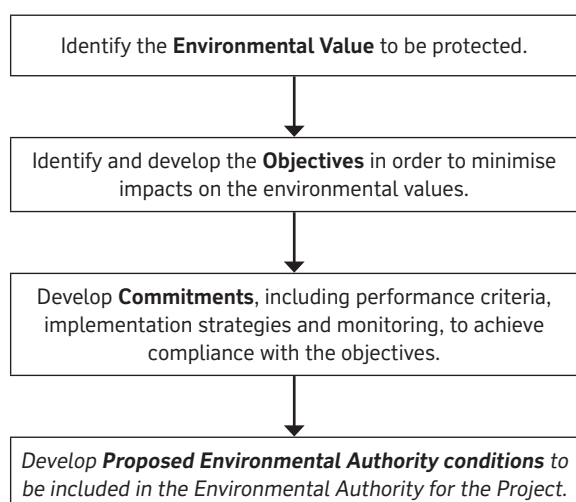


### 3. ENVIRONMENTAL VALUES, POTENTIAL IMPACTS, COMMITMENTS, PROPOSED DRAFT CONDITIONS AND SUPPORTING INFORMATION

#### 3.1 Content of the Section

This document has been designed incorporating the framework for drafting an Environmental Management Overview Strategy (EMOS), as outlined in the Queensland Environmental Protection Agency's "Guideline 8 – Preparing an Environmental Management Overview Strategy (EMOS) for Non-Standard Mining Projects". This document has been prepared in accordance with the following stages:



The guiding definitions for the terms used throughout this EM Plan are:

Environmental values: those qualities or physical characteristics of the environment conducive to ecological health, public amenity or safety.

Section 9 of the EP Act describes an "environmental value" as:

- a. "a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or
- b. another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation."

Objectives: Describes the key elements of the environment and the outcomes to be protected in order to minimise impacts on the environmental values.

Commitments: Defines the performance criteria and describes the implementation strategies (including technological and design elements together with management plans and strategies), and monitoring proposed to be undertaken to meet the objectives and achieve the performance criteria.

Proposed environmental authority conditions: Draft conditions containing measurable indicators and standards proposed to be included in the environmental authority to protect identified environmental values that may be affected by the Project. Note that the schedule and condition numbering in this document is not sequential as it is designed to facilitate consolidation with the schedules and conditions of the existing Environmental Authority (MIN100939109) for ML7024 and ML6024.

Indicators: The indicators by which the level of achievement of the environmental protection objectives can be determined, in a measurable and auditable way.

Performance criteria: Numerical standards or measurable outcomes for each of the indicators by which adequate levels of achievement of the environmental protection objectives and protection of the environmental values can be determined.

Words and phrases used throughout this EM Plan are defined in **Section 5**, except where identified in the EP Act or subordinate legislation. Where a word or term is not defined, the ordinary English meaning applies, and regard should be given to the Macquarie Dictionary.

#### 3.2 Proposed Environmental Authority Conditions: Schedule A – General Conditions

##### 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 K Plan 1 – Weipa General Area Plan and Plan 2 – Weipa Operational Areas.

**Table A1 Authorised Activities**

Mining Activities <sup>1</sup>	Mine Feature	Tenure	Maximum Surface Area of Disturbance (ha)	Map Reference (MGA 94)	
				Northing	Easting
Exploration	South of Embley Project area	ML7024	40	N/A	N/A
	Transport	ML6024	2	N/A	N/A
Extraction Areas	Mining Areas	ML7024	246,024 (Weipa and East Andoom) 100,319 (SoE)	N/A	N/A
Processing Activities	Boyd Beneficiation Plant	ML7024	262 <sup>2</sup>	N/A	N/A
	Norman Creek Beneficiation Plant	ML7024	5 <sup>2</sup>	N/A	N/A
Regulated Dams	Boyd Tailings Storage Facility	ML7024	82 <sup>2</sup>	8569825	567195
				8569825	569675
				8565185	567195
				8565185	569675
	Norman Creek Tailings Storage Facility	ML7024	1 <sup>2</sup>	8557545	578560
				8552305	578140
				8553185	580320
				8556665	576380
Water Supply Dam	Dam C (water supply dam and spillway)	ML7024	750	8566275	574055
				8566890	579665
				8564570	581175
				8561490	575595
Waste Disposal/ Treatment	Construction Camp Sewage Treatment Plant (South of Embley Project)	ML7024	0 <sup>2</sup>	8,570,955	570,640
	Boyd Infrastructure Area Sewage Treatment Plant	ML7024	N/A <sup>3</sup>	8,570,550	568,260
	Norman Creek Infrastructure Area Sewage Treatment Plant	ML7024	N/A <sup>3</sup>	8,557,730	576,035
Electricity Generation	Boyd Infrastructure Area Power Station	ML7024	0 <sup>2</sup>	8,570,485	568,305
	Norman Creek Infrastructure Area Power Station	ML7024	0 <sup>2</sup>	8,557,770	575,940
Chemical Storage Areas	Boyd Infrastructure Area	ML7024	N/A <sup>3</sup>	N/A	N/A
	Norman Creek Infrastructure Area	ML7024	N/A <sup>3</sup>	N/A	N/A
Motor Vehicle Workshops	Boyd infrastructure area	ML7024	N/A <sup>3</sup>	N/A	N/A
	Norman Creek infrastructure area	ML7024	N/A <sup>3</sup>	N/A	N/A
Construction camp	Construction camp (South of Embley Project)	ML7024	0 <sup>2</sup>	N/A	N/A
Dredging of marine sediments	Hey River Terminal	ML6024	2.5	8590950	597005
				8590950	597140
				8590665	597140
				8590665	597005
Barge/ferry terminals	Hey River Terminal	ML6024	3	8590830	597035
				8590755	597075
				8590620	596800
				8590700	596760
	Temporary seaborne access	ML7024	TBA	TBA	TBA
				TBA	TBA
Transport Corridor	Transport Corridor	ML6024	Entire Mining Lease	N/A	N/A

**Table A1 Authorised Activities**

Mining Activities <sup>1</sup>	Mine Feature	Tenure	Maximum Surface Area of Disturbance (ha)	Map Reference (MGA 94)	
				Northing	Easting
Water Treatment	Construction Camp Water Treatment Plant (SoE Project)	ML7024	0 <sup>2</sup>	8,570,870	570,735
	Boyd Infrastructure Area Water Treatment Plant	ML7024	N/A <sup>3</sup>	8,569,975	568,180
	Norman Creek Infrastructure Area Water Treatment Plant	ML7024	N/A <sup>3</sup>	8,557,345	575,600

<sup>1</sup> Mining activities include vegetation clearing

<sup>2</sup> Area of clearing in addition to that which would have been cleared for mining.

<sup>3</sup> Area of disturbance included in total infrastructure area under "Processing areas"

<sup>4</sup> Area of disturbance included in area under "Dredging of marine sediments"

A3 Access to the mining project via land authorised for that purpose by the *Mineral Resources Act 1989* (Qld) is subject to the conditions of this environmental authority.

#### Maintenance of Measures, Plant and Equipment

A4 The holder of this environmental authority must:

- a. install reasonable and practicable measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority; and,
- b. maintain such measures, plant and equipment in a proper condition; and,
- c. operate such measures, plant and equipment in a proper manner.

A5 No change, replacement or alteration of any plant or equipment is permitted if the change, replacement or alteration substantially increases, or is likely to substantially increase the risk of environmental harm caused by the mining activities.

#### Monitoring & Reporting

A6 Each time a Plan of Operations is prepared or amended, 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 and amended as promptly as necessary to meet that objective.

A7 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.

A8 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.

A9 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

A10 The environmental authority holder must provide a financial assurance of an amount determined by the administering authority in accordance with the administering authorities Guideline – *Financial Assurance for Mining Activities*, 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

A11 The holder of this environmental authority must develop and implement a risk management system for mining activities within twelve (12) months from the date of issue of this environmental authority which conforms to the Australian Standard for Risk Management (AS/NZ 4360:2004) or the latest edition of Australian Standard for Risk Management.

### Emergency Response/Contingency

- A12 An emergency response/contingency plan must be developed and implemented to respond to emergency events and incidents. This plan is to be provided upon request to the administering authority.
- A13 The emergency response/contingency plan must be developed in accordance with the most recent version of ISO14001 standard must include but not be limited to the following matters:
- response procedures which aim to minimise the extent and duration of environmental harm; and,
  - procedures to investigate the cause of the event or incident and remedial actions to be taken to prevent a recurrence;
  - timely and accurate reporting of the circumstance and nature of incidents to the administering authority;
  - procedures for accessing monitoring points during incidents; and
  - procedures to notify any person who may be affected by the event within twenty-four (24) hours, with the following information to be provided at a minimum:
    - the location of the release; and,
    - the date and time of the release; and,
    - the estimated quantity and type of any substances (if in available concentrations) involved in the incident; and,
    - the potential impacts to environmental values, livestock and public health caused by the release.

### Notification of Emergencies, Incidents and Exceptions

- A14 The holder of this environmental authority must notify the administering authority by telephone, email or facsimile, as soon as reasonably possible (no later than 24hrs) after becoming aware of:
- any emergency or incident which results in the release of contaminants not in accordance with, or reasonably expected to be not in accordance with the conditions of this environmental authority, or,
  - any monitoring result that indicates an exceedance of any environmental authority limit.

- A15 The notification must include but not be limited to the following:
- the environmental authority number and name of the holder; and,
  - the name and telephone number of the designated contact person; and,
  - the location of the emergency or incident; and,
  - the date and time of the incident; and,
  - the time the holder of this environmental authority became aware of the incident; and,
  - the estimated quantity and type of substances involved in the incident, if known; and,
  - the cause of the incident if known; and,
  - a description of the nature and effects of the incident including risks to the environment, public health or live stock, if known; and,
  - immediate actions taken to prevent or mitigate any further environmental harm caused by the release; and,
  - details of any notification of persons who may be affected by the event.
- A16 Within fourteen (14) days or as otherwise agreed, following the initial notification of an emergency, incident or exceedance, further written advice must be provided to the administering authority including the following:
- results and interpretation of any samples taken and analysed; and,
  - outcomes of actions taken at the time to prevent or minimise unlawful environmental harm; and,
  - proposed actions to prevent a recurrence of the emergency or incident.

### Transition to New Standards

- A17 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:
- 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.

### Complaints

A18 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. reason 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.

A19 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 and 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.

### Community

A20 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.

### Third Party Auditing

A21 Compliance with the conditions of this environmental authority must be audited by a suitably qualified third party auditor nominated by the holder of this environmental authority and accepted by the administering authority within one (1) year of the commencement of this environmental authority and then at regular intervals not exceeding once every three (3) years. A copy of the final audit report will be submitted to the administering authority upon request.

A22 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.

### END OF CONDITIONS FOR SCHEDULE A

### 3.3 Air Quality

#### 3.3.1 Value/Background

The relevant environmental values to be enhanced or protected are defined by the *Environmental Protection (Air) Policy 2008* (Qld) (EPP (Air)) as:

- the qualities of the air environment that are conducive to protecting the health and biodiversity of ecosystems; and
- the qualities of the air environment that are conducive to human health and wellbeing.

The Project area is situated in a mostly undeveloped and remote part of Cape York. Bushfires are common and result in particulate and greenhouse gas emissions. To the north of the Project area are the townships of Weipa and Napranum, which are approximately 4km from the closest mining areas and 40km from the Boyd infrastructure area and proposed port. To the south of the Project area is the township of Aurukun, which is 15km from the nearest mining areas and 35km from the Norman Creek infrastructure area (see **Figure 1**). There are several homesteads on the remote cattle stations more than 50km to the east of the Project area. The nearest sensitive receptors are shown on **Figure 9**.

#### Particulate Matter (Dust)

The air environment of the Project area is described in detail in RTA (2011) and RTA (2012). The ambient dust levels for Weipa, Napranum and Aurukun that have been adopted are based on monitoring of PM<sub>10</sub>, total suspended particulate (TSP) and dust deposition undertaken by RTA in Nanum in 2009. The ambient air quality values measured in Nanum (part of Weipa) are shown in **Table 3-1**.

**Table 3-1 Ambient Air Quality (Nanum, 2009)**

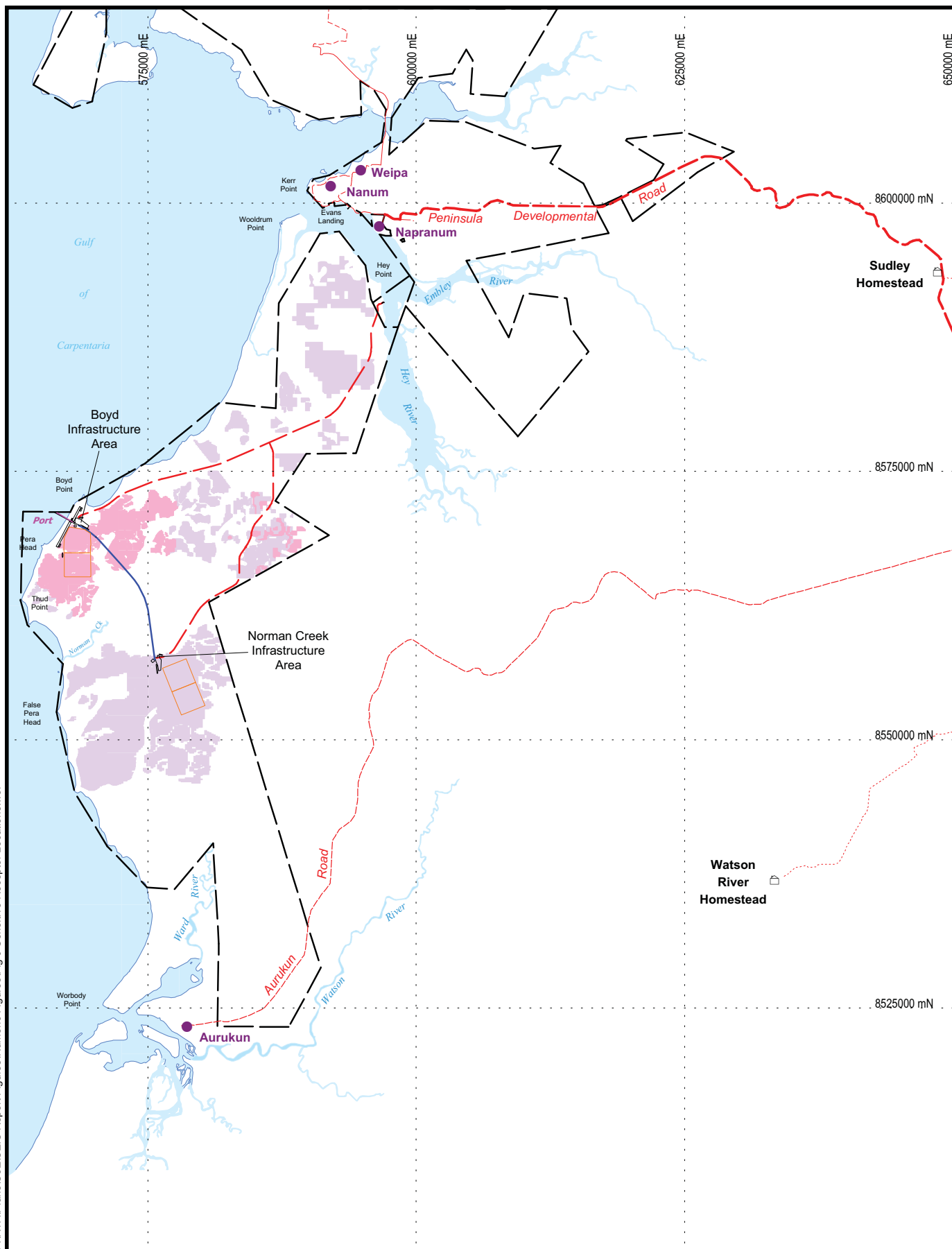
Indicator	Ambient Air Quality	Averaging Period
PM <sub>2.5</sub> *	8 µg/m <sup>3</sup>	24 hours
PM <sub>10</sub>	40 µg/m <sup>3</sup> (90 <sup>th</sup> percentile)	24 hours
TSP	56 µg/m <sup>3</sup> (90 <sup>th</sup> percentile)	Annual average
Deposited dust	86 mg/m <sup>2</sup> /day (maximum valid month)	30 days ± 2 days

\* The PM<sub>2.5</sub> values has been estimated as 20% of the measured PM<sub>10</sub> (24-hour) based on the consultant knowledge of monitoring in North Queensland.

The ambient levels for Napranum and Aurukun will be likely to be lower than Weipa due to the increased distance from existing dust sources. However, as air quality criteria are based on health protection criteria rather than ambient levels, the higher the ambient level assumed for the modelling, the more conservative the approach. Therefore, the ambient levels are assumed to be the same across Weipa, Napranum and Aurukun.

#### SO<sub>x</sub> and NO<sub>x</sub>

There have not been any measurements of existing levels of NO<sub>x</sub> or SO<sub>2</sub> in Weipa. The existing power station and vehicle fleet in the region would be the main contributors. The *Queensland 2007 Air Monitoring Report* (EPA 2008) states the annual mean for NO<sub>2</sub> is between four parts per billion (ppb) and 8ppb for various industrial locations in Queensland. For SO<sub>2</sub>, the annual mean is reported to be between one and 2ppb. The maximum one-hour NO<sub>2</sub> level is typically 40ppb. For SO<sub>2</sub> the level is typically 5ppb for the maximum one-hour and 3ppb for the maximum 24-hour average. These values have been adopted as ambient concentrations for the Project area. Given they mostly relate to industrial areas (Townsville, Gladstone, etc.) they are likely to be elevated compared to existing levels in Weipa. As for particulates, this is a conservative approach to the modelling given that air quality criteria are based on health protection criteria rather than ambient levels.



**Rio Tinto Alcan**

- RTA Mining Lease boundary
- Township (Sensitive Receptor)
- ⊡ Homestead (Sensitive Receptor)
- Road/track
- Tailings storage facility
- Mining Years 1 -13
- Mining Years 14 - 40

**South of Embley Project**

**Fig 9:  
Sensitive Receptor Locations**



5 0 5 10km

Datum/Projection: GDA94/MGA Zone 54 Date: 12/12/2011



### Visual Amenity and Light

Due to the remote location of the site, there are currently no permanent lighting sources in the Project area.

There are no permanent residences in the Project area. The nearest residential areas are in Weipa and Napranum, located north of the Project area, and Aurukun located to the south. These communities are located away from the main Project components. There are no gazetted public roads that traverse the Project area and hence no viewpoints accessible from public roads. However, the general public do use various tracks in the Project area. Members of the general public wishing to access the lands covered by the Project area require a permit from the Aurukun Shire Council.

Traditional Owners regularly visit outstations in the Project area, including Amban (False Pera Head), Waterfall (near Ina Creek), and Six Ti-Tree (located a short distance south of Ina Creek) during the dry season to go camping, fishing and undertake other activities. The major Project components are not visible from these locations; however they may be visible from roads accessing these areas.

The Hey River barge/ferry terminal is a minor development on the shoreline of the Hey River that has a low impact on visual amenity. The Hey River terminal is located within an undeveloped section

of the Hey River and is not directly visible from Napranum. A low glow from lighting at the terminal may be visible, however it is expected this would have low impact.

### 3.3.2 Objectives

The environmental protection objective for air quality is to minimise the impacts of mine-derived air pollutants on sensitive receptors beyond the boundaries of the SoE Project.

The environmental protection objective for lighting is to minimise the impacts of lighting on sensitive places.

### 3.3.3 Commitments

#### Performance Criteria

The performance criteria for air quality are:

- Compliance with the requirements of the environmental authority (including proposed limits shown in **Table 3-2**); and
- The number of air quality complaints in relation to SoE operations.

The performance criteria for lighting is:

- the number of lighting complaints in relation to SoE operations.

**Table 3-2 Proposed SoE Air Quality Criteria**

Indicator	Receptor	Air Quality Objective	Averaging Period	Comment	Source
Dust deposition	Residences	120 mg/m <sup>2</sup> /day	one month	Monitored in accordance with the most recent version of Australian Standard AS3580.10.1 <i>Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited matter – Gravimetric method</i>	DERM Guideline
PM <sub>10</sub>	Residences	50 µg/m <sup>3</sup>	one day	Monitored in accordance with the most recent version of the relevant Australian Standard for measuring 10 micrometres (PM10) suspended Note: Five (5) days of exceedences allowed each year including natural causes	EPP(Air)
TSP	Residences	90 µg/m <sup>3</sup>	one 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	EPP(Air)



## Implementation Strategy

### Particulate Matter

The predicted particulate concentrations at the sensitive places closest to the Project are shown in **Table 3-3**. The ground level concentrations at the sensitive places include the ambient background concentrations.

**Table 3-3 Predicted Particulates at Sensitive Residential Receptors at 50Mdtpa**

Receptor	Predicted Particulate Levels for Sensitive Receptors (Including Ambient Levels)				
	Maximum PM <sub>10</sub> (24 Hour) – Fifth Highest in a Year [µg/m³]	Maximum PM <sub>2.5</sub> (24 Hour) [µg/m³]	PM <sub>2.5</sub> (Annual Average) [µg/m³]	Total Suspended Particulate (TSP) (Annual Average) [µg/m³]	Dust Deposition (Highest Month) [mg/m²/day]
Proposed Criteria	50	N/A	N/A	90	120
Existing Ambient	40	81	5 <sup>2</sup>	56	86
Weipa	45	10	5	56	87
Napranum	45	9	5	56	87
Aurukun	45	10	5	56	88

<sup>(1)</sup> 20% of PM<sub>10</sub> 24-hour

<sup>(2)</sup> 20% of PM<sub>10</sub> annual average.

The model incorporates standard dust-suppression techniques, such as haul-road watering. The particulate emissions from the Project are expected to readily comply with all particulate air quality objectives at the nearest sensitive places. Apart from the conventional haul-road watering and water sprays on chutes where trucks dump crude ore into the beneficiation plant, which was incorporated into the modelling, no further mitigating measures are required.

### SO<sub>x</sub> and NO<sub>x</sub>

The diesel-fired power station(s) (and mobile equipment) are sources of NO<sub>2</sub>. The predicted SO<sub>2</sub> and NO<sub>2</sub> concentrations at the sensitive places closest to the Project are shown in **Table 3-4**. The ground level concentrations at the sensitive places include the ambient background concentrations.

**Table 3-4 Predicted NO<sub>2</sub> Concentrations at Sensitive Residential Receptors at 50Mdtpa**

Receptor	Predicted Concentrations for Sensitive Receptors				
	Maximum NO <sub>2</sub> (one hour) [ppb]	Annual Average NO <sub>2</sub> [ppb]	Maximum SO <sub>2</sub> (one hour) [ppb]	Maximum SO <sub>2</sub> (one day) [ppb]	Annual Average SO <sub>2</sub> [ppb]
Existing Ambient	40	6	5	3	1.5
Weipa	52	6	6	3	1.5
Napranum	51	6	6	3	1.5
Aurukun	51	6	5	3	1.5

The NO<sub>2</sub> and SO<sub>2</sub> concentrations from the Project are expected to comply with all air quality objectives at the nearest sensitive places. There is no need for any special mitigating measures. Stack height, exit velocity and gas volume flow rate at the power station(s) will be sufficient to ensure dispersion. Air contaminants will be released at a mass emission rate and concentration such that they do not exceed the contaminant limits stated in the Environmental Authority.

### Monitoring

An Ambient Air Quality Monitoring Program for monitoring particulate emissions will be developed and implemented prior to commencement of operations. Particulate emissions will be monitored at Nanum, Napranum, Rocky Point and the Scherger RAAF base as well as a reference site. If monitoring indicates the SoE air quality criteria have been exceeded, RTA will promptly implement dust abatement measures.

Prior to commissioning the Boyd and Norman Creek Power Stations, RTA will review the existing Weipa Stack Emission Monitoring Program (SEMP) to ensure adequacy for the Boyd and Norman Creek Power Stations or develop a new SEMP for the Boyd and Norman Creek Power Stations. The SEMP will be implemented within three months of commissioning to monitor and record the release of contaminants from the Boyd and Norman Creek Power Stations. Contaminant limits will be determined based on the results of the SEMP completed at each power station.

### 3.3.4 Proposed Environmental Authority Conditions: 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 levels identified in Table B1 – Ambient Air Quality Limits when measured at any sensitive or commercial place:

**Table B2 Ambient Air Quality Limits**

Contaminant	Limit	Methodology
Dust deposition	120 milligrams per square metre per day, averaged over one (1) month	Monitored in accordance with the most recent version of Australian Standard AS3580.10.1 <i>Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited matter – Gravimetric method</i>
Particulate matter with an aerodynamic diameter of less than 10 micrometres (PM <sub>10</sub> ) suspended in the atmosphere	50 micrograms per cubic metre over a one (1) day averaging time	Monitored in accordance with the most recent version of the relevant Australian Standard for measuring 10 micrometres (PM <sub>10</sub> ) suspended Note: Five (5) days of exceedences allowed each year including natural causes
Particulate matter (TSP) suspended in the atmosphere	90 micrograms per cubic metre over a one (1) year averaging time	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.

that emissions of dust generated by the mining activities cease to exceed the limits in Condition (B3).

#### Ambient Air Quality Monitoring

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

B6 By 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 K Plan 3 – Air Quality Monitoring Sites.

**Table B2 Location of Particulate Monitoring Stations**

Site	Northing (GDA94)	Easting (GDA94)	Location
<b>Compliance</b>			
1	8,602,161	593,928	Nanum
2	8,599,189	597,145	Napranum
3	8,604,509	596,646	Rocky Point
<b>Reference</b>			
4	8,604,828	618,016	Scherger RAAF Base

**Light**

B7

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.

**Point Source Releases to Air –Power Stations**

B8

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

**Table B3 Location of Particulate Monitoring Stations**

Release Point/ Monitoring Location	Source Description	Minimum Release Height (m)	Minimum Exit Gas Temperature (°C)	Minimum Efflux Velocity (m/s)
Boyd power station	Boyd infrastructure area	6	300	15
Norman Creek power station	Norman Creek infrastructure area	6	300	15

B9

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. in accordance with the criteria listed in Table B3 – Release Points; and  
c. released at a mass emission rate and concentration that does not exceed the limits stated in Table B4 – Contaminant Limits.

**Table B4 Contaminant Limits**

Contaminant	Limit Type	Release Limit	Release Limit Units	Minimum Monitoring Frequency
Oxides of Nitrogen (expressed as NO <sub>2</sub> )	Maximum	TBD	mg/Nm <sup>3</sup> (dry) @ 3% O <sub>2</sub>	All stacks must be monitored in accordance with the Stack Emission Monitoring Program to be developed in accordance with Condition (B10) and (B11).
Carbon Monoxide	Maximum	TBD	mg/Nm <sup>3</sup> (dry) @ 3% O <sub>2</sub>	

Note: Stack emission limits in Table B4 – Contaminant Limits are to be determined based on the results of the Stack Emission Monitoring Program completed at each power station in accordance with Conditions (B10) and (B11).

- B11 Prior to commissioning the Boyd and Norman Creek Power Stations, the holder of this environmental authority must review the existing Weipa Stack Emission Monitoring Program (SEMP) to ensure adequacy for the Boyd and Norman Creek Power Stations or develop a new SEMP for the Boyd and Norman Creek Power Stations. The SEMP must be implemented within three months of commissioning to monitor and record the release of contaminants from the Boyd and Norman Creek Power Stations. A copy of the draft SEMP must be provided to the administering authority prior to its implementation and due consideration given to any comments made on the SEMP by the administering authority.
- B12 When requested by the administering authority, the density of smoke released from an exhaust stack at the Power Stations listed in Table B3 – Release Points must be monitored using the Ringelmann method to investigate any complaint of environmental nuisance at any sensitive place or commercial place. Smoke emissions from the licensed place are not considered to be environmental harm if monitoring shows the density of smoke from any exhaust stack serving a generator unit on the mining lease 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.
- B14 The holder of this environmental authority must develop and implement and keep records of a monitoring program of contaminant releases to the atmosphere at the release points identified in Table B3 – Release Points at a frequency and for the contaminants specified in Table B4 –Contaminant Limits and which complies with the following:
- 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*; and,
  - all determinations of contaminant releases to the atmosphere must be made in accordance with methods prescribed in the most recent version of the Department of Environment and Resource Management *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; and,
- the following tests must be performed for each sample taken at each release point specified in Table B3 – Release points:
    - gas velocity, volume and mass flow rate; and,
    - temperature and oxygen content; and,
    - water vapour concentration (for non-continuous sampling).
  - samples taken must be representative of the contaminants discharged when operating under maximum operating conditions; and,
  - during the sampling period the following additional information must be gathered:
    - plants throughput rate at the time of sampling; and,
    - fuel type and consumption rate; and,
    - any factors that may influence odour and particulates emissions; and,
    - the odour and particulates treatment system operating, system status and rate; and,
    - reference to actual test methods and accuracies.
- Meteorological Monitoring**
- B15 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.
- B16 The portable meteorological station referred to in Condition (B15) 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*.
- B17 The holder of this environmental authority must record, compile, evaluate and keep all monitoring records obtained from the portable automatic meteorological station.
- END OF CONDITIONS FOR SCHEDULE B**

### 3.4 Greenhouse Gas Emissions

#### 3.4.1 Value/Background

The environmental values of the air environment to be enhanced or protected are the qualities that make the air environment suitable for the life, health and well-being of humans.

A summary of the projected greenhouse gas (GHG) emissions is shown in **Table 3-5**. The estimate of emissions from all Project components under the 50Mdtpa production scenario is 508kt CO<sub>2</sub>-e per annum. By comparison, GHG emissions in

Australia were estimated to be 537,000kt CO<sub>2</sub>-e in 2009 (DCCEE 2010a) and 181,000kt CO<sub>2</sub>-e from Queensland in 2007 (DERM 2009a).

Similar to current Weipa operations, land clearing is the largest contributor of GHG emissions. At higher mining rates there is greater operational efficiency as the intensity of GHG emissions are predicted to decrease from 0.0121t CO<sub>2</sub>-e/t bauxite under the 15Mdtpa production scenario to 0.0102t CO<sub>2</sub>-e/t bauxite under the 50Mdtpa production scenario. The estimate of diesel used for power generation includes electricity supply to Weipa township.

**Table 3-5 Predicted Energy Use and Greenhouse Gas Emissions at 15, 30 and 50Mdtpa**

Production Rate		Units	15Mdtpa	30Mdtpa	50Mdtpa
<b>Input Data</b>	Diesel used for power generation*	kL	26,100	46,100	70,100
	Diesel used for transport	kL	11,700	23,100	38,400
	Cleared land	ha	500	580	1,360
	Rehabilitated land	ha	290	850	1,360
<b>Greenhouse Gas Emissions</b>	Power generation	t CO <sub>2</sub> -e	69,740	121,100	187,400
	Transport	t CO <sub>2</sub> -e	31,600	62,300	103,500
	Vegetation cleared	t CO <sub>2</sub> -e	81,700	138,800	222,100
	Less vegetation sink (rehab)	t CO <sub>2</sub> -e	1,100	3,300	5,300
	Total	t CO <sub>2</sub> -e	181,840	318,900	507,700
	Intensity	t CO <sub>2</sub> -e/t bauxite	0.0121	0.0106	0.0102

\* Includes electricity supply for Weipa which would be supplied from the existing East Weipa power station. Conversion factors and methodology described in DCCEE (2010b).

#### 3.4.2 Objectives

The environmental protection objective for GHG is to minimise GHG emissions.

#### 3.4.3 Commitments

##### Performance Criteria

Greenhouse gas performance will be measured as emissions of greenhouse gases (CO<sub>2</sub> equivalents) per tonne of bauxite produced.

Overall efficiencies will be gained as production increases, as shown in **Table 3-5**. However, within each production scenario, greenhouse gas emissions will vary considerably from year to year, depending on production levels and activities. For example, areas close to the beneficiation plants are likely to be mined first, which means haul distances will increase over time, decreasing the greenhouse gas efficiency of production.

##### Implementation Strategy

To ensure greenhouse gas generation from the Project is minimised to the extent practicable, the following actions will be undertaken:

##### Engineering and Design

- diesel efficiency considerations will be included in assessments of new mobile and fixed equipment to optimise diesel use and reduce GHG emissions from combustion; and
- electrical efficiency considerations will be included in assessments of fixed plant and equipment to reduce on-site electricity and hence diesel use.

##### Training

- greenhouse gas awareness training will occur at induction to make employees aware of the science of climate change and efforts to minimise emissions.

### Operations and Maintenance

- equipment will be regularly maintained to retain high levels of diesel and electrical efficiency;
- a process for regular review of new technologies to identify opportunities to increase diesel and electrical efficiency will be adopted;
- vegetation clearing will be minimised to that essential for the Project;
- progressive rehabilitation will be undertaken; and
- mine plans will be optimised to ensure haul routes are planned efficiently.

At a corporate level, RTA will continue to participate in relevant research, development and improvement programs to identify energy efficiency and greenhouse abatement opportunities. RTA will also continue to participate in the Australian Government Energy Efficiency Opportunities (EEO) program, which encourages large, energy-using businesses to improve their energy efficiency.

### Monitoring

The following monitoring will be undertaken:

- regular energy audits will be conducted to identify inefficient equipment or operating procedures;
- diesel use will be measured;
- an inventory of GHG emissions and sinks will be developed and maintained; and
- GHG emissions from all relevant activities will be reported externally in accordance with the Commonwealth Government's *National Greenhouse and Energy Reporting Act 2007*.

Environmental authority conditions are not applicable for greenhouse gas as greenhouse gas emissions are managed under legislation other than the EP Act.

## 3.5 Land Management

### 3.5.1 Value/Background

#### Land Use

Lands within the Project area are not used for agriculture and are relatively undisturbed by development. There are no rural properties within the Project area. Tracks to various parts of the Project area are used by recreational vehicle users, Traditional Owners and for access for exploration. Exploration activities, including drilling and associated road development, have taken place throughout the Project area and on-going activities such as surveying, drilling, ore sampling, geotechnical investigations, creation of associated road and/or vessel access, temporary accommodation and other exploration activities are continuing.

While overall there has been very little direct disturbance and the terrestrial environment is generally in good condition, some areas have been affected by camping and rubbish dumping, and some areas have been significantly affected by the frequent fire regime and damage from feral pigs. The effect of the current fire regime on the *Eucalyptus tetrodonta* ecosystem has been the development of a homogeneous vegetation structure that varies little throughout the Project area.

The topography within the Project area comprises a gently undulating bauxite plateau landform cut by a network of rivers and smaller creeks. Landfall is from the east to the west toward the Gulf of Carpentaria. There are bauxite cliffs along the coastline, particularly between Boyd Point and Thud Point. The highest elevations (95m AHD) within the Project area are along the eastern boundary. A number of semi-perennial watercourses, plus numerous smaller ephemeral creeks traverse the Project area and flow in a westerly direction eventually discharging into the Gulf of Carpentaria. There are large estuaries associated with the Hey, Embley and Ward rivers.

The main bauxite reserves lie in the Pera Head and Boyd Point areas, south of Norman Creek, and the Hey Point area. The areas to be mined comprise *E. tetrodonta* woodlands on bauxite plateaus. Approximately 27,709ha of woodland will be cleared for mining over the life of the Project. The bauxite resource and reserves are located on the bauxite plateau. Bauxite is not usually found in the main drainage lines.

Surrounding land uses include bauxite mining and associated infrastructure to the north and native ecosystems used by Aboriginal people to the east and south. The eastern side of ML 7024 adjoins the Aurukun bauxite resource, a designated "restricted area" pursuant to part 188 of the *Mineral Resources Regulation 2003*. Further east there are a number of large cattle stations (see **Figure 9**).

#### Soils

Most of the area to be disturbed contains Red Kandosol soil type on slightly elevated plains with a level to gently undulating surface. Red Kandosols have a topsoil depth of 100 to 200mm. There are smaller areas of Yellow Kandosols and Yellow Kandosol acid soils in areas of lesser drainage and on lower slopes fringing drainage lines. The Kandosol soils are weathered and extremely infertile, and support vegetation adapted to such conditions. Nutrients such as nitrogen, calcium and potassium are concentrated in the surface 0.1m of soil, due to nutrient recycling in the litter layer. This layer represents the main nutrient storage capacity for tropical soils, and therefore will need to be preserved to facilitate rehabilitation following mining. The majority of seed readily able to germinate is present in the upper 50mm of soil.



The Kandosol soil types in mid to upper landscape positions have low potential to develop accelerated erosion when cleared of vegetation for mining or infrastructure development. The predominantly sandy surface soils, together with the low slopes on the bauxite plateau, facilitate infiltration and reduce the rate of runoff and low risk of erosion. Redoxic Hydrosols occur in the narrow drainage lines and along their margins and Orthic Tenosols occur on the very coastal margin. The Hydrosol and Tenosol soil types have a higher erosion potential. Any of these areas to be disturbed by the Project have a risk of erosion during the wet season.

#### Land Suitability

The suitability of each soil type within the Project area for low and medium input pasture and high input pasture was assessed. The Agricultural Land Classification for each soil type was also assessed, based on the agricultural land class definitions in the guidelines for the identification of Good Quality Agricultural Land (DPI and DHLGP 1993). The outcome of the land suitability assessment shows none of the soil types within the Project area are suitable for improved pasture land uses. Most of the soils (95% of the Project area) are suitable for low-intensity grazing of native pastures due to their very low fertility status. Soils associated with estuarine areas and near coastal plains within the Project area are not suitable for any improved pasture or native pasture grazing land uses. The Agricultural Land Classification assessment showed there is no Good Quality Agricultural Land within the Project area.

Mining involves removing around one metre of soil and overburden above the bauxite and then excavating the bauxite. The overburden will be returned to mined-out pits and then soil will be re-spread during rehabilitation. The final landform will be at a lower elevation than the original landform due to the removal of the bauxite, but the overall slope of the landform will be similar. Overall, the post-mining land suitability for low-intensity grazing is likely to be the same as the pre-mining suitability. The rehabilitated TSFs shall be an exception, and will not be suitable for low-intensity grazing.

RTA's objective for the rehabilitation of areas disturbed by Project mining activities is to establish a self-sustaining vegetation community using appropriate local native tree, shrub and grass species. Under the WCCCA and at the request of the WCCCC, RTA may establish post-mining land use options other than those required by regulation, subject to obtaining all necessary government approvals. While it is not currently envisaged that land uses other than native vegetation be established, RTA shall consult with Traditional Owners about rehabilitation objectives and rehabilitated land completion criteria and objectives.

#### Contaminated Land

Lands south of the Embley River are relatively undisturbed by development. Some cattle grazing took place within the Project area in the early to mid-1900's and some limited logging and sawmilling activity also took place during this period and has been discontinued (Venn 2004). Exploration activities have taken place throughout the Project area. While there has been domestic rubbish dumping at some camping locations, there is no known historic land contamination south of the Embley River.

Searches of the Environmental Management Register (EMR) and Contaminated Land Register (CLR) were undertaken to identify land parcels that will be disturbed by the Project and that may be contaminated from past and current Notifiable Activities, and/or that are known to be contaminated. No land parcels that will be disturbed by the Project are currently registered as contaminated land on the CLR.

#### Mineral Waste

The subsoil and overburden above the bauxite are benign. Generally, the subsoil and overburden stripped from a new mining area are taken directly to an existing mined-out area awaiting rehabilitation. The final landform will not have any out-of-pit dumps of excavated wastes. Therefore, there is no risk of soil or water contamination from excavated subsoil and overburden.

The principal mineral waste at the site will be tailings from the processing of the bauxite, known as beneficiation. Beneficiation involves separation of the bauxite and waste materials through crushing, screening, washing and dewatering. No chemicals are added to the process. This process produces tailings consisting of water, fine bauxite pisolites, sands and clays. Approximately 0.4Mt of tailings is produced for every 1Mdpt of bauxite. Depending on the source of crude ore, the geotechnical classification of tailings ranges from a sandy silt with clay to a clayey silt.

Bauxite tailings are benign. Representative tailings solids and tailings liquid samples were collected from the existing East Weipa and Andoom tailings storage facilities and analysed for the specified tailings constituents used to define a hazardous dam (EPA 2003). The tailings solids samples were also analysed for metals and evaluated in terms of enrichment. The results show:

- the concentrations of all constituents in tailings solids and tailings liquid are at least an order of magnitude less than the specified criteria (EPA 2003) for hazardous waste and therefore the tailings are not hazardous;
- the concentration of all measured constituents in tailings water is less than the ANZECC (2000) freshwater guidelines with the exception of aluminium;



- bauxite tailings do not trigger the EPA environmental investigation limit (EIL) for contaminated land in Queensland;
- bauxite tailings are not significantly enriched in any metal when compared to average crustal abundance using the GAI (Bowen 1979). The DME/DEH (1995) guideline entitled *Assessment and Management of Acid Drainage* states “a GAI of greater than three indicates significant enrichment to a level that warrants further examination”. None of the metals have a GAI greater than three; and
- bauxite tailings are not enriched in any metal when compared to crude bauxite ore.

An earlier assessment of fine tailings from Andoom by the National Research Centre for Environmental Toxicology (Noller 2002) concluded:

*“The chemical properties of Andoom ultrafine tailings, being essentially soil, suggest that there is unlikely to be any hazard associated with leaching by tropical rainwater as the material is already highly leached”.*

Given the GAI of one for aluminium in tailings, the assessment by Noller (2002) and the concentration of aluminium in recovery slots; aluminium in tailings is not expected to significantly impact on the environment.

#### Acid Sulphate Soils

The Hey River barge terminal has been identified as potentially containing Potential Acid Sulphate Soils (PASS), based on elevation and soil type. Construction at the Hey River barge/ferry terminal will involve an area of about 4,400m<sup>2</sup> being reclaimed and supported by rock revetment and/or sheet piles. This activity triggers the criterion listed in Section 2.3 of State Planning Policy 2/02: Planning and Managing Development involving Acid Sulphate Soils. To meet the requirements of this policy, ASS investigations were undertaken of soil at the Hey River barge/ferry terminal. The methodology and results of the ASS investigations are presented in RTA (2011). The results showed if material represented by the samples tested was to be placed on land, the addition of lime to manage acid generation is not required.

The results of chemical analyses undertaken on material to be dredged at the Hey River barge/ferry terminals are discussed in **Section 3.7**.

#### Summary of Environmental Values

The environmental values of the land that are to be protected or enhanced are:

- The integrity of topsoil as a resource to be used in rehabilitation;

- The maintenance of a stable, non-polluting landform; and
- The suitability of land for beneficial post-mining land use.

#### 3.5.2 Objectives

The objectives to protect the environmental values of the mined land are:

- The land disturbed by mining activities will be rehabilitated and made safe for humans and wildlife, non-polluting, stable and able to sustain the proposed post-mining land use; and
- The post-mining land use will be appropriate native vegetation ecosystems. At the request of the WCCCC, RTA may establish post-mining land use options other than those required by regulation, subject to obtaining all necessary government approvals.

#### 3.5.3 Commitments

##### Performance Criteria

The performance criteria for land management are:

- Compliance with the requirements of the environmental authority; and
- Rehabilitation of areas disturbed by mining activities and infrastructure to a stable landform with a self-sustaining vegetation cover able to sustain the proposed post-mining land use.

##### Implementation Strategy

##### Erosion and Sediment Control

The proposed erosion and sediment control measures to be employed throughout the life of the Project are summarised below:

- The *Engineering Guidelines for Queensland for Soil Erosion and Sediment Control* (IE Aust 1996) will be followed;
- Restrict clearing to areas essential for mining to minimise length of time soil is exposed;
- Traffic will be confined to maintained tracks and roads;
- Vegetation clearing for mining will occur following the wet season;
- Vegetation buffers will be established, which provide “setback” distances of mining areas from riparian, wetland and estuarine vegetation, to minimise sediment transport into streams and to protect sensitive vegetation types;
- Storm water and runoff from upstream catchments will be diverted away from active mining and disturbed areas;

- Active mining pits and backfilled pits awaiting rehabilitation will be lower than surrounding landform, which effectively provides internally draining sumps that contain storm water runoff. Contained storm water runoff then infiltrates through the pit floor and walls;
- Areas disturbed by mining activities and infrastructure are to be rehabilitated to a stable landform with a self-sustaining vegetation cover and where possible post mining drainage flows will emulate pre mining flows;
- In the event that active or backfilled pits are not fully internally draining, storm water runoff would be directed via a sediment pond;
- Where mining leaves batters on the edges of the pit, these will be recontoured to a maximum slope of 20% (one in five);
- Mine development work will be completed during the dry season where possible;
- Disturbed areas around construction sites will be rehabilitated promptly; and
- Sediment traps will be included as part of the drainage designs at points where haul roads cross watercourses.

An Erosion and Sediment Control Management Plan will be prepared prior to construction.

#### Contamination Prevention

A number of Notifiable Activities are proposed to be undertaken within the Project area (see **Table 2-2**). These activities have the potential to cause land contamination through spills, leaks or uncontrolled runoff from contaminated areas.

Potentially contaminated runoff from the heavy equipment workshops and service bays, fixed-plant workshops, and light vehicle and heavy vehicle wash-down areas will be directed to mine industrial area drainage slots (see **Figure 7** and **Figure 8**) from where it will be recycled to the TSF.

Hydrocarbons will be stored and handled in the heavy equipment workshop and service bays, fixed-plant workshops, and diesel and oil storage areas within the Boyd and Norman Creek infrastructure areas. Fuel storage areas have the potential to cause land contamination through leaks, spills and rupture of tanks. Contamination will be prevented by bunding fuel storage areas. Flammable and combustible liquids, including petroleum products, will be stored and handled in accordance with *AS1940:2004 The Storage and Handling of Flammable and Combustible Liquids*. The potential for contamination of land and waters will be minimised by diverting storm water around contaminated areas and facilities used for the storage of chemicals and flammable or combustible liquids.

There is the potential for land contamination to arise from hydrocarbons spills in workshops and hydrocarbon storage areas during operations. This potential will be minimised through the development and implementation of standard operating procedures for transport, handling and storage of hydrocarbons. Employees will be trained in hydrocarbon handling and emergency spill response.

#### Contaminated Land

Sites that become contaminated will be investigated, managed and remediated in accordance with the requirements of the contaminated land provisions of the EP Act. Hydrocarbon contaminated soil will be excavated and treated on-site using bioremediation techniques in an on-site landfarm. Landfarm areas will be constructed near the sludge-drying ponds at the Boyd and Norman Creek infrastructure areas. The area will be bunded and water runoff collected in the site's water management system (see **Figure 4** and **Figure 5**). Soil will be remediated to a level that meets the objective for final land use in accordance with the *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* (EPA 1998).

#### Mineral Wastes

The subsoil and overburden above the bauxite are benign and there will be no out-of-pit dumps of excavated wastes. Tailings are also benign and will be contained in tailings storage facility structures. There is no risk of soil or water contamination from excavated subsoil and overburden or tailings, therefore no specific land management strategies are required.

#### Final Landform

Areas disturbed by mining activities and infrastructure are to be rehabilitated to a stable landform with a self-sustaining vegetation cover. After overburden and soil are returned to mined-out pits the final rehabilitated landform will be at a lower elevation than the original landform due to the removal of the bauxite, but the overall slope of the landform will be similar. Where mining leaves batters on the edges of the pit, these will be recontoured to a maximum slope of 20% (one in five). The final landform will not have any out-of-pit dumps of excavated wastes or soil.

The tailings storage facility embankments and surface will be revegetated after decommissioning and minor earthworks undertaken to install suitable water management features.

### Rehabilitation Strategy

The rehabilitation strategy for the Project is consistent with the *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland – Determination of Post-Mine Land Use* (DME/DEH 1995). The strategy consists of the following integrated measures:

- Implementation of practical landform designs, to prevent erosion and establish final landform stability;
- Revegetation trials, for selection of appropriate revegetation species and methodologies;
- Progressive rehabilitation of disturbed areas as areas become available and in accordance with the Plan of Operations, using rehabilitation procedures appropriate to the type of disturbance;
- Appropriate management of the final bauxite processing waste, including construction of an earth cover; and
- Implementation of erosion-control measures, consistent with the practices described in the *Technical Guidelines for Environmental Management for Exploration and Mining in Queensland – Erosion Control* (DME/DEH 1995).

### Rehabilitation Objectives

The proposed rehabilitation objectives for each mine domain are proposed in **Table C1**. Generally, the objectives for the rehabilitation of areas disturbed by mining would be:

- to establish a self-sustaining vegetation community using appropriate local native tree, shrub and grass species; and
- to ensure land is made stable – in both geotechnical and erosion terms – to ensure post-mine land use is not compromised by site instability.

Unlike the current East Weipa post-mining areas, only a small proportion (less than 5%) of the post-mining areas in the South of Embley area are expected to be affected by groundwater to the degree that they would be suitable support a native wetland community dominated by *Melaleuca* and/or *Lophostemon* species. Therefore most post-mining landscapes in the South of Embley area are expected to be suitable to support a native dry woodland vegetation dominated by *Eucalypts*, *Corymbias*, *Erythrophleum* and other framework species.

At the request of the WCCCC, RTA may establish post-mining land use options other than those required by regulation, subject to obtaining all necessary government approvals.

### Topsoil Management

Prior to mining, all topsoil, subsoil and waste bauxite overlying the surface of the bauxite is stripped. Soil moisture levels would be assessed before soil stripping commences to ensure the soil is not so wet that it will lose its structure when handled. Approximately 600mm soil will be stripped and directly placed on mined-out areas in readiness for regeneration, however, if required, soil will be stockpiled. If soil is stockpiled, it will be managed as to maintain optimum growth media properties by maximising the stockpile surface area and minimising compaction. Stockpiled soil shall be typically used within one year to maximise the benefits of the natural seed bank and conserve symbiotic micro-organisms. Any soil stockpiled for more than one year will be sown with a native local seed mix to control weeds and erosion. Areas receiving stockpiled material are sown with a special seed mix containing additional species to the standard seed mix, including seed of species that usually “volunteer” from natural seed store in freshly returned topsoil, such as grasses and *Acacia* species. Procedures for topsoil stripping will be developed and included in the site rehabilitation procedure.

### Revegetation

At RTA's current operations north of the Embley River, the following approach is taken to revegetation:

- ripping the mine floor and compacted areas;
- resspreading of freshly stripped topsoil or stockpiled topsoil;
- soil surface scarifying along the contour immediately before seeding;
- seeding with a seed mix of locally occurring native species at a density and richness to facilitate a self-sustaining local native ecosystem; and
- application of fertiliser at an appropriate rate, if required.

A similar revegetation methodology shall be adapted and refined for the Project area.

For areas disturbed by mining, the mine floor will be ripped with a bulldozer to a minimum depth of 500mm at 3.4m centres to break up the compacted mine floor and increase water filtration rates. Ripping may occur either through replaced material or directly through the mine floor. Other compacted surfaces to be rehabilitated, such as haul roads, will be repeatedly cross-ripped to ensure water infiltration and root penetration is achieved.

Native species seed mixes would be tailored to the anticipated post-mining conditions of the area to be rehabilitated. The proximity of the post-mined landscape to the wet season water table is the key factor determining which native plant community is

the most appropriate for the post-mining landscape. Free draining areas are most suited to “Tall Darwin Stringybark woodland on lateritic red earths” and “Tall Darwin Stringybark woodland on yellow earths”. Free draining, post-mining landscapes would be seeded with a range of tree, shrub and groundcover species from these communities. Post-mining landscapes likely to be less free draining and seasonally inundated are most suited to Melaleuca swamp and Melaleuca/Swamp mahogany vegetation communities.

#### **Rehabilitated Land Completion Criteria**

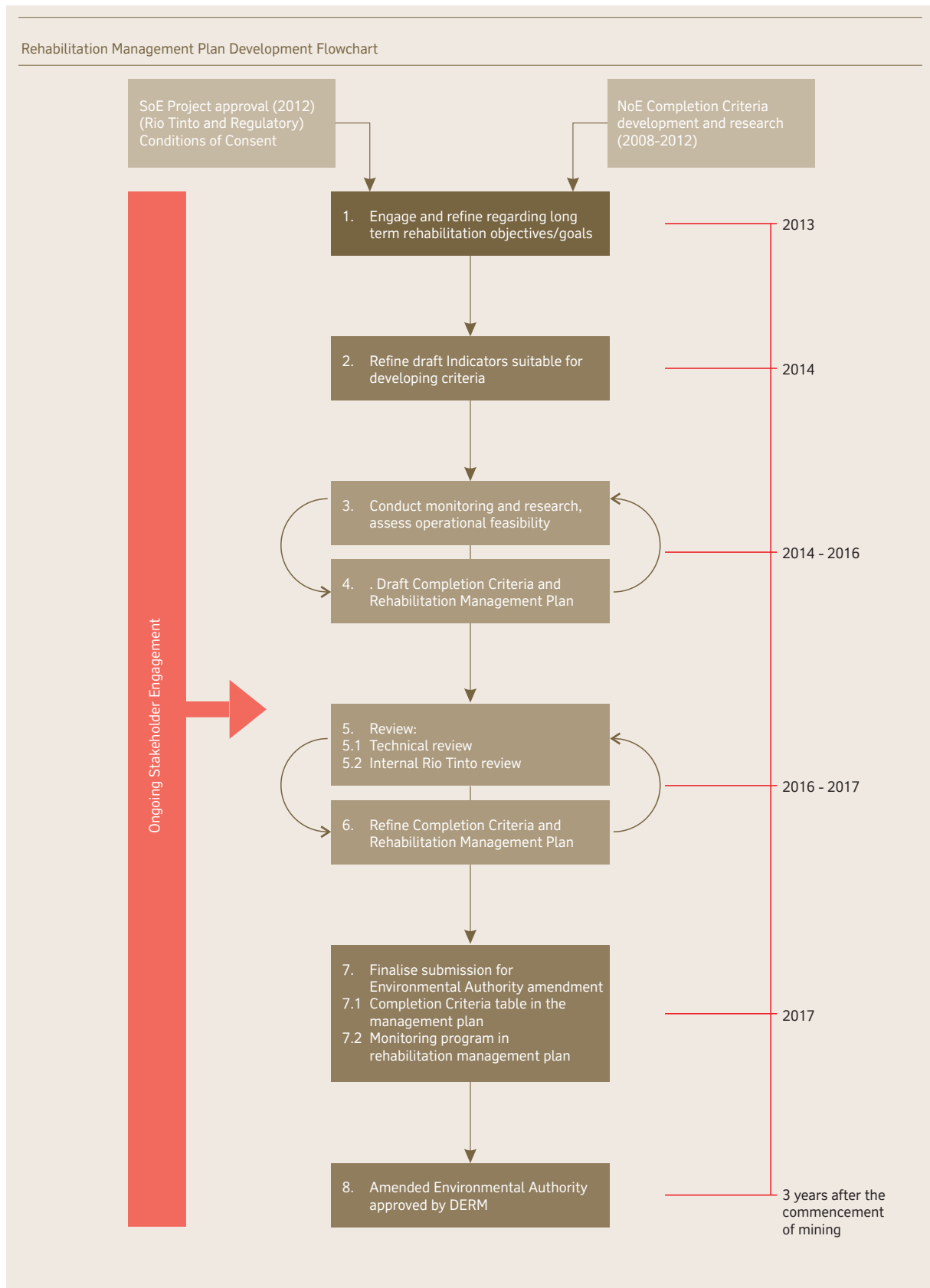
On-site revegetation trials would be undertaken to test selected species, seeding rates and establishment methodologies. Further research, such as vegetation transects in reference sites in appropriate undisturbed ecosystems, would be undertaken. In addition, RTA has committed to consulting with the Traditional Owners and the relevant Western Cape Communities Consultative

Committee (WCCCC) sub-committee regarding timelines for development of rehabilitated land completion criteria, aiming to have these developed within three years of commencement of mining.

The following flowchart has been developed to indicate the steps for development of criteria within this timeframe, taking into account previous experience at Andoom and Weipa; outcomes from on-going monitoring, trials and research projects on the South of Embley site; as well as stakeholder engagement. This feedback of information forms part of a continuous improvement loop which will continue to occur throughout operations.

Rehabilitation performance would be measured against the adopted criteria. The final completion criteria may be reviewed over time as more rehabilitation knowledge relevant to the Project area is gained.

Rehabilitation Management Plan Development Flowchart



### Rehabilitation Management Plan

The Environmental Authority (MIN100939109) issued on 30 August 2011 requires RTA to submit a Rehabilitation Management Plan for the existing East Weipa and Andoom operations by 30 August 2013 and work on the development of this plan has commenced. Many elements of this plan will be directly adaptable for the South of Embley operations, including slope and drainage design, and erosion controls. However, other aspects such as agreed post mining land use, revegetation methods, and completion criteria will be subject to the findings of further consultation with key stakeholders, site-specific revegetation trials and further research.

RTA will prepare and submit to DERM a Rehabilitation Management Plan for the SoE Project within three years of the commencement of bauxite mining. The Rehabilitation Management Plan will 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; and
- n. programs for maintenance of rehabilitation as required to achieve the nominated rehabilitation objective.

### Consultation on Rehabilitation

RTA has engaged and continues to engage with a range of stakeholders throughout the development of the Project. The WCCCA SoE sub-committee has reviewed the proposed rehabilitation objectives in the EIS and have provided comment on the process for finalising aspects of the rehabilitation process. RTA has committed to jointly developing a rehabilitation process with the Traditional Owners and relevant WCCCC sub-committee prior to the commencement of mining. However, a draft flowchart has been prepared to demonstrate the possible steps to finalising the Rehabilitation Management Plan and stakeholder engagement throughout the process.

A specific engagement plan would be developed and implemented to support planning and implementation of the rehabilitation program. Relevant stakeholders would include:

- Traditional Owners (the WCCCC and the relevant sub-committee would continue to provide the primary consultative mechanism);
- Queensland and Commonwealth Government (in particular DERM and DSEWPAC); and
- Regional neighbours (e.g. neighbouring pastoral, mining, conservational land holders)

This engagement program may form part of the proposed Communities, Heritage, and Environment Management Plan (CHEMP) proposed in the EIS (RTA 2011). Further information on the proposed CHEMP is also available in the Social Impact Management Plan.

RTA would continue to report annually to the relevant WCCCC sub-committee on rehabilitation programs, including an inventory of areas disturbed by mining, timeframes for rehabilitation, and supporting reports pertaining to the monitoring of rehabilitated areas. Ongoing community engagement, including engagement with Traditional Owners, is discussed in the Social Impact Management Plan.

### Decommissioning

The decommissioning and final rehabilitation of the Project will occur on a staged basis over several years. A Final Rehabilitation Report (FRR), which includes a contaminated site assessment, will be prepared prior to surrender of the mining lease. A contaminated site register will be maintained for the operation. Areas of soil contamination will be investigated prior to rehabilitation. Contaminated sites will be managed using methods developed on a case-by-case basis in accordance with DERM guidelines.



On the completion of mining, buildings, structures and other infrastructure will be treated as follows:

- The barge/ferry terminal, port, water-supply dam and certain roads may have some on-going beneficial use. Subject to agreement with relevant regulators and Traditional Owners, certain of these facilities may be left in place. Otherwise, RTA shall remove these facilities; and
- Buildings, plant, equipment, tanks, conveyors, pipelines and transmission lines shall be removed and the surface rehabilitated. Concrete pads will be broken up, buried, and then the area rehabilitated.
- RTA would provide Traditional Owners with the opportunity to purchase decommissioned construction camp accommodation on fair, agreed commercial terms, once the construction phase is complete.

#### Monitoring

Rehabilitation indicators are parameters that can be measured and monitored to track the performance of rehabilitation against a given objective. A range of indicators can be chosen for monitoring and **Table C1** shows those indicators currently proposed for the SoE Project. These may be improved on in the future as site-specific research trials, the findings of on-going monitoring, and consultation outcomes become available. For example, trials will be undertaken to determine if use of some felled timber for fauna refuge in rehabilitation areas is feasible, including monitoring to determine increase of faunal recolonisation/utilisation.

A monitoring program would be developed to regularly assess the success of rehabilitation. The monitoring methodology is likely to be similar to that currently used for operations north of the Embley River and include:

- monitoring in the first year after establishment at a scale of one 500m<sup>2</sup> transect plot per 10 hectares of rehabilitation; and
- follow-up monitoring four, eight and 12 years after establishment.

Performance against indicators would be used to inform an adaptive management approach.

The impacts of both controlled burning and wildfire on rehabilitation areas will be monitored.

An erosion monitoring procedure has been developed and implemented at the existing RTA mining operations north of the Embley River, and a similar procedure will be implemented for the Project. After the end of the wet season each year, mined areas and other potential erosion sites will be visually monitored to identify active erosion rills and gullies. Areas where erosion has remediated previously will also be monitored.

### 3.6 Nature Conservation

#### 3.6.1 Value/Background

Terrestrial flora, fauna and biodiversity studies have occurred over the Project area. These are described in RTA (2011) and RTA (2012). The freshwater aquatic ecology of the Project area is also described in RTA (2011) and RTA (2012).

#### Terrestrial Flora

The Weipa area is located within the Cape York Peninsula Bioregion. The Project area and wider Weipa area are located within the Weipa Plateau province (subregion) of the Cape York Peninsula Bioregion. This area is relatively homogenous in vegetation and landform, and is characterised by large areas of Darwin Stringybark (*Eucalyptus tetrodonta*) open forests or woodlands, dissected by smaller areas of riparian vegetation, vine thicket patches and paperbark swamps.

Thirty two vegetation (land) units defined by Godwin (1985) and Gunness *et al.* (1987) were mapped in the Project area with three of these being further divided into sub units for a total of 38 vegetation units. Subdivision was required to adequately describe the vegetation variation evident in the Project area that was not present in the Weipa area where the vegetation unit scheme was originally derived. Of these, unit 2b (*Eucalyptus tetrodonta*/*Corymbia nesophila* Tall Woodland on lateritic red earths) is the most widespread vegetation type, accounting for approximately 87% of the vegetation within the Project area and occurring almost exclusively upon the bauxite plateau areas where mining occurs. The remaining vegetation units are of much smaller spatial extent within the Project area and associated predominantly with drainage systems and coastal complexes peripheral to the bauxite plateau. Detailed descriptions of the vegetation of the Project area are provided in RTA (2011).

Of the 27 regional ecosystems (REs) occurring in the Project area, three are listed under the *Vegetation Management Act 1999* (Qld) (VMA) as “of concern”:

- RE 3.2.3 *Melaleuca dealbata* ± *Acacia crassica* open forest. Occurs in dune swales on the west coast;
- RE 3.2.6a *Casuarina equisetifolia* woodland. Occurs on foredunes; and
- RE 3.2.25 Sparse herbland of mixed herbaceous species on foredunes and beach ridges.

Only one of these, RE 3.2.6a would be disturbed by the Project (<0.4ha). Regional ecosystem 3.5.2 (*Eucalyptus tetrodonta*, *Corymbia nesophila* tall woodland on deeply weathered plateaus and remnants), corresponding with vegetation unit



2b and 2c1, is the most widespread RE within the Project area comprising 87,446 ha or approximately 87% of the terrestrial part of the Project area. There are no endangered regional ecosystems within the Project area.

The EPBC search did not identify any Endangered Ecological Communities (EEC) as likely to occur within the Project area, and none were identified during the field surveys.

A total of 485 plant taxa have been recorded from all vegetation types within the Project area based on results of preliminary and EIS surveys (RTA 2012).

Six flora species listed under the EPBC Act were identified as potential inhabitants of the Project area and the following two species were confirmed:

- *Dendrobium bigibbum* Cooktown Orchid (vulnerable). Occurs within footprint of Dam C, and in the vicinity of a proposed access road crossing of an upper Norman Creek tributary; and
- *Dendrobium johannis* Chocolate Tea Tree Orchid (vulnerable). Occurs within the infrastructure corridor downstream of Dam C, and in the vicinity of proposed access road crossings of Winda Winda Creek and an upper Norman Creek tributary.

Of the 16 NC Act-listed flora species identified as known to occur, likely to occur, or possibly occurring in the Project area, only three species were confirmed as present in vegetation surveys. These include:

- *Dendrobium bigibbum* Cooktown Orchid (vulnerable)
- *Dendrobium johannis* Chocolate Tea Tree Orchid (vulnerable).

No weeds or introduced flora species have been confirmed as occurring within the Project area although there was an unverified sighting of the invasive scrambler Rubber Vine (*Cryptostegia grandiflora*) on the lower reaches of Norman Creek.

### Terrestrial Fauna

A total of 269 native terrestrial vertebrate fauna species were recorded from all habitat types within the Project area based on the results of EIS surveys and preliminary studies (RTA 2011). About 98 species or approximately 36% of the total complement of species from the Project area have been identified from Darwin Stringybark open woodland, which is the habitat that occurs almost exclusively on the bauxite plateau. A detailed list of the fauna species recorded from the Project area indicating the relative abundance and habitats for each species and the results for each of the twelve comprehensive survey sites is provided in RTA (2011). A summary of species numbers is provided in **Table 3-6**.

**Table 3-6 Native Fauna Diversity Recorded within the Project Area**

	Birds	Mammals	Reptiles	Amphibians	Total
<i>Eucalyptus tetrodonta</i> habitat	62	10	23	3	98
All habitat types	184	23	45	17	269

Three species listed under the EPBC Act have been identified as possibly occurring in the Project area, however none were located during surveys. Two of these species are listed as vulnerable with one species (*Dasyurus hallucatus* - Northern Quoll) listed as endangered. No EPBC Act species are known to occur within the Project area.

A large group of bird species recorded in the Weipa region are listed in international agreements and conventions such as the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), and are covered by the EPBC Act.

The following 20 species were confirmed as present in the Project area during EIS surveys:

- *Acrocephalus stentoreus* Clamorous Reed-Warbler;
- *Apus pacificus* Fork-tailed Swift;
- *Ardea alba* Great Egret, White Egret;
- *Charadrius mongolus* Lesser Sand Plover;
- *Crocodylus porosus* Estuarine Crocodile, Salt-water Crocodile;
- *Egretta sacra* Eastern Reef Egret;
- *Fregata minor* Great Frigatebird;
- *Fregata ariel* Lesser Frigatebird;

- *Haliaeetus leucogaster* White-bellied Sea-Eagle;
- *Hirundapus caudacutus* White-throated Needletail;
- *Merops ornatus* Rainbow Bee-eater;
- *Myiagra cyanoleuca* Satin Flycatcher;
- *Numenius madagascariensis* Eastern Curlew;
- *Numenius phaeopus* Whimbrel;
- *Pandion haliaetus* Osprey;
- *Plegadis falcinellus* Glossy Ibis;
- *Rhipidura rufifrons* Rufous Fantail;
- *Sterna albifrons* Little Tern;
- *Tringa nebularia* Common Greenshank; and
- *Tringa stagnatilis* Marsh Sandpiper.

Twenty of the 44 species identified as potential inhabitants of the Project area are trans-equatorial migratory waders, which arrive in Australia each spring and disperse throughout the continent to feeding grounds amongst coastal and wetland habitats. The Western Cape York coastline is known

as a major entry corridor for many individuals of these species travelling to eastern Australia. The Project area, however, is not regarded as providing key feeding grounds for these waders and this is supported by observations of a relatively low diversity of wader species and low numbers of individuals during field surveys.

The remaining species are known to undertake seasonal migratory movements within mainland Australia or to the mainland from areas to the north including Papua New Guinea and eastern Pacific islands.

Sixteen terrestrial fauna species listed under the NC Act have been identified as known to occur, likely to occur, or possibly occurring in the vicinity of the Project. Three species listed under the EPBC Act (not including marine/migratory species) have been identified as possibly occurring in the vicinity of the Project area. Of these species, those that are known to occur within the Project area are shown in **Table 3-7**. Descriptions of these species and their habitats are provided in RTA (2011).

**Table 3-7 Fauna Species of Conservation Significance - Known to Occur**

Species	NC Act Status	EPBC Act Status
<i>Crocodylus porosus</i> Estuarine crocodile	Vulnerable	Marine Migratory (see Table 3-10)
<i>Ephippiorhynchus asiaticus</i> Black Necked Stork	Near Threatened	
<i>Esacus magnirostris</i> Beach Stone Curlew	Vulnerable	
<i>Ninox rufa meesi</i> Rufous Owl	Near Threatened	
<i>Numenius madagascariensis</i> Eastern Curlew	Near Threatened	
<i>Probosciger aterrimus macgillivrayi</i> Palm Cockatoo	Near Threatened	
<i>Sterna albifrons</i> Little Tern	Endangered	
<i>Tadornah radjah</i> Radjah Shelduck	Near Threatened	

In summary, the potential impact to habitat is as follows:

- *Crocodylus porosus* Estuarine Crocodile (vulnerable) – The Estuarine Crocodile was recorded in all freshwater and marine habitats in the Project area. Overall, the species is widespread and numerous within the study area. Foraging and nesting habitat for this species occurs with the footprint of Dam C;
- *Ephippiorhynchus asiaticus* Black Necked Stork (near threatened) – Project-related disturbance will not detrimentally affect preferred habitat types;
- *Esacus magnirostris* Beach Stone Curlew (vulnerable) – The area where the Hey River barge/ferry terminal is located supports the species but habitat will not be substantially affected;
- *Ninox rufa meesi* Rufous Owl (near threatened) – The riparian gallery forest area where the species was recorded occurs within the footprint of Dam C. The majority of potential wetland and riparian gallery forest habitat for the species will not be disturbed by mining or infrastructure;
- *Numenius madagascariensis* Eastern Curlew (near threatened) – The preferred intertidal habitat of this species will not be affected by mining or infrastructure development apart from minimal disturbances associated with the port and the Hey Point barge/ferry terminal;

- *Probosciger aterrimus macgillivrayi* Palm Cockatoo (near threatened) – The Project-related disturbance would disturb known nesting sites of the Palm Cockatoo in the Dam C footprint, although the majority of preferred habitat areas will not be disturbed by the Project;
- *Sterna albifrons* Little Tern (endangered) – Several Little Terns were observed with other shorebirds near the mouth of Waterfall Creek. The species is likely to forage in coastal and estuarine areas. The only development in coastal and estuarine areas in the port and the barge and ferry terminals, which are outside the preferred breeding environments for the Little Tern; and
- *Tadornah radjah* Radjah Shelduck (near threatened) – The preferred habitat of this species will not be affected by mining or infrastructure development.

Six species of introduced fauna were detected during the survey, including three species listed under the *Land Protection Regulation 2002* (Qld) (class two pest animals):

- feral cat;
- dingo/dingo hybrid;
- feral pig;
- cane toad;
- feral horse; and
- feral cattle.

### Freshwater Aquatic Ecology

A number of different aquatic habitats occur in the Project area including:

- Perennial flowing streams;
- Semi-perennial coastal lakes and lagoons;
- Perennial channel hosted pools and lagoons;
- Coastal swale swamps;
- Tree swamps;
- Seasonal stream channels;
- Seasonal coastal lakes;
- Spike rush swamps;
- Drainage depressions and flood runners;
- Groundwater seepage zones and springs; and
- Estuaries.

The Project area sheds runoff from a centrally located topographic high to the west via Ina and Norman Creek (with four major tributaries), to the north via Triluck - Winda Winda Creek (with three

major tributaries), Roberts and Leithen Creeks (the latter two primarily estuarine), to the east via unnamed tributary drainages of the Hey River estuary and to the south via the Ward River system (with two named tributaries, Coconut and Tappelbang Creek). A number of smaller, less-defined drainage depressions also flow independently to the Gulf of Carpentaria between these named drainage systems. Coconut and Tappelbang Creeks have their headwaters in the Aurukun Project area to the east of the Project. Within the Project area there are also several swamps that occur in depressions within the bauxite plateau, which are largely isolated from defined drainage networks.

The southern extremity of the Project area overlaps with the Archer Bay Aggregation, which is a nationally significant wetland area listed in the Directory of Important Wetlands (DIWA) (Blackman *et al.* 1999).

A full summary of the Cape York Peninsula Land Use Strategy (CYPLUS) (Abrahams *et al.* 1995) assessment of conservation values is provided in RTA (2011). With respect to aquatic ecosystems, two areas of conservation significance were identified adjacent to the Project area comprising:

- the estuary of the Embley River, which is the only known habitat of River Garfish (*Zenarchopterus buffonis*) on Cape York Peninsula; and
- the Aurukun Wetlands to the immediate south of the Project area, which have natural conservation significance due to a number of wetland and terrestrial biodiversity attributes.

The northernmost portion of the Project area is within the catchment of the Embley River. The southernmost portion of the Project area is within the catchment of the Ward River, which drains to the Aurukun Wetlands.

A total of 45 species of fish were recorded from the study area from combined field sampling conducted during May 2008 and 2009 (RTA 2011).

Four species listed under the EPBC Act have been identified as being likely to occur or possibly occurring in the Project area. However, no threatened aquatic species listed under the NC Act or the EPBC Act were confirmed as present within the Project area.

Several vulnerable or near threatened species, which may be considered semi-aquatic or dependent upon aquatic ecosystems of the Project area, were recorded during field surveys, including the Black-necked Stork (*Ephippiorhynchus asiaticus*) and Radjah Shelduck (*Tadorna radjah*).

### 3.6.2 Objectives

The environmental protection objective is to manage flora and fauna at the mine site and to minimise the risks to flora and fauna outside the immediate mine and industrial areas.

### 3.6.3 Commitments

#### Performance Criteria

The performance criteria for nature conservation are:

- Comply with the conditions of the EA; and
- No unauthorised clearing of native vegetation.

#### Implementation Strategy

The primary mitigation measures for reducing the loss of flora and fauna habitat include:

- Restrict clearing of vegetation for mining and infrastructure to the minimum required for the safe operation of mining equipment and infrastructure;
- No vegetation should be cleared outside of the mine plan/infrastructure footprint for infrastructure or purposes that could be accommodated within areas already disturbed by mining or to be disturbed by mining (e.g. borrow pits, laydown areas, access tracks);

- Wherever possible, linear infrastructure such as roads, tracks, pipelines, power lines should be located in a single consolidated infrastructure corridor rather than several smaller corridors; and
- Plan for clearing of vegetation and stripping of topsoil to occur as soon as practicable before mining to avoid redundant clearing of vegetation due to changes in the mine plan.

A number of sensitive environmental areas for flora have been identified and are described in **Table 3-8**. These comprise areas of particular local, regional or national significance with respect to habitat values, biodiversity, presence of threatened species, conservation status, refugial function, or landscape connectivity function.

The disturbance of sensitive environmental areas by mining will be avoided by the development of an environmental buffer system. The system will comprise a methodology for determining set-back distances from sensitive vegetation types and the preclusion of mining from within the designated buffers.

The sensitive vegetation to be buffered by Darwin Stringybark woodland will comprise the following vegetation types; riparian, wetland, estuarine, vine forest, and coastal vegetation on sand.

**Table 3-8 Sensitive Environmental Areas for Flora**

Flora Attribute/Area	Description
"Of Concern" Regional Ecosystems.	Of concern REs occupy approximately 408ha (1.3%) of the Project area comprising 3.2.3, 3.2.6a, and 3.2.25. All of these REs are located within Land Zone 2, which comprises coastal sand dunes and swales. Land Zone 2 would not be disturbed for mining.
Riparian gallery forest and adjoining alluvial/collegial flats along groundwater fed sections of freshwater streams. (i.e. veg units 4a1, 4a3, 5e, 5j1, 5j2).	This vegetation community is associated with shallow aquifer discharge at the periphery of drainage corridors (base of the bauxite plateau) and directly into streams. The floristic diversity of these areas is very high relative to their spatial extent and dependent on continued groundwater discharge. The vegetation types within these areas are also confirmed and are a potential habitat for a high number of threatened flora species.
Semi-permanent groundwater springs/seepage areas with rainforest/palm closed forest.	These closed forests are of very limited spatial extent but provide refugia for rainforest flora and contain flora species not occurring in other vegetation units. These areas are dependent on groundwater discharge. The vegetation is variable and range from rainforest with vines and palms, to riparian gallery forests, to ferny swamp forest with rainforest species which has affinities for unit 4a2.
Vine Forest on coastal sands and the bauxite plateau.	Vine forest patches provide a refugial function for flora and supports threatened flora. Vine Forest on the bauxite plateau is most likely indicative of an historic vegetation community where closed forest vegetation was more widespread than currently distributed.

The buffer system will exceed the minimum requirements of the Queensland Government's Regional Vegetation Management Codes as they relate to clearing set-back distances from watercourses and wetlands. In Cape York, the recommended minimum buffer distances from watercourses vary depending on stream order and, from wetlands, they depend on the significance of the wetland (DERM 2009b). These buffer distances are:

- A 50m buffer from each high bank of a watercourse with stream order one or two;
- A 100m buffer from each high bank of a watercourse with stream order three or four;
- A 200m buffer from each high bank of a watercourse with stream order five and above;
- A 100m buffer from a natural wetland; and
- A 200m buffer from a natural significant wetland.

A variable environmental buffer system will be implemented that takes into account factors such as sensitive vegetation type, important locations of threatened flora and fauna, stream order and hydrology when determining buffer distances. In all cases the above Code requirements will be met or exceeded.

Surveys will be carried out to define the boundaries of mapped sensitive vegetation types in the field. The field surveys will be carried out prior to clearing for drill lines (which are typically established for detailed orebody definition) and prior to clearing ahead of mining. The surveys will also assess the stream order of any watercourses and the presence or absence of significant ecological features such as springs, aquatic refugia and threatened flora and fauna in and around the sensitive vegetation types.

Buffer distances will then be set based on the findings of the surveys and, where relevant, stream order. Establishment of the buffer distance and authorisation for clearing non-buffered areas would be managed through a ground disturbance approval.

With respect to potential weed impacts, a weed management program comprising monitoring and control components will be important to prevent impacts on undisturbed vegetation. A weed management plan will be developed and implemented prior to commencement of construction. The main focus of the weed management program should be early detection and early control of any weed invasions. The weed management plan will include the following management strategies:

- Prior to the establishment of the mine access road, any vehicles travelling to the Project area would be required to be washed down for weeds;

- Wash-down facilities will be provided and all vehicles thoroughly washed before transfer to the Hey River barge/ferry terminal and site access road;
- Wash-down facilities will be constructed, positioned and managed such that wash water and soil is contained and not released to the surrounding ecosystems;
- Training courses will be conducted regularly for all mine personnel highlighting significant weed species and basic identification features for weeds likely to be encountered on the site, and identification charts will be posted in prominent areas around the mine site;
- Protocols will be established for easy reporting of weed occurrence by any personnel working onsite and be of a format that encourages reporting;
- Results of the weed survey and any weed reporting will be uploaded to the site geographic information system in a timely manner so that weed mapping is maintained as a live database; and
- Any weed infestation areas will have controlled access until appropriate treatment and suppression is complete and there is no risk of propagules being translocated.

The primary mitigation measure for avoiding long-term impacts on the fauna community is to implement a program of post-mining vegetation/habitat regeneration that seeks to establish similar habitats to the pre-mining landscape and include as far as possible, key flora species from the pre-mining vegetation communities (refer to **Section 3.5.3**). In the event that injured fauna is identified on the site, personnel trained in handling injured fauna will be accessed to manage the injured fauna in an appropriate manner.

A fire management program and feral animal control program will be prepared to mitigate impact to threatened fauna in undisturbed areas by enhancing the current habitat values in these areas. The fire management program will also aim to protect infrastructure and rehabilitated areas from fire damage.

RTA are consulting with Traditional Owners under the auspices of the relevant WCCCA Sub-committee to develop a Community, Heritage and Environment Management Plan (CHEMP) as a long-term management strategy, which will include flora and fauna, weeds, and environmental monitoring.

Fish way structures will be incorporated into the water supply dam spillway to provide aquatic habitat connectivity as part of waterway barrier permits under the *Fisheries Act 1994* (Qld).



If a mature crocodile needs to be relocated due to safety concerns, RTA would consult with DERM on appropriate relocation method.

### Monitoring

A selective vegetation monitoring program will be carried out to identify any effects on vegetation from edge effects and altered hydrological regime (and any other causes) and investigate measures to minimise similar future impacts. The vegetation monitoring program will have the following attributes:

- a. Monitoring sites would be established in representative areas of sensitive vegetation units occurring adjacent to mining areas and in downstream areas, both in terms of surface and groundwater hydrology. The monitoring sites would include seasonally stratified sampling data prior to mining or development (i.e. one late wet/early dry season and one pre-wet season survey event);
- b. Specimens will be collected for herbarium identification if the plant cannot be identified;
- c. Control sites for each vegetation unit should be established within the Project area in areas well away from proposed mining or infrastructure that are unlikely to experience surface or groundwater modification, and
- d. Monitoring would be undertaken periodically at an interval that would allow effective remediation should significant adverse impacts become evident.

Monitoring of the mangrove ecotonal boundary would also be undertaken using aerial photography.

A weed management program will be developed and implemented prior to commencement of construction, and will include details of a weed monitoring program. The weed monitoring program will include the following:

1. Annual weed surveys will be conducted post-wet season targeting:
  - all operational areas (mining and infrastructure) and immediately adjacent ecosystems, and
  - site access roads.
2. Periodic weed surveys will be conducted at least every three years targeting:
  - habitats where key weed species are most likely to become established, and
  - areas within the mining lease where there is high recreational visitation (especially riparian and wetland areas).

Detailed mapping of the above areas will form the basis of the weed management program and guide annual weed surveys.

Fish species composition will be surveyed above and below Dam C after one year of operation. Periodic (three to five years) monitoring of freshwater aquatic fauna will be undertaken in reaches upstream and downstream of the water supply dam.

## 3.7 Marine

### 3.7.1 Value/Background

The Project activities covered by this EM Plan that occur in marine or estuarine environments include construction and operation of the SoE port and Hey River barge/ferry terminal, and associated dredging. The existing physical and biological marine environment, including sediment properties and water quality, in the SoE Project area, are described in RTA (2011) and RTA (2012). The aquatic ecology of estuarine environments within the SoE Project area is also described in RTA (2011) and RTA (2012). Value/Background

The sediment sampling and analyses completed at the port facility and Hey River barge/ferry terminal is described in RTA (2011). The assessment of dredged material is consistent with the assessment guidance described in National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia 2009), Annex 2 of the London Protocol, and the Waste Specific Guidelines for Assessment of Dredged Material (IMO 2000). The chemical and physical characteristics of material to be dredged from the proposed port area and Hey River barge/ferry terminals was assessed, including elutriate and bioavailability. The assessment indicated that all dredge spoil is suitable for unconfined ocean disposal and did not identify any constituents present at levels of environmental concern that would persist in the water column during dredging or sea disposal.

RTA (2011) describes the existing marine water quality conditions in the SoE Project area. Water quality at the port and Hey River barge/ferry terminal exhibits significant natural fluctuations in suspended sediment, as reflected in the turbidity. Significant monsoonal driven turbidity events occur during the wet season at Boyd Point and Pera Head. The extent of this natural variation, especially the extended periods of elevated turbidity, buffers water quality impacts associated with dredging, disposal, construction and operation to some extent. These habitats may be more resilient to short-term water quality changes associated with changes in turbidity.

Albatross Bay is recognised as containing environmentally important marine habitats (Baker and Sheppard 2006). There are no declared Fish Habitat Areas (FHA) under the *Fisheries Act 1994* (Qld) within the Project area. The northern part of Albatross Bay (referred to as Pine River Bay) is a declared FHA. A small part of the Pine River FHA adjoins the north east of the SoE Project area.

The development footprints for the Hey River barge/ferry terminal and port facility have been confirmed by field inspection as consisting primarily of soft sediment habitats that contain sparse epifauna typical of soft sediments, such as seapens and tube-dwelling anemones, soft-corals or sponges. While the environmental value of these habitats is generally considered less than that of vegetated habitats, primary production in these habitats can still be quite high through microscopic benthic algae, particularly in shallow water. These areas can also contain diverse and abundant assemblages of macrobenthic infauna. While the vast majority of the Gulf of Carpentaria consists of sandy and muddy habitats, some reef habitat occurs. Near shore fringing reef communities in the vicinity of the proposed port area occur at Boyd Point, Pera Head and between Pera Head and Thud Point. These comprise both reefs containing hard corals and low profile reefs containing soft coral-sponge assemblages. The importance of these reef systems (Boyd Point to Thud Point) in a regional context may be considered to be high as they support resources that are of conservation, cultural, commercial and recreational importance. In particular, the near shore sponge and soft coral reefs provide a food resource for a range of turtle species in the area. Within the vicinity of the Port, Nine Mile Reef and the "Three Mile" area are accessed frequently by recreational and charter fishers. Seagrass beds also provide habitat for a number of species of conservation significance. Seagrass beds are typically present in the more sheltered areas of Albatross Bay, including the lower reaches of the Embley and Mission Rivers and Pine

River Bay, and are largely restricted to shallow sand and mud banks of less than four metres below mean sea level (MSL) (Roelofs *et al.* 2003). No seagrass beds were found, or are known to occur, within the footprint of the port facilities. Seagrass monitoring between 2000 and 2009 (Chartrand and Rasheed 2009; McKenna and Rasheed 2010) in the vicinity of the Hey River Terminal location occasionally reports a very thin patch of isolated seagrass. Drop camera surveys undertaken over the Hey River Terminal dredge footprint in October 2007, November 2008 and June 2009 did not record any seagrass. However it is possible that seasonally variable seagrasses were absent (e.g. *Halophila ovalis*). Overall though, it is considered that if any seagrasses do occur at the proposed terminal site from time to time, they are likely to contribute minimally to primary productivity in the area.

The Albatross Bay mangrove assemblage is extremely diverse and is the most extensive system of mangroves on the eastern Gulf of Carpentaria. Mangroves are absent from the foreshores at and adjacent to the port site. The foreshore at the location of the Hey River barge/ferry terminal has a thin mangrove fringe (one to two trees wide), established over a mud and gravel shore at the base of a low pisolite plateau.

Ten marine species of conservation significance under the *Nature Conservation Act 1992* (Qld) (NC Act) have been identified as known to occur, likely to occur, or possibly occurring in the vicinity of the Project. Fourteen marine species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) have been identified as known to occur, likely to occur, or possibly occurring in the vicinity of the Project area. Of these species, those that are known or likely to occur within the Project area are shown in **Table 3-9**.

Descriptions of these species and their habitats are provided in RTA (2011).



**Table 3-9 Marine Species of Conservation Significance - Known or Likely to Occur**

Species	NC Act Status	EPBC Act Status
Estuarine Crocodile ( <i>Crocodylus porosus</i> )	Vulnerable	Migratory
Indo-Pacific Humpback Dolphin ( <i>Sousa chinensis</i> )	Near threatened	Migratory
Australian Snubfin Dolphin ( <i>Orcaella heinsohni</i> )	Near threatened	Migratory
Dugong ( <i>Dugong dugon</i> )	Vulnerable	Migratory
Hawksbill Turtle ( <i>Eretmochelys imbricata</i> )	Vulnerable	Vulnerable, Migratory
Flatback Turtle ( <i>Natator depressus</i> )	Vulnerable	Vulnerable, Migratory
Olive Ridley Turtle ( <i>Lepidochelys olivacea</i> ) (also known as the Pacific Ridley Turtle under the NC Act)	Endangered	Endangered, Migratory
Green Turtle ( <i>Chelonia mydas</i> )	Vulnerable	Vulnerable, Migratory
Leatherback Turtle ( <i>Dermochelys coriacea</i> )	Endangered	Endangered, Migratory
Loggerhead Turtle ( <i>Caretta caretta</i> )	Endangered	Endangered, Migratory

The Indo-Pacific Humpback Dolphin and Australian Snubfin Dolphin are known to occur within the port site. Dolphins were not observed in the seagrass beds in the Embley and Hey Rivers during field studies.

Dugongs are known to occur in low densities in Albatross Bay and graze on the seagrass beds in the Embley estuary. However, no dugongs were observed associating with these seagrass beds during marine field surveys for the SoE Project. Dugongs prefer seagrasses that are early or 'pioneer' species, particularly species of the genera *Halophila* and *Halodule* (DEWHA 2010). The long, strap-like seagrass *Enhalus acoroides*, which dominates the seagrass beds of the Embley and Hey Rivers, is not a preferred species in dugong's diet. The absence of seagrass within the footprints of Port facility indicates the species would only migrate through these areas.

The three marine turtle species listed in **Table 3-9** are known to nest on the beaches in the vicinity of the port area and forage in the surrounding waters. No marine turtles were observed in the Embley and Hey Rivers during field studies. Marine turtle populations are currently adversely impacted by feral pigs (predation of nests) and becoming entrapped in ghost nets. Altered light regimes can affect nesting adult female turtles and hatchlings, therefore the environmental value of the visual environment to be enhanced or protected near the port are the qualities that make the area suitable for turtle breeding.

Marine turtles and mammals, such as whales, dolphins and dugongs, are known to be sensitive to underwater noises which are louder (greater intensity) than normal background levels. However, there are no designated Marine Parks or Protected areas in the vicinity of the Project area, and therefore the objectives provided by the *Queensland Environmental Protection (Noise) Policy*

2008 (EPP (Noise)) for critical habitats (as defined in a conservation plan under the *Nature Conservation Act 1992* (Qld) and marine parks under the *Marine Parks Act 2004* (Qld)) are not relevant to the Project. Physical damage to the auditory system of dolphins and whales may occur at noise levels of about 230–240dB re 1 µPa (Gausland 2000). Avoidance behaviour begins to occur at around 110–130dB re 1 µPa (McCauley 1994). As there is no critical breeding or feeding habitat for these species close to the construction areas, an avoidance response is unlikely to have a significant impact.

Extensive surveying for marine pest species has been undertaken at the Port of Weipa and no invasive marine pest incursions have been recorded (Hoedt *et al.* 2001; PCQ 2007; PCQ 2009). While no invasive species have been found, at least two introduced species were identified in the 1999 baseline survey (Hoedt *et al.* 2001). The detailed baseline survey of the Port of Weipa has been supplemented since 2006 by inspection every three months of larval monitoring devices installed in the port and targeted surveys by DEEDI of high-risk areas in the port. This monitoring was instigated following the discovery of the high-risk species Asian green mussel (*Perna viridis*) on a non-trading vessel that had been in the Port of Weipa. No Asian green mussels or other non-indigenous species have been detected since the monitoring began in 2006 (PCQ 2009).

### 3.7.2 Objectives

The environmental protection objective for the marine environment is to minimise the risk of the construction and operation of the Project impacting upon the ecological, recreational, cultural, and commercial (fishing) values of the physical and biological marine environment.

### 3.7.3 Commitments

#### Performance Criteria

The performance criteria for the marine environment are:

- Comply with the commitments in the Dredge Management Plans;
- No unauthorised clearing of marine vegetation (mangroves); and
- Monitoring carried out for turtles in accordance with monitoring plan.

#### Implementation Strategy

##### Dredging

The generation of dredge-induced turbidity plumes generally results from the suspension of fine sedimentary material during construction, dredging and spoil disposal activities. The migration and dispersion of turbid plumes during capital dredging at the port has been predicted through modelling (RTA 2011). High levels of turbidity limit the light available to coral assemblages. If increased turbidity is of sufficient intensity, duration and/or frequency, the tolerance levels of coral assemblages may be exceeded, resulting in stress and/or mortality.

The primary measure for minimising impacts of dredging on the marine environment is the development and implementation of a Dredge Management Plan prior to commencement of any capital or maintenance dredging activities. Dredge Management Plans will include descriptions of:

- measures to be implemented throughout dredging activities to manage water quality impacts;
- marine mammal and turtle management procedures to minimise any avoidable impacts to marine mammals and turtles resulting from dredging activities;
- management responses that relate to marine turtle incidents (injury or mortality) associated with dredging and spoil disposal activities; and
- monitoring for introduced marine pest larvae and response to a pest incursion.

##### Marine Vegetation

Given the minor scale and short duration of dredging at the Hey River terminal, it is unlikely that sediment loads would be generated over the seagrass patches adjacent to the proposed infrastructure at a thickness that would approach critical levels.

A maximum of 400m<sup>2</sup> of mangroves would be required to be removed to construct the Hey River barge/ferry terminal. The extent of mangrove clearing represents approximately 0.008% of RE 3.1.1a and 0.003% of the mangrove communities within the Project area. RTA proposes to develop an appropriate offset for mangroves in consultation with DEEDI (FQ).

##### Marine Mammals and Turtles

A lighting plan has been developed to minimise impact to turtles, which will include the following:

- Ensuring lighting is minimised overall to that which is essential for safe and efficient operation of the facility;
- Installation of timer switches or movement sensors where applicable;
- Shielding and/or recessing of lights to minimise light spill;
- Installation of long wavelength lights; and
- Any other lighting options that further reduce impacts to marine turtles while allowing for the safe and efficient operation of the port facility.

The lighting plan is detailed in **Table 3-10**.

RTA proposes an adaptive approach to work with the Traditional Owners and DERM to minimise the impacts of changes to the light regime during both the construction and operation phases of the proposed port on marine turtles, while still allowing a safe working environment. An altered above-water night-time light regime without mitigation is anticipated to cause the largest single potential threat to marine turtles.

In addition to the lighting plan, a feral pig control program would be implemented between Pera Head and Boyd Point, as well as areas of nesting north of Boyd Point and/or south of Pera Head beyond the direct zone of impact, to reduce nest predation and enhance turtle population survivorship. It is considered that this measure would produce an overall increase in hatchling numbers and therefore there would not be an overall significant adverse impact on threatened marine turtles. RTA would work with DERM to evaluate whether relocating nests is appropriate. RTA would also remove ghost nets in the vicinity of the proposed port development.

Dugongs are potentially sensitive to underwater noise and construction activities, such as pile driving, have the potential to temporarily drive Dugongs from the area or cause physical damage to the auditory system or cause temporary changes in behavioural patterns. The port area is not suitable Dugong habitat; as such, it is predicted that an avoidance response to underwater construction activities would pose a low risk of impact to Dugongs at this site. Seagrass beds are typically present in the lower reaches of the Embley River, therefore, an avoidance response to construction activities in the Embley estuary pose a moderate risk of impact to Dugongs. However, pile driving would be a one-time event of short duration (approximately 15 days).

Table 3-10 Lighting Plan

Facility	Description	Mitigation Measures
<b>Phase: Design</b>		
Shiploader	Only in use when shiploading. Only equipment would be lit. Lighting required to enable worker to enter cabin. When in use light would be required for conveyor belts, transfer shoots and discharge point to hull. Shiploader height about 8–10m above top of wharf level.	<ul style="list-style-type: none"> <li>• Long wave length lighting (low pressure sodium or equivalent)</li> <li>• Turn off unnecessary lights when not in use and minimise usage to that required for safe operation</li> </ul>
Wharf deck	Light access walkway and conveyor bends as needed	<ul style="list-style-type: none"> <li>• Long wave length lighting (low pressure sodium or equivalent)</li> <li>• Turn off unnecessary lights when not in use and minimise usage to that required for safe operation</li> <li>• Shielding, height (keep low) and direction to minimise light spill</li> </ul>
Jetty	Light access walkway and roadway as needed	<ul style="list-style-type: none"> <li>• Long wave length lighting (low pressure sodium or equivalent)</li> <li>• Turn off unnecessary lights when not in use and minimise usage to that required for safe operation</li> <li>• Shielding, height (keep low) and direction to minimise light spill</li> </ul>
Dolphin walkway	Light access walkway as needed	<ul style="list-style-type: none"> <li>• Long wave length lighting (low pressure sodium or equivalent)</li> <li>• Turn off unnecessary lights when not in use and minimise usage to that required for safe operation</li> <li>• Shielding, height (keep low) and direction to minimise light spill</li> </ul>
Tug berth	Light access berth and walkways as needed	<ul style="list-style-type: none"> <li>• Long wave length lighting (low pressure sodium or equivalent)</li> <li>• Turn off unnecessary lights when not in use and minimise usage to that required for safe operation</li> <li>• Shielding, height (keep low) and direction to minimise light spill</li> </ul>
Tug boat	Required for safe movement around deck of tug	<ul style="list-style-type: none"> <li>• Limit usage to that required for safe operation</li> </ul>
Bulk carrier (decks)	Required for safe movement around deck of bulk carrier	<ul style="list-style-type: none"> <li>• Limit usage to that required for safe operation</li> </ul>
Navigation lights	Must meet the requirements of Queensland Transport; however RTA would work to implement mitigation measures wherever possible	<ul style="list-style-type: none"> <li>• Flashing lights</li> </ul>
Emergency lighting throughout wharf/tug berth area	Only used as needed	<ul style="list-style-type: none"> <li>• Turn off unnecessary lights when not in use and minimise usage to that required for safe operation</li> </ul>
Stockpile area	No lighting required, machine (stacker/reclaimer) would be sufficient	<ul style="list-style-type: none"> <li>• No tower flood lighting (stacker/reclaimer mounted lights are sufficient)</li> </ul>

**Table 3-10 Lighting Plan**

Facility	Description	Mitigation Measures
Stacker/reclaimer	Stacker would operate continuously – machinery to be lit. Reclaimer would operate when ship loading – machinery to be lit	<ul style="list-style-type: none"> <li>• Long wave length lighting (low pressure sodium or equivalent)</li> <li>• Turn off unnecessary lights when not in use and minimise usage to that required for safe operation</li> <li>• Shielding, height (keep low) and direction to minimise light spill</li> <li>• Vegetation buffer of <i>Eucalyptus tetradonta</i> forests estimated at 25–30m high at 200m width (between stacker/reclaimer and port)</li> </ul>
Beneficiation plant	Operate continuously – machinery and work area to be lit	<ul style="list-style-type: none"> <li>• Shielding, height (keep low) and direction to minimise light spill</li> <li>• Vegetation buffer of <i>Eucalyptus tetradonta</i> forests estimated at 25–30m high at over 200m width (between beneficiation plant and port)</li> </ul>
<b>Phase: Construction and Operation</b>		
All	Administrative controls to minimise the potential for impact	<ul style="list-style-type: none"> <li>• Standard ground clearing management procedures to retain vegetation buffer</li> <li>• Training workforce regarding potential impacts and management measures</li> <li>• Limit access to beach areas</li> <li>• Standard incident reporting procedure for sea turtle incidents, hazards or near misses</li> <li>• Lighting requirements as per design would be maintained</li> <li>• Reactive monitoring for deposition and light</li> </ul>

Note: Embley River and Hey River are not nesting areas for turtles, so lighting impacts from barge/ferry terminals is not a potential impact.

Risk from physical damage to the auditory system of marine mammals and turtles from pile-driving activities would be minimised where possible through a “soft-start” approach to disperse marine fauna (including marine turtles) in the vicinity prior to normal pile driving. The “soft start” involves commencing pile driving with a partial capacity strike, or giving a warning with an underwater airgun prior to normal pile driving. It is proposed that an exclusion zone surrounding pile driving activities be established and monitored by an observer prior to normal pile driving commencing and during normal pile driving. Normal pile driving activities would not commence or be temporarily suspended if marine turtles or other threatened marine fauna are observed within the exclusion zone. Normal pile driving activities would not recommence until marine turtles or other threatened marine fauna are considered to be outside the exclusion zone. The extent of the exclusion zone would be defined based on further literature review and quantitative analysis of the potential underwater noise impacts from pile driving relating to marine

turtles or other threatened marine fauna. The final extent of the exclusion zone would be defined in consultation with DSEWPAC.

The Project involves operating a ferry from Hornibrook Terminal to Hey River Terminal. The operation of the ferry is predicted to pose a moderate risk to Dugong in the Embley estuary. Transit lanes would be defined to reduce the overall area of disturbance from vessel activities. Where possible, these transit lanes would follow greatest water depths to avoid significant meadows of seagrasses.

#### **Marine Pests**

Pests may be introduced by ships’ ballast water or hull fouling. The risk of marine pest introduction from vessels during operations is likely to be similar to the current risks associated with port operations at the Port of Weipa because vessel activity associated with bauxite export would merely shift over time from the Port of Weipa to the Project port area. Under the

DSEWPaC-approved Port of Weipa Long Term Environment Management Plan for Dredging and Dumping Activities (SKM 2009a), the Port of Weipa is considered a low risk port for marine pests and hence there is currently no requirement to undertake a comprehensive marine pest survey of the port.

All vessels owned and contracted by RTA will manage ballast water through a Ballast Water Management Plan which would comply with Australian mandatory requirements and the International Convention for the Control and Management of Ships Ballast Water and Sediments (IMO 2004). There would be no hull cleaning at the proposed port; however, pests may still be present on ships hulls. Therefore, monitoring would be undertaken to provide a means of early detection of introduced pests.

RTA would complete baseline monitoring, followed by three-monthly mussel larval monitoring in the vicinity of the new port at such time that overseas ships are utilised. RTA proposes to deploy larval plates at two locations along the SoE Project jetty. In the event of a pest incursion during either dredging or operations, RTA would advise Biosecurity Queensland immediately and work with them in planning and implementing a response. The nature of the response would be determined largely by the type of organism and its lifecycle, substrate affected and extent of incursion.

### Mining and Associated Activities

Management of surface waters in mining and operational areas to minimise water quality impacts on surface waters, which discharge into estuarine and marine waters, is described in **Section 3.8**.

To manage the risk of introducing pollutants to the marine environment, no fuel or chemicals would be unloaded at the port. Product spillage into the marine environment could occur from routine loading operations, however, bauxite is non-hazardous and the risk of impact to marine ecology is considered to be low. RTA proposes to adopt engineered designs and control measures that minimise the risk of dust generation and product spillage. Control measures include:

- when loading ships, the product reclaimers would be stopped, and the conveyor allowed to empty, before the ship loading boom travels between hatches to prevent bauxite spillage onto the deck of the ship; and
- servicing and cleaning the ship loading boom in a sealed and bunded maintenance area. Runoff from this sealed maintenance area would be directed to the head end sump for pumping back to shore.

### Monitoring

The following monitoring will be undertaken:

- Document any injury or death of marine turtles, dugong or other threatened marine fauna and report these to DERM for inclusion in the Wildlife Stranding database. Any injury or death that may be attributable to RTA operations would be investigated to determine appropriate mitigation measures;
- Water quality, marine pest, and marine mammal and turtle monitoring as described in the Dredge Management Plans; an observer will monitor an exclusion zone around pile-driving activities and normal pile-driving will not commence while threatened marine fauna are identified within the nominated exclusion zone;
- Turtle nesting activities (number, type, predation, success), behaviour (hatchling activity) and incident reporting; and
- Larval plates would be installed at two locations along the SoE Project jetty and would be retrieved and checked for introduced marine pest larvae every three months, as part of the marine pest monitoring program.

RTA is committed to continuing working with the DERM to reduce threats to marine turtles, particularly in the proposed port area, and assist with marine turtle research programs. RTA has placed sand temperature loggers near Boyd Point as part of a DERM research project to examine the potential impacts of climate change on marine turtle populations.

### 3.7.4 Proposed Environmental Authority Conditions: Schedule C – Land, Rehabilitation and Marine

#### 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 C12 & C13);
- 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.

Note: Activities which are ancillary to extraction activities such as haul and access roads, conveyors, bridges, loading ramps, pumps and pipelines 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 and implement a Land Use Management Plan (LUMP) for land within the ML 6024 and ML 7024 mining leases. This UMP will be submitted to the administering authority by 30 August 2012 for the East Weipa and Andoom mining areas, and within one (1) year of the commencement date of this environmental authority for the South of Embley Project area. 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 suitably qualified contractors trained in fauna handling, to ensure that any planned fauna handling is undertaken by a suitably qualified person; and
  - f. 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.
- 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 a suitably 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.

### Rehabilitation Objectives

- C9a Land disturbed by mining activities as identified in Schedule K Plan 7 - South of Embley Project Area Plan, must be rehabilitated in accordance with Table C1a – Rehabilitation Requirements and the objectives of the Rehabilitation Management Plan required under Condition (C16).
- C10 Areas that are available for rehabilitation must be identified in the current Plan of Operations.
- C11 Rehabilitation must commence progressively as areas become available in accordance with the Plan of Operations.
- C12 Topsoil and subsoils must be stripped separately and replaced directly in an area awaiting rehabilitation or else be stockpiled and subsequently used in rehabilitation.
- C13 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.
- C14 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 C1a Rehabilitation Requirements (South of Embley Project Area)**

Mine Domain	Rehabilitation Goal <sup>1</sup>	Rehabilitation Objective/s <sup>1</sup>	Indicators <sup>1</sup>	Completion Criteria <sup>1</sup>
Mined area	Safe	The site is safe for humans and animals, now and in the foreseeable future.	Presence of hazards	TBD
	Non-polluting	Surface and groundwater remains uncontaminated.	Surface and groundwater monitoring	TBD
	Stable Landform	Landform design achieves appropriate erosion rates.	No active erosion Ground cover	TBD Percentage ground cover (vegetation, litter and rocks combined) (TBD)
	Sustainable Land Use - Native, self-sustaining vegetation meeting criteria derived from reference sites and trials A. <i>Self-sustaining native dry woodland vegetation dominated by Eucalypts, Corymbias, Erythrophleum and other framework spp.</i>	Soil health – suitable growth medium established	Soil chemical, physical and/or biological properties	TBD
		Self-sustaining dry woodland vegetation and habitat established	Framework species presence	TBD: e.g. Minimum number of framework species present; target tree density range for all framework spp. combined
			Species richness	Species richness (number) (TBD)
			Presence of weed species	No declared noxious weeds present
			Structural composition	TBD: e.g. Percentage Foliage Projective Cover (FPC)
		Faunal species using site (or likely to)	Fauna	TBD: e.g. Fauna habitat development and/or evidence of fauna utilisation.
		Land use is established with comparable management requirements to similarly used un-mined land.	Health and resilience of vegetation	TBD: e.g. Evidence of growth and good health; Evidence of recovery following fire.
	Sustainable Land Use - Native, self-sustaining vegetation meeting criteria derived from reference sites and trials) B. <i>Self-sustaining native wetland community dominated by Melaleuca and/or Lophostemon species</i>	Soil health – suitable growth medium established	Soil chemical, physical and/or biological properties	TBD
		Self-sustaining wetland vegetation and habitat established in seasonally inundated areas	Framework species presence	TBD: e.g. Minimum number of framework species present; target tree density range for all framework spp. combined
			Presence of weed species Structural composition	No declared noxious weeds present TBD: e.g. Percentage Foliage Projective Cover (FPC)
		Land use is established with comparable management requirements to similarly used un-mined land.	Health and resilience of vegetation	TBD: e.g. Evidence of growth and good health; Evidence of recovery following fire.

Table C1a Rehabilitation Requirements (South of Embley Project Area)

Mine Domain	Rehabilitation Goal <sup>1</sup>	Rehabilitation Objective/s <sup>1</sup>	Indicators <sup>1</sup>	Completion Criteria <sup>1</sup>	
Tailings storage facilities	Safe	The site is safe for humans and animals, now and in the foreseeable future.	Presence of hazards	TBD	
	Non-polluting	Surface and groundwater remains uncontaminated.	Surface and groundwater monitoring	TBD	
	Stable Landform	Landform design achieves appropriate erosion rates.	Slope angle and length Ground cover	TBD Percentage ground cover (vegetation, litter and rocks combined): TBD	
		Sustainable Land Use –Self-sustaining vegetation meeting criteria derived from monitoring and research of existing rehabilitation on TSFs	Soil health – suitable growth medium established	Soil chemical, physical and/or biological properties	TBD
			Self-sustaining vegetation and habitat established	Framework species presence	TBD: e.g. Minimum number of framework species present; target density or cover for all framework spp. combined
					Presence of weed species
Infrastructure - Plant	Safe	The site is safe for humans and animals, now and in the foreseeable future.	Structural composition	TBD: e.g. Percentage Foliage Projective Cover (FPC)	
		Surface and groundwater remains uncontaminated.	Health and resilience of vegetation	TBD: e.g. Evidence of growth and good health; Evidence of recovery following fire.	
		Landform design achieves appropriate erosion rates.		TBD	
	Non-polluting	Surface and groundwater remains uncontaminated.	Surface and groundwater monitoring	TBD	
		Stable Landform			
	Sustainable Land Use - Native, self-sustaining vegetation meeting criteria derived from appropriate reference sites and trials	Self-sustaining vegetation and habitat established	No active erosion	TBD	
			Ground cover	Percentage ground cover (vegetation, litter and rocks combined): TBD	
			Framework species presence	TBD: e.g. Minimum number of framework species present; target density or cover for all framework spp. combined	
			Presence of weed species	No declared noxious weeds present;	
			Structural composition	TBD: e.g. Percentage Foliage Projective Cover	

**Table C1a Rehabilitation Requirements (South of Embley Project Area)**

Mine Domain	Rehabilitation Goal <sup>1</sup>	Rehabilitation Objective/s <sup>1</sup>	Indicators <sup>1</sup>	Completion Criteria <sup>1</sup>
Infrastructure – transport	Transport infrastructure such as the Port, ferry and barge terminals, mine access road, may be left in place.	Land use is established with comparable management requirements to similarly used un-mined land.  Subject to agreement with regulators and Traditional Owners some facilities such as the transport infrastructure may be left in place. The Final Rehabilitation Report will address any on-going maintenance, management and funding requirements and shall be approved by DERM	Health and resilience of vegetation  NA	TBD: e.g. Evidence of growth and good health; Evidence of recovery following fire.  NA
Water supply dam (including the fishway structure) and other water infrastructure	Water infrastructure, such as the water supply dam, may be left in place.	Subject to agreement with regulators and Traditional Owners some facilities such as the water storage dam may be left in place. The Final Rehabilitation Report will address any on-going maintenance, management and funding requirements and shall be approved by DERM	NA	NA

<sup>1</sup>. Draft rehabilitation goals, objectives, indicators and completion criteria only. These will be further developed through consultation, research, on-going monitoring, and site specific trials and included in a Rehabilitation Management Plan which will be developed, implemented and submitted to DERM within three years of the commencement of mining.

### Rehabilitation Management Plan

- C15 The holder of this environmental authority must develop, implement and submit to the administering authority a Rehabilitation Management Plan (RMP) for East Weipa and Andoom activities by 30 August 2013 and must include:
- schematic representation of final land form inclusive of drainage features;
  - slope and cover designs;
  - drainage design;
  - erosion controls proposed on reformed land;
  - revegetation methods inclusive of plant species selection, re-profiling, soil handling (including stockpiling), soil ameliorants/ amendments, surface preparation and method of propagation;
  - materials balance including available topsoil and low permeability capping material;
  - geotechnical, geochemical and hydrological studies;
  - chemical, physical and biological properties of soil and water;
  - agreed post mining land and/or infrastructure use with the landowner/ holder and the administering authority;
  - 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;
  - description of experimental design for monitoring of reference and rehabilitated areas inclusive of statistical design;
  - a rehabilitation monitoring program based on a statistically sound, mutually agreed sampling design;
  - research program and associated milestones; and
  - programs for maintenance of rehabilitation as required to achieve the nominated rehabilitation objective.
- C16 Within three years of commencement of bauxite mining at the South of Embley Project, the holder of this environmental authority must review the existing Weipa RMP to incorporate the South of Embley Project or develop, implement and submit to the administering authority a separate RMP for the South of Embley Project.

### Infrastructure

- C17 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

- C18 A Post Closure Management Plan for the site must be prepared at least eighteen (18) months prior to final ore processing onsite and implemented for a nominal period of:
- at least thirty (30) years following final ore processing onsite; or,
  - 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.
- C19 The Post Closure Management Plan must include, where necessary, the following elements:
- operation and maintenance of:
    - wastewater collection, treatment and reticulation systems;
    - the groundwater monitoring network;
    - final cover systems; and
    - vegetative cover.
  - monitoring of:
    - surface water quality;
    - groundwater quality;
    - erosion rates;
    - the integrity and effectiveness of final cover systems; and
    - the health and resilience of vegetative cover.

### Storage and Handling of Hazardous Materials

- C20 By August 2012, conduct an assessment of all explosives, hazardous chemicals, corrosive substances, toxic substances, gases, dangerous goods, flammable and combustible liquids stored and handled onsite 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 within two and a half (2.5) years.
- C21 Subject to condition C20, 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.
- C22 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:
- 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,
  - all chemical product drum storages must be bunded so that the capacity of the bund is sufficient to contain at least 100% of the maximum design storage volume within the bund.
- C23 All containment systems for chemicals and flammable or combustible liquids must be designed to minimise rainfall collection within the system.
- C24 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.

- C25 Spillage of any contaminant must be contained and land remediated to prevent environmental harm.
- C27 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 for the Assessment & Management of Contaminated Land in Queensland.

#### Bio-Remediation Pads

- C28 Soil and absorbent materials potentially contaminated with hydrocarbons must be treated onsite in a designated bioremediation area. Treated material will not be used for any purpose unless contamination thresholds defined in Table C3 - TPH Thresholds in Treated Soils are achieved.

**Table C3 TPH Thresholds in Treated Soils**

Recoverable Hydrocarbon Fraction	Maximum <sup>1</sup>
C6–C9	100 mg/kg
C10–14	100 mg/kg
C15 and greater	1000 mg/kg

<sup>1</sup> Guidelines for Assessment of Contaminated Land in Qld. 1991.

#### Marine

- C29 A Dredge Management Plan will be developed and implemented prior to commencement of any capital or maintenance dredging activities.

#### END OF CONDITIONS FOR SCHEDULE C

### 3.8 Water Resources

#### 3.8.1 Value/Background

The environmental values of waters to be protected are defined by the *Environmental Protection (Water) Policy 2009* (Qld) (EPP Water) as:

- biological integrity of a slightly modified aquatic ecosystem;
- suitability for recreational use;
- suitability for minimal treatment before supply as drinking water;
- suitability for agricultural use; and
- suitability for industrial use.

#### Surface Water

There are no pre-existing surface water dams or weirs in the Project area. The surface waters of the Project area are used by Traditional Owners and visitors for fishing, camping and recreation. RTA uses very small amounts of surface water during mineral exploration activities. There are no domestic cattle in the Project area.

Detailed baseline surface water resource studies are described in RTA (2011) and RTA (2012). The principal catchments in the Project area are presented in **Table 3-11**.

**Table 3-11 Catchment Area**

Project Area Catchments	Area (km <sup>2</sup> )
Hey River	756
Triluck Creek	108.4
Winda Winda Creek	93.9
Norman Creek (all tributaries)	259.0
Ina Creek	65.4
Ward River sub-catchment	186.9
Coconut Creek	119.2
Tappelbang Creek	126.9
Sandy Creek	105.2
Possum Creek	130.5
Ward River (all tributaries)	665.8
Adjacent Catchments	Area (km <sup>2</sup> )
Embley River	1000
Watson River	2872

The Watson River drains a relatively small area in southern extremity of ML 7024.

The proportion of surface runoff (<1%) is unusually small and reflects the flat topography and the very high infiltration rates of the soils and lateritic strata. The consequence of this is streamflow does not respond quickly to incident runoff until after the catchment is “wetted up” and there is no “first-flush” response to rainfall at the start of the wet season. Wet-season rainfall typically commences in November but it is usually not until January, after soil moisture stores are filled, that streams show appreciable flow. Thereafter, flows rise until March or April in response to wet-season rainfall and then decline once rainfall ceases. In lower catchment locations within the Project area, flows may persist until late in the dry season.

Proposed mining activities may result in impacts to surface water hydrology and quality. The Project area is not grazed and no rural homesteads are located near the Project area, therefore dams within the Project area are not accessible to stock.

#### Groundwater

The hydrogeology and groundwater resources of the Project area are described in detail in RTA (2011) and RTA (2012).

The groundwater bodies in the area have been differentiated as shallow aquifer and artesian aquifer resources. The artesian resources are hosted within the Gilbert River formation and Garraway Beds, and the shallow aquifer resources are those occurring within the formations above the Rolling Downs Group.

Proposed mining activities may result in impacts to groundwater hydrology and quality.

#### 3.8.2 Objectives

The environmental protection objectives for water resources are to:

- minimise impact on water quality and biological characteristics of surface and groundwaters;
- maintain surface water amenity values for the local community; and
- maintain suitability of surface and groundwaters for potable, agricultural and industrial use.

#### 3.8.3 Commitments

##### Performance Criteria

The performance criteria for water resources are:

- compliance with the requirements of the environmental authority;
- compliance with the requirements of the existing groundwater licence; and
- groundwater and surface water monitoring in accordance with the monitoring program.



## Implementation Strategy

### Water Supply

The Project's principal water requirements are for process water, haul-road watering, vehicle wash-down, dust suppression and potable supplies. Typically, water would be drawn in order of preference from tailings recycle, recovery slots, and then a combination of surface water dam (Dam C) and artesian bores. After the construction of the Norman Creek plant, some supplementary surface water will be drawn directly from the Ward River to minimise the risk of inadequate supply from Dam C. A detailed water balance is provided in RTA (2012) and the overall water balance for the Project is summarised in **Table 2-2**.

The locations of water management infrastructure are shown in **Figure 4** and **Figure 5** and a detailed plan of water management in the Boyd infrastructure area is provided in **Figure 6**. Schematic diagrams of the proposed Boyd and Norman Creek water management systems are shown in **Figure 7** and **Figure 8** respectively.

A water supply dam (Dam C) is on a freshwater tributary of Norman Creek (refer **Table 3-12**). If constructed in two stages, the first stage would provide 10.9GL storage capacity and, later, the wall would be raised to provide 29GL storage capacity. The dam would be constructed in a single stage (29GL capacity) should expansion of production be anticipated to occur quickly. This is the subject of ongoing feasibility studies.

Process water ponds in each of the mine infrastructure areas have been designed to contain three days supply of water for the beneficiation plants, dust suppression, and other industrial uses.

**Table 3-12 Water Supply Dam Summary**

Recoverable Hydrocarbon Fraction	Dam C	
	At 10.9 Capacity	At 29.0GL Capacity
Total catchment area (km <sup>2</sup> )	259.0	
Dam catchment area (km <sup>2</sup> )	77.3	
Dam catchment as % of total catchment	29.8%	
Maximum dam volume (GL)	10.9	29.0
Dam surface area (km <sup>2</sup> ) (at spillway)	3.6	6.5
Dam wall height (m) (at spillway)	8.0	12.0
Freeboard above spillway (m)	2.75	3.0

The artesian demand will fluctuate depending on whether there is above or below average rainfall runoff into the water supply dam. RTA has an existing artesian water licence for 9GL per annum which allows abstraction of underground water from the Gilbert River Formation and from the Garraway Beds from bores located on ML 7024. RTA proposes to apply to increase the artesian allocation to cover the fluctuations in artesian demand. It is proposed that a five-year moving average of 12GL per annum be established, with a peak abstraction of 15GL in any one year. The impact of abstraction on the artesian aquifer has been modelled and is discussed in RTA (2011).

RTA also has an existing shallow aquifer water licence for 15.77GL per annum, which allows abstraction of underground water from Weipa Tertiary Sediments under ML 7024.

During construction treated effluent from the construction camp STP would be recycled for use in irrigation of landscaped areas in the construction camp as well the dust suppression and earthwork compaction during construction in the Boyd infrastructure area, the mine access road, infrastructure corridor, Dam C and the tailings storage facilities (refer to **Figure 2** for locations). During operations, treated effluent from the Boyd and Norman Creek sewage treatment plants would be diluted in the process water pond and recycled. The management of sewage is discussed later in this section.

The Project potable water requirements are small, 15ML per annum under the 15Mdtpa production scenario rising to 30ML per annum under the 50Mdtpa production scenario. A reverse osmosis potable water treatment plant is used to treat raw water to a standard that meets the *Australian Drinking Water Guidelines* (NHMRC 2004).

### Dam Design Criteria

The dams in the Project area have been assessed against the draft Manual for Assessing Hazard Categories and Hydraulic Performance (DERM 2011) and a summary is shown in **Table 3-13**.

Table 3-13 Dam Hazard Assessment

	Wall Height >8m?	Exceeds Contaminant Concentration Trigger?	Hazard Category Assessment (DERM 2011)	Design Storage Allowance Requirement?
<b>Dam C (water storage)</b>	Yes	No	Low	No
<b>Tailings storage facilities</b>	Yes	No	Significant	Yes
<b>Process water ponds</b>	No	No	Low	No
<b>Sediment ponds</b>	No	No	Low	No
<b>Industrial area drainage slots</b>	No	No	Low	No
<b>Recovery slots</b>	No	No	Low	No

The Australian National Committee on Large Dams (ANCOLD 2000) provides hydrologic design criteria for spillways based on downstream flood hazard. Dam C represents a low to significant incremental flood hazard category and, as such, the spillway should be designed to pass a 1:1000 Annual Recurrence Interval (ARI) flood event as a minimum. A 1:1,000 ARI storm event is considered a rare event (IEA 2001). The dam spillway will be designed to pass the peak flow from a 1:2,000 ARI flood event. The spillway will be at a low gradient (<3%) and be designed to facilitate fish passage during spillway flow events.

The process water ponds and tailings storage facilities are constructed as “turkey’s nest” dams, meaning they only capture the rainfall that falls directly on the dam impoundment. None of these dams contain contaminants in concentrations that are hazardous.

The hazard category of the tailings storage facilities has been rated as “significant” for a dam break scenario in accordance with DERM’s draft Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (December 2011). The process water ponds are “low” hazard category and therefore will be designed for a spillway critical design storm of 1:100 year ARI. The process water ponds will be designed to operate a freeboard equivalent to a 24-hour 1:100 year ARI rainfall event.

The mine industrial area drainage slots and the stockpile sediment ponds receive stormwater runoff. These ponds will be sized to a volume equivalent to the runoff volume from a 1:10 ARI 24-hour rainfall event, plus 20% for sediment storage. The water from these ponds will be pumped to either the process water pond or the tailings storage facility.

Releases from the tailings storage facility spillways, process water pond spillways, mine industrial area drainage slots, tailings storage facility recovery slots and stockpile sediment ponds would occur if a storm event exceeded the specified design criteria.

Stormwater runoff generated within active mine areas is predominantly contained within the internally draining mine pits. The post-mining landscape effectively provides internally draining sumps that contain stormwater runoff, which then infiltrates through the pit floor and walls. In the event the active pit or post-mining topography is not an internally draining pit, stormwater runoff would be directed via a sediment pond. Water releases from sediment ponds in extraction areas will be monitored and compared to release water trigger levels.

The Mine Access Road alignment follows elevated portions of the landscape wherever possible to enable all weather access; however, culvert causeways would be required at certain drainage lines where low level crossings are not appropriate. The Norman Creek access road and certain internal mine haul roads will also require culvert causeways for a number of drainage line crossings. Sediment traps would be included as part of the drainage designs at points where haul roads cross watercourses.

#### Water Quality

Potential contaminant sources, such as ore, tailings, tailings liquid and stockpile runoff, have been analysed and reported in RTA (2011). The results are summarised below in terms of potential contaminant impacts to surface and groundwater:

- The results suggest bauxite stockpiles are unlikely to be a significant contributor of aluminium to surface water ecosystems via runoff. Tailings liquid and some tailings seepage waters may contain aluminium concentrations greater than 80<sup>th</sup> percentile calculated for any freshwater site in the Project area, but within the range found in late dry season sampling of site waters;
- The following metals were not detected in tailings liquor at concentrations greater than the reporting limit: arsenic, boron, cobalt, copper, lead, nickel, selenium, zinc and mercury. This, combined with the lack of enrichment in the ore (Geochemical Abundance Index (GAI) less than three, according to Bowen (1979)) indicates these elements are not

considered potential constituents of concern for the Project area.

- Tailings solid and ore samples were collected for leach analyses using two analytical methods. Based on these results, leaching from either is not anticipated to have an adverse effect on surface or ground waters.

Water from the heavy and light vehicle wash bays will be treated in oil water separators prior to recycling.

Aluminium, iron and manganese may be affected by geochemical changes arising from mining impacts or natural causes.

Due to the non-hazardous nature of the ore, tailings liquid and tailings solids, water contained within the tailings storage facilities, process water ponds, recovery slots, drainage slots and stockpile sediment ponds is non-hazardous and water releases from these containments during events that exceed the design criteria would not cause environmental harm.

A range of metals would be regularly monitored in surface waters and to provide an early indicator of any potential impacts. Waters released to the environment will be monitored and compared to release water trigger levels and contaminant limits. Water releases from extraction areas will also be monitored.

#### **Catchment Hydrology**

Modelling described in RTA (2011) indicates the overall impact of mining on catchment discharge is very much less than the normal year-to-year variation driven by rainfall variation. This is consistent with the calibrated rainfall-runoff model, which shows surface runoff is extremely low and hence changes to surface drainage patterns have little impact on overall discharge into streams.

The impact of Dam C on downstream flow was modelled using a daily rainfall-runoff model (Boughton's Australian Water Balance Model (AWBM)) embedded in a GoldSim model that takes into account inputs (catchment runoff, direct rainfall) and outputs (pumped withdrawals, evaporation, evaporation, seepage, spillway overflow and environmental releases) (RTA 2011). Dam C leads to an appreciable annual decline (>20%) in flows immediately downstream on that particular branch of the Norman Creek. However, when the catchment is considered as a whole, the overall decline (<15%) is well within the range of normal year-to-year variation.

Dam C is fitted with a low-level outlet pipe, which permits the controlled release of environmental flows when required. Sufficient water is reserved for environmental flows to enable continued releases in the driest months (August to October) of a volume

equivalent to 25% of dam inflows. The pipe is sized to enable peak discharge of up to 1000L/s, if required. When dam inflows cease, environmental flow releases cease. Once the dam is full following the onset of the wet season, the spillway would typically overflow on a regular basis. If environmental flow releases are required during the wet season, they would commence after the dam is full.

The GoldSim daily water balance model was also used to estimate Ward River flow at the pump station and the pumped volumes (RTA 2011). The overall impact of pumping on the Ward River hydrological regime is minor. The annual volume of water pumped from the Ward River would be capped at 1% of mean annual river flow at the pump station (2.67GL). In addition, no pumping would occur when Ward River flow was less than 1000L/s and the rate of pumping at all times would be less than 20% of the river flow rate.

#### **Erosion and Sedimentation**

Erosion rates from active mining areas are higher than from un-mined areas. In the wet season, increased erosion is expected to occur during mining operations from activities such as soil stripping, mining, and haul-road construction. However, due to pit layout and topography, rainfall runoff will be predominantly retained within the mined areas.

Some elevated sediment concentrations are also expected to occur in storm water runoff from ore processing and stockpile areas. Runoff and sediment collected from catch trays, belt scrapings, and the sealed maintenance area on the wharf will be pumped back to the wharf drainage sump on shore.

The following principles will be applied in the management of stormwater discharge:

- the *Engineering Guidelines for Queensland for Soil Erosion and Sediment Control* (IE Aust 1996) will be followed;
- land disturbance will be restricted to that necessary for the works;
- topsoil will be salvaged for use in rehabilitation;
- outflow will be passed from the sediment dams via engineered spillways to adjacent waterways;
- stormwater and runoff from upstream catchments will be diverted away from active mining and disturbed areas;
- drains will be protected to prevent scouring if necessary;
- sediment dams will be de-silted and cleaned periodically;
- hazardous materials will be stored in bunded areas or stored such that contaminated runoff is not generated; and

- traffic will be confined to maintained tracks and roads.

Erosion and sedimentation control program will be included in site environmental procedures.

The water quality of natural surface drainage systems would be maintained by preserving riparian vegetation corridors. The buffer system will exceed the minimum requirements of the Queensland Government's *Regional Vegetation Management Codes* as they relate to clearing set-back distances from watercourses and wetlands (DERM 2009b). The retention of vegetation buffers around and adjoining surface drainage lines and wetland features provides effective management of elevated sediment load risks that would otherwise impact aquatic ecosystems. Areas that are disturbed by mining activities and infrastructure are to be rehabilitated to a stable landform with a self-sustaining vegetation cover.

### Groundwater

The hydrogeology and groundwater quality of the Project area is described in detail in RTA (2011).

The existing water licence requires that drawdown does not exceed five metres at Bramwell Station, Batavia Downs and Weipa Crossroads monitoring bores. The modelling results indicate under the proposed licensed abstraction regime the existing water licence condition relating to maximum relative drawdown would be met (RTA 2011). The modelling predicted the existing water licence condition relating to maximum relative drawdown would be met for both a 12GL and an 18GL per annum scenario. The results

indicate the aquifer could sustainably support abstraction rates greater than the proposed rate of 12GL per annum (five-year moving average).

Section 39 of the *Great Artesian Basin Resource Operations Plan* (GAB-ROP) prescribes conditions that must be met for the chief executive to make a decision about a water licence, if the decision is associated with a management unit connected to a spring, and the water is for purposes other than domestic and stock watering (DNRW 2007). A decision associated with abstraction from a management unit connected to a spring is subject to the cumulative spring factor not exceeding 400mm head of water. The GAB-ROP prescribes how the spring factors are to be calculated (DNRW 2007).

The proposed artesian groundwater abstraction from existing and proposed new bores will take water from the Gilbert River Formation, which is connected to watercourse and recharge springs. The spring factors for the closest recharge and watercourse springs have been calculated to demonstrate the cumulative spring factor limit of 400mm is not exceeded for any of the existing or proposed new bores.

The calculated spring factors represent the highest possible cumulative spring factor for each spring because the spring factors are calculated on the assumption that all 12GL per annum is abstracted from the closest bore. The calculated spring factors presented in **Table 3-14** are all well below the spring factor limit of 400mm head of water, demonstrating the spring factor requirement is met in all cases.

**Table 3-14 Spring Factors**

Spring Type	Spring ID	Distance from Closest Borefield (km)	Closest Borefield	Spring Factor Multiplier (from Table D-2)	Spring Factor (mm Head of Water) (Spring Factor x 12,000 MLpa)
Recharge	V512	110	Andoom	0.0003	3.6
Recharge	V511	107	Andoom	0.0004	4.8
Recharge	V499	113	Andoom	0.0002	2.4
Recharge	V498	112	East Weipa	0.0002	2.4
Recharge	V495	126	SoE	0	0
Recharge	V497	138	SoE	0	0
Watercourse	Palm Creek	84	Andoom	0.008	96
Watercourse	Oliver River	100	Andoom	0.0006	7.2
Watercourse	Wenlock River	87	Andoom	0.007	84
Watercourse	Wenlock River	94	East Weipa	0.004	48
Watercourse	Archer River	129	SoE	0	0
Watercourse	Coen River	154	SoE	0	0

### Water Management Plan

A Water Management Plan will be developed to address all aspects of water management and potential impacts to receiving environments. It will consist of:

- contaminant source study;
- site water balance and model;
- water management system;
- emergency and contingency planning; and
- monitoring and review.

### Monitoring

Streamflow gauging stations will be installed upstream and downstream of Dam C, as well as in two Norman Creek sub-catchments (one to be mined and one non-mined “control”). When the Ward River pump station is installed, a stream gauging station will be installed on the river in the vicinity of the pump. The streamflow monitoring network (with the exception of the Ward River) locations will be implemented prior to commencement of mining. The streamflow monitoring for Ward River would be implemented prior to pumping from the Ward River.

Surface water will be monitored for relevant physico-chemical parameters at monitoring points located in each of the major tributaries, upstream and downstream of mining activity, where possible, on a monthly basis until a statistical baseline is established (consistent with ANZECC requirements), and then quarterly.

Groundwater levels and relevant quality parameters will be monitored at locations upgradient and downgradient of the mine industrial areas and tailings storage facilities. Groundwater levels will also be monitored upgradient, downgradient or within mining areas. The shallow groundwater monitoring bore network in the vicinity of the Boyd infrastructure areas and associated mining areas will be implemented prior to commencement of mining. The shallow groundwater network in the vicinity of the Norman Creek infrastructure area would be implemented prior to commissioning of the Norman Creek infrastructure area.

### 3.8.4 Proposed Environmental Authority Conditions: Schedule D – Regulated Dams (Including Structures Containing Mineral Waste)

#### General

- D1 The hazard 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 hazard 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 and D20.
- D3 Water and tailings may 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 does condition not exclude the storage of water or tailings in accordance 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	Northing (MGA 94)	Easting (MGA 94)
Boyd Tailings Storage Facility	8,567,370	568,445
Norman Creek Tailings Storage Facility	8,554,910	578,320

- 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	Hazard Category	Maximum Surface Area (Ha)	Maximum Capacity (Mt)	Maximum RL <sup>1</sup> (m)	Purpose
Boyd Tailings Storage Facility	Significant	1100	216	55	Storage of tailings
Norman Creek Tailings Storage Facility	Significant	1100	234	80	

<sup>1</sup> 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:
- a. the holder has submitted to the administering authority two (2) electronic copies (one (1) locked copy 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; and,
  - b. at least twenty (20) business days has passed since the receipt of those documents or the administering authority notifies the holder that a design plan and certification has been submitted for that dam.
- 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 (PAR), within the meaning of the Guidelines on Acceptable Flood Capacity for Dams February 2007 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 PAR 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 copy and one (1) working copy) of a set 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.

### Inspection of Regulated Dams

- D13 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.
- D14 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.
- D15 At each annual inspection if a mandatory reporting level is required it must be determined and marked on each regulated dam.
- D16 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 and result in an estimate of the level in that dam as at 1 November each year.

D17 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.

D18 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 final 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.

Note: Weather conditions include the commencement of the wet season. Accordingly, it may not be practicable to implement formulated actions until the end of the wet season.

D19 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

D20 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	Capacity or Diversion Capacity (Levees) AEP	Mandatory Reporting Level <sup>1</sup> (Dams Other than Levees) AEP <sup>2</sup>
Boyd 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 100 AEP, 72 hour duration rainfall event or 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 100 AEP, 72 hour duration rainfall event or wave allowance

<sup>1</sup> Refers to the level below the spillway crest, required to contain either the AEP (design risk) 72hr storm or the AEP (design risk) wave allowance, whichever is lower.

<sup>2</sup> 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.

D21 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.

D22 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.

#### Decommissioning of Regulated Dams – Objective

D25 Regulated dams must be dealt with in accordance with the conditions of this environmental authority and must not be abandoned.

D26 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.

D27 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.
- D28 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

- D29 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.
- D30 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.

#### END OF CONDITIONS FOR SCHEDULE D

### 3.8.5 Proposed Environmental Authority Conditions: 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 not be carried out in areas from which contaminants can be released into any waters, roadside gutter or stormwater drainage system.
- H3 All determinations of water quality must be:
- a. made in accordance with methods prescribed in the latest edition of the administering authorities Monitoring and Sampling Manual.
  - 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; and,
  - b. the monitoring point at which the sample was taken; and,
  - c. the measured or estimated daily quantity of the contaminants released from all release points; and,
  - d. the release flow rate at the time of sampling for each release point; and,
  - 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 release of contaminants to waters from the licensed activity 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**.
- H6 The release of contaminants to waters from the release points and extraction areas must

be monitored at the monitoring locations listed in Table H1 – Release Points (point source release) and **Table H2** – Release from Extraction Areas and at a frequency specified in Condition (H7).

**Table H1 Release Points (Point Source Release)**

Release Point	Description of Water Release	Contaminant Source	Description and Nature of Receiving Waters	Release Point/Monitoring Location	
				Northing (GDA94)	Easting (GDA94)
Tailings Storage Facilities					
Boyd TSF Spillway North Cell	Tailings decant water	Boyd TSF	Norman Creek tributary	8,568,435	569,675
Boyd TSF Spillway South Cell	Tailings decant water	Boyd TSF	Norman Creek tributary	8,566,395	569,670
Norman Creek TSF Spillway North Cell	Tailings decant water	Norman Creek TSF	Ward River tributary	8,556,550	578,960
Norman Creek TSF Spillway South Cell	Tailings decant water	Norman Creek TSF	Ward River tributary	8,554,340	579,855
Boyd Tailings Recovery Slot	Tailings decant water	Boyd TSF	Unnamed creek near Pera Head	8,567,215	567,050
Norman Creek Tailings Recovery Slot	Tailings decant water	Norman Creek TSF	Ward River tributary	8,554,160	577,090
Plant Processing Areas					
Boyd Process Water Pond	Tailings decant water	Boyd TSF	Gulf of Carpentaria near Boyd Point	8,569,850	568,250
Norman Creek Process Water Pond	Tailings decant water	Norman Creek TSF	Norman Creek tributary	8,557,380	575,460
Boyd MIA Drainage Slot	Processing Area Drainage	Plant infrastructure	Gulf of Carpentaria near Boyd Point	8,570,680	568,795
Norman Creek MIA Drainage Slot	Processing Area Drainage	Plant infrastructure	Norman Creek tributary	8,557,970	576,210
Ore Stockpile Areas					
Northern Stockpile Settling Pond	Ore stockpile drainage	Ore stockpiles	Gulf of Carpentaria near Boyd Point	8,571,615	568,855
Southern Stockpile Settling Pond	Ore stockpile drainage	Ore stockpiles	Unnamed creek near Pera Head	8,567,960	566,695

**Table H2 Release from Extraction Areas**

Monitoring Location	Description of Water Releases	Contaminant Source	Description of Receiving Waters	Release Point/Monitoring Location	
				Northing (MGA94)	Easting (MGA94)
Impacted Sites					
Defined in Plan of Operations in accordance with the REMP.	Release of contaminated stormwater via sediments dams and sheet flow	Extraction area	Streams, Creeks, Rivers and Coastal environment in and adjacent to ML 7024 and ML 6024	TBD	TBD
Reference Sites					
TBD <sup>1</sup>	TBD	TBD	TBD	TBD	TBD

<sup>1</sup> TBD based on Receiving Environment Monitoring Program.

- H7 Where there is a release to waters at the release points specified in Table H1 – Release Points (point source release) and Table H2 – Release from Extraction Areas, waters must be monitored for each quality characteristic specified in Table H3 – Release Water Trigger Levels and Contaminant Limits. For any release, waters must be monitored if it is safe to do so:
- Promptly and within twenty-four (24) hours of the commencement of release;
  - Daily during release for seven (7) days;
  - Weekly thereafter for one (1) month; and
  - Monthly for the remainder of the wet season.
- H8 The release of contaminants directly or indirectly to waters must not:
- produce any slick or other visible or odorous evidence of oil, grease or petrochemicals; nor
  - contain visible floating oil or grease.
- H9 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.
- H10 The release of contaminants to waters from point sources as defined in Table H1 – Release Points (point source release) must not exceed the release limits stated in Table H3 – Release Water Trigger Levels and Contaminant Limits when measured at the release monitoring points specified in Table H1 – Release Points (point source release) for each quality characteristic.
- H11 If quality characteristics of the release from sources defined in Table H1 – Release Points (point source release) and Table H2 – Release from Extraction Areas exceed any of the trigger levels specified in Table H3 – Release Water Trigger Levels and Contaminant Limits during a release event, the holder of this environmental authority must compare the results of the impacted site to the data from reference monitoring sites and:
- if the level of contaminants at the impacted site does not exceed the reference monitoring site data, then no action is to be taken; or
  - if the level of contaminants at the impacted site is greater than the reference monitoring site data, complete an investigation in accordance with the ANZECC & ARM CANZ (2000) methodology into the potential for environmental harm and provide a written report to the administering authority within three (3) months outlining:
    - details of the investigations carried out; and
    - actions taken to prevent environmental harm.
- Note: Where an exceedance of a trigger level has occurred and is being investigated in accordance with H11(b) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic within the three month investigation period.

**Table H3 Release Water Trigger Levels and Contaminant Limits**

Quality Characteristic	Trigger Levels (µg/L for Toxicants) - Freshwater	Trigger Levels (µg/L for Toxicants) – Estuarine Waters	Contaminant Limit <sup>11, 14</sup> (Mg/L for Toxicants) - Freshwater	Contaminant Limit <sup>11, 14</sup> (Mg/L for Toxicants) – Estuarine Waters
pH (pH unit)	4.6 <sup>15</sup> (minimum) 8.0 <sup>16</sup> (maximum)	5.7 <sup>15</sup> (minimum) 8.5 <sup>17</sup> (maximum)	4.4 <sup>15</sup> (minimum) 8.0 <sup>16</sup> (maximum)	5.3 <sup>15</sup> (minimum) 8.5 <sup>17</sup> (maximum)
EC (µS/cm)	140 <sup>10</sup>	N/A	1000 <sup>9</sup>	N/A
Sulphate (SO <sub>4</sub> <sup>2-</sup> )	80 <sup>th</sup> percentile <sup>1, 2, 5, 13</sup> of reference <sup>4</sup>	N/A	1000 <sup>6</sup>	N/A
Turbidity (NTU)	80 <sup>th</sup> percentile <sup>1, 2, 5, 13</sup> of reference <sup>4</sup> or 15 <sup>18</sup> , whichever is higher	80 <sup>th</sup> percentile <sup>1, 2, 5, 13</sup> of reference <sup>4</sup> or 20 <sup>18</sup> , whichever is higher	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>
Suspended Solids (Mg/L)	N/A	N/A	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>
Aluminium	55 <sup>19</sup>	80 <sup>th</sup> percentile <sup>1, 2, 5, 13</sup> of reference <sup>4</sup>	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup> or 5 <sup>6</sup> , whichever is lower	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>
Copper	1.4 <sup>19</sup>	1.3	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup> or 1 <sup>6</sup> whichever is lower	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>
Iron	300 <sup>19</sup>	80 <sup>th</sup> percentile <sup>1, 2, 5, 13</sup> of reference <sup>4</sup>	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>
Lead	3.4 <sup>19</sup>	4.4	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup> or 0.01 <sup>8</sup> whichever is lower	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>
Zinc	8.0 <sup>19</sup>	15	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup> or 3 <sup>8</sup> whichever is lower	95 <sup>th</sup> percentile <sup>5, 13</sup> of reference value <sup>7, 12</sup>

<sup>1</sup> An interim trigger value can be derived from ≥8 but ≤17 consecutive reference site samples, derived using DERM (2006) methodology (section 3.4.3.1).

<sup>2</sup> Trigger values are based on the 80<sup>th</sup> percentile of at least 10 and no more than 24 consecutive reference site samples, derived using the DERM (2006) methodology (Table D1, and section 3.4.3.1).

<sup>3</sup> Default trigger values – from ANZECC (2000) trigger levels for aquatic ecosystems indicative of slightly disturbed tropical Australian upland river ecosystems.

<sup>4</sup> Reference sites are to be determined in accordance with Condition (H15).

<sup>5</sup> 80<sup>th</sup> and 95<sup>th</sup> percentiles are calculated using ANZECC (2000) methodology (section 7.4.4.1).

<sup>6</sup> Contaminant limit based on ANZECC (2000) stock water quality guidelines.

<sup>7</sup> Limit levels based on reference data are to be based on 24 consecutive samples obtained at the time of a release (18 at a minimum).

<sup>8</sup> Contaminant limit based on NHMPC Drinking Water Guidelines (2011).

<sup>9</sup> Contaminant limit based on administering authority policy.

<sup>10</sup> Contaminant trigger based on Queensland Water Quality Guidelines (Table G.4 – 80<sup>th</sup> percentile).

<sup>11</sup> Contaminant limits only apply to point source discharges and when the storm event causing the water release does not exceed the specified design criteria for the dam.

<sup>12</sup> Where 95<sup>th</sup> percentile of reference is exceeded and the reference site also exceeds the value during the same event, the value of the reference site during the same event applies.

<sup>13</sup> TBD based on Receiving Environment Monitoring Program.

<sup>14</sup> Contaminant limits for fresh and estuarine waters are to be developed as a recommendation on completion of the Receiving Environment Monitoring Program and a report to be submitted under Condition (H16).

<sup>15</sup> 20<sup>th</sup> and 5<sup>th</sup> percentile of SoE Project surface water quality monitoring results (RTA 2011).

<sup>16</sup> ANZECC 2000, default trigger value for tropical Australia for slightly disturbed ecosystems, lowland river.

<sup>17</sup> ANZECC 2000, default trigger value for tropical Australia for slightly disturbed ecosystems, estuaries.

<sup>18</sup> ANZECC 2000, default trigger value for tropical Australia for slightly disturbed ecosystems, upland and lowland rivers.

<sup>19</sup> ANZECC 2000 trigger value applying to typical slightly–moderately disturbed systems, freshwater.

Note: All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/metalloids apply if dissolved results exceed trigger.

- H12 The quality of the receiving groundwaters must be monitored at the locations specified in Table H4 - Groundwater Monitoring Points (South of Embley) for each physical and quality characteristic and at the monitoring frequency stated in Table H4 - Groundwater Monitoring Points (South of Embley).

**Table H4 Groundwater Monitoring Points (South of Embley)**

Northing (GDA94)	Easting (GDA94)	Monitoring Points	Parameters	Frequency*
TBA#	TBA#	GM1 (Boyd MIA upgradient)	Level	Monthly
			pH, EC, Total Petroleum Hydrocarbons (TPH)	Quarterly
TBA#	TBA#	GM2 (Boyd MIA downgradient)	Level	Monthly
			pH, EC, TPH	Quarterly
TBA#	TBA#	GM3 (Norman Creek MIA upgradient)	Level	Monthly
			pH, EC, TPH	Quarterly
TBA#	TBA#	GM4 (Norman Creek MIA downgradient)	Level	Monthly
			pH, EC, TPH	Quarterly
TBA#	TBA#	GM5 (Boyd tailings storage facility north)	Level	Monthly
			pH, EC	Quarterly
TBA#	TBA#	GM6 (Boyd tailings storage facility east)	Level	Monthly
			pH, EC	Quarterly
TBA#	TBA#	GM7 (Boyd tailings storage facility south)	Level	Monthly
			pH, EC	Quarterly
TBA#	TBA#	GM8 (Boyd tailings storage facility west)	Level	Monthly
			pH, EC	Quarterly
TBA#	TBA#	GM9 (Norman Creek tailings storage facility north)	Level	Monthly
			pH, EC	Quarterly
TBA#	TBA#	GM10 (Norman Creek tailings storage facility east)	Level	Monthly
			pH, EC	Quarterly
TBA#	TBA#	GM11 (Norman Creek tailings storage facility south)	Level	Monthly
			pH, EC	Quarterly
TBA#	TBA#	GM12 (Norman Creek tailings storage facility west)	Level	Monthly
			pH, EC	Quarterly
8,571,000	586,000	GM13 (upgradient of mining areas)	Level	Monthly
8,569,400	583,000	GM14 (within mining areas)	Level	Monthly
8,567,200	585,700	GM15 (within mining areas)	Level	Monthly
8,568,540	584,330	GM16 (downgradient of mining areas)	Level	Monthly
8,568,220	584,330	GM17 (downgradient of mining areas)	Level	Monthly
8,566,920	583,540	GM18 (downgradient of mining areas)	Level	Monthly
8,569,110	581,960	GM19 (downgradient of mining areas)	Level	Monthly
8,573,300	578,700	GM20 (upgradient of mining areas)	Level	Monthly
8,571,800	574,000	GM21 (within mining areas)	Level	Monthly
8,571,000	572,000	GM22 (within mining areas)	Level	Monthly
8,570,120	576,190	GM23 (downgradient of mining areas)	Level	Monthly



**Table H4 Groundwater Monitoring Points (South of Embley)**

Northing (GDA94)	Easting (GDA94)	Monitoring Points	Parameters	Frequency*
8,568,370	570,880	GM24 (downgradient of mining areas)	Level	Monthly
8,567,360	570,120	GM25 (downgradient of mining areas)	Level	Monthly
8,567,220	570,900	GM26 (downgradient of mining areas)	Level	Monthly

# Coordinates would be included in the Water Management Plan once the detailed mine plan is developed.

\* Subject to safe access.

### Stream Flow Monitoring

- H13 The holder must install, operate and maintain stream flow gauging stations to determine and record stream flows at the locations specified in Table H5 - Water Flow Monitoring Points.

**Table H5 Water Flow Monitoring Points**

Latitude or Northing (GDA94) <sup>1</sup>	Longitude or Easting (GDA94) <sup>1</sup>	Gauging Station Description	Flow Recording Frequency
TBA	TBA	GS1 (Upstream Dam C)	Continuous <sup>2</sup>
TBA	TBA	GS2 (Downstream Dam C)	Continuous <sup>2</sup>
TBA	TBA	GS3 (Norman Creek sub catchment - to be mined)	Continuous <sup>2</sup>
TBA	TBA	GS4 (Norman Creek sub catchment - non-mined)	Continuous <sup>2</sup>
TBA	TBA	GS5 (in vicinity of Ward River pump station) <sup>3</sup>	Continuous <sup>2</sup>

<sup>1</sup>. Coordinates would be included in the Water Management Plan and would be based on safe access points, which are to be determined.

<sup>2</sup>. Continuous measurement refers to 90% data availability over any 12-month period to allow for downtime during maintenance and repair.

<sup>3</sup>. GS5 would be installed when the pump station is installed.

- H14 The daily quantity of contaminants released from each release point must be measured and recorded at the monitoring points in Table H1 - Release Points (point source release).

### Water Supply Dam (South of Embley)

- H15 Water may be stored in the dam specified in Table H6 – Water Storage Dam Design Criteria (South of Embley), which must be constructed with a spillway design specified in Table H6 – Water Storage Dam Design Criteria (South of Embley).

**Table H6 Water Storage Dam Design Criteria (South of Embley)**

Northing (GDA94)	Easting (GDA94)	Dam	Spillway Design
8,562,245	575,515	Dam C	Peak flow from a 1:2000 year Annual Recurrence Interval flood event.

- H16 Water may be released from the release points specified in Table H7 - Water Release Points, Sources and Receiving Waters (South of Embley).

**Table H7 Water Release Points, Sources and Receiving Waters (South of Embley)**

Release Point (RP)	Northing (GDA94)	Easting (GDA94)	Release Point	Flow in Receiving Water Required for a Release Event	Receiving Waters Description
1	8,563,000	574,800	Dam C valve	Natural flow measured at upstream monitoring point.	Freshwater tributary of Norman Creek

**Direct Pumping from Stream (South of Embley)**

H17 Water may be pumped from the stream specified in Table H8 - Water Pumping Design Criteria (South of Embley), in accordance with parameters specified in Table H8 - Water Pumping Design Criteria (South of Embley).

**Table H8 Water Pumping Design Criteria (South of Embley)**

Latitude or Northing (GDA94) <sup>1</sup>	Longitude or Easting (GDA94) <sup>1</sup>	Stream	Annual Volume of Water	Rate of Pumping
TBD	TBD	Ward River	≤1% mean annual river flow	<20% of river flow rate when river flow rate is ≥1000L/s

<sup>1</sup> Coordinates would be included in the Water Management Plan and would be based on cultural heritage surveys prior to development.

**Receiving Environment Monitoring Program**

H18 A Receiving Environment Monitoring Program (REMP) for East Weipa and Andoom mining activities 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 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.

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:

- Release points specified in Table H1 – Release Points (point source release); and
- Extraction areas specified in Table H2 – Release from Extraction Areas;

H19 The REMP for East Weipa and Andoom prepared in accordance with Condition H18 must be amended within 2 years of the commencement of this environmental authority to include South of Embley mining activities.

H20 A REMP prepared in accordance with Condition H18 or H19 must address (but not necessarily be limited to) the following:

- 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);
- description of applicable environmental values and water quality objectives to be achieved (i.e. as scheduled pursuant to the Environmental Protection (Water) Policy);
- any relevant reports prepared by other governmental or professional research organisations that relate to the receiving environment to which the REMP applies;
- 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;
- 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 Trigger Levels and Contaminant Limits to assess the extent of the compliance of concentrations with water quality objectives and/or the ANZECC & ARM CANZ (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 Trigger Levels and Contaminant Limits (in addition to dissolved oxygen saturation and temperature. The list of quality characteristics required to be monitored as per Table H3 - Release Water Trigger Levels and Contaminant Limits will be reviewed once the results of the monitoring data becomes available. If it is determined that there is no need to monitor for certain individual quality characteristics then these can be removed from Table H7 - Release Water Trigger Levels and Contaminant Limits;
  - i. monitoring biological indicators (for macroinvertebrates in accordance with the administering authorities' monitoring and sampling manual (AusRivas Methodology) and metals/metalloids in sediments (in accordance with ANZECC & ARM CANZ (2000), BATLEY and/or the most recent version of AS5667.1 Guidance on Sampling of Bottom Sediments) for permanent, semi-permanent water holes and water storages;
  - 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; 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.
- H21 A report outlining the findings of the REMP including all monitoring results and interpretations in accordance with Condition (H18) must be prepared and submitted in writing to the administering authority by 1 July 2014. 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 (H11).
- Onsite Water Storages**
- H22 Water storages stated in Table H9 – Onsite Water Storage Monitoring Locations must be monitored for the water quality characteristics specified in Table H10 – Onsite Water Storage Contaminant Limits at the monitoring locations and at the monitoring frequency specified in Table H9 – Onsite Water Storage Monitoring Locations.

**Table H9 Onsite Water Storage Monitoring Locations**

Water Storage Description	Northing (GDA 94)	Easting (GDA 94)	Monitoring Location	Frequency of Monitoring
Boyd Tailings Storage Facility	8,567,370	568,445	Primary Decant Location <sup>1</sup>	Quarterly
Norman Creek Tailings Storage Facility	8,554,910	578,320		

<sup>1</sup> Location is dependant on the volume of the individual storage and must consider stratification (i.e. depth profiles) and be appropriate for monitoring of in situ water quality characteristics.

H23 In the event that waters storages defined in Table H9 - Onsite Water Storage Monitoring Locations exceed the contaminant limits defined in Table H10 - Onsite Water Storage Contaminant Limits the holder of this environmental authority must implement measures to prevent access to waters by all livestock and minimise access by native fauna.

**Table H10 Onsite Water Storage Contaminant Limits**

Parameter	Test Value	Contaminant Limit
pH (pH unit)	Range	Greater than 4, less than 9 <sup>2</sup>
EC (µS/cm)	Maximum	5970 <sup>1</sup>
Sulphate (mg/L)	Maximum	1000 <sup>1</sup>
Aluminium (mg/L)	Maximum	5 <sup>1</sup>
Copper (mg/L)	Maximum	1 <sup>1</sup>
Lead (mg/L)	Maximum	0.1 <sup>1</sup>
Zinc (mg/L)	Maximum	20 <sup>1</sup>

<sup>1</sup> Contaminant limit based on ANZECC (2000) stock water quality guidelines.

<sup>2</sup> Page 4.2–15 of ANZECC (2000) "Soil and animal health will not generally be affected by water with pH in the range of 4–9".

Note: All metals and metalloids must be measured as total (unfiltered).

### Groundwater

H24 Groundwater monitoring bores installed after the date of issue of this environmental authority must be constructed and operated in accordance with methods prescribed in the latest edition of the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) manual titled *Minimum Construction Requirements for Water Bores in Australia*.

H25 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.

### Stormwater and Water Sediment Controls

H27 Prior to commissioning the South of Embley Project the Weipa Erosion and Sediment Control Plan must be reviewed to incorporate the South of Embley Project or a new Erosion and Sediment Control Plan developed and implemented for the South of Embley Project.

H28 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:

- prevent or minimise the contamination of stormwater; and,
- diverting uncontaminated stormwater run-off around areas disturbed by mining activities or where contaminants or wastes are stored or handled; and,
- contaminated stormwater runoff, incident rainfall and leachate is collected; and treated, reused, or released in accordance with the conditions of this environmental authority; and,
- where practicable, roofing or minimising the size of areas where contaminants or wastes are stored or handled; and,
- using alternate materials and or processes (such as dry absorbents) to clean up spills that will minimise the generation of contaminated waters; and,
- erosion and sediment control structures are placed to minimise erosion of disturbed areas and prevent the contamination of any waters; and,

- 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.
- H29 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.
- H30 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.
- H31 Any certified design plans for regulated dams on the mining lease(s) must be consistent with the Erosion and Sediment Control Plan.
- H32 Stormwater may be released from mining and infrastructure areas and the points specified in Table H1 – Release Points (point source release) and H2 – Release from Extraction Areas, in accordance with the Erosion and Sediment Control Plan.
- H33 The dams in Table H11 – Stormwater Ponds are designed with a volume equivalent to the runoff volume from a 1:10 ARI 24-hour rainfall event, plus 20% for sediment storage.

**Table H11 Stormwater Ponds**

<b>Northing* (GDA94)</b>	<b>Easting* (GDA94)</b>	<b>Stormwater Pond Location</b>
8,570,000	569,175	Boyd truck tray wash sediment pond
8,556,760	576,055	Norman Creek tray wash sediment pond
8,568,080	566,770	Southern Stockpile Settling Pond
8,571,470	568,775	Northern Stockpile Settling Pond

\* Coordinates would be included in the Water Management Plan once the detailed mine plan is developed.

#### Interference with Waterways

- H34 Destroying native vegetation, excavating, or placing fill in a watercourse, lake or spring necessary for and associated with mining operations, may be undertaken for the purposes of mining and associated activities in accordance with the Plan of Operations.

#### Water Management Plan

- H36 Prior to commissioning the South of Embley Project the Weipa Water Management Plan must be reviewed to incorporate the South of Embley Project or a new Water Management Plan developed and implemented for the South of Embley Project.
- H37 The Water Management Plan must be developed in accordance with the latest version of the administering authorities Guideline for Preparing a Water Management Plan and 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.
- H38 Each year the holder of the environmental authority must undertake a review of the Water Management Plan prior no later than 1 November to ensure that proper and effective measures, practices or procedures are in place so the mine is operated in accordance with the conditions of this environmental authority and that environmental harm is prevented or minimised.
- H39 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.

#### END OF CONDITIONS FOR SCHEDULE H

## 3.9 Waste Management

### 3.9.1 Value/Background

The environmental value to be protected or enhanced is the life, health and well-being of people and the diversity of ecological processes and associated ecosystems surrounding the Project. Inappropriate disposal of waste may lead to contamination of land and water causing adverse effects on ecosystem health.

The major sources of waste with the potential to cause impacts are:

- Green waste/cleared vegetation;
- Tailings;
- Oversize material;
- Excavated waste (including subsoil and overburden, waste rock, dredged material and contaminated soil);
- General waste (e.g. benign construction waste, plastic and wood products, clean rubber hose, computer and electrical equipment, food scraps, wrapping paper and rags, ship waste);
- Regulated waste (e.g. oily rags, oily absorbent matting, oil filters, solvents, lubricants, coolant, paints, resins, light and heavy vehicle tyres, clinical waste); Recyclable general waste (e.g. printer toner cartridges, aluminium cans);
- Recyclable scrap metal (e.g. beneficiation screens, conveyor rollers, scrap steel, bulk swarf, clean drums);
- Recyclable regulated waste (e.g. batteries, waste oil);
- Sewage effluent and sewage sludge; and
- Ballast water.

A geochemical assessment of tailings is described in RTA (2011) and summarised in **Section 3.5**. Management of dredged material and ballast water is described in **Section 3.7**.

### 3.9.2 Objectives

Minimise the impact of waste on the environment by managing the following aspects of the operation effectively:

- Green waste/cleared vegetation;
- tailings;
- excavated wastes;
- general construction and operational wastes;
- regulated waste; and
- sewage effluent and sewage sludge.

### 3.9.3 Commitments

#### Performance Criteria

The performance criteria for waste management are:

- Tailings are disposed of in TSFs;
- Volume of general and regulated wastes generated is minimised; and
- All regulated waste is tracked and disposed of appropriately, and in accordance with EA criteria.
- Sewage effluent to be used for irrigation complies with EA criteria;

#### Implementation Strategy

The waste management strategy ensures compliance with regulatory requirements as a minimum and incorporates the waste minimisation hierarchy in order of preferred options:

- waste avoidance;
- waste re-use;
- waste recycling;
- energy recovery from waste; and
- waste disposal.

Waste generated on the Project during the construction, operation and decommissioning phases is minimised through:

- waste stream characterisation and separation;
- assessment of waste reduction opportunities for identified waste; and
- management of waste in accordance with the waste minimisation hierarchy.

A waste management program will be developed prior to construction. Waste streams will be assessed for potential reuse, and if a feasible reuse option is not available, the waste will be transported to a licensed disposal facility by a licensed waste transporter. Wastes will be stored appropriately to prevent pollution until they are transferred off-site.

Certain types of regulated waste are defined as “trackable waste” in Schedule 1 of the *Environmental Protection (Waste Management) Regulation 2000* (Qld) (e.g. waste oil, clinical waste, sewage sludge, etc). Generators of trackable waste must record prescribed information about the waste and provide it to the transporter. Procedures for identification of regulated wastes and an appropriate waste tracking system for those wastes are maintained as part of the site’s Environmental Management System (EMS).

#### Green Waste

Timber harvesting takes place on current mining areas north of the Embley River. There have been a number of recent studies undertaken to assess



the economic sustainability of a timber harvesting operation for the area of the mining lease located south of the Embley River, including “Visions and Realities for a Wik Forestry Industry on Cape York Peninsula, Australia,” undertaken by the University of Queensland School of Economics (Venn 2004).

RTA supports the establishment of a Traditional Owner timber harvest operation south of the Embley River that would harvest timber on areas of the mining lease proposed to be mined or cleared for development of Project infrastructure.

Green waste from vegetation cleared prior to mining will be pushed into windrows and burned.

### Tailings

The tailings would be pumped in slurry form (30% solids by weight) from a tailings tank at the beneficiation plant to a tailings storage facility. The tailings storage facilities are “turkey’s nest” dams where tailings are discharged from the perimeter wall into cells within the dam. The tailings solids will create a beach, where suspended solids settle out, and water will be decanted and pumped back to the beneficiation plant for reuse in processing. The tailings storage facilities are divided into cells to facilitate the cycling of tailings perimeter deposition within a cell, and between cells, to enhance formation of a broad tailings beach adjacent to the perimeter walls that dries quickly to a consistent density over its full depth. Tailings storage facility walls will be raised in lifts of approximately three metres using the upstream raising technique.

The tailings storage facilities for the Boyd and Norman Creek beneficiation plants will be located close to the plants (see **Figure 4** and **Figure 5**). Prior to construction of each cell, the economic bauxite reserves from within each cell will be mined and fed into the plant if it is operating, or stockpiled for later processing if not. This approach will avoid sterilisation of economic bauxite reserves and reduce the extent of clearing of vegetation. The final Boyd tailings storage facility will have a capacity of approximately 216Mt and cover an area up to 1100ha. The final Norman Creek tailings storage facility will have a capacity of approximately 234Mt and cover an area of approximately 1100ha.

Tailings are benign and have no risk of causing soil or water contamination, therefore no specific management strategies for TSFs are required.

### Excavated Material

Excavated wastes include subsoil and overburden, waste rock, and contaminated soil. Topsoil is not considered a waste as it is retained for use in rehabilitation. Generally, the subsoil and overburden stripped from a new mining area are taken directly

to an existing mined-out area awaiting rehabilitation. The final landform will not have any out-of-pit dumps of excavated wastes. There is no risk of soil or water contamination from excavated subsoil and overburden, therefore no specific waste management strategies for subsoil and overburden are required.

Contaminated soil will be excavated and treated as described in **Section 3.5**.

### General Waste

General wastes are collected and segregated on-site for re-use, recycling or disposal. Waste is transported off-site by a licensed waste contractor.

### Regulated Waste

Any hazardous materials used onsite will be recorded in a Hazardous Materials Register. This register will include details of storage location; storage requirements; proper usage; handling information; and disposal procedures. This information will be available in material safety data sheets (MSDSs) which will be kept for all materials and chemicals maintained within the Hazardous Materials Register.

In addition:

- a. AS 1940:2004 *The storage and handling of flammable and combustible liquids* will be implemented onsite;
- b. Contractors will provide a list of hazardous chemicals and their associated MSDS prior to bringing chemicals onsite;
- c. No chemical will be allowed onsite without an MSDS;
- d. A chemical register will be established onsite;
- e. Corrosive materials will be stored and handled in accordance with AS 3780.8 *The storage and handling of corrosive substances* (Class 8 substances – corrosives);
- f. Fuels, oils and chemicals in containers of 200L or more will be stored in a bunded area with capacity of at least 110% of the largest container;
- g. Fuels, oils and chemicals in containers less than 200L capacity will be stored as above or in a fenced and roofed compound;
- h. All fuels, oils, and chemicals will be clearly labelled;
- i. Transfer of bulk fuel and handling of hazardous chemicals will be undertaken only by trained personnel;
- j. Spill clean-up kits, including absorbent materials, will be kept at each fuel and chemical storage facility;

- k. An area will be designated for the temporary storage or bioremediation of hydrocarbon contaminated soils; and
- l. Waste is transported off-site by a licensed waste contractor.

### Sewage

During the initial construction phase, prior to the STP being commissioned, sewage will be stored in holding tanks and regularly trucked to Weipa for treatment by a licensed regulated waste transporter. This method would also be utilised if temporary mobile construction camps were used for the Mine Access Road or an accommodation barge used during dredging of the Port.

Once constructed, the construction camp would be serviced by a package STP via a gravity sewerage system. During construction treated effluent from the construction camp STP would be recycled for use in irrigation of landscaped areas in the construction camp as well the dust suppression and earthwork compaction during construction in the Boyd infrastructure area, the mine access road, infrastructure corridor, Dam C and the tailings storage facilities (refer to **Figure 2** for locations).

The *Water Quality Guidelines for Recycled Water Schemes* (DNRW 2008) recommend the use of national or industry guidelines for irrigation for uses other than food crops. One of these, the *National Guidelines for Water Recycling: Management Health and Environmental Risks* (National Resource Management Ministerial Council et al. 2006), recommend that water used for landscape irrigation, including trees, shrubs and public gardens, should contain *E. coli* levels of less than 100 cfu/100mL.

*Water Supply (Safety & Reliability) Act 2008* (Qld) does not apply to water service infrastructure used for mining purposes, however, in absence of defined criteria the water quality criteria for pathogens referred to under this Act (defined in Schedule 3D of the *Public Health Regulation 2005*) is proposed. The STP at the Boyd construction camp will be designed and operated to treat water to meet the

*E. Coli* "Annual Value" criteria defined in Schedule 3D of the *Public Health Regulation 2005*, which is 10 cfu/100mL found in 95% of the samples taken for a 12-month period. The quality of treated effluent from the Boyd construction camp STP to be used in irrigation will be monitored regularly to ensure it is suitable for use in irrigation.

Once operational, sewage generated at the Boyd and Norman Creek infrastructure areas will be treated using a biological aerobic modular system. The effluent from the secondary process will be treated by an ultra-filtration membrane in order to provide a "Class A" effluent. The treated effluent will be pumped to the process water pond for re-use in the beneficiation plant.

Each STP will have a sludge-drying bed to dry the small amount of sludge that will be generated. The sludge drying beds will be covered and therefore will not generate runoff. The sludge-drying beds will be capped and rehabilitated or their contents buried in pit at the end of the mine life.

### Monitoring

The Project will monitor the volume and type of general and regulated waste generated and undertake audits to:

- ensure correct segregation of different types of waste;
- monitoring for potential environmental impacts; and
- providing baseline data to enable continuous improvement of waste avoidance, reduction and management measures.

See also **Section 3.8.3** for groundwater quality monitoring in the vicinity of TSFs.

The quality of treated effluent from the Boyd construction camp STP to be used in irrigation will be monitored for the characteristics and at the monitoring frequency stated in **Table 3-15** to ensure it is suitable for use in irrigation.

**Table 3-15 Contaminant Release Limits to Land (South of Embley)**

Contaminant	Unit	Release Limit	Limit Type	Frequency
5 day Biochemical oxygen demand (BOD) <sup>1</sup>	mg/L	20	Maximum	Quarterly
Total Suspended Solids	mg/L	30	Maximum	
Nitrogen	mg/L	30	Maximum	
		10	50 <sup>th</sup> percentile short term	
		5	50 <sup>th</sup> percentile long term	
Phosphorus	mg/L	15	Maximum	
		8	50 <sup>th</sup> percentile short term	
		5	50 <sup>th</sup> percentile long term	
pH	pH units	6.0 – 8.5	Range	
<i>E. coli</i>	Organisms/100ml	10	Found in 95% of the samples taken for a 12-month period	Weekly
Faecal Coliforms <sup>1</sup>	CFU/100ml	10		

<sup>1</sup> Based on at least 5 but no more than 10 consecutive samples.

Sewage sludge generated by the Project shall be monitored at least annually to determine annual quantities of sludge generated and disposal methods, in accordance with the Environmental Authority conditions.

### 3.9.4 Proposed Environmental Authority Conditions: Schedule E – Waste Management

#### General and 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:
- Mine waste including green waste, waste bauxite and tailings; and,
  - sewage sludge in drying beds located at the Awonga Point Sewage Treatment Plant (STP), the Boyd construction camp STP, the Boyd infrastructure area STP and the Norman Creek infrastructure area STP.

#### Waste Management Program

- E3 A waste management program in accordance with Part 5 of the Environmental Protection (Waste Management) Policy 2000 must be developed, implemented and maintained for all mining activities on the mining lease(s). The waste management program must include:

- a description of the mining activities that may generate waste;
- the types and amounts of wastes generated by the mining activities;
- a program for reusing, recycling or disposing of all wastes;
- how the waste will be dealt with in accordance with the waste 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 management hierarchy (i.e. avoidance, reuse, recycling, energy recovery, disposal);
- 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;
- procedures for dealing with accidents, spills, and other incidents that may impact on waste management;
- details of any accredited management system employed, or planned to be employed, to deal with the waste;
- how often the performance of the waste management practices will be assessed;
- the indicators or other criteria on which the performance of the waste management practices will be assessed; and
- staff training and induction to the waste management program.

**Regulated Waste**

- E4 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*.
- E5 General and regulated waste generated in the mining activity can be temporarily stored onsite awaiting removal provided it is stored to ensure there is minimal risk of causing fire or contamination to land or waters.

- 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****3.9.5 Proposed Environmental Authority Conditions: Schedule I – Sewage Treatment****South of Embley**

- I31 The quality of treated effluent from any operational sewage treatment plant must be monitored at the locations specified in Table I9 – Sewage Treatment Plants (South of Embley) for each quality characteristic and at the monitoring frequency stated in Table I10 – Contaminant Release Limits to Land (South of Embley).

**Table I9 Sewage Treatment Plants (South of Embley)**

Northings (GDA94)	Easting (GDA94)	Sewage Treatment Plant (STP) Name	Monitoring Points
8,571,026	570,737	Boyd Construction camp STP	Boyd Construction camp STP sludge-drying bed decant point

**Table I10 – Contaminant Release Limits to Land (South of Embley)**

Contaminant	Unit	Release Limit	Limit Type	Frequency
5 day Biochemical oxygen demand (BOD) <sup>1</sup>	mg/L	20	Maximum	Quarterly
Total Suspended Solids	mg/L	30	Maximum	
Nitrogen	mg/L	30	Maximum	
		10	50 <sup>th</sup> percentile short term	
		5	50 <sup>th</sup> percentile long term	
Phosphorus	mg/L	15	Maximum	
		8	50 <sup>th</sup> percentile short term	
		5	50 <sup>th</sup> percentile long term	
pH	pH units	6.0 – 8.5	Range	
<i>E coli</i>	Organisms/100ml	10	Found in 95% of the samples taken for a 12-month period	Weekly
Faecal Coliforms <sup>1</sup>	CFU/100ml	10		

<sup>1</sup> Based on at least 5 but no more than 10 consecutive samples.

- 132 If quality characteristics of the treated effluent meet the Release Limit specified in Table I10 – Contaminant Release Limits to Land (South of Embley), the environmental authority holder may irrigate the treated effluent in areas identified as disturbed in the current Plan of Operations for the purposes of dust suppression, landscape watering or other appropriate uses that are suitable for the quality of water.

#### Waste Management (South of Embley)

- 133 Screenings, grit, sewage and wastewater treatment plant sludges generated must be stored, managed and utilised so as not to cause environmental harm.
- 134 Sewage sludge generated on the licensed place must be monitored at least annually to obtain the following information:
- the estimated annual quantity and nature of each sludge produced; and
  - the current method(s) of pre-treatment or disposal.

- the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

The acoustic environment of the Project area is described in detail in RTA (2011). The Project lies a considerable distance from sensitive receptors. To the north of the Project area are the townships of Weipa and Napranum, and to the south the township of Aurukun (see **Figure 1**). There are several homesteads on the remote cattle stations to the east of the Project area. The nearest sensitive receptors are shown on **Figure 9**.

An environmental noise survey was conducted in Evans Landing, adjacent to the Department of Primary Industries Fisheries building. This site was considered to be representative of the residential areas along the Embley River, namely Napranum and the accommodation areas in Evans Landing, which would be the nearest sensitive receptors to the Project area. The measured noise levels are shown in **Table 3-16**. The noise levels recorded at Evans Landing included noise from recreational boating and activities in the boat ramp car park. During the night, noise from the Lorim Point ship loader was noted.

### 3.10 Noise and Vibration

#### 3.10.1 Value/Background

The environmental values to be enhanced or protected are:

- the qualities of the acoustic environment that are conducive to human health and well-being, including by ensuring a suitable acoustic environment for individuals to sleep, study or learn, and recreate; and

By way of comparison, the results of an earlier survey commissioned by RTA at Nanum are presented in **Table 3-17** (Moore and Associates, 2007). Nanum is approximately 3km north of Evans Landing and closer to Weipa.

The results of the noise monitoring for both Nanum and Evans Landing are similar. The background noise levels are almost identical while the  $L_{Aeq}$  (1 hour) shows Evans Landing is exposed to slightly higher overall noise levels.

**Table 3-16 Environmental Noise Survey at Evans Landing**

Date	$L_{A90}$ (1 hour) Background Noise Level [dB(A)]			$L_{Aeq}$ (24 hour) [dB(A)]	$L_{Aeq}$ (1 hour) Noise Level [dB(A)]		
	Day	Evening	Night		Day	Evening	Night
17 September 2008	-	37	37	-		52	47
18 September 2008	41	37	35	51	54	48	45
19 September 2008	40	38	36	48	50	46	48
20 September 2008	40	38	37	50	53	46	45
21 September 2008	43	41	42	53	54	56	49
22 September 2008	41	38	38	53	55	50	47
23 September 2008	42	34	39	51	53	45	48
24 September 2008	39	-	-	49	52	-	-
<b>Median Level</b>	41	38	38	51	53	48	47

Table 3-17 Environmental Noise Survey at Nanum

Date	L <sub>A90</sub> (1 hour) Background Noise Level [dB(A)]			L <sub>Aeq</sub> (24 hour) [dB(A)] <sup>#1</sup>	L <sub>Aeq</sub> (1 hour) Noise Level [dB(A)]		
	Day	Evening	Night		Day	Evening	Night
19 July 2007	42	39	36	47	48	50	42
20 July 2007	38	38	35	45	46	46	41
21 July 2007	38	38	38	47	48	45	42
22 July 2007	37	40	37	44	42	53	42
23 July 2007	41	40	36	49	48	50	42
24 July 2007	40	38	37	46	47	45	43
25 July 2007	40	38	38	48	49	45	43
<b>Median Level</b>	40	38	37	47	48	46	42

Note 1: L<sub>Aeq</sub>(24 hour) not provided in data provided by RTA but estimated from results.

There is no significant vibration sources associated with the operations. The operations do not require blasting to be carried out. Nor are there any vibration-sensitive receptors within or close to the lease area. As a result vibration issues will not be addressed further.

Underwater noise is likely to occur as a result of construction of the proposed port, tug berths and barge/ferry terminals (predominantly due to pile driving activities), and later in operation of these facilities. Marine turtles and mammals, such as whales, dolphins and dugongs, are known to be sensitive to underwater noises that are louder (greater intensity) than normal background levels. However, the potential impact of Project pile driving activities on threatened and migratory species is considered low (RTA 2011).

### 3.10.2 Objectives

The environmental protection objective for noise is to avoid causing nuisance noise levels at sensitive residential receptors beyond the boundaries of the Project.

### 3.10.3 Commitments

#### Performance Criteria

The proposed noise level criteria for the Project have been derived taking into consideration the acoustic quality objectives for health and well-being, as well as the control of background creep, both from the EPP (Noise).

Currently, the existing ambient levels are much higher than the EPP (Noise) Schedule 1 acoustic quality objectives and therefore these objectives are not able to be met.

The objective to control background creep seeks to avoid intrusiveness. Therefore the existing noise limits from the Environmental Authority MIN100939109 have been adopted for the noise level criteria proposed for the Project and are shown in **Table 3-18**.

Table 3-18 Proposed Noise Level Criteria for Residential Areas

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 <sub>Aeq, adj, 1 hour</sub>	45	45	43	45	45	43
L <sub>A1, adj, 1 hour</sub>	50	50	45	50	50	45



### Implementation Strategy

Modelling carried out by RTA (2011) demonstrates the noise levels from construction and mining are expected to comply with all noise level objectives and criteria in Weipa, Napranum and Aurukun during the day, evening and night.

During operations it has been predicted the noise from the barge and ferry is likely to be the main source of low frequency noise from the SoE Project at both Napranum and Weipa. The route for the barge and ferry is approximately mid channel and at least 1km from the banks of the Embley River at Napranum.

The manufacturer's sound power level specifications for major equipment items will be used as guidance when purchasing equipment.

It is anticipated that the construction activity would deter most turtles and marine mammals from the immediate area of piling. However, for precautionary purposes, it is proposed that a "soft start" approach would be used to disperse animals in the vicinity prior to normal pile driving. The "soft start" involves commencing pile driving with a partial capacity strike, or giving a warning with an underwater airgun prior to normal pile driving.

### Monitoring

Baseline noise monitoring will be carried out at Napranum prior to the commencement of construction. A noise monitoring campaign, which will include attended monitoring at Napranum, will be conducted after operation commences to validate the noise model. Where it is determined that actual noise levels exceed applicable noise limits, action will be taken to reduce noise levels.

An exclusion zone will be established around pile driving activities and monitored by an observer and normal pile driving will not be conducted while threatened marine fauna species are identified within the nominated exclusion zone.

### 3.10.4 Proposed Environmental Authority Conditions: Schedule G – Noise

#### General

- G1 Subject to Condition G2, noise from any mining activity as defined in Table G1 – Noise Limits must not cause unauthorised 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 licensed 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 <sub>Aeq, adj, 1 hour</sub>	45	45	43	45	45	43
L <sub>A1, adj, 1 hour</sub>	50	50	45	50	50	45

- G4 When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint related to noise (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) at any sensitive 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:
- $L_{Aeq}$ , and  $L_{ANT}$  (where N equals the statistical levels of 1, 10 and 90 and T = 60 mins);
  - background noise  $L_{A90}$ ;
  - the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels;
  - atmospheric conditions including temperature, relative humidity and wind speed and directions;
  - effects due to any extraneous factors such as traffic noise;
  - location, date and time of monitoring;
  - if the complaint concerns low frequency noise,  $Max L_{p_{LIN,T}}$ ; and,
  - 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

### 3.11 Community

#### 3.11.1 Value/Background

The Project is located in the Western Cape Region, which includes the Aurukun, Mapoon, Napranum and Weipa communities. At the time of the 2006 Census, the total population of the four communities in the Western Cape region was 5191 people. Weipa accounted for most of the region's population with 3089 people, followed by Aurukun (1039 people), Napranum (829 people) and Mapoon (234 people). Extensive community consultation and social impact assessment was undertaken as part of the EIS and is described in RTA (2011).

The area of land south of the Embley River is primarily the traditional lands of the Wik and Wik-Way people. The Wik and Wik-Way people, by birth right, are the Traditional Owners of the Wik lands, which occupy a large area along the coastal floodplains lying between Pormpuraaw and Weipa and inland to the middle reaches of rivers such as the Archer, Kendall and Holroyd Rivers (O'Faircheallaigh 1996). There are probably more than 50 clan estates and many language groups. The Wik estate occupies more than 72,000 hectares.

Mining is the principal driver of the Weipa economy and the mining workforce is the principal driver of Weipa's population. Based on 2006 Census data, RTA employees and contractors constituted 43% of the total employed workforce in Weipa and about 27% of the town's population of 3,096.

During the construction phase, the Project's workforce will be accommodated in an on-site camp and negligible effects on the local housing market are expected.

Under the 15Mdptpa production scenario, RTA's overall workforce, including Andoom, would be marginally smaller than in 2007–2008 and Weipa would have a population of about 3800, down from just over 4000 reached in 2007–2008. Under the 30Mdptpa production scenario, the overall workforce would reduce slightly (due to greater productivity in SoE operations compared to Andoom operations) and Weipa's population is projected to be about 3300. Future demands on infrastructure and government services are expected to be no higher than in recent years.

SoE mine production would be capable of increasing above 30Mdptpa when market conditions are suitable. Under the 50Mdptpa production scenario, the population of Weipa is projected to be approximately 1200 above the peak of 2007–2008. Such a population rise would require development of more residential land and housing, and provision of expanded government services.

RTA's existing operations are relatively remote from the traditional country of the Wik and Wik-Way people and from Aurukun, the nearest community. The SoE Project will bring development activities much closer to the Traditional Owners and their country.

The economic impacts of the Projects are evaluated in RTA (2011) and summarised below:

Construction Phase (for 15Mdtpa production capacity)

- Direct employment averages more than 300 per annum over three years;
- Indirect employment of approximately 179 in the local area, 395 in the Far North Queensland (FNQ) region, 632 state-wide and 705 nationally;
- Direct financial contribution of \$264 million locally, \$527.9 million in the FNQ region, \$989.9 million in Queensland and \$1,319.8 million nationally; and
- Indirect financial contribution of \$201.7 million locally, \$612.2 million in the FNQ region, \$1,829.3 million in Queensland and \$2,828.2 million nationally.

Since the economic modelling was undertaken for the 15Mdtpa production scenario in the EIS, RTA has undertaken further feasibility studies for the adopted 22.5Mdtpa initial production scenario (RTA 2012). Direct employment is now predicted to average 950 per annum over 30 months during Project construction (although peak numbers would exceed this), however this is subject to further feasibility studies.

Operations Phase – 15Mdtpa production scenario

- Direct employment, including contractors, of approximately 500 in local region;
- Indirect employment of approximately 390 locally, 788 in the FNQ region, 1170 state-wide and 1771 nationally;
- Direct annual financial contribution of \$575 million across the local, regional, Queensland and national economies, and
- Indirect annual financial contribution of \$96 million locally, \$182 million in the FNQ region, \$257 million in Queensland and \$423 million nationally.

### 3.11.2 Objectives

The environmental protection objective is to minimise environmental nuisance to neighbours from mining and associated activities and to respond to concerns expeditiously.

### 3.11.3 Commitments

#### Performance Criteria

The performance criterion for community is:

- Number of complaints.

#### Implementation Strategy

RTA has a complaints procedure that includes:

- Maintenance of a register of complaints held on-site;
- A process for receiving, handling and investigating complaints;
- Providing expeditious investigation and a response as soon as practicable; and
- Giving a non-compliance notification to any party whose actions have caused a complaint as a result of non-compliance with site environmental requirements.

RTA will continue to work with Traditional Owners to facilitate access to country, subject to mine safety requirements. RTA will also continue existing employment, training and business development programs and tailor them to the needs of the Project. The potential social impacts of the Project, both adverse and beneficial, and proposed mitigation measures are discussed in RTA (2011).

RTA will establish, promote and maintain easily accessible lines of communication between residents and land owners to ensure that community impacts are identified and managed, in accordance with Condition A20.

#### Monitoring

Complaints will be recorded in accordance with Condition A18.

## 3.12 Cultural Heritage

### 3.12.1 Value/Background

Both Indigenous and non-Indigenous cultural heritage places and values have been recorded in the Project area (RTA 2011).

#### Indigenous Heritage

The antiquity of human occupation on Cape York has been established through the excavation of rock shelter deposits near Laura, approximately 500km south of the Project area. Radiocarbon determinations from these deposits indicate Aboriginal people have occupied the Cape York region for over 35,000 years. Radiocarbon determinations from shell mounds and the smaller middens around Albatross Bay at Weipa date back to approximately 2500 years before present. Archaeological evidence for occupation

of the Weipa area prior to this may have been destroyed by the formation of the current coast line with stabilisation of sea levels approximately 6000 years ago.

Recent cultural heritage surveys around Weipa have documented a diverse record of late Holocene archaeology consisting of scarred trees, shell middens, earthen mounds and stone artefact scatters. The combined results of the archaeological surveys carried out to date in the Project area (RTA 2011) demonstrate the presence of a range of sites and places of cultural and archaeological value. Clear patterns in site distribution have emerged with the majority of sites situated within several kilometres of the coast.

#### *Scarred Trees*

Scarred trees are the dominant site type and are most likely to be found within several hundred metres of waterways or the coastal strip. Many of these will not be impacted by the Project development as they are situated within the riparian vegetation buffer. Others that will be impacted will be mitigated in consultation with Traditional Owners through the WCCCA process.

#### *Shell Middens*

Shell middens are also common, but are only found in coastal and tidal areas with major shell midden complexes located on both sides of Norman Creek within the riparian vegetation zone several kilometres upstream of the coast. Several shell mound complexes are also found along the margin of the Hey River, also in the Riparian zone. The barge/ferry terminal south of Hey Point has been positioned so as to avoid one of these large complexes.

The Weipa shell mounds are very important to Traditional Owners and are of national archaeological value established through a number of research projects undertaken since the 1960s. Major concentrations of shell mounds have been recorded along the Pine and Mission Rivers north of Weipa and the Hey and Embley Rivers to the south. The Weipa shell mounds were placed on the Register of the National Estate in 1980 (Place ID 9103). Shell mounds have also been identified in areas outside of the National Estate Boundaries.

#### *Stone Artefacts*

Stone artefacts are very rare in the area and can only be located in areas with adequate ground surface visibility. Several stone axes have been identified associated with shell middens, but these are generally uncommon. The Project will only have a minor impact on known stone artefacts, with several of these located within the Norman Creek Dam footprint.

#### *Ethnographic Sites*

A number of ethnographic sites have been documented within and adjacent to the Project Area. Several of these are located along the coast between Boyd Bay and the mouth of Norman Creek, but none of these will be adversely affected by the proposed port or Boyd infrastructure area facilities. The management of these is on-going with Traditional Owners and is being discussed as part of broader site Protection Plans under the WCCCA process.

Areas of cultural and recreational importance to Traditional Owners include Hey Point, Boyd Bay, Pera Head, Norman Creek, Amban (False Pera Head) and Waterfall (Ina Creek). Plants, animals and features of the natural environment are often associated with important cultural information connected to places of significance.

#### *Land Use*

The Project area is currently used by Traditional Owners for camping, fishing and hunting. Aurukun Shire Council administers a permit system for permission to enter Aurukun Shire boundaries, and interest was expressed during consultation for the Project EIS for a permit system to be implemented for the Project area to assist with protection of areas of cultural importance (RTA 2011).

Traditional Owners maintain fire regimes in the Project area. Fire regime is a critical determinant of vegetation condition and overall vegetation community composition with the intensity, frequency and timing of fire important for both fire-adapted and fire-sensitive vegetation types. The current fire regime within the Project area is one of extensive, high-intensity, late-dry season fires with areas close to access tracks and high recreational visitation areas being intentionally burned on an annual basis.

#### *Indigenous Land Use Agreement*

All traditional owner groups, RTA and the State of Queensland are parties to an Indigenous Land Use Agreement (ILUA), which covers ML 7024 and ML 6024. This agreement, known at the Western Cape Communities Coexistence Agreement (WCCCA), provides the context for Indigenous cultural heritage management on ML 7024 and ML 6024. The ILUA is registered with the National Native Title Tribunal (QAI2001/002) as an agreement which recognises and incorporates indigenous interests in land with development and business activities. The ILUA is recognition of Native Title, which is negotiated separately to any Native Title claims on the Cape that have been determined, or are in the application process. The benefit of the ILUA is it is flexible, negotiable, and is tailored to address specifically the impacts of bauxite mining on the landscape. All parties are bound to the provisions of the agreement.

All Indigenous cultural heritage in Queensland is protected under the *Aboriginal Cultural Heritage Act 2003* (Qld). To comply with the duty of care provision under section 23 of the Act, proponents are required to have a recognised cultural heritage management plan or other agreement that provides for the management of Aboriginal cultural heritage. The *Aboriginal Cultural Heritage Act 2003* (Qld) recognises Indigenous Land Use Agreements (ILUA) as a mechanism for managing cultural heritage as long as cultural heritage is included in the ILUA (as it is in the WCCCA). The WCCCA provides for a system of cultural heritage management over the area covered by the ILUA. In accordance with section 86 of the Act, this agreed process for identifying, assessing and managing places of cultural heritage significance satisfies the requirements of the Act and meets Queensland legislative requirements for any new permits or approvals required for Project development works. The WCCCA requires RTA and Traditional Owners to establish mutually-agreed plans for each commercial activity that may have an impact upon Indigenous cultural heritage. Under the WCCCA, the definition of a commercial activity includes extractive mining, vegetation clearing, the establishment of drill lines and the establishment of infrastructure and other facilities.

The WCCCA sets out the agreed process for consultation between RTA and Traditional Owners and this enables the Traditional Owners who can speak for country to participate in heritage surveys.

#### Non-Indigenous Heritage

A total of seven non-Indigenous heritage sites have been identified within the Project area and have been assessed as low local significance, with the exception of the house stumps, which have been assessed as low-moderate local significance. The majority of these sites appear to be associated with early exploration drilling for bauxite, extending back to the 1950s and 1960s.

#### Airstrip

There is an overgrown airstrip near False Pera head believed to have been constructed in the area in the 1950s or 1960s as part of early mineral exploration in the area. The airstrip was suitable for use by light aircraft. Associated with this airstrip is a concrete slab and pole (possibly for a windsock), as well as a small bottle dump.

#### Log Crossings

Three log-creek crossings have been identified in the Project area, two of these being situated on Norman Creek and the other on the Ward River. Each of these log crossings consist of a series of sawn logs placed horizontally across the water course. The log crossings are thought to have been constructed during the early mineral exploration phase in the 1950s-1960s.

#### Drilling Camp

Mr. Glenn White, a long term RTA mine planning employee, reported the area around the log crossing on the Ward River was also the location of a residential drilling camp. Efforts to re-locate this camp during archaeological surveys have been unsuccessful. It is possible any remnant features associated with this site has subsequently been destroyed through flooding or fire. The camp is believed to have been established in the 1960s as part of early mineral exploration in the area.

#### House Stumps

It has been reported that some old house stumps were located in the vicinity of Hey Point in the early 1990s. They may have been part of the remnants of a small satellite mission village established around 1913. The village was thought to have been established in response to a proposal to have some of the land south of the Embley River excised from the Weipa Aboriginal Reserve (RTA 2011).

A targeted heritage inspection to locate the house stumps near Hey Point was completed in 2009 under the direction of Traditional Owners who may have been aware of its location. The survey team was unable to find the house stumps at the supposed location and have subsequently concluded the site no longer remains or that local knowledge of the exact location is insufficient to find the site at this point in time. The wooden house stumps would be vulnerable to burning by the frequent fires in the area and they may have disappeared. The general location is not on ML 7024 or ML 6024 and would not be disturbed by the Project.

#### Weipa Aboriginal Reserve

The Project area was originally part of the Weipa Aboriginal Reserve. Aboriginal Reserves in Australia are now recognised as historic locations (sites), despite the presence or absence of associated physical structures or remains. This is based on the concept of the historic landscape, and the association of this landscape with important phases in history.

### 3.12.2 Objectives

The environmental protection objective is to preserve the cultural heritage values (Indigenous and non-Indigenous) of the Project area.

### 3.12.3 Commitments

#### Performance Criteria

The performance criteria for cultural heritage are:

- Cultural heritage surveys completed prior to physical works; and
- No unauthorised disturbance to sites of cultural significance.



### Implementation Strategy

All formal consultation with Traditional Owners is undertaken in accordance with the process outlined in the WCCCA. RTA are required to provide the relevant WCCCA parties with six months minimum notification prior to undertaking commercial activities that have the potential to damage places of cultural heritage value. This notification is in the form of a written work program outlining the location and size of the project area, the nature of the project and a request for the names of Traditional Owners who should be consulted about cultural heritage matters.

RTA consults directly with the Traditional Owners nominated by the WCCCA to establish the scope of any required cultural heritage assessments. The Traditional Owners nominate the names of people they wish to be involved in the heritage assessment. Up to eight, but normally four, Traditional Owners participate in heritage assessment field surveys. Ethnographic surveys are also undertaken and these often involve Traditional Owners from a wider age group. Specific site visits are also undertaken to discuss management issues.

Following the heritage assessment, RTA meets with the Traditional Owners to discuss the heritage assessment report and recommended management of identified cultural heritage sites. The report also describes the proposed commercial activity. The heritage assessment report is submitted to the WCCCA Environment and Heritage Sub-committee. These discussions between RTA, Traditional Owners and WCCCA representatives form the content of Site Protection Plans for specific areas that would be affected by mining and mining-related activity. Once the negotiated Site Protection Plans have been implemented, the RTA manager of the commercial activity would be issued a permit authorising the activities. The dispute resolution process outlined in the WCCCA would apply if RTA, the Traditional Owners and the WCCCA representatives fail to negotiate a Site Protection Plan.

#### *Cultural Heritage Management Planning*

Cultural heritage sites management on other areas of the lease, which are currently being mined, or are in preparation for mining, include a range of methods developed in negotiation with the relevant traditional owner group involved under the WCCCA. The majority of management plans regarding scarred trees involve their removal to areas specified by Traditional Owners, which are usually environmental buffers or outstations. Stone artefacts are also relocated to specified areas. Shell scatters and middens are of high archaeological and cultural significance and are usually avoided by mining so as to preserve their context and stratigraphy. In some instances, very significant scarred trees are also preserved from mining by the creation of a mining exclusion zone around the scarred tree.

As part of the mine planning process, RTA consults with Traditional Owners through the WCCCA process regarding the proximity of mining to places of cultural significance. Often these places are located within the riparian vegetation zone that will not be disturbed, but occasionally they require the creation of a new zone to ensure protection. Traditional Owners associated with the south of Embley area do not readily distinguish between cultural and natural heritage when discussing the management of country. Plants, animals and features of the natural environment are often associated with important cultural information connected to places of significance. Through consultation with Traditional Owners, the structure of a CEMP is being developed as a long-term strategy for the management of land access, fire, flora and fauna, signage, weeds, environmental monitoring and further documentation of places of cultural heritage significance. RTA only seeks to obtain information for management purposes and the CEMP would include protocols for managing culturally-sensitive information. The CEMP would include procedures to manage the accidental discovery of cultural heritage materials, including human remains, in the Project area. These procedures will be developed in consultation with the Traditional Owners through the WCCCA and will comply with relevant requirements of the *Aboriginal Cultural Heritage Act 2003* (Qld). The procedure will take into consideration the DNRM (2005) guidelines on *The Discovery, Handling and Management of Human Remains*. RTA has established procedures in use at the current Weipa mining operations that may form the basis for procedures specific to the SoE Project.

The proposed Project will have impacts on known scarred trees and two known stone artefact scatters. Mitigation measures will be developed through consultation with Traditional Owners. The recorded shell middens and ethnographic sites are located outside of the areas for proposed facilities and future mining. The results of archaeological surveys suggest scarred trees are the site type most likely to be impacted by the proposed project. Other site types are typically found in the riparian vegetation zone around water courses, the coastline and significant vegetation, such as thickets of vine forest. The majority of project facilities are situated outside of this riparian vegetation zone. Further management work will be undertaken in accordance with the WCCCA process to fully assess the impact of the proposed project on Aboriginal cultural heritage and develop mitigation strategies where required. This will include detailed surveys of all areas identified for future development.

The majority of known places of cultural heritage are well outside of future mining areas, although access to some of these places may be affected by mine development. RTA will take a proactive



approach to the management of places of cultural significance and initiate discussions with WCCCA and the Traditional Owners to establish separate heritage action plans for each location. This will ensure the cultural values of these places are effectively managed over the duration of mining in the area.

RTA has considerable experience working with Traditional Owners to manage cultural heritage at the existing Weipa operations. Management strategies have been developed with Traditional Owners to ensure Aboriginal sites are managed in a culturally-appropriate manner. These include the creation of heritage buffers within mining areas to protect scarred trees and shell middens, the relocation of scarred trees and stone artefacts outside of mining areas and the creation of scarred tree-keeping places. Significant cultural heritage places are often protected by signage and all employees are required to complete cultural awareness training. Specific project inductions are undertaken with staff to familiarise them with the relevant heritage protection measures. Traditional Owners are also employed as heritage monitors to observe activities identified as having high potential to uncover cultural heritage not visible during the assessment surveys.

As defined under the WCCCA, RTA will continue to engage with Traditional Owners to identify and protect cultural heritage places, while also meeting the provisions of the *Aboriginal Cultural Heritage Act 2003* (Qld).

#### Monitoring

Cultural heritage assessments are undertaken prior to conducting any commercial activity. The cultural heritage assessment process is described in detail in the Implementation Strategy section above.

The system of cultural heritage management implemented under the registered ILUA shall continue to be implemented. This meets the requirements of the *Aboriginal Cultural Heritage Act 2003* (Qld) and environmental authority conditions under the *Environmental Protection Act 1994* (Qld) are not relevant.

### 3.13 Temporary Seaborne Access

The road network in the vicinity of the Project is largely undeveloped, with vehicle access restricted to minor vehicular tracks. Current road access to the site is from the Peninsula Developmental Road (PDR) via Aurukun Road, Beagle Camp Access Road, Pera Head Access Road, and Amban Access Road. This would be the main access to the site, during the dry season prior to construction of the barge and ferry terminals and new Mine Access Road. Once the new barge/ferry terminals and Mine Access Road are established,

primary access to the site would be via the proposed barge/ferry terminals on the Embley and Hey Rivers.

However, the PDR and Aurukun Road are predominantly unsealed and prone to closure during the wet season. The Access Roads are also impassable during the wet season.

Depending on the timing of Project approvals, if construction commences in the latter half of the dry season or early in the wet season there will be insufficient time to establish all-weather access to allow construction to continue over the wet season. To mitigate this impact to the construction schedule, temporary seaborne access may be established on the mining lease near the proposed Port and used for approximately the first 12 months of the construction period.

Separately, construction would commence at the proposed Hey River barge/ferry terminal. This construction work could be carried out in the wet season as soon as Project approvals are received, to allow establishment of the mine access road in the following dry season. The timing of minor dredging required for the Hey River terminal would ideally coincide with the dredging required for the Humbug barge terminal and the Hornibrook ferry terminal, which are not on the mining lease.

Due to the minor nature of these works, RTA intend to seek a minor amendment to the Environmental Authority (MIN100939109). The work is proposed to commence following receipt of relevant approvals under the following Acts:

- the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act),
- the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- the *Environment Protection (Sea Dumping) Act 1981* (Cth) (Sea Dumping Act) (for Hey River dredging); and
- the *Environmental Protection Act 1994* (Qld) (EP Act).

#### Temporary Seaborne Access near Pera Head/Boyd Bay

If all required approvals are received prior to the 2012 wet season, seaborne access is required for camp establishment and start up activities over the wet season including:

- transfer of personnel;
- delivery of camp modules;
- fuel, food and consumable deliveries and sewage and waste removal; and
- delivery of earthmoving equipment.

There are several location options that are under consideration and feasibility studies are yet to be completed. Prior to selecting the preferred option, RTA will undertake field surveys to confirm the absence of seagrass and coral within the footprint of the facilities and engage Traditional Owners to assist with cultural heritage assessments in any areas that have not previously been assessed. There is flexibility in the choice of final location to avoid/minimise impacts.

The following temporary seaborne access infrastructure is proposed:

- Landing area for barges – The preferred location for the barge landing area would be between 200m and 400m north of Pera Head, dependent on the results of further consultation and surveys (refer **Figure 10**). The landing area would consist of a pontoon (or “dumb” barge) held in position with anchors and/or piles and 7.5m wide pre-cast concrete matting laid on the beach. The matting would extend from the pontoon to a cutting in the bauxite plateau, where it would also be anchored in position (**Figure 11**). Some rock may need to be placed on the concrete matting between high tide and pontoon to keep equipment out of salt water. Six 900mm diameter piles would also be installed for safe mooring of the barge. The landing area would receive up to 4 deliveries a day with some night operation to suit the tides. Personnel may also be transferred here dependant on weather conditions.
- Passenger jetty – Two locations are being considered for the passenger jetty – one near Boyd Point and one in Boyd Bay, dependent on the results of further consultation and surveys (refer **Figure 10**). The jetty would be 2m wide and consist of steel trusses supported on one 900 mm pile or two piles at the end of each 24m span (up to a maximum of 32 piles) (refer **Figure 11**). There would be a floating pontoon at the end of the jetty for all tide operation. The length is dependent on the distance from the shore to 2m water depth. At the locations shown in **Figure 10**, the length would range from 95m to 362m. Up to two transfers per day would occur, based on a 150 passenger ferry. This facility would not operate at night unless in an emergency.

All infrastructure from these temporary facilities will be removed when no longer required and the bauxite plateau at the barge landing area will be reinstated as close as possible to original contours.

### Hey River Barge/Ferry Terminal

The permanent Hey River barge/ferry terminal includes a roll-on roll-off (RORO) barge facility, vehicle parking, covered waiting area and walkway, pontoon and floating ramp for the ferry terminal. Approximately 37,380m<sup>3</sup> of material will be dredged and disposed of at the Albatross Bay spoil ground, which is currently used by the Port of Weipa. An area of about 4,400m<sup>2</sup> will be reclaimed and supported by rock revetment and/or sheet piles. A thin band of mangroves (400m<sup>2</sup>) will be cleared.

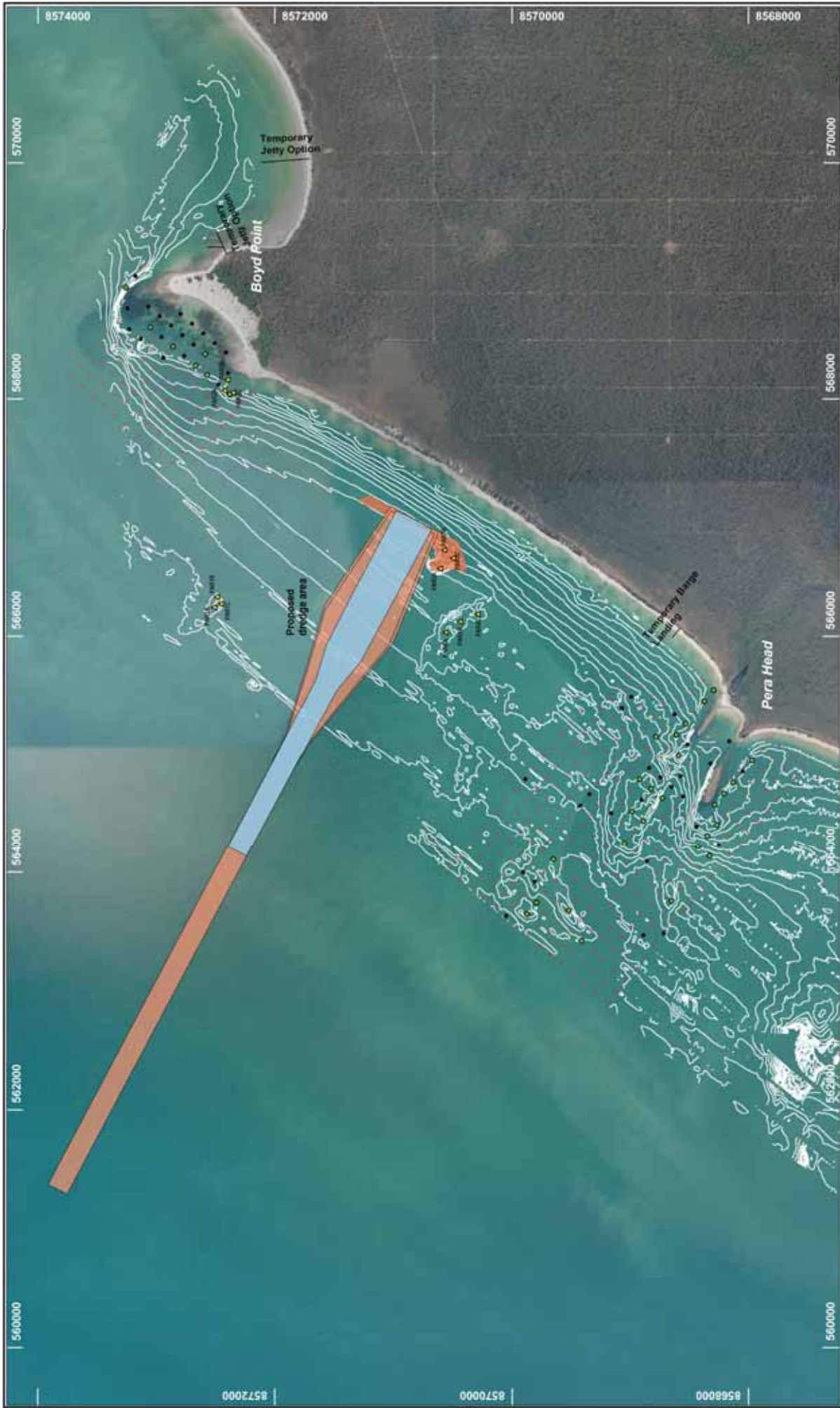
The construction of this facility is staged, with the first stage including the dredging and installation of a temporary construction barge ramp (shown in **Figure 12**). The temporary barge ramp will be used in the site establishment phase and provides access for equipment to construct the rest of permanent facility (i.e. piling etc.). The total reclaimed area of 4,400m<sup>2</sup> incorporates the temporary construction barge ramp. However, the temporary construction barge ramp will be removed when the permanent facility is commissioned. No additional mangrove clearing is required for the temporary construction barge ramp.

### 3.13.1 Value/Background

The existing physical and biological marine, aquatic and terrestrial environments in the SoE Project area are described in RTA (2011) and RTA (2012).

### Marine Ecology - Pera Head/Boyd Bay Temporary Seaborne Access

From the existing surveys, bathymetry and aerial survey, it is considered unlikely that there is significant coral or seagrass habitat in the footprint of the temporary seaborne access infrastructure. However, this will be confirmed via further field surveys prior to construction. There is no dredging proposed. Piling would create some direct disturbance to the seabed and bed levelling would be carried out, if required, by a barge-mounted excavator to remove any “lumps” and fill in any “holes” prior to the concrete matting being laid for the barge access. Bed levelling will ensure that the concrete matting lays flat on the seabed and reduces the potential for edge erosion and undercutting below the high tide mark. The concrete matting would be fixed in place by steel pins driven into the bed with an excavator.



**LEGEND**

- ▲ Proposed dredge area (stage 1)
- ▲ Drop video location
- Proposed dredge area (stage 2)
- Live cover
- × Drop camera location
- × Potential habitat

0 0.5 1km

SCALE - 1:30,000 (at A3)

Map Grid of Australia - Zone 54

Geocentric Datum of Australia 1994

N  
W E  
S

**WorleyParsons**  
*resources & energy*

**RIO TINTO ALCAN**

**SOUTH OF EMBLEY PROJECT**

**Figure 10: Reefal habitat between Pera Head and Boyd Point**

Rev	Date	Revision Description	DRN	CHK	ENG	CHK	ENG	APPD
A	25/01/2012	Issued for review						

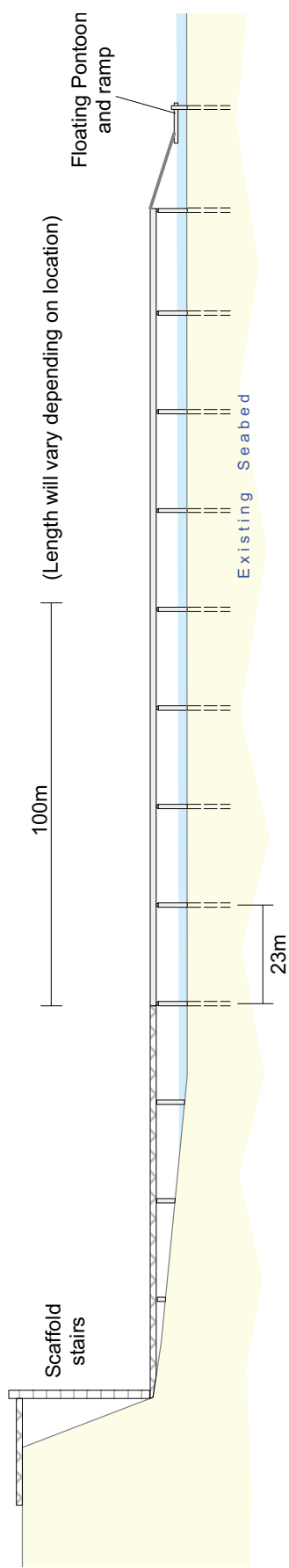
Project No: 301001-01069

Figure: 01069-00-GM-DAL-0048

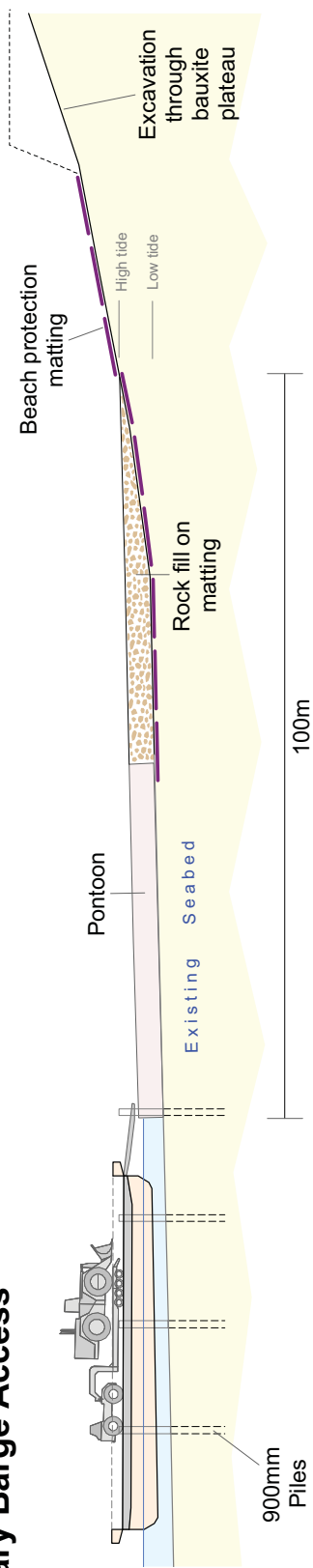
Rev: A

LiveCover - Habitat.wri

## Temporary Passenger Jetty



## Temporary Barge Access



Not to scale.

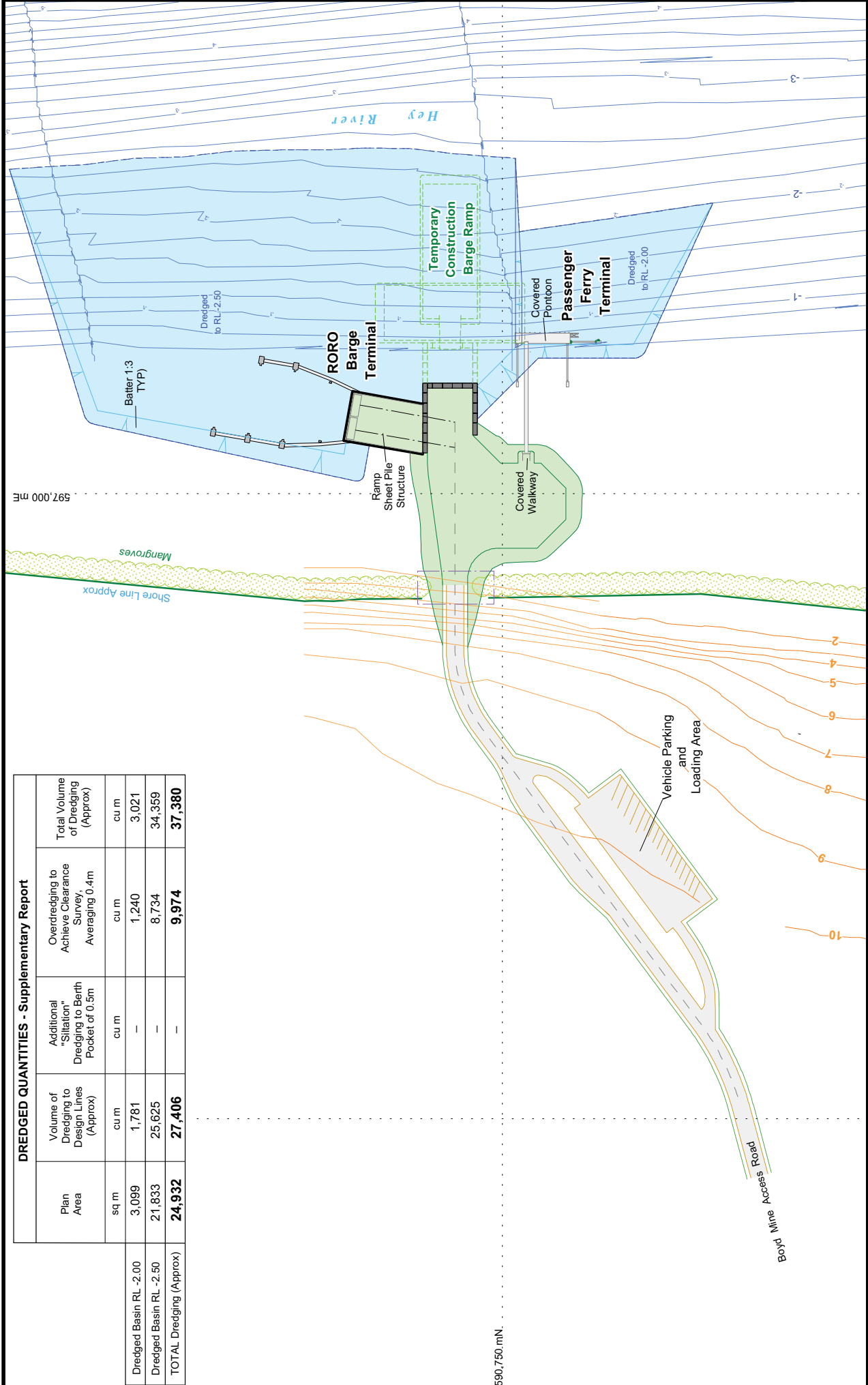
South of Embley Project

**Fig. 11: Temporary Seaborne Access  
(Conceptual Plan)**

Date: 15/12/2011

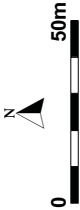


DREDGED QUANTITIES - Supplementary Report					
	Plan Area	Volume of Dredging to Design Lines (Approx)	Additional "Siltation" Dredging to Berth Pocket of 0.5m	Overdredging to Achieve Clearance Survey, Averaging 0.4m	Total Volume of Dredging (Approx)
	sq m	cu m	cu m	cu m	cu m
Dredged Basin RL -2.00	3,099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



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

Reclaimed area  
 Dredged area



South of Embley Project  
**Fig. 12: Hey River  
 Barge/Ferry Terminal**

Reef habitat is shown in **Figure 10**. Section 6.1 of the Supplementary Report to the EIS (RTA 2012) describes the area of coverage of live coral as being very low. Section 6.4 of the EIS presents water quality data for the Boyd Point/Pera Head area and Section 6.9.2 of the EIS presents the results of modelling of water quality impacts associated with the dredging for the proposed Port. Baseline investigations found that water quality at Boyd Point and Per Head exhibits significant natural fluctuations in suspended sediment and turbidity. The extent of this natural variation buffers water quality impacts associated with dredging, disposal, construction and operation to some extent. Generally, these habitats may be described as being more resilient to short-term water quality changes.

Ten marine species of conservation significance under the *Nature Conservation Act 1992* (Qld) (NC Act) have been identified as known to occur, likely to occur, or possibly occurring in the vicinity of the temporary seaborne access. Fourteen marine species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) have been identified as known to occur, likely to occur, or possibly occurring in the vicinity of the Project area. Of these species, those that are known or likely to occur within the Project area are shown in **Table 3-9**. Descriptions of these species and their habitats are provided in RTA (2011) and RTA (2012).

**Table 3-19 Marine Species of Conservation Significance – Known or Likely to Occur**

Species	NC Act Status	EPBC Act Status
Estuarine Crocodile ( <i>Crocodylus porosus</i> )	Vulnerable	Migratory
Indo-Pacific Humpback Dolphin ( <i>Sousa chinensis</i> )	Near threatened	Migratory
Australian Snubfin Dolphin ( <i>Orcaella heinsohni</i> )	Near threatened	Migratory
Dugong ( <i>Dugong dugon</i> )	Vulnerable	Migratory
Hawksbill Turtle ( <i>Eretmochelys imbricata</i> )	Vulnerable	Vulnerable, Migratory
Flatback Turtle ( <i>Natator depressus</i> )	Vulnerable	Vulnerable, Migratory
Olive Ridley Turtle ( <i>Lepidochelys olivacea</i> ) (also known as the Pacific Ridley Turtle under the NC Act)	Endangered	Endangered, Migratory
Green Turtle ( <i>Chelonia mydas</i> )	Vulnerable	Vulnerable, Migratory
Leatherback Turtle ( <i>Dermochelys coriacea</i> )	Endangered	Endangered, Migratory
Loggerhead Turtle ( <i>Caretta caretta</i> )	Endangered	Endangered, Migratory

The area where the temporary seaborne access facilities are proposed provides low to medium density Flatback Turtle nesting habitat and low density Olive Ridley and Hawksbill Turtle nesting habitat (refer Section 6.6.5 of the EIS for surveys undertaken in area). The primary factor currently impacting marine turtle nesting success at the proposed temporary seaborne access sites is predation by feral pigs (refer Section 6.9.4.3 of the EIS).

### Marine Ecology – Hey River Terminal

The soil and sediment sampling and analyses completed at the Hey River barge/ferry terminal is described in RTA (2011). The Hey River barge/ferry terminal has been identified as potentially containing Potential Acid Sulphate Soils (PASS), based on elevation and soil type. Construction at the Hey River barge/ferry terminal will involve an area of up to 4,400m<sup>2</sup> being reclaimed and supported by rock revetment and/or sheet piles. This activity triggers the criterion listed in Section 2.3 of *State Planning Policy 2/02: Planning and Managing Development Involving Acid Sulfate Soils*. To meet the requirements of this policy, ASS investigations were undertaken of soil at the Hey River barge/ferry terminal. The methodology and results of the ASS investigations are presented in RTA (2011). The results showed if material represented by the samples tested was to be placed on land, the addition of lime to manage acid generation is not required.

The assessment of dredged material is consistent with the assessment guidance described in *National Assessment Guidelines for Dredging* (NAGD) (Commonwealth of Australia 2009), Annex 2 of the London Protocol, and the *Waste Specific Guidelines for Assessment of Dredged Material* (IMO 2000). The chemical and physical characteristics of material to be dredged from the proposed Hey River barge/ferry terminals was assessed, including elutriate and bioavailability (RTA 2011). The assessment indicated that all dredge spoil is suitable for unconfined ocean disposal and did not identify any constituents present at levels of environmental concern that would persist in the water column during dredging or sea disposal.

Water quality at the Hey River barge/ferry terminal exhibits significant natural fluctuations in suspended sediment, as reflected in the turbidity (RTA 2011). The extent of this natural variation, especially the extended periods of elevated turbidity, buffers water quality impacts associated with dredging, disposal, construction and operation to some extent. These habitats may be more resilient to short-term water quality changes associated with changes in turbidity.

Albatross Bay is recognised as containing environmentally important marine habitats (Baker and Sheppard 2006). There are no declared Fish Habitat Areas (FHA) under the *Fisheries Act 1994*



(Qld) within the Project area. The northern part of Albatross Bay (referred to as Pine River Bay) is a declared FHA. The proposed works at the Hey River Terminal are more than 15km from the FHA and would not be expected to cause any impact.

Seagrass monitoring between 2000 and 2009 (Chartrand and Rasheed 2009; McKenna and Rasheed 2010) in the vicinity of the Hey River Terminal location occasionally reports a very thin patch of isolated seagrass. Drop camera surveys undertaken over the Hey River Terminal dredge footprint in October 2007, November 2008 and June 2009 did not record any seagrass. However it is possible that seasonally variable seagrasses were absent (e.g. *Halophila ovalis*). Overall though, it is considered that if any seagrasses do occur at the proposed terminal site from time to time, they are likely to contribute minimally to primary productivity in the area.

The Albatross Bay mangrove assemblage is extremely diverse and is the most extensive system of mangroves on the eastern Gulf of Carpentaria. The foreshore at the location of the Hey River barge/ferry terminal has a thin mangrove fringe (one to two trees wide), established over a mud and gravel shore at the base of a low pisolite plateau.

The Indo-Pacific Humpback Dolphin and Australian Snubfin Dolphin were not observed in the seagrass beds in the Embley and Hey Rivers during field studies however they may occur.

Dugongs are known to occur in low densities in Albatross Bay and graze on the seagrass beds in the Embley estuary. However, no dugong were observed associating with these seagrass beds during marine field surveys for the SoE Project. Dugongs prefer seagrasses that are early or 'pioneer' species, particularly species of the genera *Halophila* and *Halodule* (DEWHA 2010). The long, strap-like seagrass *Enhalus acoroides*, which dominates the seagrass beds of the Embley and Hey Rivers, is not a preferred species in dugong's diet.

No marine turtles were observed in the Embley and Hey Rivers during field studies, however some species of marine turtles may forage in these areas.

#### Terrestrial Ecology - Pera Head/Boyd Bay Temporary Seaborne Access

Flora and fauna surveys for the Project area are presented in RTA (2011) and RTA (2012).

A very small area (0.1ha) of RE3.2.6a (*Casuarina equisetifolia* woodland on foredunes) may be disturbed for the temporary seaborne access near Pera Head and Boyd Bay. RE3.2.6a is classed as an 'of concern' regional ecosystem under the VM Act.

Terrestrial fauna surveys conducted during the EIS identified the beach stone curlew (*Esacus magnirostris*) (listed as 'vulnerable' under NC Act) in the vicinity of Boyd Point and Boyd Bay. This species typically lays eggs on the sand in a shallow scrape above high tide level. There are limited opportunities for this type of nesting in the Boyd Bay/Pera Head area as high tides frequently reach the base of the bauxite cliffs abutting the back of the beaches, inundating this area and making it unsuitable for successful nesting. This is especially the case for the main beach habitat located between Pera Head and the northern end of Boyd Bay.

Sandy deposits above high tide level occur in the vicinity of Pera Swamp and more substantially at Boyd Point. None of the proposed temporary seaborne access points will directly disturb potential breeding habitat in these areas as the temporary barge landing area is located more than 200m north of Pera Swamp (Head), and the two temporary Passenger Jetty options are located adjacent to bauxite cliff shoreline habitat to the east of sandy deposits at Boyd Point.

#### Terrestrial Ecology – Hey River Terminal

A small construction laydown area would be established in the area near the Hey River terminal during the first stage of commissioning. There are no 'of concern' regional ecosystems that would be disturbed in this area.

Terrestrial fauna surveys conducted during the EIS identified the beach stone curlew (*Esacus magnirostris*) (listed as 'vulnerable' under NC Act) in the vicinity of the Hey River Terminal. The area where the Hey River barge/ferry terminal is located supports the species but habitat will not be substantially affected.

### 3.13.2 Objectives

The environmental protection objectives is to minimise the risk of the construction and operation of the Project impacting upon the ecological, recreational, cultural, and commercial (fishing) values of the physical and biological environment.

### 3.13.3 Commitments

#### Performance Criteria

The performance criteria for the construction and operation of the temporary seaborne access and Hey River Terminal are:

- no unauthorised clearing of native or marine vegetation;
- monitoring carried out for turtles in accordance with monitoring plan whilst night time lighting

is being used at the temporary seaborne access areas;

- implementation of Dredge Management Plan for the Hey River Terminal;
- rehabilitation of areas disturbed by mining activities and infrastructure to a stable landform; and
- comply with the conditions of the EA.

### Implementation Strategy – Temporary Seaborne Access

Consultation is being undertaken with Traditional Owners in accordance with the process outlined in the WCCCA regarding the locations of the proposed temporary seaborne access. RTA will undertake field surveys to confirm the absence of seagrass and coral within the footprint of the facilities and engage Traditional Owners to assist with cultural heritage assessments in any areas that have not previously been assessed.

Movement of vessels in and out of the inshore area is likely to cause very short term, localised increases in turbidity. The proposed barge landing area would more than 100m from the mapped reef habitat near Pera Head and it is very unlikely that these minor, short term fluctuations would have any impact on coral health.

The length of the facilities is dependent on access to sufficient water depth. The barge access would be designed to operate at high tide to minimise the length of the infrastructure and associated disturbance of the sea bed. The passenger jetty will have a floating pontoon which allows it to operate at all tides. Scouring can occur as a result of propeller wash or current movements and the facility would be designed such that there is sufficient draft to minimise this potential.

The concrete matting for the barge access will provide a 7.5m wide access for vehicles directly up the beach. This pathway would remove a very small proportion of the available 5.8km turtle nesting habitat available between Boyd Point and Pera Head. The provision of the concrete pathway will provide a defined pathway to prevent vehicles from disturbing turtle nests. Once laid, machinery and personnel associated with these landing points will be confined to the landing points to minimise disturbance to potential nesting areas. The existing stairway in Boyd Bay would be improved for use by passengers or a scaffold stairway built depending on location.

Modified lighting regimes can alter marine turtle hatchling sea-finding behaviour and increase mortality of hatchlings. Navigational safety lights would be installed on any structures in accordance with Maritime Safety Queensland (MSQ)

requirements. Night time barge deliveries would only be required during high tide. Lighting would only be utilised when barges are loading or unloading for safe access. The passenger jetty would only be utilised in daylight hours except in the event of an emergency.

Underwater noise is likely to occur as a result of construction of the temporary seaborne access facilities (predominantly due to pile driving activities), and later in operation of these facilities. Marine turtles and mammals, such as dolphins and dugongs, are known to be sensitive to underwater noises that are louder (greater intensity) than normal background levels. Piling would be relatively short term (2–3 weeks for each facility) and a vibratory hydraulic hammer would be used to reduce excessive noise levels. The potential impact of Project pile driving activities on threatened and migratory species is considered low (RTA 2011).

The slow-moving barges present a low risk of boat strike to threatened marine fauna. The risk of boat strike from the ferry will be minimised by reducing speed in shallow water in the approach to the temporary passenger jetty.

Machinery and personnel associated with these landing points will be confined to the landing points to prevent disturbance of beach stone curlew eggs, nests or hatchlings in potential breeding habitat. Temporary disturbance of breeding individuals may occur due to movement and noise when landing points are being used but this will represent a minor proportion of each day/night and it is not anticipated to permanently alienate potential foraging habitat for these species. Overall significant impacts on breeding activity of these species are not anticipated to occur.

Once the temporary seaborne access is no longer required, all infrastructure would be removed and the area would be rehabilitated. It is envisaged that, provided the original dune surface is reinstated, these areas would still be suitable to support RE 3.2.6a.

The construction and operation of these temporary facilities would be considerably lower impact than the construction of the Port infrastructure presented in RTA (2011).

Mitigation measures for impacts associated with the temporary seaborne access at Pera Head/Boyd Point include:

- No dredging would be required.
- Field surveys will be undertaken to confirm the absence of seagrass or coral in the vicinity of the proposed disturbance. If seagrass or coral is present, the location will be reviewed or mitigation measures will be discussed with relevant regulatory agencies.

- Disturbance of native vegetation and the coastal environment will be minimised as much as practicable.
- Mitigation measures for piling activities will include:
  - use of a vibratory hydraulic hammer for the temporary seaborne access facilities to reduce excessive noise levels;
  - a “soft start” approach to disperse animals in the vicinity prior to normal pile driving; and
  - An exclusion zone will be established around pile driving activities and monitored by an observer and normal pile driving will not be conducted while threatened marine fauna species are identified within the nominated exclusion zone.
- The following factors would be considered for lighting at the temporary seaborne facilities:
  - ensuring lighting is minimised overall to that which is essential for safe and efficient operation of the facility;
  - reducing lighting when there are no vessels at berth or being piloted in the area; and
  - shielding and/or recessing lights to minimise light spill.
- A feral pig control program will be implemented between Pera Head and Boyd Point and other areas of nesting north of Boyd Point and/or south of Pera Head to reduce nest predation and enhance turtle population survivorship.
- The passenger ferry will be limited to 8 knots in water depths of less than 5m in the approach to the temporary seaborne access.
- RTA will document any injury or death of marine turtles (e.g. animals entangled in ghost nets), dugong or other threatened marine fauna and report these to DERM for inclusion in the Wildlife Stranding database. Any injury or death that may be attributable to RTA operations would be investigated to determine appropriate mitigation measures.
- Machinery and personnel associated with these landing points will be confined to the landing points to reduce disturbance of potential threatened species breeding habitat.
- RTA will monitor for scouring of the sea bed at the temporary barge landing area near Pera Head and will implement mitigation measures if required, this may include extending the concrete matting under where the barge would enter and leave the facility or conducting localised repair work.
- Once the temporary seaborne access is no longer required, all infrastructure would be removed and

the area would be rehabilitated. The area would be monitored in accordance with the Erosion and Sediment Control Management Plan until it stabilises.

#### Implementation Strategy – Hey River Terminal

The proposed dredging at Hey River Terminal is minor in scale and short term (approximately 3–4 weeks) and is not predicted to have a significant impact on water quality. A draft Dredge Management Plan for the river facilities has been prepared and is provided in RTA (2012). The Dredge Management Plan will be finalised in consultation with the dredging contractor and implemented prior to dredging. It includes descriptions of:

- measures to be implemented throughout dredging activities to manage water quality impacts;
- marine mammal and turtle management procedures to minimise any avoidable impacts to marine mammals and turtles resulting from dredging activities;
- management responses that relate to marine turtle incidents (injury or mortality) associated with dredging and spoil disposal activities; and
- monitoring for introduced marine pest larvae and response to a pest incursion.

A maximum of 400m<sup>2</sup> of mangroves would be required to be removed to construct the Hey River barge/ferry terminal. The extent of mangrove clearing represents approximately 0.008% of RE 3.1.1a and 0.003% of the mangrove communities within the Project area. An area of about 4,400m<sup>2</sup> will be reclaimed and supported by rock revetment and/or sheet piles. RTA proposes to develop an appropriate offset for loss of fish habitat in consultation with DEEDI (FQ).

Underwater noise is likely to occur as a result of construction of the temporary seaborne access facilities (predominantly due to pile driving activities), and later in operation of these facilities. Marine turtles and mammals, such as dolphins and dugongs, are known to be sensitive to underwater noises that are louder (greater intensity) than normal background levels. Piling would be relatively short term (approximately 15 days). The potential impact of Project pile driving activities on threatened and migratory species is considered low (RTA 2011).

The slow-moving barges present a low risk of boat strike to threatened marine fauna. The operation of the ferry is predicted to pose a moderate risk to Dugong in the Embley estuary. Transit lanes would be defined to reduce the overall area of disturbance from vessel activities. Where possible, these transit lanes would follow greatest water depths to avoid significant meadows of seagrasses.

Mitigation measures for impacts associated with the Hey River Terminal include:

- Disturbance of native vegetation and the estuarine environment will be minimised as much as practicable.
- Mitigation measures for piling activities will include:
  - use of a vibratory hydraulic hammer for the temporary seaborne access facilities to reduce excessive noise levels;
  - a “soft start” approach to disperse animals in the vicinity prior to normal pile driving; and
  - an exclusion zone will be established around pile driving activities and monitored by an observer and normal pile driving will not be conducted while threatened marine fauna species are identified within the nominated exclusion zone.
- Transit lanes will be defined to follow greatest water depths to avoid significant meadows of seagrasses where possible.

### Monitoring

The following monitoring will be undertaken:

- Sightings of whales or turtles in the vicinity of pile driving will be recorded;
- Water quality, marine pest, and marine mammal and turtle monitoring as described in the Dredge Management Plan;
- A sea turtle monitoring program will be developed with consideration of turtle nesting activities (number, type, predation, success), behaviour (hatchling activity) and incident reporting, and implemented prior to the use of night-time lighting in the Pera Head/Boyd Bay area.
- Visual monitoring of scouring of the sea bed at the temporary barge landing area near Pera Head.

#### 3.13.4 Proposed Environmental Authority Conditions: Schedule L – Temporary Seaborne Access

(Note: These proposed conditions/changes to conditions are in addition to existing conditions in MIN100939109.)

- 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 K Plan 1 – Weipa General Area Plan and Plan 2 – Weipa Operational Areas.

**Table A3 Authorised Activities**

Mining Activities <sup>1</sup>	Mine Feature	Tenure	Maximum Surface Area of Disturbance (ha)	Map Reference (MGA 94)	
				Northing	Easting
Dredging of marine sediments	Hey River Terminal	ML6024	2.5	8590950	597005
				8590950	597140
				8590665	597140
				8590665	597005
Barge/ferry terminal	Hey River Terminal	ML6024	3	8590830	597035
				8590755	597075
				8590620	596800
				8590700	596760
	Temporary seaborne access	ML7024	TBA	TBA	TBA
Transport Corridor	Transport Corridor	ML6024	Entire Mining Lease	N/A	N/A

<sup>1</sup> Mining activities include vegetation clearing

- C29 A Dredge Management Plan will be developed and implemented prior to commencement of any capital or maintenance dredging activities.

## 4. ENVIRONMENTAL MANAGEMENT

### 4.1 Environmental Management System

Project operations would take place under an EMS consistent with the Australian Standard *Environmental management systems – requirements with guidance for use* (ISO 14001).

The EMS would incorporate a risk management system to identify environmental aspects of activities to be undertaken as part of the Project, carry out an assessment of the risk, and identify appropriate controls. The risk management system will conform to the Australian Standard for *Risk management* (AS/ NZS 4360:2004).

Policies and procedures would be prepared for construction, mining and related activities to control significant environmental aspects.

### 4.2 Monitoring

Environmental monitoring will occur in accordance with the requirements of the environmental authority.

The environmental monitoring for the Project will include dust, surface and groundwater, noise, flora and fauna, and cultural heritage. Commitments and proposed environmental authority conditions have been included in the relevant sections of this EM Plan.

An Environmental Monitoring Manual (EMM) will be developed as part of the EMS. The EMM will outline the environmental monitoring to be undertaken, including monitoring sites, parameters and their frequency of measurement and also make reference to monitoring procedures and records.

All monitoring and research data, collected for the purpose of demonstrating compliance with this environmental authority, must be collated and maintained in a central location, such that the data are accessible on request by the administering authority.

The EMM will be made available to the administering authority on request.

### 4.3 Reporting

Reporting commitments under the environmental authority and other legislation will be complied and include:

- Prepare Annual Returns as required under the *Environmental Protection Act 1994* (Qld);
- Submit reports for the National Pollutant Inventory (NPI) and the National Greenhouse and Energy Reporting Scheme (NGERS); and

- Notify the administering authority of incidents that may compromise compliance with the conditions of the environmental authority or incidents where serious or material environmental harm is caused, or threatened to be caused, unless that environmental harm is authorised (e.g. by the environmental authority or development approval).

A register of environmental incidents will be maintained and corrective actions assigned where required.

RTA aims to provide timely, relevant and appropriately presented information to government authorities, the local community and the general public on the environmental performance of the Project. An annual Sustainable Development Review is prepared to report publicly on social, environmental and economic performance.

### 4.4 Studies and Investigations

RTA is committed to the following studies and investigations as a minimum:

- Revegetation – on-site field trials will be conducted with a range of native tree and shrub species and grasses to optimise regeneration on major soil types;
- Rehabilitation – the criteria for achieving a self-sustaining vegetation community will be developed based on the results of the on-site field trials; and
- Water – Quarterly vertical salinity profiling in Ward River and Norman Creek.

### 4.5 Staff Training

RTA will ensure employees, contractors and visitors receive appropriate environmental awareness training. This will be achieved through a variety of methods, including induction training, formal presentations, and impromptu meetings.

Specifically, RTA requires employees, contractors and visitors are aware of:

- their roles and responsibilities, including environmental incident reporting;
- the environmental impacts, potential or actual, of their activities onsite;
- the potential consequences of poor environmental performance; and
- site emergency procedures.

Employees and contractors required to undertake work at the site must undergo an environment, health and safety induction. Environmental awareness training will also be a regular feature of site-wide training. Records of training content and attendance will be maintained.

#### **4.6 Environmental Auditing and Review**

RTA will conduct environmental audits to assess compliance with regulatory requirements and the performance of the site EMS. The objectives of the environmental auditing and review programs are to:

- monitor and report on compliance with regulatory requirements, EM Plan commitments, Plan of Operations, environmental policy, company standards, best-practice guidelines and signatory codes;

- monitor the EMS for consistency with the principles of ISO14001; and
- ensure senior management review of performance via consideration of the audit reports.

An environmental auditing program will be implemented at the operation which will include:

- internal environmental audits – annually;
- EMS review – annually;
- Plan of Operations audits – with each Plan of Operations; and
- Administering authority audits – at a frequency determined by the authority.



## 5. DEFINITIONS

Words and phrases used throughout this document are defined below except where identified in the *Environmental Protection Act 1994* (Qld) or subordinate legislation. Where a word or term is not defined, the ordinary English meaning applies, and regard should be given to the Macquarie Dictionary.

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“µg/L” means micrograms per litre.

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“20<sup>th</sup> percentile flow” means the 20<sup>th</sup> percentile of all daily flow measurements (or estimations) of daily flow over a 10-year period for a particular site. The 20<sup>th</sup> percentile calculation should only include days where flow has been measured (or estimated), i.e. not dry weather days.

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“50<sup>th</sup> percentile” means the measured values of the quality characteristic must not be greater than the release limit for any more than three out of six consecutive samples where the time interval between the taking of each consecutive sample is not less than three days.

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“80<sup>th</sup> percentile” means the measured values of the quality characteristic must not be greater than the release limit for any more than one out of five consecutive samples where the time interval between the taking of each consecutive sample is not less than three days.

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“acceptance criteria” means the measures by which the actions implemented to rehabilitate the land are deemed to be complete (same as completion criteria).

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“administering authority” means the Department of Environment and Resource Management or its successor.

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“annual exceedance probability” means the probability that the given event will be exceeded within a one-year period.

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“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.

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“acid sulphate soils” means sulphidic geological strata most commonly associated with the production of ferrous iron and sulphuric acid, which, when exposed to air and moisture may release a low pH, high heavy-metal discharge.

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“authority” means environmental authority under the *Environmental Protection Act 1994* (Qld).

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“background noise level” means noise, measured in the absence of the noise under investigation, as either:

- m.  $L_{A90,T}$  being the A-weighted sound pressure level exceeded for 90 percent of the time period of not less than 15 minutes, using Fast response, or
- n.  $L_{A90,T}$  being the arithmetic average of the minimum readings during a representative time period of not less than 15 minutes, using Fast response.

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“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.

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“dam” means a land-based structure or a void 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.

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“Decibel (dB)” is the unit of sound measurement.

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Decibel (dB) (Linear) is a linear scale of sound measurement that treats all audible frequencies as having equal value. Whereas the “A-weighting filter,” which is an approximation of loudness, is used to correct the sound pressure levels to more accurately reflect what the human ear perceives.

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“design storage allowance” as defined in the DME/DEH (1995) *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland*.

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“environmental authority” means an environmental authority granted in relation to an environmentally relevant activity under the *Environmental Protection Act 1994* (Qld).

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“environmental authority holder” means the holder of this environmental authority.

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“environmental nuisance” is unreasonable interference or likely interference with an environmental value caused by:

- a. noise, dust, odour, light; or
- b. an unhealthy, offensive or unsightly condition because of contamination; or
- c. another way prescribed by regulation.

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“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.

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“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.

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“hazard 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 *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* (Version 2.0, 2009) published by the Environmental Protection Agency on its website.

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“LA<sub>max adj,T</sub>” means the average maximum A-weighted sound-pressure level, adjusted for noise character and measured over a time period of not less than 15 minutes, using Fast response.

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“land use” is a term to describe the selected post-mining use of the land, which is planned to occur after the cessation of mining operations.

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“land” in the “land schedule” of this document means land excluding waters and the atmosphere.

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“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.

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“maximum” means the measured value of the quality characteristic or contaminant must not be greater than the release limit stated.

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“MaxLpA,T” means the maximum A-weighted sound-pressure level measured over a time period of not less than 15 minutes, using Fast response.

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“median” means the middle value, where half the data are smaller, and half the data are larger. If the number of samples is even, the median is the arithmetic average of the two middle values.

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“mg/kg” means milligrams per kilogram.

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“mg/L” means milligrams per litre.

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“minimum” means the measured value of the quality characteristic or contaminant must not be less than the release limit stated.

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“natural flow” means the flow of water through waters caused by nature.

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“ng/L” means nanograms per litre.

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“noise-sensitive place” means:

- a. a legal dwelling, caravan park, residential marina or other residential premises; or
- b. a motel, hotel or hostel; or
- c. a kindergarten, school, university or other educational institution; or
- d. a medical centre or hospital; or
- e. a protected area; or
- f. a public park or gardens.

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and includes the curtilage of any such place.

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“North of Embley area” means that area of ML 7024 that lies north of the Embley River.

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“noxious” means harmful or injurious to health or physical well-being.

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“offensive” means causing unreasonable offence or displeasure; is unreasonably disagreeable to the sense; disgusting, nauseous or repulsive.

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“progressive rehabilitation” means rehabilitation (defined below) undertaken progressively OR a staged approach to rehabilitation as mining operations are on-going.

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“protected area” means:

- a. a protected area under the Nature Conservation Act 1992 (Qld); or
- b. a marine park under the Marine Parks Act 1992 (Qld); or
- c. a World Heritage Area.

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“range” means the measured value of the quality characteristic or contaminant must not be greater than the higher release limit stated nor lower than the lower release limit stated.

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“receiving environment” means all groundwater, surface water, land, and sediments that are not disturbed areas authorised by this environmental authority.

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“receiving waters” means all groundwater and surface water that are not disturbed areas authorised by this environmental authority.

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“rehabilitation” means the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land.

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“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.

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“saline drainage” means the movement of waters, contaminated with salt(s), as a result of the mining activity.

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“sediment dam” means a structure for the capture and treatment of storm water runoff contaminated only by sediments from disturbed areas and which discharge off-site once full.

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“self-sustaining” means an area of land which has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.

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“sensitive place” [e.g. odour and dust] has the same meaning as and includes a noise-sensitive place and a commercial place.

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“South of Embley area” means the area of ML 7024 that lies south of the Embley River.

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“stable” means geotechnical stability of the rehabilitated landform where instability related to the bearing capacity, excessive settlement and subsidence caused by consolidation/settlement of the wastes deposited, and sliding/slumping instability has ceased.

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“the holder” means the holder of this environmental authority.

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“Total Organic Carbon” (TOC) means the sum of all compounds of carbon, which contain at least one carbon to carbon bond plus methane and its derivatives. For the purpose of measurement one gram of TOC is deemed to have the same flame ionisation response as one gram of hexane.

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“waters” includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water natural, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), and any underground water, any part thereof.

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