measurements near the seafloor. Advisian (2016) concluded that model predictions using depth averaging of the TSS through the water column was therefore a good approximation of what occurs (homogenous TSS throughout the water column) at the monitoring sites.

Table 4. Monitoring Sites

Site	Description	Type	Previous Monitoring Site (2016)	Water Depth (m LAT)	Coordinates	
					Latitude	Longitude
Concern (Compliance) Sites						
D1	Coral reef at Boyd Point, north of dredge area	Surface	I1	5–10 m	-12.908401	141.629653
D2	Coral reef at Pera Head, south of dredge area	Surface	I2	5–10 m	-12.947615	141.599513
D3	Coral reef between Pera Head and Thud Point, south of dredge area	Surface	I3	5–10 m	-12.957640	141.578156
D4	Coral reef at Thud Point, south of dredge area	Surface	I4	5–10 m	-13.002609	141.575766
Placement Site						
P1	North of Nine Mile Reef, south of DMPA	Profiles	R3	~25 m	-12.940123	141.447780
Reference Sites						
R1	Reference site located north of Boyd Point, representing background conditions	Surface	R1	5–10 m	-12.885811	141.664401
R2	Reference site located south of Thud Point, representing background conditions	Surface	R2	5–10 m	-13.094037	141.600002

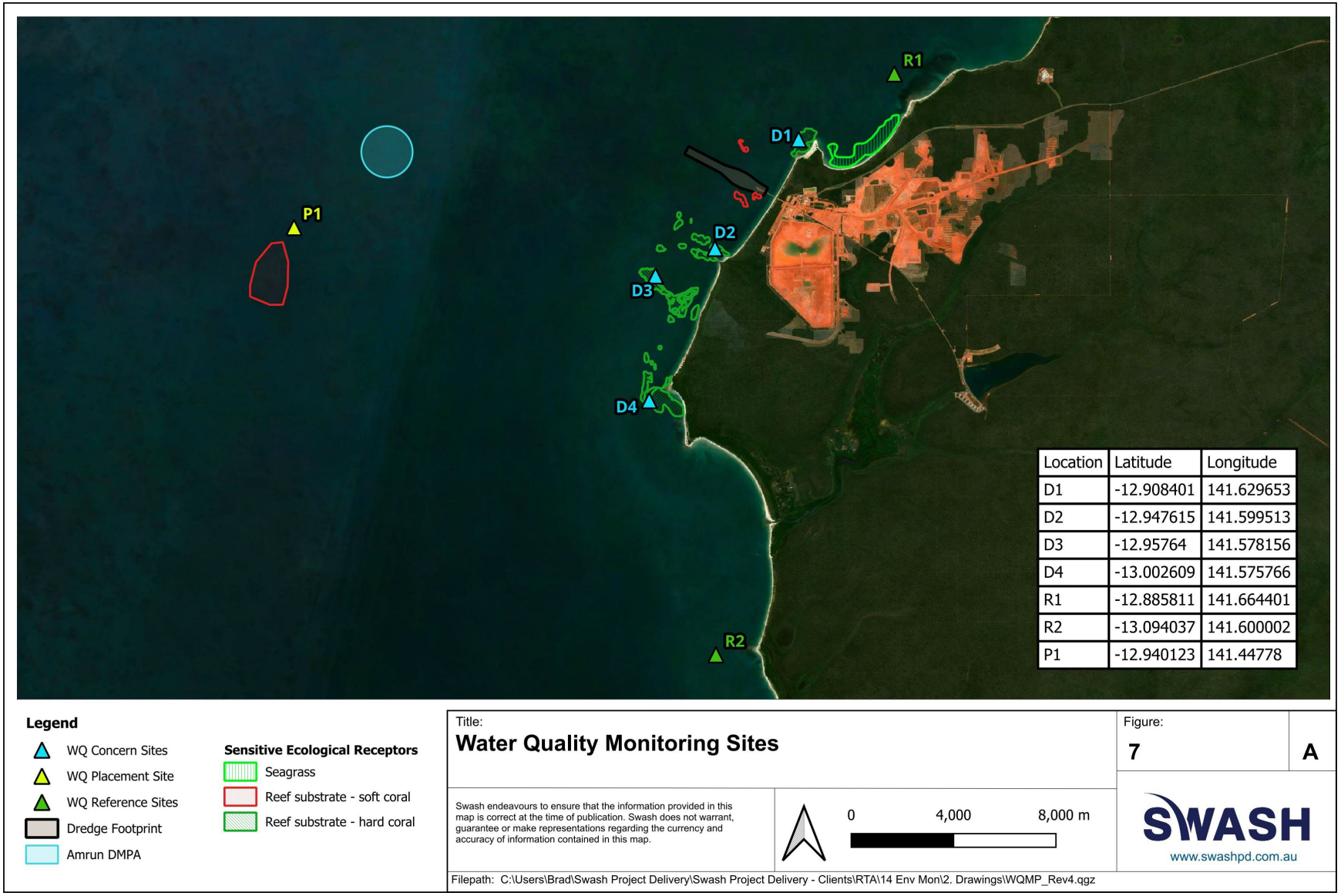


Figure 7. Water quality monitoring sites

7.3 Parameters

Water quality monitoring will be undertaken using nephelometers that measure turbidity by optical scatter producing readings in Nephelometric Turbidity Units (NTU). Turbidity provides a proxy for suspended sediments within the water column.

In accordance Table J1 and J2 in the EA, turbidity will be monitored as a surrogate water quality parameter for photosynthetically active radiation (PAR) and sedimentation rate (SR).

Advisian (2016) reported that the use of turbidity was a good surrogate for the amount of light reaching the seafloor on a given day (daily PAR), with daily PAR having a statistically significant relationship with the turbidity in the water column.

7.4 Monitoring equipment

7.4.1 Near-surface monitoring

To collect real-time water quality measurements from near-surface at the nearshore sites, water quality loggers will be mounted on purpose-built monitoring buoys. The buoys will be anchored to the seabed using a mooring system to maintain position. With the loggers installed in each monitoring buoy, the sensors will be located at a depth of approximately 1 m below the water surface.

The water quality logger (YSI EXO sonde) will be fitted with turbidity (NTU) sensors designed for long-term deployments in the marine environment. The water quality loggers will be capable of continuous logging of data, with a copper anti-fouling guard, copper tape and sensor wiping apparatus to prevent interference to sensors from marine growth. The loggers will be programmed to log data once every 15 minutes.

The monitoring buoys will be fitted with navigation lights set to flash in accordance with advice from the Harbour Master. Real-time data from each buoy will be made available via telemetry using in-built Campbell Scientific data loggers, 4G modems, batteries and solar panels.

Each buoy will be fitted with a secondary turbidity sensor for QA/QC purposes and redundancy (in case a turbidity sensor malfunctions or becomes fouled).

The monitoring equipment will be secured to the seabed using robust mooring lines and anchors to minimise theft and movement of equipment. Each monitoring buoy will be installed with a GPS tracking device, with alerts if the buoy moves location and the equipment can be tracked on the web portal if moorings break or the buoy is stolen.

7.4.2 Water quality depth profiles

Monitoring at the placement site (P1) will comprise the collection of water quality depth profiles during monthly servicing trips. A calibrated, hand-held water quality meter will be lowered from the water surface down through the water column to the seabed, logging data once per second.

The profiling data will be complemented by satellite imagery to monitor surface plumes extending from the DMPA.

Water quality depth profiling will also be undertaken at all other monitoring sites during servicing trips.

7.4.3 Permits

For deployment of the equipment in the nearshore marine environment, a ‘Notice to Mariners’ will be prepared and submitted to the Regional Harbour Master in Cairns. This will outline the type of equipment used, deployment locations and deployment period.

7.4.4 Calibration and servicing

All monitoring equipment will be calibrated prior to deployment as per the manufacturer’s specifications. Optical sensors (such as turbidity) are fairly robust and the manufacturer recommends calibration at least once every 6-12 months during use. To avoid disruption to the monitoring program, sensors will be

calibrated prior to deployment and then calibration will be routinely checked throughout the monitoring program as follows:

- A calibrated, hand-held water quality meter will take measurements from surface to bottom at each site during servicing trips to confirm the ongoing accuracy of the sensor readings. If a sensor is not reading correctly, it will be replaced with a calibrated sensor (spare sensors will be available). Alternatively, data can be adjusted via the monitoring portal (Eagle.io) to account for any sensor drift based on monthly calibration checks.
- Samples will be collected near the sensors for laboratory analysis of TSS and turbidity for two purposes:
  - To provide a secondary calibration check of the sensors.
  - To build on previous data to confirm the TSS/turbidity correlation in the study area.

To achieve the goals of the monitoring program and collect valid data, servicing of the water quality loggers will be undertaken approximately every four weeks (depending on weather conditions). The servicing trips will involve cleaning and calibration-check of all instrumentation, and any repairs or other maintenance required. Additional servicing trips may also be required if the monitoring data indicates equipment malfunction or interference.

7.4.5 Equipment failure

In the event of failure of the monitoring equipment during dredging, the following will be undertaken:

- A servicing trip will be undertaken to rectify the issue.
- If the issue cannot be rectified onsite, replacement equipment will be sourced as soon as possible.
- If required, equipment from one of the reference sites can be relocated temporarily to the dredge plume monitoring site while additional replacement equipment is sourced. During this time, the other reference site can be used along with concern sites upwind of prevailing weather which can act as temporary reference sites if required.

7.5 Quality assurance and quality control

The following will be undertaken to ensure data quality and to minimise any data loss from the real-time monitoring equipment:

- The real-time data on the monitoring portal will be maintained regularly to ensure good quality data is being recorded. If poor quality data becomes evident (potentially due to sensor fouling or malfunction), actions will be initiated to rectify (e.g. servicing trip).
- Sensors and equipment will be cleaned regularly (approximately once every four weeks, depending on weather conditions). All sensors will be calibrated prior to deployment as recommended by the manufacturer using standard solutions prepared from the National Institute of Standards and Technology (NIST) traceable reagents.
- Calibration checks will be undertaken during servicing trips to ensure accuracy and precision of sensor data is maintained. Minor sensor drift will be adjusted in the monitoring portal, while major sensor drift will be addressed by re-calibration of sensors.
- When sensors are serviced in the field, their condition and appearance will be noted. This will identify if a sensor has been biofouled or has any other noticeable issues. This data will be used to assist in the post-processing assessment of the data.
- A calibration log will be kept and made available upon request – the log will contain all calibration details and details of standards used during calibration.

7.5.1 Data Quality Control Procedures

As real-time data is automatically downloaded by the web-based monitoring portal, any potential outliers and questionable data will be assigned a quality code which will then be examined further. Rules to flag potential outliers and questionable data will be as follows:

- If any individual measurement is >100% higher or lower than adjacent measurements (e.g. a brief spike in turbidity).
- If data is outside the bounds of typical readings, e.g. negative turbidity or turbidity higher than 1,000 NTU.
- The data will be automatically plotted on the web-based monitoring portal as a time series chart and visually scanned for outliers and evidence of failed sensors, including data which has been assigned a poor-quality code. Obvious failures will result in the data being quarantined from the dataset.
- The use of twin turbidity sensors will assist investigations into the validity of potential outliers and questionable turbidity data. The two data sources will undergo automatic processing by the monitoring portal as follows:
  - Data from the two concurrent turbidity sensors will be downloaded and compared.
  - If the difference in readings is within 20%, then the average turbidity value will be used.
  - If the difference is greater than 20%, then the minimum turbidity value will be used (this assumes that biofouling would increase turbidity values).
- If turbidity readings are unusually high, data will then be examined with consideration to the meteorological and metocean conditions at the time (with data from the Bureau of Meteorology and nearby State Government wave buoy) to determine whether wind and wave conditions may have affected the measurements in question. If strong winds and/or an increase in wave height do not accompany spikes in turbidity, the data will be considered potentially erroneous and subjected to further scrutiny.

7.6 Satellite imagery

Satellite imagery will be used to produce satellite-inferred turbidity maps. These maps are produced using site-specific algorithms to convert satellite backscatter data into satellite-derived turbidity maps.

Satellite imagery will be used for the following:

- To monitor surface plumes from placement activities at the DMPA.
- To complement measured monitoring data in nearshore areas and detect dredge plumes in areas not captured by deployed instrumentation.
- To qualitatively validate sensor readings at monitoring buoys – e.g. a high turbidity reading corresponds to a visible plume on satellite image.

A combination of regular Sentinel-3 sensor lower resolution (300 m) satellite imagery (e.g. images captured most days) and less regular higher resolution Sentinel-2A/B sensors (10 m) satellite imagery (e.g. images captured every 3 to 4 days) will be sourced and processed to provide turbidity maps.

The high-resolution imagery (10m) has temporal coverage in the Amrun region every 3 days, meaning that high resolution imagery will be available two times a week (dependent on cloud cover). The extent may vary between images depending on the satellite coverage (every second image is likely to exclude the offshore placement site), however the extent will be sufficient to provide an understanding of natural turbidity and to identify any plumes from the dredging and placement activities.

The low-resolution satellite derived turbidity imagery (300m) will have a temporal coverage of approximately 1 – 2 days (11 images per fortnight). The spatial resolution means that the sensor is unlikely to be able to detect small scale plumes from the dredging activity, but it could potentially identify larger residual plumes from the dredging or placement activity and it will be able to provide an indication of the regional background turbidity. Due to the increased temporal frequency of the data relative to the

high-resolution imagery, it is likely that by utilising both the high-resolution and low-resolution imagery there should be new images available most days of the dredging program (dependent on cloud cover). Low-resolution imagery will be provided over periods when the high-resolution imagery is not available.

The satellite images for the Amrun region are captured between 09:50 and 11:00 AEST, it then typically takes around four hours before the images are available to download (it can take longer on some days) and another two hours of computational time to process the imagery into satellite derived turbidity. Based on this, daily satellite derived turbidity imagery from that morning (along with metocean data and interpretation) will be available in the late afternoon/evening of the same day. This timing is based on the timing for previous satellite monitoring undertake at the nearby Port of Weipa (North Queensland Bulk Ports) where daily email updates were provided between 4pm and 5pm each day of the dredging and included in each daily dredge report. An example of daily interpretation of satellite imagery during Weipa maintenance dredging is shown in **Figure 8**.

Along with available satellite derived turbidity imagery, daily analysis of metocean conditions and dredge activity will be undertaken to provide a coherent understanding of the relative contributions of each to local and regional sediment plumes.

Reporting of satellite imagery will include the following:

- Pre-Dredge technical note: will be provided to present satellite derived turbidity data and metocean conditions; and provide an overview of natural turbidity and relative influence of different drivers (e.g. waves and tidal currents) over the two weeks prior to dredging.
- During dredging daily updates: over duration of capital dredging, a daily email will be provided in late afternoon/early evening. This will include satellite derived turbidity imagery from that morning; plots of local metocean conditions over previous seven days; and interpretation of sediment plumes with respect to dredge activity and natural conditions. This information will also be included in daily dredge reports.
- During dredging technical notes: will be provided every 2 weeks for first month, then every 4-weeks during dredging to present results form satellite derived turbidity monitoring and discuss potential impacts of dredging on turbidity in the region.
- Post dredging technical report: will be provided following the completion of capital dredging.
- The report will present the satellite derived turbidity data over the entire monitoring period and discuss the metocean conditions, the associated natural variability in turbidity and potential impacts of the dredging and placement activities to turbidity in the region.

This approach has been successfully adopted as part of the nearby, annual Weipa maintenance dredging since 2019.

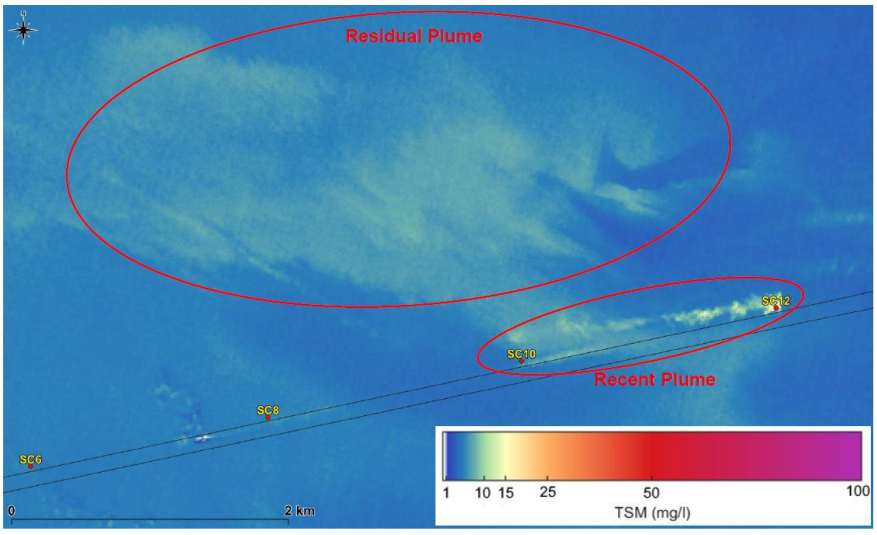


Figure 8. Example high resolution processed satellite-derived turbidity image with interpretive annotations (2024 Port of Weipa maintenance dredging of South Channel)

7.7 Data management

Real-time telemetered data will be collected from each of the surface sites and compared to the trigger values throughout the duration of the dredging. Water quality data collected during dredging will be managed as follows:

- Data will be automatically downloaded on an hourly basis via a remote telemetry system. This raw data (not quality controlled) will be displayed on a monitoring portal (e.g. Eagle.io) developed for the project.
- Raw data will undergo an automatic QC checking process, followed by a manual QC checking process (refer to Section 0) and any potentially erroneous data will be quarantined from the data set.
- The QC-cleaned data will undergo automatic calculation of required metrics (e.g. 5-day rolling median) for comparison to trigger levels (Section 7.7). The calculated median will be displayed on the monitoring portal as time series charts with trigger levels displayed. Alerts will be sent out to key project personnel if trigger levels are exceeded.
- All data will be loaded into RTA's ENVIrosys data portal.

The monitoring data will be presented in a dashboard style monitoring portal available to RTA, the dredge contractor, the BPDTAG and other project stakeholders.

7.8 Trigger levels

To assist in ensuring that impacts to sensitive ecological receptors do not occur during dredging, an adaptive management program using trigger levels will be implemented during the dredging program. Trigger values are a key tool used for minimising environmental impacts, and are typically developed using a combination of site-specific baseline data and ecological thresholds.

The process to derive water quality trigger levels is included in **Appendix A**. Based on previous studies and similar dredging programs, the following approach to setting turbidity trigger levels has been adopted:

- Analysis of baseline data – as capital dredging will be undertaken during the dry season, available dry season turbidity data was analysed, with particular emphasis on the most recent baseline data collected in 2025. Using this data, a range of summary statistics were calculated to determine the range of natural variability during the dry season.
- Cross-check against biological thresholds – the statistics which indicate the upper range of natural variability during baseline conditions were compared to ecological thresholds to ensure the trigger levels are ecologically meaningful and are not overly conservative.

The turbidity trigger levels are presented in **Table 5**. Similar to the initial capital dredging in 2016, there will be two levels of trigger values, as follows:

- Alert level – internal trigger to provide warning of increasing turbidity approaching upper range of natural variability and ecological thresholds.
- Alarm level – external trigger to indicate turbidity has reached upper range of natural variability and impacts to sensitive ecological receptors could begin to occur if management actions are not implemented.

Along with intensity values, trigger levels also require consideration of a duration element. Typically, rolling median or mean values are used in dredge programs as they take into account duration and frequency of turbid events. Sensitive ecological receptors (e.g. corals and seagrass) are influenced by the total amount of turbidity in the water column over time, not just on any single day. A rolling metric helps to smooth out daily variations and capture the long-term trends in turbidity. Based on recommendations in the WAMSI reports (e.g. Fisher *et al*, 2019a and Jones *et al,* 2019), a 14-day rolling mean will be used as the duration element.

While the 14-day rolling mean will be used as the primary means of assessing impacts from dredging, the water quality data will also be assessed over a shorter time scale than the actual trigger to provide an early warning of impending exceedance. For this purpose, an internal assessment of the same trigger over a 7 day running mean will be undertaken to indicate that water quality conditions may be nearing the trigger value, providing an early indicator that management actions may be required.

Note that trigger levels will only be used with telemetered surface monitoring sites only (i.e. D1 to D4, R1 and R2). Profiling data from the benthic offshore placement site (P1) will be compared to baseline data to assess whether placement plumes may be extending towards Nine Mile Reef. This data will be supplementary to the primary method of placement plume monitoring using satellite imagery.

Table 5. Turbidity trigger levels

Site	Intensity		Duration	Assessment of Triggers
	Alert trigger	Alarm trigger		
Concern Sites				
D1	9	12	14-day rolling mean	Alert trigger for internal response, Alarm trigger for compliance
D2	11	15		
D3	11	16		
D4	11	16		
Reference Sites				
R1	9	13	14-day rolling mean	Interpretation only
R2	12	16		

7.9 Adaptive management

The 14-day rolling mean turbidity values for the Concern sites will be compared to the 'Alert' and 'Alarm' triggers and alerts sent out to key project personnel if they are exceeded. In the event of an exceedance of the trigger levels, an assessment of the exceedance must be completed **within 48 hours** to establish whether the exceedance is due to dredging activities or other causes. This assessment would include, but not be limited to, the following:

- Check data logger operation
- Check analysis of data
- Check QA/QC procedures followed
- Assess location of dredging and/or placement activities in relation to exceedance site(s)
- Assess extent of the visible dredge plume in relation to the exceedance site(s) using satellite imagery
- Assess meteorological and ocean conditions preceding and during the exceedance(s) (e.g. wind, tide, wave and swell state)
- Assess effects of extreme weather events in the region (e.g. storms, cyclones)
- Assess number and spatial extent of exceedance site(s)
- Assess turbidity at reference sites.

The adaptive management framework will use a three-stage process, with the response strategy to turbidity exceeding the trigger levels described as follows and shown in **Figure 9**.

Level 1: Business as Usual

Turbidity levels remain below Alert thresholds, dredging continues as planned with ongoing monitoring at all times.

Level 2: Alert
Turbidity levels exceed the Alert trigger level requiring the investigation to determine if the impact is dredging related or due to elevated background conditions, whether turbidity rates are likely to continue, and identify if management measures are required to reduce turbidity levels prior to exceedance of Alarm levels (Level 3). This assessment must be completed **within 48 hours** of the exceedance. Specific actions to reduce turbidity will be detailed in the Contractors Environmental Management Plan (CEMP) and may involve actions such as relocating the dredge and/or reducing overflow.

Note: if the 14-day rolling mean at the Reference sites (R1, R2 or sites upwind of prevailing weather) also exceeds the Alert trigger level (or is within 20%), then dredging can continue as per Level 1: Business as Usual.

The BPDTAG will be notified of the exceedance and the management measures implemented (if required).

Level 3: Alarm

Turbidity levels exceed the Alarm trigger level requiring notification to the regulator **within 24 hours**. Upon reaching the Alarm trigger level, the source of increased turbidity (whether background or dredging related) must be assessed **within 48 hours** of the exceedance. If increased turbidity is dredging-related, management measures must be implemented to reduce turbidity levels to below Level 2 (Alert). Specific actions to reduce turbidity will be detailed in the Contractors Environmental Management Plan (CEMP) and may involve actions such as relocating the dredge and/or reducing overflow.

Note: if the 14-day rolling mean at the reference sites (R1, R2 or sites upwind of prevailing weather) also exceeds the Alarm trigger level (or is within 20%), then dredging can continue as per Level 1: Business as Usual.

If Alarm trigger levels are exceeded and there are no likely alternative explanations for the exceedance other than capital dredging, reactive coral health monitoring may be undertaken (refer to Coral Monitoring Plan).

The BPDTAG will be notified of the exceedance and the management measures implemented (if required).

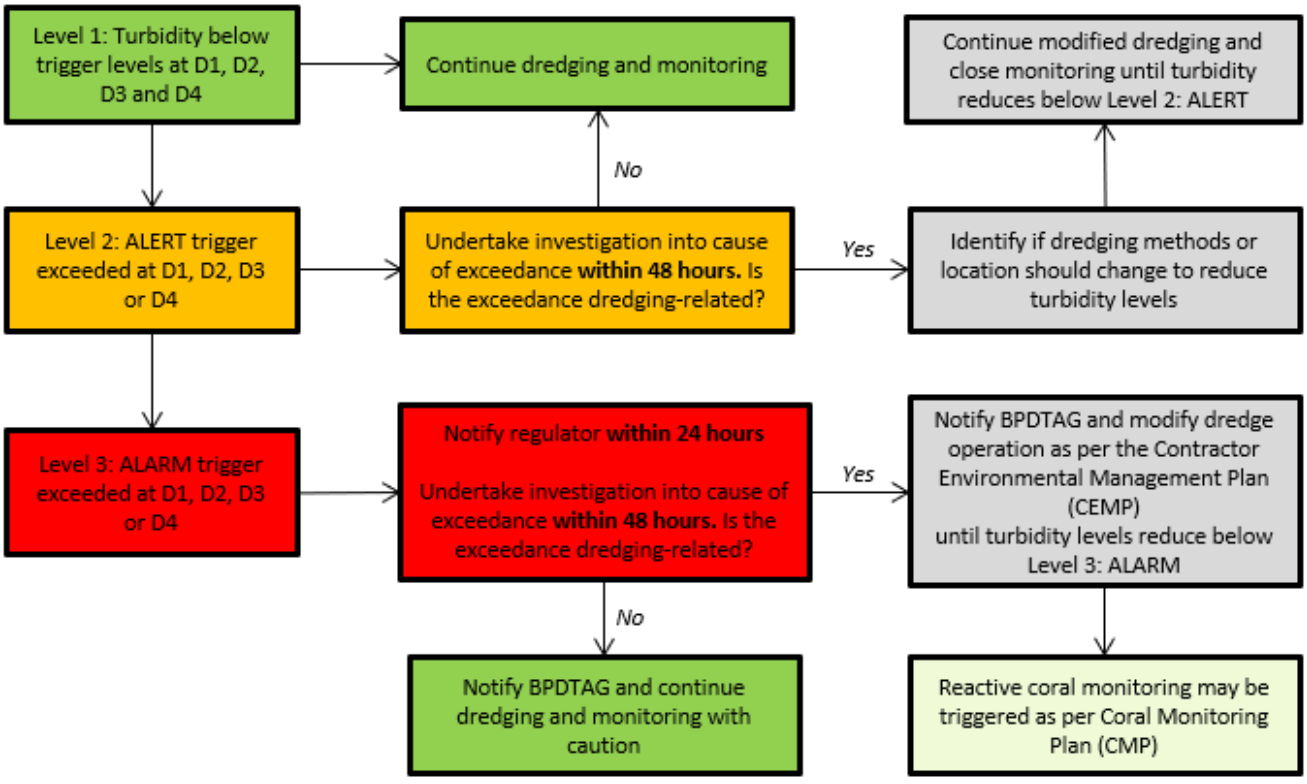


Figure 9. Adaptive management strategy

7.10 Roles and responsibilities

*The roles and responsibilities of the principal entities are detailed in **Table 6**.*

Table 6. Roles and Responsibilities

Entity	Role
Dredge Contractor	• Undertake appropriate management actions to reduce turbidity when alerted of water quality triggers being reached • Assist WQC with reporting requirements • Assist RTA and WQC in investigating and responding to complaints received • Notify RTA in the event of an environmental incident • Prepare and comply with a Dredge Management Plan
Water Quality Consultant (WQC)	• Install, operate and maintain water quality monitoring equipment • Set up and maintain water quality data management website portal, including data processing and sending trigger alert alarms to the appointed dredge contractor and RTA • Undertake regular equipment servicing trips • Prepare weekly summary reports and the post-dredging report for RTA and regulators • Review environmental performance of the dredging against triggers and evaluate effectiveness of adaptive management actions
Boyd Port Dredging Technical Advisory Group (BPDTAG)	• Review and provide advice and endorsement of the Dredge Management Plan • Review and provide advice and endorsement of the monitoring designs
RTA	• Receive alerts and notify dredge contractor and BPDTAG • Ensure the dredge contractor has appropriate environmental management systems and reporting protocols in place • Provide a complaints hotline and respond to any complaints received • In consultation with the water quality consultant, review environmental performance of the dredging against triggers and determine whether adaptive management actions are required • Report any environmental incidences or non-conformances to the relevant agencies as per EA conditions.

7.11 Reporting

Reporting will comprise the following:

- 'Alert' and 'Alarm' trigger alerts will be reported immediately to RTA via automatic alerts. These will be followed up on to make sure they were received.
- Weekly summary reports will be provided to RTA.
- A final water quality monitoring report will be provided to RTA following cessation of the dredging. This report will include raw data, summary of data, any exceedances (causes and if adaptive management required) and general discussion on water quality with respect to dredging and placement activities.
- Following cessation of dredging program, a summary of the water quality program will be shared at a BPDTAG meeting.

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Appendix A Baseline Water Quality and Triggers

SWASH
Dredging | Marine | Environment

Baseline Water Quality and Triggers - Amrun Port Capital Dredging

RTA Weipa Pty Ltd

3 November 2025



Document Control

Version	Details	Authorised by	Date
0	Draft	Brad Grant	27 October 2025
1	Final	Brad Grant	30 October 2025
2	Revised Final	Brad Grant	3 November 2025

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1 Introduction

The Amrun Port (Chith Export) Facility (CEF) was constructed in 2016 as part of the Amrun Project (initially titled South of Embley Project). The facility is owned and operated by RTA Weipa Pty Ltd, which is a wholly-owned subsidiary of Rio Tinto Aluminium Limited.

The facility is located between Boyd Point and Pera Head and comprises a 650 m long jetty and a 350 m long export wharf that is capable of loading ships up to mini-cape size. RTA Weipa currently load bauxite on a mix of panamax, dedicated post-panamax and mini-cape vessels.

RTA Weipa is proposing to increase the capacity of the Amrun Port to provide dual Mini-Cape vessel berths or dual Cape Class vessel berths. To accommodate necessary berth depths and channel depths, capital dredging of up to 3.2 million m^3 (Mm^3) is required. This dredging will be undertaken over two programs (2026 and 2028) during the dry season (May to October) when weather conditions in the Gulf of Carpentaria are typically more conducive to dredging.

To ensure potential impacts to sensitive ecological receptors are mitigated, water quality monitoring will be undertaken during the dredge program. To assist in ensuring that ecological thresholds are not reached during dredging, an adaptive management program using trigger levels will be implemented during the dredging program. These trigger levels have been developed using baseline water quality data and ecological thresholds based on previous research.

To supplement historical baseline water quality data, a baseline water quality monitoring program was implemented between July and October 2025 (three months). This report presents a summary of the baseline data collected as part of this program. This report also presents the water quality trigger levels, developed using the baseline data and ecological thresholds, to be implemented as part of the Water Quality Monitoring Plan (WQMP) during first capital dredging program in 2026. These trigger levels may be updated prior to the second dredging program in 2028 based on learnings from the first program.

1.1 Aims and objectives

The aim of this report is to present a summary of the baseline water quality data collected near Amrun port, and to present the water quality trigger levels to be implemented during proposed capital dredging at Amrun Port. The specific objectives of this report are to:

- Describe the methodology and procedures for the baseline water quality data collection undertaken in 2025.
- Present a summary of the baseline data collected to date.
- Describe the process used to set water quality trigger levels using the baseline data and ecological thresholds.

2 Previous baseline water quality data

2.1 Capital dredging – 2016

Capital dredging was undertaken between 25 March and 09 April 2016, with a total dredge volume of 202,416 m^3. To comply with environmental approvals, a water quality monitoring program was implemented to determine the impacts of dredging on sensitive ecological receptors.

The water quality monitoring program included two components: (i) *in-situ* water quality monitoring (primary monitoring method) and (ii) satellite imagery (secondary monitoring method). Monitoring was undertaken from September 2015 to May 2016 to deliver:

- Baseline dry season conditions (September to November 2015).
- Baseline wet season conditions (December 2015 to February 2016).
- Sufficient data for three months prior to initial capital dredging (26 December 2015 - 25 March 2016) as per Condition J13 (d) of the EA.
- Dredge monitoring (26 March – 09 April 2016).
- Four weeks after dredging (09 April – 08 May 2016) as per Condition J13 (d) of the EA.

In-situ water quality monitoring involved the following:

- Benthic turbidity and Photosynthetically Active Radiation (PAR) at seven sampling locations: four concern sites and three reference sites (**Figure 1**). Data was collected on sensors mounted on benthic frames and was telemetered using telemetry buoys.
- Sedimentation traps at four concern sites and one reference, conducted during baseline only.
- Monthly water quality sampling for TSS (laboratory analysis) and turbidity (*in-situ* turbidity probe), conducted during baseline only.

Internal (80th percentile) and external (95th percentile) trigger values were calculated using the baseline data collected during the wet season (Dec 2015 – Feb 2016) and the dry season (Sep – Nov 2015). These trigger values are shown in **Table 1**.

Table 1. Wet and dry season turbidity (NTU) trigger values (RTA, 2017)

Site	Depth (m)	Dry Season		Wet Season	
		Internal Trigger Level (80th percentile)	External Trigger Levels (95th percentile)	Internal Trigger Level (80th percentile)	External Trigger Levels (95th percentile)
I1	8.7	5	9	32	90
I2	8.9	4	6	11	42
I3	9.4	5	6	20	72
I4	9.2	6	8	15	57
Reference					
R1	9.3	7	11	35	85
R2	10.4	3	5	16	46
R3	26.5	4	8	8	89

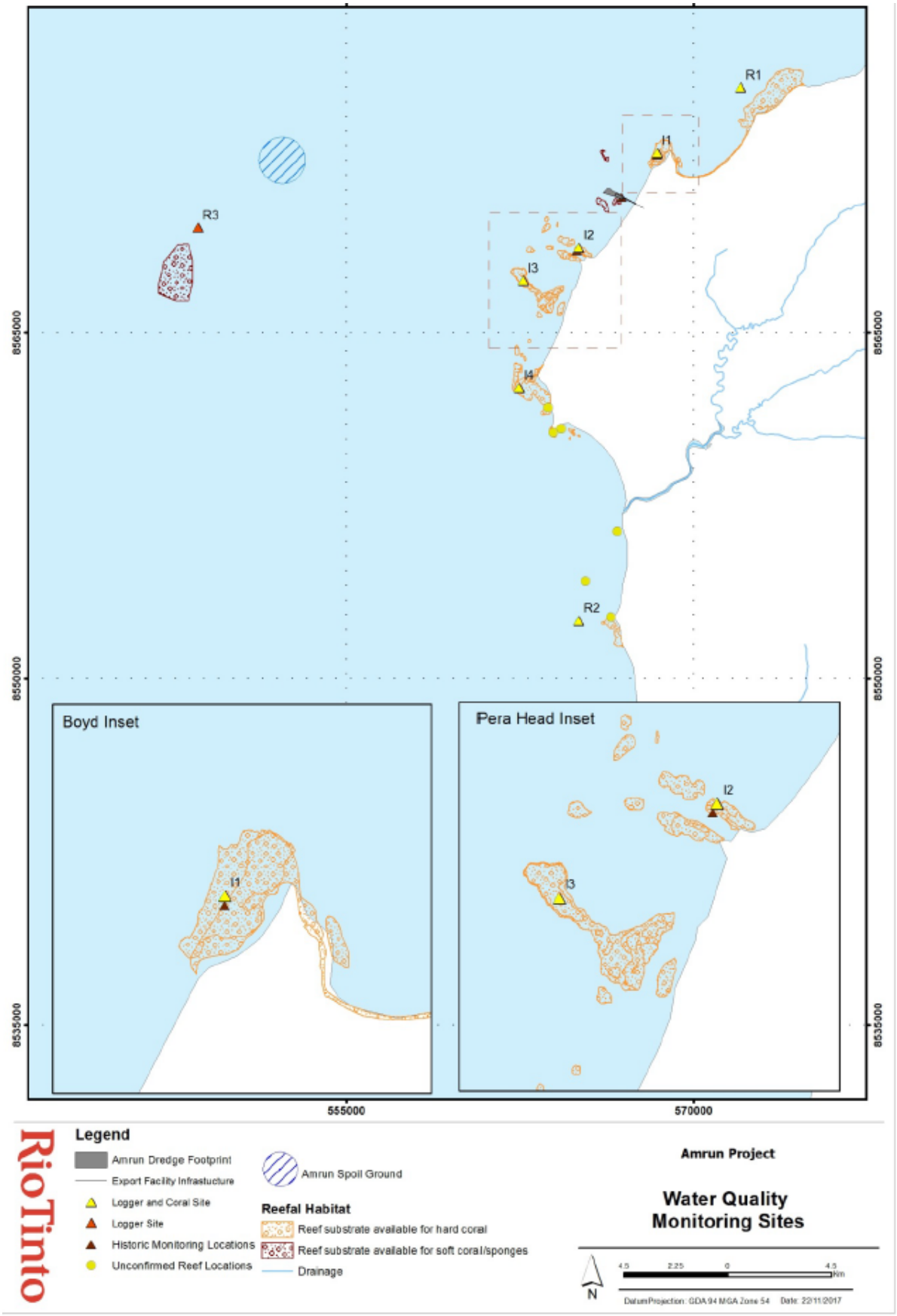


Figure 1. Water quality monitoring sites – 2016 capital dredging

2.2 Ambient monitoring (WQ3) – 2018/2019

In 2018, North Queensland Bulk Ports (NQBP) established the Port of Weipa Ambient Marine Water Quality Monitoring Program to characterise the natural variability in key water quality parameters within the adjacent sensitive habitats, and to identify potential impacts of operations at Amrun Port and the Port of Weipa on water quality.

As part of the program, water quality sensors were deployed on a benthic frame approximately 3 km to the south south-west of Amrun Port at a single location 'WQ3'. This site is the same location as site I2 shown in **Figure 1** and site D2 shown in **Figure 2**.

Instrumentation on the benthic frame at site WQ3 recorded turbidity, benthic light and deposition at a ten-minute temporal resolution. PCS (2020) analysed the data from 2018–2019 at WQ3, which is summarised in **Table 2**. PCS (2020) noted that multiple cyclones and tropical lows occurred during the 2018/19 wet season monitoring period, resulting in elevated wet season turbidity values in **Table 2**.

Table 2. Turbidity percentiles for the Amrun Port monitoring at site WQ3 (PCS 2020)

Site	Percentile Turbidity Intensity (NTUe)					Data Duration (days)	Turbidity to SSC conversion factor
	50th	80th	90th	95th	99th		
Wet Season							
WQ3	3.1	35.9	87.9	223.0	713.9	219	1.314
Dry Season							
WQ3	1.6	3.3	4.7	6.3	15.6	259	1.314
All Data							
WQ3	1.8	8.4	32.0	78.4	515.8	477	1.314

3 Baseline water quality monitoring program - 2025

This section outlines the baseline water quality monitoring that was undertaken in 2025 prior to commencement of capital dredging to be undertaken at Amrun Port during the 2026 dry season.

3.1 Duration of monitoring

Baseline water quality monitoring was undertaken over a three-month period during the 2025 dry season. Monitoring equipment was deployed on 16 July 2025 and retrieved on 9 October 2025. The purpose of this baseline monitoring was to:

- Fill a dry season data gap as there is a lack of data collected in the area between June and August, and limited surface water quality data (monitoring buoys) collected previously.
- Collect concurrent benthic and surface turbidity data at one site (D2) to confirm correlation between the two. This allows previous historical benthic turbidity data to assist with setting surface trigger values.
- Allow testing of the monitoring framework, including suitability of monitoring sites and equipment.
- Testing and/or refinement of dry season trigger values.

3.2 Monitoring sites

Baseline water quality monitoring was undertaken at seven monitoring sites as follows:

- Concern (compliance) sites – four dredge plume monitoring sites (D1 to D4) (referred to as Concern sites in the EA). These sites will be used to assess compliance with trigger values during capital dredging. The sites are located in similar water depths near the 5–10 m Lowest Astronomical Tide (LAT) depth contour.
- Reference sites – two dedicated Reference sites outside of the modelled zone of influence of dredge plumes, including R1 located north of Boyd Point and R2 located south of Thud Point. This will represent 'background' turbidity during capital dredging.
- Placement site – water quality profiling was undertaken at the placement monitoring site (P1) located near to Nine Mile Reef to the south of the DMPA.

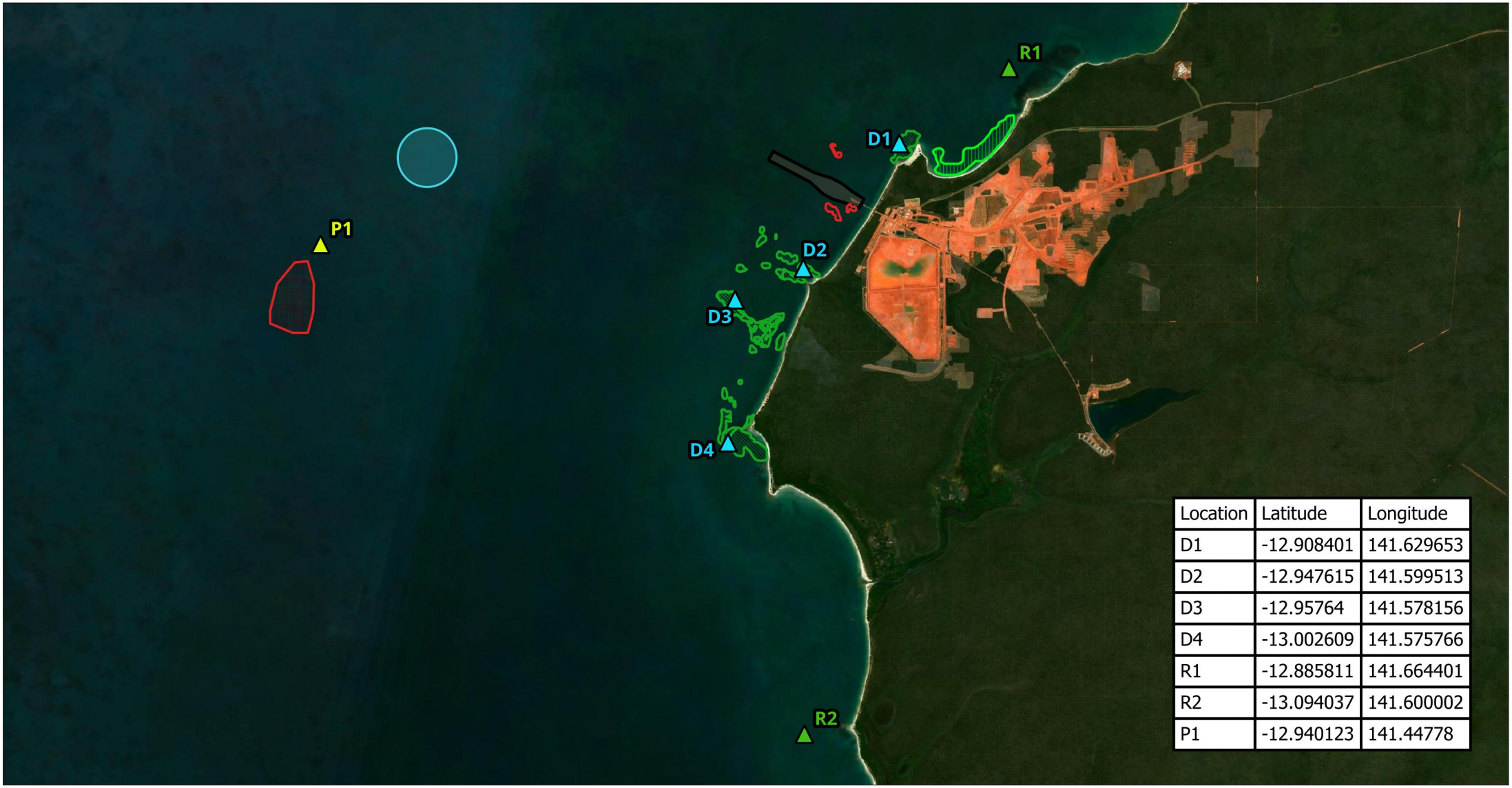
Water quality monitoring equipment was deployed at the monitoring locations listed in **Table 3** and shown in **Figure 2**. Where possible, the monitoring sites were selected based on previous capital dredge monitoring undertaken by RTA in 2016. Note that site P1 near Nine Mile Reef was a reference site (R3) in 2016, however due to its proximity to the DMPA it will be a placement monitoring site during capital dredging.

Monitoring comprised the following:

- **Near-surface** (1 m below surface) – at the concern and reference monitoring sites (D1 to D4, R1 and R2), monitoring buoys with turbidity sensors were used.
- **Near-bed** (0.5 m above seabed) – at site D2, a turbidity sensor was mounted on a benthic frame to confirm correlation between surface and benthic turbidity. This sensor logged data internally with data downloaded during servicing trips (approximately every four weeks).
- **Water quality depth profiling** (manual readings surface to bed) – at all sites during equipment retrieval trip, a turbidity sensor (logging data once per second) was lowered from the water surface down through the water column to the seabed.

Table 3. Monitoring Sites

Site	Description	Type	Previous Monitoring Site (2016)	Water Depth (m LAT)	Coordinates	
					Latitude	Longitude
Concern (Compliance) Sites						
D1	Coral reef at Boyd Point, north of dredge area	Surface	I1	5–10 m	-12.908401	141.629653
D2	Coral reef at Pera Head, south of dredge area	Surface/ Benthic	I2	5–10 m	-12.947615	141.599513
D3	Coral reef between Pera Head and Thud Point, south of dredge area	Surface	I3	5–10 m	-12.957640	141.578156
D4	Coral reef at Thud Point, south of dredge area	Surface	I4	5–10 m	-13.002609	141.575766
Placement Site						
P1	Northside of Nine Mile Reef, south of DMPA	Profiling	R3	~25 m	-12.940123	141.447780
Reference Sites						
R1	Reference site located north of Boyd Point, representing background conditions	Surface	R1	5–10 m	-12.885811	141.664401
R2	Reference site located south of Thud Point, representing background conditions	Surface	R2	5–10 m	-13.094037	141.600002



Location	Latitude	Longitude
D1	-12.908401	141.629653
D2	-12.947615	141.599513
D3	-12.95764	141.578156
D4	-13.002609	141.575766
R1	-12.885811	141.664401
R2	-13.094037	141.600002
P1	-12.940123	141.44778

Legend

- WQ Concern Sites
- WQ Placement Site
- WQ Reference Sites
- Dredge Footprint
- Amrun DMPA

Sensitive Ecological Receptors

- Seagrass
- Reef substrate - soft coral
- Reef substrate - hard coral

Title:

Water Quality Monitoring Sites

Figure: 2 A

Swash endeavours to ensure that the information provided in this map is correct at the time of publication. Swash does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

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3.3 Parameters

Water quality monitoring was undertaken using nephelometers that measure turbidity by optical scatter producing readings in Nephelometric Turbidity Units (NTU). Turbidity provides a proxy for suspended sediments within the water column.

In accordance Table J1 and J2 in the EA, turbidity was monitored as a surrogate water quality parameter for photosynthetically active radiation (PAR) and sedimentation rate (SR).

3.4 Monitoring equipment

3.4.1 Near-surface monitoring

To collect real-time water quality measurements from near-surface, water quality loggers were mounted on purpose-built monitoring buoys. The buoys were anchored to the seabed using a mooring system to maintain position. With the loggers installed in each monitoring buoy, the sensors were located at a depth of approximately 1 m below the water surface.

The water quality loggers (YSI EXO sonde) were fitted with turbidity (NTU) sensors designed for long-term deployments in the marine environment. The water quality loggers were capable of continuous logging of data, with a copper anti-fouling guard, copper tape and sensor wiping apparatus to prevent interference to sensors from marine growth. The loggers were programmed to log data once every 15 minutes.

Each buoy was fitted with a secondary turbidity sensor for QA/QC purposes and redundancy (in case a turbidity sensor malfunctions or became fouled).

3.4.2 Benthic monitoring

To collect near-bed benthic water quality data at site D2, a benthic frame with water quality logger was deployed adjacent to the site D2 monitoring buoy. The water quality logger (Insitu Marine Optics NTU logger) was fitted with a turbidity sensor capable of continuous logging of data, with a copper anti-fouling guard, copper tape and sensor wiping apparatus to prevent interference to sensors from marine growth.

The benthic logger was programmed to log data once every 15 minutes with data downloaded during servicing trips.

3.5 Monitoring data

3.5.1 Loss of data / equipment issues

Following quality control processes, any data of suspect quality was quarantined from the data set. This produced a 'QA-checked' validated data set from which further analysis could be undertaken.

Overall, the quality of data collected during the baseline program was excellent. The data capture rates of QA-checked validated data for most monitoring sites was above 99%. The less than 1% of data loss was during periods of equipment servicing. All summary statistics were calculated using the QA-checked (validated) data set. The description that follows in the next sections is based on these QA-checked data.

The only significant loss of data was from benthic site D2 which stopped logging data on 27 September due to power issues, resulting in data gap of approximately 12 days from that site. However, the benthic data from D2 was only used to confirm the correlation between surface and benthic turbidity, and was not used to derive trigger levels.

3.5.2 Wind Data

Wind data was sourced from the Bureau of Meteorology (BOM) monitoring station at Weipa Airport (Station ID: 027045). The wind rose for the monitoring period is presented in **Figure 3**, which shows the prevailing wind direction during the monitoring period was from the east to southeasterly direction (offshore winds at Amrun). Wind speed data is presented in **Figure 4**, which indicates that there was a general increasing trend in wind speed through the monitoring period. Wind direction data is presented in

Figure 5, which indicates that morning winds were predominantly from the east/southeast, while afternoon winds occasionally swung around to westerlies (i.e. onshore sea breeze).

3.5.3 Continuous monitoring data

The baseline turbidity data collected between 16 July 2025 and 9 October 2025 is presented in **Figure 6**. This shows that near-surface turbidity was similar at all sites, with turbidity below 2 NTU for most of the time. While there was a general increasing trend in wind speed through the monitoring period (**Figure 4**), due to the mostly offshore winds this increased wind speed had negligible influence on turbidity at the nearshore sites. However, turbidity did increase at all sites during periods of onshore winds (westerlies) when turbidity increased up to 10–30 NTU.

The benthic data (0.5 m from seabed) collected at site D2 is presented in **Figure 7**. The near-surface data from the adjacent monitoring buoy is also presented in this figure for comparison. This data shows that near-surface and benthic turbidity is similar, with benthic turbidity slightly higher than near-surface turbidity. Also, the benthic data contains more spikes in the data from sensor interference from floating debris near the sea floor. This is similar to other studies such as Epic Environmental (2024) and PCS (2019) where concurrent benthic and near-surface turbidity data was collected. These studies found that near-surface turbidity provided a good representation of the turbidity regime throughout the water column (i.e. similar patterns), but was less susceptible to sensor interference from floating detritus and other benthic influences associated with benthic instruments.

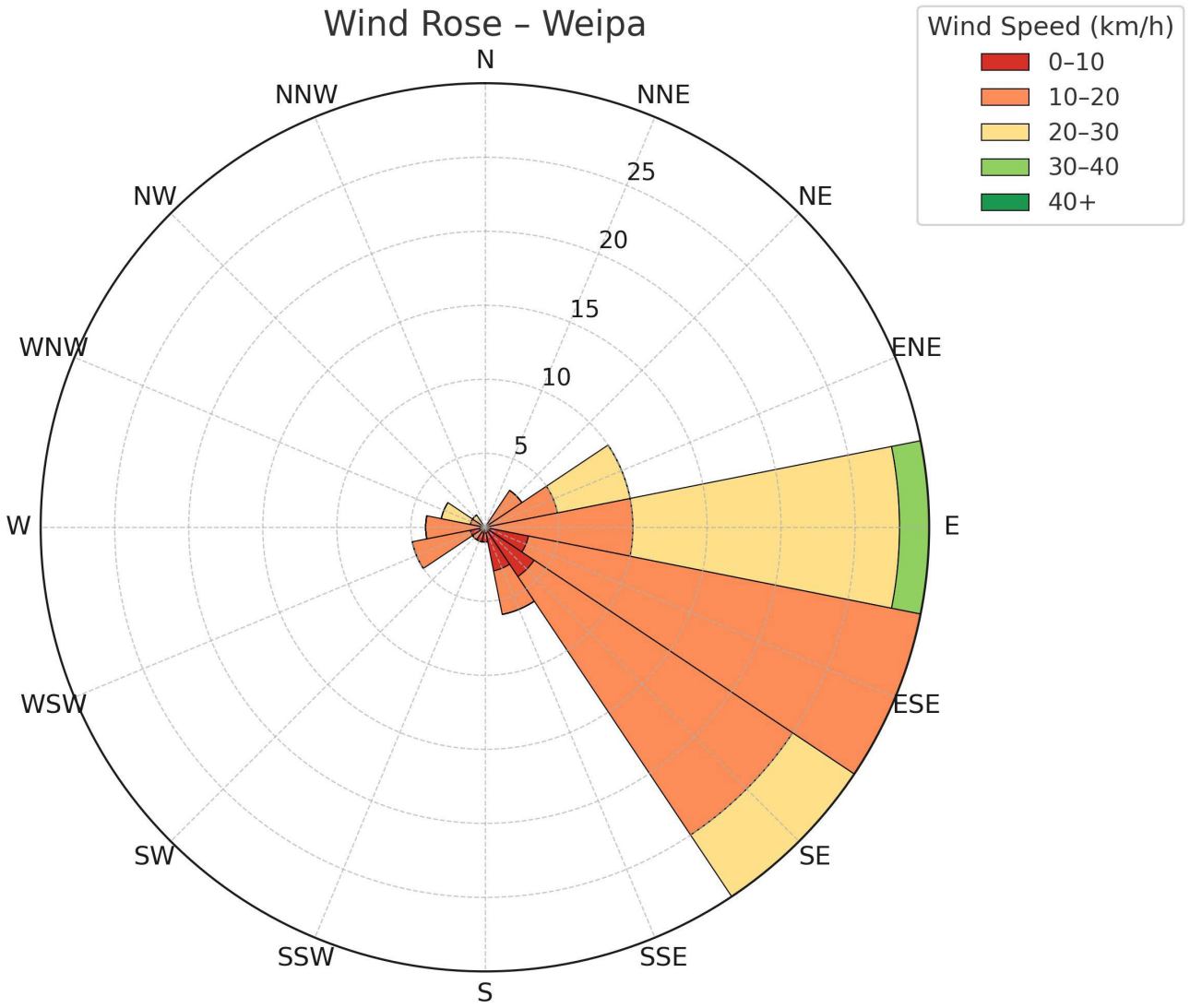


Figure 3. Wind Direction Data – Weipa Airport BoM Station (16 July 2025 to 9 October 2025)

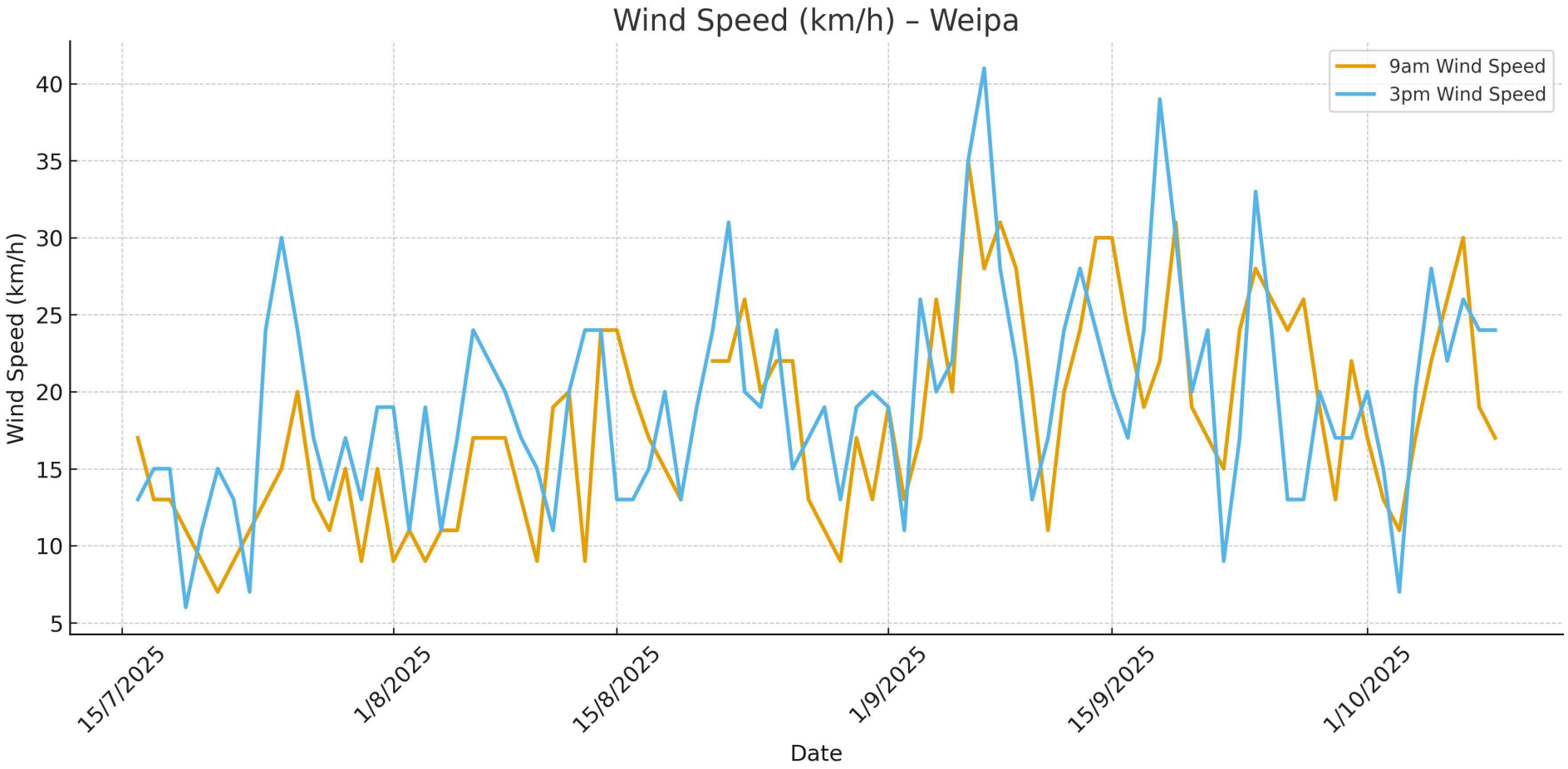


Figure 4. Wind Speed Data – Weipa Airport BoM Station

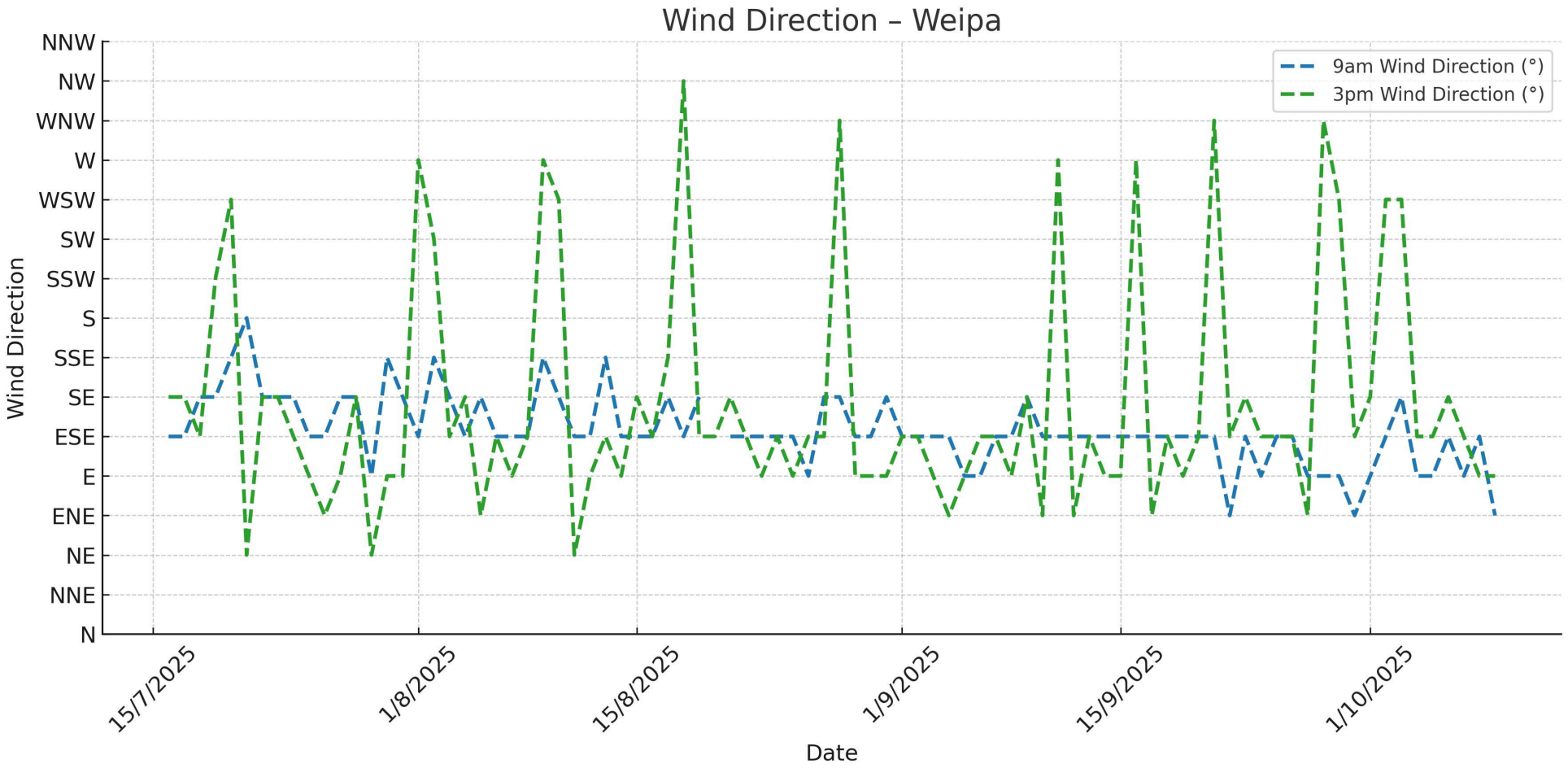


Figure 5. Wind Direction Data – Weipa Airport BoM Station

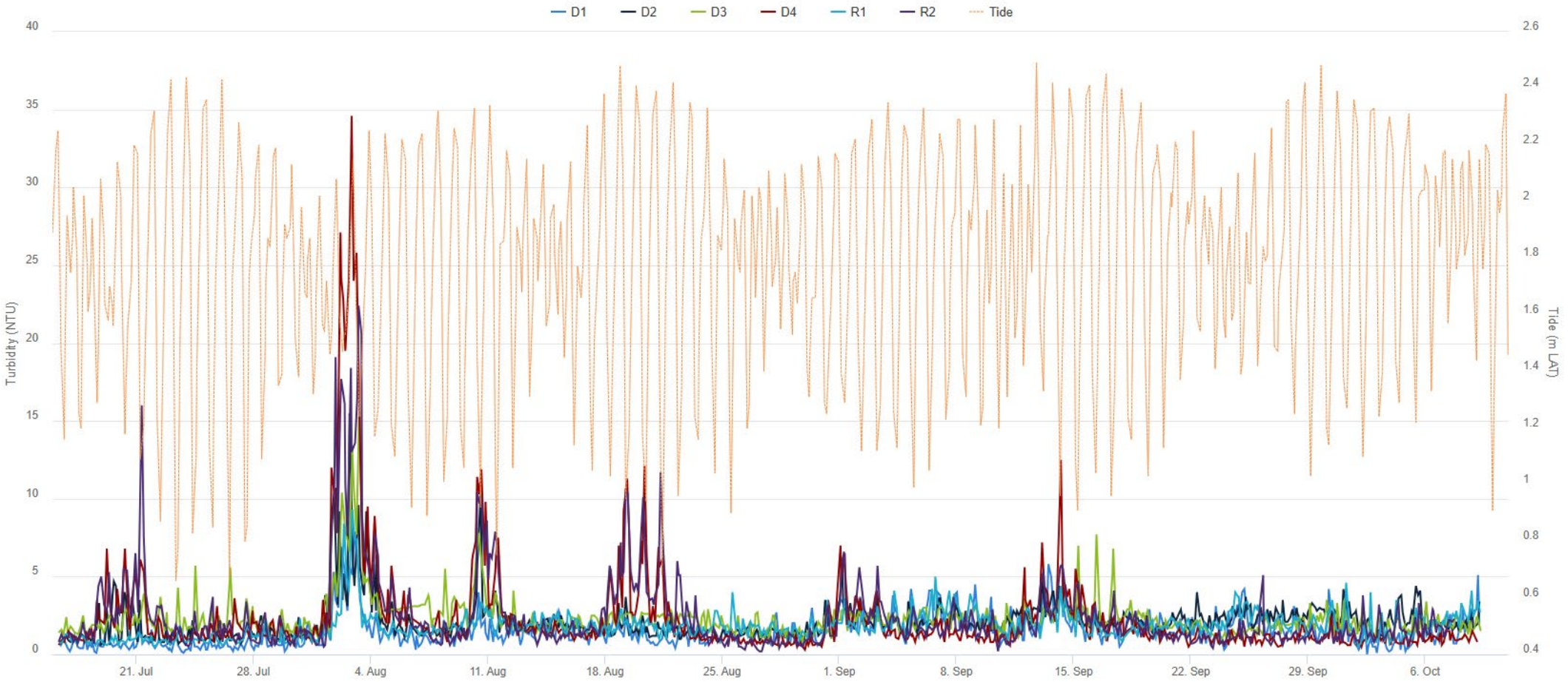


Figure 6. Near-surface turbidity data (monitoring buoys) – 16 July 2025 to 9 October 2025

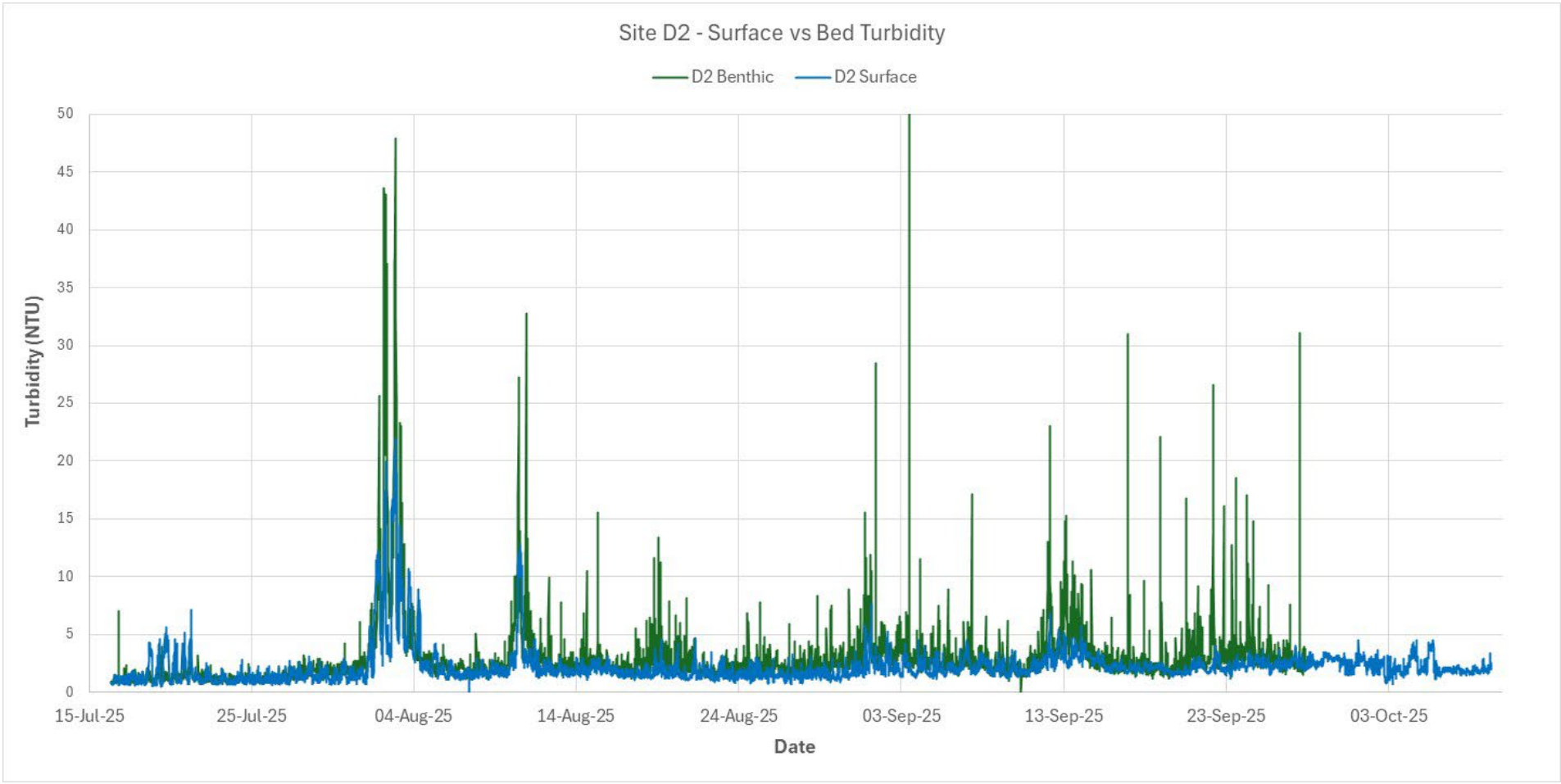


Figure 7. Near-surface turbidity compared to benthic turbidity at site D2 (note that benthic logger stopped working on 27 Sep)

3.5.4 Profiling data

Water quality depth profiling (manual readings surface to bed) was undertaken at all sites during equipment retrieval trip. This involved lowering a turbidity sensor (logging data once per second) from the water surface down through the water column to the seabed. The data is presented in **Figure 8**. This shows that turbidity was generally homogenous through the water column, increasing slightly with depth. These results are similar to depth profiling data collected by Advisian (2016) during the capital dredging in 2016.

Of note is the profiling data at placement site P1, where there was a marked increase in turbidity (~0.2 NTU up to ~1 NTU) from about 15 m down to the seabed.

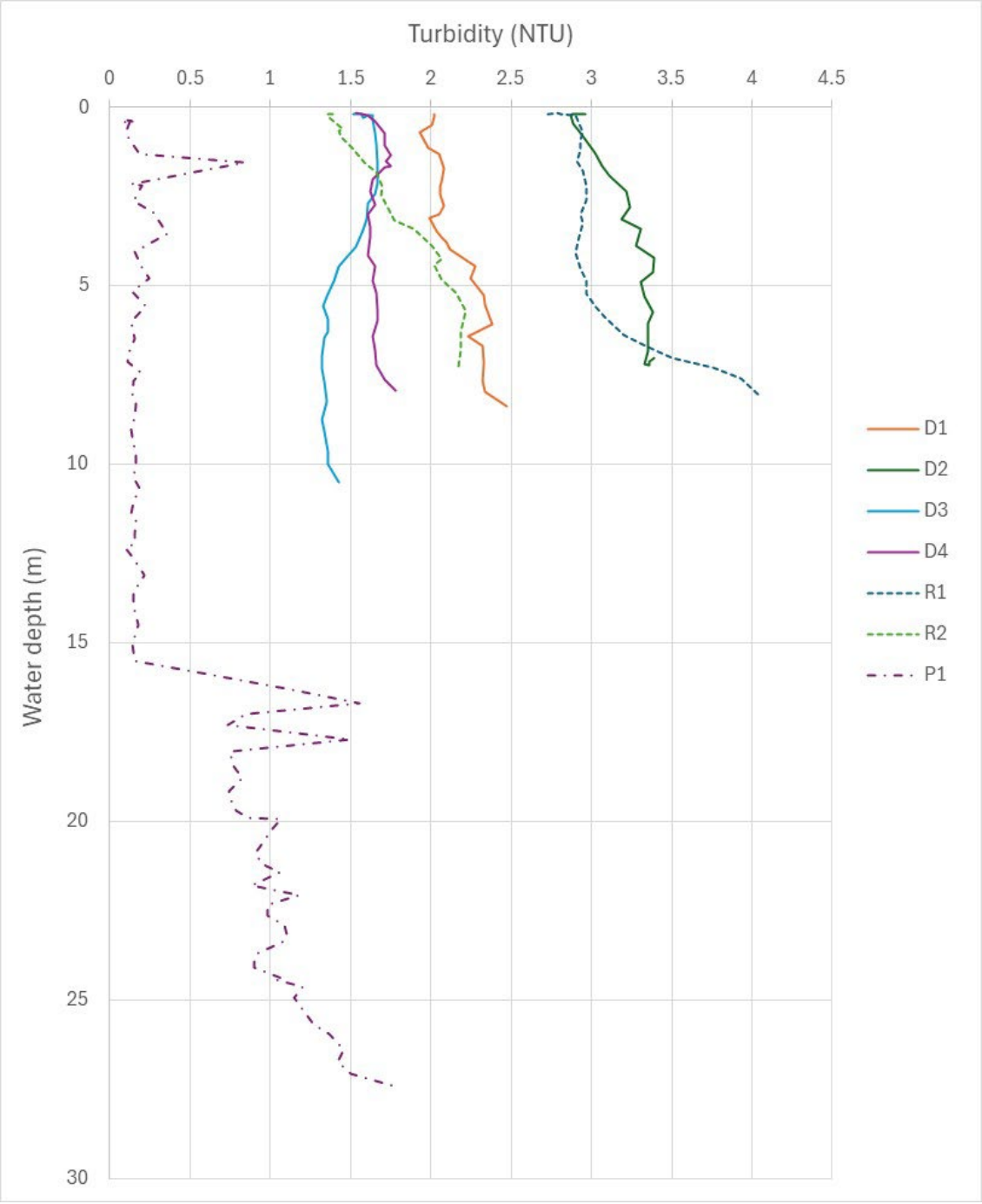


Figure 8. Turbidity depth profiling data

3.6 Summary of data

Using the QA-checked (validated) baseline data collected between 16 July 2025 and 9 October 2025, summary statistics were calculated and are presented in **Table 4**. Key findings from the data analysis includes the following:

- All surface sites had similar 20th, 50th and 80th percentile values of around 1 NTU, 1.5 NTU and 2.5 NTU respectively.
- In regard to higher percentiles (during adverse weather conditions), sites to the north of Amrun port (D1 and R1) had slightly lower 95th and 99th percentiles compared to other sites, and sites to the south (D4 and R2) had higher 95th and 99th percentiles compared to other sites. This indicates that sites to the south (D4 and R2) are more responsive to onshore westerly winds.
- When comparing surface data and benthic data at site D2, turbidity near the seabed (benthic data) was higher by 0.4 NTU at the 50th percentile, 0.7 NTU at the 80th percentile, and 2.8 NTU at the 95th percentile.
- The benthic data at D2 is similar to the data collected at the same site (WQ3) in 2018 (refer to **Section 2.2**), with 50th, 80th, 95th and 99th percentile values of 1.6 NTU, 3.3 NTU, 6.3 NTU and 15.6 NTU respectively at site WQ3 in the 2018 dry season. These values are very similar to those at D2 benthic in **Table 4** and indicates that baseline conditions during the 2025 monitoring period were similar to conditions in 2018.
- When compared to baseline data collected on benthic frames during the late dry season in 2015 (September to November 2015), the turbidity collected at near-surface sites in 2025 was generally around 2–7 NTU lower than benthic data collected in 2015 (refer to **Section 2.1**). However, when the benthic data collected at site D2 is compared to 2015, the 2015 and 2025 data is very similar – 80th percentiles around 3-4 NTU and 95th percentiles around 6-7 NTU, indicating the benthic turbidity regime in 2025 was similar to 2015.

Table 4. Summary statistics – baseline data (16/7/25 – 9/10/25)

Summary Statistic	Monitoring Sites						
	D1	D2 Surface	D2 Benthic	D3	D4	R1	R2
Minimum	0.1	0.5	0.7	0.7	0.1	0.2	0.2
20th percentile	0.9	1.3	1.6	1.5	0.9	1.2	0.9
50th percentile (median)	1.5	1.8	2.2	1.9	1.3	1.7	1.5
80th percentile	2.3	2.6	3.3	2.6	2.6	2.4	2.9
95th percentile	3.7	3.9	6.7	4.0	6.9	3.3	6.8
99th percentile	5.5	10.4	15.3	8.4	18.1	5.2	14.4
Maximum	11.3	21.7	65.8	15.9	36.6	11.2	27.4
Mean	1.7	2.2	2.9	2.2	2.3	1.8	2.3
Standard deviation	1.0	1.6	3.1	1.3	3.1	0.9	2.6

4 Trigger levels

4.1 Background

To assist in ensuring that impacts to sensitive ecological receptors do not occur during dredging, an adaptive management program using trigger levels will be implemented during the dredging program. Trigger values are a key tool used for minimising environmental impacts, and are typically developed using a combination of site-specific baseline data and ecological thresholds.

The trigger levels for the Amrun capital dredging will be based on turbidity (NTU) values. Advisian (2016) assessed a range of monitoring data from the Amrun Port area, including turbidity, photosynthetically active radiation (PAR) and sedimentation data, and concluded that the use of turbidity as a trigger appears to be a good surrogate for benthic PAR and sedimentation. Both measures have a strong statistically significant relationship with turbidity in the water column at Amrun Port. Jones *et al* (2019) support this, stating that while sedimentation can be a key pathway causing mortality of corals during dredging, it is difficult to measure in the field and therefore turbidity can be used as a surrogate.

The process of trigger level derivation is inherently complex as there are trade-offs between intensity, duration and frequency of dredging pressures and associated impacts on coral health, and it is important that guideline values incorporate a temporal component (Jones *et al* 2019). Jones *et al* (2019) suggest that time components must explicitly allow the calculation of accumulated pressure encompassing both intensity and duration, and these should be expressed in absolute terms (i.e. $x\,\mathrm{NTU}$ over period y) as opposed to relative terms (i.e. NTU above background).

It is important that trigger levels are not overly conservative and are ecologically relevant. Methods that rely solely on water quality baseline data to estimate thresholds typically yield far more conservative threshold values than those based on observed coral mortality (Jones *et al* 2019). This is because water quality measured during the baseline phase is often well below levels that would result in impacts to ecological communities. Jones *et al* (2019) reported that at most sites in their research, thresholds based on realised coral mortality were greater than the 99th percentile of the baseline time series.

To account for this, often a multiplier based extrapolation is used on baseline data (Jones *et al* 2019). This technique involves multiplying baseline levels by a certain value to reach ecological thresholds. In Jones *et al* (2019), multipliers to reach the coral response thresholds across sites at Barrow Island were 2.2 and 3 times the mean baseline conditions for turbidity.

In terms of ecological thresholds, corals are the primary sensitive receptor located in the area surrounding Amrun Port where capital dredging could potentially result in changes to the water quality parameters. The growth forms of the three most dominant coral families found around Amrun Port have a high (foliose or laminar form) or intermediate (massive or dome shaped) tolerance to suspended solids (Erftemeijer *et al*., 2012). Ecological thresholds are discussed further in **Section 4.2**.

In the Dredge Management Plan (DMP) for the initial capital dredging in 2016, RTA (2015) developed initial water quality triggers following a review of comparable dredging programs, literature review and analysis of site-specific baseline data. These trigger values were based on the 80th and 95th percentile values of baseline data for the wet and dry season, and included dry season triggers of 6.1 NTU (internal trigger) and 14.3 NTU (external trigger).

Following collection of additional baseline data and further review and analysis, Advisian (2016) prepared a Water Quality Trigger Report (Advisian, 2016) which resulted in revised site-specific trigger values (refer to **Table 1**) as follows:

- Internal turbidity trigger for the dry season between 4 NTU and 6 NTU.
- External turbidity trigger for the dry season between 6 NTU and 9 NTU.

However, the revised trigger values were only based on analysis of baseline data (80th and 95th percentiles) and Advisian (2016) acknowledged they were not ecologically meaningful. Advisian (2016) reported that the proposed trigger levels were extremely conservative when compared to the coral thresholds outlined in Erftemeijer *et al* (2012). As discussed above, this is supported by findings in Jones

et al (2019) suggesting that methods that rely solely on water quality baseline data to estimate thresholds typically yield overly conservative trigger values.

4.2 Ecological thresholds

Ecological thresholds refer to points at which a change in environmental conditions (e.g., water quality) causes an adverse change in ecosystem structure or function. Ecological thresholds are typically obtained from *in situ* field-based studies which include observations of the response of ecological receptors (e.g. corals) to changes in water quality. Thresholds can also be obtained from manipulative experiments conducted in controlled laboratory environments (*ex situ*).

The following sections provide a summary of ecological thresholds relevant to the key ecological receptors (corals) at the Amrun port.

4.2.1 Erftemeijer *et al* (2012)

Erftemeijer *et al* (2012) published a comprehensive review of published literature on the sensitivity of corals to turbidity and sedimentation, with an emphasis on the effects of dredging. Information sources for the review included peer-reviewed scientific literature, 'grey' literature in the form of environmental impact assessments, consultancy and technical reports from around the world.

Erftemeijer *et al* (2012) reported that the duration that corals can survive high turbidity ranges from several days (sensitive species) to at least 5–6 weeks (tolerant species). However, there is no single universal threshold – tolerance depends on the species, growth form, background conditions (ambient turbidity etc.), and duration of exposure. Corals from shallow-water environments, where they are frequently exposed to elevated temperatures, storms and wave action, are more likely to be tolerant of environmental stresses than corals in deeper waters.

Given the wide range of sensitivity levels among coral species and in baseline water quality conditions among reefs, meaningful criteria to limit the extent and turbidity of dredging plumes and their effects on corals will always require site-specific evaluations, taking into account the species assemblage present at the site and the natural variability of local background turbidity and sedimentation (Erftemeijer *et al* 2012).

Erftemeijer *et al* (2012) synthesised the available literature data regarding the sensitivity of different coral species to turbidity. These data were reworked and related to a relative sensitivity index, with the findings reproduced in **Table 5**. The growth forms of the three most dominant coral families found around Amrun Port have a high tolerance to suspended solids (tolerant to very tolerant) for the foliose or laminar form and intermediate tolerance for the massive or dome shaped forms (Erftemeijer *et al* 2012). Based on the types of coral present the response matrix in **Table 5** can be summarised as follows:

- no impacts at suspended solids (SS) of less than 20 mg/L (equivalent to around 15 NTU as per PCS, 2020).
- SS of 20-40 mg/L (15-30 NTU) possible minor sublethal effects could occur.
- SS of 40-100 mg/L (30-76 NTU) possible lethal and major /minor sublethal impacts could occur.
- SS of more than 100 mg/L (76 NTU) lethal (partial mortality) and major lethal (mass mortality) effects could occur.

However, it is unclear in Erftemeijer *et al* (2012) what the duration of exposure to these thresholds is – i.e. the sustained time period at these turbidity levels before impacts to corals are expected.

Note that PCS (2020) used a conversion factor of 1.314 to convert suspended solids to turbidity values (refer to **Table 2**). This conversion factor was established using concurrent water sampling and turbidity measurements at site WQ3 (site D2) at Pera Head. While the relationship between turbidity and SS is site-specific and can vary due to sediment properties, this site is likely to be generally representative of sediment type in the Amrun Port area.

Table 5. Coral response to Suspended Solids (Erftemeijer et al 2012)

Response category	Suspended solids[1] level (mg/L) tested				
	<10	10-20	20-40	40-100	>100
No effect	(most spp.)	Intermediate	Tolerant	Very tolerant	Very tolerant
Sublethal effects (minor) (reduced growth/calcification, mucus production, etc)	Sensitive	Sensitive	Intermediate	Tolerant	Very tolerant
Sublethal effects (major) (bleaching, tissue damage)	Very sensitive	Sensitive	Intermediate	Tolerant	Tolerant
Lethal effects (partial mortality)	Very sensitive	Very sensitive	Sensitive	Intermediate	Tolerant
Major lethal effects (mass mortality)	Very sensitive	Very sensitive	Sensitive	Intermediate	(most spp.)

[1] Column heading has been corrected to suspended solids (mg/L) instead of turbidity (mg/L) in Erftemeijer *et al* 2012

4.2.2 PCS (2020)

To support the Amrun Port Sustainable Sediment Management Assessment, Ports and Coastal Solutions (PCS) prepared an Environmental Thresholds report (PCD, 2020). The report assessed relevant ecological thresholds and ambient water quality conditions at Amrun Port, to better understand natural water quality conditions at Amrun Port and relate these to published environmental thresholds to define relevant, site specific thresholds.

PCS (2020) found that the published environmental thresholds in Erftemeijer *et al* (2012) were the most relevant to the Amrun region. PCS (2020) concluded that thresholds for corals suggests that there are unlikely to be impacts for the coral species present in the Amrun region below a threshold of 20 mg/L (15 NTU at Amrun). PCS (2020) reported that this threshold value corresponds to the 99th percentile turbidity during the dry season at the Amrun Port water quality monitoring site (WQ3). As this threshold is only naturally exceeded for 1% of the time, PCS (2020) considered it to represent a suitable threshold to identify periods when the turbidity increases above the natural dry season variability and therefore when coral species could potentially start to be at risk.

4.2.3 Impacts of dredging on tropical and sub-tropical benthos (Western Australian Marine Science Institute (WAMSI))

The Western Australian Marine Science Institution (WAMSI) is a collaboration of state and federal government and academic science organisations, working together to provide independent marine research. A key project undertaken by WAMSI included a large study of the effects of dredging on tropical and subtropical benthos, conducted over eight years by researchers from AIMS, CSIRO and universities. The study used extensive water quality and coral health datasets from four large scale dredging projects in the Pilbara which were made available to the Dredging Science Node for scientific study. The key publications relevant to the Amrun project include the following which relate to deriving thresholds for coral communities:

- Jones *et al* (2019) – *Synthesis Report: Defining Thresholds and Indicators of Coral Response to Dredging-Related Pressures.*
- Fisher *et al* (2019a) – *Effects of dredging and dredging related activities on water quality: Impacts on coral mortality and threshold development*.
- Fisher *et al* (2019b) – *Effects of dredging and dredging related activities on water quality: Spatial and temporal patterns.*

The WAMSI studies analysed data from field-based studies in Western Australia along with experiments conducted in aquaria at the AIMS National Sea Simulator (SeaSim, Townsville, Queensland) using coral taxa and water quality conditions that are relevant to dredging programs.

High turbidity and sediment deposition are well-known hazards to corals and the physiological responses are well described (Jones *et al*, 2019). The development of water quality thresholds for impact prediction must be relevant to the temporal scales to which the benthic organisms respond. A generally accepted model for how corals tolerate turbidity is that they survive short term periods of high turbidity by shifting between phototrophic and heterotrophic dependence, by relying on energy reserves, and by rapidly replenishing reserves in periods between turbidity events (Fisher *et al,* 2019). The ephemeral nature of plumes and the potential for corals to recover from individual turbidity events, means dredging programs can be managed by considering chronic (cumulative) pressure (Fisher *et al,* 2019).

To account for intensity and duration in thresholds, Jones *et al* (2019) recommends the use of a running means analysis, which are intuitive and computationally simple. Since turbidity can be highly skewed, and since short periods of high turbidity are ecologically significant, Jones *et al* (2019) recommends the use of means as opposed to median values as the importance of these events can be concealed in median values and especially over longer term averaging periods.

Based on extensive analysis of data, WAMSI developed a table of coral mortality thresholds for cumulative probability and running mean durations for managing dredging activities near coral reefs. These thresholds are presented in **Table 6**, noting that these thresholds are relevant to clear water high diversity shallow water coral reef ecosystems. **Table 6** includes two types of thresholds – permissive and strict thresholds. Strict thresholds focus on maximizing statistical power to detect potential impact (at the possible expense of higher false alarm rates) and indicate that mortality of corals is possible. Permissive thresholds focus on minimising false alarms and indicate that mortality of corals is probable.

In terms of duration of running means, Fisher *et al* (2019a) and *Jones et al* (2019) report that several lines of evidence suggest that a 14 day time frame may often be a practicable and useful time scale for threshold durations for the following reasons:

- Running means calculated across 1–60 day timescales for the Barrow Island data set found that a 14-day running mean showed the strongest relationships with the probability of non-zero coral mortality for both turbidity and light stress.
- A 14 day timeframe allow dredging proponents enough time to plan and enact adaptive management activities if required (such as moving dredges, changing dredging modes or production rates etc).
- Having a comparatively short time component associated with a threshold i.e. a running mean over weeks as opposed to months, means that if all dredging activities were reduced or to cease entirely, the running mean values would respond (i.e. improve) relatively quickly.
- Natural events such as storms can be reliably predicted out to around seven days by the Australian Bureau of Meteorology, and natural turbidity generating events such as storms or weather fronts are thus more foreseeable.
- Similarly, if there are cyclical periods associated with turbidity and light availability (such as with the 14 day spring-neap cycles), proponents can factor natural hydrodynamics into forward planning and decision making purposes.

Table 6. Coral mortality thresholds for managing dredging activities near coral reefs (Jones et al 2019)

Threshold type		Possible effects *(strict)*			Probable effects *(permissive)*		
		>NTU	>SSC	<DLI	>NTU	>SSC	<DLI
Cumulative probability (% days)	90%	0.7	1.3	7.4	0.7	1.3	6.6
	80%	1.0	1.9	6.3	1.2	2.1	5.4
	70%	1.3	2.3	5.5	1.6	2.8	4.6
	60%	1.5	2.8	4.9	1.9	3.4	4.0
	50%	1.8	3.2	4.4	2.3	4.1	3.4
	40%	2.0	3.7	3.8	2.6	4.8	2.8
	30%	2.3	4.2	3.2	3.1	5.6	2.3
	20%	2.8	5.0	2.6	3.8	6.9	1.7
	10%	3.5	6.3	1.7	5.1	9.1	1.0
Running mean (days)	1 d	15.5	27.9	0.4	32.4	58.3	0.1
	3 d	10.8	19.4	1.1	19.9	35.7	0.3
	7 d	8.2	14.7	1.8	13.6	24.5	0.6
	10 d	7.3	13.1	2.2	11.6	20.9	0.9
	14 d	6.5	11.7	2.5	10.0	18.0	1.1
	17 d	6.1	11.0	2.7	9.2	16.5	1.3
	21 d	5.7	10.2	2.9	8.3	15.0	1.5
	28 d	5.2	9.3	3.1	7.3	13.2	1.8
	30 d	5.1	9.1	3.1	7.1	12.8	1.9

4.3 Summary

Based on the above information, the ecological thresholds relevant to protection of coral communities at Amrun Port can be summarised as follows:

- Erftemeijer *et al* (2012) and PCS (2020) – turbidity below **15 NTU** would be unlikely to cause impacts to corals. However, it is unclear in Erftemeijer et al (2012) the duration of exposure at this level (15 NTU).
- WAMSI – turbidity below **6.5 NTU** (strict) to **10 NTU** (permissive) over a 14-day period would be unlikely to cause impacts to corals.

Fisher *et al* (2019b) note that the WAMSI thresholds are relevant to clear water high diversity shallow water coral reef ecosystems. Although the approach of turbidity profiling and using running means analyses during the dredging phase is suitable in equivalent environments, the absolute levels may not be applicable to more marginal reef sites such as turbid reef zones (Fisher *et al,* 2019b). To account for the turbidity tolerant corals at Amrun, the 'permissive' levels from WAMSI (i.e. 10 NTU over 14-day running mean) are likely to be more relevant than the 'strict' levels. However, these are likely to be conservative when applied to corals in turbid reef zones such as near Amrun Port, which are exposed to significantly elevated turbidity during the wet season. As such, the Erftemeijer *et al* (2012) and PCS (2020) threshold of **15 NTU** is likely to be the most relevant ecological threshold for corals at Amrun. These thresholds are consistent with those developed for coral communities in a similar turbidity environment for the INPEX Ichthys LNG project in Darwin Harbour, with dry season trigger values of 11–15 NTU (Cardno, 2015).

4.4 Derivation of trigger levels

Based on previous studies and similar dredging programs, the following approach to setting turbidity trigger levels has been adopted:

- Analysis of baseline data – as capital dredging will be undertaken during the dry season, available dry season turbidity data was analysed, with particular emphasis on the most recent baseline data collected in 2025. Using this data, a range of summary statistics were calculated to determine the range of natural variability during the dry season. These summary statistics are presented in **Section 3.6.**
- Cross-check against ecological thresholds – the summary statistics which indicate the range of natural variability during baseline conditions were compared to ecological thresholds to ensure the trigger levels are ecologically meaningful and are not overly conservative.

This approach is recommended by WAMSI (e.g. Jones *et al* 2019) as discussed in **Section 4.2.3** and has been used by similar large scale capital dredge programs in North Queensland ports (e.g. Port of Townsville and Port of Cairns). The EIS studies for these projects (POTL, 2016 and PN, 2017) used limits of natural variability for turbidity (number of standard deviations from the mean) to determine impact assessment thresholds to develop zones of impact mapping. These were then cross-checked with ecological thresholds (corals and seagrass) to ensure they were ecologically meaningful. These thresholds were then used as trigger levels during dredging.

Similar to the initial capital dredging in 2016, there will be two levels of trigger values, as follows:

- Alert level – internal trigger to provide warning of increasing turbidity approaching upper range of natural variability and ecological thresholds.
- Alarm level – external trigger to indicate turbidity has reached upper range of natural variability and impacts to sensitive ecological receptors could begin to occur if management actions are not implemented.

As reported in Jones *et al* (2019), using water quality baseline data alone to derive trigger values typically yields overly conservative trigger values. To account for this, a multiplier based approach has been adopted as recommended by Jones *et al* (2019) and used in other dredging programs. This technique involves multiplying baseline levels by a certain value to reach ecological thresholds. For the Amrun project, the following multiplier has been adopted:

- Alert level – multiplier of 5 x the baseline mean.
- Alarm level – multiplier of 7 x the baseline mean.

The resultant turbidity trigger levels are presented in **Table 7**, and shows that alert levels are similar to the WAMSI ecological threshold of 10 NTU (which are conservative as they are based on clear water corals), while the alarm levels are consistent with the Erftemeijer *et al* (2012) threshold of 15 NTU. Furthermore, the alert and alarm levels in **Table 7** are consistent with trigger values for coral communities in a similar turbidity environment for the INPEX Ichthys LNG project in Darwin Harbour, with dry season trigger values of 11–15 NTU (Cardno, 2015). Lastly, these trigger levels are similar to the upper turbidity range recorded during the 2025 baseline monitoring period (99th percentile values of 6–18 NTU as per **Table 4**).

Along with intensity values, trigger levels also require consideration of a duration element. Typically, rolling median or mean values are used in dredge programs as they take into account duration and frequency of turbid events. Sensitive ecological receptors (e.g. corals and seagrass) are influenced by the total amount of turbidity in the water column over time, not just on any single day. A rolling metric helps to smooth out daily variations and capture the long-term trends in turbidity. Based on recommendations in the WAMSI reports (e.g. Fisher *et al*, 2019a and Jones *et al,* 2019), a 14-day rolling mean will be used as the duration element.

While the 14-day rolling mean will be used as the primary means of assessing impacts from dredging, the water quality data will also be assessed over a shorter time scale than the actual trigger to provide an early warning of impending exceedance. For this purpose, an internal assessment of the same trigger over a 7 day running mean will be undertaken to indicate that water quality conditions may be nearing the trigger value, providing an early indicator that management actions may be required.

Note that trigger levels in **Table 7** are only to be used with near-surface monitoring sites only (i.e. D1 to D4, R1 and R2). Profiling data from the benthic offshore placement site (P1) will be compared to baseline data to assess whether placement plumes may be extending towards Nine Mile Reef. This data will be supplementary to the primary method of placement plume monitoring using satellite imagery.

Table 7. Turbidity trigger levels

Site	Intensity		Duration	Assessment of Triggers
	Alert trigger	Alarm trigger		
Concern Sites				
D1	9	12	14-day rolling mean	Alert trigger for internal response, Alarm trigger for compliance
D2	11	15		
D3	11	16		
D4	11	16		
Reference Sites				
R1	9	13	14-day rolling mean	Interpretation only
R2	12	16		

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APPENDIX G – AMRUN PORT – CORAL MONITORING PLAN

Coral Monitoring Plan

Amrun Port Expansion

Prepared For: RTA Weipa Pty Ltd

Report Date: 10 November 2025



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Disclaimer:

The information provided in this document is based on knowledge, understanding and field observations at the time of review of associated materials and/or site survey. The report should be read and considered in its entirety including consideration of the limitations described in the report.

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1 Background

1.1 Overview

H2O Consulting Group has been engaged by Swash to prepare a Coral Monitoring Plan (CMP) for the Amrun Port Expansion ("the project"), located in the Gulf of Carpentaria, approximately 40 km south of Weipa in the Cape York Peninsula. The project is proposed by Rio Tinto Alcan (RTA) Weipa Pty Ltd to facilitate increased production and export capacity of bauxite from the Amrun mine.

The existing port, known as the Amrun Port or Chith Export Facility supports the docking of ships up to 260 m LOA with 43 m beam. Currently, bauxite is loaded on panamax, dedicated post-panamax, and mini-cape vessels. In order to increase export capacity, RTA Weipa proposes to expand the port to facilitate the berthing of dual mini-cape vessels, or dual cape class vessels.

This port expansion would require capital dredging of up to 3.2 million cubic metres to accommodate necessary berth and channel depths. Additional dredging is likely to be required as part of ongoing, annual maintenance dredging works.

Marine habitats in proximity to the proposed dredge areas include patchy coral reefs, which support soft corals, sponge communities, and hard corals. These reefs are of elevated value from conservation, cultural, commercial, and recreational perspectives, given the biodiversity they support in the region. These communities may be affected by the dredging works, reduced water quality and light penetration, and sedimentation.

Coral monitoring has previously been undertaken to assess coral health against management triggers associated with the initial capital dredging works for the port's construction in 2016 (Advisian, 2016a). The dredging campaign consisted of the removal and relocation of approximately 202,416 m^3 of material. Six coral monitoring locations were surveyed, including four 'impact' and two 'reference' sites, using towed video transect surveys. Surveys were undertaken once prior to dredging (baseline) and twice following commencement of dredging operations. Statistical analysis of the results did not identify any significant changes in hard coral cover at each site across the three surveys. While high levels of bleaching were recorded, this was attributed to the sustained elevation of sea temperatures observed across northern tropical waters at the time.

1.2 Project Locality

Amrun Port (the "Site") extends into the Gulf of Carpentaria from the Amrun bauxite mine, located approximately 40 km south of Weipa, on the western coast of Cape York (Figure 1). The port was constructed in 2016 as part of the Amrun Project and has been in operation since its first shipment in 2018. The Site comprises a 650 m long jetty and 350 m long export wharf, with a total length of ~1000 m. The Site occurs within the Cook Shire Local Government Area (LGA), while the mining town of Weipa is governed by the Weipa Town Authority, and administered by RTA.

The Amrun area is typical of the inshore environment of the Cape York Peninsula. Water quality within the Port is naturally turbid due to sediment resuspension driven by wave energy and rainfall (Swash, 2025), which is substantially greater during the tropical wet season (November to April).

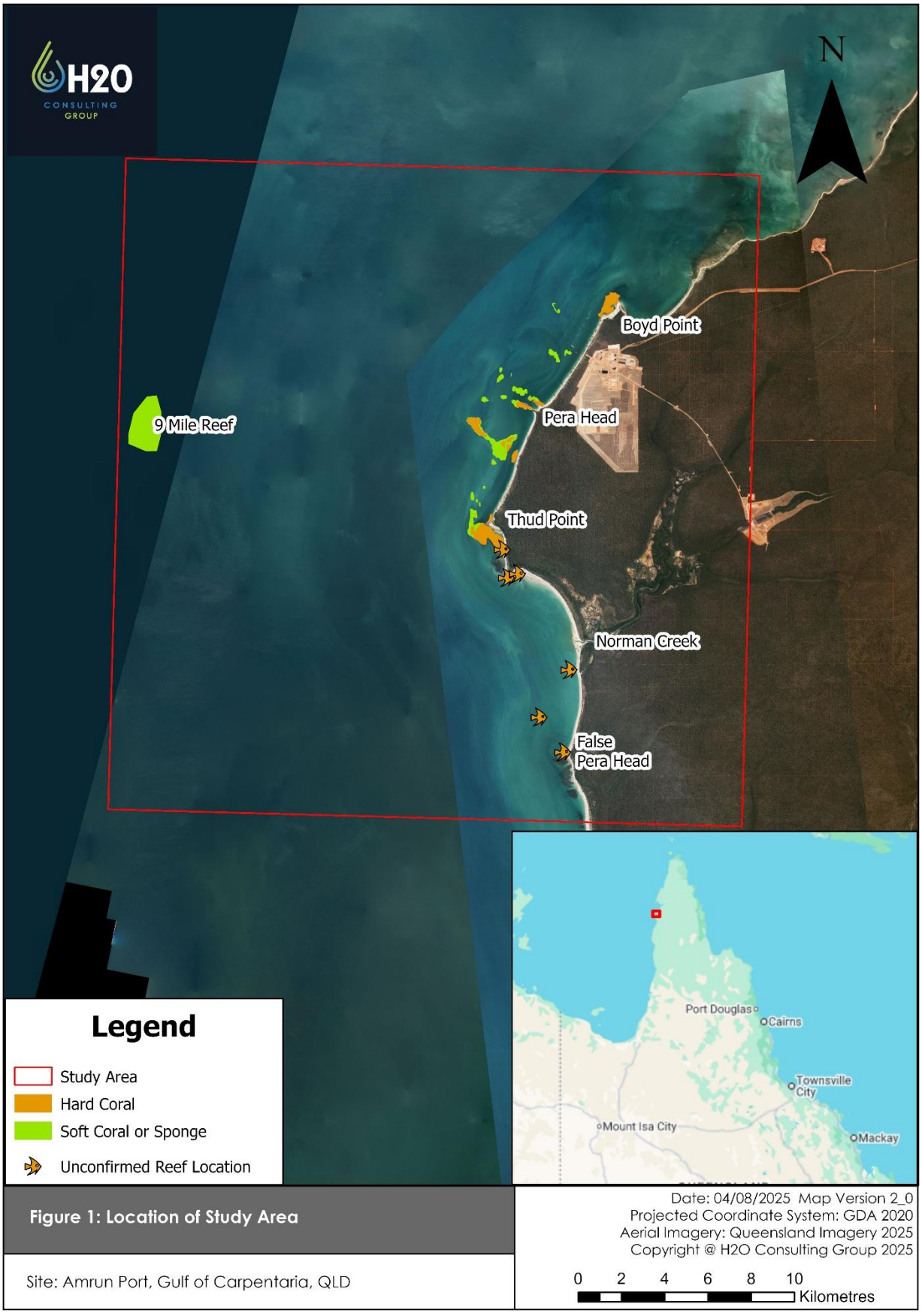


Figure 1. Location of Study Area.

1.3 Description of Proposal

The proposal involves the removal of up to 3.2 million cubic metres of sediment to accommodate the required berth and channel depths at the Site. Stage 1 (2.2 Mm^3) capital dredging is proposed to occur in the 2026 dry season with Stage 2 (1.0 Mm^3) capital dredging currently proposed to occur in the 2028 dry season. Dredging will require the use of a cutter suction dredge (CSD) to crush the underlying hard material at the Site. Subsequently, a trailing suction hopper dredge (TSHD) will likely be used to remove the crushed material and transport the dredged material aboard a central collection hopper. Dredged sediments will be transported to the Amrun dredge material placement area (DMPA), which is located approximately 14 km west of the Amrun port facility. Dredging works are proposed to take place during the dry season (May to October), during favourable weather conditions, and Stage 1 dredging is expected to take 12 weeks to complete.

1.4 Requirements of Coral Monitoring

An EIS was prepared for this project in 2011 (then known as the South of Embley Project). As part of this EIS modelling of sediment plumes indicated that dredging had potential to reduce favourable light conditions by 14% over hard coral habitat (Rio Tinto Alcan 2011). Condition 8(d) of the Coordinator Generals' Report for the EIS (State of Queensland 2012) included:

'The DMP for the port must provide details of water quality and coral health monitoring programs and water quality objectives proposed to be implemented'

An Initial Dredge Management Plan (DMP) was prepared by RTA (2015) for this project in accordance with condition J13 (f) of Environmental authority EPML00725113. The initial DMP included, *inter alia*, the following:

J13 (f) Develop and implement a coral health monitoring program that includes:

> *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 compromised due to dredging operations active at the time of monitoring.*

In addition to the above, coral monitoring was undertaken in 2016, for initial capital dredging works (Advisian 2016a), which should be considered in the development of the proposed monitoring program.

Furthermore, condition J16 (c) (EA EPML00725113) states:

J16 All subsequent Capital Dredge Management Plans for Boyd Port must be consistent with the conditions of this environmental authority and must:

> *(c) Implement a Coral Health Monitoring Program, as informed by the Initial Capital Dredge Management Program and recommended by the BPDTAG (as per condition J31).*

Water quality would be monitored as part of a separate scope of works prepared by others, which is summarised below (see Section 1.5). The water quality monitoring would provide for real time monitoring and implementation of additional coral monitoring during dredging, as required, based on agreed water quality triggers.

1.5 Water Quality Monitoring Program

A water quality monitoring plan has been prepared for the proposed capital dredging works as part of this project (Swash, 2025). Turbidity would be monitored using nephelometers to provide Nephelometric Turbidity Units (NTU). This measurement of turbidity was identified as a suitable surrogate parameter for the amount of photosynthetically active radiation (PAR) reaching the seafloor on a given day (Advisian, 2016b) and sedimentation rate (SR). It is also a very rapid and efficient surrogate measure of suspended sediment in the water column.

Water quality monitoring would be undertaken during four periods: a three month baseline phase during the dry season in the year prior to the commencement of capital dredging (completed in July to October 2025); a pre-dredging phase of at least two weeks prior to dredging, deployment for the duration of dredging; and a post-dredging phase of approximately two to three weeks to determine that ambient water quality has returned to concurrent background conditions.

Throughout these phases, seven sites would be monitored, consisting of four compliance (dredge plume monitoring) sites, one placement monitoring site and two reference sites that would provide concurrent background data. Monitoring would consist primarily of near-surface turbidity measurements, given that previous sampling found near-surface samples to provide values representative of the water column while avoiding interference from benthic influences such as seagrass wrack (Swash, 2025). At the placement monitoring site only satellite imagery will be used to monitor surface plumes extending from the DMPA and complemented with water depth profiling during monthly service trips during dredging.

The near-surface turbidity measurements will be obtained using monitoring buoys with nephelometers. The buoys would be fitted with telemetry to provide real-time data feed, including notification of trigger level exceedances to manage potential impacts to sensitive ecological receptors, namely coral reefs.

A set of site-specific and season-specific trigger values for potential impacts to corals have been developed using baseline ambient turbidity data collected by Swash and published information on thresholds for corals (Swash 2025). Trigger values have been provided as 14-day rolling means to capture the intensity and duration of elevated turbidity conditions. These values would trigger management actions identified within the DMP (Swash 2025) to minimise turbidity at the effected locations. If turbidity at the impacted locations exceeds ‘Alarm’ trigger values, further inspection and survey of corals would be undertaken (see Section 2).

1.6 Objectives

The objectives of the coral monitoring program are to:

- Detect potential changes in health of hard coral and associated reef assemblages and;
- Identify whether any potential changes in hard coral assemblages or health are attributable to the dredging works.

2 Coral Monitoring Plan

2.1 Coral Health Indicators

The following indicators have been established to detect adverse changes in the health of coral assemblages, should they occur. In addition, a number of additional measures in relation to hard coral and associated reef assemblages will be recorded to provide supporting information (Table 1).

Table 1. Indicators and supporting measures to identify dredge impacts to coral assemblages

Indicator	Unit	Rationale
Indicators		
Live hard coral	Percentage (%) cover	A standard, widely adopted measure (e.g., Miller et al., 2018) used to describe the proportion of the seafloor that is covered in live hard coral. Hard corals are important ecological components of coral reef and provide a three-dimensional structure to support fish assemblages.
Coral bleaching	Percentage (%) cover and Number of colonies	Coral bleaching occurs as corals expel their symbiotic phototrophic dinoflagellates in response to stress, which may be caused by factors such as elevated water temperatures, decreased salinity, or pollution. Recording and monitoring the occurrence and extent of bleaching will provide critical information for evaluating the health of coral assemblages.
Coral mortality	Percentage (%) cover	The proportion of dead hard coral is an important indicator of reef health, and is widely used in reef monitoring programs, including the Australian Institute of Marine Science's Long Term Monitoring Program (Miller et al., 2018).
Supporting measures		
Macroalgae	Percentage (%) cover	Macroalgae regularly live alongside corals in reef ecosystems. The potential effects of dredging on macroalgae are complex and likely depends on the types of algae present. While macroalgae are photosynthetic, and as such have the potential to be negatively affected by decreased light availability associated with increases in suspended sediment. However, genera such as sargassum are regularly found in nearshore ecosystems and are through to be resilient to high sediment regimes (Fraser et al., 2017). In extreme cases environmental disturbances can lead to phase shifts where macroalgae outcompete and dominate over corals (Mumby 2009).
Algal turf	Percentage (%) cover	Algal turfs are the short (<2 cm), multispecies assemblages of typically filamentous macroscopic algae that cover the hard substratum on coral reefs. Algal turfs are more common on degrading reef communities, and can outcompete corals in some circumstances (Swierts and Vermeij, 2016). The proportion of algal turfs can be a useful indicator of reef condition.
Crustose coralline algae	Percentage (%) cover	Crustose coralline algae (CCA) is an important component of reef systems, contributing to reef calcification and cementation and playing a crucial role in the inducement of larval settlement of benthic organisms, including coral larvae. The cover of CCA has been shown to have a strong relationship with the sedimentary environment, with lower CCA

Indicator	Unit	Rationale
		cover on more turbid and sediment-exposed reefs (Fabricius and De'ath, 2001).
Sponges and Ascidians	Percentage (%) cover	Sponges and Ascidians (SA) are important sessile components of the reef assemblages. Sponges and ascidians are filter feeders and have the potential to be more tolerant to, and potentially thrive in, a high sediment environment. However, there is also the potential for sponges and ascidians to be negatively affected by having their feeding apparatus blocked by increased fine suspended sediments or to be smothered or buried by sedimentation (Abdul Wahab et al. 2017)
Combined sessile biota	Percentage (%) cover	To increase the power of detecting small changes to reef habitat the combined cover of all sessile biota (e.g., coral, algae, sponges etc,) will also be monitored. While the influence of dredging may vary between different sessile biota, with some potentially increasing over longer timespans following dredging related impacts (e.g. algal turfs). Over short timespans most sessile biota are likely to so show similar declines due to direct burial through increased sedimentation.
Coral disease	Percentage (%) cover	Coral disease can occur naturally but is often exacerbated by environmental stressors such as declining water quality. Furthermore, when occurring concurrently with bleaching, these stressors can exacerbate each other and cause deleterious outcomes for reefs (Brandt and McManus, 2009). Monitoring the occurrence of disease will help to capture the health of coral assemblages and allow for the identification of declining health.
Sediment	Percentage (%) cover	The percentage cover of sediment (including sediment on sessile biota) will be used as an indicator of increased sedimentation occurring at monitoring sites. Given the works are expected to increase turbidity, dredging may result in an overall increase in the amount of soft sediment at monitoring sites.

In addition to the above, qualitative notes from the imagery will made on number of colonies observed at the site with disease, bleaching, sedimentation or other potential disturbances.

2.2 Timing and Number of Surveys

2.2.1 Baseline Surveys

Surveys will be undertaken ideally over a 6–12-month period to capture baseline conditions during two dry seasons at all sites prior to commencement of capital dredging works. This survey approach is favoured to account for inter-annual variability of ambient conditions during the dry season.

Alternative methods: if timing or conditions do not allow for surveys to be conducted in separate dry seasons, two surveys can be undertaken during one dry season, separated by at least six weeks. If two surveys are not feasible due to timing or conditions, a minimum of one baseline survey must be conducted during the dry season.

2.2.2 During Dredging

Reactive monitoring during dredging will consist of rapid visual assessments to be done if water quality monitoring 'Alarm' trigger values are exceeded. The objective of these surveys will be to undertake a rapid visual assessment to identify if acute impacts of coral/benthic communities are evident. These trigger values are detailed in the WQMP. If required, reactive monitoring surveys will focus on sites where water quality exceedances occur. Survey data (i.e., photo quadrats) will also be gathered to support the rapid visual assessment, and if deemed necessary these can be formally analysed to determine the accuracy of the initial assessment.

2.2.3 Post-dredging Surveys

One post-dredging survey is to be undertaken immediately (within 6 weeks) following the completion of dredging, with the second to be undertaken during the dry season or before the second year of dredging works commence.

2.3 Number of Locations and Sites

2.3.1 Sampling design

Nine locations will be selected and monitored, comprising five Potential Impact and four Reference locations. The monitoring locations are to align with those monitored as part of the previous capital dredging works (Advisian 2016a). These included:

- R1 and R3 – Northern Reference
- I1, I2, I3, I4, I5 – Potential Impact
- R2 and R4 – Southern Reference

An additional Impact location has been added at Pera Head (I5), as there are two distinct coral reefs in this area, which were found to support high coral cover (estimated to be up to 50% or greater in places) for the locality. Furthermore, Pera Head is the closest sensitive receptor to the dredge area and therefore has the highest potential risk of exposure to dredge plumes.

Given the distance between the two Reference locations, an additional northern (R3) and southern (R4) Reference location to those previously monitored have been added to provide an accurate measure of background variability in coral assemblages and health beyond the potential impact area (Figure 2). The eastings and northings for each location are provided in Appendix 1.

Six sites would be sampled at each location. A sample sites would consist of a circular area of approximately 10 m radius around a central point, which will be located via Differential GPS (accuracy <1m) and marked with a float prior to sampling. Given the patchy nature of the coral community at each location (Advisian 2016a), small sites are considered most appropriate for this program as they can ideally be positioned within a contiguous area of reef habitat (i.e. consistent coral cover).

Sites would be established in areas with the highest hard coral cover. A fixed position for the centre of each site (based on GPS coordinates) typically between 2 and 6 m depth, as this depth range appears to support the highest coral covers across the locality, would be chosen. The sites will be at least 50 m apart, if possible, although this may be reduced if suitable reef habitat is limited at any location.

At each site ~20 random photo quadrats of the seabed, spaced at least 0.5 m apart would be collected from a downward orientated HDD still camera. Care would be taken to avoid collection of any overlapping photo quadrats.

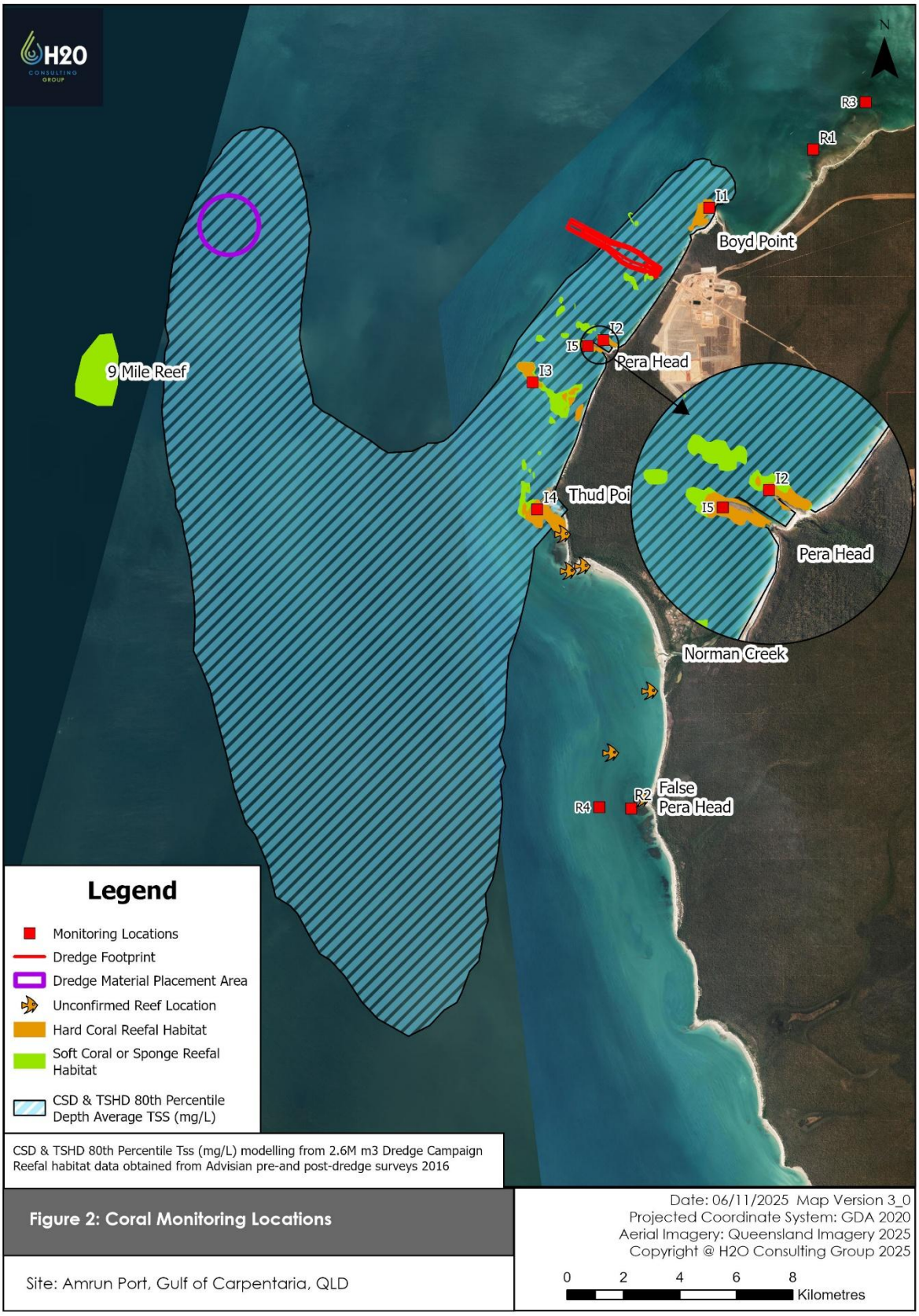


Figure 2. Coral Monitoring Locations

2.4 Image Capture and Analysis

The photo quadrats would be used to record data as per Table 1.

Images will be captured using a downward facing high-definition (HD) still camera mounted to a Remotely Operated Vehicle (ROV) with additional downward facing live feed HD camera. Image capture must be collected at a consistent height above the seabed to obtain comparable sized photo quadrats of approximately 0.25 m^2 per image, and in a manner that avoids overlapping photo quadrats. This will be achieved by using the ROV depth sensor and mounted laser scalers. Imagery would only be collected and analysed where hard substrata habitat and//or hard coral dominated the field of view (sand and sand dominated areas would be excluded from the survey). Between 20-30 images will be collected at each site.

Image analysis

Habitat composition will be analysed for 15 randomly selected images using specialised photo quadrat analysis software. Care would be taken to ensure no over lapping quadrats are selected for imagery analysis.

2.4.1 Benthic Composition

The percentage cover of organisms and substratum would be quantified based on 32 points overlaid on the photo quadrats. At each point one of the following categories are to be assigned:

- Hard coral – live (identified to family or growth form if more appropriate)
- Hard coral – bleached
- Hard coral – dead
- Algal turf
- Soft coral
- Crustose coralline algae
- Macroalgae
- Seagrass
- Sponges and Ascidians
- Other sessile living fauna
- Sediment (sand/ silt and shell) substrate
- Gravel, rubble and rock substrate
- Sessile Biota with sediment
- Indeterminable
- Wrack (mobile)
- Other mobile biota

The categories of ‘indeterminable’, ‘wrack’, and ‘other mobile biota’ would be excluded from the calculations of percent cover.

2.4.2 Bleaching, Mortality, Sedimentation and Disease

The number of coral colonies with bleaching, mortality (complete and partial) or sediment accumulation would also be recorded within the full 0.25 m² area of each photo quadrat. This is done to increase the sensitivity of the analysis to detect these occurrences, which can be relatively rare. This assessment will be conducted using the 20 images that were previously chosen for benthic composition analysis. While coral disease can

be difficult to accurately assess from photographs, any signs of disease or other coral stress will also be recorded.

2.4.3 Additional Information

A general visual description of the reef and hard coral cover that includes the following would be included for each survey:

- Dominant family and growth form of hard corals,
- Other dominant components of the benthic assemblage (e.g. sponges, macroalgae),
- Evidence of any coral predators or physical damage to corals.
- Depth of each site; and
- Approximate water visibility, time and date of survey, and water conditions (including tide state).

2.5 Results and Data Analysis

The following indicators of coral health would be used to assess potential impacts to coral health:

- Hard coral (% cover)
- Coral bleaching (% cover)
- Coral mortality (% cover)

In addition, the overall condition of the monitoring locations will be assessed using a lines of evidence approach based on the following indicators:

- Algal turf, macroalgae and crustose coralline algae (% cover)
- Sponges and Ascidians (% cover)
- Sessile biota combined (% cover)
- Sediment substrate (% cover)
- Changes in benthic assemblage (multivariate dataset)
- Sedimentation on sessile biota (% cover)

2.6 Statistical Analysis

2.6.1 Survey design

The optimal statistical analyses designed to detect an impact due to dredging activities would utilise a Beyond-BACI model comprising the following times of sampling Before dredging activities vs After dredging activities and Control (absence of dredging) vs Impact (presence of dredging). The basic model is shown in Table 2; however, it may need to be adjusted depending on available time and access to sampling sites. Nonetheless the design proposed should be the intention.

The analyses would test the null hypothesis that there is no significant difference in each selected indicator among Locations and Surveys, using a two-factor design (Table 2). The current design will require four surveys – two before dredging activities commence and two after cessation of dredging activities. Should the number of surveys change due to unavoidable circumstances the design will need to be revised.

Statistical analysis is to include Permutational Analysis of Variance (PERMANOVA) and Non-metric Multidimensional Scaling (nMDS) for multivariate indicators. For univariate indicators PERMANOVA or an Analysis of Variance (ANOVA) may be applied. Where significant interactions or main factors' effects are detected, pairwise or post-hoc tests are to be applied to comparisons required to test the null hypothesis.

Table 2. BACI experimental design to be used

Design	Factors	Sample Replication
Time (temporal)	Before	B1 B2
	After	A1 A2
Location (spatial)	Control / Reference	R1 R2 R3 R4
	Potential Impact	I1 I2 I3 I4 I5

2.6.2 Power Analysis

A power analysis will be done to assess whether the proposed number of sites are adequate to detect a 30% change in coral cover, following the first baseline survey. Qualitative observations within the Study Area estimate hard coral varies between ~10-50% coverage at sites, with natural variability of hard coral cover between the monitoring locations (Pers. Comm. H2O Consulting Group November 2025). Given the lower density and natural variability of coral at monitoring locations a 30% reduction in coral cover is considered appropriate to reliably detect changes. A 30% effect size allows for the natural variability in hard coral cover at monitoring locations, measurement error, and to capture changes that have the potential to be ecologically significant in the locality.

2.7 QA/QC Requirements

The quality assurance/quality control (QA/QC) requirements for each stage of the monitoring plan above are provided below in Table 3.

Table 3. QA/QC requirements for each stage of the monitoring plan

Stage	QA/QC Requirements
Field mobilisation	Check weather, tides, and local conditions. This should include any real time turbidity measures. Where in-water visibility of less than 2 m is expected, consideration to delaying field surveys should be given.
Image capture	The site will be relocated with Differential GPS (<1m accuracy) A temporary marker buoy is to be placed at the centre of each site to guide the survey. The site survey should not be undertaken if: • Tidal movements do not allow the camera or ROV to adequately maintain its position within the sampling site • The in-water visibility at the seabed is less than 1 m Before completion of each site, the collection of adequate imagery including quality should be reviewed. Where additional imagery is required, all imagery will need to be disregarded and an entire new set collected to avoid non-independence of data between photo quadrats. All imagery is to be downloaded from field equipment and uploaded or stored on a secondary device at the end of each day's survey work.
Image analysis	Imagery is to be reviewed with any poor-quality images to be put aside. Random images for analysis are to be selected from the remaining images. A second experienced marine ecologist/ taxonomist is to analyse 15% of images for quality assurance/quality control (QA/QC). If the site hard coral cover accuracy is lower than 90% the site must be re-analysed. The accuracy of the other indicators will be assessed on a case-by-case basis and re-analysed if necessary and feedback provided to the scorer. Automated methods should be used to extract all data from the imagery analysis. Where manual methods are used, all data entries must be checked by a second person.
Statistical analysis	All statistical analysis, experimental designs, and outputs are to be reviewed by a senior data scientist.

3 Reporting Requirements

3.1 Baseline Reporting

A baseline report is to be provided at the completion of the baseline surveys. This report should include

- Brief background,
- Methodology including dates of baseline surveys,
- Objectives of the baseline monitoring program,
- QA/QC procedures,
- Map showing monitoring sites,
- Limitations of the baseline monitoring program,
- Description of rainfall and weather patterns during the baseline period,
- Descriptive results for all identified indicators (means ± SE),
- Statistical analysis comparing differences between locations and baseline surveys (where a second survey is able to be undertaken),
- Outcomes of power analysis
- Discussion of results and influencing factors; and
- Appendices with raw data and statistical outputs.

3.2 During Dredging Reporting (Reactive)

If reactive coral monitoring is required during dredging (i.e. water quality alarm exceedance), a brief report of the rapid visual, qualitative assessment is to be provided within 7 days of completion of the survey. This report should include:

- Brief background including description of event which trigged reactive monitoring,
- Rapid visual assessment methodology (based on qualitative *in situ* observations) including dates of reactive assessment. If conditions are suitable, a full set of photoquadrats will be collected at each location visited, which can be later analysed as a recommendation of the report.
- Description of the visual condition of corals and other sessile biota including any indications of increased sedimentation or coral stress.

Following consultation, a full assessment of coral condition (as per post-construction surveys) may then be done, if considered necessary.

3.3 Post Dredging Reporting

A post dredge report is to be provided at the completion of each post dredge survey. This report should include:

- Brief background,
- Methodology including dates of post dredging surveys,
- Objectives of the monitoring program,
- QA/QC procedures,
- Map showing monitoring sites,
- Limitations of the monitoring program to date,

- Description of rainfall and weather patterns during the post dredging period,
- Descriptive results for all identified indicators (means ± SE),
- Statistical analysis comparing differences between locations and surveys,
- Identification of significant changes in coral assemblages and health based on the identified indicators and if they are attributable to the dredging works,
- Discussion of results and influencing factors,
- Recommendations in regard to future monitoring requirements; and
- Appendices of raw data and statistical outputs.

3.4 Reporting QA/QC Procedures

Reports are to be reviewed internally by a Principal Marine Ecologist before issue of draft.

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Appendix 1 - Monitoring location positions

Location	Easting	Northing
I1	568770	8573031
I2	565105	8568490
I3	562660	8567045
I4	562804	8562680
I5	564565	8568291
R1	572370	8575028
R2	566031	8552396
R3	574184	8576649
R4	564927	8552444

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APPENDIX H – AMRUN PORT – UNEXPECTED FINDS PROTOCOL

The appointed cultural heritage observer must monitor works to identify any potential heritage items, for example artefacts from shipwrecks or sunken aircraft, Aboriginal objects, suspected human remains, etc. In the event that an unexpected heritage item is discovered, the unexpected finds protocol detailed in **Table 14** must be followed.

The Environmental Representative and Weipa Cultural Heritage Superintendent are responsible for ensuring the unexpected heritage finds protocol is followed and any unexpected find is reported in the RTAW incident reporting system as soon as possible.

Table 14: Unexpected heritage finds protocol

Step	Action
1	**Stop work, protect item and inform the site supervisors**
1.1	Stop all work in the immediate area of the item and notify the Dredge Construction Project Manager and Weipa Cultural Heritage Superintendent. RTA Weipa Cultural Heritage Superintendent or delegate to make a determination for response if 'unexpected find has occurred' and if further action required.
1.2	Establish a 'no-go zone' around the item. On land, use high visibility fencing, where practical. On water, record coordinates of heritage item and add buffer zone of minimum 30 metres.
1.3	Inform all site personnel about the no-go zone.
1.4	Inspect, document, and photograph the item.
1.5	Confirm with the site Environmental Representative and Weipa Cultural Heritage Superintendent that the item is unexpected, and report as an incident in the RTAW system.
2	**Notify Queensland Police of unexpected find (if suspected human remains)**
2.1	If it is suspected that the unexpected find is human remains, you must notify the Queensland Police by telephone immediately in accordance with the Queensland Government *Guidelines for the discovery, handling and management of human remains.*
2.2	Following confirmation by Queensland Police that the unexpected find is ancestral human remains, WCCCA will be advised. Works will not recommence in the area until authorised by Queensland Police. All verbal conversations with police and WCCCA must be noted and documented in the incident report.
3	**Notify regulators and WCCCA of unexpected find (other than human remains)**
3.1	For cultural heritage artefacts: • Notify WCCCA in accordance with agreed communication protocols. • Notify the Dept. Women, Aboriginal and Torres Strait Islander Partnerships and Multiculturalism (DWATSIPM) Cultural Heritage team: P: 1300 378 401 E: cultural.heritage@dwatsipm.qld.gov.au For non-Indigenous archaeological artifacts: • Notify DETSI: P: 13 74 68 E: Archaeology@des.qld.gov.au Submit the Notification of a discovery form online: https://www.qld.gov.au/environment/land/heritage/archaeology/notification-of-a-discovery For shipwreck or sunken aircraft artefacts: • Notify DCCEEW in accordance with the process detailed on their website: https://www.dcceew.gov.au/parks-heritage/heritage/underwater-heritage • Contact UnderwaterHeritage@environment.gov.au for further information on management of shipwreck or sunken aircraft artefacts in accordance with the *Underwater Cultural Heritage Act 2018*.

3.2	A record of all notifications and any response/advice received from the relevant regulator(s) and WCCCA must be retained and provided in writing to the RTA Weipa HSE Manager, the RTA Communities Manager and Kangwinan Project General Manager.
4	**Contact and engage an Aboriginal or historical archaeologist and/or an Aboriginal or historical heritage consultant**
4.1	Contact an RTA Weipa qualified archaeologist as endorsed through WCCCA to discuss the location and extent of the unexpected find. Provide photographs and arrange a site inspection if required.
4.2	Following advice from the RTA Weipa qualified archaeologist, engage a suitably qualified and experienced Aboriginal or historical archaeologist or heritage consultant. Depending on the nature of the find, a suitably qualified and experienced underwater archaeologist may be engaged.
5	**Preliminary assessment and recording of the find**
5.1	The Aboriginal or historical archaeologist (in consultation with WCCCA and/or the relevant regulator) may determine from the photographs that no site inspection is required because no archaeological constraint exists i.e. the unexpected find is not a significant Aboriginal object or an archaeology artifact. Any such advice must be provided in writing (via email or letter with the consultant's name and company details clearly identifiable) to the RTA Weipa HSE Manager, the RTA Communities Manager and Kangwinan Project General Manager.
5.2	Arrange site access for the Aboriginal or historical archaeologist/Aboriginal heritage consultant to inspect the unexpected find as soon as practicable.
5.3	Subject to the Aboriginal or Historical archaeologist/Aboriginal heritage consultant's assessment, work may recommence at a set distance from the unexpected find. Existing protective fencing or buffer zones established in Step 1 may need to be adjusted to reflect the extent of the newly assessed protective area. No works are to take place within this area once established.
5.4	The Aboriginal or historical archaeologist/Aboriginal heritage consultant may provide advice after the site inspection and preliminary assessment that no heritage constraint exists (i.e. the unexpected find is not a significant Aboriginal object or an archaeology artifact). Any such advice should be provided in writing (via email or letter with the consultant's name and company details clearly identifiable) to RTA Weipa HSE Manager, the RTA Communities Manager and Kangwinan Project General Manager.
6	**Determine management requirements for site and develop management plan**
6.1	An archaeological or heritage management plan must be developed outlining management actions to ensure damage to the item is minimised and work can recommence. This plan will be developed by the Aboriginal or historical archaeologist in consultation with WCCCA and other stakeholders as required.
7	**Prepare to resume work**
7.1	A copy of the final archaeological or heritage management plan and/or final advice from regulators must be retained and a copy sent to the RTA Weipa HSE Manager, the RTA Communities Manager and Kangwinan Project General Manager before works can resume.
7.2	The project environmental management plan must be updated to include any additional controls and requirements identified.
7.3	Written clearance to resume work must be provided by the RTA HSE Manager and the Aboriginal or historical archaeologist/Aboriginal heritage consultant. Clearance will only be given once all archaeological excavation and/or heritage recommendations and approvals (where required) are complete. Resumption of work must be in accordance with all relevant Project / heritage approvals / determinations.
7.4	If required, ensure archaeological excavation/heritage reporting and other heritage approval conditions are completed in the required timeframes. This includes artefact retention repositories, conservation and/or disposal strategies
8	**Resume work**

APPENDIX I – AMRUN PORT CDMP – INDEPENDENT PEER REVIEW

Australian Government
Department of Climate Change, Energy, the Environment and Water

EPBC 2010/5642

Mr Tim Deery
Principal Advisor – Environment
HSE Pacific Operations
Rio Tinto Aluminium
Email: timothy.deery@riotinto.com

Approval of qualified expert for South of the Embley Bauxite Mining Project (EPBC 2010/5642)

Dear Mr Deery

Thank you for your correspondence dated 7 August 2025 to the department, requesting approval of a suitably qualified independent peer reviewer to undertake the review of the Capital Dredging Management Plan under conditions 14 and 60 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval 2010/5642.

I have noted the information provided, including the qualifications and experience of the nominated independent peer reviewer and the requirements specified in definitions attached to the EPBC Act approval for the above project.

As delegate of the Minister for the Environment and Water I have approved Dr James Stoddart to undertake review of the Capital Dredging Management Plan under conditions 14 and 60 of 2010/5642.

Should you require any further information please contact Cath Cooney by email to PostApproval@dcceew.gov.au or telephone 0466 475 032.

Yours sincerely



Rachel Short
Branch Head
Environment Assessments (Vic, Tas) and Post Approvals Branch
Environment Regulation Division

20 October 2025

This document provides an evaluation of the effectiveness of Rio Alcan (the Proponent) responses in addressing issues raised in the primary independent peer review of the Capital Dredging Management Plan for expansion of the South of Embley port facilities. This document should be read in conjunction with the original review, dated 1 October 2025. Proponent responses were provided in the following documents provided by the Proponent on 11 November 2026:

- 2025-2029 Capital Dredging Management Plan, Amrun (Boyd) Port November 2025, Rev 2 (Word Version), 11 November 2026
- Water Quality Monitor Plan – Amrun Port Capital Dredging, Rev 4, 6 November 2026
- Coral Monitoring Plan, Amrun Port Expansion, Rev 2, 10 November 2026
- Amrun Expansion CDMP Review 2025_RT response_251111

Evaluation of Responses against Original Review

In summary, the responses and revisions provided adequately cover the issues raised in the initial independent peer review and I have no further outstanding issues. The remainder of this document describes how I have reached that conclusion.

The two tables below are reproduced from the original review. In Table 2, column 1 is the original finding, column 2 is the degree to which revisions correct or ameliorate the issue raised. Where an item was flagged originally as *Complies,* no further comment is provided here. It is noted that where suggestions for improvement were made in the original review for compliant items, these have been taken up in the revision of the CDMP.

TABLE 2: Review comments by Section of the DMP: Condition 14 Assessment.

Item & Finding	Once Revised
Does the CDMP fulfil requirements of the National Assessment Guidelines for Dredging Australian Government (2009) to avoid or mitigate impacts on: a. Commonwealth Marine Area; b. Listed turtle species; c. Listed dolphin species; and d. Dugong (*Dugon dugon*) and Bryde's Whale (*Balaenoptera edeni*). Note: Requirements of the NAGD 2009 for management plans (p.22 of NAGD) are listed below with reference to items *a* to d above.	
• *overall management framework* – describe how the plan integrates with the overall management framework Partial compliance The managerial framework for the dredging project, including accountabilities for the CDMP, is set out clearly in Section 7.1. However, experience from past dredging projects shows that there is a risk that any environmental management measure not included in the dredging contract is unable to be enforced. There should be a	*Complies* The CDMP is now clearly linked to the dredge contract and the dredge contractor's responsibilities noted.

Item & Finding	Once Revised
commitment in this section that management actions required from the contractor (including cessation or rescheduling of dredging) should be included in the dredge contract.	
• *context* – put the proposal in the context of the local environment, including history of dredging and dredge material disposal at the site Partial compliance Section 4 contains a sufficient description of the local environment for the general plan and a useful treatment of items a to c in the condition dot points. However, given the specific referencing of protection for dugong and Bryde's whale, this section should provide a more detailed description for these species. At present, the contention that they are rare in the project area (Section 5.4) requires further elaboration in this section.	*Complies* Sections 4.5.4 and 4.5.5 of the CDMP Rev 2 discuss the relevant species in sufficient detail.
• *description of the project* – provide information on dredging and disposal for the term of the plan or permit, including the location, staging, and timing of activities *Complies* The description of proposed dredging covers all relevant areas. However, at this stage several details are 'best guess' – including timing and plant. It would be useful to add a review point in Section 7.6 prior to commencing dredging to confirm that the dredging characteristics (including plant and timing) are consistent with those used in the current draft of CDMP to predict impacts.	
• *information on approvals* – provide details of any approvals, relevant conditions and any other statutory requirements *Complies* The legal framework and approvals history is described in Sections 1.1 and 1.2.	
• *description of the existing environment* – characterise the dredging and disposal sites and adjacent areas, including its water column, sediments, biota, resources and other uses (existing and potential) of the area Partial compliance The CDMP provides a comprehensive coverage of the environment of the project area. The amount of data provided on the physical and biological environment adequately demonstrates that the local environment has	*Complies* The potential impacts on the social and recreational uses of the area are now included in the CDMP.

Item & Finding	Once Revised
been well documented and is well understood in terms of dredging risk. While there is an excellent coverage of the physical environment, social use of the area is only discussed briefly. However, refence to an environmental risk assessment (Eco Logical Australia 2020) suggests that there has been an assessment of social values of the area. It would be useful to add more information on social uses of the area or append the risk assessment to support the contention of only minor temporary impacts on uses such as fishing contained in Section 5.	
• *description of the material for disposal* – provide a summary of sediment types, their status relevant to the values in these Guidelines *Complies* Section 3 of the CDMP provides a summary of results of a considerable past sampling of sediments. This section also notes that DCCEEW have provided an exemption that further sediment sampling is not required.	
• *description of potential impacts* – address both potential short-term and long-term impacts and any uncertainties regarding the predicted impacts *Complies* The impacts section is a comprehensive treatment resting on an interpretation of a large amount of relevant data collected during and around previous dredging programs. Impacts are well considered based on previous experience. Note that there are no specific sections treating dugong (other than brief mentions) or Bryde's whale. This should be contingent on these species being demonstrated to be rare in the area – as requested in the review above.	
• *management strategies and actions* – describe strategies and actions to mitigate impacts – including specific and auditable measures; performance indicators; monitoring requirements; corrective actions; and responsibilities and timing for management and monitoring activities *Complies* Environmental objectives, monitoring and management strategies are supplied for all potential impacts identified in Table 11.	

Item & Finding	Once Revised
Monitoring and management actions for turtles, dolphins, dugong and whales (supplied as general marine mammal guidelines and not specifically directed towards Bryde's whale) are set out in detail in section 6.4. Note – see Table 3 of this review for comments on likely effectiveness of nominated monitoring and management actions.	
• *contingency arrangements* – identify corrective actions and contingency plans should undesirable or unforeseen impacts occur Partial compliance Table 11 lists corrective actions for all environmental risks – However, see Table 3 of this review for qualifications on the form of many of those corrective actions. While dredging is planned for the non-cyclone season, cyclones occasionally occur outside the normal period. There should be some discussion of what management would be put in place to avoid dredging when cyclonic conditions occur which could result in plume dispersal conditions outside those used in models of sediment transport.	*Complies* Table 11 and the contingent monitoring plans of the CDMP have been amended to include appropriate adaptive management responses. The following table describes this in more detail. The Proponent's Table of individual responses sets out management measures which would be enacted routinely during cyclonic conditions.
• *continuous improvement* – identify opportunities for continuous improvement to prevent, minimise or mitigate environmental impacts in the longer term *Complies* The CDMP uses results of past programs for continual improvement and commits to a substantial monitoring program directed at informing future dredging management.	
• *auditing requirements and reporting* – outline reporting and documentation standards, timing and responsibility of any auditing or reporting *Complies* Relevant auditing and reporting requirements are set out with timeframes. The only improvement suggested is that in 7.2 auditing is only targeted for 'minor capital dredging'. It should also occur during the major dredging works.	
• *review of management plan* – make provisions for a review of the management plan, including consultation with the TACC, to ensure it remains current.	*Complies* Firmer wording and provisions for relevant reviews have been added

Item & Finding	Once Revised
Partial compliance Section 7.6 allows for a review of the CDMP. However, text in 7.6 advises that BPDTAG (TACC) and WCCCA 'may' review the CDMP. This is inconsistent with 'provisions for a review of'. Additionally, there is no commitment to review and update the plan should monitoring show that management actions are not working. In an extended campaign(s) such as planned here, such an update may be required.	to Section 7.6 of the CDMP which provide a clear and appropriate basis for future reviews.

Table 3 of the original review contained items relating to 'degree of effectiveness' rather than the stricter compliance/non-compliance items. Responses are assessed here as to the degree they ameliorate issues raised in the original review as constraining effectiveness.

TABLE 3: Review comments by Section of the DMP: Condition 61 Assessment.

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
Overall: I found the document unclear regarding adaptive management responses. In many critical areas, the management actions listed in Table 11—meant to be triggered when environmental thresholds are exceeded—consist primarily of using data to inform future management decisions. While building knowledge is valuable, and may be an appropriate response for short-term dredging campaigns, it is not an effective form of adaptive management in the context of large capital dredging programs that run for several months. In such cases, immediate responses are essential to prevent or reduce environmental impacts. I could see no references to management actions in Table 11 designed to immediately stop or reduce potentially harmful environmental stresses derived from dredging and/or disposal activity. The document appendices do include staged triggers for harmful thresholds related to water quality and coral health, which follows best current dredging practices. In other recent large dredging projects, 'Alert' conditions lead to investigations or precautionary, low-cost interventions, while 'Alarm' conditions prompt immediate, active management to reduce environmental stress. Under 'Corrective Actions', Table 11 of the CDMP lists only using data to inform dredging management in future years. The water quality monitoring plan (see below) states that if an Alarm level is reached then there should be "the implementation of management actions by the dredge contractor to reduce turbidity levels". This is not implemented within Table 11 of the CDMP. Coral monitoring during dredging is stated to be implemented following Alarm levels of water quality, but without any discussion of what management would occur should coral health be shown to be negatively impacted by that water quality.

In practice, effective adaptive management actions often involve significant financial costs. Therefore, it is essential that such measures are clearly defined and incorporated into the dredging contract from the outset. Without the capacity to halt dredging operations considered to cause environmental harm beyond that permitted, the CDMP is not likely to be effective were such events to occur.

Evaluation of Revised Documents

The CDMP and the Water Quality Monitoring Plan have been revised to specify that adaptive management aimed at reducing pressures identified through water quality exceedances will now be implemented. Table 11 and Section 6.2.3 of the CDMP discuss the inclusion of altered dredging characteristics that may be implemented via the dredging contractor's Environmental Management Plan in response to exceedance of an Alarm level trigger.

The timing and process to be followed in implementing adaptive management is set out in Section 7.9 of the revised Water Quality Monitoring Plan.

While the exact form of dredging management to be implemented to reduce pressure on water quality remains only as a series of options, this is aligned with current practice. Effective management is best developed in conjunction with the Proponent and dredging contractor. That is consistent with the revised CDMP commitment to shape adaptive monitoring via the dredging contractor's EMP and the results of exceedance investigations.

FINDING	COMMENTS ON REVISION
Water Quality Monitoring: The intent and methods of the water quality monitoring plan (WQ Plan) are well described. However, the effectiveness of the program should consider the following suggested improvements. Site Selection: Monitoring at the sensitive receptors provides a sound basis for evaluating whether water quality conditions at these sites are meeting requirements. Some extra sites between the source of impact and the sensitive receptors would act as early warning sentinels, provide ground truthing for plumes observed in satellites, allow more confidence in assigning an origin to any exceedances and provide data to validate predictions of sediment dispersion in the impact hypothesis. Thresholds: Development of water quality thresholds requires further review against current science to confirm that the triggers selected are appropriate. Trigger development to safeguard coral health appears to be based on three studies: PCS (2020), Advisian (2016) and Erftemeijer et al. (2012) and is based ultimately on the risk of reducing light levels at the seabed. I agree with the use of light levels and an	Site Selection Rather than adopt sentinel sites, the revised water quality plan takes the approach of using satellite imagery to identify early warning signs of plumes and capacity to determine the origin of plumes affecting sensor-recorded data. While satellite imagery may miss plumes occurring at depth, it has the advantage of covering the entire area of interest and has a history of successful use in similar dredging programs. Triggers The water quality monitoring plan now includes an appendix which describes the development of triggers in much greater detail and includes a more thorough use of recent benchmark

FINDING	COMMENTS ON REVISION
intensity-duration-frequency approach (IDF), but consider that the studies used have the potential to lead to incorrect IDF prescriptions. The PCS study was focussed directly on seagrass in the shallow flats around the Port of Weipa and not coral. It excluded treatment of water quality data from the instrument sited near the current project area and dealt with effects on seagrass at 5-10 m depth (depth being a major influence on light at the seabed) within an estuarine environment. The Advisian study cautions on the use of its triggers for coral health and the Erftemeijer study is now dated. The Western Australian Marine Science Institute's multi-million-dollar study of the effects of dredging on tropical and subtropical benthos, conducted over 8 years by researchers from AIMS, CSIRO and universities has provided a broad range of relevant, peer reviewed, publications on the issue. Researchers from these programs have also worked with North Queensland Bulk Ports to ensure that the results can be extrapolated to Queensland conditions. The results of that study are not referenced. The thresholds developed here should be reviewed in context with the papers and reports from the WAMSI studies. In particular: Jones R, Fisher R, Bessell-Browne P, et al (2019) : *WAMSI Dredging Science Node Theme 4 Synthesis Report: Defining Thresholds and Indicators of Coral Response to Dredging-Related Pressures.* Theme 4 Final Synthesis Report. Prepared for the WAMSI Dredging Node, Perth, WA Adaptive Management (Sect 7.9): The Alert and Alarm staging of triggers is useful and complies with current best practice. Currently, the first response to an Alarm trigger is to evaluate whether the exceedance is dredging related before any action occurs. As this evaluation may be time consuming and evaluating whether an exceedance is dredging related is always problematic, this process should have a stated timeframe and some clear guidance as to what criteria will be used to make that decision. Any extended period of investigation of past events may mean an unacceptable stress lasts for longer than desirable before mitigation action is implemented.	studies in developing water quality triggers for dredging. The basis of triggers now appears sound. <u>Adaptive Management</u> Comments above have dealt with the revised adaptive management strategy in general form. The timing and form of exceedance investigations is now outlined in sufficient detail in the Water Quality Plan to confirm its likely effectiveness. FINDING The revised Water Quality Monitoring Plan is fit for purpose in supporting the CDMP objectives.

FINDING	COMMENTS ON REVISION
Coral Health Monitoring: Given the patchy/sparse nature of corals in the area, the management triggers suggested here seem excessive. At present, the monitoring program is unlikely to deliver the stated capacity to test the impact thresholds it establishes without an unacceptably high Type II error rate. With coral communities described as being patchy and existing at 4-6% cover in this area (CDMP Table 6), coral monitoring using transect/quadrat methods is likely to be subject to extreme variability. It is highly unlikely that the claim of a high power of detecting a 10% change can be met with the suggested methods (N.B. a 10% change in 4-6% cover means detecting a 0.4% change in real cover, when sampling variance of coral cover within a site over time is likely to be higher than estimated mean cover). Rather than using precise changes in coral cover, benthic monitoring would be better to address all sessile benthos (note that Table 6 of the CDMP lists other benthic categories at equal or greater abundance than corals) and use a multiple lines of evidence approach to employ all indicators of dredging impacts (Table 1 of the coral monitoring plan) in a holistic trigger scheme. The current coral monitoring plan is quite high level at this stage. One area where it needs elaboration is in the method of establishing the 'fixed' transects and how data will be collected. Should the plan's intent to capture coral data in a highly repeatable manner be maintained, it will be critical to have the "fixed" transects and quadrats physically marked and recorded by divers and not remote methods. Experience shows that despite claims of remotely deployed cameras recording 'fixed' areas, these techniques invariably introduce considerable variance as to exactly what area is recorded and the angle it is recorded at. Additionally, remotely deployed cameras are inefficient at recording coral recruitment. Small coral recruits are not discernible from images and often settle on vertical or inverted surfaces which are unable to be photographed. Comprehensive recording of recruitment occurring over timeframes such as envisaged here requires intensive diver-based observations.	<u>Revised Coral Monitoring</u> As noted in the original review, effective coral monitoring of low-cover, patchy coral communities on fragmented reefs, such as occur adjacent to the project area is not possible with high precision. Indeed in such communities where disturbance and change are frequent, high precision monitoring can be misleading. The coral monitoring program has been revised to present a more realistic set of tests of impact. Higher effect sizes for decline in cover and the relegation of other parameters to semi-quantitative lines of evidence has improved the ability of the program to make useful inferences. In its revised form the methodology of the program and its analyses provide an effective tool to evaluate whether the dredging program has caused any significant impacts on the coral community of this area.

FINDING	COMMENTS ON REVISION
Marine Megafauna Management: The CDMP uses numbers of dead or injured turtles recorded as its indicator of the effectiveness of management in avoiding such impacts. In some cases, it uses the term 'entrained' to indicate the method of injury. Detecting turtles that have been entrained by a cutter suction or trailer dredge is almost impossible. In either case, the turtle is in pieces and deposited in the dredge hopper together with large amounts of spoil. Thus, detection of damaged turtles will be confined to those found in project waters. That statistic will depend on what systematic program is used to look for dead or injured turtles. The current description of 'daily monitoring' (CDMP Section 6.4.1) should be more precise on the resources used and areas surveyed each day to demonstrate a reasonable chance of finding injured/dead turtles. Section 6.4.1 of the CDMP states that where monitoring identifies more than two marine turtles killed within 24 hours, dredging will stop until an investigation is completed. However, Section 6.4.3 is more equivocal about what management would be implemented in such an event. Neither management response discusses what conditions would need to occur before dredging was restarted in an event where the investigation showed current dredging practice was responsible for the turtle deaths. Effectiveness would be improved if the above were rectified.	Sections 6.4.1 and 6.4.3 of the CDMP have been amended to provide further detail on monitoring for turtle injuries and how responses to incidents would be managed. These sections now redress the original lack of detail. Exactly what management measures might be implemented to ameliorate dredging procedures causing mortalities (if found) is left unspecified. With no history of turtle mortalities from previous dredging programs here, it is difficult to identify how these might arise and what management measures might be required. Thus, making the identification of appropriate management contingent on investigations to be conducted at the time of the incident (as specified in the revised text) is appropriate.

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South of Embley
Draft Capital Dredge Management Plan – Expansion
Independent Peer Review

Document Reviewed: DRAFT 2025-2029 Capital Dredge Management Plan, Amrun (Boyd) Port, September 2025

Independent Peer Reviewer: Dr James Stoddart

Review Date: 1 October 2025

This document provides an independent peer review of the document specified above (hereafter called the CDMP) against the conditions of approval EPBC 2010/5642 appearing in Table 1 below. Rio Tinto (Alcan) advise that the requirements of Condition 60 of the EPBC approval pertaining to appointment of the independent reviewer and review criteria have been met.

TABLE 1: Review EPBC conditions addressed.

Conditions
14. The approval holder must submit to the **Minister** for approval a Capital Dredging Management Plan/s for capital dredging activities associated with the South of Embley project. The Capital Dredging Management Plan/s must be prepared in accordance with the Australian Government National Assessment Guidelines for Dredging (2009), or their most current versions, to avoid and mitigate **impacts** on: a. Commonwealth Marine Area; b. Listed turtle species; c. **Listed dolphin species;** and, d. Dugong (*Dugong dugon*) and Bryde's Whale (*Balaenoptera edeni*).
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.

This review addresses these conditions in detail in the following two tables. The wording of the two conditions requires a different approach to each. Condition 14 is assessed as to whether the CDMP complies with it or not. Findings are categorised as:
Complies – the condition intent is fully met and/or management proposed is likely to be effective in meeting stated objectives: some improvements might be suggested;
Partial Compliance – the CDMP addresses the condition but should be improved in nominated areas;
Not compliant – either does not address the condition or is unlikely to be effective.

Condition 61 is one of degree and requires comment as to how effective or not the CDMP and contingent plans are in meeting objectives.

TABLE 2: Review comments by Section of the DMP: Condition 14 Assessment.

Item & Finding	Relevant Report Section
Does the CDMP fulfil requirements of the National Assessment Guidelines for Dredging Australian Government (2009) to avoid or mitigate impacts on: a. Commonwealth Marine Area; b. Listed turtle species; c. Listed dolphin species; and d. Dugong (*Dugon dugon*) and Bryde's Whale (*Balaenoptera edeni*). Note: Requirements of the NAGD 2009 for management plans (p.22 of NAGD) are listed below with reference to items *a* to d above.	
• *overall management framework* – describe how the plan integrates with the overall management framework Partial compliance The managerial framework for the dredging project, including accountabilities for the CDMP, is set out clearly in Section 7.1. However, experience from past dredging projects shows that there is a risk that any environmental management measure not included in the dredging contract is unable to be enforced. There should be a commitment in this section that management actions required from the contractor (including cessation or rescheduling of dredging) should be included in the dredge contract.	Section 7.1
• *context* – put the proposal in the context of the local environment, including history of dredging and dredge material disposal at the site Partial compliance Section 4 contains a sufficient description of the local environment for the general plan and a useful treatment of items a to c in the condition dot points. However, given the specific referencing of protection for dugong and Bryde's whale, this section should provide a more detailed description for these species. At present, the contention that they are rare in the project area (Section 5.4) requires further elaboration in this section.	Section 2.1 – past dredging Section 3 & 4 - environment
• *description of the project* – provide information on dredging and disposal for the term of the plan or permit, including the location, staging, and timing of activities *Complies* The description of proposed dredging covers all relevant	Section 2

Item & Finding	Relevant Report Section
areas. However, at this stage several details are 'best guess' – including timing and plant. It would be useful to add a review point in Section 7.6 prior to commencing dredging to confirm that the dredging characteristics (including plant and timing) are consistent with those used in the current draft of CDMP to predict impacts.	
• *information on approvals* – provide details of any approvals, relevant conditions and any other statutory requirements *Complies* The legal framework and approvals history is described in Sections 1.1 and 1.2.	Section 1.1, 1.2
• *description of the existing environment* – characterise the dredging and disposal sites and adjacent areas, including its water column, sediments, biota, resources and other uses (existing and potential) of the area Partial compliance The CDMP provides a comprehensive coverage of the environment of the project area. The amount of data provided on the physical and biological environment adequately demonstrates that the local environment has been well documented and is well understood in terms of dredging risk. While there is an excellent coverage of the physical environment, social use of the area is only discussed briefly. However, refence to an environmental risk assessment (Eco Logical Australia 2020) suggests that there has been an assessment of social values of the area. It would be useful to add more information on social uses of the area or append the risk assessment to support the contention of only minor temporary impacts on uses such as fishing contained in Section 5.	Section 4 & 5
• *description of the material for disposal* – provide a summary of sediment types, their status relevant to the values in these Guidelines *Complies* Section 3 of the CDMP provides a summary of results of a considerable past sampling of sediments. This section also notes that DCCEEW have provided an exemption that further sediment sampling is not required.	Section 3

Item & Finding	Relevant Report Section
• *description of potential impacts* – address both potential short-term and long-term impacts and any uncertainties regarding the predicted impacts *Complies* The impacts section is a comprehensive treatment resting on an interpretation of a large amount of relevant data collected during and around previous dredging programs. Impacts are well considered based on previous experience. Note that there are no specific sections treating dugong (other than brief mentions) or Bryde's whale. This should be contingent on these species being demonstrated to be rare in the area – as requested in the review above.	Section 5
• *management strategies and actions* – describe strategies and actions to mitigate impacts – including specific and auditable measures; performance indicators; monitoring requirements; corrective actions; and responsibilities and timing for management and monitoring activities *Complies* Environmental objectives, monitoring and management strategies are supplied for all potential impacts identified in Table 11. Monitoring and management actions for turtles, dolphins, dugong and whales (supplied as general marine mammal guidelines and not specifically directed towards Bryde's whale) are set out in detail in section 6.4. Note – see Table 3 of this review for comments on likely effectiveness of nominated monitoring and management actions.	Table 11 Section 6
• *contingency arrangements* – identify corrective actions and contingency plans should undesirable or unforeseen impacts occur Partial compliance Table 11 lists corrective actions for all environmental risks – However, see Table 3 of this review for qualifications on the form of many of those corrective actions.	

Item & Finding	Relevant Report Section
While dredging is planned for the non-cyclone season, cyclones occasionally occur outside the normal period. There should be some discussion of what management would be put in place to avoid dredging when cyclonic conditions occur which could result in plume dispersal conditions outside those used in models of sediment transport.	
• *continuous improvement* – identify opportunities for continuous improvement to prevent, minimise or mitigate environmental impacts in the longer term *Complies* The CDMP uses results of past programs for continual improvement and commits to a substantial monitoring program directed at informing future dredging management.	
• *auditing requirements and reporting* – outline reporting and documentation standards, timing and responsibility of any auditing or reporting *Complies* Relevant auditing and reporting requirements are set out with timeframes. The only improvement suggested is that in 7.2 auditing is only targeted for 'minor capital dredging'. It should also occur during the major dredging works.	Section 7.2 & 7.4 & 7.7
• *review of management plan* – make provisions for a review of the management plan, including consultation with the TACC, to ensure it remains current. Partial compliance Section 7.6 allows for a review of the CDMP. However, text in 7.6 advises that BPDTAG (TACC) and WCCCA 'may' review the CDMP. This appears to be inconsistent with 'provisions for a review of'. Additionally, there is no commitment to review and update the plan should monitoring show that management actions are not working. In an extended campaign(s) such as planned here, such an update may be required.	Section 7.6

TABLE 3: Review comments by Section of the DMP: Condition 61 Assessment.

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
Overall: I found the document unclear regarding adaptive management responses. In many critical areas, the management actions listed in Table 11—meant to be triggered when environmental thresholds are exceeded—consist primarily of using data to inform future management decisions. While building knowledge is valuable, and may be an appropriate response for short-term dredging campaigns, it is not an effective form of adaptive management in the context of large capital dredging programs that run for several months. In such cases, immediate responses are essential to prevent or reduce environmental impacts. I could see no references to management actions in Table 11 designed to immediately stop or reduce potentially harmful environmental stresses derived from dredging and/or disposal activity. The document appendices do include staged triggers for harmful thresholds related to water quality and coral health, which follows best current dredging practices. In other recent large dredging projects, 'Alert' conditions lead to investigations or precautionary, low-cost interventions, while 'Alarm' conditions prompt immediate, active management to reduce environmental stress. Under 'Corrective Actions', Table 11 of the CDMP lists only using data to inform dredging management in future years. The water quality monitoring plan (see below) states that if an Alarm level is reached then there should be "the implementation of management actions by the dredge contractor to reduce turbidity levels". This is not implemented within Table 11 of the CDMP. Coral monitoring during dredging is stated to be implemented following Alarm levels of water quality, but without any discussion of what management would occur should coral health be shown to be negatively impacted by that water quality. In practice, effective adaptive management actions often involve significant financial costs. Therefore, it is essential that such measures are clearly defined and incorporated into the dredging contract from the outset. Without the capacity to halt dredging operations considered to cause environmental harm beyond that permitted, the CDMP is not likely to be effective were such events to occur.

FINDING	DOCUMENT REVIEWED
Water Quality Monitoring: The intent and methods of the water quality monitoring plan (WQ Plan) are well described. However, the effectiveness of the program should consider the following suggested improvements. Site Selection: Monitoring at the sensitive receptors provides a sound basis for evaluating whether water quality conditions at these sites are meeting requirements. Some extra sites between the source of impact and the sensitive receptors would act as early warning sentinels,	Water Quality Monitoring Plan - Amrun Port Capital Dredging. RTA Weipa Pty Ltd 18 September 2025

provide ground truthing for plumes observed in satellites, allow more confidence in assigning and origin to any exceedences and provide data to validate predictions of sediment dispersion in the impact hypothesis. Thresholds: Development of water quality thresholds requires further review against current science to confirm that the triggers selected are appropriate. Trigger development to safeguard coral health appears to be based on three studies: PCS (2020), Advisian (2016) and Erftemeijer et al. (2012) and is based ultimately on the risk of reducing light levels at the seabed. I agree with the use of light levels and an intensity-duration-frequency approach (IDF), but consider that the studies used have the potential to lead to incorrect IDF prescriptions. The PCS study was focussed directly on seagrass in the shallow flats around the Port of Weipa and not coral. It excluded treatment of water quality data from the instrument sited near the current project area and dealt with effects on seagrass at 5-10 m depth (depth being a major influence on light at the seabed) within an estuarine environment. The Advisian study cautions on the use of its triggers for coral health and the Erftemeijer study is now dated. The Western Australian Marine Science Institute's multi million dollar study of the effects of dredging on tropical and subtropical benthos, conducted over 8 years by researchers from AIMS, CSIRO and universities has provided a large range of relevant, peer reviewed, publications on the issue. Researchers from these programs have also worked with North Queensland Bulk Ports to ensure that the results can be extrapolated to Queensland conditions. The results of that study are not referenced. The thresholds developed here should be reviewed in context with the papers and reports from the WAMSI studies. In particular: Jones R, Fisher R, Bessell-Browne P, et al (2019) : *WAMSI Dredging Science Node Theme 4 Synthesis Report: Defining Thresholds and Indicators of Coral Response to Dredging-Related Pressures.* Theme 4 Final Synthesis Report. Prepared for the WAMSI Dredging Node, Perth, WA	

Adaptive Management (Sect 7.9): The Alert and Alarm staging of triggers is useful and complies with current best practice. Currently, the first response to an Alarm trigger is to evaluate whether the exceedance is dredging related before any action occurs. As this evaluation may be time consuming and evaluating whether an exceedence is dredging related is always problematic, this process should have a stated timeframe and some clear guidance as to what criteria will be used to make that decision. Any extended period of investigation of past events may mean an unacceptable stress lasts for longer than desirable before mitigation action is implemented.	
Coral Health Monitoring: Given the patchy/sparse nature of corals in the area, the management triggers suggested here seem excessive. At present, the monitoring program is unlikely to deliver the stated capacity to test the impact thresholds it establishes without a very high Type II error rate. With coral communities described as being patchy and existing at 4-6% cover in this area (CDMP Table 6), coral monitoring using transect/quadrat methods is likely to be subject to extreme variability. It is highly unlikely that the claim of a high power of detecting a 10% change can be met with the suggested methods (N.B. a 10% change in 4-6% cover means detecting a 0.4% change in real cover, when sampling variance of coral cover within a site over time is likely to be higher than estimated mean cover). Rather than using precise changes in coral cover, benthic monitoring would be better to address all sessile benthos (note that Table 6 of the CDMP lists other benthic categories at equal or greater abundance than corals) and use a multiple lines of evidence approach to employ all indicators of dredging impacts (Table 1 of the coral monitoring plan) in a holistic trigger scheme. The current coral monitoring plan is quite high level at this stage. One area where it needs elaboration is in the method of establishing the 'fixed' transects and how data will be collected. Should the plan's intent to capture coral data in a highly repeatable manner be maintained, it will be critical to have the "fixed" transects and quadrats physically marked and recorded by divers and not remote methods. Experience shows that despite claims of remotely	Coral Monitoring Plan Amrun Port Expansion Prepared For: RTA Weipa Pty Ltd Report Date 19 September 2025

deployed cameras recording 'fixed' areas, these techniques invariably introduce considerable variance as to exactly what area is recorded and the angle it is recorded at. Additionally, remotely deployed cameras are inefficient at recording coral recruitment. Small coral recruits are not discernible from images and often settle on vertical or inverted surfaces which are unable to be photographed. Comprehensive recording of recruitment occurring over timeframes such as envisaged here requires intensive diver-based observations.	
Marine Megafauna Management: The CDMP uses numbers of dead or injured turtles recorded as its indicator of the effectiveness of management in avoiding such impacts. In some cases, it uses the term 'entrained' to indicate the method of injury. Detecting turtles that have been entrained by a cutter suction or trailer dredge is almost impossible. In either case, the turtle is in pieces and deposited in the dredge hopper together with large amounts of spoil. Thus, detection of damaged turtles will be confined to those found in project waters. That statistic will depend on what systematic program is used to look for dead or injured turtles. The current description of 'daily monitoring' (CDMP Section 6.4.1) should be more precise on the resources used and areas surveyed each day to demonstrate a reasonable chance of finding injured/dead turtles. Section 6.4.1 of the CDMP states that where monitoring identifies more than two marine turtles killed within 24 hours, dredging will stop until an investigation is completed. However, Section 6.4.3 is more equivocal about what management would be implemented in such an event. Neither management response discusses what conditions would need to occur before dredging was restarted in an event where the investigation showed current dredging practice was responsible for the turtle deaths. Effectiveness would be improved if the above were rectified.	

CONCLUSIONS:

The current draft of the Capital Dredging Management Plan is a comprehensive treatment of the environmental issues relevant to the proposed dredging program. However, it requires some additions and amendments to comply fully with condition 14 of EPBC 2010/5642 and to make it effective in reaching its environmental outcome objectives.

In particular, the CDMP should describe what immediate measures to reduce environmental stress from dredging would be included in corrective actions should dangerous levels of water quality be identified at receptor sites.



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