

**Environmental Impact Statement (EIS)
assessment report under the
*Environmental Protection Act 1994***

Bauxite Hills Project
proposed by Aldoga Minerals Pty Ltd
(a wholly owned subsidiary of Metro Mining Limited)
31 March 2017

\

Prepared by: Impact Assessment and Operational Support, Department of Environment and Heritage Protection

© State of Queensland, 2013.

The Queensland Government supports and encourages the dissemination and exchange of its information. The copyright in this publication is licensed under a Creative Commons Attribution 3.0 Australia (CC BY) licence.



Under this licence you are free, without having to seek our permission, to use this publication in accordance with the licence terms.

You must keep intact the copyright notice and attribute the State of Queensland as the source of the publication.

For more information on this licence, visit <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Disclaimer

This document has been prepared with all due diligence and care, based on the best available information at the time of publication. The department holds no responsibility for any errors or omissions within this document. Any decisions made by other parties based on this document are solely the responsibility of those parties. Information contained in this document is from a number of sources and, as such, does not necessarily represent government or departmental policy.

If you need to access this document in a language other than English, please call the Translating and Interpreting Service (TIS National) on 131 450 and ask them to telephone Library Services on +61 7 3170 5470.

This publication can be made available in an alternative format (e.g. large print or audiotape) on request for people with vision impairment; phone +61 7 3170 5470 or email <library@ehp.qld.gov.au>.

March 2017

Contents

Contents.....	3
List of tables.....	5
List of figures.....	6
List of acronyms and abbreviations	7
1 Introduction	10
2 Project description	11
2.1 Project location	11
2.1 Tenures	11
2.2 Sensitive receptors	12
2.3 Workforce.....	12
2.4 Mine pit configurations	13
2.5 Mining, port and barging infrastructure	13
2.6 Construction.....	15
2.7 Mining operation	16
2.8 Site disturbance & cumulative impacts.....	18
3 Environmental impact assessment process	19
3.1 Environmental Protection Act 1994	19
3.2 Environment Protection and Biodiversity Conservation Act 1999	20
3.3 Consultation	21
3.3.1 Commonwealth Department of the Environment and Energy	21
3.3.2 Public consultation	21
3.3.3 Advisory body	21
3.3.4 Public notification	22
3.3.5 Key matters raised in submissions	22
3.4 Matters considered in the EIS assessment	24
4 Assessment of the EIS	25
4.1 Project description	25
4.2 Project alternatives	25
4.3 Climate.....	26
4.3.1 Values, impacts and mitigation measures	26
4.3.2 Assessment and conclusions	26
4.4 Land	30
4.4.1 Values, impacts and mitigation measures	30
4.4.2 Rehabilitation and Decommissioning.....	31
4.4.3 Assessment and conclusions	41
4.5 Ecology	42
4.5.1 Existing environmental values	42
4.5.2 Potential impacts.....	49
4.5.3 Cumulative impacts.....	50
4.5.4 Assessment and conclusions	51

4.6	State Environmental offsets	53
4.6.2	Conclusions and recommendations	55
4.7	MNES.....	55
4.7.1	Existing environmental values (MNES) identified in the EIS	56
4.7.2	Potential impacts on MNES	58
4.7.3	Cumulative impacts.....	70
4.7.4	Conclusion and recommendations	71
4.8	Coastal processes	73
4.8.1	Physical marine and estuarine environments.....	73
4.8.2	Potential impacts.....	75
4.8.3	Mitigation measures.....	78
4.8.4	EHP conclusion and recommendations.....	79
4.9	Air.....	82
4.9.1	Environmental Protection (Air) Policy 2008 (EPP (air)	82
4.9.2	Values, impacts and mitigations measures	82
4.9.3	Assessment and conclusions	82
4.10	Noise and vibration	86
4.10.1	Environmental Protection (Noise) Policy 2008 (EPP (noise).....	86
4.10.2	Values, impacts and mitigations measures	86
4.10.3	Assessment and conclusions	86
4.11	Waste.....	88
4.11.1	Values, impacts and mitigations measures	88
4.11.2	Assessment and conclusions	88
4.12	Water Quality	92
4.12.1	Values	92
4.12.2	Impacts and mitigations measures	95
4.12.3	EHP conclusions.....	95
4.12.4	EHP recommendations.....	96
4.13	Water Resources Groundwater	97
4.13.1	Cape York water resources (shallow aquifer).....	97
4.13.2	Great Artesian Basin water resources	97
4.13.3	Requirements for the take of associated water	97
4.13.4	Assessment approach in the EIS.....	98
4.13.5	Values, impacts and mitigations measures	98
4.13.6	Assessment and conclusions	98
4.14	Biosecurity	110
4.14.1	Values, impacts and mitigations measures	110
4.14.2	Assessment and conclusions	110
4.15	Transport.....	114
4.15.1	Values, impacts and mitigations measures	114
4.15.2	Assessment and conclusions	114

4.16	Cultural heritage.....	121
4.16.1	Values, impacts and mitigations measures	121
4.16.2	Assessment and conclusions	121
4.17	Social and economic.....	124
4.17.1	Values, impacts and mitigations measures	124
4.17.2	Assessment and conclusions	124
4.18	Hazard and safety.....	129
4.18.1	Values, impacts and mitigations measures	129
4.18.2	Assessment and conclusions	130
5	Recommendation on the suitability of the project	135
6	Project approvals and recommended conditions	137
6.1	Environmental authority (EP Act).....	137
6.2	Australian Government approval (EPBC Act).....	137
6.3	Approvals	137
7	Approved by	141
Appendix 1 - Recommended conditions for the environmental authority (resource activity)		142
Schedule A: General		142
Schedule B: Air.....		145
Schedule C: Waste		145
Schedule D: Noise		146
Schedule E: Groundwater		146
Schedule F: Water		152
Schedule G: Land and Rehabilitation		156
Schedule H—Maps and Plans		159
Appendix 2 - DNRM recommendations for the Project		169
Appendix 3 - DAFF recommendations for the project		169
Appendix 4 - PBSA and QAS recommendations for the Project.....		169
Appendix 5 - DTMR recommendations for project		170
Appendix 6 – Recommended tidal works (cyclone moorings) information requirements and conditions		171

List of tables

Table 1.	Bauxite Hills project infrastructure	13
Table 2.	Key Steps undertaken during the EIS process for the project.	19
Table 3.	Key matters raised in public and agency submissions	22
Table 4.	EIS assessment of climate	27
Table 5.	Decommissioning, rehabilitation objectives and completion criteria by domain.....	32
Table 6	EIS assessment of Land.....	35
Table 7.	Regional ecosystems ground-truthed in the project area.....	43
Table 8.	Likelihood of occurrence of threatened terrestrial fauna species	44
Table 9.	Potential impacts on terrestrial and aquatic areas and proposed mitigation measures	49
Table 10.	Significant residual impacts on MSES requiring an offset.....	55

Table 11. Environmental values for air to be protected: human health	83
Table 12. EIS assessment of air quality	84
Table 13. EIS assessment of noise	87
Table 14. EIS assessment of waste	89
Table 15. EIS assessment of water resources and groundwater	101
Table 16. EIS assessment of biosecurity risk	111
Table 17. EIS assessment of transport	116
Table 18. EIS assessment of cultural heritage values	122
Table 19. EIS assessment of social and economic values	125
Table 20. EIS assessment of hazard and safety	131
Table 21. Key potential impacts of the project.....	136
Table 22. Approvals required for the Bauxite Hills Project	137

List of figures

Figure 1. Project location and project infrastructure in the Skardon River Catchment (From SEIS Figure 1-2)	12
Figure 2. Hydrogeological conceptual model (Figure 10-16 of the EIS).....	107
Figure 3. Cross section of Big Footprint Swamp (Figure 10-15 of the EIS)	108
Figure 4. Proposed EA Groundwater monitoring network (Figure 9-5 of the SEIS).....	109

List of acronyms and abbreviations

AADT	Annual average daily traffic
ACH Act	<i>Aboriginal and Cultural Heritage Act 2003</i>
ARI	Average reoccurrence interval
ASS	Acid sulfate soils
AWL	Associated water licence
BLA	Barge loading area
BLF	Barge loading facility
BoM	Bureau of Meteorology
BPA	Biodiversity Planning Assessment
CHMP	Cultural Heritage Management Plan
CLR	Contaminated Land Register
COAG	Council of Australian Governments
CRG	Community Reference Group
CYSF	Cape York Sustainable Futures
DAF	Department of Agriculture and Fisheries
DATSIMA	Department of Aboriginal and Torres Strait Islander and Multicultural Affairs
DCS	Department of Community Safety
DEWS	Department of Energy and Water Supply
DHPW	Department of Housing and Public Works
DILGP	Department of Infrastructure, Local Government and Planning
DIWA	Directory of Important Wetlands in Australia
DNRM	Department of Natural Resources and Mines
DO	Dissolved oxygen
DoEE	Commonwealth Department of Environment and Energy
DSD	Department of State Development
DSITIA	Department of Science, Information Technology, Innovation and the Arts
DSO	Direct Shipping Ore
DTMR	Department of Transport and Main Roads
EA	Environmental authority
EHP	Department of Environment and Heritage Protection
EIS	Environmental impact statement
EM Plan	Environmental management plan
EMR	Environmental Management Register
EP Act	<i>Environmental Protection Act 1994</i>
EP Regulation	Environmental Protection Regulation 2008
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPBC EOP	EPBC Act Environmental Offsets Policy
ERA	Environmentally relevant activity
ERP	Emergency Response Plan
ESA	Environmentally sensitive area

ESCP	Erosion and sediment control plan
EVs	Environmental values
EVNT	Endangered, Vulnerable or Near Threatened
FA	Financial assurance
FIFO	Fly-in fly-out
GA	Gulf Alumina Limited
GAB	Great Artesian Basin
GDE	Ground dependent ecosystems
GES	General ecological significance
GHG	Greenhouse gas
GQAL	Good quality agricultural land
HES	High ecological significance
HEV	High ecological value
IAS	Initial advice statement
IMP	Introduced marine pests
Land Act	<i>Land Act 1994</i>
Land Protection Act	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>
MDL	Mining development lease
MIA	Mine infrastructure area
ML	Mining lease
MLA	Mining lease application
MR Act	<i>Mineral Resources Act 1989</i>
MSQ	Maritime Safety Queensland
Mtpa	Million tonnes per annum
NC Act	<i>Nature Conservation Act 1992</i>
NPA	National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development
NT Act	<i>Native Title Act 1993</i>
OCG	Office of the Coordinator General
OGV	Ocean going vessels
OMAC	Old Mapoon Aboriginal Corporation
PASS	Potential acid sulfate soils
PM	Particular matter (e.g. PM _{2.5} , PM ₁₀)
PSBA	Public Safety Business Agency
PVMO	Policy for Vegetation Management Offsets
PWMP	Pest and Weed Management Plan
QBOP	Queensland Biodiversity Offsets Policy
QGEOP	Queensland Government Environmental Offsets Policy
QH	Queensland Health
QMDC	Queensland Murray-Darling Committee
QPS	Queensland Police Service
QTT	Queensland Treasury and Trade

RE	Regional ecosystems
REMP	Receiving Environment Monitoring Program
RHM	Regional Harbour Master
ROM	Run-of-mine
RORO	Roll on roll off facility
SCL	Strategic Cropping Land
SEA	Strategic environmental area
SHMS	Safety and Health Management System
SP Act	<i>Sustainable Planning Act 2009</i>
SRBP	Skardon River Bauxite Project
SSE	Site Senior Executive
TEC	Threatened Ecological Community
TLO	Train load out
TOR	Terms of reference
TSF	Tailings storage facility
TSS	Total suspended solids
UHF	Ultrahigh frequency
VHF	Very high frequency
VM Act	<i>Vegetation Management Act 1999</i>
WCCCA	Western Cape Communities Co-existence Agreement
WCCT	Western Cape Communities Trust
WMP	Water Monitoring Plan
WONS	Weeds of National Significance
WRP	Water Resources Plan

1 Introduction

This Environmental Impact Statement (EIS) assessment report ('assessment report' hereafter) for the Bauxite Hills Project (the project) was prepared by EHP pursuant to Chapter 3 of the *Environmental Protection Act 1994* (EP Act). It provides an evaluation of the EIS prepared by Aldoga Minerals Pty Ltd, a wholly owned subsidiary of Metro Mining Limited ('the proponent' hereafter). The matters dealt with in the EIS were defined in the Terms of reference (TOR) published by the Department of Environment and Heritage Protection (EHP).

This report is an assessment of the EIS prepared by the proponent. It outlines the findings of the EIS and information provided through the public and agency consultation. This assessment report:

- summarises the proposed project, the EIS process and the approvals that would be necessary for the project's commencement
- evaluates the key issues associated with the potential environmental, economic and social impacts of the proposed project
- assesses the potential impact on prescribed environmental matters under State and Commonwealth legislation
- outlines avoidance, planning, management, monitoring and other measures proposed to minimise adverse environmental impacts
- evaluates the commitments proposed to minimise adverse environmental impacts in the EIS documents
- assesses the suitability of the project and identifies matters required for the proposed project to proceed
- identifies issues that were not resolved or that require specific conditions for the proposed project to proceed
- recommends conditions relevant to operational, monitoring, management, offset and other requirements
- completes the EIS assessment process for the Bauxite Hills Project under section 60 the EP Act.

This assessment report has been prepared and completed pursuant to sections 58, 59 and 60 of the EP Act and will assist EHP in making decisions under Chapter 5 of the EP Act and other departments in making decisions under their respective legislation. The EP Act EIS process is accredited for the assessment of matters of national environmental significance (MNES) under the EPBC Act in accordance with the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland (2012). A copy of this assessment report will be given to the Commonwealth Minister for the Environment, who will make a decision with respect to the controlled action under Part 9 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2 Project description

A detailed description of the project is provided in Chapter 4 of the Supplementary Report for the EIS December 2016 (SEIS). For completeness and clarity about what this assessment report refers to, a summary of the key project elements is provided below.

The proponent is proposing to develop an open cut bauxite mine and barging/transshipment operation on a greenfield site on the western coastline of Cape York, Queensland (the project), approximately 35 kilometres (km) northeast of Mapoon and 90km north of Weipa. The project is on mining lease applications (MLA) MLA20676, MLA20689, MLA20688 with access to Rio Tinto Alcan's ML7024 for transportation (MLA100130). Subject to approvals, the construction of the mine is due to commence in 2017.

The project is characterised by three shallow open cut pits that would be connected via internal haul roads to an existing north-south haul road leading to a barge loading area (BLA) and mine infrastructure area (MIA) operated by the Skardon River Bauxite project (SRBP). Bauxite would be hauled to the SRBP run-of-mine (ROM) stockpile using road train trucks and then loaded onto barges. The mine would not be operational during the wet season.

The bauxite from the project is suitable as a Direct Shipping Ore (DSO) product (i.e. ore is extracted and loaded directly to ships with no washing or processing required). The operation would produce and transport up to 5 million tonnes per annum of ore over 12 years. Bauxite would be transported by barge via the Skardon River to the transshipment site, approximately 12km offshore in the Gulf of Carpentaria, and loaded into ocean going vessels and shipped to customers.

2.1 Project location

The project would be located on west coast of Cape York Peninsula, approximately 90km north of Weipa, in the Parish of Skardon within the Cook Shire. The west coast of the peninsula borders the Gulf of Carpentaria. Cape York has an estimated residential population of around 17,000 (at 30 June 2011). The closest community, Mapoon, is located approximately 10km southwest of the project area. It is located in the shire of Mapoon and associated (Old Mapoon Aboriginal Corporation) trust lands cover an area of 458.5km². Mapoon's population is small with less than 300 people counted in 2012.

The open cut pits (BH1, BH6 west & BH6 east) would be located on the slightly elevated bauxite plateau within the Skardon River catchment which drains west into the Gulf of Carpentaria. BH1 is surrounded to the north by the main channel and south by the south arm of the Skardon River. BH6 west is bounded by a ridgeline parallel to the Skardon River and its western boundary is adjacent to a series of swamps, coastal dunes and low lying tidally influenced areas. BH6 is bounded by the south arm of the Skardon River in the north and extends south to the proposed accommodation camp. The project location and available infrastructure in the Skardon River Catchment is shown in red in Figure 1. Figure 1 also shows the infrastructure no longer required for the project as highlighted in white.

The project is remote from any township with the nearest town being Mapoon. Since the project would be located entirely within Aboriginal freehold land (Lot 11 on SP204113 and Lot 13 SP204113), a Conduct and Compensation Agreement for Mining was negotiated in January 2016. Traditional Owners use the land intermittently for cultural activities, hunting and fishing. There is no agricultural, forestry or grazing on the land but a small number of tourists camp on the beach near the mouth of the Skardon River.

The SRBP previously owned by Gulf Alumina Limited (Gulf Alumina), is on adjacent tenements. The SRBP was recently approved to mine 3-5MT/y of bauxite as DSO. The SRBP site has an existing accommodation village, BLA and haul road previously installed for a disused kaolin clay mine. These facilities are now owned by the proponent and would be used to support mining operations for the Bauxite Hills project. Rio Tinto Alcan hold extensive tenements for bauxite mining on the eastern and southern boundaries, however to date, no applications have been lodged to mine these tenements.

2.1 Tenures

The proponent has made application for mining leases (ML) MLA20676, MLA20689, and MLA20688 and for MLA100130 requesting access for transportation purposes over Rio Tinto Alcan's tenements. The proponent has indicated they have an in principle agreement with Rio Tinto Alcan for the transportation lease (see Figure 1).

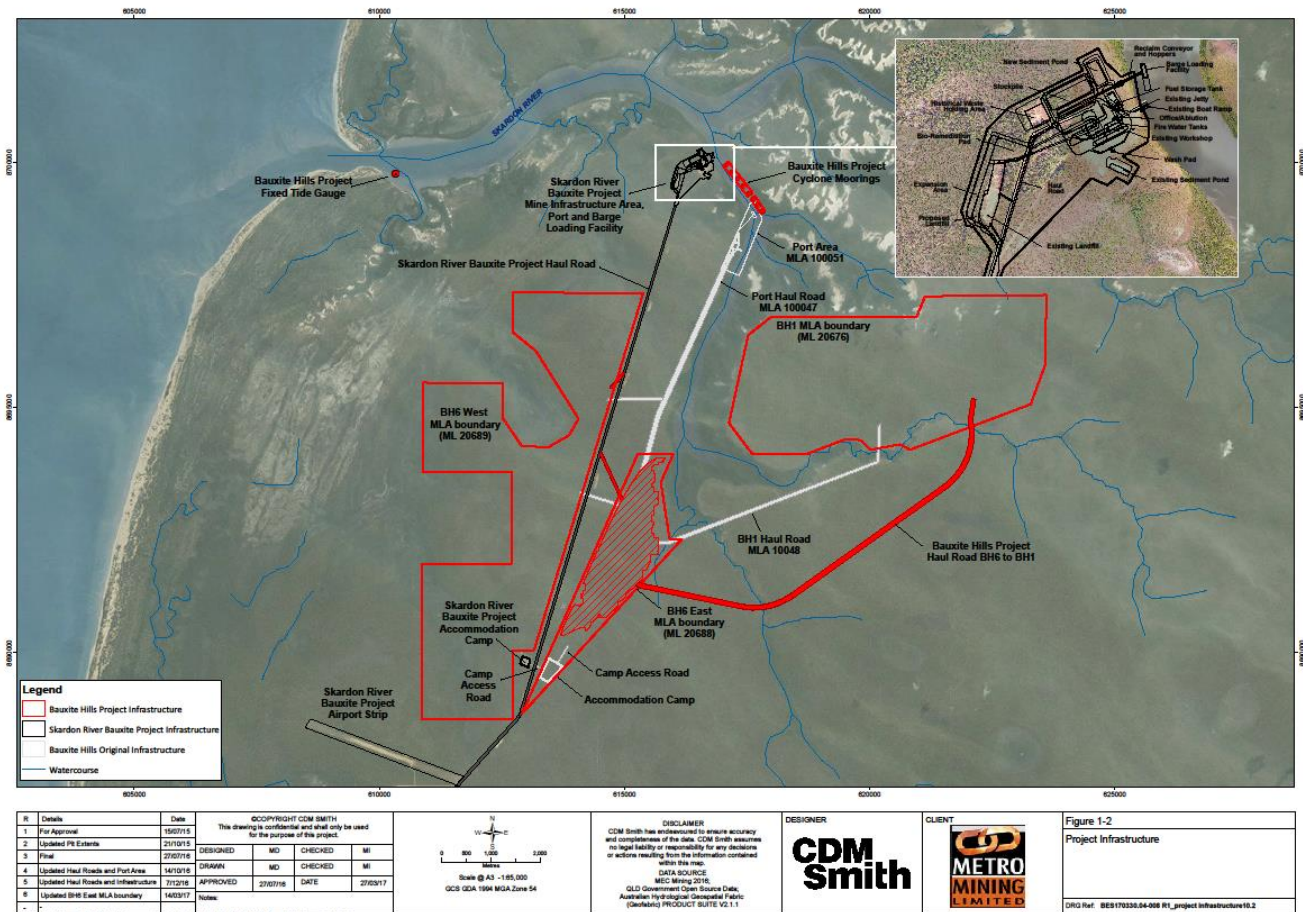


Figure 1. Project location and project infrastructure in the Skardon River Catchment (From SEIS Figure 1-2)

2.2 Sensitive receptors

In the EIS, 47 sensitive receptors were identified using aerial photography as having the potential to be impacted by the originally proposed project activities. The EIS identified the closest residential receptor (R44) is located approximately 16km southwest of the BH6 east mining pit and approximately 20km from the BLA. Potential sensitive receptors were shown in Figure 13-2 and listed in Table 13-6 of the EIS, and also in Appendix 1, Schedule H Figure 3 of this assessment report. The camping area at the mouth of the Skardon River is also identified as a sensitive receptor, situated approximately 7km from the BLA.

The EIS identified the neighbouring tenement holder's existing airstrip (R45) and mine camp (R46) as sensitive receptors and addressed these as external receptors. However, the SEIS identified the neighbouring SRBP airstrip, accommodation camp and MIA and barge loading area (BLA) as facilities that would be used by the Bauxite Hills project as places of work for that project's workforce.

The proponent has acquired Gulf Alumina and consequently the SRBP and has indicated that the operations of the SRBP and the Bauxite Hills project would be integrated into a single mining operation and would be regulated as such. Therefore the SRBP airstrip, accommodation camp, MIA and BLA would not be sensitive sites and instead would need to be managed under workplace health and safety requirements.

Marine sensitive receivers

The project did not specifically identify marine fauna as sensitive receptors but did identify that marine species would be vulnerable to the impacts of construction and operation of the BLF and the roll-on roll-off facility (RORO). The project did not identify that terrestrial flora and fauna specifically as sensitive receptors but these could be impacted by air (dust) and noise impacts that could reduce habitat quality and could directly impact on species survival (e.g. orchids in trees near roads).

2.3 Workforce

It estimated that 75 employees would be required during construction and 254 during peak operations. The project would be 100% fly-in fly-out (FIFO) due to its remote location. Access would be by air and sea transport. The

proponent now owns the SRBP and so would have unfettered access to the SRBP airstrip. Employees and contractors would be flown in using the airstrip and suitably accommodated in the upgraded SRBP accommodation camp located south between BH6 East and BH6 west (see Figure 1). The mine would operate two 12 hour shifts per day for eight months of the year, shutting down operations during the wet season. Contractors would most likely work a two week on, and one week off roster. The workforce is likely to be sourced from Weipa or Cairns and possibly Bamaga and Cooktown.

The proponent is developing workforce management plans and strategies, and would continue to do so as project planning and engagement with stakeholders progresses. The proponent has commenced engagement with local training and skills organisations and is seeking partnerships with other relevant agencies. The composition and source of workers would not be known until recruitment commences. No positions within the project are to be specified as being resident or non-resident with all positions open to the 'right' candidate, wherever that person may reside. Agreed employment actions from an agreement with native title parties would be incorporated into workforce management plans and strategies.

2.4 Mine pit configurations

The mining pit locations were determined by the location of bauxite deposits and existing and proposed MLs held by the proponent, Gulf Alumina and others. Big footprint swamp was excised from the proposed MLAs for the project and mining pits were set back 50m from the MLA boundaries for access. MLA boundaries were proposed 100m from MSES where possible, although some impacts from haul roads and other infrastructure would be unavoidable. The project would include three mining pits, BH6 west, BH6 East, and BH1. BH1 is the far eastern pit between two branches of the Skardon River which is likely to be the first pit mined.

The EIS indicated that a reviewed mine plan, considering the timing of mining sequence, would be submitted.

2.5 Mining, port and barging infrastructure

The option to beneficiate the bauxite was not considered feasible due to the costs of infrastructure and the environmental risks associated with having a processing facility and tailings dam near the Skardon River. Due to the takeover of the adjacent SRBP, key infrastructure originally proposed in the EIS would now not be required as access to the SRBP airport, BLA, MIA, haul roads, and accommodation camp is available for the project. The location of mine pits and infrastructure proposed for the revised project is shown in Figure 1. The mine infrastructure originally required and now required for the project is described in Table 1 below.

Table 1. Bauxite Hills project infrastructure (From SEIS Table 4-1)

Retained infrastructure	Mine pit BH1 Mine pit BH6 east Mine pit BH6 west Haul road – BH1 to BH6 east Haul road – BH6 west to SRBP main haul road to MIA Haul road – BH6 east to SRBP main haul road to MIA Water supply Communication network Cyclone moorings Fixed tidal gauge Barging and tug activities Ocean going vessel anchorage
Infrastructure no longer required	MIA BLF Roll-on roll-off facility (RORO) Main haul road – BH6 east to MIA Accommodation camp and associated ancillary infrastructure
SRBP approved supporting infrastructure	MIA Port facilities BLA Water supply, power supply and communications Main haul road to MIA and associated borrow pits Accommodation camp and associated ancillary infrastructure Skardon River airstrip

Haul roads

Haul roads would be located as shown in red in and would be constructed using local materials from borrow pits within the corridor and mining pits. Haul roads would be designed and built to appropriate standards design for multi-train haul trucks with two lanes of traffic (2 x 4m lanes + 2 x 2m shoulders + batters) except across creek culverts to minimise disturbance. Table drains would

be within batters. Some borrow pits would be used for ongoing maintenance, all others rehabilitated. Indicative road design criteria proposed for the project were provided in Figure 4-2 of the SEIS.

Erosion and sediment control measures would be implemented to minimise the risk of sediment mobilisation. The haul road between BH6 east and BH1 would cross waterways and would be designed and constructed in accordance with Austroads – Guide to Road Design Part 5B – Open Channels, Culverts and Floodways appropriate for wet season flows.

Communications

Prior to construction, adequate communication systems must be operational to support the health and safety for all personnel involved in the project. The project proposes to use a combination of the existing commercial Telstra mobile Next G network together with the public ultrahigh frequency (UHF) radio network and satellite phones.

Radio procedures for emergency declaration would be in accordance with the standard operating procedures as instructed during generic and site specific induction processes. A permanent very high frequency (VHF) radio repeater station would be established on-site to meet the needs of both the construction and operational phases. Alternatively, talks would continue with the relevant parties in regards to upgrading the existing services located in Mapoon.

Raw and potable water

For the project's accommodation camp and general operational requirements, the proposed water supply is via the local sub-artesian Bulimba Formation aquifer (likely depth range 15–20m) and/or the GAB in the Gilbert River Formation (likely depth range 250–300m) to meet a total annual demand of 400ML. Assuming 240 days of operation per year and 20 hours of daily pumping time, a total yield of 22L per second is required from the combined bores. Polyethylene storage tanks are proposed to ensure supply each with a total storage of between 2–10 ML. The number of tanks required would be based on balancing the need to locate raw water storage near the water use versus trucking water to where it is used and the final design of the integrated water supply network.

Figure 4-3, of the SEIS, shows the indicative locations of the shallow aquifer production bores. An exploration drilling program would confirm the yield and water supply potential of the shallow aquifer and confirm the final number and location of the production bores. Tanks would be positioned at each bore to provide raw water supply.

The proponent has submitted an application for a permit to take water pursuant to s237 of the *Water Act 2000* to Department of Natural Resources and Mines (DNRM). The proponent has also submitted an application to DNRM under s25A of the Water Resource (Great Artesian Basin) Plan 2006 to register an interest for 500ML per water year of state reserve unallocated water. Whilst initial water requirements are estimate to be 400ML per water year, the proponent is seeking a further contingency should additional water be required to meet operational demand.

Cyclone moorings

The project originally proposed cyclone moorings in a location close to the SRBP port area. The revised proposal indicates that the cyclone moorings required for the project would be located further upstream but still inside the Port of Skardon Limits. The revised location has been selected in consultation with Regional Harbour Master (RHM) and Maritime Safety Queensland (MSQ), considering navigational safety and reduced wave fetch during a cyclonic event. The new location and arrangement is shown in above.

As described in the EIS, it is the proponent's intention that when not in use the barges would be moored in the Skardon River clear of other river traffic. The new location is upstream of SRBP's proposed BLF and is not anticipated to interfere with their proposed barge operations. The EIS indicated a base case for four sets of pile type moorings (consisting of two piles) for each tug and barge set and two sets for each of the two floating cranes. Piles are planned to be removed at the end of mine life.

The impacts and management of the cyclone moorings were discussed in Chapters 6 and 19 and Appendix D of the SEIS. Not enough information was provided with the EIS to undertake a full assessment of the impacts of the proposed cyclone mooring.

Fixed tide gauge

To accurately confirm tidal levels for safe operation of the barges to the offshore transshipment area, the project requires the placement of a fixed tidal gauge on the southern side of the Skardon River near the mouth (see Figure 1). The RHM has been consulted on the location of the tidal gauge. The proponent would monitor river depth and tidal stages at its loading location and at all critical locations between the loading facility and downstream through

the mouth of the Skardon River. Barges would be loaded to drafts that would adequately clear the shallowest areas of the Skardon River. The tidal gauge would be fixed by a pile. A transmittal antenna, solar panel, round maintenance platform with handrails, an acoustic sounder, and an access ladder would also be constructed above the water line. Figure 4-2 of the SEIS shows the proposed design of the fixed tidal gauge.

Ocean Going Vessel (OGV) Anchorage

Bauxite would be shipped to overseas markets via a combination of Supramax (see Plate 4-4), Ultramax (see Plate 4-5), Panamax (see Plate 4-6) and Mini Capesize (see Plate 4-7) Class Vessels. Geared Supramax and Ultramax class OGVs would be used during year one and until such time that the floating crane system is established. Once the floating crane is operational all four classes of OGV would be utilised. Dependent on the class of OGV, loading would take approximately four to six days, requiring between 15 to 20 loaded barges to complete each cargo.

The indicative location of the shipping route and the OGV anchorage areas are shown on Figure 6-2 of the EIS. The five anchorage areas are proposed to be located away from reefs and other benthic habitats.

2.6 Construction

Key elements of the construction program are described in section 4.5 of the SEIS and include:

- clearing, stripping and stockpiling topsoil for all disturbance areas
- construction of mine infrastructure including haul roads and internal access roads
- preparation of open cut pits including the removal of overburden using front end loaders, excavators and trucks. Selected excavated material would be used as fill for construction work.

The construction of BH1 open cut pit, haul roads and other associated mine infrastructure are planned to commence in year one. All materials required for the construction would be barged to site either from Port of Cairns, Port of Darwin or the Port of Weipa. The Port of Kurumba may also be used to load equipment for construction activities. Approximately 30 barge movements are expected including both to and from the site, would be required during the construction period for equipment and infrastructure. Some smaller barge movements may be required for consumables, anticipated to be at four movements per week during construction. No bed-levelling or dredging of the river is required for the project, however the SRBP is proposing bed levelling at the river mouth.

Materials brought to site would be stored on appropriately constructed hardstand at the SRBP MIA. All hazardous materials would be stored and managed at the SRBP MIA in accordance with the details regarding the usage and storage of hazardous are discussed in the EIS, Chapter 18 – Hazard and Safety.

Indicative timing of construction program:

- vegetation clearance and site preparation Q3 2017 July to September
- development of BH1 open cut pit Q3 2017 August to November
- development of BH1 haul road Q3 2017 July to September
- development of supporting infrastructure Q3 2017 July to September
- first bauxite export

BH1 haul road construction would commence with site clearance work, soil removal and storage, bulk earthworks and temporary drainage works in accordance with proposed relevant environmental management plans (EMPs) and erosion and sediment control plans (ESCP).

Site preparation would include:

- site clearance – staged to minimise cleared areas. Soil for rehabilitation would be stripped and stored using best practice methods to protect soil quality (including separation of topsoil and subsoil where needed) and managing erosion risks
- civil works – construct environmental protection measures, erosion and sediment controls, sourcing quarry materials from on-site borrow pits, installation of power infrastructure, temporary drainage. Civil works approved under the SRBP approved EA would commence ASAP, prior to construction for the project. The SEIS estimates civil works construction timeframe of seven months.
- mobilisation of workforce to site and use of SRBP accommodation camp
- haul and access roads establishment
- laydown and storage areas in addition to those at SRBP MIA.

Raw water supply for the construction activities would be sourced from the SRBP allocations. Quarry materials for construction would be sourced from existing borrow pits where suitable road material is available. The project would use standard construction equipment, general trade equipment and specialised equipment as required.

The management of the waste streams are discussed in Section 4.6.5 and Section 14 of the SEIS and Chapter 14

of the EIS. Waste material generated through construction would be separated into separate waste streams. Until such time that an appropriate waste management system is in place at the site all construction wastes would be removed from site by barge by appropriately licenced contractors to licenced recycling, treatment and disposal facilities. Potential utilisation of the SRBP approved landfill for the projects would be undertaken and any change to the existing EA condition would be discussed if required.

Construction site management

The Site Senior Executive (SSE) would be responsible for site management during the construction phase. The SSE would be supported in this role by a senior site representative from the principal construction contractor. A site Safety and Health Manager and Environmental Manager would present on the site during the construction.

Emergency response and security

An Emergency Response Plan (ERP) would be implemented at the site as part of the overall Safety and Health Management System (SHMS) prior to the commencement of construction activities.

First aid and emergency rescue facilities and equipment would be established prior to the commencement of construction and would remain onsite for the life of the project. Appropriately trained personnel would be onsite at all times to implement emergency response procedures.

Site safety inductions would include emergency response procedures, standard operating procedures, rescue and escape procedures, first aid resources and processes.

Access to the site would be controlled and the security system would be regularly reviewed. Visitors would be controlled within standard operating procedures and be authorised, inducted, and registered.

2.7 Mining operation

The SEIS stated that construction is planned to commence in July 2017, following the necessary environmental approvals. Detailed design and construction would then commence. The first shipment of bauxite is planned for later in 2017. The mine plan would be periodically reviewed and changes may require approval and to be reflected in the Plan of Operations. Section 4.6 of the EIS described the process for mining and shipping bauxite that would be undertaken and is summarised below:

- Progressive removal of vegetation – preclearance surveys, reuse of trees for habitat or erosion control, otherwise wood chipped and composted. Vegetation not composed or used in rehabilitation would be windrowed and burned and incorporated into topsoil.
- Removal and storage of topsoil – stockpiled or directly used in rehabilitation and final landform.
- Removal of overburden – overburden that is removed before mining would be progressively deposited in the mined-out areas.
- Bauxite excavation – is expected that CAT992K front end loaders with 12m³ bucket capacity would be used. The excavated ore would be hauled using “Pit Hauler” trucks that have three trailers and a total capacity of 200t. No drilling or blasting is required and most of the ore would be free dug. Some ripping may be required in areas of cemented bauxite.
- Screening – bauxite would be screened either in pit or at the MIA before stockpiling. Organic material would be retained or returned to the mined area and burned with the stripped vegetation or used in rehabilitation.
- Transport of material – ore would be transported by haul truck to the product stockpile at the SRBP MIA.
- Dust control – Dust would be managed using water trucks on the haul roads and in-pit.
- Sediment and erosion measures would be constructed and managed.
- Barge loading. Barges would be moored alongside the approved SRBP BLF and loaded. Barges would be towed by tugs from the SRBP BLF to the transshipment location, approximately 12km from the mouth of the Skardon River. Six temporary mooring buoys (four for barge and tugs and two for the floating ship loaders (commencing from year three)) would be located in the river, downstream of the SRBP BLF. A single day mooring would be located offshore immediately to the west of the river mouth to assist barges in transit.
- Transshipment – OGVs would anchor within 12km offshore from the Skardon River mouth in a designated area. Under-keel depth in the transshipment area would be between 10-12 LAT to enable loading during all tidal stages. During years 1 and 2 barges would be unloaded using cranes on board the OGVs. During years 3 to 12 two floating cranes would be moored at the transshipment location and would transfer bauxite from barges to the OGVs.
- Rehabilitation – Mined areas would be progressively rehabilitated to meet agreed final land use criteria. Overburden material would be placed and shaped, before being covered with topsoil and any available composted material. Selected cleared vegetation may be placed back onto the area to provide initial habitat and assist with soil erosion controls.

- Final landform – Final landform is dictated by the bauxite floor and the amount of overburden replaced in the pit. In most areas, this is expected to be stable with good drainage. Where necessary additional excavation/earthworks would be carried out to achieve a suitable land profile or drainage outcome. These works are standard for mining operations and would be readily achieved using existing mining equipment.

On site waste management

The management of the waste streams are discussed in Section 4.6.5 and Section 14 of the SEIS and Chapter 14 of the EIS and include:

- general waste suitable for disposal to offsite landfill
- putrescible wastes suitable for onsite composting
- reusable or recyclable materials such as wood, scrap metal, paper, cardboard, aluminium cans, glass and plastic bottles
- regulated waste such as sewage, tyres, solvents, lubricants, redundant chemicals and engine coolant.

The proponent is committed to implementing waste minimisation and efficiency strategies and would ensure that construction and operation activities are in line with the waste management hierarchy outlined within the Environmental Protection (Waste Management) Policy 2000. The hierarchy lists the following principles of waste management:

- avoid waste by optimising methods used within the construction, operation and decommissioning phases (most preferred)
- reuse waste by identification of secondary sources that can utilise waste
- recycle waste by identification of facilities that can recycle the particular waste stream
- energy recovery from waste, e.g. creating energy from incineration and
- disposal of waste at an appropriate facility (least preferred).

No onsite landfill is proposed for this project, with all general, recyclable and regulated wastes being removed from site for treatment and disposal at licenced facilities. The adjacent SRBP has an approved landfill and, if within the scope of the approval, the project may seek to utilise the facility. The project's waste management procedures and strategies are presented in the Chapter 14 – Waste Management of the EIS.

Evacuated waste

The estimated excavated waste volumes for the life of the project, excluding decommissioning (2028) are shown in Table 4-7 of the SEIS. Whilst referred to as waste, the excavated waste materials would be returned to the pit void as part of the mine's rehabilitation program. It is not expected that there would be any waste material stockpiles retained out-of-pit at the cessation of mining.

Air emissions

The main air emissions from mining operations are caused by wind-borne dust, haul road generated dust, materials handling, stockpiles and transfers. The project is remote from sensitive receptors and no impacts are anticipated. Management and mitigation measures would be implemented as a precaution to suppress dust emissions of stockpiles, haul roads and mined areas.

Barge loading

Where previously the proponent proposed standalone MIA and BLF infrastructure, the proponent would utilise the approved SRBP MIA and BLF for the stockpiling of bauxite and loading of barges. These activities would be carried out at the SRBP MIA and BLF in accordance with the conditions and approvals described in the SRBP EA.

Barge operations

Bauxite would be transported via trucks to the SRBP MIA. Shallow draft tug boats would standby with barges during loading. Loaded barges would be moved by tugs and leave the MIA, travel downstream on the Skardon River to the transshipment area in the Gulf of Carpentaria where the bauxite would be transferred to OGVs. Barges would be discharged and unloaded using cranes on board the OGV or by one of the two floating cranes moored at the transshipment area. Shallow draft tug boats would pick up empty barges and return them to the BLF. Shallow draft work boats would be used for general support throughout the operations. A single logistics barge would be required each week during operations and used to transport waste from the site. A double skinned barge would deliver fuel each week to the project. Tugs and barges would use cyclone moorings when not in operation.

Barging would operate 24 hours a day during the eight month operational period. With a capacity of 3,000t barges would deliver 1 Million tonnes per annum (Mtpa) in year one of the operations. From year two onward, barges with a capacity of 7,000t would be used to deliver up to 5Mtpa. Given tides and months of operation the project anticipates that:

Year 1: 666 one way barge movements to deliver 1Mtpa, equating to six barge movements per day
Year 2: 1,334 one way barge movements to deliver 4Mtpa, equating to six barge movements per day
Years 3 to 12: 1,666 one way barge movements to deliver 5Mtpa, equating to seven barge movements per day

OGV pilotage and safety

Vessels of between 60,000 to 80,000t each would be loaded at the transshipment anchorage site. Vessels would be loaded in approximately four to six days, requiring 15 to 20 loaded barges to complete each cargo. Each barge would typically have a capacity of between 3,500t and 6,500t. The number of barges that can move through the Skardon River and its mouth safely and within tidal constraints is a consideration for the project adjacent projects and the Harbour Master.

2.8 Site disturbance & cumulative impacts

The proponent recently acquired Gulf Alumina and consequently the SRBP operation. As a result some of the infrastructure originally required would now not be needed, significantly reducing the impacts and disturbance of the project. See Table 1 above. Impacts associated with the originally proposed RORO facility, MIA, BLF and a haul road to the MIA/BLF would be avoided.

The disturbance area for the Project originally proposed was approximately 1,466.94ha of remnant vegetation, or approximately 37% of the total MLA area (4,060ha). A revised project on fewer MLA' as described in Section 2.6 above would mean the disturbance area for the Project would now be 1433ha of remnant vegetation. This remnant vegetation is habitat for threatened fauna and adjacent to habitat for threatened flora.

A 50m buffer from the ML boundaries for access and buffers from the mining areas to Matters of State Environmental Significance (MSES) and Matters of National Environmental Significance (MNES) are proposed.

Cyclone moorings and barging are proposed in the Skardon River where impacts to marine flora and fauna may result from pile driving, propeller wash and bank erosion and these are proposed to be monitored and managed. This impact would likely add to and potentially double the potential impacts that may arise from the SRBP barging operation.

The transshipment area is within commonwealth waters and may impact on marine benthic habitats. Impacts on water quality and marine fauna would need to be monitored and managed. This is in addition to the transshipment operation proposed in the SRBP.

Indirect impacts on wetlands as a result of mining impacts on groundwater are not fully understood, however it is predicted that that any changes in groundwater levels would not mean the wetlands would not function outside their normal seasonal range. The EIS proposes to monitor wetlands and manage mining activities to avoid adverse impacts.

The project tenements are adjacent to MLs held by Gulf Alumina and Rio Tinto Alcan and EPMs held by other companies. Cumulative impacts have been discussed in the EIS.

3 Environmental impact assessment process

The EIS for the proposed project was jointly assessed under Queensland’s EP Act and the Commonwealth EPBC Act using the EIS process under the EP Act in accordance with the assessment bilateral agreement between the Commonwealth of Australia and the State of Queensland. Further information on the EIS process under the EP Act is described in the EHP Guideline titled ‘*The EIS process for resource projects under EP Act*’ which is available on EHP’s website at www.ehp.qld.gov.au.

3.1 Environmental Protection Act 1994

The key steps in the project’s EIS assessment process is provided in Table 2.

On 17 August 2015, Aldoga Pty Ltd (on behalf of the proponent) applied under the EP Act for an EA for bauxite mining on MLAs (EPML03398515). On 2 September 2015 EHP decided that an EIS would be required to properly assess the application. On 21 September 2015, EHP notified Aldoga Pty Ltd that the EA application requires assessment by EIS.

A decision to require an EIS effectively suspends the EA application process and the EIS process fulfils the public notification requirements of the EA.

The TOR for the EIS were finalised on 23 February 2016. The proponent submitted an EIS and EHP decided under section 49 of the EP Act that it substantially addressed the TOR and could progress to the notification stage. A 30 day submission period commenced on Thursday 19 May 2016 and ended 5pm Wednesday 29 June 2016.

19 submissions were received (including one from EHP) and forwarded to the proponent on 5 July 2016. The proponent provided a response to submissions and an amended EIS to EHP on 20 December 2016.

EHP decided on 3 February 2017 under section 56 of the EP Act that the response to submissions and the submitted EIS were adequate for the EIS process to proceed to the assessment report stage. Providing the assessment report to the proponent completes the EIS process under Chapter 3 of the EP Act.

Upon completion of the EIS process under Chapter 3, any current application process suspended by the EIS process resumes pursuant to their respective law. For the proposed project, the EA application resumes to Chapter 5 of the EP Act. Under section 172 of the EP Act, EHP must then decide if the EA application is approved subject to conditions or is refused.

The draft EA and conditions are provided to the proponent and EIS submitters who are given the opportunity to object or have the matter referred to the Land Court as per Chapter 5 of the EP Act.

Table 2. Key Steps undertaken during the EIS process for the project.

Step in the EIS process	Date completed
Proponent applied for an EA/ML application (EPML03398515)	17 July 2015
Properly made application made	17 August 2015
Information request made by EHP requiring an EIS	21 September 2015
Proponent referred the project to the Commonwealth Minister for the Environment and Energy (DoEE)	6 August 2015
Commonwealth Minister for the Environment decided the project is a ‘controlled action’	18 September 2015
The proponent prepared and submitted a draft TOR to EHP	11 November 2015
Comment period for the draft TOR	7 December 2015 to 3 February 2016
EHP finalised TOR	23 February 2016
Proponent submitted the EIS	8 April 2016
The EIS submission period	19 May 2016 to 29 June 2016
Submissions were forwarded to the proponent	5 July 2016

Step in the EIS process	Date completed
The period within which the proponent had to prepare a response to submissions was changed by agreement	2 August to 1 July 2017
The proponent responded to the submissions, provided any amendments of the EIS; and submitted an EIS amendment notice to EHP	20 December 2016
EHP decided if the response to submissions and amended EIS were adequate for the EIS process to proceed	3 February 2017
EHP prepared the EIS assessment report	31 March 2017
EIS assessment finalised and issued to the proponent completing the EIS process	31 March 2017

3.2 Environment Protection and Biodiversity Conservation Act 1999

The proposed project was referred on 6 August 2015 to DoEE (EPBC 2015/7538). On 18 September 2015, the Minister for the Environment determined the proposed project to be a controlled action to be assessed by EIS in accordance with the bilateral agreement with the State of Queensland. The Minister determined that the proposed action was likely to have a significant impact on the following controlling provisions:

- sections 18 and 18A (listed threatened species and communities)
- sections 20 and 20A (listed migratory species)
- sections 23 and 24A (Commonwealth marine areas).

The potential impacts of the project on the controlling provisions were assessed under Queensland's EIS process which has been accredited for the assessment under the EPBC Act in accordance with the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland (2012).

Based on the information available in the referral, DoEE decided that the proposed project would be likely to have a significant impact because:

- The action would involve clearing of vegetation which may provide suitable habitat for listed threatened species and migratory species including bare-rumped sheath-tail bat, northern quoll and red goshawk.
- Construction activities and barge access would be likely to have a significant impact on listed threatened species and migratory species, including marine fauna.
- The construction and operation of the transshipment facility (including ship loading and barge access) is likely to have a significant impact on the Commonwealth marine environment.

On 23 February 2016, EHP finalised the TOR for the project which included tailored TOR for the MNES. On 8 April 2016 the proponent submitted the EIS to EHP. EHP, as the assessing agency, reviewed the submitted EIS for the proposed project against the information requirements outlined in Appendix 2 of the TOR, EPBC Act guidelines and other relevant recovery plans, conservation advices and technical information.

As per the Bilateral Agreement, DoEE carried out its own review of the EIS assessment documentation and provided EHP with a submission on the EIS. DoEE also provided comments to EHP on the draft EIS report as required by the administrative arrangements for the bilateral agreement. Section 4.7 MNES of this report explains the extent to which the Queensland Government EIS process addresses the actual or likely impacts of the project on the controlling provision under the EPBC Act, the potential impacts and provides a conclusion about the acceptability of the impacts in light of the commitments to undertake mitigation and management measures.

A copy of the final EIS assessment report will be given to the Minister for the Environment who will decide whether to approve or refuse the controlled action under part 9 of the EPBC Act and if relevant, apply conditions to the approval necessary to protect MNES.

3.3 Consultation

3.3.1 Commonwealth Department of the Environment and Energy

DoEE was consulted throughout the assessment and was invited to make formal submission during the public consultation timeframes and also as an advisory agency to EHP.

3.3.2 Public consultation

Chapter 3 of the EIS outlined the public consultation program carried out by the proponent in detail. In addition to the statutory requirements for advertising the TOR and EIS notices and the mailing of the notices to interested and affected parties, the proponent undertook community consultation with members of the public and other stakeholders before, during and after the public submission period of the EIS.

Community and stakeholder consultation activities included:

- one-on-one meetings with Traditional Owners, native title parties, landholders and local community groups
- government agency meetings and briefings
- elected representative briefings
- establishment of key project contact points
- factsheets/newsletters and letters
- media releases
- statutory consultation and public notice advertisements
- information provided on proponent's website; including making the EIS available online.

3.3.3 Advisory body

EHP consulted the following organisations to assist in the assessment of the TOR and EIS for the Bauxite Hills Project:

- Australian Government Department of the Environment
- Department of Aboriginal and Torres Strait Islander and Multicultural Affairs
- Public Safety Business Agency (Queensland police, fire and emergency services)
- Department of Education, Training and Employment (Strategic Engagement; Infrastructure Strategy Research and Performance)
- Department of State Development
- Department of Infrastructure, Local Government and Planning
- Department of National Parks, Sport and Racing
- Department of Justice and Attorney-General (Hazardous chemicals; Workplace Health and Safety QLD)
- Department of Communities, Child Safety and Disability Services
- Queensland Health – Tropical Public Health Unit
- Department of Housing and Public Works
- Department of Energy and Water Supply
- Queensland Ambulance Service
- Department of Transport and Main Roads
- Department of Agriculture and Fisheries
- Department of Natural Resources and Mines
- Department of Sciences, Information Technology and Innovation
- Weipa Town Authority
- Cook Shire Council
- Mapoon Aboriginal Shire Council
- Old Mapoon Aboriginal Corporation
- Northern Cape York Group #1 (c/- Cape York Land Council)
- Angkamuthi People
- Apudthama Land Trust
- Port of Skardon River (Ports North)
- North Queensland Bulk Ports Corporation Limited
- Cairns and Far North Environment Centre
- Department of Tourism, Major Events, Small Business and the Commonwealth Games (TOR only).

3.3.4 Public notification

The EIS assessment process provides the public notification requirements for the site-specific and amendment applications for the EA.

In accordance with the statutory requirements, public notices were placed in *The Australian* and in *The Western Cape Bulletin* newspapers to notify the availability of the draft TOR and EIS for review and public comment. In addition, notices advising the availability of the draft TOR and the EIS for public comment were displayed on EHP's website. The EIS was available to the public on the proponent's webpage.

The draft TOR and EIS were placed on public display at the following locations during their respective public comment and submission periods:

- EHP Business Centre: Level 3, 400 George Street, Brisbane QLD 4000
- EHP Business Centre: Level 4, Building 2, William McCormack Place 5b Sheridan Street, Cairns QLD 4870
- Weipa Town Council Library Service, Hibberd Centre, Rocky Point, Weipa QLD 4874
- EHP's website: <https://www.ehp.qld.gov.au/management/impact-assessment/eis-processes/bauxite-hills-project.html>
- The proponent's website: <http://www.metromining.com.au/resources-projects/bauxite-projects/> (EIS only).

3.3.5 Key matters raised in submissions

EHP finalised the TOR after considering comments from the proponent, the advisory body, the public and others.

19 submissions on the published EIS were received within the submission period, including one from EHP, one from DoEE, 10 from other state government organisations, five from non-government organisations, and two from members of parliament. One submission was received after closing of the submission period but was accepted by EHP and forwarded to the proponent with all submissions.

All government agencies that made submissions raising matters were given the opportunity to review and provide comments on any amendments made to the EIS. EHP also sought comments and recommendations on conditions that should apply to the project and on the adequacy or otherwise of the amended EIS chapters in addressing concerns raised in submissions. Letters were sent to all private submitters advising them on the submission of the amended EIS together with details for obtaining the proponent's response to their submission.

Key matters raised in submissions are summarised in Table 3. These matters, as well as other comments and recommendations made in submissions were addressed by the proponent in their response to submissions and in changes made to the EIS. These matters raised and any other comments and recommendations made by the advisory body on the EIS documents were considered by EHP in undertaking the assessment of the EIS and in reporting the findings and recommendations in this assessment report.

Table 3. Key matters raised in public and agency submissions

Topic	Issue summary
Project description	<ul style="list-style-type: none"> • infrastructure location, design and inclusion on maps at appropriate scale • impacts of construction • impacts on wetlands of high ecological significance (HES) • options for shared infrastructure and options to reduce impacts • stand-alone project options, alternatives and agreements with adjacent lessees • requirements to operate outside port limits • tidal works requirements • areas provided for stockpiles • buffer zones • haul roads and borrow pits • ERAs and notifiable activities included in the EIS • MIA buildings and activities – location outside flood areas and containment • first responder contingency • RORO construction impacts • construction materials.
Water	<ul style="list-style-type: none"> • adequacy of the 1:10 year sediment pond design to protect water quality and marine habitat. • adequacy of monitoring locations • erosion and sediment control plan • sediment monitoring, capture and management • surface water quality impacts and release points • performance outcomes for wetlands need to be as per the EP Regulation.

Topic	Issue summary
	<ul style="list-style-type: none"> • water quality guidelines and limits have not been derived in accordance with water quality guidelines • landfill management and leachate generation • groundwater monitoring (landfill management and leachate generation) • management of leachate during the wet season • groundwater monitoring in relation to the bioremediation pad and landfill • waste handling and storage • cumulative impacts of the proposed increase of groundwater supply • acid sulfate soils • receiving Environment Monitoring Program • water supply and the water resources, Great Artesian Basin (GAB), plan • groundwater dependent ecosystems (GDEs) • indirect impacts on wetlands • groundwater monitoring • haul road crossings of waterways and wetlands – flooding and drainage.
Land/ecology	<ul style="list-style-type: none"> • post mining objectives and rehabilitation methods • rehabilitation, indicators and reference sites and resulting landform and vegetation communities. • bioremediation approach and location of • acid sulfate soils • ESCP's consideration of soil types, sensitive environments; • impacts on HES wetlands from haul road, MIA, RORO, BLF • location of topsoil and overburden stockpiles not described • impacts on marine species – noise from pile driving, sediment release, boat strike, lighting • seagrass extent and impacts from barging uncertain • impacts and mitigation on water mouse uncertain • northern quoll, black footed tree rat, masked owl and red goshawk likelihood of occurrence • identification of hollow-bearing tree habitat • habitat mapping and impacts on chocolate tea tree orchid and black footed tree rat • likelihood of occurrence of migratory species • cumulative impacts on MSES and MNES • offset requirements for MSES and MNES • stygofauna surveys • GDEs and springs • indirect impacts on wetlands • adequacy of sampling of aquatic ecosystems and monitoring approach • monitoring of impacts • cumulative impacts • offsets strategy.
Barging/shipping	<ul style="list-style-type: none"> • shoreline erosion • propeller wash impacts • cooperation of vessel operations • whether bed levelling or dredging would be required • extension of port limits or approval to carry out port activities outside port limits. • navigational aids required • surveying the channel annually after the wet season and after events • management plans are required in accordance with MSQ guidelines • tidal works application required for cyclone moorings.
Social	<ul style="list-style-type: none"> • 100% FIFO and limited access by ground transport • limited information about strategies to manage incidents, medical emergencies was provided. An ERP was requested. • on site medical capacity and response to acute medical conditions is limited to rotary and fixed wing aircraft • noise impacts on sensitive receptors – accommodation village and fauna.
Other	<ul style="list-style-type: none"> • waste • potential impacts on cultural heritage sites • bushfire hazard management • emergency response planning and spill management • cumulative impacts of multiple project infrastructure.

3.4 Matters considered in the EIS assessment

This assessment report fulfils the requirements of the prescribed matters in Section 9 of the EP Regulation under section 58 and 59 of the EP Act.

The following matters were considered by EHP in the assessment of the EIS:

1. The final TOR for the EIS, issued on 23 February 2016, set out the key information requirements to be considered in the EIS including critical and routine matters. While they were not exhaustive, the TOR outlined the scope of critical matters that should be given detailed treatment in the EIS. The TOR stated that if significant matters arose during the course of preparation of the EIS that were not incorporated in the TOR (e.g. currently unforeseen issues that emerge as important or significant from environmental studies) then these issues should also be fully addressed in the EIS.
2. Additional matters to those listed in the final TOR that were identified and addressed in the EIS.
3. The submitted EIS which refers to the combined submitted documents provided by the proponent. The submitted EIS comprised:
 - the EIS that was made available for public submissions from 19 May 2016 to 29 June 2016
 - the proponent's summary of the submissions, received by EHP 20 December 2016
 - a statement of the proponent's response to the submissions EIS (referred to as the 'Response to Submissions' in this assessment report), received by EHP on 20 December 2016
 - any amendments made to the submitted EIS because of the submissions (referred to as the 'Supplementary Report to the EIS' in this assessment report), received by EHP on 20 December 2016
 - Any other information provided to EHP prior to the Assessment report being completed as per section 66 EP Act.
4. All properly made submissions and any other submissions accepted by the chief executive
5. The standard criteria listed in schedule 4 of the EP Act. Matter(s) prescribed under a regulation.
 - a. For the purpose of assisting the decision stage of the EA assessment, the regulatory requirements, which EHP is required to comply with for all environmental management decisions, are listed in Chapter 4 of the EP Regulation and include:
 - i. assessment against the environmental objectives and performance outcomes specified in schedule 5, part 3 of the EP Regulation for the operational assessments of air, water, wetlands, groundwater, noise, waste and land (Table 1); and the land use assessment of site suitability, location on site and critical design requirements (Table 2).
 - ii. environmental values declared under the regulation
 - iii. the attributes for the area under the *Regional Planning Interests Act 2014*
 - iv. environmental protection policies
 - v. MNES under the EPBC Act (listed threatened species, listed migratory species).

Section 59 of the EP Act requires that an EIS assessment report must:

- address the adequacy of the EIS in addressing the final terms of reference
- address the adequacy of any EMP for the project
- make recommendations about the suitability of the project
- recommend any conditions on which any approval required for the project may be given
- contain another matter prescribed under a regulation.

These matters are addressed in the following subsections.

4 Assessment of the EIS

EHP determined that the EIS adequately addressed the TOR including the mandatory and further requirements of an EIS, relevant legislation, methodology, impact identification, avoidance and mitigation, to the extent that the EIS could be released for public consultation. During the consultation period, a number of issues were raised in submissions (see section 3.3.5) some of which were addressed by the proponent and amendments made to the EIS. EHP decided that the responses to the submissions were adequate to allow the process to continue to the assessment report completing the process.

This assessment identified further work which would need to occur prior to the EA application and prior to conditions being finalised for the EA approval.

4.1 Project description

The project was described in the EIS. The project description provided in the submitted EIS was considered adequate for the purposes of public consultation and met the requirements of the TOR. A summary of submissions received on the EIS is provided in section 5 of this report. Information was requested for the project description in submissions. The proponent provided further detail of project elements. Further detail will be requested in the conditions of the EA.

The project described in the supplementary information provided in response to submissions on the EIS represented a much changed project with significantly reduced impacts. This was a result of the proponent's take-over of the adjacent SRBP and access to that project's infrastructure. A description of the project as currently proposed is provided in section 2 of this report.

4.2 Project alternatives

Sections 2.5.4 and 7.4.3 of the EIS described the alternatives to the project. A number of scenarios were considered to evaluate the relative social, economic and environmental advantages of different project alternatives. Results were used to select the final project proposal and scope, largely confined by the fixed location of bauxite resources and MLA areas.

Locality, technological and conceptual alternatives were documented in the EIS submitted for public consultation:

- **No development scenario** – avoid environmental impacts and existing land uses would persist. Significant social and economic impacts would result.
- **Location alternatives of mine pits, MIA, BLF and RORO** – limited by bauxite deposits and the configuration of MLAs; Big Footprint Swamp was excised from the MLA; MSES was avoided by 100m where possible, however impacts on MSES are unavoidable for the MIA, BLF and haul roads due to being limited by the existing MLA configuration.
- **Onsite product beneficiation** – this was considered but due to infrastructure costs and increased environmental risks, this option was not considered further.
- **Operating the entire year or only the dry season** – decided to operate only over the dry season to maximise efficiencies, avoid risk of environmental impacts, and avoid cyclone/evacuation risk.
- **Design and location of the BLF** – Two potential structural forms were considered for the BLF: (1) causeway and short relieving span; and (2) piled approach jetty. The piled approach jetty with a short causeway was selected as there would be less potential for effects on river flow, turbidity, displacing mangrove mud, less need for rock armour. Two locations options were considered. Option 1 was selected even though the jetty would be substantially longer making it the higher cost option. Option 1 would avoid the need for bed levelling and therefore would have less risk to environmental values.
- **Barge design** – shallow draft vessels were the preferred option which would remove the need for dredging and/or bed levelling and would increase the time available for operation due to tidal limitations.
- **Location of transshipment** – the chosen location of the OGV anchorage area for the project is a longer route for barges but would have fewer impacts on reef assemblages. A 1km buffer was applied to reefs.

The proponent demonstrated efforts to avoid environmental impacts through the initial design.

The location of the haul road, BLF, RORO and MIA initially proposed in the EIS would have resulted in significant impacts on HES wetlands. Submissions on the EIS requested that further effort be made to reduce these impacts by way of alternative locations for the infrastructure and/or by negotiating commercial agreements with adjacent leaseholders to share mine infrastructure.

In responding to the submissions on the EIS, the proponent explored options for moving port infrastructure and the associated haul road to a less environmentally sensitive area and explored commercial agreements to share

infrastructure with the adjacent SRBP in an effort to avoid and minimise impacts on HES wetlands. With the acquisition of SRBP the Bauxite Hills project proposes to use SRBP's accommodation camp, main haul road, mine infrastructure area, BLA and air strip. In addition, the proponent has in principle agreement to access Rio Tinto Alcan's tenement west of pit BH6 east so that the haul road linking pit BH6 east with pit BH1 can avoid HES wetlands.

4.3 Climate

EIS Chapter 3 – Climate described the regional climatic conditions and the potential impacts of climate, natural disasters, natural hazards and climate change. It also sets out climate change adaptation strategies. Impacts of climate patterns in relation to discharges to water, air and the propagation of noise were discussed in EIS Chapter 9 – Water Management, EIS Chapter 12 – Air Quality, Appendix F – Air Quality and GHG Technical Report; and EIS Chapter 13 – Noise and Vibration. Natural hazards are further described in Chapter 18 of the EIS and section 4.18 of this assessment report.

The EIS Chapter 3 – Climate stated that the objective of the EIS was to describe the existing climate of the project area, identify any risks to the Project from natural or induced climatic hazards or impacts of climate change in the region, and determine suitable management and mitigation measures to ensure safety of employees. These include contractors, visitors and minimise impacts of the environmental values. It set performance criteria as:

- Infrastructure would be constructed to the appropriate standards and mine design would be resilient to natural or induced climate hazards or climate change.
- Operations would be conducted to protect the health and safety of employees, contractors and visitors, and minimise any impact on the existing environmental values (EVs).
- Management and mitigation strategies would reduce the risk of potential impacts from natural or induced climatic hazards and climate change to an acceptable level.

The EIS addressed the 6.7 to 6.9 of the TOR and provided a description of values, risks and management measures.

Information on existing climatic conditions was obtained from the Bureau of Meteorology's (BoM) online data portal. Data was also obtained from weather stations at Old Mapoon, Weipa Ave, Weipa Airport and Pisolite Hills (temporary) to characterise historical regional and local climatic patterns and used to predict indicative climatic trends, cycles and extremes. A weather station was recently installed at the adjacent Skardon River Bauxite Project site, did not provide reliable information. Two pluviometers have been installed on the Skardon river project site as part of a data sharing arrangement, however there is not sufficient data available at this stage to establish local rainfall averages. Information was also obtained using the Air Quality and Greenhouse Gas assessment (Vipac 2016). A prognostic air pollution model TAPM and a diagnostic meteorological model CALMET were used.

Climate change predictions were based on relevant and contemporary sources from Queensland government 2010, CSIRO 2015, Steffen *et al.* 2012, and IPCC 2014.

4.3.1 Values, impacts and mitigation measures

A summary of the existing values as described in the EIS including extreme values for a range of natural hazards including floods, bushfires and cyclones and assessing how climate could affect environmental values and management of operations at the site is provided in Table 4.

4.3.2 Assessment and conclusions

The EIS adequately addressed the requirements of section 6.7 to 6.9 of the TOR in relation to climate. The values and the potential risks have been adequately described. Climate factors have been included into models which have informed the assessment for coastal, air, water matters.

The project included design controls and strategies to adequately mitigate risks of climate factors. Climate change risk would continue to be assessed during further stages of the Project implementation. The proponent has considered adaptation measures in the design and operation of the project including moving infrastructure out of flood risk areas. Commitments are proposed to manage the risk. Specific recommendations are contained in Table 4.

Recommended conditions

All commitments outlined in EIS Chapter 3, Table 3-9 must be implemented by the proponent where they do not conflict with any subsequent regulatory approval conditions.

Model mining conditions appropriate to regulate risks associated with climate, natural disasters and hazards on the draft EA.

Table 4. EIS assessment of climate

EIS Summary			EHP Recommendations
Existing Environment	Potential impacts to EVs	Avoidance, mitigation and management commitments	
<p>Monsoon climate in a Climate Classification of Equatorial - tropical savannah - using BoM modified Koppen classification system (BoM 2014a).</p> <p>Cyclones and tropical storms possible between December and April. Fifteen cyclones have passed within 100km of the project area between 1970 and 2006. Only three have reached category 4. None have reached category 5.</p> <p>50 days of lightning strikes per year.</p> <p>Rainfall/Flooding</p> <p>Mean annual rainfall ranges 1,640mm to 1,768mm December to March = monsoon period. 95% of rain falls between Nov and April.</p> <p>90 days of rain per year. Driest period is June, July & August.</p> <p>Humidity highest in February.</p> <p>Evaporation 2,000mm – 2,400mm per year.</p>	<p>Climatic conditions, natural disasters and hazards and climate change have the potential to impact on the construction, operations and rehabilitation of the project (refer to risk assessment in EIS Table 3-8).</p> <p>Health and safety of employees from storm surge, flooding, wind-blown debris.</p> <p>High winds can cause structural damage and be a safety risk.</p> <p>Damage to port, ferry, barge and road infrastructure from flooding, storm surge, and high winds possible.</p> <p>Storm surge impacts are likely to be low.</p> <p>Flooding generally restricted to areas near the Skardon River.</p> <p>Damage to other infrastructure such as buildings and storage tanks possible.</p> <p>Damage to erosion and sediment controls would increase the risk of release of sediment.</p> <p>Vegetation rehabilitation is at risk due to high winds and low rainfall during the dry season.</p>	<p>Operating in the dry season, skeleton crew on site during wet season.</p> <p>Extreme weather contingency plans would be developed with emergency procedures established and in consultation with relevant emergency providers.</p> <p>Site ERPs to be prepared in consultation with emergency services.</p> <p>Onsite resources and training for staff.</p> <p>Coordinate with DTMR and Weipa Cyclone Control Centre.</p> <p>Link to warning systems through the BoM and Cyclone Control Centre.</p> <p>Allocate resources to repair damage if it occurs.</p> <p>Infrastructure located out of flood areas and constructed to Australian building standards;</p> <p>Pre-wet season preparation to place into safe shut down over wet season.</p> <p>Monitoring.</p> <p>Water quality/contamination mitigation is described in section 4.13.</p> <p>Amended project design to remove roads and infrastructure from flooding areas. Roads that would be flooded would be designed to be periodically inundated.</p> <p>Most of the project infrastructure and operations are located on the plateau that rises 8-15m about waterways.</p> <p>A reliable source of water would be established. Raw water supply from the GAB is under consideration supported by potable water from the local shallow groundwater aquifer and water storage tanks filled by wet season rain. Collection of surface waters and water from the Skardon river remains a</p>	<p>All commitments outlined in EIS Chapter 3, Table 3-9 must be implemented by the proponent where they do not conflict with any subsequent regulatory approval conditions.</p> <p>Model mining conditions appropriate to regulate risks associated with climate, natural disasters and hazards on the draft EA.</p> <p>Key climate commitments in the EIS such as the time of the year for the mining and barging operation, safety plans and actions to occur prior to the wet season to ensure releases of sediment are minimised are to be implemented. See Table 3-9 of the EIS.</p>

		fall back option depending on wet seasons.	
Wind Predominately SE to NW. Summer winds NW to SE. Cyclones seasonal causing high wind speeds.	Winds can blow dust and air contaminants toward sensitive receptors, however, given the prevailing winds are from the SE to NW during autumn spring and winter the risk of impact is low.	Plant and infrastructure facilities including the adjacent camp would be designed to Australian standards to reduce risk of structural damage. The guideline “2 Wind Resistant Housing” (Queensland Government, 2012) has been referenced in the design and construction. Rehab - Species adapted to high winds would be used as they have a high regeneration capacity.	As above.
Temperature and Bushfires Hottest = October, November and December minimum temperatures ranging 34-36°C. Coolest = July and August monthly mean minimum temperatures ranging 17.5-18.9°C.	Risk of bushfires in late dry season (winter and spring) when rainfall is at its lowest. Fires occur regularly in the area caused by lightening, annual back burning, fires lit by visitor (pig shooters) and traditional owners. The EIS identified the bushfire prone risk as medium potential bushfire intensity - Figure 3-7.	Operating in cooler months. Appropriate bushfire management strategies would be developed to mitigate bushfire hazard risks. Site specific fire management plan established prior to construction including fire breaks and low intensity controlled burns. ERP and procedures in consultation with emergency services. Includes training of all staff. Fire protection infrastructure (eg water sprays on conveyors). Consultation with Mapoon Land and Sea Rangers and local authorities/land holders regarding fuel load and burning. Adequate shaded areas. Staff encouraged to hydrate, PPE provided, monitoring of water sources to ensure safe supply, temperature tolerant machinery used, monitoring.	As above.
Coastal	Site is mapped within an indicative erosion prone area (Figure 3-8). Coastal erosion and storm tide inundation are naturally occurring coastal processes/coastal hazards which can impact on safety and infrastructure along the coast. Risk of erosion or permanent or temporary inundation from a storm event. The projected sea level rise and a predicted increase in cyclone intensity mean there is likely to be a progressive worsening of coastal hazards.	Minimised through the positioning of infrastructure on the plateau and therefore outside of the PMF flood modelling footprint. Any road crossings and other infrastructure within the modelled flood areas are all designed to allow periodic inundation.	As above.
Temperature Inversions Highest potential during summer.	Dust particulates and pollutants can be trapped close to the ground causing increased concentrations. Temperature inversion potentials were incorporated into air quality and noise impact modelling and so potential	Temperature inversion potentials were incorporated into air quality and noise impact modelling and so potential impacts and mitigation measures were considered in those sections. A range of dust suppression measures for stockpiles and	NA.

	<p>impacts were assessed in those sections.</p> <p>Given highest potential for temperature inversions is in Summer, this would not be a high risk.</p>	<p>roads have been developed to ensure airborne dust impacts are minimised. These are further discussed in section 4.10.</p>	
Earthquakes	<p>No earthquakes have been recorded in the project area over the last 60 years and the risk of earthquake is considered low.</p>	<p>NA.</p>	<p>NA.</p>
Climate Change	<p>Based on the 50th percentile expected change for the project area based on medium emissions are:</p> <ul style="list-style-type: none"> • Temperature change = 0.6°C–1.0°C • Rainfall change = +/- 2% • Wind speed change = +/- 2% • Sea temperature change of 0.6°C–1.0°C • Given the short time of the project, 12 years (2017–2028), the potential changes in rainfall, temperature and winds as a result of climate change are expected to be negligible. • Exposure to higher temperatures. • Higher flooding than expected. Intense rainfall. 	<p>Secure water supply from the GAB and shallow aquifer. Tank water would also be used. This removes the need for large water storages for surface water – dams which create a flooding risk.</p>	<p>As above.</p>

4.4 Land

Topography, geology, soils, landscape and visual amenity and land use of the project were described and assessed in EIS Chapter 4 – Land. EIS Chapter 2 – Project description EIS Appendices A1 (Soil Samples), A2 (Contaminated Land Register (CLR) Search Results), A3 (ESCP), and Section 5 of the SEIS December 2016. Acid sulfate soils were also discussed in EIS Chapter 6, Chapter 7 and Chapter 19 and in Section 5 of the SEIS. Potential impacts on native title rights and interests were discussed in EIS Chapter 15 – Cultural Heritage. Rehabilitation and decommissioning was addressed in the EIS Chapter 4 Section 4.8.3 and in the SEIS sections 4.7 and 5.7.

4.4.1 Values, impacts and mitigation measures

A summary of the land's values including topography, land use, geology & geomorphology, resources, soils and land suitability, land disturbance, land contamination, impacts and proposed avoidance and mitigation measures on land is provided in the following sections. A summary of the proposed approach to rehabilitation of the site post mining is provided in section 4.2.2 of this report. Where there would be impacts on land values, those impacts and the proposed mitigation measures are considered in Table 6 below.

4.4.1.1 Regulatory framework and values

Section 4.2 of the EIS described the regulatory framework relevant for the project:

- EP Act
 - financial assurance (FA)
 - plan of operation
 - final rehabilitation report and EA surrender.
- *Land Act 1994*
 - sustainable resource use
 - land evaluation and capability and balancing the economic, environmental, cultural and social opportunities
 - values and protection of the land for development, community, environmental & cultural purposes
 - ecologically sustainable development
 - best practice environmental management in mining
 - mine closure
 - rehabilitation requirements
 - consultation with community and industry groups and authorities.
- *Regional Interests Act 2014*
 - the project is not in an area of regional interest nor in an area mapped as strategic cropping land and therefore approvals under this legislation are not required.
- *Land Protection (pest and stock route management) Act 2002*
 - declared pest species identified onsite would be managed.
- Cape York Regional Plan
 - Strategic environmental areas (SEA) – the project is not within a SEA or designated precinct. The closest SEA is approximately 30km south at the confluence of the Wenlock and Ducie Rivers - Steve Irwin reserve.
- National Parks
 - Jardine River National Park is located approximately 55km northeast and the Batavia National Park about 75km southeast of the project.
- Priority Agriculture areas
 - The project area is not wholly or in part located within a PAA. The nearest PAA to the project being Mapoon located approximately 35km to the southwest of the Project area.

4.4.1.2 Mineral Resources and resource utilisation

The project's bauxite deposits are located within the Carpentaria Basin, a sub basin of the GAB. The Carpentaria Basin is Jurassic to Cretaceous age, covering the majority of the western Cape York. The geology that sub-crops on the project area is tertiary age Bulimba Formation.

The bauxite occurs on plateaus as the upper part of a Quaternary/Tertiary loose, pisolitic, laterite profile that is up to about 15m thick. Deposits of silt, clay and sand occur in the valleys/rivers and alluvial deposits are derived from Palaeozoic basement rocks.

The bauxite forms from weathering and leaching shales and siltstones of the underlying Bulimba Formation and Lower Cretaceous Rolling Downs Group. This has resulted in a lateritic profile; an upper bauxite layer of up to 5m, grades over a narrow ferricrete layer which grades into mottled and silty clays (kaolinite and sandy clay layers) which then grade into the dark grey cretaceous shales and siltstones (underlying rock). Pisolitic bauxite deposits confirmed at a depth of 0.6–5m under shallow topsoil of 0–0.6m. Ferricrete occurs 5–6m; mottled silty clay (kaolin) 6–30m and grey siltstone or sandstone >30m.

The total marketable ore reserves bauxite reserves available for the project was estimated in the EIS to be approximately 48.2 Million tonnes.

The EIS described the method proposed for extracting the bauxite. The project would be an open cut mining operation utilising front end loaders and trucks for hauling. The material does not need any drilling and blasting; however, some ripping by dozers is likely to be required. Front end loaders would be used for loading due to their high manoeuvrability.

Bauxite would be hauled to the product stockpile using road train trucks. Overburden material would be initially stored ex-pit. In-pit overburden storage is expected to commence within the first six months of production. The overburden volume is low for this deposit and it is not expected to represent an issue in terms of waste storage or required capacity of mining equipment.

The bauxite resource is contained in BH6 west (MLA 20689), BH6 east (MLA 20688) and BH1 (MLA 20676). The anticipated annual production rates are shown in Table 4-5 and presented in Figure 4-6 (total production schedule) and Figure 4-7 (production schedule by pit) of the SEIS. The mine may be extended as a result of further exploration activities at the site and subsequent optimisation of the mine plan to reflect increased reserves.

4.4.1.3 Land Use suitability

The EIS referenced a land use suitability assessment by Biggs and Philip (1995). The assessment indicated most of the Cape York Peninsular north of Aurukun as “land suitable for low intensity grazing of native pastures”. The Rio Tinto Alcan Amrun EIS land suitability findings were consistent with Biggs and Philip (1995).

The Queensland agricultural land classification system categorised the project area as Class B: Limited Crop Land (see Figure 4-9). The description of Class B Land is land that is suitable for a narrow range of current and potential crops; land that is marginal for current and potential crops due to severe limitations but is suitable for pastures; land may be suitable for cropping with engineering and/or agronomic improvements. A “narrow range of crops” is defined as three or less existing crops of local commercial significance, with the exception of areas where there is an infrastructure requirement to support an industry. The EIS concluded that there is currently no cropping or pasture production within the project area and no historical evidence of these activities. The low soil fertility, isolation and limited infrastructure would preclude the viability of agricultural activities within the project area.

4.4.2 Rehabilitation and Decommissioning

4.4.2.1 Rehabilitation goals and objectives

The project would require the rehabilitation of approximately 1,433ha of disturbed land.

The EIS described the following rehabilitation and decommissioning goals for the project, consistent with the principles of ecologically sustainable development as required by the EP Act:

- landform that is physically safe for humans and wildlife, geotechnical stable and non-polluting
- a landform with the same or similar land use suitability and EVs it had prior to the disturbance unless other beneficial land uses are agreed with the post-mining landowners, Traditional Owners and relevant regulators
- progressive rehabilitation of disturbed land so that it is self-sustaining or safe and consistent with an agreed post mining land use
- maintaining the same or similar pre-mining water values, including surface water and groundwater quality and volume that maintain existing ecological processes and are acceptable for existing and future users.

The EIS stated that the base case for rehabilitation is that all land disturbed by mining would be rehabilitated with native vegetation to maintain the same, or similar, pre-disturbance environmental and cultural values; and that all infrastructures would be decommissioned unless otherwise agreed with post mining land owner and Traditional Owners and regulators.

Figure 4-16 of the EIS describes the progressive rehabilitation that would be undertaken as mining advances rather than taking place as a large operation once mining is complete.

Land not impacted by mining activities would be retained as undisturbed native vegetation, including vegetation that would be retained within environmental buffers along waterways and significant swamp areas. Through the

retention of vegetation buffers and proposed progressive rehabilitation with endemic, native species, no significant changes to the broad scale vegetation character of the project area at the landscape scale are expected.

4.4.2.2 Post mining objectives and completion criteria

Two rehabilitation reference sites in tetradonta woodland, outside the mining area, were identified as R1 and R2 in Table 5-2 and Figure 5-3 of the SEIS. The SEIS states that a reference site for BH1 would be identified in consultation with EHP. Any additional reference sites or additional floristic monitoring of them would be determined prior to construction and monitoring of reference sites would be incorporated into the detailed Rehabilitation Management Plan.

Reference sites would be established and assessed to capture pre-mining ecological parameters, and to be used as an indicator for achievement of the completion criteria. They would be permanent monitoring locations to compare floristic attributes between natural and rehabilitation areas.

A general list of components to be covered in rehabilitation completion criteria include:

- Landform stability and performance.
- Biodiversity.
- Revegetation.
- The monitoring and management of exotic species.

Indicative rehabilitation indicators and completion criteria were provided in the EIS and are provided in Table 5. Action plans would be prepared for each domain. The proponent indicated that these would also be incorporated into the Rehabilitation Management Plan and the Plan of Operations.

Table 5. Decommissioning, rehabilitation objectives and completion criteria by domain (from EIS Table 4-17)

Domain	Outcome	Objective	Completion Criteria
General			
All site components	Community and future generations are left with no residual liability for site rehabilitation or maintenance.	To ensure that progressive rehabilitation and site decommissioning leave the area safe, fit for purpose, and non-polluting.	Government acceptance of mine completion report which demonstrates achievement of all completion criteria.
Rehabilitation Completion Criteria			
All site components	Geotechnical stability has been confirmed.	Erosion rate is managed to levels that do not compromise post mine land use. Safety risk to people and fauna is managed. Water catchment values are maintained.	All artificial slopes will have a slope that is <8m tall and <30°. No single area of bare soil within rehabilitation that exceeds 25m ² in area. Any visible, active erosion is within levels recorded at reference sites. Surface water and groundwater quality meets the agreed trigger values set in the EA.
	Ecological and biodiversity indicators are confirmed to approach pre-existing conditions.	Vegetative community similar to pre-existing. Vegetative community to be self-sustaining.	Greater than 50% of the total woody biomass (as assessed by basal area) should comprise dominant tree species of RE 3.5.2 and/or RE 3.3.12 and/or RE 3.3.14a. Stem densities within rehabilitated sites should exceed the 10th percentile of the reference sites. Rehabilitation monitoring to demonstrate natural seeding and/or suckering is occurring. Rehabilitation monitoring to demonstrate that native species richness exceeds the 10th percentile of reference sites. Rehabilitation is free from Class 1 and 2 declared weeds. Rehabilitated vegetation communities must persist over multiple wet seasons. Rehabilitated vegetation communities must meet all completion criteria having experienced a fire within the previous five years.

4.8.3.4 Proposed Rehabilitation Methods

The EIS listed the progressive rehabilitation methods proposed for the project.

Pre-mining:

Mine planning – a conceptual life of mine plan was provided in the EIS which included buffer areas. Progressively more detailed mine plans would be developed at temporal scales, with annual mine plans including rehabilitation works. The annual mine plan would be incorporated into the Plan of Operations which is a regulatory requirement setting out a program of actions to meet EA conditions including rehabilitation of disturbed areas. FA Projects' calculation to cover commitment costs for the project would be provided with the Plan of Operations.

Pre-clearing surveys - a progressive annual vegetation clearing plan would be developed to ensure all pre-mining requirements are completed. Vegetation clearing would be limited each year to the minimum that is required for the following year's operations. Prior to vegetation clearing, both ecology and Indigenous cultural heritage clearance surveys would be undertaken. Suitably qualified staff would undertake pre-clearing surveys. If threatened flora and/or fauna species or their breeding place are found a relevant species management plan would be followed. Clearing would be suspended until appropriate management plan can be developed. Hollow bearing trees/nests would be identified and used in rehab, seeds collected and records of flora and fauna taken. The Indigenous cultural heritage pre-clearance surveys would be undertaken in accordance with the native title and landowner agreement.

Cleared vegetation management - Vegetation clearing would be carefully timed to be undertaken when soil moisture has reduced to minimise soil compaction issues, but not be so dry as to make clean extraction of roots a problem. Hollow bearing trees would be selectively felled to be used in rehabilitation. A portion would be windrowed near the pits and pushed over rehabilitation areas for habitat and seed source once topsoil and seeding has occurred. Some vegetation would be mulched and managed as waste. Remaining vegetation would be burnt in accordance with fore management plan and the ash used in rehabilitation areas.

Topsoil collection and management - The dominant soil type of the project area is Weipa a Red Kandosol, which has a typical topsoil depth of 100mm to 200mm; however, the soil survey identified a number of areas where additional topsoil material had collected along naturally lower lying areas across the plateau. Where these areas are intersected, all topsoil would be collected to the maximum depth available. These soils are weathered and low in nutrients, and support vegetation adapted to such conditions. The majority of seed readily able to germinate is present in the upper 50mm of soil. Stripping would be timed to minimise compaction issues, grass or understorey vegetation would be incorporated to retain biological activity. Where possible, topsoil would be placed directly into rehabilitation areas and so the height of the stockpiles would be minimised. The stockpiles would be allowed to self-vegetate and would be inspected after each wet season for erosion and weeds. The removal of topsoil and overburden during the mining process has the potential to change the nature of these materials and their subsequent interaction with the surrounding environment in a number of ways. By following the proposed topsoil management procedures, the potential for any of these negative changes in soil quality to occur would be minimal.

Overburden removal and management - All overburden would be returned to the mined-out pit area and rehabilitated. However, a small amount of overburden material would need to be temporarily stockpiled outside of the actual pit footprint at the commencement of a new pit. Any vegetative or coarse rock material that is collected during the basic screening processes would be returned to the mine pits and incorporated into the overburden.

Post-mining:

Final landform and drainage – once mining is complete the pit floor would be deep-rippled (100mm–500mm) to maintain groundwater interactions prior to the overburden being replaced. Earthworks would be required to reinstate topography and drainage. The final landform design would be incorporated into the annual Plan of Operations and conform to, 2% slope; high walls flattened to 5% slope; appropriate drainage structures; a similar topography to the surrounding areas; similar surface and groundwater flow paths as identified in baseline surveys.

Replacement of topsoil - topsoil would be replaced over the entire rehabilitation block to an average depth of 200mm and amounts monitored to ensure adequate topsoil resources are available for rehabilitation.

Revegetation - revegetation activities would commence once topsoil has been replaced and scheduled towards the dry season and to stimulate germination. Selected tree, shrub and groundcover species would be sown using locally collected seed stock where available. Direct seeding of local provenance species would be undertaken, with an aim to rehabilitate at a similar rate to that of mining, thereby minimising the area of land disturbed at any one time. Revegetation works at the start of the project life would commence once mining has been completed over a large enough area to be suitable for rehabilitation. This is estimated to take two years based on the conceptual mine plan. The species mix is to re-create as closely as possible the Eucalyptus tetradonta dominated ecosystems. Seeding of locally collected key species of trees and shrubs would enable the establishment of an ecosystem that would, once established, resemble the surrounding unmined areas.

The proponent is confident that a successful rehabilitation program would be developed for the project and a healthy native ecosystem would be established. However, given the lower topography that has been identified following mining, there is potential for a slight increase in the water holding capacity within the mined areas. While not considered significant, this could result in a slightly different ratio of local species, such that the Darwin Stringybark ecosystem may incorporate a higher number of *Melaleuca* sp. than occurred in the pre-mining ecosystem.

Rehabilitation monitoring and maintenance - Rehabilitated areas would be assessed six and 18 months after seeding. Long term monitoring sites would also be established to record the progression of species composition over time, and the establishment of an ecosystem that approaches the values and completion criteria of the pre-existing landscape. Analogue sites away from the mining area would also be established at the commencement of construction works. Monitoring of the long-term sites would be undertaken approximately every three - five years. Before lease relinquishment all rehabilitation would be monitored to ensure it meets parameters defined in the completion criteria. Rehabilitation maintenance would be undertaken on rehabilitated areas including rehabilitation infill, fire management and weed and pest animal control. Rehabilitation infill would occur if rehabilitated areas have not established successfully, are impacted by natural disaster (e.g. cyclones or fire), or do not meet the developed rehabilitation completion/completion criteria.

Fires can be detrimental to rehabilitation, particularly in young (<10 years old) rehabilitation. Fire would be actively prevented from entering rehabilitated areas until they are old enough to be resilient to fire. Once resilient to fire, the fire would be introduced to manage for the long-term viability of the ecosystem. A detailed Weed and Pest Management Plan would also be developed with the input of the Mapoon Land and Sea Rangers.

Decommissioning - Decommissioning would occur prior to mine closure and would involve the removal of project infrastructure and services, and the remediation of all environmentally disturbed areas. A decommissioning plan would be developed to ensure closure goals would be met and be developed based on the following philosophy/concepts:

- remove infrastructure (unless requested to be left as is) and revegetate to a predetermined post-mine land use
- minimise unnecessary land disturbance
- compacted areas would be ripped, re-contoured, topsoiled (where required) and revegetated
- minimise erosion and its potential off lease effects
- protect downstream water quality from contaminated runoff
- on relinquishment, ensure that the agreed post-mine land use has been reached.

The EIS indicated that all buildings, offices, plant equipment, workshops, raw water tanks, power plant, conveyors, sewage treatment plant, fuel storage tanks, stockpiles and associated facilities would be decommissioned and removed from site. Compacted areas would be ripped, re-contoured, topsoiled (where required) and reseeded.

Any infrastructure to be left onsite following mine closure would depend on the requests of the proponent, the Traditional Owners and the landowner requests.

Table 6EIS assessment of Land

EIS *				EHP RECOMMENDATIONS
Environmental attribute(s) and values	Action/ Contaminants	Potential impact to attribute or EVs (unmitigated)	Avoidance, mitigation and management commitments	
<p>Topography/Landscape</p> <p>The Project's mining is on bauxite plateaus that surround the Skardon River which drains into the Gulf of Carpentaria.</p> <p>Mine pit areas are proposed across an elevation range of approximately 6–16m ADH.</p> <p>The plateaus are non-undulating and exhibit moderate slopes of approximately 0.6% (BH1) and 0.3% (BH6). Steeper slopes are encountered along the fringes of the Skardon River (BH1 & BH6 east).</p> <p>The land is characterised by tributary gully formations. East from BH6 East and BH6 west, the plateau gently slopes (1%) south and west toward sand dunes and the Gulf of Carpentaria.</p> <p>Tall eucalypt woodland, melaleuca wetlands, grassland,</p>	<p>Land disturbance</p>	<p>The mining activity would reduce the height of the plateau.</p> <p>Given that project infrastructure would be adjacent to identified wetland areas, the potential for impacts to the quality of surface water runoff has been identified as a significant risk.</p> <p>1,425ha of <i>Eucalyptus tetradonta</i> woodlands is proposed to be removed and a further 6ha of riparian melaleuca forest is also proposed to be disturbed. This disturbance would have impacts on landform and flora and fauna (discussed in detail as section 4.5)</p> <p>Land disturbance resulting from land clearing, open cut mining excavations, construction of mine infrastructure, haul roads, BLF and RORO.</p> <p>Land disturbance areas are identified as the predominant risk for increased erosion and release of sediments to air and water which could impact on water courses, flora and fauna, and environments.</p>	<p>Setbacks and buffers are maintained between mining pits, roads and retained environmental values and habitat.</p> <p>Maintain average slope gradients consistent with pre-existing slope gradients.</p> <p>Longer slopes managed through contour diversion berms.</p> <p>Staged clearing and progressive rehabilitation of mined areas.</p> <p>Implement:</p> <ul style="list-style-type: none"> • flooding and regulated structures • water diversions • sediment control structures • rehabilitation criteria. <p>Where possible avoid and minimise clearing of riparian vegetation.</p> <p>Limit works that cross water courses/drainage lines to early dry season and stabilise prior to the wet season.</p> <p>Where riparian vegetation must be cleared:</p> <ul style="list-style-type: none"> • remove and stockpile it away from watercourse with erosion and sediment controls • revegetate and stabilize areas less than 40m from a watercourse immediately on completion of work wherever possible • minimise slope gradients while maintaining appropriate drainage requirements within 40m of the watercourse • Install temporary earth banks or other controls along cleared slopes to divert sediments from the watercourse towards sediment control structure of vegetated area. <p>A detailed ESCP based on the conceptual ESCP would be developed for the construction and operation phases. The ESCP would consider the variables in a seasonal context to measure and manage the risk of soil erosion from mine activities.</p> <p>Install sediment fences and other erosion and sediment control measures in accordance with the endorsed ESCP.</p> <p>Sediment control basins would be designed taking into account predicted soil loss, seasonal rainfall, soil erosivity, the sensitivity of the</p>	<p>Although the EIS provided some information about broad completion criteria and rehabilitation methods, further detail would be required in order to set specific completion criteria for each domain, monitoring, and rehabilitation goals,</p> <p>EHP recommends that a rehabilitation management plan be submitted to EHP for approval prior to the commencement of project activities providing sufficient detail regarding rehabilitation of the site.</p> <p>Reference sites are to be described and mapped and agreed to by the administering authority including an additional site for BH1.</p> <p>The proponent has committed to undertaking progressive rehabilitation. It is recommended that conditions of the EA reflect this requirement. Progressive rehabilitation would act</p>

EIS *				EHP RECOMMENDATIONS
Environmental attribute(s) and values	Action/ Contaminants	Potential impact to attribute or EVs (unmitigated)	Avoidance, mitigation and management commitments	
<p>and mangrove vegetation communities surround the Skardon River estuary. See Chapter 6 and Appendix B and C of the SEIS.</p> <p>The terrestrial environment is in good condition. Some areas have been affected by camping, frequent controlled and uncontrolled fires, and damage from feral pigs. The adjacent tenement contains a disused kaolin mine and associated infrastructure – haul roads, port, airstrip, and accommodation village.</p>			<p>receiving environment.</p> <p>Monitoring and maintenance programs for erosion and sediment controls.</p> <p>Temporary controls would be in place prior to disturbance and construction activities commencing.</p> <p>Ensure that all waters that discharge to waterways meet the project specific water quality criteria/objectives.</p> <p>Minimise all land disturbance, including vegetation clearance.</p> <p>Schedule works to minimise active disturbance at any one time via construction plans.</p> <p>Clearly delineate disturbance areas (and no go areas) to limit disturbance to these areas.</p> <p>Restrict vehicle movements to nominated construction and haul road areas to limit ground disturbance and implement dust suppression methods (application of water).</p>	<p>to reduce the likelihood of sediment mobilisation of impacted areas and return landscape and habitat values as soon as possible.</p> <p>A condition requiring that the completion criteria to maintain stable groundwater levels within groundwater dependent ecosystems affected by the project (Big Footprint Swamp and Skardon River) is to be included in a revised rehabilitation management plan is recommended to be put on the EA.</p>
<p>Soils present in the area of the project site:</p> <p>Weipa – Deep gradational or uniform red massive soils with aluminous concretions.</p> <p>Batavia – Deep gradational mottled yellow soils with nodules.</p> <p>Skardon – Recent estuarine deposits under mangrove – intertidal hydrosol;</p>	<p>Removal of vegetation, topsoils and stockpiling.</p> <p>Excavation for infrastructure.</p>	<p>Weipa is the dominant soil on the site and mining areas and haul roads are likely to impact on this soil.</p> <p>Batavia occurs at the northern and southern edges of BH1 and at the drainage line between BH6 and BH1. The area within BH1 would not be developed, whereas the haul road connecting BH6 and BH1 would cross the drainage line where the soils are located.</p> <p>Skardon is mapped to occur in narrow strips along tidal fringes associated with mangroves. The BLF RORO, MIA, haul road are now not needed</p>	<p>A topsoil management plan would be developed and implemented.</p> <p>A detailed ESCP based on the conceptual ESCP would be developed for the construction and operation phases. The ESCP would consider the variables in a seasonal context to measure and manage the risk of soil erosion from mine activities.</p> <p>Mining of the plateau would mean that slopes are naturally inward draining and would act as a self-draining sediment trap for disturbed mine areas.</p> <p>Vegetation corridors and clearing set backs are proposed.</p> <p>No water is proposed to be released from mine pits.</p> <p>Pits and haul roads have been located to avoid areas with acid sulfate soils (ASS).</p> <p>It is unlikely that ASS would be encountered, however, if it is, the ASS</p>	<p>Condition ESCP.</p> <p>Condition ASS treatment.</p> <p>Condition for release limits for treated ASS water.</p>

EIS *				EHP RECOMMENDATIONS
Environmental attribute(s) and values	Action/ Contaminants	Potential impact to attribute or EVs (unmitigated)	Avoidance, mitigation and management commitments	
<p>ASS.</p> <p>Caravan – Deep to very deep coloured uniform sands formed in beach ridges on chenier and beach ridge plains.</p> <p>Mapoon – Deep duplex or gradational soils with dark loamy surface over mottled.</p>		<p>and the project would not impact on Skardon soils.</p> <p>The new haul road alignment between BH6east and BH1 has been mapped to avoid areas of Skardon soils and hence avoid impacting on acid sulfate soils. The rivers that the road would cross may expose Skardon soils although this is unlikely.</p> <p>The mine pit areas are located on plateaus and as such would not disturb marine sediments and potential acid generating material. Samples taken from within the proposed pits returned the lowest total sulphur contents of <0.01% S and 0.02% S, respectively. This is consistent with the soil type Weipa – deep gradational or uniform red massive soil with aluminous concretions.</p> <p>These soils are not associated with iron sulphide marine sediments deposited during the Holocene period (between 18,000 and 6,500 years ago) of high water level. The sulphur content of these samples indicates that the risk of acid mine drainage in these areas is low.</p> <p>Caravan is present within small locations at the western edge of BH6 west but no impact is proposed in this location.</p> <p>No development is proposed to occur over areas of Mapoon soils.</p> <p>There is a low risk of erosion of soils and sedimentation into high ecological value (HEV) waters.</p>	<p>would be taken to a bunded ASS treatment pad located in the footprint of the BH6 east mine pit. The treatment pad would have appropriate bunding to 0.3m height, drainage to withstand a 1 in 2 year storm event and be built on a clay base to prevent leachate. Dewatering would be managed to pH 7–8.5; turbidity to 10NTU; dissolved oxygen (DO) to >80%. Treated water would be released to the Skardon River. Treated soils returned to the mined-out section of BH1.</p> <p>The pad would be located on stable ground within this area and away from overland flow paths. Locating the treatment pad within the BH6 east mine pit footprint prevents the unnecessary disturbance of additional areas.</p>	

EIS *				EHP RECOMMENDATIONS
Environmental attribute(s) and values	Action/ Contaminants	Potential impact to attribute or EVs (unmitigated)	Avoidance, mitigation and management commitments	
<p>Land contamination</p> <p>The EIS stated that EHP's Environmental Management Register (EMR) indicated that lot 11 SP204113; L12 SP204113 and Lot 13 SP204113 are listed on the EMR for Chemical storage, landfill, petroleum product, oil storage contaminated land on the CLR.</p> <p>The EIS stated that the EMR listing is associated with the portions of the lots related to the adjacent Bauxite Mine operation Skardon River Bauxite Mine and their tenements. The proponent now owns that adjacent mining operation but this EIS and assessment report relate only to the assessment of matters on the MLs for the Bauxite Hills EIS.</p>	<p>Removal or disturbance of topsoil that could be contaminated.</p> <p>Construction of haul roads on adjacent tenement.</p> <p>Mine infrastructure, port, stock piles and handling.</p> <p>Contamination of soils may occur as a result of incorrectly managed chemical storage and handling, and petroleum product storage and handling.</p> <p>Topsoil may also be contaminated with overburden material and decrease its effectiveness as a growth medium, if not</p>	<p>The project has changed so that the risk of contamination of the mine infrastructure area or barge load out such as fuel storage bunding, stockpile runoff impacts are now not relevant.</p> <p>If chemical storage etc was required then the contamination of soils has the ability to affect the quality of water runoff and future soil use (eg for rehabilitation) and land suitability for future land uses.</p> <p>The EIS did not identify that there are any contaminated sites associated with the haul roads. The listings are not relevant unless haul roads or other infrastructure are proposed to be built on contaminated land.</p> <p>The risk of land contamination associated with the operational phases of the projects is considered to be very low and the project would be required to meet Australian standards in design and operation to prevent leaks and ruptures.</p> <p>Offsite migration of contamination via soil or groundwater is not likely from the design and construction of appropriate standard containment structures and management controls that have proven to be effective in the past.</p>	<p>The amended project description provided with the response to the submissions would mean that the project would not have a mine infrastructure area with stockpiles and fuel storage.</p> <p>The project now no longer proposes activities that could contaminate land, except for a low risk of potential acid sulfate soils (PASS) disturbance. However, the EIS outlined the following management and mitigation measures:</p> <ul style="list-style-type: none"> • Storage and handling of all potential contaminants to Australian Standards. • Limited potential for contamination due to no benefaction and simplified mining practices. • Refuelling undertaken in appropriately designed areas, including oil/water separators. • Spill reporting and clean up procedures. 	<p>Model conditions relating to the management of contaminated soils and land would suffice to manage this risk if contaminated land is encountered in installing haul roads and other infrastructure.</p>

EIS *				EHP RECOMMENDATIONS
Environmental attribute(s) and values	Action/ Contaminants	Potential impact to attribute or EVs (unmitigated)	Avoidance, mitigation and management commitments	
	<p>managed correctly.</p> <p>Contamination of soils has the ability to affect water quality runoff, future soil use (including as rehabilitation medium) and land suitability.</p>			
<p>Existing Land uses</p> <p>Current land uses include mining and mining exploration, cultural activities, limited cattle grazing, recreational 4WDing, hunting, camping, fishing and limited boating.</p> <p>No evidence of recent agricultural use except limited grazing.</p> <p>Use of the area by Traditional Owners is discussed in Chapter 15. Areas of cultural importance identified include Big Footprint Swamp, Lunette Swamp, and middens near Port of Skardon River.</p>	<p>Mining.</p> <p>Port.</p> <p>Barging.</p>	<p>Visual impacts of permanent lighting and tug and barge operations on those using the area for recreational purposes.</p> <p>A temporary (during construction and operation activities) reduction in recreational, cultural and hunting areas.</p> <p>Approximately 3,000ha of cumulative impacts on these values resulting from the project and the SRBP.</p>	<p>The proponent had negotiated a Cultural Heritage Management Agreement/Plan that includes measures to compensate the recognised traditional owners for the loss of amenity and access.</p> <p>There are no viable means of reducing the impacts to visual amenity.</p> <p>SRBP also has negotiated a Cultural Heritage Management Agreement/Plan with recognised Traditional Owners.</p>	<p>Limited and recognised impacts that would be addressed through the Cultural Heritage Agreement.</p> <p>EHP expects that the proponent would have ongoing discussions with users of the area and resolve any potential conflicts and safety concerns over the life of the project.</p>

EIS *				EHP RECOMMENDATIONS
Environmental attribute(s) and values	Action/Contaminants	Potential impact to attribute or EVs (unmitigated)	Avoidance, mitigation and management commitments	
<p>Final landform design</p> <p>Final landform would be similar to that of pre-mining as all pits would be backfilled with subsoil and topsoil.</p> <p>Post rehab land use</p> <p>Vegetative community similar to pre-existing. Vegetative community to be self-sustaining. Section 4.4.2 of this assessment report summarises the rehabilitation approach and completion criteria.</p>	<p>Movement of topsoils and over burden</p>	<p>Final landform may be slightly lower than the natural surface elevation and include some shallow depressions. This would result in wetter environments and likely to result in less successful rehabilitation of tetradonta forest and greater success of species that prefer wetter environments such as melaleuca species.</p>	<p>Rehabilitation Management Plan (RMP). Geotechnical commitments for a stable landform.</p> <p>The EIS states that:</p> <ul style="list-style-type: none"> no spoil dumps would remain outside of mining pits and all overburden would be returned to pits no final voids proposed no tailings dams no creek diversions all mining pits are above the probable flood level. 	<p>Condition the EA to require the RMP to reflect suitable completion criteria, final landform design, and suitable reference sites to be agreed with the administering authority. An additional reference site for BH1 is recommended. Also groundwater levels reflective of pre disturbance variability should also be included as completion criteria.</p> <p>Surface water flows to Big Footprint Swamp are also to be restored post mining.</p>
<p>Visual amenity</p> <p>Closest sensitive receptor is at Mapoon (35km) and campers and boating visitors to the Skardon River.</p>	<p>Vegetation removal</p> <p>Lighting generally</p> <p>Port and barge operation and lighting</p> <p>Trans shipping operation and lighting</p>	<p>No significant landscape or visual impacts are anticipated, particularly as retained vegetation would limit the local view shed.</p> <p>However, there is the potential for a view of the project barging and transhipment operation from the Skardon River Mouth (campers, boating craft, and fishers). Particularly at night.</p> <p>Given the common use of the port infrastructure, there would now be only one barge facility in the River.</p>	<p>Limit vegetation clearance;</p> <p>Vegetation buffers between mined areas and the Skardon river providing screening.</p> <p>Landscaping established where needed to minimise visual impacts.</p> <p>Minimise lighting except for safety/shipping etc</p> <p>Use of materials and paint colours that blend with the surrounding landscape.</p> <p>Lighting would be limited to essential during construction and operation and intense lighting avoided.</p> <p>Automated light to be used where possible.</p>	<p>NA</p> <p>Given the common use of the port infrastructure, there would now be only one barge facility in the River.</p>
<p>Flora and fauna (see section 4.5).</p>	<p>See section 4.5.</p>	<p>See section 4.5.</p>	<p>See section 4.5.</p>	<p>See section 4.5.</p>

4.4.3 Assessment and conclusions

Chapter 4 of the EIS described the assessment methods implemented for each land related matter. A desktop assessment, including review of publically available literature, maps and resources relevant to the geology, soils and landforms in the project area was undertaken. Field surveys (12 to 16 October 2015) and laboratory analysis focussed on the characterisation of soils for land use suitability, agricultural value and potential use in rehabilitation. Field surveys for soil characterisation and acid sulfate investigations aligned with the TOR requirements.

Topography and landforms were mapped and geological information was gathered from drill holes and publically available data. Land disturbance was described. Landscape and visual amenity impact assessment included a desktop review and identified sensitive receptors and the visual effects of topography and vegetation using a 5m elevation model.

The EIS described the project using appropriately scaled maps indicating the owners/tenement holders, infrastructure (roads and road reserves, railways, stock routes, power lines, easements for water, power, gas or communications). More detail was required on some project elements.

Contaminated soils

No contaminated land on the CLR was present on the site. However, the project may result in land becoming contaminated from the use of fuel or storage of overburden.

The conditions recommended in Appendix 1 relating to the management of contaminated soils and land would suffice to manage this risk if contaminated land is encountered in installing haul roads and other infrastructure.

Cultural heritage

The EIS addressed all sections of the terms of reference including section 8.2.6 relating to identification of existing or potential native title rights and interests potentially impacted by the project and the potential for managing those impacts by an Indigenous Land Use Agreement or other measure. The proponent entered into Cultural Heritage Management Agreements with the relevant Indigenous parties for the area. Section 15.2.2 and 15.3.2 of the EIS Section 4.16 of this assessment report address these matters.

The EIS recognised potential impacts to traditional owners that would be addressed through the Cultural Heritage Agreement. EHP expects that the proponent would have ongoing discussions with users of the area and resolve any potential conflicts and safety concerns over the life of the project.

Final land form and Rehabilitation

The EIS provided a description of the proposed approach to rehabilitation of the site post mining and a description of the final land form likely post mining. EHP considered that while the level of detail provided was sufficient to determine that the post mine landform proposed was appropriate, but that from a regulative perspective, details would be required concerning the timing and nature of the rehabilitation.

EHP requested the establishment of suitable reference sites to guide the rehabilitation of the impacted areas. In response, the proponent provided the location of two reference sites and indicated that further reference sites would be established as required.

EHP also commented on the decommissioning and rehabilitation objectives and completion criteria indicating that the level of groundwater in groundwater dependent ecosystems (Big Footprint Swamp and Skardon River) would provide an important measure of rehabilitation of the site, whether further rehabilitation work is required to maintain the water catchment values, and that these were not included as completion criteria in Table 4-17 of the submitted EIS.

EHP recommended that the proponent add the 'maintenance of stable groundwater levels within the groundwater dependent ecosystems (Big Footprint Swamp and Skardon River)' as completion criteria in Table 4-17.

It is recommended that the proponent prepare and submit a rehabilitation management plan (RMP) for approval by EHP that deals with the following matters:

- the completion criteria for each domain including criteria reflect pre-disturbance variability of groundwater levels within groundwater dependent ecosystems affected by the project (Big Footprint Swamp and Skardon River).
- the final landform including assurance that pre-mining surface water flows be returned to Big Footprint Swamp.
- suitable reference sites.

Recommended conditions for this matter are provided in Appendix 1.

Erosion and sediment Plan

EHP's submission raised the issue that soils surveys indicate differences in erosion potential between different soil units. Despite this, the soils erosion assessment that informed the conceptual ESCP has used the same soil erodibility factors across catchments.

The proponent stated that a detailed ESCP based on the conceptual ESCP would be developed for the construction and operation phases. The ESCP would consider the variables in a seasonal context to measure and manage the risk of soil erosion from mine activities.

A condition is recommended in Appendix 1 requiring a completed ESCP be submitted to EHP by an agreed date considering the final design of the project and the variables of soil type and erosive potential is recommended to be put on the EA.

Acid Sulfate Soils

Risks to exposing ASS have been significantly reduced by the changed project which no longer requires a haul road a, MIA and RORO, and BLF in areas of PASS.

To manage the residual risk, a model condition indicating that suitable action be taken to avoid areas of ASS and if exposed, appropriate treatment of the sediments is to take place. This has been reflected in the recommended conditions in Appendix 1 of this report.

4.5 Ecology

A number of EIS documents described flora and fauna of the project area, namely EIS Chapter 5 – Terrestrial and freshwater ecology, EIS Chapter 6 – Marine ecology, EIS Appendices B1, B2, B3, C, and K (containing technical reports on terrestrial, aquatic and marine ecology, environmental offsets and the Environmental Management Plan). Additional information relating to terrestrial and aquatic ecology, marine ecology, MNES, and water quality was provided in the Supplementary Report to the EIS December 2016.

This section of the assessment report assesses the EIS conclusions for the terrestrial, aquatic and marine ecology. MNES are discussed separately in section 0, environmental offsets in section 0, and coastal processes in section 4.8

A number of site surveys and studies were undertaken as part of the EIS process to gather data about ecological and flora and fauna values.

4.5.1 Existing environmental values

The following section is a summary of the predicted occurrence of environmental values based on database searches, field surveys and habitat assessments which is documented in the EIS. Databases searched included the EPBC Act Protected Matters Search Tool, Queensland Wildlife Online flora and fauna database, Queensland Museum Zoology database and Birdlife Australia New Atlas database. The search extent for all databases was a 25km radius from a central point of the project area.

The EIS identified that the majority of the project area is composed of remnant vegetation described as a mosaic of open forest, woodland, extensive swamplands, gallery forests on perennial streams and rivers, closed forest and mangroves. The majority of the site is *Eucalyptus tetrodonta* (Darwin stringybark) and *Corymbia nesophila* (Melville Island bloodwood) tall open woodland on bauxite plateaus with melaleuca and mangrove wetland communities in depressions and fringing the Skardon River.

4.5.1.1 Environmentally sensitive areas

The proponent identified the presence of Category B (of marine plant communities) and Category C (coastal management district) environmentally sensitive areas (ESA). The impact areas of the project largely lie outside these ESAs.

4.5.1.2 High Ecological Value waters/wetlands

The undisturbed water quality values of the Skardon River and associated wetlands are a HEV area. The water quality objectives for these wetlands, under the Environmental Protection (Water) Policy 2009, are to be maintained.

4.5.1.3 Vegetation communities

The proponent identified 16 regional ecosystems (REs) within the project area based on Queensland Regional Ecosystem (RE) mapping (version 8). However, field surveys identified 14 REs in total, six of which were not included in Queensland RE mapping. Nine REs were reclassified after ground-truthing field surveys. The

proponent adopted the ground-truthed maps for the purpose of the EIS. EHP provided the amended maps and technical reports from the EIS to the Queensland Herbarium for certification but is satisfied that the ground-truthed maps better reflect the vegetation communities present on site.

The majority of project area (excluding non-remnant vegetation) consists of *E. tetradonta/Corymbia nesophila* woodland (RE3.5.2 in the EIS). Note that this RE code has been superseded. In the latest version 10 Queensland government mapping the code for this type of eucalypt woodland is RE3.5.36b. This updated code would be used throughout this report. All REs are listed as 'least concern' under the *Vegetation Management Act 1999* (VM Act) except for RE3.3.12 and RE3.3.51 (both listed as 'of concern' under the VM Act and EHP's biodiversity mapping ('biodiversity status')). Ground-truthed REs identified in the mine lease and BH1 haul road areas are shown in Table 7. No threatened ecological communities (TECs) listed under the EPBC Act were identified on the project site.

Table 7. Regional ecosystems ground-truthed in the project area (adapted from EIS Tables 5-7, 5-12, 2-1, EIS Appendix B1 and Table 10-2, SEIS Table 6-8 and Table 6-9)

Regional ecosystem	Description	VM Act status	Biodiversity status ²
3.1.1*	<i>Rhizophora stylosa</i> +/- <i>Bruguiera gymnorhiza</i> closed forest. Occurs as outer mangroves (estuarine wetland).	Least concern	No concern at present
3.1.3*	<i>Ceriops tagal</i> +/- <i>Avicennia marina</i> low open forest (extensive on intertidal areas).	Least concern	No concern at present /
3.1.6*	Sparse herbland or bare saltpans on salt plains and saline flats (estuarine wetland).	Least concern	No concern at present
3.3.12*	<i>Melaleuca quinquenervia</i> open forest associated with scattered coastal swamps (palustrine wetland).	Of concern	Of concern
3.3.14*	<i>Melaleuca saligna</i> +/- <i>M. viridiflora</i> , <i>Lophostemon suaveolens</i> woodland on drainage swamps (palustrine wetland).	Least concern	No concern at present
3.3.22	<i>Corymbia clarksoniana</i> or <i>C. novoguineensis</i> woodland on alluvial plains.	Least concern	No concern at present
3.3.32*	<i>Melaleuca viridiflora</i> +/- <i>M. saligna</i> woodland in sinkholes and drainage depressions (palustrine wetland).	Least concern	No concern at present
3.3.42	<i>Melaleuca viridiflora</i> low woodland in drainage areas (not wetlands or floodplain).	Least concern	No concern at present
3.3.49b*/3.3.22a/3.3.64 BH1 haul road	<i>Melaleuca viridiflora</i> low open woodland on low plain with scattered emergent <i>Corymbia clarksoniana</i> . <i>Corymbia clarksoniana</i> or <i>C. novoguineensis</i> woodland on alluvial plains. <i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i> open sedgeland in drainage swamps in dune fields.	Least Concern	No concern at present
3.3.49b*/3.3.9a* BH1 haul road	<i>Melaleuca viridiflora</i> low open woodland on low plain with scattered emergent <i>Corymbia clarksoniana</i> . <i>Lophostemon suaveolens</i> open forest. Occurs on streamlines, swamps and alluvial terraces.	Least concern / Least concern	No concern at present / No concern at present
3.3.51	<i>Melaleuca acacioides</i> +/- <i>Hakea pedunculata</i> tall shrubland on marine plains (not wetlands or floodplain).	Of concern	Of concern

Regional ecosystem	Description	VM Act status	Biodiversity status ²
3.3.65*	Ephemeral lakes and lagoons on alluvial plains and depressions (palustrine wetland, e.g. vegetated swamp).	Least concern	No concern at present
3.5.36b**	<i>Eucalyptus tetrodonta</i> , <i>Corymbia nesophila</i> tall woodland on deeply weathered plateaus and remnants.	Least concern	No concern at present
3.7.3/3.3.49b BH1 haul road	Tall semi-deciduous notophyll and/or microphyll vine thicket on colluvial plains. <i>Melaleuca viridiflora</i> low open woodland on low plains.	Of concern/Least concern	No concern at present

²conservation status used for assessments under the EP Act

*These wetland communities are mapped as MSES wetlands

** Formerly RE3.5.2.

4.5.1.4 Terrestrial flora

Only one potential threatened flora species listed under the *Nature Conservation Act 1992* (NC Act) was found within the project area. An orchid that was either the vulnerable *Dendrobium johannis* or least concern *D. trilamellatum* was found during field surveys; the plants could not be identified to species level because there were no flowers. Hence, the EIS stated that targeted surveys would be carried out during flowering periods (March – July).

The EIS Table 5.8 identified the following NC Act listed species with the potential to occur within the project area:

- *Cepobaculum carronii*, listed as *Dendrobium carronii* (epiphytic orchid) – vulnerable
- *Dendrobium bigibbum* (Cooktown orchid, epiphytic orchid) – vulnerable
- *Dendrobium johannis* (epiphytic orchid) – vulnerable
- *Paspalum multinodum* (grass) – vulnerable
- *Lepturus geminatus* (grass) – near threatened.

Fourteen special least concern plant species were found within the project area.

4.5.1.5 Terrestrial fauna

Table 8. Likelihood of occurrence of threatened terrestrial fauna species (adapted from EIS Table 5-9) shows the EIS likelihood of occurrence in the project area of threatened terrestrial fauna species. Not all of these species would be impacted by the proposed project (e.g. beach stone-curlew). Hence, the EIS identified the potential habitat in the project area which may be impacted by the project (project footprint).

Table 8. Likelihood of occurrence of threatened terrestrial fauna species (adapted from EIS Table 5-9)

Species	NC Act status ¹	Likelihood of occurrence ²
Beach stone-curlew (<i>Esacus giganteus</i>) listed as <i>Esacus magnirostris</i> in the NC Act.	Vulnerable	Found adjacent – northern bank of Skardon River
Palm cockatoo (<i>Probosciger aterrimus</i>).*	Near threatened	Confirmed - found on site
Red goshawk (<i>Erythrorchis radiatus</i>).	Endangered	Potential
Eastern curlew (<i>Numenius madagascariensis</i>).*	Vulnerable	Potential
Masked owl (northern subspecies) (<i>Tyto novaehollandiae kimberlii</i>).	Vulnerable	Potential
Bare-rumped sheath-tail bat (<i>Saccolaimus saccolaimus</i>).	Endangered	Potential
Chestnut dunnart (<i>Sminthopsis archeri</i>).	Near threatened	Potential

Spectacled flying-fox (<i>Pteropus conspicillatus</i>). ^{**}	Vulnerable	Unlikely
False water rat, water mouse (<i>Xeromys myoides</i>). ^{**}	Vulnerable	Unlikely
Ghost bat (<i>Macroderma gigas</i>). ^{**}	Vulnerable	Unlikely

¹conservation status under the NC Act.

²Likelihood of occurrence (based on EIS conclusions which may differ from EHP's assessment of likelihood of occurrence).

*Species assessed as a MNES species under the Environmental Protection Biodiversity Conservation Act 1999

**The EIS excluded these three species due to a lack of records in the region or lack of habitat, or both.

The following special least concern species were found during field surveys within the project area or adjacent on mudflats or the neighbouring Skardon River Bauxite Project:

- short-beaked echidna (*Tachyglossus aculeatus*)
- eastern osprey (*Pandion cristatus*)
- whimbrel (*Numenius phaeopus*)
- common sandpiper (*Actitis hypoleucos*)
- little tern (*Sternula albifrons*)
- rufous fantail (*Rhipidura rufifrons*)
- great egret (*Ardea alba*)
- eastern cattle egret (*Bubulcus coromandus*).

4.5.1.6 Habitat values and connectivity

The proponent described the habitat values present on the project site in the context of the Skardon River catchment. While the Skardon River is a permanent waterway, many associated wetlands and watercourses within the project area are ephemeral and flow or fill only in the wet season.

The project is located in a relatively intact bioregion where habitat fragmentation is not currently a threat to most species. There are large tracts of native vegetation available for dispersal and highly mobile species such as bats are able to move through the landscape using seasonally available foraging resources. A significant threat to wildlife is habitat degradation caused by pest animals and plants, and from inappropriate fire regimes.

The project area is linked to riparian corridors along the Skardon River and continuous vegetation across ML areas. The Skardon River-Cotterell River aggregation to the north of the project area is considered a riparian corridor of regional significance under the Cape York Biodiversity Planning Assessment (BPA). Continuous tracts of vegetation link south to the Port Musgrave aggregation listed under the Directory of Important Wetlands in Australia (DIWA) including significant riparian corridors along the Dulcie and Wenlock Rivers (state significant corridor) and Namaleta Creek. These are mapped as regionally significant riparian corridors.

Fauna habitat features in the Darwin stringybark woodlands were assessed in the EIS. The woodlands contain numerous trees with hollows, loose and decorticating (i.e. falling off) bark, sparsely scattered food trees, perching opportunities, and large cracks. The ground has sparsely scattered logs (some with hollows), moderate leaf litter coverage, termite mounds (about 4 per hectare), and dense vegetation cover during the wet season.

There are several palustrine wetlands, coastal and sub-coastal floodplains, and estuarine wetlands associated with the Skardon River. Wetlands provide important late dry season resources for native fauna and in general the outer margins support excellent swamp habitat. Many of the wetlands are impacted by pigs and cattle.

Big Footprint Swamp is a large palustrine melaleuca wetland which occurs north and south of MLA20676, drying out as the dry season progresses. This wetland, and others like it, provide important habitat. Ground habitat was present throughout, as were tree hollows and trees providing nectar resources. Water remains in the lowest part of the wetland toward the end of the dry season. The margins are somewhat impacted by late season fires. Large hollow bearing swamp box and paperbarks occur in the margins and are impacted by fires that affect nesting and breeding hollows.

4.5.1.7 Waterways

The project is located in the Skardon River catchment. The Skardon River is perennial with ephemeral tributaries. Stream flows are highly variable but typically occur during wetter months (November to April), with low to no flows the rest of the year. The Skardon River is a tidal creek with low freshwater input from low-gradient, seaward sloping coastal flats and is influenced by tidal currents. The river's southern tributary flows through the middle of the project area, while the other tributary lies to the south of the BH1 pit. South of BH1 pit the river is ephemeral.

4.5.1.8 Wetlands

Wetlands associated with the site were described in the EIS Section 5.6.3.1, Appendix B2 Section 5.4, and SEIS Appendix B.

The Skardon River catchment is listed under the DIWA as is part of the Skardon River-Cotterell River wetland aggregation. The project area contains wetlands associated with the Skardon River-Cotterell River wetland aggregation.

The EIS described a wide range of wetlands occurring within or near the project area, most of which are classified as HES or general ecological significance (GES) wetlands based on the Queensland referable wetlands mapping. Wetland classes include estuarine and palustrine waterbodies. In summary the key wetland areas on the project site include the following:

- wetlands as part of the Skardon River-Cotterell River wetland aggregation (DIWA)
- Big Footprint Swamp (HES wetland)
- Lunette Swamp (GES wetland)
- several unnamed palustrine and estuarine wetlands (VMA and HES wetlands).

In the west of MLA20689 (within BH6 mining footprint) there are estuarine wetlands. A drainage channel of the Skardon River and estuarine wetland systems occurs in the west of MLA20676 (within BH1 pit footprint) while estuarine and palustrine wetlands also occur in the north and south of MLA20676.

Big Footprint Swamp, according to the EIS, is a palustrine wetland and is largely an isolated melaleuca swamp dependent on rainfall, runoff and groundwater recharge. In the dry season it is limited to a remnant, shallow pool which dries up in some years. The regional ecosystem classification for the fringing areas of Big Footprint Swamp is RE3.3.14 - *Melaleuca saligna* +/- *M. viridiflora*, *Lophostemon suaveolens* woodland on drainage swamps (palustrine wetland).

Ground-truthed vegetation mapping indicated two additional areas of wetland RE3.3.14 occurring on the southern tip of BH6 east pit and north of the BH6 west pit.

4.5.1.9 Groundwater dependent ecosystems

The EIS identified the following GDE based on a desktop analysis:

- Skardon River and its tributaries and riparian zone
- Big Footprint Swamp
- Lunette Creek (a north to south trending drainage line)
- Lunette Swamp
- Namaleta Creek and its riparian zone (adjacent to the project area).

These GDEs are potentially sensitive to changes in hydrogeological regimes.

The Skardon River is a perennial river receiving groundwater discharge (base flow). Aquatic ecosystems associated with the river are therefore seasonally dependent on discharge of groundwater which maintains flow in the dry season. Riparian vegetation is supported by surface flows and groundwater, either from alluvial aquifers or surface expressions.

Big Footprint Swamp is a freshwater swamp located near the north west of the BH6 pit and is classified as a coastal/subcoastal floodplain tree swamp with a high potential for reliance on surface expression of groundwater. During EIS surveys Big Footprint Swamp contained water at the end of the dry season, supporting aquatic fauna and providing water for other, non-aquatic fauna.

Lunette Creek is to the west of Big Footprint Swamp which is identified in the GDE atlas as having a high potential to rely on surface expression of groundwater. Discharge of ground water along the drainage line occurs during the wet season.

Lunette Swamp to the south of the BH6 west pit is identified in the GDE atlas as having a moderate potential for groundwater interaction; discharge of groundwater is possible when the water table rises during the wet season.

Namaleta creek, located further south of Lunette Swamp and BH6 pit, is identified in the GDE atlas as a low lying wetland along the creek with high potential for groundwater interaction, relying on surface expression of ground water.

Like Big Footprint Swamp, the two additional mapped areas of RE3.3.14 would be also classified as a coastal/subcoastal floodplain tree swamp with a high potential for reliance on surface expression of groundwater.

The proponent identified that ephemeral springs were present in areas south of the Skardon river arm south of BH1 pit. These springs were not identified in the EIS as GDEs and this was raised with the proponent in submissions. Their presence indicates that it is likely that other ephemeral springs could be present in the area

south of the Skardon River south arm and north of the proposed haul road to BH1 pit. The water monitoring plan for the project should include monitoring impacts (e.g. water level changes) on ephemeral springs.

4.5.1.10 Aquatic ecology surveys

Aquatic ecology surveys were originally undertaken for the EIS between 4 and 11 November 2014, corresponding to the late dry season. Follow-up surveys were undertaken between 31 January and 6 February 2015, corresponding to the early wet season (refer to Appendix B2 of the EIS for detailed results of the earlier surveys). A single aquatic ecology survey was also carried out for the SRBP in March 2015 (RPS, 2015).

An additional dry season survey was carried after publication of the EIS, from 11 to 15 June 2016 (Appendix B of the SEIS). This survey complemented previous surveys in the late dry and early wet seasons, and provided a temporal representation of aquatic ecological conditions for the project and surrounding area across six sites. At the time of the survey Big Footprint swamp and Lunette Swamp contained large amounts of water. AQ03 and AQ05 were on streams that had strong flows. AQ06 contained minor flow.

4.5.1.11 Aquatic freshwater flora

The proponent stated that melaleuca forests were the dominant vegetation on all wetland sites, native couch (*Paspalum* sp.), water chestnut (*Eleocharis dulcis*) and small water ribbons (*Triglochin dubia*) were also identified (none are species of conservation significance).

Lycopodiella limosa, listed as near threatened under the NC Act, has previously been recorded 50km east of the project site (Worley Parsons 2011b). Habitat for *L. limosa* includes wetlands and swamps on soft organic mud/organic sands substrate. The proponent considered it to have a moderate likelihood of occurrence as there was suitable habitat within wetland areas adjacent to the project site. However, it was not recorded in surveys.

Nine species were recorded in an additional early dry season survey in 2016: water chestnut (*Eleocharis dulcis*), *Eleocharis* sp., *Eriocaulon setacueum*, pipewort (*Eriocaulon* sp.), *Nitella* sp., native waterlily (*Nymphaea violacea*), lily (*Nymphoides* c.f. *aurantiaca*), lily (*Nymphoides* c.f. *exiliflora*), and frogmouth (*Philydrum lanuginosum*). The proponent concluded that the diversity of aquatic macrophyte species was generally low across the site.

4.5.1.11.1 Aquatic freshwater fauna

The early dry season aquatic ecology survey (SEIS Appendix B) identified the following freshwater fauna values:

- a total of 555 individuals from 37 macro invertebrate taxa from six sites sampled
- four different micro-crustaceans were identified
- a total of 469 individuals of fish from nine species from six sites sampled. AQ05 recorded the highest diversity of species – seven
- unnamed freshwater crabs were recorded in Big Footprint Swamp and Lunette Swamp. They had been previously recorded in Big Footprint Swamp and an un-named stream in the early wet season in 2015 - the EIS concluded that they are found in two swamp systems and one creek in proximity to the project from early wet to early dry but their abundance and distribution is thought to be variable
- a northern snake-necked turtle (*Chelodina oblonga*) wide distribution across tropical northern Australia and southern Papua New Guinea
- Macleay's freshwater snake (*Pseudoferania polylepis*) - wide distribution across tropical northern Australia and southern Papua New Guinea.

Although none of the aquatic species recorded were listed under state or federal legislation, some of the species, including the un-named freshwater crab, would be of scientific interest. This is in part due to the paucity of surveys in the region.

4.5.1.11.2 Stygofauna

The EIS relied on the stygofauna sampling carried out for the neighbouring Skardon River Bauxite Project. The SRBP's EIS stated that four morpho-species were found within two higher taxa Oligochaetes and Acarina and that all species recorded are likely to have broad environmental tolerances and be widely distributed in the southern Skardon River and Namaleta Creek catchment areas. Hence the EIS concluded that the likelihood of major impacts to stygofauna would be low because stygofauna are unlikely to be restricted to the project area, and also that as the area is dominated with a clay substrate it would be poor habitat for stygofauna.

The proponent states that given half of the monitoring for the FRC stygofauna study for the SRBP was undertaken within the Bauxite Hills project area (and the bores sampled aquifers associated with RE3.5.36b, which remains extensive in the wider region) the stygofauna monitoring undertaken was directly relevant for the project and further monitoring would be unnecessary. The results of the SRBP EIS show there is low diversity of taxa collected across both of the project areas and that this is likely to be similar across the wider region.

EHP's assessment against the Guideline for the Environmental Assessment of Subterranean Aquatic Fauna (Department of Science, Information Technology and Innovation, 2015) indicates that the level of survey undertaken for the project would be suitable for a pilot study and the findings of the study indicate that stygofauna are present and that habitat exists. Where a pilot survey confirms the presence of subterranean aquatic fauna a comprehensive survey is required.

4.5.1.11.3 Marine habitats

The proponent stated that the Skardon River and adjacent inshore and offshore areas encompass several marine habitats, including saltmarsh, mangroves, seagrass, rocky reef, oyster reef, coral reef and broad areas of intertidal and subtidal soft substrates. The project area itself contains saltmarsh, mangroves and wetlands (RE3.1.1a, RE3.1.3, and RE3.1.6 9). The saltmarsh/salt pans are part of the Skardon River–Cotterell River Aggregation.

Intertidal habitats surrounding the mouth of the Skardon River are dominated by sand beaches. Further into the estuary and river system, silty sands and muds dominate the intertidal substrate. This is accompanied by increasing mangrove habitat, declining sandy shores, ironstone banks and Casuarina dominated habitat. The river mouth and inner estuary systems contains extensive intertidal mud and sandbanks. As the river narrows, the banks become steeper, favouring mangroves.

The proponent summarised seagrass surveys carried out between 1986 and 2015 which identified several small patches of seagrass. Important seagrass beds were near the Skardon River mouth, and about 500m from the existing barge ramp at the Port of Skardon, and adjacent to the mangrove banks near the existing Port of Skardon. However, the Skardon River EIS identified seagrasses on the opposite river bank (approximately 230m away) and upstream of the proposed works along the southern bank (~500m) from the existing Port of Skardon barge ramp.

An additional marine plants survey was undertaken in 2016 concluded that two small areas of seagrass were located within the Skardon River, although none within the footprint of the project's infrastructure. This included the new locations proposed for the barge cyclone moorings. The survey concluded that seagrass areas mapped in previous studies were not there in 2016, indicating a transient establishment of seagrass in the river.

The proponent stated that the majority of subtidal benthic habitats within the Skardon River estuary are dominated by open bare substrates of silt, silty/sand, sand and rock (approximately 77%) with limited live benthic cover (mainly macroalgae). Rocky shoals and rubble fields provide suitable habitat for macroinvertebrates dominated by sponges, sea squirts and brown macro-algae. Several areas of oyster rock/reef have been identified adjacent to mangrove banks.

A detailed survey (Chartrand and Thomas, 2010) confirmed the absence of any benthic habitat other than bare sand within the ebb tide bar. Marine habitats in the transshipment area and the ebb bar near the mouth of Skardon River are described in more detail in section 4.8– Coastal processes of this assessment report.

4.5.1.11.4 Marine and estuarine fauna

The following threatened marine fauna (NC Act) are known or likely to occur at or near the project area, including the Skardon River and adjacent beaches north and south of the mouth of Skardon River and/or along the barge routes (Queensland Government data flfa EVNT v8):

- olive ridley turtle (*Lepidochelys olivacea*) - endangered- confirmed nesting records along the beach north and south of the mouth of the Skardon River
- loggerhead turtle (*Caretta caretta*) - endangered - highly likely to occur (feeding, not nesting)
- flatback turtle (*Natator depressus*) - vulnerable- confirmed nesting records along the beach north and south of the mouth of the Skardon River
- hawksbill turtle (*Eretmochelys imbricata*) - vulnerable- confirmed nesting records along the beach north and south of the mouth of the Skardon River
- green turtle (*Chelonia mydas*) – vulnerable - likely to occur (feeding, not nesting)
- estuarine crocodile (*Crocodylus porosus*) - vulnerable - found on project site
- dugong (*Dugong dugon*) - vulnerable - confirmed record in the Skardon River
- Indo pacific humpback dolphin (*Sousa sahalensis*) - near threatened - also known as Australian humpback dolphin: likely to occur in river and adjacent project activities
- Australian snubfin dolphin (*Orcaella heinsohni*), previously known as the Irrawaddy dolphin (*Orcaella brevirostris*) - near threatened - likely to occur in river and adjacent to project activities.

EPBC Act listed threatened marine species are summarised separately in section 0of this assessment report. All of the species listed above, except the estuarine crocodile, are also listed under the EPBC Act. No marine fauna field work was carried out as part of the EIS.

A Commonwealth Marine Area is designated approximately 80 nautical miles from the transshipment area in the

Gulf of Carpentaria. Ships would need to traverse the Marine National Park Zone and the Multiple Use Zone of the area but shipping is a permitted use within these zones. Also a Marine Bioregional Plan for the North Marine Region is relevant for all of the Gulf of Carpentaria and extends west to the Kimberley coast. These both highlight the significant marine conservation values present in the region. The EIS states that the conservation values are relevant to the project and that the listed marine species known or likely to occur in the project area are described in Section 6.5.4 of the EIS.

4.5.1.12 Weeds and pests

The proponent identified several weed species adjacent to disturbed sites of the neighbouring Skardon River project, namely on the Port of Skardon landing and the existing kaolin mine. Introduced weed species included *Hyptis suaveolens* (min weed) and *Stylosanthes hamata* (stylo).

Neither of these species is listed as a declared pest plant under the *Land Protection (Pest and Stock Route Management) Act 2002* (Land Protection Act) or as Weeds of National Significance (WONS).

The following introduced fauna species were present on the site:

- pigs (*Sus scrofa*)
- dingo/wild dog (*Canis lupus dingo*)
- feral cat (*Felis catus*)
- cane toad (*Rhinella marina*)
- Asian house gecko (*Hemidactylus frenatus*)
- cattle (*Bos* sp.).

Pigs, cats and dogs are classified as class 2 pests under the Land Protection Act.

4.5.2 Potential impacts

Potential impacts of the project are listed in Table 9 along with mitigation measures that were proposed in the EIS. The project would impact on remnant vegetation providing habitat for a diverse range of flora and fauna. The most significant impact would be on the Darwin stringybark woodland which has tree hollows that provide shelter, roosting and breeding habitat for threatened fauna, as well as food resources and breeding sites for prey species of threatened predators. The project layout was changed after EIS consultation so that impacts on mangrove communities and a lot of the HES wetlands have been avoided.

Table 9. Potential impacts on terrestrial and aquatic areas and proposed mitigation measures

Potential impact	Mitigation measures/commitments
Vegetation clearing	Clearing to be conducted in the dry season. Preclearance ecological surveys. Clear delineation of clearing areas for operators and supervisors. Sourcing of seed for rehabilitation from retained vegetation areas.
Dust impacts on adjacent vegetation	Progressive clearing and rehabilitation to minimise the total area of disturbance. Water trucks for dust suppression proposed.
Habitat for terrestrial flora and fauna	A species management plan would be implemented prior to project clearing and would stipulate management measures to be undertaken for species at risk. Preclearance ecological surveys - EHP notified if important species is found. Relocation of breeding places and fauna into adjacent habitat if found. Relocation of chocolate tea tree orchid (<i>D. johannis</i>) if found in pre clearance surveys of melaleuca dominated habitat. Notification procedure if native fauna are injured. Use of fallen logs and rocks in adjacent habitat areas. Speed restrictions on haul roads. Clearing conducted in the dry season. Clear delineation of clearing areas for operators and supervisors. Rehabilitation seed stocks sourced from retained vegetation areas. Progressive clearing and rehabilitation to minimise the total area of disturbance.

	The project was changed to reduce impacts on mangrove and melaleuca vegetation communities due to the agreement to use adjacent project's infrastructure.
Wetlands and freshwater flora and fauna	<p>ESCP and design of the pits would minimise sediment impacts from mined areas.</p> <p>Specific requirement for monitoring Big Footprint Swamp would be made in the project Water Management Plan (WMP), and the Receiving Environment Monitoring Program (REMP). If needed, direct management options would be implemented such as redirection of excess water to allow for the aeration of the melaleuca root zone in the dry season for example.</p> <p>Groundwater levels would be monitored in the WMP.</p> <p>Buffers would be maintained between mined areas and wetlands and the Skardon River.</p> <p>Progressive rehabilitation would occur and peak water levels would tend toward pre mining levels.</p> <p>The project was changed to reduce impacts on mangrove and melaleuca vegetation communities due to the ability to use adjacent project's infrastructure.</p>
Marine and estuarine flora and fauna and their habitats	<p>The project was changed to reduce impacts on mangrove and melaleuca vegetation communities due to an agreement to use adjacent project's infrastructure.</p> <p>EMP Appendix K of the EIS provides mitigation measures to address impacts.</p> <p>A Marine Monitoring Program is proposed which would monitor total suspended solids (TSS) and other water quality values, seagrass and other benthic communities, and impacts on marine fauna.</p> <p>Buffers would be maintained between mined areas and wetlands and the Skardon River.</p> <p>Groundwater levels would be monitored in the WMP.</p> <p>WQ monitoring program would be implemented.</p> <p>ESCP and design of the pits would minimise sediment impacts from mined areas.</p> <p>An exclusion zone of 500m was proposed in the EIS with spotter catchers to identify marine fauna entering the zone. Soft start was proposed for cyclone moorings originally proposed. EHP recommends that these measures be applied to the construction of the cyclone moorings proposed to be located outside of the ML.</p>

4.5.3 Cumulative impacts

Vegetation communities

The Skardon River catchment is within the relatively intact Cape York Bioregion. Both SRBP and Bauxite Hills projects propose to clear 2,614ha of Darwin stringybark woodland and forest (RE3.5.36b), about 3% of the total 810,279ha of this RE on western Cape York (adapted from Table 6-10 of the SEIS). However, current bauxite MLs cover 50% of this RE so the long-term, cumulative impact of mining on this vegetation type, and habitat for several threatened species, is significant. Many small mines have the same impact as a single big mine.

Mitigation and offsets for small projects need to consider the cumulative impact of all mining on the vegetation at a larger scale.

At the project scale, the configuration of the clearing for both projects would mean connectivity of habitats would be maintained.

Wetlands and aquatic flora and fauna

The proponent states that the combined impacts of the project and SRBP include the following:

- 33% (worst case) reduction in surface water runoff to Big Footprint Swamp during any combined years of mining operations
- potential localised cumulative impacts on small drainage lines and gullies west of BH6 east pit
- where peak water table is deep, mining has the potential to increase the height of the peak water table relative to pre-mining conditions but the EIS suggests this drawdown would be offset by a predicted increase in pool levels in particular years
- minor changes in pool levels of wetlands are expected but would be within the natural dynamic seasonal conditions. Potential net increase in groundwater discharge to Skardon River is estimated to be 7-8% but it is assumed that impacts would decrease after 2027 as rehabilitation takes place.

Marine habitat

The proponent stated that cumulative impacts to the marine environment associated with the joint development of this project and the SRBP may arise from increased boat traffic in the estuary and potential impacts to turbidity, erosion of benthic communities and banks, collision and noise impacts on marine fauna.

The SEIS provided a Skardon River Vessel Assessment (Royal Haskoning DHV, June 2016) exploring the impacts of vessel wake waves and propeller wash. The model was based on a single vessel but then stated that a worst case for combined impacts would be expected to be two vessels travelling from the wharf to the transshipment area in a convoy. Assuming that this could result in a doubling of TSS concentrations then the short peak TSS concentration of up to 50mg/l could occur. This would disperse within one hour to a concentration of less than 10mg/l and on the following tide would be reduced to less than 2mg/l. The assessment did not account for other vessels in the river straight after the convoy resuspending.

The proponent suggested that additional impacts to propeller wash impacts at the SRBP BLF would not exceed those accounted for in the SRBP EIS as a harder substrate is assumed to be present limiting erosion after soft sediments have been moved and suspended.

4.5.4 Assessment and conclusions

The project would share road and port infrastructure with the already approved SRBP. The change in the layout of the project would reduce impacts on mangrove and melaleuca vegetation communities. Clearing for duplicated roads and port facilities would no longer be necessary. The largest impact on vegetation communities and wildlife habitats would be the clearing of 1,425ha of *Eucalyptus tetradonta* woodland (RE3.5.36b).

The configuration of the clearing from both projects would mean connectivity of habitats would be maintained.

Terrestrial Flora

The proponent concluded that the chocolate tea tree orchid is likely to occur and there is suitable habitat on-site. The project would require clearing 7.9ha of suitable melaleuca habitat for a haul road. The melaleuca dominated habitat is also suitable habitat for a similar species *D. trilamellatum*. The proponent stated that the areas to be cleared would be inspected by a qualified specialist and if found, specimens would be translocated into adjacent suitable habitat.

The chocolate tea tree orchid is also listed as endangered under the EPBC Act and an assessment was carried out in section 4.7 of this report. Any offset or mitigation requirements for the species would need to be consistent with approval under the EPBC Act. EHP recommends that pre-clearance surveys be undertaken. If important species are found in the impact zone (including a dust impact area) they should be translocated into adjacent suitable habitat away from direct and indirect impacts. Relevant approvals under the NC Act would be required to be able to translocate any plants found.

Terrestrial Fauna

The proponent concluded that most threatened species were only potentially present in the project area. Only species that were present or considered likely to occur were given detailed assessment in the EIS. The proponent concluded that the project would not have significant residual impacts on any threatened species listed under the NC Act.

EHP disagreed with the likelihood of occurrence assessment for the red goshawk, masked owl, northern quoll, and the bare-rumped sheath-tail bat. EHP considers these threatened species are likely to occur in the project area because they are known from the region and there is suitable habitat on the project site. Several species are dependent on hollow-bearing trees that are a component of the woodlands across the project site. Hollows provide breeding habitat for some species and the woodlands in general provide foraging and breeding resources for prey species. In the case of the red goshawk, there is a confirmed occupied nest within 40km of the project site (R. Seaton pers. comm., EHP 2016) and part of the mining area overlaps with a 1km buffer around waterways which is thought to be preferred nesting habitat for the species.

EHP considers that clearing for the project is likely to reduce the extent of foraging habitat and, in the case of masked owl and bare-rumped sheath-tail bat, breeding habitat (tree hollows). Tree hollows also provide breeding habitat for terrestrial fauna that are prey for the red goshawk and masked owl.

These species are also threatened under the EPBC Act and EHP recommends that federal approval for the project should contain offset conditions for these species. EHP also recommends that pre-clearance surveys be undertaken prior to clearing habitat, targeting the red goshawk, masked owl, bare-rumped sheath-tail bat. If a breeding place is found, it should be avoided until the end of breeding or the nest should be moved. A Species Management Program under the NC Act, to manage impacts of interfering with animal breeding places, must be completed.

Any mitigation and offsets for these species would also provide benefits for the near threatened palm cockatoo that is known to occur in the woodlands. A Species Management Program under the NC Act should include measures to mitigate impacts on the palm cockatoo.

Wetlands

No direct impacts on wetlands are proposed but programs are proposed to monitor health of wetlands and respond with management if needed. The adequacy of the monitoring program and the number and placement of monitoring points is not confirmed. EHP requires that a revised monitoring program be completed before commencing mining works, including additional monitoring locations upstream and downstream of impact areas associated with haul roads and mine pits.

GDE springs were identified close to the originally proposed haul road to the BH1 pit. This would suggest that additional GDE springs could occur close to impact areas. A condition is required to ensure that surveys are undertaken to identify any springs, collect baseline data, and monitor any impacts. Groundwater models should be refined in order to consider potential impacts these on these springs.

Two newly mapped areas of RE3.3.14 were identified in the late dry season survey and included on SEIS Figure 6-3 and shown to overlap with the BH6 east pit. The proponent changed mining pit BH6 east boundary to avoid impacts on RE3.3.14. A condition is required to ensure that this area and the area of RE3.3.14 north of mining pit BH6 west are included in monitoring plans, for baseline and post mining, and management measures are put in place to ensure that impacts to these wetlands are avoided or minimised.

EHP recommends that conditions provide for specific monitoring of Big Footprint Swamp in the project WMP, and the Receiving Environmental Monitoring Program (REMP). Also conditions should require that direct wetland management options be implemented such as redirection of excess water to allow for the aeration of the melaleuca root zone in the dry season.

Marine ecology and coastal development

The proponent did not undertake specific surveys for marine fauna in the Skardon River but assumed the presence of a suite of species and committed to some management and mitigation measures.

Recommendations for managing impacts on marine and coastal values are included in Section 4.7 MNES and 4.8 Coastal Processes of this report.

Potential impacts on the marine environment would need to be managed. To this end, EHP requires an integrated marine monitoring and management program (IMMMP) which describes the approach to monitoring, reporting and management of the following values:

- Marine water quality including turbidity
- Sediment and substrate stability/characteristics
- Bed and bank stability
- Benthic communities including seagrass
- Mangroves
- Marine megafauna
- Marine introduced pests.

Any measured impacts on seagrasses and other marine plants would need to be mitigated, monitored and reported, and offsets may be required.

A tidal works application would be required for the construction of the proposed cyclone moorings. EHP requires information about the full suite of potential impacts, management and mitigation measures (see Appendix 6 of this report). Any potential offsets should be provided as required by the tidal works approval. An exclusion zone of 500m was proposed in the EIS with spotter catchers to identify marine fauna entering the zone and a soft start was proposed for pile driving construction works. These mitigation measures would need to be specified in the tidal works application for the construction of the cyclone moorings proposed to be located outside of the ML.

The EIS stated that cyclone moorings would be required for the project in addition to the cyclone moorings that would be required for the SRBP. Justification for why a duplicated cyclone mooring area is needed should be provided in the tidal works application.

4.6 State Environmental offsets

The proponent assessed the potential impacts of the project on prescribed environmental matters defined as MSES listed in schedule 2 of the Environmental Offsets Regulation 2014 (EO Regulation). Under schedule 1 of the EO Regulation, a resource activity carried out under an Environmental Authority under the EP Act is a prescribed activity for the purposes of the *Environmental Offsets Act 2014* (EO Act).

The proponent demonstrated that all reasonable on-site avoidance and mitigation measures have been applied to potential impacts of the project on MSES. The EO Act requires offsets to compensate for residual impacts on after all on-site avoidance and mitigation measures have been applied. The proponent identified the prescribed environmental matters under the EO Act that may be applicable to the project (Table 5-13 of Chapter 5 of the EIS).

Based on the EIS, SEIS and GIS shape files provided, EHP concluded that the following MSES would be impacted:

- regulated vegetation, i.e. vegetation within a defined distance from defining banks of a relevant watercourse (RE intersecting a watercourse)
- regulated vegetation that intersects with an area shown as a wetland on the vegetation management wetlands map (RE intersecting a wetland)
- a HES wetland
- a HEV wetland or watercourse
- protected wildlife habitat (habitat for an animal that is endangered or vulnerable wildlife or special least concern animal).

4.6.1.1 RE intersecting a watercourse & RE intersecting a wetland

Vegetation that is within 25m from the defining bank of a stream order 1 or 2 watercourse (shown on the VM Act watercourse map) is a MSES. Table 1 of the Queensland Environmental Offsets Policy – Significant Residual Impacts Guideline (SIG) states that clearing within 50m of the defining bank of a mapped wetland RE (in the Regional Ecosystem database) is a significant impact on MSES.

The haul road to BH1 pit would impact on an area of regulated vegetation 50m wide through two sections of waterways/wetland REs. In Table 2.1 of the SIG, clearing a wetland RE or watercourse RE of greater than 20m wide for linear infrastructure in a sparse RE is considered a significant impact.

Therefore the total clearing of 6ha of both MSES values (wetland RE and watercourse RE) would be a significant impact requiring an offset.

4.6.1.2 Wetland (HES wetland)

Under schedule 2 of the EO Regulation a HES wetland shown on EHP's map of referable wetlands; HEV wetlands and watercourses and/or a wetland protection area are MSES. The significant impact guidelines for wetlands and watercourses state that there is an impact on MSES if it is likely that the action would result in environmental values being affected in any of the following ways:

- areas of the wetland or watercourse being destroyed or artificially modified, or
- a measurable change in water quality of the wetland or watercourse—for example a change in the level of the physical and/or chemical characteristics of the water, including salinity, pollutants, or nutrients in the wetland or watercourse, to a level that exceeds the water quality guidelines for the waters, or
- the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected, or
- a substantial and measurable change in the hydrological regime or recharge zones of the wetland, e.g. a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland, or
- an invasive species that is harmful to the environmental values of the wetland being established (or an existing invasive species being spread) in the wetland.

Mining operations would be close to HES wetlands Bigfoot Swamp, Lunette Swamp and other wetlands (RE3.3.14). The proponent concluded that there would be no direct impacts on these wetlands. There may be changes in water levels in the wetlands caused by mining but these would be within normal ranges. EHP accepts this conclusion but highlights that, while modelled changes to water levels may be within the natural range, it is also the seasonal timing, frequency and duration of inundation that may influence impacts. Hence, EHP recommends conditions to ensure the protection of these HES wetlands. The proponent must note that if residual impacts would occur on HES wetlands after avoidance and mitigation measures have been applied, offsets would be required at a later stage.

4.6.1.3 Protected wildlife habitat

The proponent identified five terrestrial flora, nine terrestrial fauna and nine marine species listed as endangered and vulnerable under the NC Act with a possible or confirmed occurrence within the project area. All of the species, except the beach-stone curlew, are also listed as threatened under the EPBC Act. The black-footed tree-rat is listed under the EPBC Act but not under the NC Act.

The proponent concluded that there would be no significant residual impacts on MSES protected wildlife habitat. EHP accepts the conclusion in the EIS that the project would not result in a significant residual impact on habitat for the chocolate tea tree orchid, northern quoll, spectacled flying fox, false water rat, eastern curlew, beach stone-curlew, and estuarine crocodile, provided avoidance and mitigation measures were put in place. The proponent has proposed specific mitigation measures to reduce impacts on the northern quoll, such as imposing speed limits on haul roads. Preclearance surveys targeting the chocolate tea tree orchid would be required in areas of melaleuca habitat and if found the proponent would be required to comply with the NC Act protected plants legislation. Offsets may be required for unavoidable impacts on protected plants.

EHP is not satisfied that there is unlikely to be a significant residual impact on habitat for the red goshawk, masked owl and bare-rumped sheath-tail bat.

EHP considers that the loss of 1425ha of Darwin stringybark eucalypt woodland habitat would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that these species are likely to be in decline (EPB Act significant impact guidelines). It would also disrupt ecologically significant locations, particularly breeding habitat. Offsets for impacts on these species would be required under the EO Act.

However, all three species are also listed as threatened under the EPBC Act and an assessment of impacts is presented in section 4.7 of this assessment report. EHP recommends that the Australian Government impose a condition requiring offsets to compensate for the project impacts on these species. The proponent would need to submit an offsets proposal that is consistent with the EPBC Act Environmental Offsets Policy.

If the Australian Government imposes a condition requiring offsets for the same matter, the proponent would not be required to provide offsets under the EO Act for impacts on these species. Section 4.7 of this report has detailed species profiles for all species.

Marine species

All threatened marine species listed under the NC Act, with the exception of the estuarine crocodile, are also listed threatened under EPBC Act. An assessment was carried out in section 4.7 of this assessment report.

There is very little information about populations of these marine and estuarine species in the project area and there is also a lack of certainty about potential impacts of the project from the high level of vessel activity and disturbance in the Skardon River that would result from concurrent operation of the Skardon River and Bauxite Hills projects.

Notwithstanding management and mitigation measures, EHP concluded that there is likely to be an impact on the speartooth shark, dwarf sawfish, green sawfish, largetooth sawfish, dugong, Australian snubfin dolphin and the flatback, olive ridley and hawksbill turtles. However, the extent of habitat for these species is difficult to quantify and the EO Act requires offsets for significant impacts to habitat for MSES wildlife, not a direct impact to the species.

EHP recommends that the Australian Government impose a condition requiring offsets for impacts to marine species to compensate for the project impacts on these species. The proponent would need to submit an offsets proposal that is consistent with the EPBC Act Environmental Offsets Policy (refer to section 4.7). If this occurs, the proponent would not be required to provide offsets for this same matter under the EO Act.

4.6.1.4 Waterway providing for fish passage

Waterway barrier works are regulated under the *Fisheries Act 1994* (Fisheries Act) when barriers to fish movement, including partial barriers, are installed across waterways. The EIS stated that the haul road between BH6 east pit and BH1 pit would be designed so that no waterway barriers would be constructed.

The EIS concluded that the project would not have a significant impact on fish passage. The design and construction of the haul road between BH6 east and BH1 would be in accordance with *Austroroads – Guide to Road Design Part 5B – Open Channels, Culverts and Floodways* appropriate for wet season flows. The haul road crossings would allow for the natural movement of floodwaters allowing for fish passage.

EHP recommends that the proponent apply DAF's *Code for Self-assessable Development – Minor Waterway Barrier Works*, on the final design and confirm that the project would not result in any negative outcomes for fish populations. EHP is satisfied with the proponent's conclusions that there would not be a significant residual impact of waterway providing for fish passage if these design guidelines are adhered to.

4.6.1.5 Marine plants

Marine plants within the meaning of the Fisheries Act are classified as MSES. The EIS identified that potential impacts on the marine plants, mangroves and seagrasses would be largely avoided due to a revised project description provided in response to submissions and because of the opportunity to utilise infrastructure on the adjoining project site.

The originally proposed BLF, RORO and MIA area and associated haul road was removed from the project and therefore, the project would not impact on mangroves or salt marsh communities. The barging operations remain a project requirement and impacts on seagrass communities in the Skardon River remain uncertain. An Integrated Marine Monitoring Program would be required to be implemented to monitor the health of benthic plants and fringing mangroves to ensure their protection during the project and the adjacent project's operation.

In the SRBP EIS, surveys identified seagrass approximately 220m to 500m distant to the proposed wharf facility. However, the EIS concluded that there would be no significant impacts on the seagrass community due to vessel movements and increased turbidity. Prior to development, pre-clearing surveys would be undertaken to define the detailed distribution of seagrass within the proposed construction area and monitoring of water quality and the health of seagrass beds would be undertaken. DAF and EHP are satisfied that given the proposed monitoring of seagrass for both barging operations, no offsets are required at this stage. However, should significant impacts on seagrass occur due to project activities, offsets may be required at a later stage.

4.6.2 Conclusions and recommendations

Measures to avoid and mitigate impacts on MSES were demonstrated in the EIS.

Offsets are applicable for the project under the EP Act and EO Act for the unavoidable impacts on MSES including the clearing of habitat for protected wildlife species (red goshawk, bare-rumped sheath tailed bat), regulated vegetation (intersecting a watercourse), regulated vegetation (intersecting a wetland). These are summarised in Table 3 below and reflected in the recommended conditions in Appendix 1 of this report.

Section 14 of the EO Act states that the administering agency must consider any offset condition that has been imposed under another Act. Since the listed threatened terrestrial and marine species identified in Table 4 above are also listed as threatened under the EPBC Act, EHP recommends that DoEE impose a condition requiring offsets for substantially the same matters. Hence, the proponent would not be required to provide offsets under the EO Act. Refer to section 4.7 of this assessment report for the assessment of MNES offset requirements.

Offsets proposed under the EPBC Act would effectively account for offsets required under the EO Act. Any outstanding offsets for unavoidable impacts to MSES would need to be offset in accordance with the EO Act.

The proponent must note that regardless of the requirement under the EPBC Act, there are also requirements under the NC Act for interfering with any breeding places for NC Act listed species which requires management of impacts under a species management plan.

Table 10. Significant residual impacts on MSES requiring an offset

MSES	Description	Significant residual impact (ha) requiring an offset*
Regulated vegetation (of concern)	RE3.3.7/3.3.49b	1.9ha – cleared for linear infrastructure
Regulated vegetation (intersecting a watercourse or wetland) <ul style="list-style-type: none"> VMA Act watercourses/wetlands 	RE3.3.49b/3.3.9 RE3.3.49b/3.3.22a/3.3.64	6ha of watercourse vegetation associated with creek crossings of the haul road between BH6 east and BH1 haul road
Wetland (HES Wetland) <ul style="list-style-type: none"> a HES wetland shown on the map of referable wetlands 	Same as above: RE3.3.49b/3.3.9 RE3.3.49b/3.3.22a/3.3.64	6ha of watercourse vegetation associated with creek crossings of the haul road between BH6 east and BH1 haul road
Protected wildlife habitat:** <ul style="list-style-type: none"> habitat for an animal that is endangered, vulnerable or special least concern wildlife 	<ul style="list-style-type: none"> red goshawk (endangered) bare-rumped sheath tail bat (endangered) masked owl (vulnerable) 	Total terrestrial wildlife habitat impacted: 1425ha* Further surveys are required to identify actual protected wildlife habitat per species.

* Areas based on final GIS files provided to EHP after the EIS was completed, including final haul road alignment.

** The species listed were also identified as MNES and were assessed in accordance with the EPBC Act. Any offsets required for these matters would be decided and administered under the EPBC Act.

4.7 MNES

EIS documents used to assess MNES included EIS Chapter 5 – Terrestrial and freshwater ecology, EIS Chapter 6 – Marine ecology, EIS Chapter 7 – Matters of national environmental significance, EIS Chapter 19 – Coastal environment, EIS Appendices B1, B2, B3 and C containing specialist reports on offsets, terrestrial and aquatic ecology and MNES and the SEIS submitted by the proponent as a response to EIS submissions.

This section assesses the EIS conclusions about the impacts of the proposed project on MNES. Specialists in the Department of Environment and Heritage Protection (EHP) and the Department of Environment and Energy (DoEE) have considered the information provided in the EIS and other relevant information to assess the likelihood of occurrence and impacts on MNES.

Recommendations are provided. DoEE will consider these recommendations and decide the acceptability of identified and potential impacts on MNES, and the conditions that might apply to an approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

4.7.1 Existing environmental values (MNES) identified in the EIS

The following section is a summary of the predicted occurrence of MNES relevant to the project based on database searches, field surveys and habitat assessments documented in the EIS. Databases searched included the EPBC Act Protected Matters Search, Queensland Wildlife Online flora and fauna database, Queensland Museum Zoology database and Birdlife Australia New Atlas database (all using a 25km radius from the central point of the project area).

4.7.1.1 Threatened ecological communities

The EPBC Act Protected Matters Search indicated that no threatened ecological communities (TEC) occur in the project area. The closest mapped TECs are springs in '*The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin*', more than 50km from the site.

4.7.1.2 Terrestrial Flora

Five threatened terrestrial flora species were predicted to occur in the project area and surrounds based on database searches. Based on field surveys and habitat assessments, the EIS Table 7-15 concluded that the following species were likely or had the potential to occur in the project area.

- *Cepobaculum carronii* – vulnerable
- *Dendrobium bigibbum* (also listed as *Vappodes lithicola* and *Vappodes phalaenopsis*) – vulnerable
- *Dendrobium johannis* (Chocolate tea tree orchid) – vulnerable.

Of these species, only *Dendrobium johannis* was considered likely to occur because it is known from the broader area and the site contains suitable wetland habitats. No threatened flora species were recorded during field surveys.

4.7.1.3 Terrestrial Fauna

Ten threatened fauna species were predicted to occur within 25km of the project area based on database searches. Using results of field surveys (see section 7.7.1.2, EIS Chapter 7 for survey methods description) and habitat suitability assessments, the EIS Table 7-15 concluded that the following seven species are either known, likely to occur or have potential to occur in the project site:

Birds

- *Erythrotriorchis radiatus* (red goshawk) – vulnerable
- *Numenius madagascariensis* (eastern curlew) – critically endangered
- *Probosciger aterrimus macgillivrayi* (palm cockatoo) – vulnerable
- *Tyto novaehollandiae kimberlii* (masked owl (northern subspecies)) – vulnerable

Mammals

- *Dasyurus hallucatus* (northern quoll) – endangered
- *Mesembriomys gouldii rattoides* (black-footed tree-rat (north Queensland)) - vulnerable
- *Saccolaimus saccolaimus nudicluniatus* (bare-rumped sheath-tail bat) – critically endangered

The palm cockatoo and the black-footed tree-rat were both recorded during field surveys. The palm cockatoo was listed as vulnerable under the EPBC Act after the project was declared a controlled action. It did not require assessment but the EIS included information on the species.

Bat surveys identified a call from *Saccolaimus* sp. which was not identified to species level.

Section 7.8.1.2 of the EIS provided descriptions of the species classed as known and likely to occur namely: palm cockatoo, black-footed tree-rat and the chocolate tea tree orchid.

4.7.1.4 Migratory birds

Twenty bird species listed as migratory under the EPBC Act were identified in database searches as potentially occurring in the project area. The following nine species were recorded during field surveys:

- *Pandion cristatus* (eastern osprey)
- *Numenius phaeops* (whimbrel)
- *Actitis hypoleucos* (common sandpiper)
- *Gelochelidon nilotica* (gull-billed tern)
- *Sternula albifrons* (little tern)
- *Rhipidura rufifrons* (rufous fantail)

The following six species were considered to potentially occur:

- *Fregata ariel* (lesser frigatebird)
- *Tringa nebularia* (common greenshank)
- *Gallinago hardwickii* (Latham's snipe)
- *Cuculus optatus* (oriental cuckoo)
- *Apus pacificus* (fork-tailed swift)
- *Hirundo rustica* (barn swallow).

Section 7.8.1.2 of the EIS provides descriptions of the species known to occur in the project site.

4.7.1.5 Marine fauna

Twenty three marine species were predicted to occur within 25km of the project area based on database searches. Fourteen are listed as threatened and 22 are listed as migratory. The following four of these species are known to occur in the area:

- *Natator depressus* (flatback turtle) – vulnerable/migratory
- *Orcaella heinsohni* (Australian snubfin dolphin) - migratory
- *Sousa chinensis* (Indo-Pacific humpback dolphin) - migratory
- *Crocodylus porosus* (Estuarine crocodile) - migratory

Using results of field surveys (see Tables 5.2 and 5.3, EIS Chapter 5 for survey methods description) and habitat assessments the EIS concluded that the following species were considered likely to occur:

- *Chelonia mydas* (green turtle) – vulnerable/migratory
- *Eretmochelys imbricata* (hawksbill turtle) – vulnerable/migratory
- *Lepidochelys olivacea* (olive ridley turtle) – endangered/migratory
- *Glyphis glyphis* (spear-tooth shark) – critically endangered
- *Pristis clavata* (dwarf sawfish) – vulnerable/migratory
- *Pristis pristis* (freshwater sawfish) – vulnerable/migratory
- *Pristis zijsron* (green sawfish) – vulnerable/migratory
- *Anoxypristis cuspidata* (narrow sawfish) - migratory

The EIS considered that the following four species had potential to occur:

- *Caretta caretta* (loggerhead turtle) – endangered/migratory
- *Orcinus orca* (killer whale) - migratory
- *Dugong dugon* (dugong) - migratory
- *Manta alfredi* (coastal manta ray) - migratory

Section 7.8.1.2 of the EIS provides descriptions of most of these species.

4.7.1.6 Conclusion on description of values

EHP considers that, based on information provided in the EIS documentation and submissions made on the EIS, that the MNES in the project area have been adequately identified and described in the EIS.

The EIS concluded that species that were unlikely to occur or had the potential to occur in the project site were not considered to be at risk of impacts from the project and were therefore not subject to impact assessment. The categorisation of species as potentially occurring was a topic in submissions and these species are addressed in the following section.

4.7.2 Potential impacts on MNES

The process of impact assessment used in the EIS was to initially establish likelihood of occurrence of threatened species. On instruction from DoEE, the EIS only assessed the impacts of the project on species that are considered likely to occur, or are known to occur, in the area.

Section 5.6.2.2 of the EIS states that the EIS adopted a conservative approach to predicted occurrence of conservation significant fauna species. Species that may occur on site were assumed to be present unless evidence to the contrary exists. Despite this initial approach, only the black-footed tree-rat was considered in impact assessment. After assessment, other species were given a potential likelihood rating and the EIS concluded that the project would not significantly affect these species.

Overall, the EIS did not present evidence to rule out the presence of good quality habitat in the project area for species that are known from the area, even if they were not recorded during EIS surveys. EHP does not consider that assessments of significance should rely on records of threatened species in remote, poorly surveyed areas. A lack of records is as likely to be from lack of survey effort in area as it is to be a result of the species really not being present. Assessments of significance should focus on the presence of habitat. Similarly, DoEE focusses on the presence of habitat when making decisions about project impacts on threatened species.

The following assessment includes fauna species that EHP considers are likely to occur in area because habitat is present.

4.7.2.1 Threatened ecological communities

There are no EPBC Act threatened ecological communities near the project site.

4.7.2.2 Threatened flora

The EIS provides a significant impact assessment only for *Dendrobium johannis* (chocolate tea tree orchid) because it was considered likely to occur: it is known from the broader area and the site contains suitable wetland habitats including melaleuca wetlands and fringing habitats. The species was not recorded in field surveys in the proposed clearing footprint of the project.

The EIS concluded that although 7.9ha of *Melaleuca* dominated habitat for the species would be cleared for infrastructure, plants found during pre-clearing survey will be translocated to the large areas of suitable habitat being retained on site, and the project will result in only minor impacts on the species.

EHP is satisfied that the project is unlikely to affect listed threatened flora species. However, the EIS states that pre-clearing surveys will be undertaken as part of the mitigation strategies to identify any listed flora species. EHP supports this approach and recommends that the approval should contain a condition that requires pre-clearing surveys at each stage of mine development.

4.7.2.3 Terrestrial fauna

The project will result in progressive clearing of 1425ha of *Eucalyptus tetradonta* woodland in the mining areas and a total of 1433ha for the whole project, including infrastructure. EHP considers that the woodland is likely to contain breeding (tree hollows) and foraging resources that are shared by several threatened species. EHP considers that habitat is present in or around the project site, or both, for the following threatened species:

Birds

- *Erythrotriorchis radiatus* (red goshawk) – vulnerable
- *Tyto novaehollandiae kimberlii* (Masked owl (northern)) – vulnerable

Mammals

- *Mesembriomys gouldii rattoides* (black-footed tree-rat) – vulnerable
- *Dasyurus hallucatus* (northern quoll) – endangered
- *Saccolaimus saccolaimis nudicluniatus* (bare-rumped sheath-tail bat) – critically endangered

The EIS concluded that there were no impacts on any threatened species. The EIS argues that there is sufficient habitat around the project site that the amount that would be cleared is not significant.

Black-footed tree-rat (*Mesembriomys gouldii rattoides*)

EPBC Act Listing Status: Vulnerable

Information provided in the EIS:

The EIS survey methods used for the black-footed tree-rat included a baited cage trap and a camera at eight

sites, daytime searches at trap sites and through the site in appropriate habitat, minimum 30 minute (2 people) early evening spotlight surveys at trap sites and night-time track surveys.

In a species description, the EIS notes that the black-footed tree-rat has been recorded mostly from eucalypt woodlands and dens mostly in tree hollows and sometimes dense foliage (particularly of *Pandanus* species).

The black-footed tree-rat was not recorded during EIS surveys but the EIS notes that it was caught in the surveys carried out for the adjacent Skardon River Bauxite Project EIS. Despite the fact that the project site contains the eucalypt woodland that is acknowledged habitat the species, and that it has been caught recently nearby, Table 5.9 states only that 'Possible habitat, including denning habitat consisting of *E. tetradonta* woodlands and tree hollows' exists within the project area.

The project would involve clearing a total of 1434ha of vegetation that is regarded black-footed tree-rat habitat. Of this total, 1425ha is *Eucalyptus tetradonta* forest and woodland. The EIS states that threats to the species include habitat loss and fragmentation, inappropriate fire regimes and feral cat predation, in addition to grazing.

Table 5-16 of the EIS provides an assessment of project impacts against significant impact criteria. Under all criteria it concludes that the project is unlikely to affect the species and no offsets are proposed under the EPBC Act. The basis for this conclusion is primarily that habitat remains widespread in the surrounding region.

EHP Assessment:

Distribution and population

1. The distribution of the black-footed tree-rat is poorly known in north Queensland. It has been recorded mostly from eucalypt forests and woodlands on the east coast. There are some records across Cape York Peninsula, around Mungkan Kandju National Park, which is well south of the project site. However, the species is present. It was recorded during recent EIS surveys for the adjacent Skardon River project.

Habitat

2. The black-footed tree-rat occurs in eucalypt forests and woodlands, especially where tree hollows are plentiful. It dens mostly in these hollows but also in dense vegetation like *Pandanus* sp.

Population in development area and region

3. The *Environmental Reporting Tool* (Commonwealth of Australia, 2015) indicates that habitat for the species is likely to occur where the project is located.
4. The Queensland Wildnet database has recent records 30km east of Weipa.
5. The *Approved Conservation Advice for Mesembriomys gouldii rattoides (black-footed tree-rat (north Queensland))* (Threatened Species Scientific Committee, 2015) lists fire and loss of habitat and fragmentation as most likely causes of decline. Predation by cats and dingos, impacts of invasive grasses and habitat degradation by livestock and feral animals are plausible but undemonstrated factors. No threat abatement plans have been identified that are relevant to management of the black-footed tree-rat. The following threat abatement plans would be relevant to management of the black-footed tree-rat:
 - *Threat abatement plan for predation by feral cats* (Department of the Environment, 2015).
 - *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by five listed grasses* (Department of Sustainability, Environment, Water, Population and Communities, 2012).

Impacts of the proposed action

6. The main impact of the project would be clearing of 1434ha vegetation, mostly *Eucalyptus tetradonta* woodland, which is foraging habitat and potentially breeding habitat for the black-footed tree-rat.
7. Altered fire regimes, from increasing development of the area, may also impact on habitat.

Mitigation of impacts

Land clearing

8. Clearing areas to be delineated so operators avoid disturbance of adjacent areas.
9. A Significant Species Management Plan would be written and implemented before clearing for management of threatened species.
10. Pre-clearing surveys conducted using a spotter catcher.

11. Vegetation clearing to be conducted in the dry season to avoid the breeding season of several species, however this mitigation may not apply to the black-footed tree-rat as it breeds throughout the year although it may peak in the late dry season.

Site rehabilitation

12. As part of site rehabilitation some hollow-bearing trees would be felled and relocated to rehabilitation areas to provide immediate breeding habitat.
13. Rehabilitation would be progressive and involve provision of nest hollows and microhabitat features such as trees and logs.

Habitat fragmentation

14. Fauna crossings would be built to assist fauna movement between habitats.
15. Buffers of at least 100m would be provided between mine pits and sensitive areas such as wetlands and riparian vegetation.

Mortality

16. Vehicle speed limits would be put in place in higher risk areas for vehicle strike, such as near wetlands and waterways.

Fire

17. A Fire Management Plan would be prepared focussing on managing fuel loads and putting in place appropriate fire regimes to maintain biodiversity while minimising risk of bushfire.

Conclusion

The project area is dominated by eucalypt forests and woodlands that are known habitat for the black-footed tree-rat and the species has been recorded recently in the project area using camera surveys.

The *Survey guidelines for Australia's threatened mammals* (Commonwealth of Australia, 2011) do not provide recommendations for locating the black-footed tree-rat, but the effort required for an uncommon species would be higher than the standard procedures used in this EIS. The Skardon River project happened to record one individual while conducting surveys for the Northern Quoll. They used 45 remote cameras across the Skardon River Bauxite project site compared to only 8 cameras for this project site. Higher trapping effort may have produced more records for the species in the area.

Table 5.16 in the EIS provides a significant impact assessment that focusses on presence of an important population. Against all criteria it concludes that the project would have no impact on the black-footed tree-rat and that an important population is unlikely to exist in the area. EHP disagrees with these conclusions. Given that the recent record of the species in the Skardon River bauxite mine site is the most northern Cape York record in available databases, the population in this area represents the most northerly known extent of the range.

EHP considers that regardless of the number of individuals caught during surveys or the presence or absence of an 'important' population, the species is present and the mine area would directly affect 1434ha of its habitat.

EHP considers that there is a high likelihood that the woodland that is to be cleared would contain hollow-bearing trees. Hence, there is a high probability that the project would result in an impact on black-footed tree-rat habitat because of the loss of nesting and roosting resources. EHP recommends that the proponent be required to survey and map breeding and foraging habitat for this species as it is confirmed as present in the area.

Red goshawk (*Erythrotriorchis radiatus*)

EPBC Act Listing Status: Vulnerable

Information provided in the EIS:

The EIS states that the project site contains eucalypt forests and woodlands adjacent to the Skardon River that may be breeding and foraging habitat for the red goshawk. *Eucalyptus tetradonta* woodland (ground-truthed RE3.5.2) would be cleared to create mine pits. The EIS states that it is unlikely that any breeding habitat would be affected because no large nesting sites were observed.

The bird survey methods used in the EIS that apply to the red goshawk included morning and afternoon bird surveys at trap sites totally 120 minutes per site, and incidental observations during the course of EIS work.

The species was not recorded during EIS surveys but the bird survey methods used in the EIS assessment were not tailored for threatened species, only general methods used in quadrat based fauna surveys. Few of these fauna survey sites were in areas that the EIS recognised as higher value for the red goshawk. The effort applied

is not sufficient to draw conclusions about the presence of red goshawk in an area and was not consistent with the recommendations for detecting the red goshawk in the *Survey Guidelines for Australia's Threatened Birds; EPBC Act survey guidelines 6.2* (Department of the Environment, Water, Heritage and the Arts (DEWHA), 2010). EHP suggests that even the guidelines underestimate the time required to detect red goshawk in an area.

The EIS stated that the area provided some habitat for the species and the red goshawk was given a 'potential' likelihood of occurrence. With only a potential likelihood of occurrence it was not considered further in impact assessment.

EHP Assessment:

Distribution and population

1. The red goshawk is endemic to Australia and sparsely distributed in coastal and sub-coastal areas from the Kimberley to northeast NSW. The range includes the entire Cape York Peninsula. The distribution is partly fragmented in the heavily settled east coast areas but elsewhere it is not severely fragmented.

Habitat

2. The red goshawk occupies extensive woodlands and forests with a mosaic of vegetation types that are open enough to allow fast manoeuvring flight. Foraging areas contain permanent water, are fertile and biologically rich with large bird populations. The species forages in open forest and along ecotones. Breeding habitat for the red goshawk is a subset of favoured foraging areas that contains tall stands of trees typically within 1km of permanent water. In north Queensland, the species occurs in extensive, uncleared mosaics of native vegetation that contain a mix of eucalypt, ironbark and bloodwood species. The species is known to range approximately 10km from nests.

Population in area and region

3. There are thought to be approximately 65-70 breeding pairs of red goshawk in Cape York.
4. There is a red goshawk breeding record 40km south of the project area and also records from the Steve Irwin Wildlife Reserve.
5. The species was not found during EIS surveys however, given the site is within the known range for the species, there are nearby records, and suitable habitat on site, the species is likely to be present.
6. Threats to the species identified in the *Approved Conservation Advice for Erythrorhynchus radiatus (red goshawk)* (Threatened Species Scientific Committee, 2015) that are relevant to this assessment include vegetation clearing leading to habitat fragmentation and degradation, the loss of hollow-bearing trees that provide breeding habitat for prey, and habitat loss due to altered fire regimes. There are no threat abatement plans that have been identified as relevant for management of the red goshawk.

Impacts of the proposed action

7. The EIS stated that there is potential for red goshawk to forage in woodlands (RE3.5.2) and 1425ha of this habitat would be cleared for the mine.
8. A simple analysis of GIS layers shows about 260ha of this vegetation is within 1km of waterways in ML20676 and ML20688. The EIS acknowledges this as 'primary' habitat for the species in the project area. The species forages over large areas, and woodland further than 1km from water would contain breeding habitat for prey species.
9. The EIS states that the project would have minimal impact on riparian vegetation which is the 'primary' habitat for the species.
10. A factor that is not considered in the EIS is the potential impact of general disturbance of breeding pairs caused by mining, not just the physical removal of habitat. Experts have suggested that breeding pairs may only tolerate a certain amount of disturbance in their home range. Therefore, a potential impact of the project is abandonment of nests around the mine site. This impact has not been quantified.
11. The EIS considers that the species only has potential to be there (based on likelihood of occurrence) and hence was not considered in the impact assessment.

Mitigation of impacts

Land clearing

12. Retention of breeding places in situ where possible.
13. Clearing areas to be delineated so operators avoid disturbance of adjacent areas.

14. A Significant Species Management Plan would be written and implemented before clearing for management of threatened species, including raptor species in general.
15. Pre-clearing surveys conducted using a spotter catcher.
16. Installation of nest boxes and hollow logs in retained habitat.
17. No clearing buffers would be established around raptor nests – although there is still a risk that disturbance may result in birds abandoning areas.

Site rehabilitation

18. As part of site rehabilitation some hollow-bearing trees would be felled and relocated to rehabilitation areas to provide immediate breeding habitat.
19. Rehabilitation would be progressive and involve provision of nest hollows and microhabitat features such as trees and logs.

Habitat fragmentation

20. Buffers of at least 100m would be provided between mine pits and sensitive areas such as wetlands and riparian vegetation.

Fire

21. A Fire Management Plan would be prepared focussing on managing fuel loads and putting in place appropriate fire regimes to maintain biodiversity while minimising risk of bushfire.

Conclusion

The project site is within the range of the red goshawk and there are records of the species in the region. The species was not found during EIS surveys for this project however the survey methods were not comparable with the recommendations under the EPBC Act survey guidelines.

Eucalyptus tetradonta woodland provides breeding and foraging habitat for the species. It contains large trees suitable for nesting and tree hollows that support breeding of prey species. Birds are a large part of the red goshawk diet and tree hollows provide nests for species such as parrots and lorikeets, as well as species that feed on nectar from sources like the profuse blossom of large eucalypts.

The EIS acknowledges that the site contains habitat for the species, but that the 'primary' habitat for the species is within 1km of permanent water. While pairs typically nest within 1km of water (*National recovery plan for the red goshawk Erythrotriorchis radiatus* (Queensland Department of Environment and Resource Management, 2012) they also forage over a large areas (up to 200km²). Considering only the potential nesting areas within 1km of permanent water there is still a large area that would be cleared in ML20688 and ML20676. Clearing is recognised as a threat to the species, in addition to fire which is also a potential impact of development of the area (Approved Conservation Advice for *Erythrotriorchis radiatus* (red goshawk) (Threatened Species Scientific Committee, 2015)).

The palm cockatoo shares the same woodland and tree hollow resources as other threatened species, including the red goshawk. Because the palm cockatoo was seen several times during surveys, the EIS acknowledges that 'the tetradonta woodlands and fringing melaleuca forests in the Project site and surrounding area provide foraging and breeding habitat for this species. Hollow bearing trees provide nesting sites for this species'. In the case of the red goshawk the EIS conclusion was that the area contains only potential habitat.

Based on what is known about the species, that the project site is in the known range of the species, there are records nearby, and the fact that the project site contains suitable habitat, the red goshawk should be regarded as likely to occur for the purposes of assessment (based on the criteria used in Section 5.4.4.3 of the EIS). Because the project site contains vegetation that is habitat for the species and that the project would involve clearing this habitat, EHP considers that there is the potential that the project would impact on this species.

Masked owl – (*Tyto novaehollandiae kimberlii*)

EPBC Act Listing Status: Vulnerable

Information provided in the EIS:

The EIS stated that the project area does provide some suitable habitat for the masked owl in woodlands, including tree hollows for nesting. However, the EIS stated that there are no recent records of the masked owl from Cape York. The Action Plan for Australian Birds shows a single record near Aurukun, 170km south of the project site. The species has not been recorded in the Weipa region despite extensive recent surveys for development projects.

The bird survey methods used in the EIS that apply to the masked owl included minimum 30 minute (2 people) early evening spotlight surveys trap sites, night-time track surveys, and diurnal bird surveys, morning and afternoon, at trap sites totalling 120 minutes per site. Non-targeted surveys were also conducted while undertaking survey work for other species.

The species was not recorded during EIS surveys. The EIS bird survey methods included general methods used in quadrat based fauna surveys. The effort applied was not sufficient to draw conclusions about the presence of masked owl in an area and was not consistent with the recommendations for detecting the masked owl in the *Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guideline 6.2* (Department of the Environment, Water, Heritage and the Arts (DEWHA), 2010). The guidelines recommend call playback as the most likely method to yield results because the species is nocturnal and cryptic.

The EIS stated that as there are no records for the species in the wider region and there is extensive similar habitat available the project is unlikely to have significant impacts on the masked owl. The masked owl was considered as only potentially present. Therefore the EIS concluded that the project would not impact on the species and no offsets were proposed.

EHP Assessment:

Distribution and population

1. The distribution of the masked owl is poorly known. The known range of the species includes three suggested subpopulations; the Kimberley region, Northern Territory and Cape York. In Queensland it occurs along the southern rim of the Gulf of Carpentaria, Cape York Peninsula and south to the Atherton Tablelands.

Habitat

2. In the Northern Territory the masked owl mainly occurs in eucalypt tall open forest (especially those dominated by *Eucalyptus miniata* and *E. tetradonta*) but also roosts in monsoon rainforests and forages in more open vegetation types. Generally, the species has been recorded from riparian forest, rainforest, open forest, Melaleuca swamps and around mangrove edges.
3. The species has a large home range. Evidence from the southern subspecies suggests a non-breeding home range of 10km². Within this home range the species requires tall trees with large hollows for nesting. The species feeds in open woodland on small to medium-sized mammals. Tree hollows also provide habitat for mammalian prey species.

Population in development area and region

4. The Australian Government's Species Profile and Threats Database (SPRAT) indicates the project occurs within the indicative distribution of the species.
5. The Queensland Wildlife Online fauna database does not contain records of the species on western Cape York Peninsula. The Action Plan for Australian Birds has a single record near Aurukun.
6. Scarcity of preferred foods, small to medium-sized mammals, is a likely cause of decline of the species. The impact of fire on the availability of large trees with hollows for nesting may also contribute to low numbers. The masked owl has also been affected by broad-scale changes in the environment caused by livestock and feral animals grazing and also impacts on invasive plants, particularly pasture grasses. There are no threat abatements plans relevant to the masked owl.

Impacts of the proposed action

7. The project would result in clearing of 1425ha of *Eucalyptus tetradonta* woodland, nesting habitat for the species and breeding and foraging habitat for their preferred, small to medium-sized mammal prey. Masked owls forage in open habitats for this prey.
8. Given a likely cause of decline of the masked owl is declining prey populations in northern Australia, an activity that removes not only nesting habitat for the masked owl, but habitat for a range of potential prey species would affect the local population.
9. Other impacts include disturbance from light, noise and vibration which may influence breeding and foraging behaviour; dust generated by the mine, which may further reduce foraging grounds by impacting vegetation communities; mortality due to construction activities and vehicle strike; and increased fire frequency related to development of the area.
10. The EIS concludes that the project is unlikely to have a significant residual impact on the masked owl because it has not been recorded in the project area and there are no recent records on Cape York. The EIS also stated that project impacts would be minor and there is extensive habitat surrounding the site.

Mitigation of impacts

Land clearing

11. Clearing areas to be delineated so operators avoid disturbance of adjacent areas.
12. A Significant Species Management Plan would be written and implemented before clearing for management of threatened species.
13. Pre-clearing surveys conducted using a spotter catcher.
14. No clearing buffers would be established around raptor nests – although there is still a risk that disturbance may result in birds abandoning areas.

Site rehabilitation

15. As part of site rehabilitation some hollow-bearing trees would be felled and relocated to rehabilitation areas to provide immediate breeding habitat, in addition to provision of nest boxes for particular species requirements.
16. Rehabilitation would be progressive and involve provision of nest hollows and microhabitat features such as trees and logs.

Habitat fragmentation

17. Buffers of at least 100m would be provided between mine pits and sensitive areas such as wetlands and riparian vegetation.

Fire

18. A Fire Management Plan would be prepared focussing on managing fuel loads and putting in place appropriate fire regimes to maintain biodiversity while minimising risk of bushfire.

Conclusion

*The approved conservation advice for *Tyto novaehollandiae kimberli* masked owl (northern)* (Threatened Species Scientific Committee, 2015) states that a threat to the species is the reduction in the availability of large trees and hollows as a result of a more intense, frequent and extensive fire regime. Hollows in mature eucalypts that may occur throughout the project site represent the most important microhabitat feature that may be lost as a result of clearing.

The EIS did not provide specific information about presence of hollow-bearing trees in the eucalypt woodland. The EIS stated that mitigation of impacts on hollow dependent species would be the use of a spotter catcher in pre-clearing surveys to identify potential tree hollows used for nesting or roosting.

EHP considers that the project area contains suitable masked owl habitat and this should be verified prior to clearing. Because the project site contains vegetation that is habitat for the species and that the project would involve clearing this habitat, particularly breeding habitat, EHP considers that there is the potential that the project would impact on this species.

Bare-rumped sheathtail bat (*Saccolaimus saccolaimus nudicluniatus*)

EPBC Act Listing Status: Critically endangered

Information provided in the EIS:

The EIS stated that the species was possibly recorded using acoustic methods but could not be positively identified. Suitable foraging habitat occurs throughout the project area and larger hollow bearing trees, including *E. tetradonta* with which the species has been associated in the Northern Territory, are present.

The EIS survey methods used for the bare-rumped sheathtail bat included Anabat surveys carried out over 24 nights (over two seasons) and fifteen nights of harp trapping (over two seasons) at 6 sites. For a large area, the survey effort was less than the minimum recommended in the *Survey guidelines for Australia's threatened bats* (Commonwealth of Australia, 2010). Incidental observations were recorded during the fauna survey period.

The bare-rumped sheathtail bat was considered as only potentially present. Therefore the EIS concluded that the project would not impact on the species and no offsets were proposed. However, the EIS acknowledges that the species may be present in the region and recommends implementing mitigation measures to avoid or minimise potential impacts on the species.

EHP Assessment:

Distribution and population

1. The bare-rumped sheath-tail bat is distributed across northern Australia, including Cape York Peninsula. One of the most recent records of the species is from the east coast at Iron Range, around the same latitude as Weipa.
2. Not enough is known about the species to draw conclusions about whether its distribution is continuous or fragmented.

Habitat

3. The bare-rumped sheath-tail bat occurs mostly in lowlands, typically in woodland, forest and open environments. The species roosts and breeds in deep hollows of eucalypts, including *E. tetradonta*. Roosts at Iron Range in Queensland were in *E. tetradonta* dominated woodland with subdominants bloodwoods.
4. There is only anecdotal information about foraging habitat, based on habitat around roost sites. It is suggested the species may forage over habitat edges.

Population in development area and region

5. The *Environmental Reporting Tool* (Commonwealth of Australia, 2015) indicates that habitat for the species is likely to occur where the project is located.
6. The nearest records of the species are from Iron Range on the east coast of Cape York. Given that it occurs at low density, cannot be reliably identified using acoustic detection methods, and is difficult to catch, its presence in the project area cannot be ruled out.
7. Like the biology of the species, the threats facing the bare-rumped sheath-tail bat are poorly known. The Species Profile and Threat database (DoEE, 2017) lists habitat loss from agricultural and urban development as one known threat. Likely threats include vegetation changes (understorey clearing for grazing, fire regimes and weeds), competition for hollows, disease and climate change. There are no threat abatement plans that are relevant to management of the bare-rumped sheath-tail bat.

Impacts of the proposed action

8. The main impact of the project would be clearing of 1425ha of *Eucalyptus tetradonta* woodland which is foraging habitat and potentially breeding habitat for the bare-rumped sheath-tail bat.
9. Altered fire regimes, from increasing development of the area, may also impact on habitat.
10. In the assessment of direct impacts of the project, the EIS states that only species that are likely to occur or are known to occur are considered. The bare-rumped sheath-tail bat was regarded as potentially present. The EIS concluded that the project would not impact on the species and no offsets were proposed.

Mitigation of impacts

Land clearing

11. Clearing areas to be delineated so operators avoid disturbance of adjacent areas.
12. A Significant Species Management Plan would be written before clearing for management of threatened species.
13. Pre-clearing surveys conducted using a spotter catcher.

Site rehabilitation

14. As part of site rehabilitation some hollow-bearing trees would be felled and relocated to rehabilitation areas to provide immediate breeding habitat, in addition to provision of nest boxes for particular species requirements.
15. Rehabilitation would be progressive and involve provision of nest hollows and microhabitat features such as trees and logs.

Habitat fragmentation

16. Buffers of at least 100m would be provided between mine pits and sensitive areas such as wetlands and riparian vegetation.

Fire

17. A Fire Management Plan would be prepared focussing on managing fuel loads and putting in place appropriate fire regimes to maintain biodiversity while minimising risk of bushfire.

Conclusion

The EIS did not provide specific information about presence of hollow-bearing trees in the eucalypt woodland. The EIS stated that mitigation of impacts on hollow dependent species would be the use of a spotter catcher in pre-clearing surveys to identify potential tree hollows used for nesting or roosting.

EHP considers that the project area contains suitable bare-rumped sheath-tail bat habitat and this should be verified prior to clearing. Because the project site contains vegetation that is habitat for the species and that the project would involve clearing this habitat, particularly breeding habitat, EHP considers that there is the potential that the project would impact on this species.

Northern quoll (*Dasyurus hallucatus*)

EPBC Act Listing Status: Endangered

Information provided in the EIS:

The EIS stated that given recent records of the species around Weipa, there was potential for the species to colonise its historical range, which includes the project area. Hence the northern quoll was considered potentially present in the project area as suitable foraging habitat occurs in the region. However, there is limited suitable denning habitat such as rocky outcrops. The EIS states that the species is known to generally forage in areas proximate to these rocky outcrops.

The EIS survey methods used for the northern quoll included a baited cage trap and a camera at eight sites, and minimum 30 minute (2 people) early evening spotlight surveys at trap sites and night-time track surveys. The survey effort was less than the minimum recommended in the *Survey guidelines for Australia's threatened mammals* (Commonwealth of Australia, 2011).

The northern quoll was considered as only potentially present and suitable foraging habitat is present. As the species was not detected in studies for the Project or for the SRBP and limited denning habitat was identified, the EIS concluded that the project would not impact on the species and no offsets were proposed.

EHP Assessment:

Distribution and population

1. In Queensland, the northern quoll occurs as far north as Weipa, south to Gracemere and Mt Morgan near Rockhampton, and west to around Carnarvon National Park. Local populations still persist in north and central Queensland coast areas despite the presence of cane toads. There are recent records from around Proserpine, Midge Point, Eungella, and Cape Upstart.
2. The population declined over most of its mainland range by about 95% between 1980 and 2010 and the distribution is now highly fragmented.

Habitat

3. The northern quoll occupies rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beach scrub, grasslands and desert. Habitat critical to the survival of the species is defined as any habitat within the modelled distribution of the species where denning or shelter habitat, or both, occurs (*EPBC Act referral guideline for the endangered northern quoll, *Dasyurus hallucatus**; Australian Government, DoE 2016 (quoll referral guideline)).
4. The quoll referral guideline describes habitat critical to the survival of the northern quoll as habitat within the modelled distribution which provides shelter, refuge and in the form of:
 - rocky habitat such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines or treed creek lines
 - structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs
 - offshore islands where the northern quoll is known to exist.

Population in development area and region

5. The *Environmental Reporting Tool* (Commonwealth of Australia, 2015) and the quoll referral guideline indicate that habitat for the species is likely to occur where the project is located.

6. The northern quoll was not recorded in the project site. However, the EIS survey effort over an area of several thousand hectares was not sufficient to confidently conclude that the species was not present (*EPBC Act 1999 referral guidelines for the endangered northern quoll, Dasyurus hallucatus* (DSEWPaC, 2011)).
7. The species has been recorded at Steve Irwin Wildlife Reserve in recent years, 40-50km southeast of the project site, and also in the Weipa area.
8. Major threats to northern quoll populations include cane toad mortality (quolls have persisted where cane toads are present but they do not appear to recolonise areas where they were extirpated), habitat degradation and removal, fire management, weed incursions, and feral predators. Threat abatement plans that are relevant to management of the northern quoll on Cape York are the following:
 - *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* (Commonwealth of Australia, 2011)
 - *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by five listed grasses* (Department of Sustainability, Environment, Water, Population and Communities, 2012)
 - *Threat abatement plan for predation by feral cats* (Department of the Environment, 2015).

Impacts of the proposed action

9. The main impact of the project would be clearing of 1425ha of *Eucalyptus tetradonta* woodland which is potentially foraging and breeding habitat for the northern quoll.
10. Altered fire regimes, from increasing development of the area, may also impact on habitat.
11. The project is considered to have minor impacts on the northern quoll. No offsets are recommended.

Mitigation of impacts

Land clearing

12. Clearing areas to be delineated so operators avoid disturbance of adjacent areas.
13. A Significant Species Management Plan would be written before clearing for management of threatened species.
14. Pre-clearing surveys conducted using a spotter catcher.
15. Vegetation clearing to be conducted in the dry season to avoid the breeding season of several species (the black-footed tree-rat breeds year round but may peak in the late dry season).

Site rehabilitation

16. As part of site rehabilitation some hollow-bearing trees would be felled and relocated to rehabilitation areas to provide immediate breeding habitat.
17. Rehabilitation would be progressive and involve provision of nest hollows and microhabitat features such as trees and logs.

Habitat fragmentation

18. Fauna crossings would be built to assist fauna movement between habitats.
19. Buffers of at least 100m would be provided between mine pits and sensitive areas such as wetlands and riparian vegetation.

Mortality

20. Vehicle speed limits would be put in place in higher risk areas for vehicle strike, near wetlands and waterways.

Fire

21. A Fire Management Plan would be prepared focussing on managing fuel loads and putting in place appropriate fire regimes to maintain biodiversity while minimising risk of bushfire.

Conclusion

EHP is satisfied that the project site where clearing would occur is not likely to contain important habitat for the northern quoll and that the project is unlikely to have unacceptable impacts on the species. If the quoll is present it is more likely to use habitats around wetlands and waterways that are largely outside the clearing footprint for the project. Mitigation measures to reduce mammal mortality from vehicle strike would help to reduce potential impacts on the project. Also, the retention of hollow logs in retained areas may provide additional sheltering opportunities for the species.

4.7.2.4 Migratory bird species

There are several sites in the project area that contain habitat for migratory birds, including the mouth of Namaleta Creek and surrounding areas, the Wenlock River and the lower Dulcie River and the Skardon River and its adjacent creek systems and intertidal shores and beaches.

The EIS concluded that the most important habitat for waterbirds is Big Footprint Swamp. Mangroves in the surrounding area may also provide roosting habitat. The EIS concluded that these areas could not be considered important habitat under the criteria in the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (Department of the Environment, 2013) because species were observed in low numbers, the project area is not at the limit of the species range and it is not likely to be a significant 'staging' post for birds travelling via the Eastern Asian-Australasian Flyway.

The EIS proposes to protect Big Footprint Swamp by putting in place a 100m buffer zone to the wetland to avoid impacts of clearing activities.

The EIS predicts a small increase in the depth of Big Footprint Swamp, as more groundwater is discharged due to mining (a maximum increase in peak pool level of 0.15m at the height of the wet season). The EIS concludes that the long-term effect of this increase on the ecological function of the wetland, including use by migratory birds, is unlikely to be significant. The predicted increase in discharge to the swamp is 1.5% from 2035 onwards. A Receiving Environment Monitoring Program would be implemented to monitor the hydrogeological regime of Big Footprint Swamp.

The EIS initially proposed a BLF and MIA and haul road alignment that would have meant clearing of 20.5ha of mangroves. In the revised EIS the BLF, MIA and haul road was removed from the project and no clearing of mangroves is now necessary.

No further mitigation measures are proposed for migratory species as impacts are expected to be absent or minor.

EHP is satisfied that the project is unlikely to have a significant impact on migratory waterbirds because the project activities are well separated from the habitat areas on the site and nearby. The project would involve clearing habitat for terrestrial migratory birds but the species predicted to occur are relatively common and widespread.

4.7.2.5 Estuarine species

The estuarine crocodile is widely distributed throughout Cape York. The project would have a limited direct impact on the estuarine crocodile habitat in the Skardon River and the increase in barge traffic is unlikely to disturb crocodiles to the point where the population would be affected. EHP considers that the project is unlikely to have unacceptable impacts on the estuarine crocodile.

EHP was advised by CSIRO marine fauna research staff that the largetooth, dwarf and green sawfishes are all likely to occur in both the Skardon River and Namaleta Creek. The critically endangered Speartooth shark is likely in Namaleta Creek and possibly in the Skardon River. The EIS acknowledges that these species are all likely to be in the waterways around the project site.

Project impacts on these cryptic species are difficult to assess because there is very little information about their biology and there is a lack of certainty about the potential impacts of human activities on their behaviour and population status. The EIS concluded that barge transit routes or transshipping operations would not alter key habitat for these species.

Commercial and recreational (and illegal) fishing are known threatening processes. But the impact of the proposed large increase in vessel traffic in the Skardon River, and the disturbance that may have on populations of threatened marine and estuarine species, is unknown.

When operational there would be a substantial increase in barge traffic in the Skardon River if the Skardon River Project and the Bauxite Hills Project would operate at the same time. The EIS stated that to meet the basic annual tonnages and weekly bulk carrier loading targets, up to 100 barge trips would be needed in the Skardon River each week (3,600 – 4,000 movements annually). Traffic would also include additional movements for fuel and materials supply.

Therefore, EHP considers that there is a high risk that the project would result in impacts on the habitat, water quality and directly on speartooth shark and the sawfish species through boat strike, propeller wash and bed levelling activities. The presence and population status of these threatened estuarine and riverine species in the project area needs to be established. Baseline population information and continuous monitoring of habitat requirements (e.g. water quality and sources of disturbance) is needed to determine if there would be any adverse impacts on these species as a result of project construction and operations and inform appropriate mitigation and management measures if required.

4.7.2.6 Marine species

EHP considers that the project is unlikely to disturb marine turtle nesting in the area, particularly if proposed mitigation measures for feral pig impacts are put in place. However, there is a lack of certainty about the potential impacts of vessel traffic in the estuary on feeding turtles, and on turtle movements along the coast. These concerns should be addressed in a monitoring program to establish baseline population information on which corrective actions can be based.

Although the transshipment area is 10-12km offshore, light at the facility would need to be managed to minimise potential impacts on turtles, particularly on hatchlings. Point sources of light can cause aggregations of hatchlings that result in feeding stations for hatchling predators such as fish and sharks. The project should be required to minimise lighting impacts on marine species, particularly turtle hatchlings, subject to workplace health and safety requirements. Management measures should include consideration of timing and length of time lights are on, light intensity, and the direction of lights.

The EIS stated that while some seagrass species preferred by dugong occur adjacent to the port area, it is unlikely to constitute a sufficient biomass to sustain a population of dugong. The EIS considered that the severity of impacts from vessel movement and barge loading during operations would be low.

As with the estuarine species, given the lack of certainty about the impacts of vessel activity and associated disturbance in the Skardon River on dugong and inshore dolphins, particularly the Australian snubfin dolphin, EHP considers that the project has the potential to impact on these species and that approval of the project should be subject to monitoring work being carried out on these species to determine the current status of populations; how the proposed use of the estuary may affect these species and appropriate mitigation and management measures.

4.7.2.7 Impacts on estuarine, marine and marine migratory species

The EIS describes potential impacts of the project on Skardon River estuary coastal processes and water quality and the potential impacts from vessel strike, light spill and underwater noise.

Hydrodynamics

The EIS states that there would be a minor change hydrodynamics (current velocities and patterns) around mooring blocks and cyclone moorings and because of vessel traffic in the Skardon River.

None of the development is large enough to alter sediment transport processes in the Skardon River. Propeller wash from barges and other service vessels would cause some sediment transport but the EIS states that changes resulting from these sources are likely to stay within the natural variability of the river system.

The EIS states that wake waves from vessel traffic in the Skardon River are not likely to cause erosion of river banks because they would be attenuated by fringing mangrove vegetation that lines river banks. The EIS acknowledges that ongoing port operations over the next 12 years may alter bank stability and cause erosion and further investigation into erosion potential is recommended.

Mitigation measures to address coastal processes include the following:

- soft start for cyclone mooring piling construction; fauna exclusion zone of 500m, spotters.
- preparing a vessel traffic plan with speed limits
- maintaining existing vegetation around the port facility to minimise erosion
- annual hydrological surveys of the river mouth
- seagrass monitoring program
- monitoring of bank erosion and vessel wake impacts
- establish shoreline monitoring stations to define baseline conditions against which shifts in bank and vegetation stability and erosion can be assessed.

Water quality

The main mitigation measures proposed in the EIS for impacts on water quality is to establish a long-term program of ambient water quality starting before construction to collect baseline data. The aim of the program would be to identify chronic or acute changes to water quality as a result of project activities. Other mitigation measures include the following actions:

- regular monitoring of sediments in the estuary
- monitoring of bauxite spills during loading and unloading and ensure spill management processes are in place
- minimise vessel speeds and reduce impact of propeller wash on sediments
- implement a project stormwater management plan.

Vessel strike

With the increase in vessel movements in the estuary from both Bauxite Hills and Skardon River mines, the potential for collisions with marine fauna would increase. Mitigation measures would focus on managing boat speeds during transit under a vessel access and speed limit plan. Research has identified that visual cues are important in avoidance behaviour in turtles, making reduced speeds the most effective tool for minimising impacts. Given the slow speed of vessels, vessel strike on cetaceans is not considered a risk requiring specific mitigation.

Light spill

Light sources from the proposed project are from the mine, the transshipment area (10-12km offshore). Moving vessel lights are not considered to be a significant impact. Methods to reduce potential impacts of lighting on marine fauna would include the following:

- only essential lighting used in the development
- turtle friendly lighting used where necessary (initially long wavelength lights and where this is not possible, low pressure sodium lights (with amber filter) or LEDs would be considered
- lighting design to include shrouding
- lights to be lowest intensity for the task and installed low in the vertical plane
- automation, timers and motion detectors used wherever possible.

Underwater noise

The EIS described the potential impacts of underwater noise from vessels and piling on marine fauna, including animals avoiding noisy areas, changing vocalisations and potentially permanent hearing impacts and tissue trauma. The underwater noise impacts on marine fauna from the increase in vessel traffic in the Skardon River is unknown. Operation of barges and tugs are proposed for 32 weeks of the year. A vessel management plan would involve avoiding shallower waters and restriction of vessel movements and speeds.

As part of the Significant Species Management Plan, a monitoring program should be implemented to document changes in behaviour or distribution of marine fauna using the Skardon River channel.

4.7.2.8 Commonwealth marine areas

The transshipment area, where bauxite would be loaded from barges to ocean going vessels (OGV) is in the Commonwealth marine area approximately 12km from the Skardon River mouth. The EIS stated that a 1km buffer was placed around offshore reef habitats for selection of a transshipment area, to ensure impacts on reef assemblages were minimised. OGVs would anchor at the transshipment site in a designated area.

Barges used to transport bauxite to the transshipment area are 80m to 90m long and would be towed by tugs from the loading point in the Skardon River. The EIS states that, in all years except the first year, barges would operate for eight months of the year. The EIS did not state that barges would be covered during transit. The EIS states that negligible amounts of dust and spillage would be generated during the transshipment process and that as bauxite is completely inert, impacts on the environment from the loading process would be low. However, EHP recommends that barges should be covered. EHP concludes that with the implementation of proposed mitigation measures to manage barge and transshipment vessels and anchoring, including barge covering, it is unlikely that unacceptable impacts would occur on the Commonwealth marine areas.

4.7.3 Cumulative impacts

An assessment of cumulative impacts should consider impacts in space and time. In considering cumulative impacts, the EIS only documents the clearing occurring as a result of other developments in the region. It does not provide an analysis, subjective or analytical, of the effect of bauxite mining in the region on MNES.

The Skardon River catchment is within the relatively intact Cape York Bioregion. Both SRBP and Bauxite Hills projects propose to clear 2614ha of Darwin stringybark woodland and forest (RE3.5.36b), about 3% of the total 810,279ha of this RE on western Cape York (adapted from Table 6-10 of the SEIS).

However, current bauxite MLs (about 400,000ha) cover 50% of this RE. Figure 5-10 (also 7-17) of the EIS shows the extent of contiguous development of bauxite mining project from Aurukun to the Skardon River, a distance of 200km of coastal western Cape York Peninsula. These bauxite MLs cover the most biologically diverse areas near the coast. For species like the red goshawk it is most likely breeding habitat as evidence suggests they do not breed in sub-coastal areas. Similarly, it would be the most productive habitat for all the MNES threatened species assessed in this report, compared with drier inland areas.

Therefore, the long-term, cumulative impact of mining on this vegetation type, and habitat for several threatened species, is significant. The cumulative effect of all of these mines is a compelling argument for the application of offsets to each project.

4.7.4 Conclusion and recommendations

A total of 1434 ha of remnant vegetation comprising mostly *Eucalyptus tetradonta* forest and woodland is proposed to be cleared for the mine. This report provides assessments for species that EHP considers were likely to occur in the project area because habitat is present and there are regional records. All recovery plans, threat abatement plans and approved conservation advices relevant to these species were considered in the assessment process.

4.7.4.1 Terrestrial flora

The EIS concluded that the project would not impact on EPBC Act threatened flora because most listed flora species have a low likelihood of occurrence in the project areas that would be disturbed.

EHP is satisfied that the project is unlikely to have unacceptable impacts on listed threatened flora species. Nevertheless, as committed to in the EIS, EHP recommends that pre-clearing surveys should be carried out at each stage of mine and infrastructure development to identify and manage threatened species that may be present in the clearing footprint.

EHP further recommends that the proponent be required to provide an offset if residual significant impacts to listed threatened flora species are determined likely to occur.

4.7.4.2 Terrestrial fauna

The EIS provides significant impact assessments for one threatened fauna species that is known to occur in the project area. Based on the impact assessments, the EIS concluded that the project would not impact on EPBC Act threatened fauna.

EHP considers that the project would impact on habitat for the black-footed tree rat habitat and the red goshawk and potentially the masked owl and bare-rumped sheath-tail bat. The areas to be cleared for the project contain breeding and foraging resources for all species.

EHP recommends the following conditions of approval requiring the proponent to protect habitat for the black-footed tree-rat, red goshawk, masked owl, and bare-rumped sheath-tail bat:

- prior to clearing, identify and map areas of high-value habitat that provides breeding, roosting and foraging resources (nests trees and tree hollows)
- avoid nest and roost areas and establish exclusion zones around them (Clearing and other project activities that could disturb breeding sites (if found) should not commence until after breeding season)
- submit an offset management plan consistent with EPBC Act environmental offsets policy for residual impacts on confirmed areas of habitat
- develop a species management program (NC Act) for the black-footed tree-rat, red goshawk, masked owl and bare-rumped sheath-tail bat
- Contribute to research programs to investigate the ecology of hollow dependent species including the red goshawk, masked owl, black-footed tree-rat and bare-rumped sheath-tail bat and their prey.

A species management program under the Queensland NC Act would be required for interfering with the breeding place of any species in the project area

4.7.4.3 Migratory species

The EIS considered that it is unlikely the project would impact on migratory bird species. EHP is satisfied that the project is unlikely to have unacceptable impacts on listed migratory species (refer to section 4.8.4.3).

4.7.4.4 Estuarine and marine species

EHP concluded that there is a possibility that the proposed project would result in impacts on the speartooth shark, dwarf sawfish, green sawfish, largetooth sawfish, dugong, Australian snubfin dolphin and the flatback, olive ridley and hawksbill turtles. The conclusion is based on the fact that there is very little information about populations of these marine and estuarine species in the project area and a lack of certainty about potential impacts on these species caused by the high level of vessel activity and disturbance in the Skardon River that would result from concurrent operation of the proposed Skardon River Bauxite Project and the Bauxite Hills Project.

Due to the potential for identified project impacts and the risks associated with these impacts, EHP recommends that the proponent is required to develop and undertake a monitoring program for the following species during construction, operation and decommissioning of the project:

- speartooth shark – critically endangered
- dwarf sawfish, green sawfish, largetooth sawfish – vulnerable / migratory / marine

- flatback turtle and hawksbill turtle – vulnerable/migratory/marine
- olive ridley turtle – endangered / marine / migratory
- dugong – marine/migratory
- Indo-pacific humpback dolphin, Australian snubfin dolphin – cetacean / migratory.

The findings of the monitoring program should be used to inform avoidance, mitigation and adaptive management measures for these species to ensure that any impacts are appropriately managed.

Further, EHP recommends that the proponent prepare an offset delivery plan that includes a financial contribution to support an independent research program for the speartooth shark, dwarf sawfish, green sawfish and largetooth sawfish. The findings of the research should be used to inform avoidance, mitigation and adaptive management measures for these species to ensure that any impacts are appropriately managed.

The findings of the research and monitoring programs should be made publicly available to help build knowledge about the species and their response to developmental pressures.

4.7.4.5 EPBC offset requirements

The EIS concluded that there would be no significant residual impacts to MNES from the project and no offsets for the controlling provisions were proposed.

However, EHP considers that there is a real possibility that clearing tall, mature, hollow-bearing trees in the mine footprint would result in a significant residual impact on the black-footed tree-rat, masked owl, red goshawk, and the bare-rumped sheathtail bat. This clearing has the potential to remove breeding habitat for the species or their prey, or both.

The EIS stated that 1430ha of potential habitat would be cleared for the project. Finer scaled mapping of hollow-bearing trees within the project footprint would refine the estimate of impacts on important habitat and inform an offset delivery plan, if required. EHP recommends that the proponent undertake pre-clearance survey of woodland areas to identify hollow bearing trees, potential breeding habitat for the black-footed tree-rat, masked owl, red goshawk, and bare-rumped sheathtail bat. An offset proposal based on the outcomes of pre-clearance surveys should be submitted, in accordance with the EPBC Act Environmental Offsets Policy.

There is little information on the biology of marine and migratory species in the project area resulting in a lack of scientific certainty about project impacts on these species. Any impacts would be cumulative due to the increase in vessel traffic and associated disturbance in the Skardon River estuary from multiple bauxite projects using the estuary. The lack of certainty about project impacts on listed marine and estuarine species is sufficient justification for EHP to conclude that the project could result in an impact on these species. As land-based offsets would not be appropriate to compensate for potential impacts on these species, EHP recommends that the proponent should submit an offset proposal outlining a financial contribution that would support research and monitoring projects aimed at improving understanding of populations of these species in the Skardon River and Namaleta Creek systems. Research and monitoring would provide a basis for corrective actions should impacts be detected.

A financial offset proposal should recognise the cumulative impacts of the Skardon River Bauxite Project and the Bauxite Hills Project. A coordinated research and monitoring program could be funded from both these projects.

4.7.4.6 Other recommendations

Management of impacts on threatened species and communities

The proponent must implement measures to avoid, mitigate and manage impacts on EPBC listed species and their habitat during vegetation clearing, construction, operation, and decommissioning of the project. The proponent should undertake vegetation clearing for each project phase in a manner that avoids or minimises the potential for impacts on EPBC listed fauna species. The proponent must ensure that management actions are carried out in a manner that takes into consideration approved conservation advices and is consistent with relevant recovery plans and threat abatement plans.

Disturbance limits

The EPBC approval should set limits on the disturbance of habitat for EPBC Act listed threatened species based on further fauna habitat assessments.

Environmental offset package

The proponent must provide an environmental offset package that complies with the EPBC Act Environmental Offsets Policy if significant residual impacts to MNES are determined. The offset package should be submitted to DEE for approval by the Minister for the Environment prior to the start of the project.

Commitments

Where the proponent's commitments outlined in EIS do not conflict with any subsequent approval conditions and any recommendations of this assessment report, the proponent must implement the commitments as stated in its EIS Commitment Register.

4.8 Coastal processes

A number of EIS documents described coastal processes in relation to the proposed project: EIS Chapter 19 – Coastal environment; EIS Chapter 6 Marine Ecology; EIS Appendix B3 – Marine ecology and coastal processes; EIS Appendix 17 – Coastal processes supplementary report; EIS Appendix 15 – Surface Water and Groundwater Monitoring Plan. Appendix I – Shipping Technical Assessment; Appendix J – Bathymetric Survey Report Skardon River;

The proponent submitted a response to EIS submissions and a report titled Supplementary Report to the EIS referred to as the (SEIS). The documents further described coastal processes in relation to the project: SEIS Chapter 7 Marine Ecology; SEIS Appendix D – Marine Plant Survey; SEIS Appendix E - Skardon River Vessel Assessment

The proposed barging operation and bauxite shipping operations are summarised in sections 2 and 4.8 of this assessment report. The barges for both the SRBP and the Bauxite Hills projects would now be loaded and offloaded at a single site being the loading facility approved for the SRBP. Mooring facilities during the wet season are proposed to be required separately for each project.

Marine ecology is described in section 4.5 and section 0 of this assessment report.

Based on comments on the EIS, the proponent changed the description of the project so that cyclone moorings are now proposed to be located on the opposite bank slightly upstream of the SRBP port.

4.8.1 Physical marine and estuarine environments

4.8.1.1 Marine and estuarine environment

The EIS described the Gulf of Carpentaria as a large and relatively shallow body of water which is enclosed on three sides by the Australian mainland and bounded on the north by the Arafura Sea. The Skardon River extends approximately 8km from the mouth before branching into two distinct systems, north and south. These branches both continue for another 8-9 km each, terminating approximately 17km from the river mouth. The Skardon River is described as a tidal creek as it has a low freshwater input with low-gradient, seaward sloping coastal flats, which are influenced by tidal currents. The mudflats which surround the creeks tend to be high relative to the tidal planes, with seawater being mainly confined to the tidal channels except during high tide on spring tides. Due to strong tidal currents and large tidal ranges, the waters are can be turbid.

Five hydrographic surveys of the Skardon River are available from 1998 to 2015 and all extend at least from the Ebb tidal delta offshore of the entrance up to the port location. The EIS focussed on the changes in bed elevation between the surveys and concluded that the bathymetry in the area between the entrance, including the entrance, and the port area has been relatively stable from 1998 to 2015 with some minor changes between 1998 and 2002. The bathymetry offshore of the entrance has been more dynamic. However in the 17 year period only one category 1 cyclone tracked close to the Skardon River. The data across the 17 years represents relatively calm conditions. Strong winds and large waves during a cyclone have the potential to cause significant sediment transport along the shoreline adjacent to the Skardon river mouth.

Previous coastal processes, water quality, and sediment studies have been undertaken in the Gulf of Carpentaria for the Amrun Bauxite Project (previously known as the South of Embley Project), the Pisolite Hills Project and the SRBP. These have been considered in the EIS. No site specific modelling was undertaken for the Project as no dredging or bed levelling is proposed. However, Ports and Coastal Environmental Pty Ltd undertook a Marine Ecology and Coastal Processes report (PaCE 2016) for the Project which analysed the previous data and reported on the characteristics of the physical environment (coastal processes, water quality, and sediment) among other matters.

The offshore transshipment area location was selected on the basis of the benthic habitat and sediment surveys (PaCE 2015) which identified very low density benthic communities and sediments that are sand dominant. The location was selected to minimise impacts.

Based on these reports and other sampling, the EIS described the coastal and marine environment and provided information on water level, tidal conditions, waves, storm surge, sediment transport, sea level rise, coastal soils, and shoreline evolution. In summary the EIS described:

Water level - the Gulf of Carpentaria can be subject to sea level fluctuations of up to 0.5m which can result in large areas of inundation by tides in summer (monsoon) months. These areas do not support mangroves or freshwater vegetation and form salt pans.

Tidal conditions

- 8 months of water level data at the Skardon River Barge ramp has been used to predict tidal planes, calculated using the Australian Tides Manual (PCTMSL, 2011). The tidal planes show larger tidal levels and ranges at Vrilya Point and Shardon River Barge Ramp compared with Weipa and Cullen Point. The increased tidal levels are at least partially a result of local amplification of the tidal wave within the river. The tidal signal at Skardon River is predominantly diurnal with a small semi-diurnal signal indicating a small second high and low water each day.
- Currents – tidal currents are a dominant process in the Skardon River which drives the transport of sediment into the estuary. Currents are influenced by the channel depth and tidal range inside and outside of the estuary. Coarser sediments settle out of suspension; however the creeks are usually turbid as strong tidal currents allow fine sediments to remain in suspension.
- Bed form – offshore features indicate active coastal processes and natural sand transport across the entrance to the river. At the mouth of the river, braiding occurs and coarser sediments are deposited. Further upstream the river has a relatively flat bed with no obvious bed forms brought about by current velocities indicating lower speeds. It is likely that the bed material has a higher percentage of fine silts and clays than further downstream.
- A calibrated hydrodynamic model was developed and calibrated against measured tide and water level data. The EIS concluded that the model was capable of consistently predicting water speed.

Waves – the wave climate is seasonal and wave activity is highest in the wet season and during tropical cyclones and monsoon events. Wave heights are generally small and calm in the dry season.

Storm Surge – based on an assessment at Weipa, the relative storm tide level is predicted to be low and the potential for a high storm surge compared with Weipa was low because less intense cyclones were likely to occur at the same time as a spring tide. Water levels in the Skardon River are likely to be similar to Weipa and the EIS concluded that storm tides are not considered a significant risk.

River Flows – a hydrological assessment of the Skardon River was undertaken by SRK Consulting (2013) concluding that the Skardon River is approximately 30km long, with a total catchment area of approximately 480km² that the catchment is undisturbed; freshwater discharge is highly seasonal with high flows in wet season (December to April); and the mean annual discharge is 730,000ML. The desktop information and the project's hydrological assessment described the Skardon River as an estuarine system dominated by tidal currents with low freshwater inputs. The River is described as perennial although the EIS also suggests that freshwater inflows may cease altogether during the dry season.

Sediment Transport and particle size distribution – sediment transport is driven by two processes: tidal currents; and waves. There is a description of the particle size distribution from the mouth to upstream of the wharf area, showing sediments dominated by silt and clay fractions at the upstream area, with silt and clay fractions reducing downstream to be replaced by gravel and sand at the wharf area and sand in the lower reaches of the mouth.

Sea level rise – The projected potential sea level rise by 2100, based on the IPCC Fifth Assessment Report, is expected to range from 0.28 to 0.98m. The EIS indicated that land elevation would be in excess of 4m ADH and is therefore considered sufficiently high that sea level rise or storm surge or inundation over the 12 year life of the project would not be considered a risk for the project.

Coastal Soils – A desktop search for information and sampling for acid sulfate soils (ASS) was undertaken. ASS and potential areas of ASS (PASS) were identified within or adjacent to material which surrounds the Skardon River along its shoreline. **Skardon Soils** are described as recent estuarine deposits under mangrove; intertidal hydrosol; ASS. Skardon is mapped to occur in narrow strips along tidal fringes associated with mangroves.

River sediments were also tested for ASS and PASS. Only one location exceeded the QASSIT Action criteria for net PASS.

Shoreline and bank evolution at the mouth of the Skardon River has experienced little change over the study period from 1989 to 2014. Little change in the mouth or banks of the Skardon River over this time indicates the river has been stable. The offshore channel has also not changed significantly over this period. Fringing mangroves present along the banks of the majority of the Skardon River would act to stabilise the sediment along the banks and attenuate local wind waves and tidal currents. Mangroves help to create a depositional environment and indicate the banks of the river are currently stable and accreting.

Water quality

The Skardon River is described as a partially well-mixed tidal creek system. During the dry season freshwater flows reduce and may cease. The bulk of freshwater input into the river occurs during the wet season is from inundation by short lived, sometimes intensive flooding. The highest rainfall activity typically occurs in January. During the dry season water cycles are driven by evapotranspiration leading to an increase in salinity in the upper reaches of estuaries. Turbidity is influenced by seasonal rainfall and is highest in the wet season (mean turbidity levels wet season = 30.3NTU) and lowest towards the end of the dry season (mean turbidity levels dry season = 4.2NTU). Low turbidity provides increased benthic light to seagrasses. The data presented on ambient turbidity water quality, in particular ambient TSS levels within the rivers was limited. Turbidity in the lower part of the water column was also variable and subject to tidal currents during a tidal cycle.

The EIS described the Skardon River as a near natural system with respect to water quality, despite historical kaolin mining. High level of metals, nitrogen and phosphorous, reductions in dissolved oxygen and variability of salinity and turbidity are considered a feature of these highly biologically productive, turbid, tidally dominated estuary systems. Key findings from the EIS regarding water quality in the Skardon River are:

- very high natural seasonal variability in turbidity in the Skardon estuary (wet - 30.3NTU; dry - 4.2NTU)
- during the wet season increased freshwater flows act to reduce salinity; during the dry season, increases in salinity as freshwater inflows reduce, estuarine waters become more tidally influenced and standing water in the upper tributaries are affected by evaporation
- at the mouth a pH range of 7-8 is present, reducing upstream into the estuary. There is a strong correlation between tides and pH
- dissolved oxygen (DO) reduces as distance from the mouth of the river increases. There is a strong correlation between tides and DO
- total nitrogen and total phosphorous concentrations are potentially naturally elevated
- copper, zinc aluminium and iron concentrations are naturally elevated
- the full suite of hydrocarbons remained non detectable despite no anthropogenic inputs.

Sediments of the Skardon River are largely un-impacted, with limited impact from nearby historic kaolin mining. Particle size analysis depicts a decrease in silt and clays and increase in sands from upstream to downstream locations. Benthic video confirms the role of tidal currents in mobilising sediments, sands and lighter gravels. Sand waves and ripples indicate sand friction mobilisations processes. Still images of the lower and mid estuary reaches identified relatively coarse sands.

4.8.2 Potential impacts

The EIS states that some of the proposed elements of the Project have the potential to directly or indirectly impact on coastal processes. In response to submissions, the project description changed so that the BLF, MIA, RORO and the associated haul road are now not required. This change has reduced the potential impacts on the coastal environment. The Project retains the need for a barging operation and cyclone moorings but would utilise the SRBP approved port facility downstream of the originally proposed BLF. Project specific cyclone moorings are proposed and these located in the southern arm of the Skardon River upstream of and on the opposite bank to the existing wharf. There is no discussion of co-locating these moorings with the proposed SRBP cyclone moorings.

4.8.2.1 Mining operations

Water level – the mining operations are not expected to significantly increase or decrease the existing natural water balance of the Skardon River. Water issues are discussed in Chapter 10 of the EIS and in section 4.13 and 4.14 of this assessment report.

Sediment run-off - According to the EIS, the project does not propose any releases to the Skardon River due to the ability to utilise the adjacent project's infrastructure, the mining pit set-backs from the Skardon River, and the erosion and sediment controls that would be in place.

Acid Sulfate Soils – Impacts on ASS are largely avoided since the Project no longer retains the need for a BLF, RORO, MIA and associated haul road on the banks of the Skardon River.

4.8.2.2 Barging operation

Local hydrodynamics

Tug and barge traffic may induce altered patterns and may lead to localised erosion of underlying soft sediments by way of erosion from propeller wash during manoeuvre of the barges.

The proposed development is not expected to have any impacts on river flushing as there is no change to the tidal prism of the Skardon River.

Morphology and longshore transport

Given no alterations in bathymetry are proposed at the ebb bar, no changes to sediment transport processes are predicted.

Vessel generated waves

Barges would generate wake waves. The EIS discussed two studies (Royal Haskoning DHV 2016; PaCE 2016) which identified where the channel was in relation to the river bank and modelled wave heights based on different vessel speeds. The EIS concluded that with a maximum vessel speed of 6 knots adopted for the project and given the location of the channel in relation to the banks (i.e. the width of the Skardon River), the wake waves from the barges are predicted to be small when they reach the shoreline and are therefore not anticipated to significantly impact on the banks of the river. The EIS identified two relatively narrow sections in the river where the risk of impact to banks from wave wash may be higher. Adherence to speed limits and navigating as close as possible to the centreline of the channel at these sections would be critical. The Marine Traffic Management Plan and Marine Operations Management Plan should ensure adoption of these practices in barge operations. Monitoring of the banks within the Skardon River where erosion risk has been identified is recommended as part of a Marine Monitoring Program (MMP) required as a condition of the EA.

Propeller wash

The EIS described how bed erosion rates from propeller wash increase with the height above elevation threshold, and erosion rates are higher for sandy mud than for sand. See Figure 19-7 and 19-8 of the SEIS. The Royal Haskoning DVH 2016 study showed that the potential resuspension of bed sediment due to bed shear stress from propeller wash could occur when the bathymetry was shallower than 5m below chart datum (CD) for sandy mud and shallower than 2.5m below CD for sand, assuming a water level approximating mean sea level of 2.2m CD. Potential resuspension was predicted along a 2 km stretch of the navigational channel immediately downstream of the originally proposed BLF, and another 2 km stretch toward the seaward end of the ebb bar. Under existing conditions these areas experience limited natural resuspension of bed sediments due to tidal currents.

Propeller wash was shown to have the potential to cause erosion of the bed in the navigation channel in two locations, at the ebb bar and for 2km downstream of the BLF. In the latter area the sediment type is sandy mud. Modelling undertaken for the SRBP indicated that sediments within the channel would be exposed to short lived erosive forces during minimum barging operating depth periods. As water levels increase the forces are reduced and erosion is not predicted. The EIS predicts that over time, sediment disturbance via propeller wash would sort sediments and potentially armour the channel alignment by increasing the coarse fraction, particularly in the shallower lower reaches. At the shallow site downstream of the wharf, the EIS predicts that over time propeller wash would uncover underlying consolidated strata and bed erosion would be curtailed. The assumption that there would be underlying consolidated strata was not confirmed.

Even though barging is now proposed to be operated out of the SRBP port those predicted upstream impacts may still be relevant to the new location of the cyclone moorings and the impacts associated with moving barges from the SRBP port to the location of the proposed cyclone moorings. The substrate in the location of the new cyclone moorings is in a section of the Skardon River upstream of the SRBP port and is identified as containing over 90% silt clay (see Figure 19-22 of the EIS). Therefore there is likely to be increased turbidity levels and possible bed and bank erosion given the depth and proximity of manoeuvring vessels. The Royal Haskoning DVH study also undertook plume dispersion modelling to predict the advection and dispersion of the suspended sediment resulting from propeller wash. Results were that the plume was characterised by a relatively low concentration of sediment (approximately 5mg/L) that dispersed quickly (peak concentrations for less than one hour). The PaCE study predicted that the suspended sediment generated in the water column would range from 0 to 2.8mg/L). Where vessels were actively manoeuvring (for instance at the wharf), modelling predicted sediment concentrations of 25mg/L and where two vessels were transiting simultaneously, modelling predicted concentrations up to 50mg/L, reducing to 10mg/L within 1 hour.

An assessment of the potential impacts of the barge operation in the context of the location of the cyclone moorings should be undertaken as proposed in the SEIS. This should also identify the cyclone moorings site as a site that should be monitored for erosion (bed and banks) and elevated turbidity.

4.8.2.3 Cyclone moorings

The SEIS proposed a new location for the cyclone moorings required for the project, however, insufficient information was provided in the SEIS regarding the new location of the cyclone moorings and their construction. Minor changes in current flow are predicted from pile construction and cyclone moorings. Local mobilisation of soft sediments may be expected in the immediate vicinity of these features.

The proposed location of the cyclone moorings are within a PASS mapped area – Figure 19-18 of the EIS. Testing and mitigation measures would need to be outlined in the Tidal Works application.

The Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines (Dear et al 2002) identifies piles as a low impact construction method for ASS affected areas. AS 2159-1995 – Piling Design and Installation (Standards Australia 1995) is the guideline to assist the use of piles in soils and advises on concrete performance in sulfate rich environments. Samples taken from marine sediments indicated on sample exceeded the QASSIT action criteria for total actual acidity. There is a risk of release of ASS during construction of cyclone moorings if marine sediments in the identified areas are disturbed or exposed to oxidation processes.

Several seagrass surveys were undertaken and Queensland government seagrass mapping considered. The most recent survey occurred in 2016 in response to submissions on the EIS concerning seagrass extent and further supported the position that seagrass in the Skardon River is seasonally influenced and does not occur in the Skardon River with any size of permanence to support seagrass dependent marine fauna.

Very little seagrass was recorded in the new cyclone mooring area and the EIS does not predict any significant impacts from the barge movements or the cyclone mooring construction.

4.8.2.4 Mooring buoys

Little information was provided in the EIS with respect to mooring buoys, however few impacts are expected. Mooring buoys installed for the project should be seagrass friendly design.

4.8.2.5 Offshore transshipment area and bulk vessels

The offshore transshipment operation would not involve any permanent structure in the marine environment. It is expected that fine grained sediment in the offshore shipment area would be eroded from the bed in the area impacted by the bulk vessels propeller wash leaving coarser grained sediments. The coarser sediment is predicted to remain in place preventing any further erosion. This would need to be confirmed with monitoring data.

Scour is predicted at the transshipment area for laden vessels leaving the area; however, impacts are not anticipated to be significant.

Further information on impacts to benthic habitats, marine ecology and commonwealth marine waters is found in EIS Chapter 6 marine Ecology, Chapter 7 Matters of National Environmental Significance; and sections 4.5; 4.7; 4.16 of this assessment report.

4.8.2.6 Climate change, sea level rise and storm inundation

Shoreline and bank evolution Impacts: during storm surges, lowering or scarping of the inlet profile is anticipated. The severity of impacts would depend on the depth of firmer underlying strata. It is also anticipated that wave run up would result in the transport of sediment into the littoral zone when storm surge is combined with high tide.

4.8.2.7 Cumulative Impacts

The available access to the SRBP infrastructure means that the BLF and MIA are now not needed and impacts on mangroves, sea grasses and salt pans proposed for the Bauxite Hills project would now not occur. The cumulative impacts of the barging operation when combined with the approved Skardon River project remain a consideration for the assessment.

With the collaborative operation of the Bauxite Hills and Skardon River projects, it is considered that the combined annual tonnage of 10Mtpa is now less likely to occur. The predicted impacts from each project would not change as the EIS indicated that the SRBP and the Bauxite Hills projects still require the levels of barging originally required and would operate these concurrently within the Skardon River.

It is assumed that both projects would use the same navigational channel which would double the incidence of propeller wash within the navigational channel. This has the potential to increase the periodicity of elevated TSS and reduced light attenuation with the potential to affect seagrass beds and other benthos, particularly within and close to the shallow areas downstream of the Skardon River port.

Propeller wash from tugs has been shown to cause bed erosion in two places in the channel. One 2km upstream section near the SRBP port has a sandy mud substrate which increases erosion and suspension rates. However, erosion rates near the Skardon River port are expected to be limited by the sediment properties as consolidated layers are exposed under the softer surface, thereby preventing further bed erosion once this layer is reached. Sediment properties were not confirmed and would be required to be confirmed and reported.

Neither project poses a significant impost on water quality outside of the process of propeller wash. Management of runoff from stockpiles at the wharf are the subject of conditions for the SRBP environmental authority and would now need to take into consideration an increase in stockpiled product in the MIA.

The proposed cyclone moorings for the Bauxite Hills project are additional to those approved for the Skardon River project. The EIS did not assess the risks of the new location of the cyclone moorings and the barge

movements between the Skardon River port and the moorings. The impacts on coastal process and the physical marine environment associated with barge traffic include vessel wake impacts, propeller wash turbidity and water quality impacts.

Wave wake impacts from barges from both projects are expected to be limited as they would be slow, operating between 46 knots and would operate as close as possible to the centreline of the deepest part of the channel within the Skardon River. The supply vessels may operate at different speeds but these are less frequent and would not add significantly to impacts.

The operation of the transshipment zones would be duplicated for both the Bauxite Hills project and the Skardon River Project, as would the potential for propeller wash during departure of the bulk carriers. However, the EIS states that given an absence of benthic habitats, localised impacts of propeller wash, availability of alternative habitat, and the distances between the two operations, the impacts may be considered as separate processes. An effective increase in marine pressures is unlikely. The separation of the operations should prevent a cumulative effect.

For the combined projects the total number of barges operating from the Skardon River Port could result in a cumulative impact to water quality due to operational spillages or chemical releases.

The risk of hydrocarbon spillages may be high given the two barge operations occurring concurrently.

4.8.3 Mitigation measures

The EPP Water states that the management intent for HEV waters (i.e. the Skardon River) is to maintain natural values and condition of the waters. WQO are set to maintain its natural state. Where indicators of water quality health may be exceeded, then monitoring would target the assessment of other physical or biological predictors of condition to confirm 'no change' to existing conditions. Monitoring of water quality in the Skardon River would be undertaken during construction and operation, and include locations within adjacent seagrass habitats and locations up and down stream of the new wharf. The proponent proposed a program of monitoring and environmental auditing to ensure water quality and the systems designed to protect it are maintained throughout construction.

The EIS stated that the Marine Monitoring Program (IMMP) would be implemented prior to the commencement of construction of activities. The monitoring program would be established to define the extent of any water quality and physical erosion impacts, with a baseline data collection phase to be implemented prior to construction. The Marine Monitoring Program would be closely linked to the management and mitigation measures outlined in the EIS Chapter 17 Transport and would be incorporated into the project's EMP. The aim of the EMP should be to audit the veracity of the predictions in the EIS and SEIS material and the success of proposed mitigation measures. Monitoring should include:

- monitoring marine water quality, including collection of baseline and ambient TSS levels prior to barge operations
- monitoring of sediment plumes as a result of propeller wash, including their extent, concentration and duration
- monitoring of benthic habitats, including seagrass
- monitoring of shoreline habitats and wave wake erosion
- monitoring of substrate erosion impacts as a result of propeller wash and
- regular monitoring of sediments at the loading and offloading/transshipment site to identify and quantify spillages

This program would be in concert with the monitoring program required for the Skardon River Bauxite Project EA and would include monitoring of:

- water quality monitoring to establish baseline water quality and set site specific water quality objectives for HEV waters for different estuary zones in the Skardon River, open coastal waters and offshore waters
- water quality monitoring during construction of the wharf
- water quality monitoring during bed levelling
- water quality during operations along the navigation channel/barge route for changes in water quality resulting from propeller wash
- water quality monitoring in the river near sediment pond release zones
- sediment quality monitoring in the Skardon River and offshore
- vessel wake wave monitoring comprising wave monitoring and river bank monitoring
- monitoring of propeller wash impacts
- seagrass monitoring, primarily near the wharf
- mangrove monitoring near the wharf

- marine pest monitoring

The monitoring program would describe corrective actions which are to be used should monitoring show that assumptions in the EIS are not met. For example, where sediment monitoring identifies material spillages, measures would be implemented to prevent reoccurrence.

It was concluded in the EIS that propeller wash is expected to make the most significant impact on coastal processes and values. Based on PaCE 2016 modelling, the EIS proposed key management and mitigation measures for the impacts related to increased turbidity and impact to shallow water environments (including seagrass beds) as a result of propeller wash:

- speed limit of 46 knots and a Marine Traffic Management Plan Implemented
- speed limits <4knots within 500m of seagrass beds
- remain within the deep water navigation channels during transit; and
- utilise defined shipping routes and follow proposed Marine Traffic Management Plan.

The highest turbidity increases were predicted to be limited to the navigation channel (maximum width of 20m) and the area adjacent to the Skardon River Port during vessel manoeuvring. Manoeuvring around the cyclone moorings is also expected to result in increased turbidity, due to propeller wash. To mitigate the impacts of increases turbidity and erosion of the bed, Royal Haskoning DHV 2016 made the following recommendations:

- vessel speed should be limited to 6knots within the Skardon River and
- vessels should navigate the centreline of the navigation channel to limit erosion of the bed due to propeller wash

Other mitigation proposed in the EIS included reducing the speed limit to 4 knots in shallow sections of the river; confining transit of shallow areas to higher tidal water levels; reducing vessel drafts through reduced loads during lower tidal waters.

Cyclone moorings:

No specific impact operational mitigations were provided in the SEIS for the new location of the cyclone moorings however, construction mitigations relating to pile driving are included based on measures that would have applied to the BLF pile driving activity which is now no longer required. Mitigation measures relating to impacts on marine fauna would be relevant to the new location but further information including description of the environment, impacts, mitigation measures and a revised monitoring program, together with justification for not co-locating the cyclone moorings for both projects, would be required with the forthcoming tidal works application.

Acid Sulfate Soils:

Acid Sulfate Soils – field soils survey and preliminary ASS investigation. Predictive ASS mapping (CSIRO) was used. Laboratory testing was appropriate. Mitigation and treatment measures are proposed. EHP submission requested more definitive locations of ASS, volumes that would need treatment, the size and location of treatment pads, and more information on the potential impact and mitigation measures and alternatives. The BLF RORO, MIA, Haul road are now not needed and the project would not impact on Skardon soils. Also the new haul road alignment between BH6east and BH1 would mean the project would avoid areas of Skardon soils and hence avoid impacting on ASS or PASS. It is unlikely that ASS would be encountered, however, if it is, the ASS would be taken to a bunded ASS treatment pad located in the footprint of the BH6 east mine pit. The treatment pad would have appropriate bunding to 0.3m height, drainage to withstand a 1 in 2 year storm event and be built on a clay base to prevent leachate. Dewatering would be managed to pH 7 – 8.5; turbidity to 10 NTU; DO to >80%. Treated water would be released to the Skardon River. Treated soils returned to the mined-out section of BH1.

There is a possibility that ASS could be encountered in river sediments disturbed during the construction of the cyclone mooring pilings. Sufficient information must be provided with the tidal works application regarding the presence of ASS and any management strategies required.

Additional field investigation should be undertaken to identify ASS or PASS and if required, the preparation and implementation of an ASS Management Plan.

Should a detailed ASS Management Plan be required, then additional analysis within the construction footprint would need to be undertaken in accordance with the QASSIT guideline and management and mitigation steps developed and implemented specific to the cyclone moorings.

4.8.4 EHP conclusion and recommendations

Submissions on the EIS indicated concern about the potential impacts on the marine environment from the location of the BLF and MIA and haul road only the edge of the Skardon River. The SEIS addressed this concern

by modify the Project and utilising the adjacent SRBP's infrastructure and reducing direct impact on coast wetlands and marine environments.

The Bauxite Hill project now proposed has changed so that the BLF, RORO and MIA areas along the banks of the Skardon River are now not required. The adjacent project's infrastructure would be utilised. The Project does not propose any releases into the HEV waters of the Skardon River from the mining activity. The project retains the barging and shipping component for assessment in the EIS. The SEIS also included a proposal to locate cyclone moorings in a section of the Skardon River, outside of the MLA area.

These changes mean a significantly reduced risk to the coastal and marine environment; however, impacts and risks remain resulting from the cyclone moorings and barging activities within the Skardon River.

Barging:

The key coastal environment impacts predicted from the Project are bed erosion and the consequential increase in turbidity from propeller wash impacts. These impacts are most likely within the navigation channel and near the Skardon River Port and cyclone moorings where barges and tugs would be manoeuvring. Where propeller wash is causing excessive sediment suspension, then a management response may be to increase the time period between barge traffic.

Wake wave impacts are not expected based on modelled impacts of barge movements at conservative speeds. Monitoring of banks would be required and if assumptions are found not to be accurate and wake wave impacts become apparent further management measures would be required. For example, where wake waves are causing erosion, drop speeds to 4 knots.

EHP requires that an Integrated Marine Monitoring Program (IMMP) be developed by an appropriately qualified person, and implemented by the environmental authority holder. The IMMP must include the monitoring and management of the following:

- marine water quality
- sediment quality
- vessel wake waves
- seagrass
- mangroves
- propeller wash and
- marine introduced pests

The IMMMP must update the modelled impacts vessel wake erosion and propeller wash, audit the effectiveness of design and mitigation measures, and identify additional management measures to address the likely impacts. Management steps may include changes in operations to avoid unacceptable impacts. For example, if wake waves are found to be causing erosion, drop vessel speeds to 4 knots. Where propeller wash is causing excessive sediment suspension, increase the time period between barge traffic. The frequency of vessel movements and the number of vessels in convoy should be considered in the IMMMP to account for settlement times for suspended sediment as a result of propeller wash.

Where impacts to marine plants/mangroves occur that are unavoidable, an offset may be required to compensate for the loss of the matter.

Barge vessel speed is not to exceed 6 knots in the Skardon River channel and 4 knots in shallow reaches with mobile sediments to avoid impacts on increased turbidity, as well as erosion of the river bed and Skardon River banks due to propeller wash and vessel wake waves. A reduced speed would also lower the chances of boat strike with marine fauna in the river and at the mouth where turtles are known to nest. Revision of vessel speeds may need to be adjusted if impacts are greater than predicted. The proponent is required to ensure all relevant documents reflect the requirement for vessels to travel at a maximum speed of 6 knots and 4 knots at specific locations.

The timing (in relation to tidal water levels) and frequency of manoeuvring vessels into the cyclone moorings should take into account the potential impacts on the substrate and banks, and water quality at the site, from the propeller wash and mitigations incorporated in the operating procedures for vessels at the moorings.

The Marine Operations Management Plan should reflect these recommendations and amend work practices where information from the IMMMP indicates unacceptable impacts.

Cyclone Moorings:

A new location for the cyclone moorings was identified in the SEIS and the proponent predicted that impacts associated with the installation and removal of the cyclone moorings are expected to be negligible and of short duration.

No management or mitigation measures were provided in the EIS for the new location of the cyclone moorings. There is uncertainty about the number of vessels that would utilise the moorings and whether the cyclone moorings would be used by vessels from both the Project and the SRBP. Potential impacts and mitigation measures relating to impacts on marine fauna would be relevant to the construction and operation of the cyclone moorings.

Impacts from the cyclone moorings have not been fully assessed. Further information about the design of the proposed cyclone moorings, location, environmental values, impacts, mitigation measures would be required with the Tidal Works application under Schedule 3, part 1, table 4, item 5(a) of the SP Act. The information requirements are outlined in the guideline: *Assessable coastal development; Department of Environment and Heritage Protection; EM2066 v4*. Pre-lodgement advice can be provided.

EHP considers that insufficient information was provided in the SEIS regarding the new location of the cyclone moorings and their construction and therefore this infrastructure has not been assessed as part of the EIS. Detailed information would be required with an application for Tidal Works as outlined below and in Appendix 6 which the proponent has indicated they would provide.

EHP requires that the following information be provided with the application:

- Provide a management plan in conjunction with the overall project EMP that includes management strategies to minimise impacts on the receiving environment from the construction and operation of the cyclone moorings, including but not limited to:
 - environmental commitments - a commitment by senior management to achieve specified and relevant environmental goals;
 - description of works to be undertaken, including the type of equipment to be used and the location of works;
 - environmental issues and potential impacts;
 - the actual and potential release of any contaminants;
 - the potential impact of these sources and contaminants;
 - actions to be taken to minimise the impacts of the works on the surrounding environment;
 - monitoring of impacts and the outcomes of management measures;
 - contingency plans including the practices and procedures to be employed to restore the environment or to mitigate impacts on the receiving environment; and
 - periodic review of environmental performance and continual improvement.
- Describe whether there could be a reduced overall environmental impact from combining the SRBP cyclone moorings with those proposed for the Project should also be discussed. If so consider the least impacting and safest alternatives for cyclone mooring locations in the Skardon River.
- Provide a revised IMMMP with the application. The IMMMP should identify the cyclone moorings site as a monitoring site for bed and banks erosion and elevated turbidity. Confirmation of the nature of the hardness of the substrate at the site is also required.
- Further water quality, sediment and turbidity monitoring as well as the derivation of water quality triggers are to be undertaken prior to commencement of construction of cyclone moorings. This would include capturing turbidity through logger data from key receiving habitats, as well as from above and below the impact areas.
- A detailed ASS assessment where the pilings are proposed and if ASS is found then the ASS Management Plan is to be updated to address this with appropriate management strategies. This may include the choice of piling installation and methods to minimise ASS disturbance.
- Potential impacts from the piling on marine megafauna including threatened species (QLD) and proposed measures to avoid, minimise and mitigate these impacts.
- Undertake an assessment of the potential impacts of the barge operation in the context of the location of the cyclone moorings proposed in the SEIS. This should include consideration of the number of barge movements to and from the moorings, impacts on bed and banks, marine flora and fauna etc and information about the operating procedures required to minimise these impacts.
- A complete response to the Coastal Protection State Development Assessment Provisions (Module 10) addressing coastal hazard considerations, impacts on coastal resources and impacts on MSES and proposed management and mitigation measures.

In addition, EHP recommends the following general requirements which would minimise potential impacts on the coastal and marine environment:

- an ESCP must be implemented including pre wet season measures that minimise sediment runoff into the HEV waters.
- the monitoring frequency for TSS following a storm event must be carried out within 2 hours of release.
- where it is not practical to sample TSS during and after storm events a relationship between TSS and

turbidity should be developed and with subsequent measures of turbidity used to infer TSS and use turbidity data to compare with an equivalent TSS limit of 50mg/L

- the proponents of the proposed Skardon River Bauxite and Bauxite Hills projects would require a coordinated approach in regards to the management and monitoring of environmental values of the Skardon River, including but not limited to water quality, sediments, and risk management associated with potential leaks and spillages into the estuarine and marine environment.
- ASS sampling must be undertaken prior to construction and implementation of an ASS Management Plan be implemented if ASS would be impacted.

The Environmental Authority and its conditions (see Appendix 1) and a future Tidal works application and approvals (see Appendix 6) would manage impacts on coastal and marine values. The MNES section 4.7 of this report and the subsequent EPBC approval for the controlled action would also set requirements about managing impacts on the marine environment and on listed marine species. The proponent must implement the commitments as stated in SEIS Appendix J – Consolidated Commitments.

4.9 Air

The relevant sections of the EIS used to assess the air shed and management of likely air impacts were EIS Chapter 12 – Air Quality and Appendix F – Air Quality and Greenhouse Gas Technical Report. Further information was submitted by the proponent in the SEIS.

4.9.1 Environmental Protection (Air) Policy 2008 (EPP (air))

The project has indicated that the management hierarchy for air emissions (Part 4, section 9) from the EPP for Air would be used to manage air from operations, and construction processes. The air quality objectives in schedule 1 have been considered, and it is accepted that the Model Mining Conditions for Air would adequately address these objectives, whilst maintaining effective measures to regulate the air impacts of the proposal. The environmental values for air to be protected include: Human health and wellbeing; protecting aesthetic environment; agricultural use; health and biodiversity of ecosystems.

4.9.2 Values, impacts and mitigations measures

A summary of existing values, impacts and proposed avoidance and mitigation measures on air as outlined in the EIS is provided in Table 12.

Existing background air quality includes natural sources of particles generated from bushfires, salts spray and wind-blown dust. The EIS air quality assessment did not collect on-site air quality data to determine existing airshed values. The proponent carried out a suitable air quality desktop study, using inferred data from other mine sites to predict local airshed background pollutant concentrations for dust deposition, TSP, PM₁₀ and PM_{2.5}.

Background air quality was estimated using monitoring data reported from air quality assessment for other mines in Queensland, including South of Embley and Pisolite Hills Projects. Air quality modelling was undertaken to predict emission rates for project activities based on the schedule for 2024, when the mining activities are expected to be at near full capacity and located closest to the residential sensitive receptors located in Mapoon.

The likely impact on sensitive receptors was predicted using air dispersion modelling for total suspended particulates (TSP), particulate matter less than 10µm diameter (PM₁₀) and less than 2.5µm (PM_{2.5}) and dust deposition. The SRBP accommodation camp and existing airstrip and terminal were also modelled and included as sensitive receptor locations. The airshed is associated with 47 potential sensitive receptor locations with the closest location is Mapoon approximately 16km southwest of the ML boundary. However the SRBP accommodation camp is also currently considered a sensitive receptor and should be subject to standard air quality conditions.

4.9.3 Assessment and conclusions

EHP determined that the EIS adequately addressed the TOR and submissions received on the EIS relating to air, as well as the environmental air quality objectives and performance outcomes stated in schedule 5, table 1 of the EP Regulation.

The methodology used in the EIS to characterise background air quality and model the potential impacts of the project on air quality and GHG was appropriate to establish protection limits for the EA. Suitable avoidance and mitigation commitments to minimise emissions of contaminants to air and achieve regulatory limits consistent with EHP's model mining conditions were proposed.

EHP provided a submission on air quality and the issues raised were adequately addressed in the SEIS. The SEIS identified two changes to the project that would reduce air quality impacts on sensitive receptors. The first

is to rely on the power generation capacity of the SRBP rather than a generator on the site. As a generator is no longer on site, emission factors and conditioning are no longer required for this issue. Note that the SRBP already has conditions that cover that projects generator. The second is to rely on the SRBP accommodation camp, therefore reducing the number of sensitive receptor sites and removes the need for a STP. The SRBP is now the closet human sensitive receptor site, and already has suitable conditions related to air quality emissions on the SRBP EA.

Specific recommendations from EHP’s assessment, including recommendations to adopt custom conditions to capture proponent’s commitments to minimise impacts on air values are contained in Table 12 below.

The recommended conditions for the environmental authority with respect to air quality (see Appendix 1 of this assessment report) would be sufficient to manage impacts to air from the project.

Table 11. Environmental values for air to be protected: human health

EIS Table 12-3 Air criteria Pollutant	Basis	Averaging Time	Criteria	Source	Exceedances¹
Particulate Matter Criteria					
Total Suspended Particulates (TSP)	Human Health	1 year	90 µg/m ³	MMC2	NA
PM10	Human Health	24 hour	50 µg/m ³	MMC2	Five days per year
PM2.5	Human Health	24 hour	25 µg/m ³	MMC2	NA
	Human Health	Annual	8 µg/m ³	Air NEPM	NA
Dust deposition	Amenity	30 days	120 mg/m ² /day	MMC2	NA

Table 12. EIS assessment of air quality (summarised from EIS Chapter 12, Air quality)

EIS SUMMARY*			EHP RECOMMENDATIONS
Air characteristics and levels and EVs	Potential impacts on EVs	Avoidance, mitigation and management commitments	
<p>Environmental values for air to be protected: Human health and wellbeing; protecting aesthetic environment; agricultural use; health and biodiversity of ecosystems.</p> <p>Existing air quality: natural sources of particles generated from bushfires, salt spray particles from the Gulf and wind-blown dust.</p> <p>Sensitive receptors:</p> <p>Skardon River Bauxite Project accommodation camp is closest sensitive receptor at 0.3km W of mining pit (BH6)</p> <p>Existing Gulf Alumina air strip and terminal is a sensitive receptor 3.3 km SW of mining pit (BH6).</p> <p>Mapoon township is a sensitive receptor R44 = either 18.1sw (table 12-8) OR 16km in text (s12.5.7)</p> <p>Natural environment and woodlands and habitat.</p>	<p><u>Site preparation & construction phase</u></p> <p>Dust generating activities (in both construction and operational phases) have potential to generate high levels of dust, if not appropriately managed</p> <ul style="list-style-type: none"> land clearing before mining and mine infrastructure can create dust emissions from vehicle and ship movement exhaust clearing and burning of windrow vegetation – odour and dust nuisance impacts emissions are likely from haul truck movements (accounting for 55% of predicted total PM₁₀ /year) dust deposition on native vegetation. <p>Predicted emissions:</p> <p><i>Construction</i></p> <p>The 24 hour average ground level PM₁₀ concentration at the accommodation camp was predicted as 35 µg/m³ with 50% dust control on haul roads. This is below the EPP (Air) objectives of 50 µg/m³</p> <p><i>Operations</i></p> <p>Highest TSP, PM₁₀, PM_{2.5} and dust deposition concentrations were predicted at the existing Hail Creek mine camp site (R1) but concentrations were still below air quality criteria.</p>	<p>Construction:</p> <ul style="list-style-type: none"> During construction phase less equipment would be utilised than that required for full operations Re-use as much cleared vegetation as possible through the rehabilitation process and potentially through a trial composting process. Watering of haul roads to reduce dust emissions Limiting vehicle movements and speed, particularly during shift changes and meal times to reduce dust emissions <p>Operational phase:</p> <ul style="list-style-type: none"> Minimise area of exposed soil at any time that may generate dust Progressive site rehabilitation and revegetation After initial extraction all overburden material would be placed back within the mined area Minimise double handling of material Identification of fine and/or friable material (e.g. top soil) and implement a risk management approach to dust mitigation Minimise topsoil stripping activities during adverse weather conditions Preparation of work areas prior to commencement of mining activities e.g. watering of extraction areas Erect physical barriers (e.g. bunds or wind breaks) around stockpiles or areas where earth moving is required Restrict vehicle movement to defined routes Allow vegetation to establish on stockpiles to prevent wind erosion 	<p>Predictive modelling results in the EIS predict dust deposition, TSP, PM₁₀, PM_{2.5} and other pollutants would not exceed air quality criteria at sensitive receptor locations.</p> <p>Bauxite hills EIS supplementary report states that the SRBP accommodation village would be use as accommodation camps for the project which would reduce the number of sensitive locations to be managed for potential air quality impacts</p> <p>The EIS cumulative impact assessment concluded that TSP, PM₁₀, PM_{2.5} concentrations and dust deposition at the sensitive receptors would meet the EPP (Air) objectives.</p> <p>Furthermore, PM₁₀ was identified as the most critical air quality parameter cumulative result.</p> <p>Use of Model mining conditions are reasonable to manage air</p>

EIS SUMMARY*			EHP RECOMMENDATIONS
Air characteristics and levels and EVs	Potential impacts on EVs	Avoidance, mitigation and management commitments	
		<ul style="list-style-type: none"> Minimise topsoil stripping activities during adverse weather conditions 	quality Include air quality commitments in commitment conditions.
	Odour emissions from onsite waste bins transfer stations and sewage treatment facility.		Changes to the proposal means that the project no longer includes an STP as it would be relying on the STP approved for the SRBP. Therefore odour emissions would be managed via the SRBP EA.
	Greenhouse gas (GHG) emissions primarily from electricity consumption.		Changes to the proposal means that the project no longer requires generators as it would be relying on generators approved for the SRBP. Therefore GHE emissions would be managed via the SRBP EA.

4.10 Noise and vibration

The noise background and management commitments for mitigating identified likely noise impacts were described in EIS Chapter 13 – Noise and Vibration and detailed noise studies were undertaken and described in EIS Appendix G – Noise and Vibration Technical Report. Further information was submitted by the proponent in the SEIS.

4.10.1 Environmental Protection (Noise) Policy 2008 (EPP (noise))

The project has indicated that the management hierarchy for noise (Part 4, section 9) from the EPP for Noise would be used to manage noise from operations, and construction processes. The Acoustic quality objectives in schedule 1 have been considered, and it is accepted that the Model Mining Conditions for Noise would adequately address these objectives, whilst maintaining effective measures to regulate the noise impacts of the proposal.

4.10.2 Values, impacts and mitigations measures

A summary of existing values, impacts and proposed avoidance and mitigation measures on noise and vibration are outlined in the EIS provided in Table 13. EIS assessment of noise

The environmental values that could potentially be impacted include sensitive receptors situated in the SRBP mining camp and surrounding terrestrial and marine fauna. The EIS identified that noise may adversely affect wildlife by interfering with natural noises such as communication, noise of predators and prey, and may affect mating behaviour. Analysis of the proposed noise limits shows that predicted noise levels are considered to be below those levels that could potential cause adverse impacts to animal behaviour, however there is inconclusive data about the impacts of noise on animal behaviour.

4.10.3 Assessment and conclusions

The requirements of the TOR in relation to noise were adequately addressed in the amended EIS. Appendix G contains an assessment against the EO & PO. For this value (noise) the assessment concluded that the EIS provided sufficient information and that in most cases sufficient measures were proposed to protect the environmental values. However there was some concern regarding the potential impacts on marine species as there has been little research done in the field of underwater impacts from construction activity noise and vibration. The EIS and supplementary reports propose the use of trained marine spotters, and a slow start up of machines involved in the construction of cyclone moorings.

Model conditions would be sufficient to manage impacts on the land based sensitive receptors. In addition it is recommended that an additional condition that captures the commitments for marine sensitive receptors, and that a specific condition be included to regulate the slow start up proposed for construction of the cyclone moorings, so that sensitive marine species have a chance to move from the area. It is recommended that due to the possible presence of sensitive species that marine spotters may not see, a slow start-up time of 15mins is conditioned, as discussed in the EIS supplementary report – section 7.2.2.

Table 13. EIS assessment of noise

EIS SUMMARY*			EHP RECOMMENDATIONS
Noise characteristics and levels	Potential impacts on EVs	Avoidance, mitigation and management commitments	
Low frequency noise	<p>public amenity - Noise nuisance impacts on residential sensitive receptors</p> <p>Impacts to health and biodiversity of fauna</p>	Limited amounts of low frequency noise are not expected to impact residential receptors at Mapoon	EHP model mining conditions are considered sufficient.
Impact to health and wellbeing of humans	public amenity - Noise nuisance impacts on residential sensitive receptors	<p>Training operators to use equipment to minimise unnecessary noise emissions</p> <ul style="list-style-type: none"> • Covers and enclosures • Maintain roads and equipment to minimise noise • Minimise drop heights of materials • Enclose significant noise sources where possible 	<p>Use of Model mining conditions are reasonable to manage noise</p> <p>Include Noise commitments in commitment conditions</p>
<p>Nuisance to nearby sensitive receptors</p> <p>Daytime: 35 dB $L_{Aeq, adj 15 min}$; 48 dB $L_{A1, adj 15 min}$</p> <p>Evening: 35 dB $L_{Aeq, adj 15 min}$; 45 dB $L_{A1, adj 15 min}$</p> <p>Nigh time: 30dB $L_{Aeq, adj 15 min}$; 37 dB $L_{A1, adj 15 min}$</p>	<p>public amenity - Noise nuisance impacts on residential sensitive receptors</p> <p>Maintaining reasonable quality of life.</p>	<p>Training operators to use equipment to minimise unnecessary noise emissions:</p> <ul style="list-style-type: none"> • Covers and enclosures • Silences on safety valves • General restriction of construction to daytime And • operational procedures to introduced to reduce noise • Maintain roads and equipment to minimise noise • Minimise drop heights of materials • Enclose significant noise sources where possible 	<p>Accepting that noise would be attenuated as adjusted for standard accommodation for mine sites the model mining conditions for Noise and Vibration are considered adequate for the sensitive receptor identified as the SRBP accommodation camp.</p>
<p>Impacts to health and biodiversity of ecosystems</p> <p>Pile Driving Noise impacts</p>	<p>Ecological health:</p> <ul style="list-style-type: none"> • Impact on terrestrial species as sensitive receptors • Impact on marine species as sensitive receptors. 	<ul style="list-style-type: none"> • Covers and enclosures • Silences on safety valves • General restriction of construction to daytime; and • operational procedures to introduced to reduce noise 	<p>Condition to regulate slow start up at 15mins for construction of cyclone moorings, to ensure mobile species have time to move from the area.</p> <p>Noise commitments for marine works be included in commitment conditions.</p>

4.11 Waste

EIS Chapter 14 – Waste management identified the waste streams expected to be generated by the project's activities, provided an assessment of the potential impacts of generated waste and described management options for waste minimisation and disposal. The SEIS indicated that the project would now rely on the approved Accommodation and sewage treatment systems of the adjacent SRBP.

As the Bauxite is suitable for direct shipping with no washing required, and there is no material processing proposed on site, other than sifting out rocks, trees and other land material in pit, there are no proposed tailings dams for the site. This means that there are no expected mine tailings or mine reject wastes generated which minimises discharges proposed from the project into the environment.

All other generated waste is proposed to be reused onsite where possible, composted for use in rehabilitation, or taken offsite and disposed of in licensed recycling facilities or as a last resort licensed landfills. Reuse of waste applies to items such as timber off-cuts, paint in sufficient quantities, or material to be composted for use in progressive rehabilitation works. The waste rock and other material separated from the ore would be used as either fill for the pits during rehabilitation, or composted for mixing into top soil stockpiles.

4.11.1 Values, impacts and mitigations measures

Values identified in the EIS potentially impacted: visual amenity, surface water and land, Marine environment, Ground water, ecological values (through increasing pests or feral animals which impacts on native species), health and safety of the community

The main wastes anticipated to be generated include:

- Green waste through clearing the site to commence construction of infrastructure
- Waste generated through the construction, operational and decommissioning of the project including: building and construction waste, general and recyclable waste and regulated waste
- General domestic waste generated by construction and operational workforce, due to isolated location
- Plant and equipment waste generated by the vehicles, plant and equipment used to undertake construction activities including excavations, onsite haulage, grading and material compaction
- Wastes generated through mining in the form of spoil (from overburden and interburden removal and ex-situ emplacement) and rejects from coal processing (i.e. coarse rejects and dewatered tailings).

The characteristic and volume of waste predicted to be generated through the project, potential disposal options and proposed management strategy for each waste are provided in Table 14-2 of the EIS. A summary of the existing values, impacts and avoidance and mitigation measures associated with waste is provided in Table 14. EIS assessment of waste

4.11.2 Assessment and conclusions

EHP determined that the EIS adequately addressed the TOR and submissions received on the EIS relating to waste management in most parts, as well as the environmental objectives and performance outcomes stated in schedule 5, table 1 of the EP Regulation, however there are several issues identified by EHP in regards to construction waste composting, burning of waste and potential spillage during land to barge transfers.

Environmental values are unlikely to be affected unless there is a spill or a containment or waste transfer failure occurring. Management proposed to address this issue would be to hire a specialist waste removalist.

EHP concluded that the waste streams are likely to be managed appropriately as very little waste is intended to be disposed of onsite. Waste that is sent offsite would be managed in accordance with licensed transport and recycling and disposal facilities where required by law. The SEIS commits to managing the waste in accordance with the waste management hierarchy, and all waste streams are either intended for reuse on-site either as additional material or part of composting facilities, or transported offsite and recycled where possible.

It was noted in the EHP's submission on the EIS that the composting facilities would not be operational immediately and for some of the construction phase. The SEIS section 4.5.5 addressed this issue and stated that all wastes would be exported from site until the site waste management system is operational. As the composting system would not be available for some of the construction phase it is essential that to avoid odour and vermin risks, material waiting for composting systems is not stored onsite. The removal of compostable material prior to waste systems being operational is recommended.

EHP advises that if a notifiable activity is identified as being carried out on the land, the owner or occupier of the land, local government or a local government or auditor must notify the EHP under section 320A of the EP Act.

Appendix 1 of this report recommends conditions for the EA with respect to waste management.

Table 14. EIS assessment of waste

EIS SUMMARY*			EHP RECOMMENDATIONS
Waste volume and characteristics	Potential impacts on EVs	Avoidance, mitigation and management commitments	
<p>General and Recyclable Waste: e.g. green waste, building and construction waste, domestic waste, commercial and office waste</p> <p>Green Waste accrued from ~ 500ha of clearing vegetation for initial mining and construction of the MIA, BLF, RoRo and accommodation camp</p>	<p>Risks of site contamination as a result of a spill or improper handling of regulated waste materials</p> <p>Waste spills could impact on Fisheries or marine species through runoff from contaminated sites</p> <p>Smoke from burning waste can impact air quality</p>	<p>Minimise clearing requirements were practicable, with staged clearing of vegetation</p> <p>Larger veg hollow logs and parts of hollow bearing trees reused onsite during progressive rehabilitation for fauna habitat.</p> <p>Waste that is not used would be burned and incorporated into topsoil stockpiles</p> <p>BLF, MIA and haul roads have been relocated away from sensitive mangrove habitats to reduce the potential impacts to fish nursery areas</p> <p>Mitigation in commitment not to start recycling and separating wastes until systems are in place on site, prior to systems being in place, all waste would be transported off site.</p>	<p>Key commitments must be implemented by the proponent where they do not conflict with any subsequent regulatory approval conditions.</p> <p>Model mining conditions for waste are appropriate to regulate risks to EVs.</p> <p>Commitment has been made in the supplementary EIS to keep burning waste to a minimum.</p> <p>Also include custom conditions in draft EA to capture key commitments made by proponent in the EIS to minimise risk to environmental values.</p>
<p>Building and Construction Timbres- offcuts packaging materials</p>	<p>Onshore waste has the potential to impact on visual amenity, water (surface and groundwater) quality, marine environment, ecology health and safety and the capacity of regional waste management facilities if they are not properly managed</p> <p>All waste being transferred to barges has the potential to cause impacts on environmental values through spillage during transfer from land to barge.</p> <p>It was noted that composting facilities are not operational during at least part of this phase, which increases the risk of impacting on visual amenity, air quality through odour, and ecology health through encouraging vermin.</p>	<p>Avoid over ordering and delivery of excess materials</p> <p>Reuse on site if possible</p> <p>Recycle through chipping and mulching if possible</p> <p>Disposal through burning with the wastes included into the compost of use in rehabilitation works</p> <p>Commitment to engage a specialised waste contractor to handle and remove waste from site.</p> <p>Shipping containers to remove waste in bulk would be used to minimise spillage</p> <p>Composting recycling with appropriate management methods</p>	<p>The EIS' waste minimisation strategy is considered reasonable, though burning of vegetation potentially generates air quality issues.</p> <p>The EIS indicates that there would be no disposal of waste materials onsite, except for screened rock material extracted from the pits. This would be reused to fill pits during rehabilitation.</p> <p>General model mining conditions for waste disposal are appropriate to manage risk with a possible additional condition relating to handling and transfer from port to boat and shipping of waste by boat.</p> <p>As the composting system would not be operational for some of the construction phase it is essential that, to avoid odour</p>
<p>Metals including steal</p>		<p>Avoid over ordering</p> <p>Reuse onsite though stockpile system</p> <p>Transport offsite to recycling facility</p>	

EIS SUMMARY*			EHP RECOMMENDATIONS
Waste volume and characteristics	Potential impacts on EVs	Avoidance, mitigation and management commitments	
Concrete Residual paints, sealants, solvents, resins		Avoid over ordering, stockpile for reuse Reuse in form of concrete blocks on site. Reuse where suitable quantities exist stockpile at a designated area for reuse. Stockpile then Transported offsite to waste disposal facility by licenced contractor	and vermin risks, material waiting for composting systems is not stored onsite. A condition requiring removal prior to waste systems being operational is recommended.
Plastics – excess packaging Electrical waste and electronic equipment		Avoid and minimise – avoid over ordering Recycle – storage and removal to recycling facility	
Contaminated soil		Treat and reuse - onsite bioremediation through land farming	
Worker accommodation camp	N/A – new project plan does not include additional accommodation – would use facilities assessed under SRBP.	N/A	Waste management for accommodation has been removed from this EIS as the project would now share the facilities assessed under the SRBP. The accommodation camp has already assessed and the EA has been issued. It is considered that the approved conditions for waste on the SRBP EA are appropriate to regulate waste associated risks to EVs.
Operation and maintenance of plant and machinery Waste oil	Onshore waste has the potential to impact on visual amenity waster (surface and groundwater) quality, marine environment, ecology health and safety and the capacity of regional waste management facilities if they are not properly managed All waste being transferred to barges has the potential to cause impacts on environmental values through spillage during transfer from land to barge.	Recycle – storage and removal to recycling facility	The EIS and Supplementary waste minimisation strategy is considered reasonable, though burning of vegetation potentially generates air issues. The EIS and Supplementary report contain no disposal of waste materials onsite, except for composting material and screened rock material extracted from the pits. Composted material would be reused in

EIS SUMMARY*			EHP RECOMMENDATIONS
Waste volume and characteristics	Potential impacts on EVs	Avoidance, mitigation and management commitments	
Tyres		Recycle – storage and removal to recycling facility Dispose if not higher order option viable – offsite landfill	<p>rehabilitation through addition to top soil. Screened material would be reused to fill pits during rehabilitation.</p> <p>Model mining conditions for waste disposal are appropriate to manage risk with a possible additional conditions relating to handling transfer from port to boat and shipping of waste by boat.</p> <p>Compositing conditions should be added to ensure that this material is handled appropriately.</p>
Batteries		Recycle - storage and removal to recycling facility	
Drums – storage of grease oils and other hydrocarbons or chemicals		Avoid and minimise – avoid over ordering Recycle – storage and removal to recycling facility Dispose if not higher order option viable – offsite landfill	
Electrical waste and electronic equipment		Avoid and minimise – avoid over ordering Recycle – storage and removal to recycling facility	
Sewage effluent from the accommodation camp and administration buildings	N/A – new project plan does not include additional accommodation – would use facilities assessed under SRBP. No additional impacts.	Sewage effluent is to be treated at a treatment plant (ERA 63 (1)) at the adjacent SRBP accommodation camp STP which has sufficient capacity.	<p>Sewage treatment: Note sewage treatment management has been removed from this EIS as the project would now share the facilities assessed under the SRBP.</p> <p>The facilities already assessed and a EA has been issued. It is considered that the approved conditions for waste on the SRBP EA are appropriate to regulate waste associated risks to EVs.</p>

4.12 Water Quality

The water quality management commitments for mitigating likely water quality impacts were described in EIS Chapter 9 – Water Quality and detailed studies were undertaken and described in EIS Appendix E2 – Surface Water Technical Report. Further information was submitted by the proponent in section 9 of the SEIS.

4.12.1 Values

The project is located within the Skardon River catchment, which forms approx. 350 km² of the Ducie drainage basin and is bounded by the Ducie River and Namaleta Creek catchments to the south, the McDonald River catchment to the north and the waters of the Gulf of Carpentaria to the west. The Skardon River is a perennial system whilst the Namaleta Creek and freshwater reaches of the Ducie River are ephemeral, generally only flowing after rainfall events of sufficient size to generate runoff. Stream flow in rivers tends to show a lagged response to rainfall, with wet-season rainfall commencing in November and reaching its peak in January, whilst an appreciable increase in surface water flow is not noted until January, reaching peak flow in March. This coincides with the timing of rainfall-derived recharge and suggests that prolonged stream flow in rivers and creeks are maintained to some extent by baseflow. The project area is surrounded by low lying swamps which are seasonally inundated.

The project is partially located in the Skardon River - Cotterell River Aggregation which is a Nationally Important Wetland area (EHP, 2009). A second Nationally Important Wetland, the Port Musgrave Aggregation, covers the Port of Musgrave and estuarine areas of Namaleta Creek to the south of the Project. Big Footprint Swamp, a freshwater swamp located near the northwest boundary of BH6 is registered in the Queensland Directory of Important Wetlands. Two smaller areas of the same vegetation type as Big Footprint Swamp were mapped in the revised vegetation mapping for the project.

The project proposed pit locations are situated either side of the Skardon River on elevated bauxite plateaus. No product processing is proposed on site and stockpiles would be managed on the adjacent project's mine infrastructure area and regulated via an already approved environmental authority.

No surface water release points or sediment dams are proposed for the project. However management of sediment associated with the construction of haul roads and vegetation clearing would be managed for the project in the context of the HEV environment. Sediment dams and release points are proposed as part of the SRBP environmental authority.

The haul roads would be constructed using local materials (i.e. ironstone, laterite or low grade bauxite) taken from within the existing borrow pits adjoining the main SRBP haul road, within the proposed haul road corridor or from the BH1 mine pit. The haul road design would be based on acceptable road design standards such as the Austroads Guide to Rural Road Design and the Queensland Road Planning and Design Manual. The basic design criteria adopted for the indicative design process is presented in Table 4-2 of the SEIS (see SEIS Figure 4-1 for indicative haul road design). Haul road design would include suitable culverts and over flow structures to allow the free flow of water during the wet season, when the mine is not operating.

The existing water quality for the Project area was examined from a range of data sources for the EIS:

- DNRM gauge station data from the Dulhunty River station
- Publicly available data from Rio Tinto Alcan's Amrun (formerly known as the South of Embley Project 2012) located approximately 110 km to the south of this Project
- Publicly available data from the previously proposed Metro Mining Pisolite Hills Project approximately 50 km to the south (data collection spanned 2008 to 2013);
- Water quality data from the EIS for the adjacent SRBP; and
- Specific water quality monitoring undertaken for the Project, representing freshwater, estuarine/marine water and groundwater.

The EIS contained a database comprising project derived site specific data in addition to regional water quality data associated with other projects. This dataset formed the basis for the water quality analysis in the EIS. Since the release of the EIS for public consultation, three further sampling events were undertaken. A review of the revised water quality dataset, which incorporated the three additional rounds of data, against descriptions of natural conditions was undertaken and documented in the SEIS. Although there was a shift in some statistical means it was assessed that the additional data has not materially different from the assessment of background conditions described in Chapter 9 of the EIS. The revised assessment is considered more reflective of site specific conditions.

The SEIS provided more information about the receiving environment monitoring points for freshwater; upper estuary, and lower estuary, surface water release and reference monitoring points.

The decision to utilize the approved SRBP infrastructure provided the opportunity to avoid potential water quality impacts associated with the haul road and BLF originally proposed on the Skardon River and for the design and implementation of a cooperative surface water monitoring program across both projects. No release points would be required as the approved release points associated with the SRBP would be utilised.

A summary of existing surface water and groundwater quality values, impacts and proposed avoidance and mitigation measures are outlined in the EIS and summarised below.

Freshwater and marine water quality characteristics

Table 9-2 of the SEIS described the site specific water quality characteristics for freshwater would be similar to regional conditions although EC and turbidity would be an order of magnitude higher. The regional freshwater dataset was dominated by sites within Namaleta Creek which is a larger freshwater system than sites represented in the site specific freshwater dataset and accounts for the variability in EC and turbidity. Conditions for estuarine environments would be more variable with turbidity and EC reported at lower levels for the revised site specific dataset in comparison to the regionally derived dataset, whilst nutrients (particularly phosphorus) are higher. It is likely that a degree of variation between site characterisation can be attributed to the increase in dataset used in the site specific characterisation (for example site specific dataset refers to 33 data points for EC whilst the regional dataset refers to 16).

Groundwater water quality characteristics

The concentrations of total dissolved solids in groundwater samples collected since February 2016 were within the range of values detected in the previous sampling rounds. Major ion concentrations were generally within the range of values previously detected except for bicarbonate alkalinity (121 mg/L detected in BH6-MB2-S in May 2016, compared to the previous maximum of 50 mg/L).

The concentrations of dissolved chromium and manganese were found to be marginally higher than the maximum concentrations previously detected (0.004 and 0.57 mg/L respectively, compared to the previous maximum of 0.003 and 0.29 mg/L respectively). Additional metals have been analysed including barium, beryllium, boron, cobalt and vanadium with minimum concentrations below laboratory detection limits and maximum concentrations of 0.019 mg/L, 0.001 mg/L, 0.3 mg/L, 0.005 mg/L and 0.01 mg/L, respectively.

An elevated concentration of total nitrogen (121 mg/L) was detected in BH6-MB2-S in May 2016, above the previously detected maximum of 15.3 mg/L, noting this is the same bore where an anomalously high concentration of bicarbonate alkalinity was detected. As BH6-MB2-S has only contained sufficient water to be sampled on two occasions (March 2015 and May 2016), it is not clear if the result is an anomaly. However, it is noted that the ionic balance of the sample is outside of the acceptable range and causes have not been identified. (refer to the laboratory certificate EB1612196 presented in Appendix G of the SEIS).

The total phosphorus concentrations are within the range of values previously detected.

Environmental Protection (Water) Policy 2008 (EPP (water))

The EIS described that the Environmental Protection (Water) Policy 2009 (EPP (Water)) provides the basis for the effective administration and enforcement of the EP Act. The EPP (Water) seeks to protect Queensland waters while allowing for Ecologically Sustainable Development. The purpose of the EPP (Water) is to identify EVs for the defined water; and determine water quality guidelines and water quality objectives (WQOs) to enhance or protect the identified EVs.

A review of the EPP (Water) indicates that EVs and WQOs have not yet been defined for the Ducie River drainage sub-basin. Those EVs most likely relevant to the Project were outlined in section 9.5.1 of the EIS.

In accordance with the QWQG, the national AWQG guidelines for fresh water were used for comparative purposes when assessing existing local and regional surface water quality.

The EIS indicated that waters (surface and groundwater) associated with the project area, are HEV waters in nature suggesting the biological integrity of the water is effectively unmodified or highly valued. The following EVs listed under the EPP (Water) are relevant to the waters potentially impacted by the Project:

1. For HEV waters - the biological integrity of an aquatic ecosystem. Apart from the previous Kaolin mine and associated port infrastructure on the Skardon River, limited development has occurred in the vicinity of the Project. Namaleta Creek does overflow into the previous Kaolin Mine pits during periods of high flow, but in general, the biological integrity of the aquatic system is largely intact;

2. For waters that may be used for recreation or aesthetic purposes - the suitability of the water for secondary recreational use or visual recreational use. The Skardon River is currently utilised for recreational fishing, hunting and camping, with temporary camp sites usually established at the mouth of the Skardon River, with the appropriate approval of the land owners (Old Mapoon Aboriginal Corporation);
3. For waters that may be used for producing aquatic foods for human consumption - the suitability for producing the foods for human consumption. There is limited use of the waters for commercial fishing and no production of aquatic foods occur in the waters surrounding the Project;
4. For waters that may be used for drinking water - the suitability of the water for supply as drinking water. The adjacent SRBP along with this Project intend to use shallow groundwater bores for drinking water. There are no other known drinking water users in the area;
5. For waters that may be used for industrial purposes - the suitability of the water for industrial use. This Project and the adjacent SRBP intend to use deeper groundwater sources for mining operations including and dust suppression. However, apart from these two operations, no other operations use water from the Project area for industrial purposes; and
6. The cultural and spiritual values of the water. Members of the Indigenous community use water resources surrounding the Project area for fishing and hunting and water resources including the Skardon River, Big Footprint Swamp and Lunette Swamp all have cultural and spiritual values to the Traditional Owners.

The EIS defined three water classifications for the amalgamation of similar water data sites to generate the trigger values. These water classifications are; freshwater, upper estuary and lower estuary and were based on the physical nature of the sample-site water bodies, which affects processes such as flushing and residence times as well as key chemical characteristics including electrical conductivity.

- Sites SW01, SW03 and SW04 were grouped and defined as “freshwater”
- Site SW05 was not included in the groupings due to its location high in the Skardon River estuary where it is considered a transitional location between upstream freshwater inputs (average electrical conductivity of 24,482 $\mu\text{S}/\text{cm}$) and the tidal environment.
- Sites W6, W1, W2, W7, W3 and SW02 were grouped together and defined as “upper estuary” based on their electrical conductivity (range of 32,343-45,274 $\mu\text{S}/\text{cm}$) and location within the Skardon River being a branch off the main channel.
- Sites W4 and W5 were grouped together and defined as “lower estuary” based on their electrical conductivity (range of 48,599-49,137 $\mu\text{S}/\text{cm}$) and location within the Skardon River estuary (i.e. within the main channel) that would likewise result in characteristics different to those within the more tidally constrained upstream branches.

The EIS concluded that the data used to characterise the two receiving water types upper estuary (8 sites; average 14 samples) and groundwater (8 sites; average 26 samples) was sufficient to establish interim reference criteria for the 20th, 50th and 80th percentiles for the majority of parameters. Table 9-3 of the SEIS provides a summary of the number of samples for each defined water types. Sampling locations are shown in Figure 9-2.

An ongoing monitoring program was proposed and would include reference criteria for freshwater, upper estuary and lower estuary are presented in Table 9-4, Table 9-5 and Table 9-6 of the SEIS respectively to continue to inform water quality data. These would be based on the existing data and where sufficient data is not available; the criteria in the ANZECC ARMCANZ 2000 or other guidelines were applied.

The criteria outlined for monitoring receiving water were based on site specific data where sufficient data exists to derive site specific criteria and guidelines. Where insufficient site specific data is available default criteria and guidelines have been applied.

Receiving surface water contamination limits would be as per those provided in the SRBP environmental authority and include turbidity, pH, total suspended solids, aluminium, and surface slicks, visible evidence of oil and grease. Surface water monitoring points proposed in the EIS are shown on Figure 4 of Appendix 1 Schedule H of this assessment report.

Groundwater monitoring locations and frequency are provided in Table 9-12 of the SEIS. Groundwater contaminant limits proposed are provided in Table 9-14 are to be sampled monthly. Groundwater trigger values are proposed in Table 9-15 and are also proposed to be sampled monthly. Figure 3 of Appendix 1 Schedule H in this assessment report shows the locations of groundwater monitoring network proposed in the EIS.

4.12.2 Impacts and mitigations measures

The decision to utilise the SRBP infrastructure would see a reduction in disturbance of approximately 7 ha of riverside area, the majority of which would have been estuarine sediments under mangroves and thereby PASS, that would no longer be disturbed.

The relocation of the BH1 haul road away from HES wetland areas also contributes to a reduction in potential impacts to water quality. The BH1 haul road now avoids the tidally influenced areas of the upper Skardon River and therefore reduces the potential for sediments to mobilise and contributing to a reduction in water quality. Moreover, the relocation of the haul road reduces the potential for ASS to be disturbed during construction.

A reduction in cumulative impacts on water quality was identified due to the use of SRBP infrastructure:

- combined water monitoring and management
- an increase in buffer zones in the vicinity of HES wetlands
- the potential for the mobilisation of sediments potentially impacting upon water quality has been reduced by having a single disturbance area for the MIA and BLF and the relocation of the haul roads away from the areas adjoining the Skardon River
- the risk of ASS disturbance has been eliminated outside of the already approved SRBP site; and
- the cumulative risk of harmful spills (e.g. hydrocarbons, detergents, degreasers etc.) during construction and operations storage of chemicals at the MIA (e.g. hydrocarbons, detergents, degreasers, etc.) has been reduced as a result of the utilisation of the MIA, BLF and RoRo to the SRBP MIA and BLF area.

No release points are proposed for the project. Release points are proposed as part of the SRBP environmental authority. Erosion and sediment control measures would be implemented for managing potential impacts associated with the topsoil stockpile, the initial over burden stockpile, haul road construction and vegetation clearing.

The EIS proposes that the quality of the receiving waters would be monitored by the operator of the combined projects at the compliance monitoring locations (see Table 9-9) and in accordance with the compliance monitoring requirements specified in the SRBP draft EA (see Table 9-10). The actual locations of these monitoring sites would be confirmed with EHP in accordance with the SRBP EA.

4.12.3 EHP conclusions

EHP determined that the EIS adequately addressed the TOR and submissions received on the EIS relating to surface water, however there were outstanding issues that could be addressed through conditions on the environmental authority.

EHP's submission raised concerns about the water quality data grouping, sufficiency of data to define water quality objectives, and the site specific trigger values appropriate for HEV waters. Also, EHP raised concerns about the adequacy of the sampling and monitoring approach for surface and groundwater; and that insufficient background characterisation of the water quality had been undertaken to develop site-specific discharge criteria for specific water quality criteria i.e. EC, NTU and TSS).

Surface water quality

In response to EHP's submission, the proponent indicated that the changed project would now mean there would not be any discharge points to the HEV environment. Therefore site-specific discharge criteria would not now be required.

The proponent also proposed that water quality objectives would be developed at a later date once sufficient background data has been collected and proposed interim contaminant trigger levels and release criteria proposed in the EIS, for turbidity, total suspended solids and electrical conductivity.

Additional data describing surface water quality was collected. The SEIS states in section 9.1 "Since the EIS was submitted, three subsequent surface and groundwater monitoring events (May, June and July 2016) have been completed. This additional information has enabled the calculation of interim site specific trigger values based on reference data for most parameters of interest, as per the preferred method for the protection of HEV systems as outlined by the QWQG." As the monitoring and compliance approach for HEV waters requires a minimum of 24 samples to determine the relevant trigger values, the majority of the SEIS trigger values are not appropriate at representing the existing condition of the HEV waters. Only the pH and Aluminium quality characteristics for the upper estuary achieved the minimum 24 sample requirement for HEV water trigger values. As the QWQG do not prescribe an interim trigger value approach, the SEIS'

recommendation to use interim values for the HEV water compliance approach is not supported by EHP. EHP determined that these interim release criteria were not appropriate at meeting regulatory requirements or to protect environmental values, particularly HEV waters and aquatic ecosystems and the proponent must establish the locally derived HEV trigger values prior to mining activities, in accordance with the requirements of the QWQG.

EHP commented on the EIS that WQOs were provided in three groups 1) freshwater, 2) upper estuary, and 3) lower estuary. The estuary groups presented in the SEIS appear appropriate; however it was not clear whether it was appropriate to group the wetland at big footprint swamp from freshwater streams. The SEIS did not adequately justify whether the water qualities in the big footprint swamp and freshwater streams were similar enough to combine or whether the freshwater streams were adequately represented in the freshwater group. The water quality data appears to have been re-grouped into freshwater, upper estuary, and lower estuary. However, no data summaries were provided for freshwater streams, swamps and surface springs.

Surface water monitoring was not adequate and further monitoring sites would need to be established particularly upstream and downstream of the haul road crossings and also in Skardon River receiving waters.

Groundwater quality:

Table 9-7 shows summary statistics for all groundwater bores. No description of the variability between bores has been provided. This would limit the development of appropriate baseline conditions.

The SEIS also stated that “modelling predicts that pumping of shallow groundwater to meet 400 ML/yr is viable and could result in a maximum localised drawdown of around 1 m. This is considered sustainable and unlikely to cause a reversal of hydraulic gradient that would lead to ingress of saline water from the Skardon River.”

No data appears to have been provided describing the GAB. Chapter 10 of the SEIS states that “Due to the project’s remote location, significantly increasing the difficulty and cost of getting an appropriately sized and certified drilling rig to site, there has been no drilling into the GAB aquifer at the site and information on the GAB aquifer has been inferred from regional mapping data and cross-sections presented in Smerdon et al (2012) and DISTIA (2014).”

Monitoring of bores and the location and number of monitoring bores were not considered sufficient to describe the quality of waters in the either the shallow or the GAB aquifer.

4.12.4 EHP recommendations

The surface water and ground water are considered to be HEV waters and a site specific condition would apply to manage the risks of the project on these unmodified waters. The site specific conditions involve HEV water trigger values that the applicant must set prior to mining activities commencing. Adequate sampling of the relevant quality characteristics, for each water type grouping, is required in order to meet the minimum data requirements for HEV Waters under the QWQG. As the applicant failed to meet this requirement during the EIS process, EHP recommends that further sampling be undertaken to set trigger values as a condition for the draft EA. As the protection of HEV water is a regulatory requirement under the *Environmental Protection (Water) Policy 2008*, the applicant must establish the locally derived HEV trigger values prior to mining activities, in accordance with the requirements of the QWQG.

There is insufficient data to set HEV limits for groundwater in the EA, so a condition is recommended to continue monitoring each aquifer to collect sufficient data to set values prior to mining activities commencing.

The locations of the monitoring bores on Figure 9-5 of the SEIS were not adequate and sufficient sampling locations need to be identified in order to representatively sample the systems. The monitoring program would need to be capable of determining the pre-disturbance groundwater levels, groundwater quality and inferred flow directions for at least the following locations and situations:

- reference bore locations hydraulically up-gradient and compliance bore locations down-gradient of all mining activities;
- all the hydrogeological units/aquifers that have the potential to be affected by mining activities, suspected of interacting with groundwater dependant ecosystems, inclusive of paleo-channels;
- Big Footprint Swamp and Lunette Swamp;
- regional ecosystem 3.3.14;
- groundwater abstraction location(s) for potable water supply; and
- areas prone to saline ingress.

Additional surface water monitoring points would be required upstream and down-stream of the haul road creek crossings to monitor impacts of the road construction and operation on WQ indicators. A site specific condition is recommended. This requirement has been included in the condition regarding a REMP.

Waterway barriers

The proponent is required to follow the design specifications for waterway barriers outlined in DAF's self-assessable codes for waterway barrier works (or SDAP Module 5.2 where relevant) to ensure there are no adverse impacts to fish species in the waterways within the ML. EHP recommends that the proponent implement the recommendations included in Appendix 3 - DAFF recommendations for the project.

Additional surface water monitoring points are required upstream and down-stream of the haul road creek crossings to monitor impacts of the road construction and operation on WQ indicators including aquatic flora and fauna and fish passage.

4.13 Water Resources Groundwater

EIS Chapter 10 – Groundwater described the existing groundwater resources within and surrounding the project, the potential impacts of the project on groundwater resources and proposed measures to avoid and minimise impacts. Further details of the groundwater impact assessment were provided in EIS Appendix E1, Groundwater Technical Report. Section 10 of the SEIS provided additional information and responses to matters raised in submissions on the EIS on water resources.

4.13.1 Cape York water resources (shallow aquifer)

The EIS indicated that a water licence approval would be sought under the *Water Act 2000* to supply groundwater from the shallow aquifer to the Project.

Section 4.3.6.1 of the SEIS noted that the Cape York Water Resource Plan under section 26 of the *Water Act 2000* took effect on 6 May 2016. There is a moratorium on the take of water under this plan until a final water plan is in place. The moratorium applies to the take of water from a watercourse, lake, spring and underground water. However, the proponent is applying for a temporary water permit, for consumptive purposes, until the moratorium period is finalised pursuant to section 237 of the *Water Act 2000*.

4.13.2 Great Artesian Basin water resources

The project would be located within the 'Cape' management area of the Water Resources (Great Artesian Basin) Plan 2006. In parallel to the application for a temporary water permit for the sub-artesian aquifer water supply, Metro Mining wrote to DNRM seeking to have the project declared a Project of Regional Significance pursuant to s25A of the Water Resource (Great Artesian Basin) Plan 2006 (GAB WRP). DNRM assessed the application and on 23 December 2015 declared it a Project of Regional Significance.

Gaining *Project of Regional Significance* status means that Metro Mining is eligible to acquire a water entitlement from unallocated water of the GAB held by the State in the strategic reserve. The proponent has lodged an application. DNRM has sought further information about the distances from GAB Springs and requested that this be addressed in the EIS. Since the release of the EIS, Metro Mining has submitted an application to DNRM to register an interest for 500ML per water year of state reserve unallocated water from the GAB Water Resource Plan. Whilst initial water requirements are estimate to be 400 ML per water year, the proponent is seeking a further contingency should additional water be required to meet operational demand. The application is currently under assessment against the requirements of the *Water Act 2000*. A revised GAB Water Resource Plan is currently under community consultation.

4.13.3 Requirements for the take of associated water

Under reforms introduced in 2016, the *Mineral Resource Act 1989* (MRA), through section 334ZP provides for underground water rights to a holder of an MDL or ML to take underground water if the taking happens during the course, or results from the carrying out of an authorised activity for the lease. Water taken under this arrangement is described as 'associated water'. An example of activities to which this applies, includes mine dewatering of underground water to the extent necessary to achieve safe operating conditions in the mine. Other take of underground water would require an authorisation as described above.

However, as the EA was applied for before the commencement of the provisions for the as-of-right take of associated water (ie before 6 December 2016), section 334ZP does not apply and the project must obtain an associated water licence (AWL) which would be assessed by DNRM. The AWL would be assessed and

conditioned for groundwater impacts, and administered by DNRM, in accordance with sections 1250E to 1250G of the *Water Act 2000*.

4.13.4 Assessment approach in the EIS

Groundwater Quality

The EIS stated that the waters (both surface and groundwater) of the Project area are considered to be of HEV waters - waters in which the biological integrity of the water is effectively unmodified or highly valued. A full discussion of the water quality aspects of surface and ground water quality is provided in section 4.12 of this assessment report.

Hydrology

A catchment hydrology impact assessment was conducted for the EIS to determine the impact of the Project on surface water resources and to establish baseline catchment hydrology. A rainfall runoff relationship was established for the Ducie Basin (35km south of the Project) through the calibration of Broughton's Australia Water Balance Model (AWBM) parameters via the rainfall library platform. The AWBM uses daily runoff data to conceptualise surface and base flow stores and excesses released as runoff.

The mine's impact on hydrology was assessed via the AWBM method. A baseline considered to be the "natural state" was used and then parameters were varied from the baseline to represent likely changes for different land uses – hardstand, open pit mining, and rehabilitated areas. No local data was available to calibrate the model so the Ducie River gauge data was used and conservatism was applied to the model.

Hydrogeology

As the depth of the mining of bauxite is shallow and occurs above the shallow aquifers, impacts on the deeper GAB aquifers from mining are thought to be a low risk.

Groundwater modelling was undertaken for the Project to predict the effect the mine activities would have on groundwater quality and surface water groundwater interactions. As the depth of the mining of bauxite is shallow and occurs above the shallow aquifers, impacts on the deeper GAB aquifers from mining are thought to be a low risk. Hydrogeology data was collected from within the study area and surrounds over the past 25 years during various investigations. Six pairs of monitoring bores were installed within pits BH1 and BH6, and Gulf Alumina installed monitoring bores for the SRBP. Monitoring data from these were used for baseline information necessary to inform hydrogeological conceptualisation. The data collected included long term groundwater levels, capturing seasonal dynamics, manual depth to water measurements, samples to characterise the groundwater quality across seasons and years (2011 to 2016). The monitoring bores were located up, cross and down gradient of the proposed mining areas and near surface water courses and swamps. Six nested pairs of monitoring bores were used to investigate the vertical connectivity of shallow aquifers. A hydrogeological model was developed. See Figure 2–Hydrogeological conceptual model (Figure 10-16 of the EIS)below.

GDEs

The assessment of potential impacts of mining on groundwater-dependent ecosystems (GDEs) utilised the approach outlined in the GDE toolbox (Richardson et al., 2011). The proponent developed an eco-hydrogeological conceptual model of Big Footprint Swamp (See Figure 2–Hydrogeological conceptual model (Figure 10-16 of the EIS)below), and made use of a calibrated numerical groundwater model to predict changes to the groundwater regime that have the potential to affect Type 2 GDEs (aquatic ecosystems dependent on baseflow) and Type 3 GDEs (terrestrial vegetation). The presence and significance of Type 1 GDEs have been assessed in Section 4.5 of this report, based on the results of a stygofauna survey.

4.13.5 Values, impacts and mitigations measures

A summary of existing values, impacts and proposed avoidance and mitigation measures on water resources and groundwater is provided in Table 15. EIS assessment of water resources and groundwater

4.13.6 Assessment and conclusions

DNRM's submission on the EIS commented on water allocation aspects of the project and DNRM also subsequently commented on the adequacy of the proponent's response to the submissions. EHP's submission also included comments on aspects of water resources and groundwater. There are outstanding

matters to be resolved via subsequent applications for the project.

Water allocation - GAB:

- The SEIS did not fully address DNRM's requirements with respect to the proposed water extraction from the Great Artesian Basin (GAB) under the *Great Artesian Basin Water Resource Plan 2006*.
- There was not sufficient evidence provided in the EIS to conclude that the proposed groundwater extraction from the GAB would not affect the environmental values of GAB springs.

Water allocation - Shallow aquifer:

- Modelling of groundwater in the EIS to investigate the effects of extracting 400 ML of water from the shallow aquifer (not connected to the GAB) was not discussed in the EIS and supporting technical information requested by DNRM was not provided in the SEIS.
- Subsequent to the SEIS, DNRM received information from the proponent intended to be sufficient to issue a temporary permit to take 400ML of water from the shallow aquifer.

Description of the water resource environment:

- DNRM confirms that the description of the hydrological and hydrogeological environment was accurate except that EHP is of the view that there are three distinct groundwater systems (not two):
 - Bauxite/ironstone layer
 - Rolling Downs formation
 - Great Artesian Basin
- The hydrogeological model needs to be further informed with field sampling data of the bores.

Extraction bores:

- Additional bores are intended and required for the project.
- A map showing the locations of existing and proposed extraction bores would be required and an indication of the impacts associated with any additional bores.

Groundwater monitoring:

- Locations of the proposed EA groundwater monitoring network bores were provided on Figure 9-5 of the SEIS and Appendix 1 Schedule H Figure 3 of this assessment report. Additional locations may be required. Sufficient sampling would need to ensure representative sampling of the systems.
- Groundwater data provided in the EIS was not sufficient to determine baseline for each of the hydro-stratigraphic units, nor was it sufficient to suggest that the three units were similar enough to be grouped together for the purposes of monitoring. It is recommended that the proponent initially monitor all three units. This data would be used to justify monitoring of one unit.
- The monitoring program of these HEV groundwaters would need to commence prior to mining and be capable of determining the pre-disturbance groundwater levels, groundwater quality and inferred flow directions for at least the following locations and situations:
 - reference bore locations hydraulically up-gradient and compliance bore locations down-gradient of all mining activities
 - all the hydrogeological units/aquifers that have the potential to be affected by mining activities, suspected of interacting with groundwater dependant ecosystems, inclusive of paleo-channels
 - Big Footprint Swamp and Lunette Swamp
 - regional ecosystem 3.3.14
 - groundwater abstraction location(s) for potable water supply, and
 - areas prone to saline ingress.

Recharge rates into the Skardon River and Big Footprint Swamp:

- Mining is predicted to cause a temporary increase in the volume of groundwater discharged to Big Footprint Swamp and the Skardon River tributaries and estuary.
- There remains uncertainty about the impacts of mining bauxite in BH1 pit with respect to the impact on recharge rates of groundwater from the bauxite plateau into the Skardon River and its effect on base flow.
- Include monitoring and reporting of recharge rates in the indicators of the Receiving Environment Monitoring Program (REMP).
- Monitoring of the RE3.3.14 and Big footprint swamp is recommended to test the predicted impacts

- Monitoring of actual discharge rates.
- Cumulative impacts would be monitored through ongoing surface and groundwater monitoring programs.
- Management measures have been proposed to ensure melaleuca root aeration is maintained.

Other water users

- Impacts on other bores (other users) in the area and Mapoon were not identified but the EIS indicated that impacts would not be significant.
- Identify all bores used by other users surrounding the project, monitor and provide evidence that they would not be impacted by the proposed water extraction and mining activity.

Water extraction from GAB for consumptive purposes

The SEIS did not fully address DNRM's requirements with respect to the proposed water take from the Great Artesian Basin (GAB) under the *Great Artesian Basin Water Resource Plan 2006*. No drilling of the GAB aquifer was undertaken to support modelled assumptions.

The SEIS report concluded that:

“Given significantly lower extraction volumes proposed for the Project, it is highly unlikely that the proposed extraction of groundwater would induce discernible reduction in hydraulic head in the area of GAB supported springs more than 30 km from the site.

While no perennial springs have been identified in the vicinity of the Project, any ephemeral wet season springs located closer to the mine site would almost certainly be a result of groundwater rising from the shallow aquifer as a result of rainfall. At the Project location, any groundwater in the GAB aquifer (the Gilbert River Formation) becomes underlain/sealed by several hundred metres of low permeability rocks of the Rolling Downs Formation.”

However, limited studies and no drilling has occurred into the GAB aquifer. EHP recommends that further data be collected to test assumptions in the EIS and that this information be provided to DNRM so that any potential impacts on springs can be considered.

To demonstrate acceptable outcomes and support the application, the proponent must undertake studies in relation to affected springs and management units connected to those springs by:

- engaging a consultant to conduct the required studies; or
- requesting the hydrological models produced by DSITI, and approach DSITI to undertake the work; or
- relocating the proposed bore to a location with sufficient separation distance from the affected springs.

Stygo fauna

The proponent has fulfilled the requirement for a pilot study but according to DSITI's Guideline for the Assessment of Subterranean Aquatic Fauna, the proponent must now conduct a comprehensive survey. According to the guideline's survey requirements, the proponent must collect a total of 40 samples from a minimum of 10 representative bores, acquired over two seasons, with sampling occurring at least three months apart. The proponent should the sampling periods be November – January, and at least three bores be located with broad distribution in and around the BH1 MLA boundary (ML 20676) as this area has not been sampled.

An additional survey of stygofauna within the BH1 Project area is recommended, following DSITIA's Guideline for the Environmental Assessment of Subterranean Aquatic Fauna¹.

¹ [Guideline for the Environmental Assessment of Subterranean Aquatic Fauna; Queensland Government; 2014](#)

Table 15. EIS assessment of water resources and groundwater

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Potential impacts	Avoidance, mitigation and management commitments	
<p>Climate: A distinct wet season between December and March A distinct dry season between April and November High evaporation rates</p>			NA
<p>Hydrology: The majority of the Project is located in the Skardon River catchment, within the Ducie drainage basin. Skardon River is tidally influenced and discharges to the Gulf of Carpentaria. Ephemeral streams drain the upper catchment. Swamps occur in the catchment, the most notable being is Big Footprint swamp. Melaleuca swamps occur landward of the fringing mangroves on the Skardon River. Pit BH6 partially is within the Namaleta Creek catchment is a significant wetland in the study area.</p>	<p>Changes to the hydraulic regime are expected. Potential impacts include:</p> <ul style="list-style-type: none"> Reduction of surface water runoff and increase in base flow from mine pit excavation. Altered drainage flow lines from pit excavation, catchment diversion, and haul road construction. Reduced surface runoff to Big Footprint Swamp, Skardon River and Namaleta Creek, noting that groundwater discharges are predicted to increase and so impacts on ecosystems are not expected to be significant. Contamination of clean water runoff entering mine areas. <p>Cumulative impacts from the Project in conjunction with the SRBP are expected for the Big Footprint Swamp catchment. Assessment in 10.7.1 and mitigation in 10.9.1.1</p>	<p>The proponent proposes to develop an Environmental Management Plan to encompass all impact management actions. Stormwater impacts managed through:</p> <ul style="list-style-type: none"> The mine water management network. Implementation of the ESCP <p>The expected reduction in surface water runoff is expected to be offset by the increased base flow discharge to estuarine and palustrine environments. Cumulative impacts would be monitored through ongoing surface and groundwater monitoring programs. Management measures would be proposed to ensure melaleuca root aeration is maintained.</p>	<p>Monitoring of actual discharge rates. Condition: Cumulative impacts would be monitored through ongoing surface and groundwater monitoring programs. Management measures would be proposed to ensure melaleuca root aeration is maintained.</p>
<p>Hydrogeology: The extent of the hydrogeological study area was defined as the Skardon River, Ducie River and McDonald River catchments. Hydrostatic units were defined as:</p>	<p>Anticipated impacts and cumulative impacts to groundwater resources include:</p> <ul style="list-style-type: none"> Increased discharge and pool level in Big Footprint Swamp. Increased discharge to Skardon River tributaries. 	<p>Maintenance of stable groundwater levels within the area of GDEs (Big Footprint Swamp and Skardon River) has been included as a completion criterion, as shown in bold in Table 10-1 of the SEIS.</p>	<p>EHP is of the view that there are three distinct systems:</p> <ul style="list-style-type: none"> Bauxite/ironstone layer Rolling Downs formation

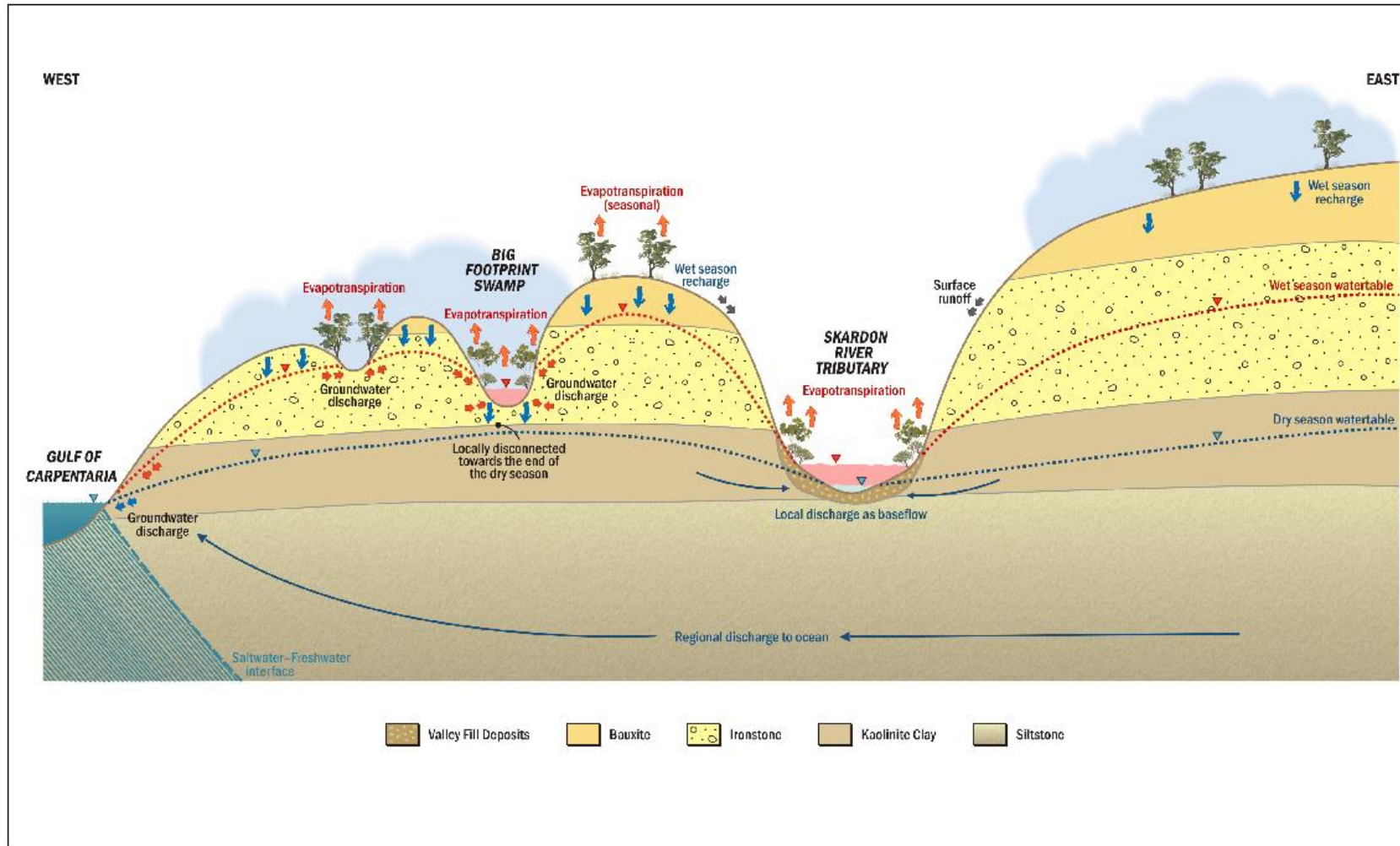
EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Potential impacts	Avoidance, mitigation and management commitments	
<ul style="list-style-type: none"> Valley filled sands Bauxite Ironstone Kaolinite clay Siltstone (weathered zone) Rolling Downs formation Great artesian basin aquifers <p>Two groundwater flow systems were delineated:</p> <ol style="list-style-type: none"> Local groundwater flow system in the upper unconfined aquifer which interacts with surface water and potentially sensitive receptors. This is associated with the shallow units of the Bulimba formation – valley-sand fill, bauxite, ironstone kaolinite clay and siltstone. Regional groundwater flow system at depth within the GAB recharge zone in the northern and eastern portions of western Cape York. <p>HSUs of most interest to the EIS are in the shallow aquifer.</p> <p>A summary hydrogeological conceptual model was developed and is shown below in Figure 2–Hydrogeological conceptual model (Figure 10-16 of the EIS)</p>	<ul style="list-style-type: none"> Waterways to the west of the MLs. Also the EIS stated: As the depth of the mining of bauxite is shallow and occurs above the shallow aquifers, impacts on the deeper GAB aquifers from mining were thought to be a low risk. <p>Based on the depth of mining the potential for the water table to intersect with the floor of the pits is considered low and the dewatering of aquifers is not considered to be likely. However the water table may intersect the bauxite layer during the wet season.</p> <p>The small area of vegetation removal and bauxite mining would have insignificant impacts on the overall groundwater balance, particularly in wetter years.</p> <p>Temporary increases in base flow of up to 23% are possible before returning to pre-mining values following rehabilitation.</p> <p>Baseflow of the Skardon river is maintained by groundwater from the kaolinite clay layer which would not be disturbed during mining.</p> <p>The ground profile post mining would result in an overall depression of the landscape which would change the dynamics of recharge and discharge and groundwater quantity. Faster wetting or recharge could also occur due to a thinner unsaturated zone.</p>	<p>Post mine rehabilitation of mine pits.</p> <p>Post mine removal of catchment diversions to restore current flow paths.</p>	<ul style="list-style-type: none"> Great artesian basin <p>Further justification as to why the units can be grouped into only two systems for the purposes of monitoring and management.</p> <p>The model need to be further informed with field sampling data of the bores.</p> <p>Locations of the monitoring bores on Figure 9-5 of the SEIS were provided but the proponent would need to ensure that these are sufficient sampling locations.</p> <p>Monitoring information provided in the EIS was not sufficient to determine baseline data for each of the systems.</p> <p>There remains uncertainty about the impacts of mining bauxite in pit BH1 wrt the impact on recharge rates of groundwater from the Bauxite Plateau into the Skardon River and its effect on base flow.</p>
<p>Shallow groundwater aquifer dynamics:</p> <ul style="list-style-type: none"> The groundwater flow is toward the Skardon River reflecting surface water flows, suggesting the river is 	<p>A sensitivity analysis was undertaken to investigate the potential effects of extracting 400 ML/yr groundwater from the shallow aquifer (weathered siltstone of the Bulimba</p>	<p>Development of an EMP which encompasses and manages a range of plans that aim to manage water resources. These include the site</p>	<p>Condition the EMP and other relevant plans to manage water resources.</p>

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Potential impacts	Avoidance, mitigation and management commitments	
<ul style="list-style-type: none"> a gaining stream Recharge occurs via infiltration after rainfall therefore the levels fluctuate in wet and dry seasons. Rapid infiltration occurs due to macropore flow (i.e. flow fissures) Aquifer peaks in late March Little recharge occurs and a steady decline in levels are observed over the dry season Groundwater discharges to the Skardon River and its tributaries providing base flow and maintaining surface water flow. As the water table rises, discharge of groundwater occurs in other locations where the water table intersects with the ground surface (e.g. Big Footprint Swamp). The dry season ground water level is about 2.5m below Big Footprint Swamp becoming disconnected during the dry season. Wet season springs have also been identified along Irish Creek High levels of shallow aquifer connectivity. Kaolinite clay does not limit connectivity. However the shallow and lower aquifers are separated as much as 500m with little leakage. Water table fluctuates as much as 14m seasonally. 	<p>Formation).</p> <p>The modelling predicts that pumping of shallow groundwater to meet 400 ML/yr is viable and could result in a maximum localised drawdown of around 1 m. This is considered sustainable and unlikely to cause a reversal of hydraulic gradient that would lead to ingress of saline water from the Skardon River.</p> <p>Model - An annual extraction volume of 400 ML was partitioned over six production bores over the dry season (period of mining), each pumping at 2.7 L/s. The production bores were positioned outside of the proposed footprint of the mine and approximately 3 to 4 km apart to minimise interference. The modelling suggests that predicted drawdown would be temporary and local, and associated interference effects between the production bores are unlikely to result in the reversal of hydraulic gradient near the Skardon River, with the dry season groundwater flow direction maintained towards the river. As the shallow aquifer is heterogeneous, the actual sustainable pumping rate and associated drawdown would be expected to vary depending on the actual location of the bores.</p>	<p>rehabilitation plan, surface water Management Plan, groundwater management plan, erosion and sediment management plan, etc</p> <p>Implementation of a mine water network to manage impacts to water resources.</p> <p>Design water management system to allow for variations in rainfall and evaporation.</p>	<p>Undertake additional monitoring to confirm model assumptions and conclusions that there is unlikely to be an impact to the shallow aquifer.</p>
<p>GAB aquifer There was no site specific information provided on the quality of waters within the</p>	<p>No drilling into the GAB aquifer has occurred. The deepest borehole drilled was 126</p>	<p>None proposed</p>	

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Potential impacts	Avoidance, mitigation and management commitments	
<p>GAB. The GAB is thought to be in the sandstone of the Gilbert River Formation and is considered an excellent aquifer providing groundwater resources in the region. Supplies from the confined portions range from 60 to 80 L/s and from the unconfined portions 1 to 5 L/s (DNRM 2005).</p>	<p>meters below ground level on the SRBP tenements and the GAB aquifer was not intersected. This mean the shallow groundwater contained in the Bulimba formation is separated from the GAB aquifer by some 200m of the low permeable Rolling Downs Formation.</p> <p>Using government models and information, the proponent undertook a hypothetical study considered extraction from two hypothetical bores located within the project's tenement (BH6) and three hypothetical bores located within SRBP's tenement with total extraction rates of 2.38 to 3.8gL per year (9 x more than the 400ML per year proposed for the Project. It considered cumulative impacts of extraction of 40 years equating to 922gL. Results were that the 922gL is a minor fraction of the GAB aquifer (3 million gL) and the maximum annual extraction rate is less than the annual recharge rate. DSITIA (2014) potential impacts of drawdown on existing users and springs are minimal. And since the extraction rate is much lower that the 922gL, potential impacts are even less likely.</p> <p>Rio Tinto Alcan's Weipa project holds the sole rights to 9GL/year (16 to 19ML/day) of the GAB allocation, however projects of state and regional significance may apply for a discretionary allocation from 10,000ML supply. The Project has been given significant project status for this purpose.</p>		<p>water consistent with proposed quantities and details in the EIS.</p>
<p>Surface water and groundwater interaction:</p>	<p>Baseflow of the Skardon river is maintained by groundwater from the kaolinite clay layer</p>	<p>None proposed</p>	<p>EHP recommends a condition requiring monitoring to</p>

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Potential impacts	Avoidance, mitigation and management commitments	
<p>Groundwater from the shallow aquifers maintains dry season flow in the Skardon River and tributaries including Irish Creek. Initial rainfall in the dry and early wet season is taken up by wetting of the unsaturated zone.</p> <p>Stream flow increases is observed in mid-January probably from an increase in the water table rising above the stream channel.</p> <p>Base flow to streams from the GAB aquifer are thought to be in the eastern part of western Cape region, close to the GAB recharge zones, 30km east of the Project.</p> <p>Namaleta creek is ephemeral and with flow occurring after high rainfall events.</p> <p>The Ducie River is tidally influenced.</p>	<p>which would not be disturbed during mining. Reversal of flow direction and ingress of higher salinity water was identified as a risk. Groundwater flow direction would remain toward the river and baseflow would be maintained therefore ingress of higher salinity water is unlikely.</p>		confirm no or minimal impact on baseflow in the Skardon River – see Appendix 1.
<p>Groundwater dependent ecosystems (GDEs) GDEs were identified as Skardon River, tributaries and riparian zone; Big Footprint Swamp; Lunette Creek; Lunette Swamp; Namaleta Creek and riparian zone.</p> <p>While no perennial springs have been identified in the vicinity of the Project, any ephemeral wet season springs located closer to the mine site are likely to be a result of groundwater rising from the shallow aquifer as a result of rainfall.</p> <p>GDEs that depend on groundwater from GAB aquifers are not located on the Project</p>	<p>The EIS states that for Big Footprint Swamp:</p> <ul style="list-style-type: none"> • 26% of the catchment area would be mined. • approx. 33% surface runoff reduction to Big Footprint Swamp is predicted by year 10 of mining. • Approx. 9% increase in base flow to Big Footprint Swamp by year 10 of mining. • Approx. 4% increase in baseflow and 7% decrease in surface runoff <p>Mining is predicted to cause a temporary increase in the volume of groundwater discharged to Big Footprint Swamp and the Skardon River tributaries and estuary.</p>	<p>Maintenance of stable groundwater levels within the area of GDEs (Big Footprint Swamp and Skardon River) has been included as a completion criterion, as shown in bold in Table 10-1 of the SEIS.</p> <p>Post mine rehabilitation of mine pits.</p> <p>Post mine removal of catchment diversions to restore current flow paths.</p>	Monitoring of the RE3.3.14 and Big footprint swamp is recommended in the EA to test the predicted impacts. See Appendix 1.

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Potential impacts	Avoidance, mitigation and management commitments	
<p>site but are located more than 30 km east of the site.</p> <p>Big Footprint Swamp conceptual model is in Figure XX below. Hydrographs indicate that the extent of inundation varies seasonally with rainfall, runoff and water table. The dry season provides critical root zone aeration for Melaleuca trees.</p> <p>Worley Parsons identified a spring (SP01) but the EIS states it is not meet the GDE definition, however this was not verified.</p>	<p>Ground water extraction is unlikely to induce a discernible reduction in hydraulic head of GAB supported springs more than 30 km from the Project site.</p> <p>The EIS states it is located outside of the predicted area of influence of mining. was identified during a field study south of BH1 and north of the proposed</p>		
<p>Other users:</p> <ul style="list-style-type: none"> • SRBP mine • SRBP camp • Rio Tinto Alcan • Mapoon township water supply • Western Cape domestic and stock groundwater use. • Traditional hunting and fishing and other cultural purposes • Recreational purposes 	<p>The EIS identified that potential impacts of drawdown on existing users and springs would be minimal.</p> <p>Mapoon town is 16 km south, on the other side of the Wenlock River/Port Musgrave.</p> <p>Rio Tinto Alcan's Weipa project holds the sole rights to 7GL/year (16 to 19ML/day of the 9GL/year GAB allocation, however projects of state and regional significance may apply for a discretionary allocation from 10,000ML supply. The project has been given significant project status for this purpose.</p>	None proposed	<p>Provide a monitoring program of shallow and GAB aquifers to confirm that mining and water take would not impact on any other users in proximity to the mine.</p> <p>See Appendix 2 DNRM recommendations</p>



R Details		Date	©COPYRIGHT CDM SMITH This drawing is confidential and shall only be used for the purpose of this project.				NOT TO SCALE	DISCLAIMER CDM Smith has endeavored to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.	DESIGNER CDM Smith	CLIENT METRO MINING LIMITED	Figure 10-16
1	-	22/02/18	DESIGNED	AR	CHECKED	RG					Schematic hydrogeological cross-section
-	-	-	DRAWN	AR	CHECKED	RG					
-	-	-	APPROVED	RG	DATE	22/02/18					
-	-	-	Notes:								
<small>\\BES18018_ksawg\GIS\DATA\XIP\AL\Groundwater\Fig_10-16_Schematic_cross_section_v2.mxd</small>											
<small>DRG Ref: Fig_F_Schematic_cross_section_v2</small>											

Figure 2–Hydrogeological conceptual model (Figure 10-16 of the EIS)

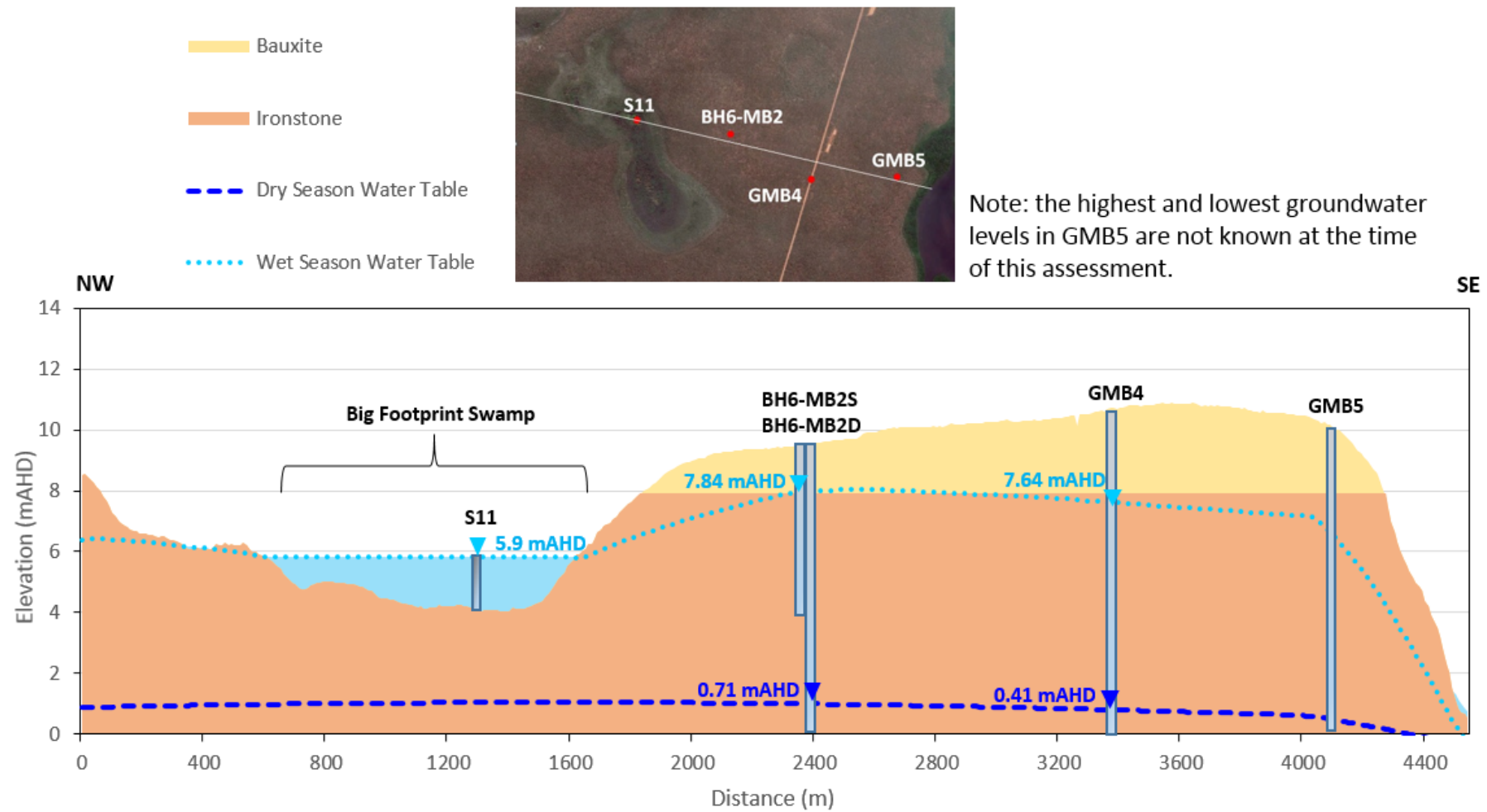


Figure 3 – Cross section of Big Footprint Swamp (Figure 10-15 of the EIS)

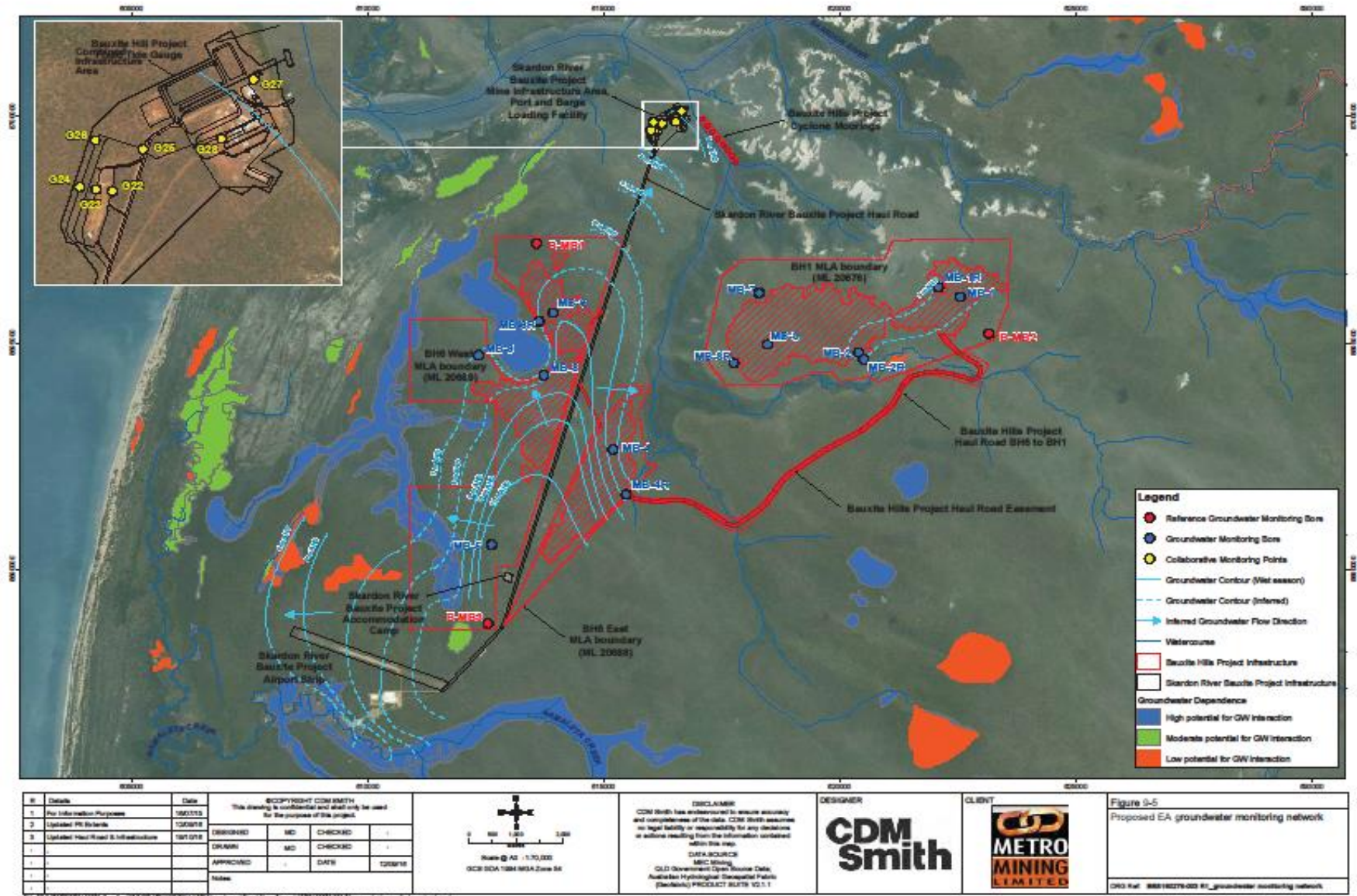


Figure 4 – Proposed EA Groundwater monitoring network (Figure 9-5 of the SEIS)

4.14 Biosecurity

The biosecurity impacts and management activities to protect environmental values were described in EIS Chapter 8 – Biosecurity. Further discussion of marine pest species is in Chapter 6 – Marine Ecology, Chapter 17 – Transport, Appendix B3 – Marine Ecology and Coastal Processes and Appendix I Shipping Technical Assessment of the EIS. Submissions on the matter were addressed in the Supplementary report to the EIS December 2016 Appendix A; submission reference number 9.14.

4.14.1 Values, impacts and mitigations measures

A summary of existing values, impacts and proposed avoidance and mitigation measures on noise and vibration are outlined in the EIS is provided in Table 16. EIS assessment of biosecurity risk

The EIS identified the regulatory framework for the management of biosecurity issues and the assessment method. The EIS included a desktop review to assess the risks associated with vector borne diseases and relied on the baseline surveys reported in “*Marine Pests of the Skardon River and Port Kennedy, Qld*”, Aquenal Pty Ltd 2008.

4.14.2 Assessment and conclusions

DAF made a submission on the EIS informing the proponent that a plan referenced in the EIS is being replaced with the Cook Shire Biosecurity Plan 2016-2020. DAF require that the Pest and Weed Management Plan (PWMP) and the EMP make reference to the new plan which would be written under the *Biosecurity Act 2014*. DAF also requires that reference is made to the Regional Biosecurity Strategy for Cape York Peninsula 2016-2020 and that the PWMP aligns with its priorities.

The proponent did not update the relevant documents but gave a commitment to do so when the Cook Shire Biosecurity Plan is finalised.

The requirements of the TOR in relation to Biosecurity were adequately addressed in the EIS. The EIS provided sufficient information proposed sufficient measures to manage biosecurity risks but requires the amendments as per above. Appendix 3 of this report includes a recommendation to update PWMP and the EMP to align to the priorities of the Regional Biosecurity Strategy for Cape York Peninsula 2016-2020 (prepared written under the *Biosecurity Act 2014*). Implementation of the commitments proposed by the proponent would also assist to manage this matter.

Table 16. EIS assessment of biosecurity risk

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Potential impacts	Avoidance, mitigation and management commitments	
<p>Terrestrial pests (fauna) The following animals are recorded as occurring in the Project area:</p> <ul style="list-style-type: none"> • dingo (<i>Canis lupus dingo</i>) • feral cat (<i>Felis catus</i>) • feral pig (<i>Sus scrofa</i>) • cane toad (<i>Rhinella marinus</i>). <p>It is likely that wild dogs (<i>Canus lupus familiaris</i>) are also present.</p> <p>The dingo is declared indigenous to Australia and section 17 and 62 of the NC Act protect the dingo in protected areas.</p>	<p>The storage of wastes could attract existing pest fauna and may concentrate in the area.</p> <p>Pest fauna species could be transported to the site on plant and equipment (rodents and tramp ants) including yellow crazy ants.</p> <p>Tramp ant species pose a major threat to biodiversity and agriculture and vectors for the introduction are air and sea freight.</p> <p>An increase in population or the introduction of new pest fauna species could impact on the densities of native fauna and flora species on the site and surrounds.</p> <p>The behaviours of feral pigs impact on the site by competing with native fauna for resources, causing erosion, spreading weeds, impacting riparian and wetland vegetation, and impacting turtle nesting sites. 90% of nests for the flat backed turtle are predated on west Cape York.</p> <p>Feral cats cause direct predation of native fauna.</p> <p>Dingos and wild dogs can reduce the presence of feral cats/foxes.</p> <p>The project area is potential habitat for the endangered northern quoll and animals can die as a result of ingesting cane toads.</p>	<p>A PWMP would be developed in coordination with the Mapoon Land and Sea Ranges and in accordance with the Cook Shire Council Pest Management Plan 2012-2016.</p> <p>A waste management plan would be prepared to ensure:</p> <ul style="list-style-type: none"> • access to food wastes by pest species is reduced • waste collection areas are secured • avoid the creation of artificial water points • fencing to limit fauna access to camp/worker facilities. 	<p>Implement the EMP and commitments</p>
<p>Terrestrial pests (flora) Other than the disturbance associated with an existing kaolin mine close to the Project, the surrounding woodlands are predominantly undisturbed. Swamps and riparian zones show localised impacts associated with feral pigs and cattle.</p> <p>Desktop and field surveys found robust populations of introduced flora including Mint weed, Stylo, at the port of Skardon River and at the kaolin mine.</p> <p>Other weed species are known to occur in the broader Weipa area.</p>	<p>Cattle can cause impacts on native vegetation such as overgrazing, transportation of weeds, walking track erosion, nutrient contamination of waterways.</p> <p>There is the potential for current good condition habitats to be degraded by exotic species.</p> <p>The weed species found at the port and kaolin mine and known to occur in the broader area present a significant threat of invasion for the project.</p> <p>Weeds have the potential to:</p> <ul style="list-style-type: none"> • increase competition for resources with native species • reduce productivity of land • reduce natural biodiversity 	<p>No established road access to the site.</p> <p>Wash down of all plant and machinery prior to it being shipped to site.</p> <p>Clearing would be minimised.</p> <p>Endemic species used for revegetation.</p> <p>Rehabilitation would occur at the earliest opportunity and buffers created around riparian and wetland areas.</p> <p>Wash-down procedure would be followed and a facility would be constructed on site for vehicles entering or leaving the MLs. Bunded and away from drainage lines.</p>	<p>Implement the EMP and commitments</p>

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Potential impacts	Avoidance, mitigation and management commitments	
	<ul style="list-style-type: none"> alter hydrology, fire regimes, geomorphic processes injury or kill native fauna through consumption of toxins. facilitate animal pest movement and disease spread. 	<p>Vehicles would keep to roads or compacted surfaces wherever possible.</p> <p>Identified weeds would be treated to avoid spread using best practice (DAF).</p> <p>Treated areas would be monitored.</p> <p>Weed management included in site induction.</p> <p>PWMP would be developed in coordination with the Mapoon Land and Sea Ranges and in accordance with the Cook Shire Council Pest Management Plan 2012-2016 and would require surveys and mapping of areas.</p>	
<p>Marine pests</p> <p>Given the low shipping activity in the Skardon River since the close of the kaolin mine in 1999, there is a low potential for introduced marine pests (IMP).</p> <p>No listed IMP species were detected in a survey undertaken for the Skardon River in 2008. Typical of most ports in Australia, non-invasive cosmopolitan and cryptogenic species were found such as the striped barnacle and the reticulated barnacle.</p> <p>No marine pest incursions have been recorded in the Port of Weipa. DOEE considers the Port of Weipa a low risk for marine pests, however routine monitoring is undertaken. No pest species have been identified to date.</p> <p>The anchorage area for the OGV and the areas near the port of Skardon River consist of a muddy bottom and have suitable habitat for IMP and that foreign structures such as pilings and moorings can provide potential habitat for pioneering IMP.</p>	<p>IMPs can adversely impact marine industries, the environment, human health, and amenity.</p> <p>Substantial costs of eradication and ongoing management.</p> <p>The potential for pilings and moorings to provide habitat for IMP species would reduce as they are colonised by other native marine species. These are therefore a low risk given the absence of IMP in the Skardon River.</p> <p>Higher risk of introduction during construction rather than operation.</p> <p>Marine pests can enter the environment through ballast waters and biofouling of marine vessels.</p> <p>Biofouling risks are higher from vessels that come from afar rather than from local vessels.</p>	<p>Risks of spread from ballast water can be reduced by minimising the build-up of biofouling and incorporating this procedure into routine vessel maintenance.</p> <p>The requirement to discharge ballast water sourced from the open ocean outside Australian waters of (12nm) would reduce the risk of IMP species being introduced.</p> <p>EMP for the project would include monitoring and early detection of species; and implementation of IMP emergency response where an IMP is detected.</p> <p>Shipping vessels are recognised as a high risk vector.</p> <p>OGV are not required to adhere to guidelines. Where a biological risk is identified they can be placed in quarantine in accordance with best practice.</p> <p>Non trading vessels would observe the National Biofouling Management Guidelines for Non-trading vessels. The guidelines would be appended to the EMP.</p> <p>A Marine Pest Monitoring Program (MPMP) would be developed by Ports North with collaboration with the proponent and would be in accordance with the Australian Marine Pest Monitoring Manual and Guidelines.</p>	Implement the EMP and commitments
<p>Plant disease</p> <p>No information was provided in the EIS.</p>	<p>The North Australian Quarantine Strategy (NAQS) target plant diseases and their potential impacts were discussed in section 8.6.4. Black sigatoka, Citrus</p>	<p>All vehicles and machinery entering Australian ports from overseas would need to comply with quarantine</p>	Implement the EMP and commitments

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Potential impacts	Avoidance, mitigation and management commitments	
	canker, Citrus greening, panama disease, and Fatal disease in coconuts. These are considered serious threats to agricultural productivity, export markets, and the environment.	laws and procedures. No rubbish would be transferred to the site from OGV. Supplies to site would be sourced locally. Discourage workers from bringing fruit and vegetables and other plant matter, site inductions would inform visitors about risks, quarantine bins would be provided, suspect plant materials would be reported to DAF.	
Northern Australia Quarantine Strategy (NAQS) The project is within the zone of the NAQS.	The NAQS was established to provide an early warning of pests and weeds and disease and biosecurity risks. A number of serious pests and diseases have been detected in the Torres Strait but as yet are not on the Australian mainland.	The NASQ involves: <ul style="list-style-type: none"> • Early detection • Reporting • Risk pathways • Engage stakeholders/public awareness 	Implement the EMP and commitments
Vector Borne Disease	Mosquito borne diseases such as chikungunya and Japanese encephalitis is present in Queensland. The mosquitos <i>Aedes albopictus</i> a vector of dengue and chikungunya diseases and has established in the Torres Strait and could spread to mainland Australia.	Mosquito management strategies would be incorporated into the EMP. Illness symptoms would be monitored and reported to the appropriate authorities. Personal protection measures would be implemented to avoid and repel mosquitoes. Elimination and removal of potential breeding grounds, feeding opportunities and harbourage associated with human habitation. Drainage would be designed to silt, debris and pooling. Road design would use culverts to avoid ponding. Rehabilitation and landscaping would avoid ponding.	Implement the EMP and commitments

4.15 Transport

A transport assessment for the project was provided in EIS Chapter 17 – Transport and Appendix I – Shipping Technical Assessment. The EIS assessed the project’s proposed methods to transport site personnel, materials, products and wastes to and from the Project site. Modes of transport were discussed including air, land, sea transport. Chapter 17 provided an assessment of the current and potential transport impacts associated with these transport methods and proposed mitigation measures. The assessment methodology is summarised below:

Air:

- reviewed the existing surrounding airports and their transport volumes
- reviewed the Project generated air transport volumes, distribution and throughputs.

Land:

- reviewed the key access routes for construction and operations
- reviewed the impact on public transport network and state controlled transport networks
- reviewed any road upgrades required.

Sea

- reviewed and assessed the shipping risk elements associated with the Project to underpin the development of marine management plans to be implemented during construction and operation of the Project.

The Department of Transport and Main Roads (DTMR) made a submission on the EIS. The SEIS was submitted on 20 December 2016 by the proponent providing a response to EIS submissions. DTMR were given the opportunity to comment on the SEIS and provided recommended conditions.

4.15.1 Values, impacts and mitigations measures

The project site is very remote and road access to the site is limited. The project does not propose to use any existing state controlled roads. Internal haul roads would be used to transport bauxite to the Skardon River Project barge loading facilities. An existing airstrip and port facility is available to transport workers, construction materials and bauxite ore.

A summary of existing transport infrastructure, potential impacts from the Project and proposed avoidance and mitigation measures outlined in the EIS is provided in Table 17 EIS assessment of transport.

4.15.2 Assessment and conclusions

Given limited road access, the project would be 100% FIFO. The EIS concluded that the existing Skardon River Project airstrip had adequate capacity to accommodate the flight schedules for 100% FIFO out operation required for the Project. The adjacent Skardon River project proposes to upgrade the existing airstrip in the short term and eventually relocate the airstrip immediately to the south of the existing airstrip to allow mining of the bauxite resource under the current air strip. Since the proponent now owns Gulf Alumina, access to the airstrip would be unrestricted for the Project. Emergency services would have access the airstrip.

All of the project’s materials required for construction and transport of the bauxite resource to the transshipment location in the Gulf of Carpentaria would be delivered on vessels that would operate through the Port of Skardon (POS). The POS is regulated by Department of Transport and Main Roads (DTMR) – Maritime Safety Queensland (MSQ), and operated by Ports North. The Skardon River Project has approval to build an upgraded BLF which the project would have unfettered access to screen, load barges and deliver the bauxite to the transshipment vessels. A haul road is also available to the Project to truck the bauxite to the barge facility. Navigation and safety issues were addressed.

The SEIS described the Proponent’s intention to:

- define the location of the navigation channel in consultation with Ports North and RHM. MSQ would then undertake hydrographical surveys and navigational markers would be established and included in relevant plans
- share the navigational channel with the adjacent SRBP operation within the Port of Skardon limits
- note that the mouth of the Skardon River would be hydrographically surveyed by MSQ at the end of each wet season at the shared expense of operators in the area
- complete, in accordance with MSQ guidelines and with the operation of both SRBP and the Project, the following plans before operations begin:

- Marine Operations Management Plan
- Aids to Navigation Management Plan
- Marine Traffic Management Plan
- Ship Sourced Pollution and Prevention Management Plan
- Pollution and Prevention Equipment and Procedures;
- Cyclone Management Plan

MSQ is satisfied with the proponent's undertakings, responses and proposed mitigation measures. To assist proponents to manage maritime-related impacts and to identify mitigation strategies, MSQ has developed guidelines for major development proposals which specify the minimum information required by MSQ to evaluate significant development proposals. The preferred format for presentation of this information is through the development of management plans for vessel traffic management; aids to navigation; ship-sourced pollution prevention/spill management. The guideline is available at <http://www.msq.qld.gov.au/Waterways/Major-development-proposals.aspx>.

MSQ commented to EHP that it is not in a position to fund any safety improvements that may be required, nor would it be likely that this funding could be made available to undertake the immediate works necessary to ensure the ongoing safety, health and efficiency of the maritime/shipping environment and traffic conditions for the proposal to proceed.

Therefore, once further information is available on the final design of the project, the proponent is required to undertake a review of the shipping and port traffic aspects of the project for both construction and operational phases. The proponent must provide an updated assessment that clearly identifies any necessary safety improvements works, rehabilitation and maintenance costs to mitigate the impacts of project traffic before any work begins. It is strongly recommended that the proponent continues to liaise with the RHM to discuss and resolve these issues in a timely manner.

MSQ recommended the following conditions which are also listed in Appendix 5.

Post-Assessment contact with the Department of Transport and Main Roads

Once the proponent has received final approval and wishes to proceed with the project, it must contact the RHM before any works/ shipping starts, to discuss the shipping safety, traffic and pollution impacts of the project. This includes for the import of any materials for construction. Any management plans or other mitigation measures for these issues required by the RHM and MSQ must be discussed and approved as necessary.

Maritime infrastructure

The proponent must implement all impact mitigation measures necessary to avoid adverse impacts on the safety, condition and efficiency of shipping in Queensland waters. Discussions must take place with the RHM to determine any required measures and an "Aids to Navigation Plan" developed and approved if required. A Maritime Infrastructure Agreement may also be required and need approval from the RHM and MSQ in conjunction with this. Any plans and agreements must be in place and approved before the project begins construction.

Maritime safety, traffic and ship-sourced pollution impact assessments

Discussions must take place with the relevant RHM about maritime safety, traffic and ship-sourced pollution impacts from the project. The following plans must be developed by suitably qualified people to be approved by the relevant RHM if deemed necessary: vessel traffic management, and ship-sourced pollution prevention.

Any plans and agreements must be in place and approved before the project begins construction.

Further information would also be required on the cumulative impacts of the project from a marine transport perspective, including any impacts from the transportation of material to construct the project.

Table 17 EIS assessment of transport

EIS SUMMARY*			EHP ASSESSMENT
Existing infrastructure and values	Potential impacts (no mitigation)	Avoidance, mitigation and management commitments	
<p>Air: Airports</p> <p>Cape York support a number of airport facilities including the Weipa Airport, Cairns Airport, Northern Peninsular Airport (NPA), Cooktown Shire Airport, and Mapoon Airstrip.</p> <p>The Skardon River airstrip (SRA) is an existing airstrip supporting smaller commuter airlines wanting access to the area.</p> <p>The airstrip has access roads to the Project.</p> <p>100% of the project workforce would be FIFO. The airport infrastructure is available to the project.</p>	<p>The approach to source workers from 100%FIFO may prevent local and indigenous employment opportunities; however this is unavoidable due to poor road access and distances to townships.</p> <p>Due to poor road access, it is not possible to transport the workforce from a nearby population centre (eg Mapoon or Weipa).</p> <p>The project assumed flights:</p> <ul style="list-style-type: none"> • Twice weekly Cairns – SRA • One weekly NPA – Weipa and Cooktown • 75% full between Cairns-SRA (30 passengers) • 75% full NPA, Weipa and Cooktown flights (15 passengers) • 40 weeks pa operation. <p>Arriving at the SRA the EIS assumed 40 seater planes and estimated:</p> <ul style="list-style-type: none"> • 10 flights per week during construction. • Three flights per week during operation. <p>The project would result in an estimated:</p> <ul style="list-style-type: none"> • 5,000 additional passenger movements and 160 additional aircraft movements pa through the Cairns airport • Additional 80 aircraft movements through NPA, Weipa, and Cooktown. • 80 additional aircraft movements assuming one flight each week over the 40 operational weeks. <p>Flights and passengers are generally expected to be within airport capacities. At Cairns airport, the increase would equate to <.01% of current airport movements and passenger through put.</p> <p>A cumulative increase in aircraft activity at the SRA has the potential to impact the capacity of the airport to support increased passenger and aircraft movements.</p>	<p>No specific mitigation measures were proposed as the EIS concluded that there would not be a significant impact to the existing Cairns or Weipa airports.</p> <p>The Project proposes to use twin-turboprop Embraer EMB 120 Brasilia aircraft to transfer FIFO workforce to the Project.</p> <p>The adjacent SRBP proposes to upgrade the existing airstrip in the short term and eventually relocate the airstrip immediately to the south of the existing airstrip to allow mining of the bauxite resource under the current air strip. Since the proponent now owns SRBP, access to the airstrip would be unrestricted for the project. Emergency services would also be able to access the airstrip.</p> <p>Contractors would be used to manage airstrip operations and flights and would be required to consult with relevant agencies as required.</p>	<p>Matter adequately assessed in EIS.</p>
<p>Sea: Shipping and Maritime Activities</p> <p>Shipping and other maritime activities such as marine tourism operations, commercial and recreational fishing in the eastern</p>	<p>The EIS noted the following potential impacts from shipping:</p> <p>Routine discharges, emissions and activities such as exhaust gas, anti-fouling coating (AFC) leachates, treated effluent from on board sewage treatment plants and oily water filtering systems,</p>	<p>The proponent will consult with MSQ to ensure appropriate management strategies, systems and regulations shipping is subject to control maritime pollution, limit the risk of abnormal events, avoid and manage</p>	<p>Matter adequately assessed in EIS.</p>

EIS SUMMARY*			EHP ASSESSMENT
Existing infrastructure and values	Potential impacts (no mitigation)	Avoidance, mitigation and management commitments	
<p>reaches of the Gulf of Carpentaria and the Skardon River are currently limited.</p> <p>Weipa is the closest port from which major shipping activities occur – 100km south. Rio Tinto's Alcon's port at Amrun project would ramp up – 40km south. Karumba further south again services around 10 to 20 bulk carriers for zinc and 5-10 ships visit for cattle each year.</p>	<p>and radiated underwater noise.</p> <p>Unless a vessel is badly maintained or operated, the remaining vessel emissions such as exhausts and AFC biocide leachate is likely to be minimal and not cause substantive environmental harm.</p> <p>Vessels within the Skardon River present a low environmental risk although unlikely impacts may be due to fauna strike, collision, grounding, etc</p> <p>Impacts on Marine Fauna are discussed in section 4.5 Ecology/For and Fauna of this assessment report.</p> <p>Larger ships have greater capacities for fuel storage and therefore have a high risk to the environment if its containment is breached.</p> <p>Large vessels and ships would not be refuelled at the Skardon River and would be bunkered at sea. There is a risk of spills.</p> <p>Vessel refuelling and oil transfer at the BLF presents a lesser level of risk to the environment, however there is still the potential of hoses and couplings failing or tanks overfilling.</p> <p>Shipping waste from local ships would be created and require management.</p> <p>Air emissions: Vessel sourced Nox and other atmospheric contaminants are not likely to present a significant impact.</p> <p>Anchoring can impact on flora and fauna on the sea floor and in sediments. Scouring can occur. The extent of disturbance is dependent on water depth, substratum, type and size of anchor, length of cable, weather and sea conditions. Upon removal depressions are likely to be temporary and the likely to return to pre-disturbance conditions. Unlikely to be any impact of anchorage on trawling activities as they would not be able to operate in the anchorage areas during the operating months.</p> <p>Impacts on marine fauna from vessel noise are possible and are discussed in section 4.10 – Noise and vibration of this assessment report.</p> <p>Wash and wake impacts are discussed in section 4.8 – Coastal Processes of this assessment report.</p> <p>Vessel lighting impacts are discussed in section 4.5 Ecology/</p>	<p>environmental harm are in place for the Skardon River. These include:</p> <ul style="list-style-type: none"> • Marine Pollution and prevention equipment and procedures; • Oil and chemical spill response • Crew training and competencies • Compulsory pilotage • Vessel navigation safety and collision avoidance measures • Charting and navigation aids • Marine Management Plan • Marine Execution Plan • Vessel Traffic Management Plan • Aids to Navigation Management Plan • Ship sourced pollution Management Plan • Oil Response Management Plan <p>Other measures mentioned in the EIS include:</p> <ul style="list-style-type: none"> • Maintain vessels • On shore disposal of wastes only from local boat waste. • No garbage disposed of at sea and no garbage would be transferred from bulk carriers. • Waste management and mitigation measures are discussed in EIS Chapter 14 – Waste Management. • Safety and navigational aids and adherence to the MSQ regulations would limit the risk of these things occurring. • From 1 August 2010, new ships are to have smaller tanks and suitable tank separation distances and design features to reduce environmental risk. The EIS does not indicate whether the ship used for the project would be of this standard. 	<p>Implement avoidance, mitigation and management commitments.</p>

EIS SUMMARY*			EHP ASSESSMENT
Existing infrastructure and values	Potential impacts (no mitigation)	Avoidance, mitigation and management commitments	
	Flora and Fauna and section 4.4 – Land of this assessment report.	<ul style="list-style-type: none"> Risks associated with bunkering to refuel ships at sea would be managed Risk to the environment from refuelling at the BLF is reduced as the requirement would be limited to smaller craft and small quantities of diesel is required for small craft , under controlled conditions, and in accordance with applicable standards and operating procedures. Risk reduction and management measures would be in place and include oil containment, onsite spill containment and clean up equipment and contingency plans. 	
<p>Sea: Port</p> <p>Port of Skardon River with existing and proposed to be improved navigational channel. Port facilities have been approved to be upgraded in the SRBP's EA.</p>	Potential cumulative impacts due to the two projects operating concurrently to deliver Direct Shipping Ore to transshipment area in the Gulf of Carpentaria.	<p>Barge design</p> <p>Mooring buoys</p> <p>Navigational aids</p> <p>See mitigation measures listed under Shipping and Maritime Activities above.</p>	Matter adequately assessed in EIS.
<p>Sea: Reserves</p> <p>West Cape York Marine Reserve is located to the west-northwest of the Skardon River in the Gulf of Carpentaria. It includes a Special Purpose Zone (SPZ) just north of the proposed transshipment area and a Marine National Park Zone north of the SPZ and directly west of Thursday Is.</p>	<p>The barges moving to anchored bauxite carriers would transit through both State and Commonwealth waters. These activities would occur approximately 2 km outside of the Marine Reserve.</p> <p>Ocean going vessels moving to and from the transshipment location may include transiting through the Marine National Park Zone. Vessel transit is a permitted activity for all three zones.</p> <p>No significant impact is predicted.</p>	<p>No specific mitigation measures were proposed.</p> <p>Specific mitigation measures relating to marine habitat impacts and marine fauna impacts are discussed in Section 4.5 – Ecology/Flora and Fauna, and Section 4.7 MNES of this assessment report</p> <p>See mitigation measures listed under Shipping and Maritime Activities above.</p>	The risk to the reserves is considered low so long as safety and spill procedures are followed.
<p>Sea: Fisheries:</p> <ul style="list-style-type: none"> Northern Prawn Fishery 880,000km² from Weipa to the Kimberly Carpentaria Inshore Fin Fish Fishery– tidal waters out 25nm Gulf of Carpentaria Developmental 	<p>Given the large area encompassed by all of these fisheries and the relatively dispersed and low level of activity no specific adverse effects are anticipated from the project.</p> <p>Similar to commercial fishing activities, recreational and traditional fishing is dispersed and at low levels of activity and are therefore</p>	There is low potential for interaction of fishers with shipping movements, nonetheless, the proponent commits to complying with all maritime safety regulations and consult with relevant bodies for commercial fishing and charter boat industry about managing project	Matter adequately assessed in EIS.

EIS SUMMARY*			EHP ASSESSMENT
Existing infrastructure and values	Potential impacts (no mitigation)	Avoidance, mitigation and management commitments	
<p>Fin Fish Fishery– waters beyond 25nm from the QLD coast</p> <ul style="list-style-type: none"> Gulf of Carpentaria Commercial Line Fishery – from the NT border to tip of Cape York. <p>Recreational fishing generally confined to beaches and nearshore areas and is understood to occur from boats leaving Mapoon.</p> <p>Rights of access to traditional fisheries are exercised by Mapoon Aboriginal Community.</p>	<p>unlikely to be affected by the project’s port and shipping activities.</p> <p>Access to beaches along the Skardon River would not be affected.</p> <p>Potential impacts on fish passage and fish habitats from barging and shipping are discussed in EIS section 6.6, Chapter 6 – Marine ecology; and section 4.5 of this report. It is unlikely that the barging and tug operation would impact on mangroves. There is the potential for seagrass in the Skardon River to be impacted by barging propeller wash.</p> <p>Cyclone moorings have the potential to impact on fishing values. A full assessment of the impacts on the cyclone moorings was not provided in the EIS and additional information about impacts (including on fishing) and mitigation measures would be required with the Tidal Works application.</p> <p>Moring buoys are unlikely to impact on fishing values, although the barges and their propeller wash may.</p>	<p>activities in the context of fishing.</p> <p>Shallow barges would be used to avoid impact on benthic habitats.</p> <p>Barges restricted to deep channel and maximum speeds of between 4-6 knots to limit propeller wash and wave wake impacts.</p> <p>The project proposes to utilise the adjacent Skardon River Project’s barge loading facilities, reducing the impacts the project would have had on mangroves and seagrass beds in the Skardon River.</p>	
<p>Land:</p> <p>The Project site is remote and difficult to get to by the existing road network.</p> <p>Peninsular Development Road (PDR) is unsealed, not maintained and only suitable for 4WD access in the dry season.</p> <p>Access is via the PDR to Telegraph Road then east at Bramwell Junction, then along Bamaga Road, then Heathland Track and again along Telegraph Track, and bush track to the site.</p> <p>From the north access is from Bamaga road, Heathlands Track, old Telegraph Track and bush track.</p> <p>Access to BH1 pit is proposed via a haul road on tenements agreed to with Rio Tinto Alcan.</p> <p>Vehicle access from Mapoon is via Weipa and then onto the PRD and can take 8-14</p>	<p>The project does not intend to rely on existing road networks for access. And therefore no assessment was done against DTMR guidelines for Assessment of Road Impacts for Development (DTMR 2006a) or the DTMR Road Planning and Design Manual (DTMR 2006b).</p> <p>Infrequent and minimal use of the public transport and state controlled road network, and no new off lease alterations proposed.</p> <p>There would be limited council and state road network use proposed.</p> <p>Use of the current Weipa road network would be limited and light passenger vehicles only used. The EIS estimates 3-5 vehicle movements per week. Planes arriving at Weipa airport would be met with passenger vehicles. In some cases if small charter planes cannot be used to transport them to site immediately there may be cause to accommodate workers in Weipa overnight.</p> <p>Workers from Mapoon would drive to Weipa and then fly to the site.</p> <p>Light vehicles and small trucks would transport stores, plant and equipment to barges positioned at Evan’s landing in the Embly</p>	<p>Given no significant impacts are anticipated, no mitigation measures are proposed.</p>	<p>Matter adequately assessed in EIS.</p>

EIS SUMMARY*			EHP ASSESSMENT
Existing infrastructure and values	Potential impacts (no mitigation)	Avoidance, mitigation and management commitments	
<p>hours to access the site from Mapoon.</p> <p>Evan's landing on the Embly River south of Weipa would be used to load supply barges for the project.</p>	<p>River near Weipa. Local vehicles using the existing road network. Given the infrequent and minor use of the existing road network it is not expected that current use would be affected.</p> <p>To summarise:</p> <ul style="list-style-type: none"> • no new infrastructure external to the project would be required. • no new or alterations to public infrastructure • use of roads in Weipa would be limited • dangerous good would not be transported by road • significant impacts to existing road transport are not anticipated. 		
<p>Landholder access:</p> <p>Currently there is access to traditional owners, campers and fishing folk to the Skardon River.</p>	<p>The project may limit access to the site for cultural, fishing and camping areas due to safety during operation.</p>	<p>The proponent would ensure that public access routes to recreational fishing areas are maintained.</p> <p>The proponent has entered into an Agreement with the Traditional Owners regarding site access and post mining land use.</p>	<p>Matter adequately assessed in EIS.</p>
<p>Environmental values</p> <ul style="list-style-type: none"> • Air Quality • Noise and Vibration • Health and Safety • Hazard and Risk 	<p>Assessment of Air Quality and noise impacts at the Skardon River Airstrip were discussed in Chapter 12 – Air Quality and Chapter 13 Noise and Vibration of the EIS; Chapter 18 Hazards and Safety;</p> <p>Impacts of noise on marine fauna is discussed in Chapter 13 Noise; Chapter 6 Marine Ecology;</p>	<p>See mitigation measures above for Shipping and Maritime activities</p>	<p>Addressed and conditions are recommended in Appendix 1</p>

4.16 Cultural heritage

The environmental values relevant to Indigenous and non-Indigenous cultural heritage at the project area were described in EIS Chapter 15 – Cultural Heritage and in EIS Appendix K – Environmental Management Plan, Chapter 13 – Cultural Heritage Management. Potential impacts of the project on cultural heritage values and proposed management and mitigation measures were also described.

Two submissions regarding cultural heritage were received and addressed by the proponent in the supplementary report to the EIS December 2016 Volume 3, Appendix E to J, Chapter 15 – Cultural Heritage; submission reference numbers 18.1, 18.2 and 18.3.

Mining tenures ML 40082, ML40069 and ML 6025 were granted via the Right to Negotiate process under the *Native Title Act 1993*.

4.16.1 Values, impacts and mitigations measures

The proponent has entered into a native title agreement with the Ankamuthi, who are the registered native title claimants for the project area on the south side of the Skardon River (QC1999/026; QUD 6158/98).

A Section 31 Deed was signed in December 2013 with the Ankamuthi People. The agreement includes the implementation of a Cultural Heritage Management Plan (CHMP). The CHMP would involve a detail assessment of Aboriginal values in the project area and provide management and mitigation measures for managing potential impacts.

A summary of EIS's assessment of Indigenous and non-Indigenous cultural heritage values, potential impacts and proposed avoidance and mitigation measures is provided in Table 18. EIS assessment of cultural heritage values (from EIS Chapter 15 and EIS Appendix K, Chapter 13)

4.16.2 Assessment and conclusions

EHP determined that the EIS in conjunction with the SEIS adequately addressed the TOR and submissions received on the EIS. An adequate assessment of the project's potential impacts on cultural heritage values and measures to minimise potential impacts on Indigenous and non-Indigenous cultural heritage places was provided.

Table 18. EIS assessment of cultural heritage values (from EIS Chapter 15 and EIS Appendix K, Chapter 13)

EIS SUMMARY*			EHP RECOMMENDATIONS
Cultural heritage values	Potential impacts during construction and operation (no mitigation)	Targeted management and mitigation measures	
Indigenous cultural heritage			
<p>There are no registered or known significant sites within the project area.</p> <p>The area is known to have been occupied by the Ankamuthi Aboriginal language group and provided fertile land for environmental resources.</p> <p>Various potential and confirmed material and items (such as middens) of Indigenous cultural heritage have been identified within the project area and in locations within the broader project area.</p> <p>Items of unrecorded Indigenous cultural heritage may also occur within or near the proposed Project development and without appropriate site management initiatives, may be threatened by construction activities.</p>	<ol style="list-style-type: none"> 1. Loss of physical cultural heritage as a result of land clearing – cumulative loss of culture heritage objects; 2. Unauthorised damage or theft to cultural heritage places and objects e.g. vehicles driving over shell middens; 3. Loss of cultural knowledge, language and practices as a result of an inability to access places of cultural heritage significance to undertake hunting and cultural practices; and 4. Introduced feral animals causing damage to cultural heritage sites. 	<p>Pre-clearance surveys;</p> <p>Areas identified as having a cultural significance would be, where practicable, avoided; and</p> <p>Consult with relevant Aboriginal parties.</p> <p>Prior to land clearing extensive knowledge would be gathered and documented on cultural practices in the area;</p> <p>Areas identified as having a cultural significance would be, where practicable, avoided; and</p> <p>Consult with Aboriginal parties.</p> <p>Site inductions would incorporate areas of cultural significance; and</p> <p>Driving in these areas would be prohibited with additional controls e.g. signage and/or fencing, if required.</p> <p>Appropriate controls and management strategies would be adopted including fencing, where practicable, culturally significant sites.</p>	<p>Proponent must:</p> <p>Undertake at minimum the commitments stated in section 15.7 of the EIS.</p> <p>Maintain compliance with the signed Ancillary Agreement, incorporating the Cultural Heritage Management Plan requirements;</p> <p>Continually engage and negotiate with the Ankamuthi People (QUD6158/98), Northern Cape York Group #1 (QUD157/11) and Old Mapoon Aboriginal Corporation in accordance with the Cultural Heritage Management Agreement;</p> <p>Develop and implement procedures, including pre-clearance surveys, to identify and manage any areas or items of Indigenous and non-Indigenous cultural heritage significance; and</p> <p>Identify, assess and record Indigenous heritage sites, including appropriate induction of relevant Project personnel.</p>
Non-Indigenous heritage			

<p>No designated sites within or nearby to the project area found on registers and databases maintained by the Commonwealth, State and local governments</p> <p>The closest site listed site is the wreck of the vessel 'Fiji', located approximately 30km south of the project area.</p>	<ol style="list-style-type: none"> 1. Loss of physical unidentified non-Indigenous cultural heritage as a result of land clearing 2. Unauthorised damage or theft to unidentified non-Indigenous cultural heritage places and objects e.g. clearing or pastoral relics. 3. Introduced feral animals causing damage to unidentified non-Indigenous cultural heritage sites. 	<p>Pre-clearance surveys;</p> <p>Areas identified as having a cultural significance would be, where practicable, avoided; and</p> <p>Visual observations and inspections (where required) during operation.</p> <p>Pre-clearance surveys;</p> <p>Site inductions would incorporate procedures to identify potential items of significance; and</p> <p>Activities with potential to adversely impact items of significant (e.g. clearing) would be prohibited from areas without pre-clearance surveys.</p> <p>Appropriate controls and management strategies would be adopted including fencing, where practicable, culturally significant sites.</p>	<p>The proponent must:</p> <p>Develop and implement a Historical Heritage Management Plan for the management of any non-Indigenous cultural heritage in the event such is found.</p> <p>Include custom conditions on EA to develop and implement Historical Heritage Management Plan.</p> <p>As per the Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth), notification to the Commonwealth Department is required as soon as practical, including the location and description of discovery.</p> <p>Notification to EHP as soon as practical and include location and description of discovery.</p>
---	---	---	--

4.17 Social and economic

EIS Chapter 16 – Social and Economic Impacts reviewed the existing social environment of the project's location and identified likely social and economic impacts, including cumulative impacts of the project on the existing environment. The EIS estimated the social and economic impacts arising from the project at the local, regional, state and national levels and recommended mitigation strategies and monitoring regimes. A full economic technical report was provided in EIS, Appendix H – Economic Technical Report.

The proponent responded to the EIS submissions on social and economic issues in the SEIS. Appendix A - Chapter 16 of the SEIS outlines the six submissions, reference numbers 3.1, 4.1, 5.1, 7.1, 8.1, 8.2, 8.3, 8.4, 8.5 and 10.1. Matters raised in submissions were predominantly focussed on:

- provisions for local/regional employment, with particular regard to women, Aboriginal and Torres Strait Islanders and people with disabilities
- provision for local/regional procurement
- provisions for annual public reporting
- strategy to address any cumulative impacts of other projects in relation to local/regional employment.

4.17.1 Values, impacts and mitigations measures

Social and economic impact assessments were carried out as part of the EIS which considered local (Cook Shire Council; Mapoon Shire local government area) and regional communities (Weipa Town Area local government area; Napranum Shire local government area; Northern Peninsula Area Regional Council; Aurukum Shire local government area; Cairns City Council) and economies (Cooktown; Mapoon; Weipa; Napranum; Injinoo and Bamaga; Aurukum; Cairns) that could be affected by the project. In addition potential cumulative social impacts with other projects that are proposed or operational in the area were also identified and assessed including the Skardon River Bauxite Project, Weipa Bauxite Mine, Amrun (formerly South of Embley) Bauxite Project, Hey Point Bauxite Project and Aurukum Bauxite Project. A summary of existing social and economic environment values, potential impacts and proposed avoidance and mitigation measures and EHP's recommendations are provided below in Table 19 EIS assessment of social and economic values (summarised from: EIS Chapter 16; EIS, Appendix H; & SEIS Chapter 16 & Appendix A).

4.17.2 Assessment and conclusions

EHP determined that the EIS adequately addressed the TOR and submissions received on the EIS relating to social and economic impacts. Suitable avoidance and mitigation commitments to avoid and enhance the projects social and economic impacts were proposed. Specific recommendations from EHP's assessment are contained in Table 19 EIS assessment of social and economic values (summarised from: EIS Chapter 16; EIS, Appendix H; & SEIS Chapter 16 & Appendix A).

DSD and DILGP advised that there were no outstanding issues.

Table 19 EIS assessment of social and economic values (summarised from: EIS Chapter 16; EIS, Appendix H; & SEIS Chapter 16 & Appendix A)

EIS*			EHP RECOMMENDATIONS
Existing social and economic environment	Potential impacts (unmitigated)	Avoidance, mitigation and management commitments	
<p>Social</p> <p>Land surrounding the project are is currently used for mineral exploration, camping, recreational and traditional fishing and hunting practices. Cattle grazing is a common land use in the region but there are no active cattle properties in the immediate vicinity of the project.</p> <p>Relevant stakeholders include individuals, communities, non-government organisations, private organisations, government agencies, small businesses and others who have an interest or a 'stake' in the project and its outcome.</p> <p>At the time of the 2011 census, the combined population of the Cooktown, Mapoon, Weipa, Napranum, Bamaga,</p>	<p>Key economic and social factors:</p> <p><u>Opportunities for employment</u></p> <ul style="list-style-type: none"> • An estimated average of 254 jobs would be required over the 12 year life of the mine. • Opportunities for local community members, in particular local Indigenous persons, women and people with disabilities would be maximised. • Due to the poor road access to the project area, the direct workforce would be 100% FIFO. • Increased opportunities for employment in the local area is considered a beneficial cumulative impact of the collective mining projects. • Employment of local Indigenous members would likely benefit household income directly and provide indirect community benefits through higher wages. <p><u>Potential business opportunities</u></p> <ul style="list-style-type: none"> • The construction and operations of the project would provide employment and a range of business opportunities. • Potential opportunities for Traditional Owners and local communities related to land and coastal management, agriculture, timber harvesting, civil construction, contract mining, ecotourism services, training and development, seed collection and rehabilitation, cultural heritage management and general goods and services. <p><u>Transport and site access issues</u></p> <ul style="list-style-type: none"> • Impact on existing infrastructure. • Access predominantly via airstrip and barge, with limited road access and no current plans to use or upgrade any of the existing roads in the region. • Increase in flights (considered minor). • Access to recreational fishing in the Skardon River and existing bush camping. 	<p><u>Opportunities for employment</u></p> <ul style="list-style-type: none"> • Commitment to maximising opportunities for local community members, in particular local Indigenous persons, women and people with disabilities. • Workforce plans that maximise the opportunity for local workers to get jobs. • Workers to live in local existing housing, or in purpose-built villages, where there is community support. • Accommodation that provides a safe, clean and healthy environment for works. • Preferred local employment will favour, in order of priority <ul style="list-style-type: none"> - The Northern Peninsula (Bamage/Injinoo), Mapoon and Weipa area - Cape York Region / North Queensland - The rest of Queensland - Elsewhere in Australia. <p><u>Potential business opportunities</u></p> <ul style="list-style-type: none"> • Local business opportunities, particularly Indigenous business opportunities, would be encouraged and ways to form partnerships that provide good social and economic outcomes would be sort. <p><u>Transport and site access issues</u></p> <ul style="list-style-type: none"> • Access predominantly via airstrip and barge, with limited road access and no current plans to use or upgrade any of the existing roads in the region. • Commitment to maintain at least the existing access controls, with potentially more stringent control being required to limit access to the mining operations that may also reduce access concerns for sensitive environmental and cultural areas. • Access to recreational fishing in the Skardon River and the existing bush camping, would not be impacted, except for potentially diverting the existing access track away from the mining operations. In the Skardon River itself, the BLF would 	<p>Where the proponent's commitments do not conflict with any subsequent approval conditions and any recommendations of this report, the proponent must implement the commitments as stated in the EIS.</p>

<p>Injinoo and Aurukun communities was 5,915 (approximately 0.137% of the total Queensland population). From this total, 4,512 identify as Indigenous persons including Torres Strait Islanders.</p> <p>Apart from Weipa Town Area, all of communities near the project area are rated as 'most disadvantaged', in the ABS Socio-Economic Indexes for Areas (SEIFA) for relative socio-economic disadvantage and economic resources.</p> <p>Existing challenges on the communities include the need for quality education that leads to employment outcomes, lack of available housing and access to health care facilities.</p> <p>Mining related employment is centred in Weipa with Napranum experiencing significantly less direct and indirect income benefits from this industry.</p>	<p><u>Exclusion of the community</u></p> <ul style="list-style-type: none"> • Traditional Owners and the existing freehold land owners raised concerns regarding transparency of land operations and complying with agreed conditions. • Access to the site for Traditional Owners. <p><u>Disruption to community cohesion</u></p> <ul style="list-style-type: none"> • Potential impact to the community values of a number of local and regional communities including Mapoon, Weipa, Napranum, Aurukun, Cairns and Cooktown and the Northern Peninsula Regional Council communities. • Law and order and alcohol control issues, interrelated with other issues such as domestic violence, child safety, health and youth crime. <p><u>Increased demand on community services including:</u></p> <ul style="list-style-type: none"> • health services • education services • emergency services • essential services • transport infrastructure • community and recreational facilities and services. <p><u>Demographic changes</u></p> <ul style="list-style-type: none"> • The use of local residents may encourage a higher proportion of the working aged population to maintain residence in the local area rather than look elsewhere for work. This could result in decreased mobility of the local population. <p>Cumulative Social Impacts</p> <ul style="list-style-type: none"> • Encourage establishment of new local businesses to supply the projects and it may enable expansion of existing small business, however increased demand for local supplies and services also has the potential to limit availability and increase prices. • Increase of local employment and business opportunities may act to insulate the region's economy from general economic downturns. • Project would inhibit direct access to the approved MLs. This poses a direct impact to local residents and Indigenous communities who utilise these areas for recreational and cultural activities. However no major additions to this are anticipated. 	<p>extend a small way into the Skardon River, still allowing significant free access along all stage of the river for recreational purposes.</p> <p><u>Exclusion of the community</u></p> <ul style="list-style-type: none"> • Access to the site for Traditional Owners would be established and implemented through the Cultural Heritage Management Agreement (CHMA), facilitated through the Liaison Committee that would include members from the land owners (OMAC), the Traditional Owners (Ankamuthi and Northern Cape York Group #1) and the proponent. This would detail agreed protocols to facility how access to the site is arranged and undertaken. • Regular stakeholder communications, covering updates on the project, would be undertaken as part of the stakeholder engagement. <p><u>Disruption to community cohesion</u></p> <ul style="list-style-type: none"> • Remote location of the site and the limited site access. • Review past studies undertaken on FIFO mining employees and adopt similar management styles, particularly when it comes to rostering. • While the remote location of the operation necessitates FIFO operations, the proponent understands that the FIFO roster would be a significant factor in employee satisfaction and would look for opportunities to develop a roster that would be sustainable for the majority of employees. <p><u>Increased demand on community services</u></p> <ul style="list-style-type: none"> • Typically minor illnesses and injuries would be treated onsite at the project's first aid facility and would not increase the demand on health services. However, emergency evacuation of patients may be required (infrequently) for more specialist healthcare provision. The increased demand is assessed as being low and no mitigation is proposed. • The project is not expected to have a significant impact on the existing education services and no mitigation is proposed. • Onsite emergencies such as fires, chemical spills and onsite security matters would be in the first instance be managed through a project ERP, thus reducing the demand on existing services, which if required would be of short duration. Management of incidents at seas or in the Skardon River are also included in the ERP. • The increased demand on essential services is not expected to be significantly affect the existing supply as the load would 	
---	--	---	--

	<ul style="list-style-type: none"> • Increase demand on community and essential services. <p>Economic Impacts assessment The economic contribution within both the FNQ Region and Queensland is anticipated to be highest within the mining, transport, postal and warehousing sectors.</p> <p><i>Beneficial impacts</i></p> <ul style="list-style-type: none"> • Economic growth product during the construction phase (short term) and operational phase (to a lesser extent, but longer term) of the project flowing from direct and indirect impacts. • Export revenue associated with the sale of bauxite, which in turn facilitate the payment of royalties to the Queensland Government in the order of \$36 million/year once the mine is fully operational. • Potential small increase in the Cape York local population through the attraction of operational workers. • Increased employment opportunities for Cape York residents including residents of Indigenous communities [i.e. Ankamuthi People, the Northern Cape York Group #1 and The Old Mapoon Aboriginal Corporation (OMAC)]. • Opportunities for local Cape York and FNQ suppliers to support the construction and operation of the project. <p><i>Adverse impacts</i></p> <ul style="list-style-type: none"> • Opportunity cost of the project in terms of lost ecosystem services. • Tightening of the local and regional labour market potentially resulting in increased labour costs. • Potential for skills shortages. • Potential localised inflation in the local Cape York housing market. • Potential localised inflation in Cape York commercial and industrial property markets. • Increased burden on Cape York infrastructure, particularly during the construction phase (for example barge landings and airstrips). <p>During the 2019 to 2026 period, the peak employment effects of the project are estimated at:</p> <ul style="list-style-type: none"> • FNQ Region: total employment contribution of 280 FTEs, comprising direct contribution of 200 FTEs and indirect contribution of 79 FTEs; and • Rest of Queensland: total employment contribution of 100 FTEs, comprising direct contribution of 50 FTEs and indirect 	<p>be borne at the project site. Therefore no mitigated is proposed.</p> <ul style="list-style-type: none"> • The project does not propose to use or modify the existing road network outside of the project area. Consequently no demand on the existing road infrastructure is anticipated, so no further mitigation is proposed. • Negligible impact on the community due to increased usage of recreational facilities and services is expected and consequently no mitigation is proposed. <p>Cultural Heritage Management Agreements with the relevant Traditional Owners, which meet the <i>Aboriginal Cultural Heritage Act 2003</i> requirements, are incorporated into an overarching Ancillary Agreement. The agreement incorporates key engagement strategies that target:</p> <ul style="list-style-type: none"> • Improved opportunities for the Ankamuthi people, Northern Cape York #1 ground and the Old Mapoon Aboriginal Corporation and associated parties. • Increased employment, retention and career development of local Indigenous people. • Positive contribution to Indigenous economic and social development. • Sensitivity and understanding in cultural heritage management. • Cultural awareness training for all employees. • Compensation for land access. <p>Stakeholder Engagement and Consultation aims include to:</p> <ul style="list-style-type: none"> • Continue consultation and engagement programs with stakeholders to ensure their views are understood and considered throughout the life of the project. • Continue to participate with government in local and regional planning processes and provide timely information about the project to inform discussion and decision making. • Continue to work to mitigate project impacts on the local community. <p>Community Health and Safety aims include to:</p> <ul style="list-style-type: none"> • Expand its community safety awareness program in conjunction with industry partners, government and community groups, to develop responses to project-related community safety issues in the region. • Communicate and strictly enforce its code of conduct for all staff and contractors to uphold a high standard of behaviour. 	
--	---	--	--

	<p>contribution of 50 FTEs.</p>	<ul style="list-style-type: none"> • Collaborate with government, industry and other providers to mitigate any potential impacts on health and emergency services in local communities. <p>Provisions for Local/Regional Procurement, preference would favour, in order of priority, supplies from:</p> <ul style="list-style-type: none"> • The Northern Peninsula (Bamaga), Mapoon and Weipa area • Cape York Region/North Queensland • The rest of Queensland • Elsewhere in Australia. <p>In accordance with the Queensland Resources and Energy Sector Code of Practice for Local Content, a Local Content Strategy would be development that would:</p> <ul style="list-style-type: none"> • Ensure the principle of the code is communicated and integrated within the procurement. • Strategies and procedures developed by the proponent and within the project supply chains. • Ensure early and ongoing engagement of local industry. • Promote procurement opportunities to local industry (including effective communication of scope of works and tender opportunities). • Promote capability requirements to local industry. • Identify capable local industry. • Engage with contractors or subcontractors based on the most competitive tender proposal, that shall include (amongst other things) consideration of direct and indirect cost factors, past performance, reliability, maintainability, innovation, whole-of-life costs, value, safety compliance, environmental sustainability performance, financial capability, and supply chain reliability. 	
--	---------------------------------	--	--

4.18 Hazard and safety

EIS Chapter 18 – Hazard and Safety described the potential risk to people and property that may be associated with the project in the form of preliminary risk assessment accordance with relevant standards. Chapter 18 assessed the risk to the workforce, stakeholders, environment and local communities.

The following legislation and policy applies to the project:

- The *Mining and Quarrying Safety Health Act 1999* (MQSH Act) applies to mining activities and requires risk to a person from operations to be at an acceptable level and within acceptable limits and as low as reasonable achievable.
- The transshipment and marine working areas are not captured under the MQSH Act and as such are subject to the *Work Health and Safety Act 2011* (WHS Act). This includes any place where a worker goes or is likely to be while at work, including, vessels, any waters and any installation on the bed of any waters or floating on any waters. The WHS Act sets out obligations to implement reasonable measures to ensure health and safety taking account of the risk, the consequences, knowledge of the hazard and suitable controls.
- The objective of the *Disaster Management Act 2003* is to mitigate the potential adverse effects of an event. This is achieved by establishing disaster management groups and plans for the State, disaster districts and local government areas. The plans relevant to the Project are the Cook Shire Local Disaster Management Plan and the Weipa Town Authority Local Disaster Management Plan.
- The Fire and Rescue Service Act 1990 and subordinate regulations require the operator to establish effective relationships with the Queensland Fire and Emergency Services to provide for the prevention and response to fires and incidents endangering persons, property or environment.
- The *Coastal Protection and Management Act 1995* (CPM Act) aims to protect, conserve, manage and rehabilitate Queensland's coastal resources and biological diversity. The Project is located in a coastal hazard area.
- The *Transport Operations (Marine Safety) Act 1994* imposes a general safety obligation on all vessel owners, operators, masters and crew to operate vessels safely at all times. The Act allows the Maritime Safety Queensland (MSQ) to plan and manage marine safety and other related marine operational issues and respond to incidents.
- The Maritime Safety Queensland Act 2002 (MSQ Act), administered by MSQ and the Department of Transport and Main Roads, provides advice regarding marine safety, ship-sourced pollution and related matters. The MSQ Act facilitates the transfer of obligations from MSQ to port authorities in port areas so that they deliver pilotage services, in particular pilotage areas. The Port of Skardon River is operated by Ports North and activities in this area are subject to the Port Rules, including specific pilotage requirements and the Port of Skardon River EMP.
- The adverse impacts of bushfires, landslides and flooding have been assessed with consideration to the State Planning Policy (SPP) – State Interest Guideline – Natural Hazards, Risk and Resilience.
- The Queensland Model Planning Scheme Development Code for Hazardous Industries and Chemicals (Workplace Health and Safety Queensland, 2016) provides additional guidance for development involving hazchems.

4.18.1 Values, impacts and mitigations measures

A preliminary risk assessment was undertaken for the construction and operational stages of the project. The assessment involved:

- identification of surrounding community values including sensitive receptors;
- identification of hazards of the Project which may present an impact to community safety:
 - project activities and proposed facilities
 - hazardous materials stored and transported
 - technological and natural hazards
 - potential for hazardous incidents to occur; and
- assessment of risks including:
 - identifying the pathway in which a hazard could cause harm
 - evaluating risk associated with each hazard
 - applying a risk rating to the hazards and risks
 - proposing mitigation measures
 - reviewing residual risk with mitigation measures in place

Values were identified based on the land uses associated with the area. Sensitive receptors for this chapter were consistent with those identified in EIS Chapter 12 – Air Quality and Chapter 13 – Noise and Vibration.

Sensitive receptors

Within a 25km radius of the Project, 47 sensitive receptors were identified using aerial imagery (see EIS Figure 18-1 and Appendix 1 Schedule H Figure 1 of this report). The closest residential receptor is located at Mapoon approximately 16km southwest of the ML boundary. There are two commercial receptors owned and operated by Gulf Alumina which are the Skardon River airstrip located 3.3km southwest and the Gulf Alumina Skardon River Bauxite Project (SRBP) camp located 0.3km west of the MIA.

Water users in the area have also been considered to be a sensitive community receptor. The only groundwater user identified in the study area is the SRBP camp which has limited extraction from the Lunette aquifer. Beyond the study area and approximately 35 km southwest of the MIA, the Mapoon town water supply is from the Bulimba Formation. Further details on water users are in Chapter 10 – Water Resources.

The Skardon River and estuary area is classified as a MSES – HES wetland and contains HEV waters. The mangroves bordering the Skardon River and the area known as Big Footprint Swamp are classified MSES's with HES.

There are a number of groundwater dependent ecosystems identified within the study area including Big Footprint Swamp and the Skardon River and estuary which are likely to depend on shallow groundwater. These areas also hold cultural and spiritual values to the Traditional Owners.

There are other small areas of MSES Regulated Vegetation adjacent and within the Project area.

4.18.2 Assessment and conclusions

Table 20. EIS assessment of hazard and safety below provides a summary of the EIS assessment of hazards and safety and EHP's recommendations. EHP determined that the EIS adequately assessed the impacts of natural and project induced hazards on people and property. EHP considers the hazards and risk associated with the project can be considered acceptable if the relevant statutory guidelines and regulations are met and with the adequate implementation of management plans and commitments in EIS (Table 18-3).

PSBA made a submission noting that the relevant sections of the draft model code in the State Planning Policy (SPP) should be applied to assist in mitigating adverse effects of bushfire. As discussed in Section 18.2.8.1 the adverse impact of bushfires with consideration to the SPP – State Interest Guideline – Natural Hazards, Risk and Resilience was considered in the EIS and the proponent commits to giving consideration to the draft model code. The proponent has committed to consider the code and manage bushfires via a Land Use Management Plan (LUMP) (refer to Section 21 of the SEIS).

Queensland Ambulance Service requested that they be formally consulted and engaged regarding the proposed ERP so that access strategies and on-site medical capacity be reviewed. The proponent has committed to formally notify and engage with QAS in developing the ERP.

In addition, operations outside of the wet/cyclone season and pre wet season preparation is required to reduce risks to people and the environment.

Table 20. EIS assessment of hazard and safety

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Hazards & Risk	Avoidance, mitigation and management commitments	
<p>Sensitive receptors associated with the project are described above.</p> <p>The project is in the Cap York in an area subject to tropical storms and cyclones.</p>	<p>BoM identified 15 cyclones have passed within 100 km of the Project between 1970 and 2006. Only three have reached Category 4. There have been no Category 5 cyclones in the region. Risks identified with cyclones are:</p> <ul style="list-style-type: none"> • health and safety of employees and the community from storm surge, flooding and wind-blown debris; • damage to port, ferry and barge infrastructure from storm surge and waves; • damage to other infrastructure from wind and flooding; • damage to revegetation from wind and heavy rain. 	<p>The project would not operate during the wet season, when changes related to increased rainfall, wind speed, storm surge and tropical storm probabilities are expected to impact the Project.</p>	<p>Site should be prepared for the cyclone season before operation ceases at the beginning of the wet season. Equipment, people and mine pits, barges should be secured or relocated at the end of the work season.</p>
<p>Bushfire hazard area - medium potential threat rating</p>	<ul style="list-style-type: none"> • medium potential threat rating; • Bushfire - approximately 13% and 33% of the region is burnt each year, predominantly grass fires. 	<p>The Cape York Fire Program and the Mapoon Land and Sea Rangers provide fire management and coordination between land holders, the community, industry and all levels of government.</p> <p>The Cape York Fire Program has improved coordination and cooperation between stakeholders across all land tenures by developing a sound base for sustainable fire management strategies and practices. The proponent has had discussions with Cape York Sustainable Futures in April 2015 regarding fire management specific to the Project.</p> <p>The proponent is working in partnership with Mapoon Land and Sea Rangers to develop a coordinated Fire Management Plan incorporating</p> <p>A bushfire management plan would be developed considering TO bushfire management, safety of people, design and siting of buildings, firebreaks and setbacks, access to fire fighting vehicles, road access for vehicles, adequate water supply, the environment, storage of hazardous/flammable materials.</p> <p>Buildings fitted with appropriate firefighting equipment and facilities</p> <p>All welding activities, where practicable, would be conducted in the main workshop area. The area would be cleared of flammable materials and a suitable fire extinguisher would be positioned</p>	<p>Adequate response to the risk.</p> <p>A submission was made noting that the relevant sections of the draft model code in the State Planning Policy (SPP) should be applied to assist in mitigating adverse effects of bushfire.</p> <p>As discussed in Section 18.2.8.1 the adverse impact of bushfires with consideration to the SPP – State Interest Guideline – Natural Hazards, Risk and Resilience was considered in the EIS and the proponent commits to giving consideration to the draft model code.</p> <p>The proponent has committed to consider the code and manage bushfires</p>

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Hazards & Risk	Avoidance, mitigation and management commitments	
		<p>within reach of the work area</p> <p>All fire-fighting extinguishers would comply with AS/NZS 1841.1:2007. Fire-fighting equipment would be compatible with that used by Queensland Rural Fire Service. Routine inspections of fire-fighting equipment would take place at least weekly</p> <p>Basic fire control training would be given as part of the induction and regular refresher training given.</p> <p>In the event a fire cannot be controlled by mine workers, or threatens public property, the Queensland Rural Fire Service would be contacted.</p>	<p>via a Land Use Management Plan (LUMP) (refer to Section 21 of the SEIS).</p> <p>The proponent's commitments and response would be sufficient.</p>
<p>The Skardon River is an erosion prone coastal area and contains areas the subject of inundation.</p>	<ul style="list-style-type: none"> vulnerable to storm impact, sediment loss and channel migration. the potential for a high storm tide (combined tide and surge) to occur at Weipa is anticipated to be low, with a 100 year Average Recurrence Interval (ARI) of approximately 2 metre Australian Height Datum (mAHD) (compared to a highest astronomical tide level of 1.63 mAHD) the storm tide levels for the Skardon River are comparable to Weipa, therefore, storm tides are not considered a significant risk 	<p>Tide gauge to monitor changes.</p> <p>The project would not operate during the wet season, when changes related to increased rainfall, wind speed, storm surge and tropical storm probabilities are expected to impact the Project.</p> <p>The following measures would be undertaken to ensure there is no unnecessary increase in erosion as a result of the Project activities:</p> <ul style="list-style-type: none"> Avoid or minimise movement of vehicles and other machinery on beaches, where possible; Locate all buildings, workshops and storage areas outside erosion prone area and as far landward as practicable Minimal changes to the coastal environment and tide movements through design of infrastructure. 	<p>Adequate commitments</p>
<p>Lower lying areas are classified as Flood Hazard Area Level 1</p>	<p>Flood modelling was carried out up to the probable maximum flood. Results indicated that inundation would be confined within waterways, with some inundation of the broader floodplain caused by the increased ocean levels associated storm tide.</p>	<p>The project would not operate during the wet season, when changes related to increased rainfall, wind speed, storm surge and tropical storm probabilities are expected to impact the Project.</p> <p>The project has been designed to ensure it is constructed on elevated land.</p>	<p>Adequate commitments</p>
<p>Climate change</p>	<p>the short duration of the project in the context of impacts from climate change means it is unlikely to be affected by climate change</p> <p>predicted sea level rise and cyclone intensity could result in worsening coastal hazards</p>	<p>The project would not operate during the wet season, when changes related to increased rainfall, wind speed, storm surge and tropical storm probabilities are expected to impact the Project.</p> <p>The specific risk of climate change to the Project is low given the short duration of the project and the predicted impacts of climate change are longer term.</p>	<p>Adequate commitments</p>

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Hazards & Risk	Avoidance, mitigation and management commitments	
	severe storms may impact on infrastructure		
<p>The project would store and use a number of hazardous substances, including those listed in the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code).</p> <p>Table 18-1 of the EIS listed hazardous substances likely to be used on site.</p>	<p>Hazchem storage onsite which triggers assessment is the storage of diesel in above ground tanks, being over 60,000L it is considered a high impact under the model assessable development thresholds.</p> <p>The proposed storage onsite would be 500,000L of diesel which is equivalent to 177t, this is well under the 50,000t trigger limit for major hazard facilities defined within Schedule 15 of the Work Health and Safety Regulation 2011.</p>	<p>The Code for Hazardous Industries and Chemicals provides a minimum separation distance of 13m for storages of 500,000L of diesel. The current proposed storage area for fuel would be located greater than 13m from the ML boundary.</p> <p>Standard Operating Procedures (SOPs) would be reviewed to ensure safety processes and storage and handling procedures are adequate and conform to Australian Standard (AS) 1940:2004 - The Storage and Handling of Flammable and Combustible Liquids.</p> <p>Due to the proposed combined use of infrastructure with the adjacent SRBP, facilities to store dangerous goods, the fuel farm and waste material storages located at the SRBP MIA would be utilised to service both projects. This consolidation reduces the risks associated with having duplicated infrastructure adjacent to the Skardon River and enables a consistent and collaborative approach to managing hazards and risks, particularly in regard to managing hazardous materials and barge loading activities.</p>	NA
Health and Safety	<p>The risks associated with being located in a remote tropical environment:</p> <ul style="list-style-type: none"> tropical diseases (i.e. Malaria, Ross River and Barmah River Viruses and Dengue Fever) venomous/dangerous animals remote location and roster may impact the mental health of workers handling wastes <p>The health and safety risks associated with bauxite mining relate to noise, dust, ergonomics, trauma/injury, fatigue, heat.</p> <p>Potential health and safety risks associated with the interaction of work areas and onsite traffic volumes remain.</p> <p>Barge operation incidents may impact property, cause physical injury and damage the marine environment. The risks associated with the barge operation relate to incidents such as:</p> <ul style="list-style-type: none"> risk of marine collisions groundings or vessel strikes from moving 	<p>An ERP would be prepared for the operations of the Project and would incorporate the aspects of the approved SRBP to be also utilised including the MIA, BLF haul roads and accommodation facilities. The ERP would be prepared as per the legislative requirements and in consultation with the DCS, QFRS, QPS and QAS. A copy of the final ERP would be provided to the interested parties.</p> <p>The proponent would have emergency service responses and capability on standby which can be activated in an emergency to avoid the strain on local regional services. Road access is not considered a viable option for any emergency response, therefore either rotary or fixed wing aircraft would be the likely option. Fast water transport to Weipa is the fall-back option if for any reason aircraft access is restricted.</p> <p>The SSE would ensure the mine has the resources and facilities for the mine's preparedness in reasonably foreseeable emergency situations.</p> <p>The proponent has the responsibility of self-sufficiency for immediate emergency response. A delayed attendance by the Queensland Fire and Emergency Services is available upon request for assistance.</p> <p>The project does not intend to not operate during the wet season, when the chance of tropical storm is highest.</p>	<p>A submission raised concern about emergency response and site access.</p> <p>Consultation with the relevant authorities in preparing the relevant plan is required.</p> <p>A copy of the ERP and all other relevant documents are to be provided to the relevant authorities to ensure effective coordination of emergency response and procedures.</p>

EIS SUMMARY*			EHP RECOMMENDATIONS
Existing environment	Hazards & Risk	Avoidance, mitigation and management commitments	
	<p>marine vessels</p> <p>Oil spills can result from such incidents.</p> <p>The remoteness of the site presents a risk that health and safety injuries are not attended to in time. The time taken to respond depends on the type, location and severity of the incident. The nearest paramedics and ambulance stations are located at Weipa and Bamaga. The diversion of the resources at this location could impact on the Weipa and/or Bamaga communities, given response by road could be 12 to 16 hours or more.</p>	<p>The Project and the SRBP would initially have management processes and procedures specific to each project outside of the MIA. A consistent management approach would ultimately be developed to remove the potential for inconsistent management practices between the Projects and reduce risks to the health and safety of workers and visitors to the site.</p> <p>The risks associated with having two separate barge movement schedules have been removed through the utilisation of the SRBP MIA and BLF. Barge movements would be managed and coordinated from the one commencement point (i.e. the SRBP BLF) and a single navigation channel established to service both projects.</p> <p>A single set of management plans would be prepared to support the barging operations.</p>	
Malicious acts can create potentially hazardous conditions.	Malicious acts pose a safety risk to the public and workers and may result in injury or property damage. Given the remote location and no access to the site by road, the risks of this are considered to be low.	None proposed but considered unlikely.	

5 Recommendation on the suitability of the project

The proponent has met the statutory requirements of Chapter 3 of the EP Act for the EIS process.

The information provided in this EIS process by the proponent about the proposed Bauxite Hills Project and its potential impacts on the identified environmental values have been assessed by representatives of the Australian, state and local governments, industry, interest groups and members of the public through an open, public review process.

EHP concludes that the project would have positive impacts on local, regional, state and national economies through royalties, taxes, charges and wages. Impacts to environmental and social values including land, ecological, coastal and marine environment, groundwater, surface water, MSES, MNES, surface water resources, and emergency services were identified. Key impacts are summarised in Table 21.

Measures to avoid and minimise any adverse impacts were also described.

In response to submissions on the EIS, the project was amended resulting in significantly reduced impacts on high ecologically significant wetlands. The project would now utilise existing mine infrastructure (including barge loading, stockpiling, fuel) on an adjacent tenement reducing the need to duplicate these on the project site.

Overall, the project EIS adequately addressed the published TOR, and has outlined a range of mitigation measures which, if applied, would further avoid or minimise adverse environmental impacts. The majority of government and community concerns were covered satisfactorily in the EIS released for public review in 2015 and subsequently in the proponent's responses to the submissions and the Supplementary Report to the EIS (SEIS) further, which together comprise the submitted EIS. EHP is satisfied that with the implementation of avoidance, mitigation, management measures, offsets on MSES and MNES, progressive rehabilitation, and commitments in the EIS, the potential impacts to environmental values can be appropriately minimised to the greatest possible extent consistent with State and Commonwealth Government Environmental legislation or policy.

A number of actions, including those committed to by the proponent are required to be completed. Management plans for land management and marine operations are yet to be completed. Notably, the proponent must provide an Integrated Marine Monitoring Program and additional water quality monitoring and water quality release limits based on further background water quality monitoring. Other matters that require attention by the proponent are clearly stated in section 4 of this report and where departments have specifically recommended actions to be undertaken or noted, these have been discussed in section 4 and also listed in Appendices 2, 3, 4 & 5.

Notwithstanding the need for the proponent to address these matters, no issues of sufficient magnitude have been identified during the EIS assessment process that are contrary to Government legislation or policy that would prevent the project from proceeding. The matters identified in this assessment can be dealt with by imposing conditions on approvals that would require the proponent to meet required levels of environmental and social performance and/or require the proponent to take any necessary actions.

In determining the suitability of the project EHP considered all commitments made by the proponent in the EIS including, but not limited to, Appendix J of the SEIS – Consolidated Commitments. A substantial number of these commitments would be regulated through the recommended conditions in the EA and/or other State and/or Commonwealth legislation and/or Australian Standards. If the project proceeds, EHP expects all commitments made by the proponent to be delivered.

Consequently, the project has been determined to be suitable to proceed to the decision stage of the EP Act, Chapter 5. Proponent would be required to obtain all necessary approvals including those under EP Act.

Table 21 Key potential impacts of the project

Matter	Key impacts
Land and waste	<ul style="list-style-type: none"> • Direct disturbance of 1433ha of land. • Increased susceptibility of land to soil erosion and degradation due to clearing, excavation, disturbance and subsidence. • Rehabilitation of mining pits and decommissioning of the site is proposed but the ecosystem would not be returned to exactly what it is now which is habitat for threatened species.
Water:	<ul style="list-style-type: none"> • Potential changes to groundwater quantity and quality • Potential impact on the ecological function and significance of riparian vegetation, springs, seeps and groundwater-dependent ecosystems and their role in maintaining local ecosystems and biota. • Potential impacts to overland flow due to subsidence. • Reduction in the catchment of surface water flows to Big Footprint Swamp • Impacts on waterways and riparian vegetation from haul road crossings potentially impacting on water quality • Impacts on several watercourses in the transport corridor including localised direct deformation of the stream bed and altered hydraulic flows.
Ecological:	<ul style="list-style-type: none"> • Impacts on MSES and MSES including threatened flora and fauna, vegetation communities and other ecological values particularly clearing of 1433ha of remnant vegetation. • Impact on habitat for threatened species: <ul style="list-style-type: none"> • MNES and MSES protected species • MSES protected species • MNES protected species • Potential impact on the ecological function of riparian vegetation, springs, and groundwater-dependent ecosystems and their role in maintaining local ecosystems and biota. • Ecological impacts to terrestrial ecology due to increased pests and weeds and reduced habitat connectivity across the project area. • Potential for impacts on downstream water quality and aquatic ecology due to road crossing and changes in base flow and sediment transport.
Coastal and marine	<ul style="list-style-type: none"> • Increased vessel movements in the near pristine Skardon River • Additional infrastructure in the Skardon river • Potential for spills in the marine environment. • Lighting impact on turtles from boating • Potential for temporary impact from pile driving from installation of cyclone moorings in the Skardon River estuary. • Potential for wave wake impacts. • Potential for propeller wash impacts on benthic habitats.
Social and economic:	<ul style="list-style-type: none"> • Project would contribution to the local, regional, state and national economies through royalties, taxes, charges and wages. • Capital expenditure of approximately \$50.13 million into regional Queensland economy. • Mining of the bauxite would generate royalties valued at approximately \$36 million/year once the mine is fully operational, payable to the Queensland Government. • Creation of an estimated 254-280 jobs required over the 12 year life of the mine. • Increased opportunities for employment in the local area is considered a beneficial cumulative impact of the collective mining projects. • Increased employment opportunities of local Indigenous members would likely benefit household income directly and provide indirect community benefits through higher wages. • Project would help sustain employment and create opportunities for new local businesses, regional development and investment. • Increased demand for local supplies could limit availability and increase prices. • The project workforce would be 100% FIFO. • Positive employment and business opportunities for local and regional areas. • No significant impacts on regional communities. • No significant cumulative impacts.
Other impacts:	<ul style="list-style-type: none"> • Potential impacts on airports and ports utilised for the project • Potential impact on recreational and cultural users of the area.

6 Project approvals and recommended conditions

Following the release of this report, the proponent would be required to obtain statutory approvals from Commonwealth, state and local government agencies before the project can proceed. An overview of the approvals required for the project are summarised in Table 22. Approvals required for the Bauxite Hills Project. Key approvals required for the project include an Environmental Authority under the EP Act and approval by the Australian Government under the EPBC Act. The EIS process has sought to provide an assessment of matters relevant to these approvals and where possible, provide advice and recommendations concerning key matters regulated by these approvals.

6.1 Environmental authority (EP Act)

Appendix 1 of this report contains recommended conditions based on EHP's model mining conditions (EHP, 2016). These conditions have been tailored for the project to regulate risks to environmental values and capture key commitments made by the proponent in the EIS. The recommended conditions outlined in Appendix 1 are considered necessary to achieve the environmental objectives and desirable for the regulation of identified and potential environmental impacts identified in this assessment. The recommended conditions are not considered complete or finalised until the all outstanding matters have been adequately addressed by the proponent.

6.2 Australian Government approval (EPBC Act)

The EIS provided an assessment of the likelihood of occurrence of MNES and significant residual impacts. These matters have been assessed in this report and recommendations have been made for the Commonwealth Minister for the Environment to consider when making a decision about the action and any conditions that might be placed on such an approval.

6.3 Approvals

A number of other approvals required for the project have been identified (see Table 22 **Error! Reference source not found.**). Where possible, advice and recommendations have been made concerning key matters regulated by these approvals. Recommendations relating to the required tidal works application under the *Sustainable Planning Act 2009* for the installation of cyclone moorings have been provided in section 4.8 and Appendix 6 of this report. Specific conditions for these approvals would be developed during the application and assessment processes under the relevant legislation.

Table 22. Approvals required for the Bauxite Hills Project

Approval	Legislation (administering authority)	Detail
Key state approvals		
Granting of MLs	<i>Mineral Resources Act 1989</i> (DNRM)	Resource tenure is sought in the form of three MLs (MLA20676, MLA20689 and MLA20688) for minerals and infrastructure pursuant to the MR Act. A further application for a MLA100130 pursuant to s316 of the <i>Mineral Resources Act 1989</i> for the haul road over ML7024 (held by Rio Tinto Alcan) has been made. Previous MLAs and a s316 application which are now redundant following the acquisition of Gulf Alumina and the utilisation of the SRBP and would be withdrawn on approval of the project.
Environmental authority (mining activities) (EA)	<i>Environmental Protection Act 1994</i> (EHP)	A granted EA for the proposed project would allow the proponent to mine bauxite under schedule 2A (ERA 11, particular resource activities) of the Environmental Protection Regulation 2008 (EP Regulation). The EA would also cover the following activities that are directly associated with, or facilitate or support, the mining activities, and which would otherwise require approval under the EP Act as 'prescribed ERAs', listed under schedule 2 of the EP Regulation: <ul style="list-style-type: none"> ERA 31 (2) (b) – Mineral processing (the relevant activity) consists of processing, in a year, more than 100,000t coke or

Approval	Legislation (administering authority)	Detail
		<p>mineral products.</p> <p>Note that the project nominated ERA 33 (Crushing, milling, grinding or screening more than 5,000 t of material in a year), however, after having assessed the proposed project, EHP's Minerals Business Centre have advised that ERA 31 is more appropriate for the regulation of the activity.</p> <p>Based on the project description and activities outlined in the EIS, a set of recommended conditions have been prepared for the proposed project (Appendix 1). These would also be relevant to ERA 31.</p> <p>EHP may require additional information from the proponent on several matters as identified in the assessment report that would need to be provided before EHP could finalise and issue a draft EA under section 181 of the EP Act.</p>
Commonwealth approvals		
<p>Approval to undertake an action that may impact on MNES</p> <p>(Controlled Action)</p>	<p><i>Environment Protection and Biodiversity Conservation Act 1999</i> (DoEE):</p> <ul style="list-style-type: none"> • assessment of listed threatened species and communities • assessment of impacts on listed migratory species • assessment of impacts on Commonwealth marine areas 	<p>The Project was referred on 11 August 2015 (EPBC 2015/7538) and on 18 September 2015, DoEE declared the Project a controlled action under the EPBC Act.</p> <p>This assessment report includes an assessment of impacts on MNES as a result of the proposed action. This assessment would be provided to the Commonwealth Environment Minister to inform decision-making about whether or not to approve the proposed action and any conditions that should be applied under part 9 of the EPBC Act.</p> <p>This assessment report also includes EHP's recommended conditions of approval for the project to manage and offset impacts to MNES not addressed through state imposed conditions).</p>
<p>Indigenous heritage</p>	<p><i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i> (Commonwealth)</p>	<p>Notification to the Commonwealth Department as soon as practical and include location and description of discovery.</p>
<p>Native title</p>	<p><i>Native Title Act 1993</i> (Commonwealth)</p>	<p>The proponent has finalised an Ancillary Agreement with both Native Title Parties. The ancillary agreement includes a Cultural Heritage Management Agreement (CHMA) which covers the protection and management of all Aboriginal Cultural Heritage in the CHMA area for the purposes of the proposed mining and transshipment activities. OMAC, the trustee of the Aboriginal freehold land is a signatory to the Ancillary Agreement.</p>
Offsets (State and Commonwealth)		
<p>Offset requirements for MNES and state environmental significance (MSES)</p>	<p>Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>; EPBC Act Environmental Offsets Policy 2012 (DoEE) - assessment of MNES</p> <p>Queensland <i>Environmental Offsets Act 2014 (EO Act)</i>, Environmental Offsets Regulation 2014, Queensland Environmental Offsets Policy (EHP) - assessment of MSES</p>	<p>Offsets would be required under State and Commonwealth legislation (refer to sections 4.6 and 4.7 of this report).</p> <p>However, under the EO Act an offset condition cannot be required by the state if the Commonwealth has imposed a condition for the same, or substantially the same, impact on the same matter OR if the Commonwealth has decided an offset is not required.</p>

Approval	Legislation (administering authority)	Detail
Other State Approvals		
Species management program for tampering with animal breeding places	<i>Nature Conservation Act 1994</i>	If pre clearing surveys indicate the presence of breeding places then a SMP for tampering with a breeding place is required. Hollows are considered a breeding place for a number of fauna and their prey.
Protected Plants permit	<i>Nature Conservation Act 1994</i>	A flora survey is required prior to clearing, and if the flora survey identifies the presence of EVNT plants in the clearing impact area then a clearing permit is required. A clearing permit is not required if impacts to EVNT plants can be avoided (i.e. there is no clearing to take place within 100m of the EVNT plants).
Permit to take water (surface water and/or groundwater) and approvals for related infrastructure	<i>Water Act 2000 (DNRM)</i>	An application to divert water during the construction and operation of the mine would be required for this project.
Water licence – to take or interfere with water Water permit to take water (surface water or groundwater) for a activity with a reasonably foreseeable conclusion Riverine protection permit – for the excavation or placement of fill in a watercourse (applies to non-tidal watercourses, lakes and springs)	<i>Water Act 2000 (DNRM)</i> Water Resource (Great Artesian Basin) Plan 2006	The proponent would need to consult with DNRM on: <ul style="list-style-type: none"> • Approvals that may be required prior to the take of water including water permits to take surface water or groundwater and/or water licence for dewatering groundwater. • Depending on the location of the proposed bores, development approval in addition to water licences may also be necessary. • A riverine protection permit under the <i>Water Act 2000</i> may be required to excavate or place fill in a watercourse.
Licence to take water from the Great Artesian Basin (GAB)	<i>Water Act 2000 (DNRM)</i>	The project has been declared 'regionally significant' by DNRM and an application for a water allocation is in progress. Note this application may be withdrawn should a sufficient water supply exist with the SRBP.
Removal, destruction or damage of marine plants	<i>Fisheries Act 1994</i> (Department of Agriculture and Fisheries; DAF)	The proponent would need to consult with DAF on: <ul style="list-style-type: none"> • Approvals required prior to impacts on marine plants defined under the <i>Fisheries Act 1994</i> (e.g. as part of the cyclone mooring construction or barge operations).
Waterway barrier permit Code for Self-assessable	<i>Fisheries Act 1959 (DAF)</i>	Waterway barrier works approvals are associated with waterway crossing outside of the MLA. As all waterway crossings would be within the MLs and managed under the conditions of an EA, separate waterway barrier works approvals are not required to be obtained.

Approval	Legislation (administering authority)	Detail
Development – Minor Waterway Barrier Works		Water barriers would be managed through a condition on the EA
Tidal works / Prescribed tidal works Code for self-assessable development Minor impact works involving the removal, destruction or damage of marine plants (MP06)	<i>Coastal Protection and Management Act 1995</i> <i>Sustainable Planning Act 2009</i>	Approvals for the installation of cyclone moorings: A tidal works or prescribed tidal works approval would be required for the installation of cyclone moorings depending on their siting relative to the mean high water spring. Further information is requested to be included with any tidal works application (refer to section 4.8 of this assessment report). The proponent would need to consult with EHP, DAF and other government agencies in order to identify additional information required to support future tidal works or prescribed tidal works applications. If any unforeseen impacts on marine plants occur as a result of project activities, including barging, an application to authorise those impacts and offsets may be required.
Operational Works for Damage to Marine Plants and Tidal Works	<i>Sustainable Planning Act 2009</i> <i>Cook Shire Council and Referral Agency – SARA</i>	Any damage or removal of marine plants beyond the ML boundary and the placement of prescribed tidal works associated with the cyclone moorings and fixed tidal gauge.
Buoy Mooring Authority	<i>Transport Operations (Marine Safety) Act 1994 (Maritime Safety Qld)</i>	MSQ has a whole-of-state framework for approving buoy moorings. A RHM may create some area-specific conditions.
Marine Fuel Transfer Activity Permit	<i>Port of Skardon River Port Rules (Ports North)</i>	Undertaking refuelling activities at the BLF as it is within the Port Limits. Note this may not be required should an existing permit be held for the SRBP and noting that the proponent would use the approved SRBP fuel farm and distribution network.
Maritime operations, pollution and safety	<i>Transport Infrastructure Act 1994 and Transport Operations (Road Use Management) Act 1995 (Department of Transport and Main Roads: Maritime Safety Queensland; MSQ)</i>	The proponent would need to consult with Maritime Safety Queensland (MSQ) and Ports North in the ongoing management of project related maritime operations.
Biosecurity management strategies, e.g. weed and pest, diseases (such as foot-and-mouth disease) and contaminants (such as lead on grazing land)	<i>The Biosecurity Act 2014 (DAF)</i>	The proponent would have an obligation to undertake all reasonable steps to ensure no spread of pest, disease or contaminant. There are seven categories of restricted matters listed under the Act. Each category places restrictions on the biosecurity matter or requires actions to be taken to minimise the spread and adverse impact of the matter.
Cultural heritage management plan	<i>Aboriginal Cultural Heritage Act 2003 (Department of Aboriginal and Torres Strait Islander and Multicultural Affairs; DATSIMA)</i>	The proponent has a duty of care by which all reasonable and practicable measures must be implemented to ensure the activity does not harm Aboriginal cultural heritage.
Assessment reporting of previously	<i>Queensland Heritage Act 1992 (EHP)</i>	Notification to EHP as soon as practical and include location and description of discovery. However, no areas have been identified which are listed on the Queensland Heritage Register.

Approval	Legislation (administering authority)	Detail
unrecorded sites of non-Indigenous cultural heritage significance		
The Cape York Regional Plan	<i>Regional Planning Interests Act 2014</i> (Department of State Development)	The EIS indicated that the project does not fall within an area of regional interest.

7 Approved by

ORIGINAL SIGNED

Signature

Chris Loveday
Director, Impact Assessment and Operational Support
 Department of Environment and Heritage Protection
 Delegate of the chief executive
Environmental Protection Act 1994

31 March 2017

Date

Enquiries: EIS Coordinator
 Ph. (07) 3330 5048
 Fax. (07) 3330 5875

Appendix 1 - Recommended conditions for the environmental authority (resource activity)

Obligations under the Environmental Protection Act 1994

In addition to the requirements found in the conditions of an environmental authority for the project, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. This includes, the holder of the EA must comply with the following provisions of the Act:

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

Recommended conditions of an environmental authority

The environmentally relevant activity(ies) described in Section 6.3 of this report must be conducted in accordance with the following site specific conditions of approval.

Schedule A: General

Schedule A: General	
Condition number	Condition
A1	This environmental authority authorises environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.
A2	<p>Scope of Activity</p> <p>The Environmental Authority holder is approved to mine bauxite under schedule 2A (ERA 11, particular resource activities) of the Environmental Protection Regulation 2008 (EP Regulation), and to undertake ERA 31 (2)(b) – Mineral processing - processing in a year, more than 100,000t coke or mineral products.</p> <p>Note that the project nominated ERA 33 (Crushing, milling, grinding or screening more than 5,000 t of material in a year), however, ERA 31 is more appropriate for the regulation of the activity.</p>
A3	<p>In carrying out the mining activity, the holder of this environmental authority must comply with Table A1 - Authorised mining activities and locations and the following plans provided in Schedule H—Maps and plans:</p> <ul style="list-style-type: none"> • Schedule H—Figure 2 (Project layout—mine area and infrastructure);

Table A1—Authorised mining activities and locations

Mine domain	Mine feature name	Mining lease	Location (MGA94, Zone 56)		Maximum disturbance area (ha)
			Easting	Northing	
Mine Pits	BH1	ML20676	TBA ¹	TBA ¹	664.4
	BH6 East	ML20688	TBA ¹	TBA ¹	292.2
	BH6 West	ML20689	TBA ¹	TBA ¹	394.65
Haul Roads	BH1 to BH6 Haul Road	ML100130	Refer to Schedule H ²		90.2

Table A1—Authorised mining activities and locations notes:

1. To be provided before EA issue, one central data point (to 1 decimal point only, for each mine feature) to be provided to the administering authority.
2. Locations presented in Schedule H - Maps and Plans.

A3	<p>The holder of this environmental authority must:</p> <ul style="list-style-type: none"> a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority b) maintain such measures, plant and equipment in a proper and efficient condition c) operate such measures, plant and equipment in a proper and efficient manner d) ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.
A4	<p>Monitoring</p> <p>The environmental authority holder must, when requested by the administering authority, undertake relevant specified monitoring within a reasonable timeframe nominated or agreed to by the administering authority to investigate any complaint of environmental harm. The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures, where implemented, must be provided to the administering authority within 10 business days of completion of the investigation, or no later than 10 business days after the end of the timeframe nominated by the administering authority to undertake the investigation.</p>
A5	<p>All sampling and monitoring required by this environmental authority must be undertaken by an appropriately qualified person.</p>
A6	<p>Except where specified otherwise in another condition of this environmental authority, all monitoring records or reports required by this environmental authority must be kept for a period of not less than five (5) years and be provided to the administering authority upon request.</p>
A7	<p>The following information must be recorded in relation to all monitoring required under the conditions of this environmental authority:</p> <ul style="list-style-type: none"> a) the date and time at which the sample was taken; b) the location or monitoring point at which the sample was taken; c) the results of all monitoring and details of any exceedances of the conditions of this environmental authority; d) any other pertinent details of relevance to interpreting the sampling results (i.e. stream flow, wind conditions or any unusual observations such as odour or colouration).
A8	<p>Financial assurance</p> <p>FA must be lodged with the administering authority in the amount, the form and within the time required by the administering authority.</p>
A9	<p>Risk management</p> <p>By <an agreed date with the administering authority> and prior to commencement of the activity, the environmental authority holder must develop and implement a risk management system for mining activities which complies with the content requirement of the Standard for Risk Management (ISO31000:2009), or the latest edition of an Australian standard for risk management, to the extent relevant to environmental management.</p>
A10	<p>Notification of emergencies, incidents and events</p> <p>The environmental authority holder must notify the administering authority by verbal and written notification within 24 hours after becoming aware of any emergency, incident, event or monitoring result, which does or may contravene a condition of this environmental authority.</p>
A11	<p>Notification to the administering authority, in accordance with condition A10 must be provided to the administering authority's Pollutions Hotline on 1300 130 372 and the PollutionHotline@ehp.qld.gov.au.</p>
A12	<p>Within 10 business days following the initial notification of an emergency or incident, or receipt of monitoring results, whichever is the latter, further written advice must be provided to the administering authority, including the following:</p> <ul style="list-style-type: none"> a) results and interpretation of any samples taken and analysed; b) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm; c) proposed actions to prevent a recurrence of the emergency, incident or event.

<p>A13</p>	<p>Investigations</p> <p>Except where specified otherwise in another condition of this environmental authority, in the event of any monitoring showing exceedance of trigger values or limits specified in the conditions of this environmental authority, the environmental authority holder must:</p> <ul style="list-style-type: none"> a) complete an investigation to identify the potential cause of the exceedance and the potential for environmental harm being caused or likely to be caused by the exceedance; b) provide a written report to the administering authority within three (3) months of the date of the original exceedance, outlining: <ul style="list-style-type: none"> i. details of the investigation carried out; ii. actions taken to prevent environmental harm.
<p>A14</p>	<p>Complaints</p> <p>The environmental authority holder must record all environmental complaints received about the mining activities including:</p> <ul style="list-style-type: none"> a) name, address and contact number for of the complainant; b) time and date of complaint; c) reasons for the complaint; d) investigations undertaken; e) conclusions formed; f) actions taken to resolve the complaint; g) any abatement measures implemented; h) person responsible for resolving the complaint.
<p>A15</p>	<p>Third-party reporting</p> <p>By <an agreed date with the administering authority> and prior to commencement of the activity, the holder of this environmental authority must:</p> <ul style="list-style-type: none"> a) obtain from an appropriately qualified person a report on compliance with the conditions of this environmental authority. b) obtain further such reports at regular intervals, not exceeding three years, from the completion of the report referred to above in a). c) provide each report to the administering authority within 90 days of its completion
<p>A16</p>	<p>The environmental authority holder must implement any findings arising from the audit (unless the administering authority confirms in writing they are not required) and take necessary action to ensure compliance with the conditions of this environmental authority.</p>
<p>A17</p>	<p>Where a condition of this environmental authority requires compliance with a standard, policy or guideline published externally to this environmental authority and the standard is amended or changed subsequent to the issue of this environmental authority, the environmental authority holder must:</p> <ul style="list-style-type: none"> a) comply with the amended or changed standard, policy or guideline within two (2) years of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation, or where the amendment or change relates specifically to regulated structures referred to in condition H36, the time specified in that condition; b) until compliance with the amended or changed standard, policy or guideline is achieved, continue to remain in compliance with the corresponding provision that was current immediately prior to the relevant amendment or change.
<p>A18</p>	<p>Meteorological monitoring</p> <p>By <an agreed date with the administering authority> and prior to commencement of the activity, the environmental authority holder must establish and maintain an automatic weather station at the licensed place to measure and record daily data on wind speed, wind direction, temperature and rainfall.</p>
<p>A19</p>	<p>Commitments</p> <p>All commitments made in the EIS generally and listed in Appendix J of the SEIS, must be implemented by the environmental authority holder. Any proposed changes to the commitments register must be provided to the administering authority and the register updated by agreement prior to implementation.</p> <p>Note 1: If there is an inconsistency between a commitment and a condition of this environmental authority, the environmental authority condition prevails.</p> <p>Note 2: The commitment register can be updated by an agreed amendment, in accordance with section 215(1) of the Environmental Protection Act 1994.</p>

Schedule B: Air

Schedule B: Air	
Condition number	Condition
B1	Air emissions resulting from mining activities must not cause environmental harm to any sensitive place or commercial place.
B2	Dust and particulate matter monitoring By <an agreed date with the administering authority> and prior to commencement of the activity, the environmental authority holder must design and implement an air quality monitoring program that can ensure compliance with conditions B1 and B3.
B3	<p>The proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the dust and particulate matter emissions generated by the mining activities do not cause exceedances of the following levels when measured at any sensitive or commercial place:</p> <ul style="list-style-type: none"> a) dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with the most recent version of Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter – Gravimetric method. b) a concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM₁₀) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time, for no more than five exceedances recorded each year, when monitored in accordance with the most recent version of either: <ul style="list-style-type: none"> 1. Australian Standard AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM₁₀ high volume sampler with size-selective inlet – Gravimetric method, or 2. Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM₁₀ low volume sampler—Gravimetric method. 3. Standards Australia AS3580.9.8 Methods for sampling and analysis of ambient air-Determination of suspended particulate matter – PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser, or 4. Standards Australia AS3580.9.11 Methods for sampling and analysis of ambient air-Determination of suspended matter PM₁₀ beta attenuation monitors, or 5. Other relevant equipment authorised by the administering authority. c) a concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometres (PM_{2.5}) suspended in the atmosphere of 25 micrograms per cubic metre over a 24-hour averaging time, when monitored in accordance with the most recent version of AS/NZS3580.9.10 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM (sub)2.5/(sub) low volume sampler—Gravimetric method; d) a concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 1 year averaging time, when monitored in accordance with the most recent version of AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—Total suspended particulate matter (TSP)— High volume sampler gravimetric method.

Schedule C: Waste

Schedule C: Waste	
Condition number	Condition
C1	<p>General All general and regulated waste generated in carrying out mining activities must be removed to a facility that can lawfully recycle or dispose the waste.</p>

C2	Waste Management Plan By <an agreed date with the administering authority> and prior to commencement of the activity, the environmental authority holder must develop and implement a Waste Management Plan (WMP).
-----------	--

Schedule D: Noise

Schedule D: Noise	
Condition number	Condition
D1	Noise from mining activities must not cause a nuisance to any sensitive receptor * as defined in the EPP (Noise)
D2	When requested by the administering authority, event based noise monitoring relevant to a verified complaint must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint related to noise at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following receipt of final monitoring report.

* the location of sensitive place is identified in **Schedule H** – Figure 1 - Potential sensitive receptors.

Schedule E: Groundwater

Schedule E: Groundwater	
Condition number	Condition
E1	The holder of this environmental authority must not release contaminants to groundwater.
E2	<p>Monitoring program and reporting</p> <p>By <an agreed date with the administering authority> and prior to commencement of the activity, a groundwater monitoring program must be designed by an appropriately qualified person(s) and be submitted to the administering authority.</p> <p>The groundwater monitoring program must be capable of determining the pre-disturbance groundwater levels, groundwater quality and inferred flow directions for at least the following locations and situations:</p> <ul style="list-style-type: none"> • reference bore locations hydraulically up-gradient and compliance bore locations down-gradient of all mining activities; • all the hydrogeological units/aquifers that have the potential to be affected by mining activities, suspected of interacting with groundwater dependent ecosystems, inclusive of paleo-channels; • Big Footprint Swamp and Lunette Swamp; • regional ecosystem 3.3.14; • groundwater abstraction location(s) for potable water supply; and • areas prone to saline ingress
E3	By <an agreed date with the administering authority> and prior to commencement of the activity, the environmental authority holder must implement the groundwater monitoring program required by condition E2.
E4	Groundwater quality and levels must be monitored at the locations and frequencies defined in Table – E1 Groundwater monitoring locations and frequency for quality characteristics identified in Table E2 - Groundwater contaminant limits and Table E3 – HEV groundwater trigger values.
E5	By <an agreed date with the administering authority> and prior to commencement of the activity, site specific limits for all quality characteristics listed in Table E2 - Groundwater contaminant limits must be calculated in accordance with the minimum data requirements and be provided to the administering authority. <i>Note 1: The raw data must be provided with the calculated site specific trigger values.</i> <i>Note 2: This condition does not apply to quality characteristics for interpretation purposes, or where a value is already included in the relevant table.</i>
E6	Groundwater quality monitoring results from compliance bores identified in Table E1- Groundwater monitoring locations and frequency must not exceed any of the limits defined in Table E2 - Groundwater contaminant limits .

E7	<p>If quality characteristics of groundwater from compliance bores identified in Table E1- Groundwater monitoring locations and frequency exceed any of the limits stated in Table E2- Groundwater contaminant limits the environmental authority holder must complete an investigation into the potential for environmental harm and provide a written report to the administering authority within 28 days or another timeframe agreed to by the administering authority, outlining;</p> <ol style="list-style-type: none"> details of the investigations carried out and the cause of the exceedance; an assessment of environmental harm; and the management measures proposed or implemented to prevent future exceedances and environmental harm. <p><i>Note 1: Where an exceedance has occurred and is being investigated, in accordance with this condition, no further reporting is required for subsequent exceedance events for that quality characteristic.</i> <i>Note 2: In accordance with Table E2 – Groundwater contaminant limits, the exceedance of three consecutive samples for a quality characteristic is considered an exceedance of the contaminant limit.</i></p>
E8	<p>High ecological value groundwater's The environmental authority holder must not cause a change to the existing condition of the receiving environment (HEV groundwater) as a result of the mining activities.</p>
E9	<p>Calculated site specific trigger values for all quality characteristics listed in Table E3 – HEV groundwater trigger values must be provided to the administering authority by xx xx 2018, in accordance with the following data requirements:</p> <ol style="list-style-type: none"> be based on a minimum of 24 samples, unless it can be demonstrated to the satisfaction of the administering authority that an acceptable level of variation is achieved for a trigger value based on a lower number of samples; and demonstrate that an acceptable level of variation is achieved for a trigger value based on the sampling period. <p><i>Note 1: The raw data must be provided with the calculated site specific trigger values.</i> <i>Note 2: An acceptable level of variation can be defined according to the guidance in ANZECC fresh and marine water quality guidelines and ARMCANZ (2000) section 3.2.4.2 volume 1.</i> <i>Note 3: This condition does not apply to quality characteristics for interpretation purposes, or where a value is already included in the relevant table.</i></p>
E10	<p>Quality characteristics listed in Table E3 – HEV groundwater trigger values, must be measured at the monitoring bores and at the minimum frequency specified in Table E1 - Groundwater monitoring locations and frequency to determine;</p> <ol style="list-style-type: none"> the 20th, 50th and 80th percentile of the last 12 consecutive samples analysed for each quality characteristic; and the 75% confidence intervals around each of the percentiles stated in condition E10 a). <p><i>Note: The environmental authority holder must use the procedures in Appendix D1: Compliance assessment protocols of the Queensland Water Quality Guidelines 2009, for determining the required percentiles and confidence intervals.</i></p>
E11	<p>From xx xx 2017, the environmental authority holder must submit a report to the administering authority by xx xx (link to above date) each year, providing:</p> <ol style="list-style-type: none"> the percentiles required by condition E10 a); the confidence intervals around each percentile required by condition E10 b); and comparison of the trigger values in Table E3 – HEV groundwater trigger values to the percentiles and confidence intervals calculated in accordance with condition E10a) and E10b).
E12	<p>If any trigger value specified in Table E3 – HEV groundwater trigger values is outside the 75% confidence intervals calculated in accordance with condition E10b), the environmental authority holder must:</p> <ol style="list-style-type: none"> Undertake an investigation to determine; <ul style="list-style-type: none"> the extent of change from the HEV groundwater's existing condition; and the potential adverse ecological impacts due to the change beyond the HEV existing condition; and the management measures proposed to comply with the HEV groundwater trigger values specified in Table E3 – HEV groundwater trigger values. Provide a report to the administering authority detailing the outcomes of condition E12 (a)(i) to condition E12 (a)(iii), including a plan to implement the management measures proposed in accordance with condition E12 (a)(iii); Provide monthly reports to the administering authority until the HEV groundwater trigger values that were exceeded are complied with. <p><i>Note: Where an exceedance of a HEV groundwater trigger value has occurred and is being investigated, no further reporting is required for subsequent trigger events for that quality characteristic.</i></p>
E13	<p>Bore construction and maintenance and decommissioning The construction, maintenance and management of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring.</p>
E14	<p>Groundwater levels Any extraction of water from groundwater bores to support mining activities or any change in groundwater levels due to the extraction of bauxite must not cause environmental harm.</p>

Table E1 - Groundwater monitoring locations and frequency

Monitoring point	Location (MGA94 – Zone 54) ¹			Aquifer screened (mbgl) ²	Minimum monitoring frequency
	Location Description	Easting	Northing		
Mining areas ¹					
Reference bores ³					
TBA ³	TBA ³	TBA	TBA	TBA	Monthly
Compliance bores ³					
TBA ³	TBA ³	TBA	TBA	TBA	Monthly

Table E1 - Groundwater monitoring locations and frequency notes:

1. Locations presented in **Schedule H - Maps and Plans**.
2. Aquifer formations to be provided based on the Groundwater Monitoring Program in accordance with **condition E2** of the Environmental Authority and prior to mining activities commencing.
3. Bore locations to be provided based on the Groundwater Monitoring Program in accordance with **condition E2** of the Environmental Authority and prior to mining activities commencing.

Note: Monitoring is not required where a bore has been removed as a direct result of the mining activity.

Note: RL must be measured to the nearest 5cm from the top of the bore casing.

Note: Construction of all bores must be logged, records of logs kept and bore top casings surveyed to 0.01 m Australian Height Datum.

Table E2 – Groundwater contaminant limits

Quality characteristics	Unit	Limit ²	Limit type	Minimum monitoring frequency
Shallow aquifer				
Aluminium ¹	µg/L	Insert 95 th percentile of true population data	Three consecutive samples	Monthly
Dissolved oxygen	mg/l	Insert 95 th percentile of true population data		
pH	Max	Insert 95 th percentile of true population data		
	Min	Insert 5 th percentile of true population data		
Suspended solids	mg/L	Insert 95 th percentile of true population data		
Total dissolved solids	mg/L	Insert 95 th percentile of true population data		
Turbidity	NTU	Insert 95 th percentile of true population data		
Bulimba formation aquifer				
Aluminium ¹	µg/L	Insert 95 th percentile of true population data	Three consecutive samples	Monthly
Dissolved oxygen	mg/l	Insert 95 th percentile of true population data		
pH	Max	Insert 95 th percentile of true population data		
	Min	Insert 5 th percentile of true population data		
Suspended solids	mg/L	Insert 95 th percentile of true population data		
Total dissolved solids	mg/L	Insert 95 th percentile of true population data		
Turbidity	NTU	Insert 95 th percentile of true population data		
Rolling downs formation aquifer				

Quality characteristics	Unit	Limit ²	Limit type	Minimum monitoring frequency
Aluminium ¹	µg/L	Insert 95 th percentile of true population data	Three consecutive samples	Monthly
Dissolved oxygen	mg/l	Insert 95 th percentile of true population data		
pH	Max	Insert 95 th percentile of true population data		
	Min	Insert 5 th percentile of true population data		
Suspended solids	mg/L	Insert 95 th percentile of true population data		
Total dissolved solids	mg/L	Insert 95 th percentile of true population data		
Turbidity	NTU	Insert 95 th percentile of true population data		
All aquifers				
Major Ions	mg/L	For interpretation purposes		Monthly
Redox potential	mV			
EC	µS/cm			

Table E2 - Groundwater contaminant limits notes:

1. To be sampled and measured as dissolved and total.
2. The contaminant limits specified in this Table apply to all groundwaters.

Table E3 – HEV groundwater trigger values

Quality characteristics	Unit	HEV groundwater trigger values			Minimum monitoring frequency
		20 th percentile	50 th percentile	80 th percentile	
Shallow aquifer					
Aluminium ²	µg/L	TBA ¹	TBA ¹	TBA ¹	Monthly
Dissolved oxygen	mg/l	TBA ¹	TBA ¹	TBA ¹	
pH	Max	TBA ¹	TBA ¹	TBA ¹	
	Min	TBA ¹	TBA ¹	TBA ¹	
Suspended solids	mg/L	TBA ¹	TBA ¹	TBA ¹	
Total dissolved solids	mg/L	TBA ¹	TBA ¹	TBA ¹	
Turbidity	NTU	TBA ¹	TBA ¹	TBA ¹	
Bulimba formation aquifer					
Aluminium ²	µg/L	TBA ¹	TBA ¹	TBA ¹	Monthly
Dissolved oxygen	mg/l	TBA ¹	TBA ¹	TBA ¹	
pH	Max	TBA ¹	TBA ¹	TBA ¹	
	Min	TBA ¹	TBA ¹	TBA ¹	

Quality characteristics	Unit	HEV groundwater trigger values			Minimum monitoring frequency
		20 th percentile	50 th percentile	80 th percentile	
Suspended solids	mg/L	TBA ¹	TBA ¹	TBA ¹	
Total dissolved solids	mg/L	TBA ¹	TBA ¹	TBA ¹	
Turbidity	NTU	TBA ¹	TBA ¹	TBA ¹	
Rolling downs formation aquifer					
Aluminium ²	µg/L	TBA ¹	TBA ¹	TBA ¹	Monthly
Dissolved oxygen	mg/l	TBA ¹	TBA ¹	TBA ¹	
pH	Max	TBA ¹	TBA ¹	TBA ¹	
	Min	TBA ¹	TBA ¹	TBA ¹	
Suspended solids	mg/L	TBA ¹	TBA ¹	TBA ¹	
Total dissolved solids	mg/L	TBA ¹	TBA ¹	TBA ¹	
Turbidity	NTU	TBA ¹	TBA ¹	TBA ¹	
All aquifers					
Major Ions	mg/L	For interpretation purposes			Monthly
Redox potential	mV				
EC	µS/cm				

Table E3 – HEV groundwater trigger values notes:

1. To be provided to the administering authority in accordance with **Condition E9**.
2. To be sampled and measured as dissolved and total.

Note: Include monitoring of groundwater elevation accurate to 0.005 metres AHD.

Note: Be made in accordance with methods prescribed in the latest edition of the administering authority's Water Quality Sampling Manual.

Table E4 – Groundwater quality triggers and limits

Parameter	Contaminant triggers	Contaminant limit
Aluminium (dissolved)	TBA	TBA
Arsenic (dissolved)	TBA	TBA
Barium (dissolved)	TBA	TBA
Cadmium (dissolved)	TBA	TBA
Chromium (dissolved)	TBA	TBA
Copper (dissolved)	TBA	TBA
Iron (dissolved)	TBA	TBA
Lead (dissolved)	TBA	TBA
Manganese (dissolved)	TBA	TBA

Nickel (dissolved)	TBA	TBA
Zinc (dissolved)	TBA	TBA
Mercury (dissolved)	TBA	TBA
Calcium	TBA	TBA
Magnesium	TBA	TBA
Sodium	TBA	TBA
Potassium	TBA	TBA
Chloride	TBA	TBA
Sulphate	TBA	TBA
Nitrate + Nitrite	TBA	TBA
Total Kjeldahl Nitrogen as N	TBA	TBA
Total Nitrogen as N	TBA	TBA
Ammonia as N	TBA	TBA
Carbonate Alkalinity	TBA	TBA
Bicarbonate Alkalinity	TBA	TBA
Hydroxide Alkalinity	TBA	TBA
Total Alkalinity	TBA	TBA
pH	TBA	TBA
Total Petroleum Hydrocarbons	TBA	TBA
Total Dissolved Solids	TBA	TBA

Table E5 – Groundwater level monitoring

Monitoring location Level trigger threshold	Monitoring location Level trigger threshold
BH01	TBA
BH02	TBA
BH03	TBA
BH04	TBA
BH05	TBA
BH06	TBA
BH07	TBA
BH08	TBA
BH09	TBA

BH010	TBA
VWP01	TBA
VWP02	TBA
VWP03	TBA
VWP04	TBA
LH04	TBA
LH05	TBA
LH06	TBA
LH07	TBA
LH09	TBA
LH10	TBA
LH11	TBA
LH12	TBA
LH14	TBA

Schedule F: Water

Schedule F: Water	
Condition number	Condition
F1	Contaminants that would, or have the potential to cause environmental harm must not be released directly or indirectly to any waters.
F2	<p>High ecological value waters</p> <p>The environmental authority holder must not at any time cause a change, as determined by condition F6, to the existing condition of the mining activities receiving waters that are of high ecological value (HEV) waters, including:</p> <ul style="list-style-type: none"> • Skardon River and its tributaries; • Irish Creek; and • Wetlands – Big Footprint Swamp and Lunette Swamp. • areas of RE3.3.14
F3	<p>By <an agreed date with the administering authority> and prior to commencement of the activity calculated site specific trigger values for all quality characteristics listed in Table F2 – HEV waters trigger values must be provided to the administering authority in accordance with the following data requirements:</p> <ol style="list-style-type: none"> a) be based on a minimum of 24 samples, unless it can be demonstrated to the satisfaction of the administering authority that an acceptable level of variation is achieved for a trigger value based on a lower number of samples; and b) demonstrate that an acceptable level of variation is achieved for a trigger value based on the sampling period. <p><i>Note 1: The raw data must be provided with the calculated site specific trigger values.</i></p> <p><i>Note 2: An acceptable level of variation can be defined according to the guidance in ANZECC fresh and marine water quality guidelines and ARMCANZ (2000) section 3.2.4.2 volume 1.</i></p> <p><i>Note 3: This condition does not apply to quality characteristics for interpretation purposes, or where a value is already included in the relevant table.</i></p>

F4	<p>Quality characteristics listed in Table F2 – HEV waters trigger values must be measured at the monitoring points specified in Table F1 - Receiving waters monitoring points to determine the following:</p> <ol style="list-style-type: none"> a) the 20th percentile, 50th percentile and 80th percentile of each quality characteristic, based on at least 12 samples collected over the wet season period; and b) the 75% confidence intervals around each of the percentiles stated in condition F4 a). <p><i>Note: The environmental authority holder must use the procedures in Appendix D1: Compliance assessment protocols of the Queensland Water Quality Guidelines 2009, for determining the required percentiles and confidence intervals.</i></p>
F5	<p>From 1 July 2018, the environmental authority holder must submit a report to the administering authority by 1 July each year, providing:</p> <ol style="list-style-type: none"> a) the percentiles required by condition F4 a); b) the confidence intervals for each percentile required by condition F4 b); and c) a comparison of the trigger values in Table F2 – HEV waters trigger values to the percentiles and confidence intervals calculated in accordance with condition F4 a) and F4b).
F6	<p>If any trigger value specified in Table F2 – HEV waters trigger values is outside the 75% confidence intervals calculated in accordance with condition F4), the environmental authority holder must:</p> <ol style="list-style-type: none"> a) Undertake an investigation to determine; <ol style="list-style-type: none"> i. The extent of change from the HEV waters existing condition; and ii. The potential adverse ecological impacts due to the change beyond the HEV existing condition; & <ol style="list-style-type: none"> i. The management measures proposed to comply with the HEV waters trigger values specified in Table F2 – HEV waters trigger values. b) Provide a report to the administering authority detailing the outcomes of condition F6a)(i) to condition F6(iii), including a plan to implement the management measures proposed in accordance with condition F6a)(iii); c) Provide monthly reports to the administering authority until the HEV waters trigger values that were exceeded are complied with. <p><i>Note: Where an exceedance of a HEV waters trigger value has occurred and is being investigated, no further reporting is required for subsequent trigger events for that quality characteristic.</i></p>
F7	<p>Receiving environment monitoring program (REMP)</p> <p>By <an agreed date with the administering authority> and prior to commencement of the activity, the environmental authority holder must develop and implement a Receiving Environment Monitoring Program (REMP) to monitor, identify and describe any adverse impacts to surface water and groundwater environmental values (including stygofauna), quality and flows due to the mining activity. This must include monitoring the effects of the mine on the receiving environment periodically and while contaminants are being discharged from the site.</p> <p>For the purposes of the REMP, the receiving environment is the waters of:</p> <ul style="list-style-type: none"> • Skardon River; • Irish Creek; • Connected or surrounding waterways of the Skardon River; • Wetlands (including Big Footprint, Lunette Swamp, RE3.3.14); and • Groundwater. <p>The REMP must encompass any sensitive receiving waters or environmental values downstream of the authorised mining activity (including associated haul roads) that would potentially be affected (directly or indirectly) by release of sediment or contaminants to waters.</p> <p>The REMP must be designed and implemented in order to demonstrate that the environmental values of Lunette Swamp, Big Footprint Swamp and the Regional Ecosystem 3.3.14 are comparable to pre mining conditions.</p> <p>The REMP must measure any adverse impacts on flora and fauna species richness and species abundance.</p> <p><i>Note: The environmental values of wetlands are defined under section 81A of the Environmental Protection Regulations 2008.</i></p> <p><i>Note: Refer to Schedule H—Figure 7 (Location of the relevant Regional Ecosystem 3.3.14.).</i></p>
F8	<p>A report outlining the findings of the REMP, including all monitoring results and interpretations, must be prepared annually and submitted to the administering authority on request. This must include an assessment of background and reference water quality, and downstream water quality compared against water quality objectives and the suitability of current discharge limits to protect downstream environmental values.</p>
F9	<p>Water management plan</p> <p>By <an agreed date with the administering authority> and prior to commencement of the activity, a WMP, which includes a surface water and groundwater management and monitoring plan, must be developed by an appropriately qualified person and implemented by the environmental authority holder.</p>

F10	<p>Integrated Marine Monitoring Program</p> <p>By <an agreed date with the administering authority> and prior to commencement of marine related activities (including barging and cyclone mooring construction) an Integrated Marine Monitoring Program (IMMP) must be developed by an appropriately qualified person, and implemented by the environmental authority holder. The IMMP must include the monitoring and management of the following:</p> <ul style="list-style-type: none"> • Marine water quality; • Sediment quality; • Vessel wake waves; • Seagrass; • Mangroves; • Propeller wash; and • Marine introduced pests.
F11	<p>Stormwater and sediment controls</p> <p>By <an agreed date with the administering authority> and prior to commencement of the activity, a certified ESCP must be developed by a Certified Professional in Erosion and Sediment Control and implemented by the environmental authority holder.</p>
F12	By 1 November each year, the ESCP must be updated and implemented to include all disturbed areas.
F13	The minimum design standard of the erosion and sediment control ponds must be designed to capture rainfall and catchment runoff during a 1:10 ARI 24 hour storm event.
F14	Haul road waterway crossings are required to be designed and constructed in accordance with DAF's self-assessable codes for waterway barrier works (or SDAP Module 5.2 where relevant).

Table F1 - Receiving waters monitoring points

Monitoring points ²	Easting (MGA94, Z54)	Northing (MGA94, Z54)	Receiving Waters location description
Lower estuary – Skardon River			
W4	614284.4	8701662.8	TBA m downstream of the SRBP MIA, BH6 East, BH6 west and BH1 mining areas and haul roads.
W5	610246.5	8700107.2	TBA m downstream of the SRBP MIA, BH6 East, BH6 west and BH1 mining areas and haul roads.
Upper estuary – Skardon River			
W3	617294.9	8699516.9	TBA ¹ m upstream of the SRBP MIA and downstream of BH6 East, BH6 west and BH1 mining areas and haul roads.
W6	616859.1	8700289.0	TBA ¹ m downstream of the SRBP MIA and TBA ¹ m downstream of BH6 East, BH6 west and BH1 mining areas and TBA ¹ m downstream of the BH6 east haul road to BH1.
W8	616414.0	8692915.7	TBA ¹ m upstream of the SRBP MIA and TBA ¹ m downstream of BH6 East mining area and TBA ¹ m downstream of the BH6 east haul road to BH1.
W11	TBA ¹	TBA ¹	TBA m upstream of SRBP MIA on the northern branch of the Skardon River upper estuary.
Freshwater – Irish Creek and Bigfoot Print Swamp			
W1	620193.6	8694107.6	TBA ¹ m upstream of the SRBP MIA and TBA ¹ m downstream of the BH6 East to BH1 haul road
W2	622986.8	8694195.3	TBA ¹ m upstream of the SRBP MIA and TBA ¹ m upstream of the BH6 East to BH1 haul road
W7	613192.5	8695467.6	Big Footprint Swamp
W9	TBA ¹	TBA ¹	TBA ¹ m downstream of BH6 East to BH1 haul road.

W10	TBA ¹	TBA ¹	TBA ¹ m upstream of BH6 East to BH1 haul road.
-----	------------------	------------------	---

Table F1 - Receiving water upstream reference sites and downstream monitoring point notes:

1. To be provided to the administering authority by <an agreed date with the administering authority>.
2. Locations presented in **Schedule H - Maps and Plans**.

Table F2 – HEV waters trigger values

Quality characteristic	Unit	HEV waters trigger values			Monitoring frequency
		20 th percentile	50 th percentile	80 th percentile	
Lower estuary – Skardon River					
Turbidity	NTU	TBA ¹	TBA ¹	TBA ¹	Fortnightly, for a total of at least 12 samples over the wet season.
pH	Range	TBA ¹	TBA ¹	TBA ¹	
Total suspended solids	mg/L	TBA ¹	TBA ¹	TBA ¹	
Aluminium ²	µg/L	TBA ¹	TBA ¹	TBA ¹	
Upper estuary – Skardon River					
Turbidity	NTU	TBA ¹	TBA ¹	TBA ¹	Fortnightly, for a total of at least 12 samples over the wet season.
EC	µS/cm	TBA ¹	TBA ¹	TBA ¹	
Total Dissolved Solids	mg/L	TBA ¹	TBA ¹	TBA ¹	
pH	Range	TBA ¹	TBA ¹	TBA ¹	
Total Suspended Solids ³	mg/L	TBA ¹	TBA ¹	TBA ¹	
Aluminium ²	µg/L	TBA ¹	TBA ¹	TBA ¹	
Freshwater - Irish Creek Wetlands (Lunette and Bigfoot swamp)					
Turbidity	NTU	TBA ¹	TBA ¹	TBA ¹	Fortnightly, for a total of at least 12 samples over the wet season.
pH	Range	TBA ¹	TBA ¹	TBA ¹	
Total Suspended Solids ³	mg/L	TBA ¹	TBA ¹	TBA ¹	
Total Dissolved Solids	mg/L	TBA ¹	TBA ¹	TBA ¹	
Aluminium ²	µg/L	TBA ¹	TBA ¹	TBA ¹	

Table F2 - HEV waters trigger values notes:

1. To be provided to the administering authority in accordance with **Condition F3**.
2. To be measured as both dissolved and total concentrations.

Schedule G: Land and Rehabilitation

Schedule G: Land and Rehabilitation	
Condition number	Condition
G1	Land disturbed by mining must be rehabilitated in accordance with the rehabilitation management plan required in G6 and in accordance with a completed Table G1 – Rehabilitation requirements – Bauxite Hills Mine as agreed by the administering authority.
G2	The environmental authority holder must utilise vegetation for beneficial uses in the course of carrying out mining activities. Where beneficial uses are exhausted, the holder may burn vegetation cleared provided the activity does not cause environmental harm to the receiving environment or at any commercial place.
G3	Contaminated Land The environmental authority holder must not contaminate land by the release of hazardous contaminants.
G4	Buffer zones The environmental authority holder must not conduct mining activities within the buffer zones presented in Schedule H - Maps and Plans - Figure x - Buffer zones and within 100 m of Big Footprint Swamp and the Regional Ecosystem 3.3.14 presented in Schedule H - Maps and Plans – Figure x – Location of the relevant Regional Ecosystem 3.3.14.
G5	Rehabilitation Management Plan and Progressive Rehabilitation By <an agreed date with the administering authority> and prior to commencement of the activity, the environmental authority holder must develop, implement and submit to the administering authority a Rehabilitation Management Plan (RMP), that includes: <ul style="list-style-type: none"> a) schematic representations of the proposed final landform including, landform type, slope, regional ecosystems, drainage designs and any post mining land or infrastructure use agreed with the landowner/holder and the administering authority; b) the rehabilitation goals, objectives, indicators and completion criteria for each agreed post mining land use within each domain and the final vegetation community type; c) rehabilitation methods including landform establishment, plant species selection, growing media development and methods of revegetation; d) proposed reference sites, including justification for their selection; e) materials balance including available topsoil and subsoil; f) geotechnical, geochemical and hydrological studies; g) a rehabilitation schedule integrated with the mine plan schedule; h) a rehabilitation monitoring program, based on best practice industry methods and standards, that must be capable of: <ul style="list-style-type: none"> i. assessing the condition of rehabilitation sites compared to reference sites; ii. assessing the function of rehabilitation sites compared to reference sites; iii. comparing the progression of rehabilitation site indicators to the targeted completion criteria; and iv. identifying rehabilitation objectives that are not progressing towards the completion criteria. v. management actions for rehabilitation objectives not progressing towards the completion criteria and programs for maintenance of rehabilitation as required to achieve the nominated rehabilitation objective; i) on-site revegetation trials which test the success of the rehabilitation methods proposed for condition G6(b); and j) a completion criteria that groundwater levels within groundwater dependent ecosystems affected by the project (Big Footprint Swamp and Skardon River) are similar to pre-disturbance levels.
G6	Rehabilitation of mined panels must commence progressively and within (12 or 24) months of each panel being mined in accordance with the RMP.
G7	The environmental authority holder must review and update the RMP in the following circumstances: <ul style="list-style-type: none"> a) the rehabilitation schedule changes with the mine plan schedule; b) based on the outcomes of on-site revegetation trials; and c) based on the outcomes of rehabilitation monitoring programs.
G8	Topsoil and subsoils must be stripped and stored separately and managed to prevent erosion and degradation of soil quality.

G9	<p>Land Use Management Plan (LUMP)</p> <p>By xx xx 2017, the environmental authority holder must develop, implement and submit to the administering authority a Land Use Management Plan (LUMP). The LUMP must include:</p> <ul style="list-style-type: none"> a) buffer zones for sensitive ecological areas; b) landscape connectivity corridors; c) fire management; d) fauna habitat management; and e) weed and pest management.
G10	<p>Acid Sulfate Soils</p> <p>Potential Acid Sulfate Soil areas must have field surveys conducted by an appropriately qualified person prior to any disturbance occurring in order to identify if the soils are Acid Sulfate Soils (ASS) and if so must be managed in accordance with condition G12.</p>
G11	<p>If ASS are identified then an ASS Management Plan must be developed in accordance with the latest edition of the Queensland ASS Technical Manual and implemented by the environmental authority holder to treat and manage ASS, to prevent the release of contaminants to water and land.</p>
G12	<p>Exploration</p> <p>All exploration activities carried out under this environmental authority must comply with each of the standard environmental conditions contained in the most recent version of the Eligibility criteria and standard conditions for exploration and mineral development projects.</p>
G13	<p>Environmental Offsets</p> <p>Significant residual impacts to prescribed environmental matters are not authorised under this environmental authority or the Environmental Offsets Act 2014 unless the impact(s) is specified in Table G2 - Significant residual impacts to prescribed environmental matters.</p> <p>Note: Protected wildlife habitat has been assessed by the Commonwealth in accordance with Section 15 of the Environmental Offsets Act 2014.</p>
G14	<p>Records demonstrating that each impact to a prescribed environmental matter did not, or is not likely to, result in a significant residual impact to that matter must be:</p> <ul style="list-style-type: none"> a) completed by an appropriately qualified person; and b) kept for the life of the environmental authority.
G15	<p>An environmental offset made in accordance with the Environmental Offsets Act 2014 and Queensland Environmental Offsets Policy, as amended from time to time, must be undertaken for the maximum extent of impact to each prescribed environmental matter authorised in Table G2 - Significant residual impacts to prescribed environmental matters.</p>
G16	<p>Non-staged impacts</p> <p>The notice of election (including the offset delivery plan) for the environmental offset required by condition G16 must be provided to the administering authority no less than three (3) months before the proposed commencement of the significant residual impacts for which the environmental offset is required.</p>

Table G1 - Rehabilitation requirements – Bauxite Hills Mine

Note – Insufficient detail was provided in the EIS to complete Table G1. The administering authority requires further detail regarding the rehabilitation requirements for inclusion into this environmental authority.

Mine domain	Rehabilitation goal	Rehabilitation objectives	Indicators	Completion criteria
Mine Pits BH1, BH6 East and BH6 West	TBA ¹	TBA ¹	TBA ¹	TBA ¹
BH1 to BH6 Haul Road	TBA ¹	TBA ¹	TBA ¹	TBA ¹

Table G1 - Rehabilitation requirements – Bauxite Mine notes:

1. To be provided to the administering authority in accordance with **Condition G1**.

Table G2 - Significant residual impacts to prescribed environmental matters.

Prescribed environmental matter	Location of prescribed environmental matter ¹ (MGA94 – Zone 54)	Maximum extent of impact / Maximum extent of impact – stage 1
Regulated vegetation		
Regulated vegetation (of concern) RE3.3.7/3.3.49b	TBA ¹	1.9ha – cleared for linear infrastructure
Regulated vegetation (intersecting a watercourse or wetland)		
VMA Act watercourses/wetlands RE3.3.49b/3.3.9 RE3.3.49b/3.3.22a/3.3.64	TBA ¹	6ha of watercourse vegetation associated with creek crossings of the haul road between BH6 east and BH1 haul road
Wetland (HES Wetland) - a HES wetland shown on the map of referable wetlands RE3.3.49b/3.3.9 RE3.3.49b/3.3.22a/3.3.64	TBA ¹	6ha of watercourse vegetation associated with creek crossings of the haul road between BH6 east and BH1 haul road
Protected wildlife habitat:**		
Habitat for an animal that is endangered, vulnerable or special least concern wildlife <ul style="list-style-type: none"> • red goshawk (endangered) • bare-rumped sheathtail bat (endangered) • masked owl (vulnerable) 	TBA ¹	Total terrestrial wildlife habitat impacted: 1425ha* Further surveys are required to identify actual protected wildlife habitat per species.

Table G3 - Significant residual impacts to prescribed environmental matters notes:

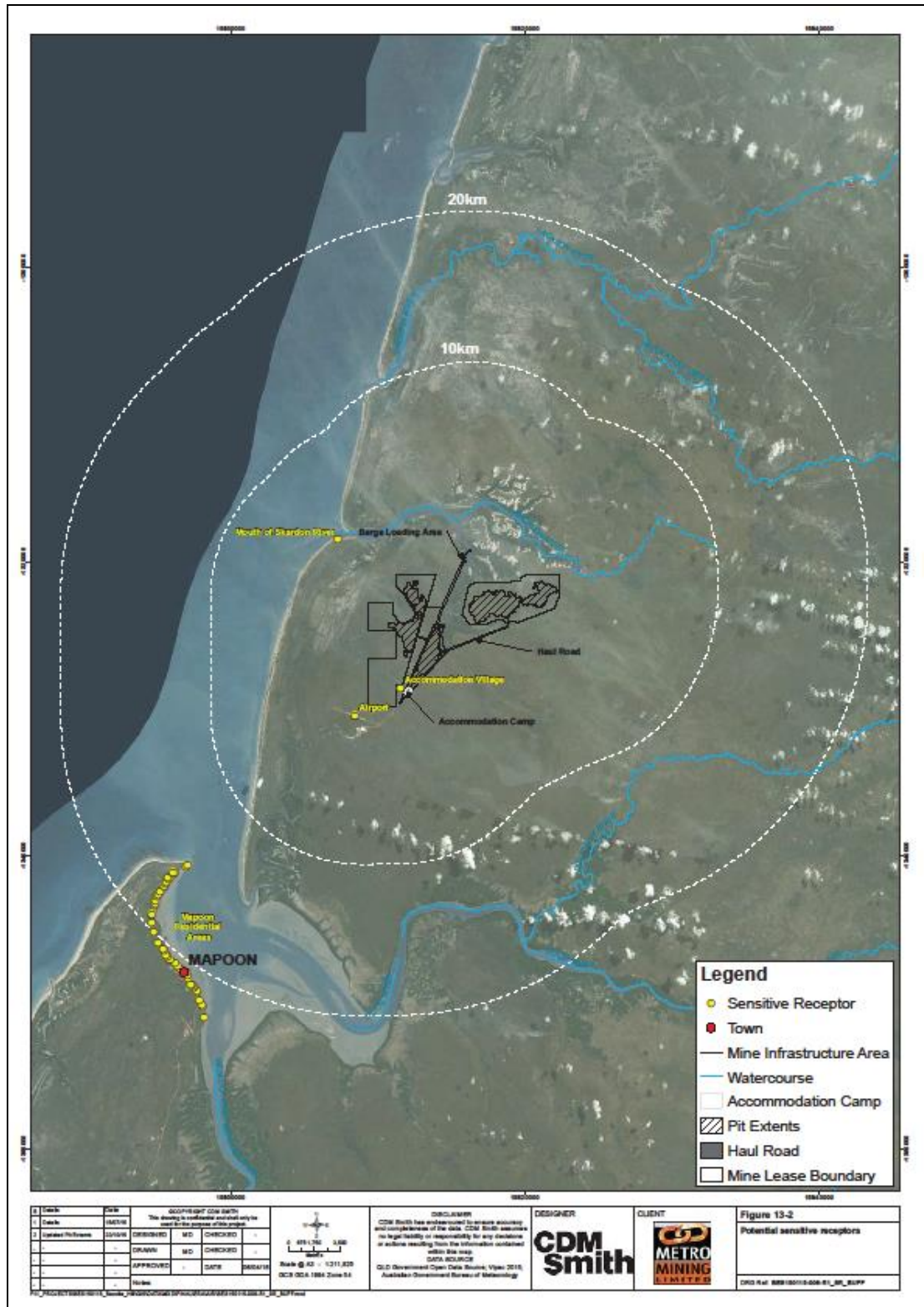
1. To be provided to the administering authority prior to EA issue.

* Areas based on final GIS files provided to EHP after the EIS was completed, including final haul road alignment.

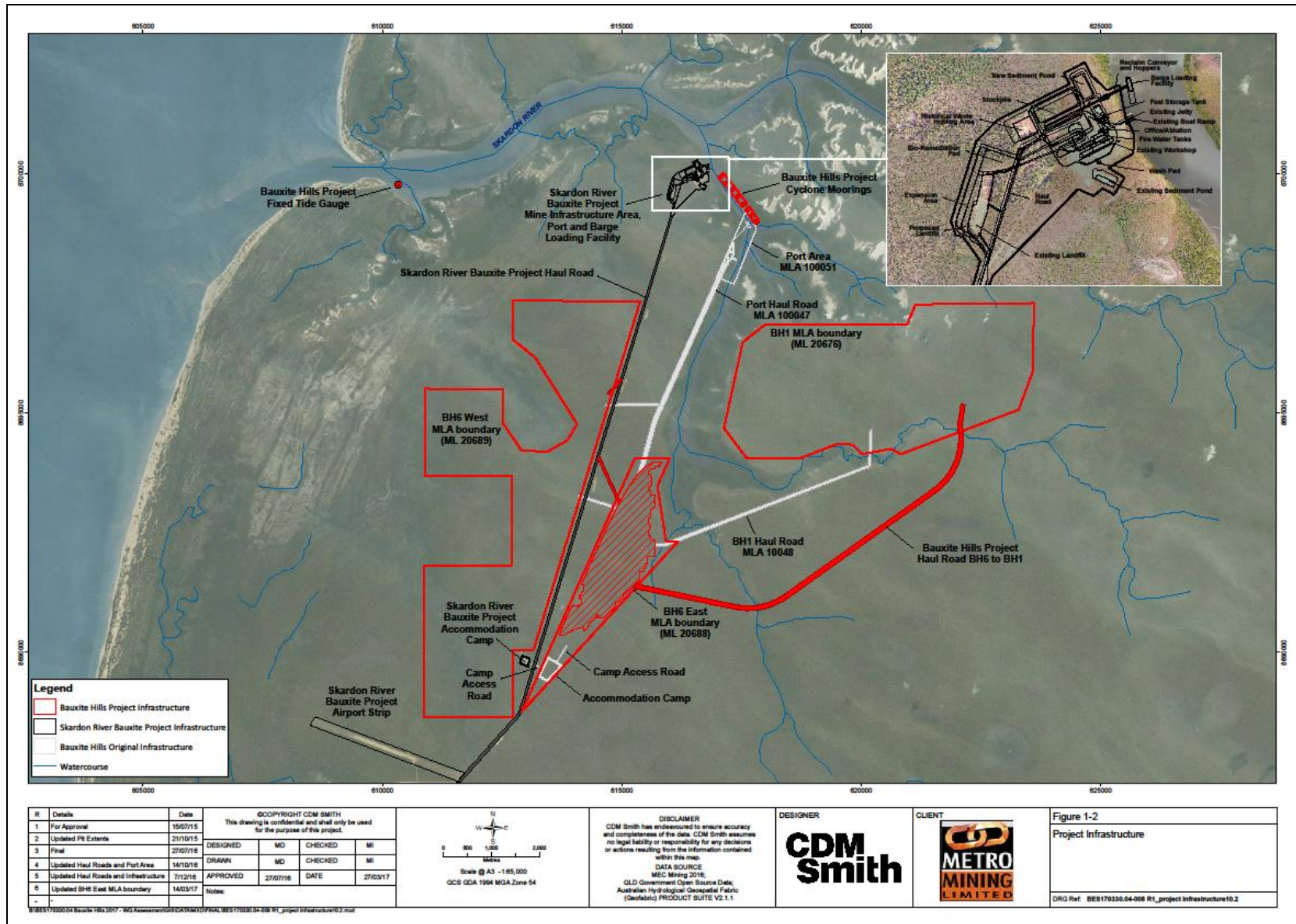
** The species listed were also identified as MNES and were assessed in accordance with the EPBC Act. Any offsets required for these matters would be decided and administered under the EPBC Act.

Schedule H—Maps and Plans

Schedule H—Figure 1 (Potential Sensitive receptors) (taken from Figure 13-2 of the EIS)

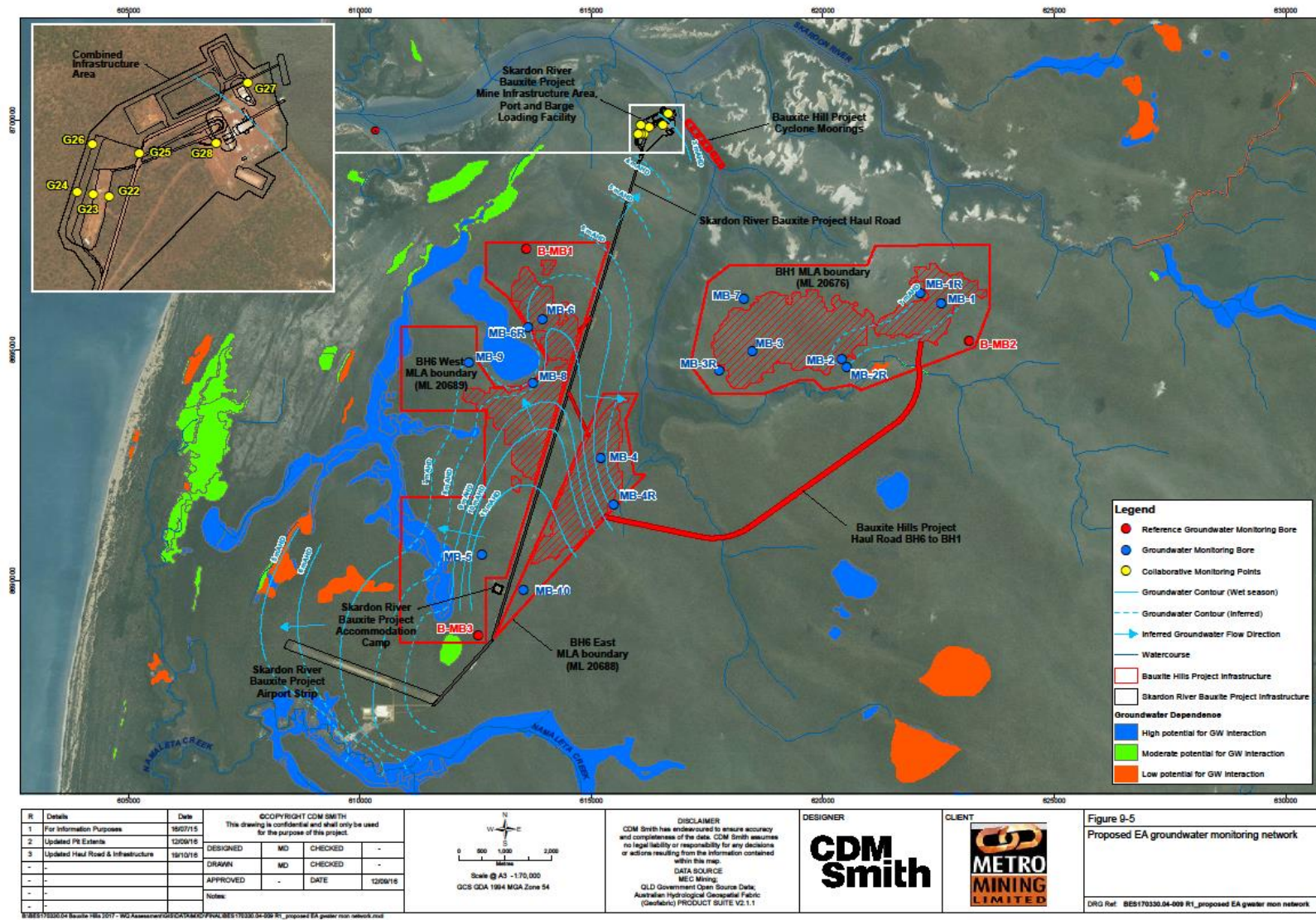


Schedule H—Figure 2 (Project layout—mine area and infrastructure) – authorised mining activities and locations (in red excluding cyclone moorings). See Table A1

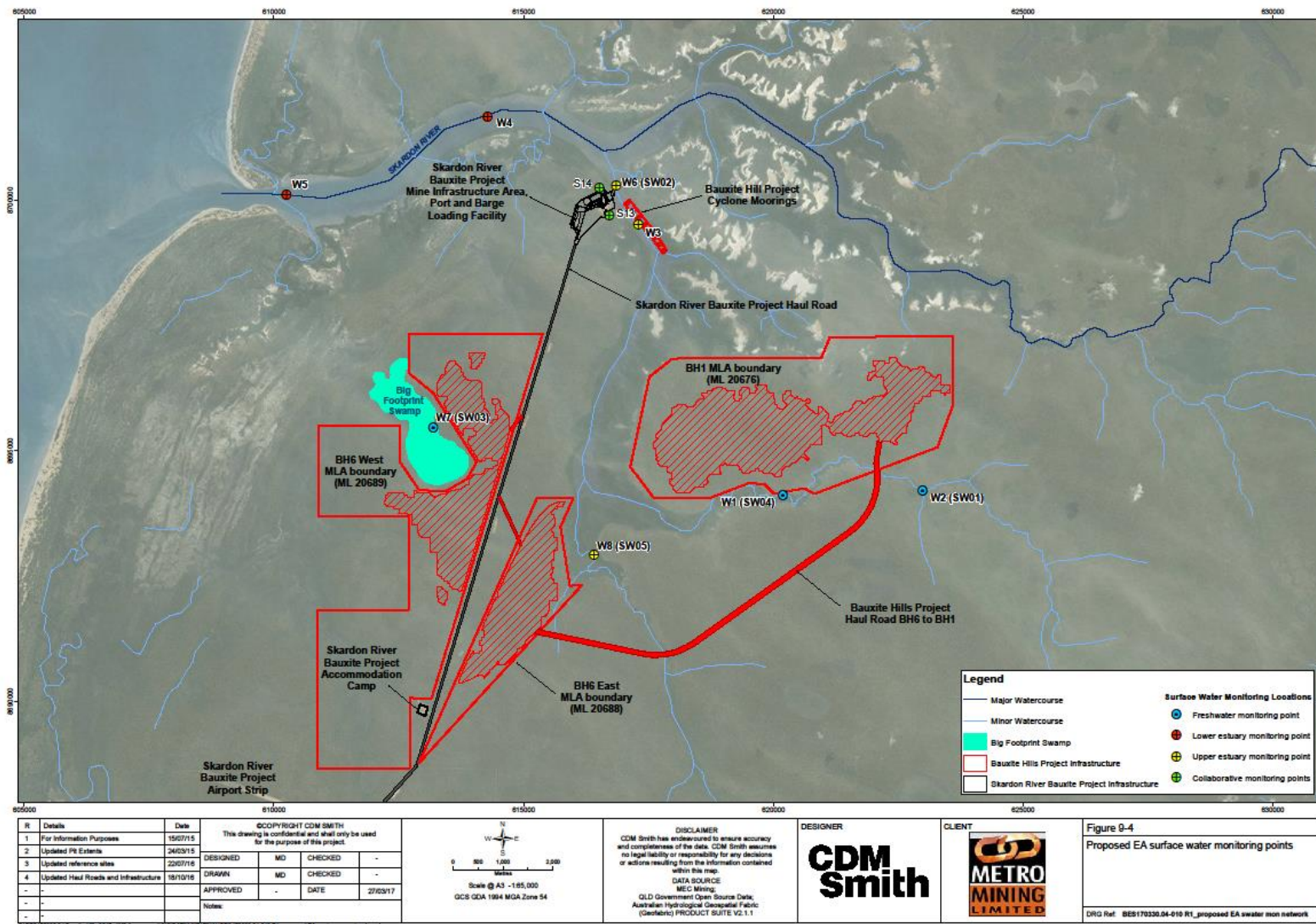


Schedule H—Figure 3 (Groundwater Monitoring Locations).

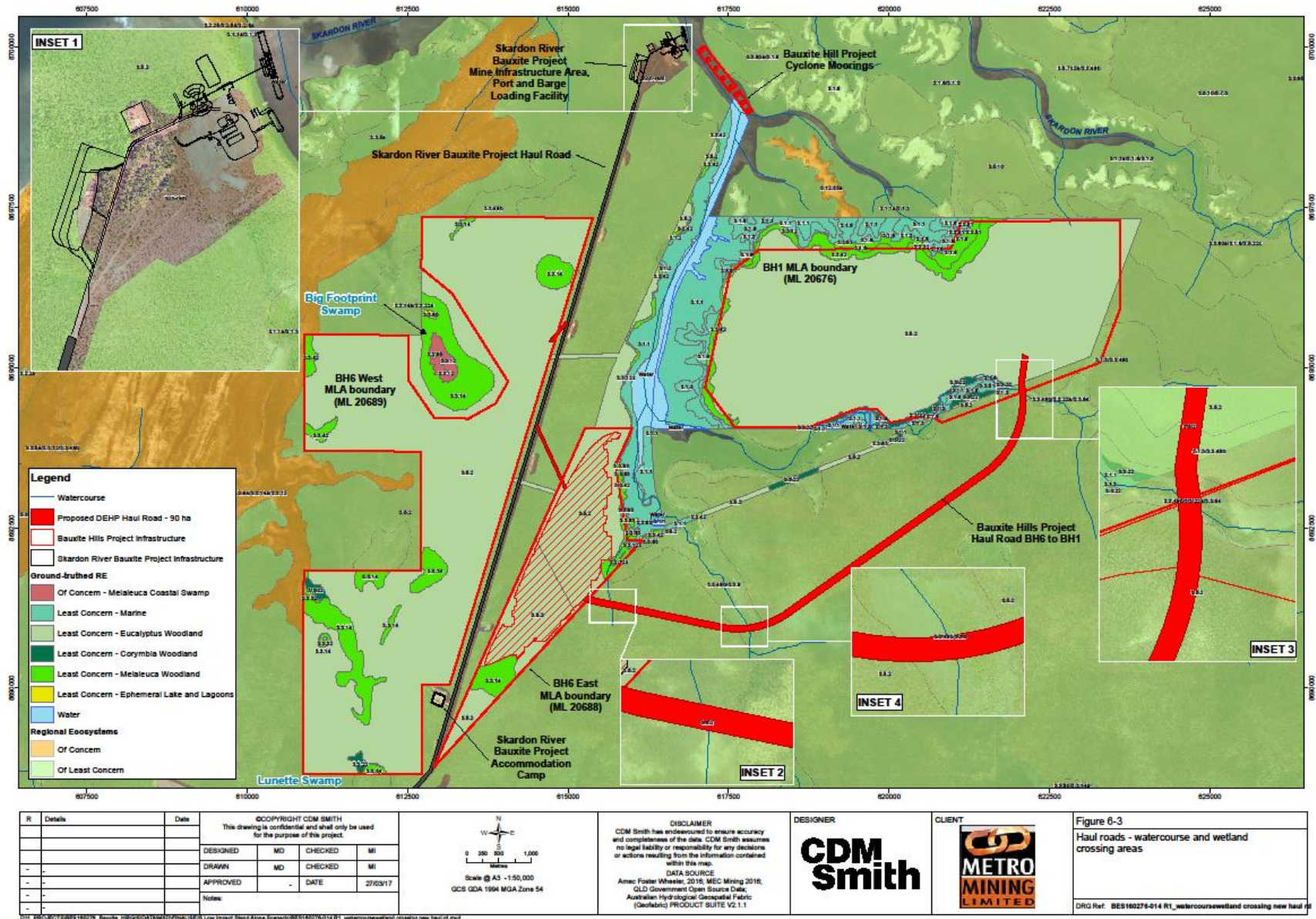
To be updated when all additional groundwater monitoring points have been submitted to the administering authority.



Schedule H—Figure 4 (Surface Water Monitoring Locations). To be updated when additional surface water monitoring points have been submitted to the administering authority.



Schedule H—Figure 5 (Location of haul road watercourse crossings and the Regional Ecosystem 3.3.14).



Schedule I—Definitions

Key terms and/or phrases used in this document are defined in this section. Where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

‘Acceptance criteria’ mean the measures by which the actions implemented to rehabilitate the land are deemed to be complete (same as completion criteria).

‘Administering Authority’ is the agency that administers the environmental authority provisions under the *Environmental Protection Act 1994*.

‘Adverse impacts’ on marine animals includes:

- masking social communications used to find mates or identify predators;
- temporary and permanent hearing loss or impairment;
- displacement from preferred habitat;
- disruption of feeding, breeding, nursing and communication;
- strandings;
- death and serious injury from haemorrhaging and tissue trauma.

‘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 relating to the subject matter using the relevant protocols, standards, methods or literature.

‘Authorised activity’ for a mining tenement is an activity that its holder is, under this Act or the tenement, entitled to carry out in relation to the tenement.

‘Authority’ means environmental authority (mining activities) under the Environmental Protection Act 1994.

‘Background’, with Reference to the water schedule means the average of samples taken prior to the commencement of bauxite mining activities from the same waterway that the current sample has been taken.

‘Chemical’ means:

- a) an agricultural chemical product or veterinary chemical product within the meaning of the *Agricultural and Veterinary Chemicals Code Act 1994* (Commonwealth), or
- b) a dangerous good under the Australian Code for the Transport of Dangerous Goods by Road and Rail approved by the Australian Transport Council, or
- c) a lead hazardous substance within the meaning of the Workplace Health and Safety Regulation 1997, or
- d) a drug or poison in the Standard for the Uniform Scheduling of Drugs and Poisons prepared by the Australian Health Ministers’ Advisory Council and published by the Commonwealth, or
- e) any substance used as, or intended for use as:
 - (i) a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product, or
 - (ii) a surface active agent, including, for example, soap or related detergent, or
 - (iii) a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide, or
 - (iv) a fertiliser for agricultural, horticultural or garden use, or
 - (v) a substance used for, or intended for use for mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater, or
 - (vi) manufacture of plastic or synthetic rubber.

‘Certified Professional in Erosion and Sediment Control (CPESC)’ means a person who has been certified by the Australasian CPESC committee.

‘competent person’ means a person with the demonstrated skill and knowledge required to carry out the task to a standard necessary for their reliance upon collected data or protection of the environment.

‘commercial place’ means a workplace used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees’ accommodation or public roads.

‘Contaminants’ means any prescribed water contaminants listed under Schedule 9 of *the Environmental Protection Regulations 2008*.

‘Disturbance’ of land includes:

- a) compacting, removing, covering, exposing or stockpiling of earth
- b) removal or destruction of vegetation or topsoil or both to an extent where the land has been made susceptible to erosion
- c) carrying out mining within a Watercourse, waterway, wetland or lake
- d) the submersion of areas by tailings or hazardous contaminant storage and dam/structure walls
- e) temporary Infrastructure, including any Infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after the mining activity has ceased
- f) releasing of contaminants into the soil, or underlying geological strata.

‘Effluent’ treated waste water released from sewage treatment plants.

‘Environmental authority holder’ means the holder of an environmental authority issued under section 195 that approves an environmentally relevant activity applied for in an application or any others works conducted by a another entity on the approved leases.

‘Equilibrium’ means a state where ‘balance’ is achieved despite changing variables.

‘Existing condition’ means the condition of the ecosystem prior to the bauxite mining activities commencing.

‘General waste’ means:

- a) Construction wastes and demolition waste;
- b) Solid inert waste;
- c) Putrescible wastes and domestic garbage;
- d) Green wastes; and
- e) General recyclable wastes, consisting of paper, cardboard, recyclable plastics, glass, aluminium, and steel cans.

Note:

- *Paper covered plasterboard must only be received at the approved place if it is generated by construction and demolition activities and delivered to the approved place as part of a mixed load of materials;*
- *Drums containing any residual regulated wastes are themselves a regulated waste and must not be accepted for disposal at the approved place unless they have been triple rinsed or thoroughly cleaned.*

‘Hazardous waste’ means a contaminant that, if improperly treated, stored, disposed of or otherwise managed, is likely to cause environmental harm because of—

- (a) its quantity, concentration, acute or chronic toxic effects, carcinogenicity, teratogenicity, mutagenicity, corrosiveness, explosiveness, radioactivity or flammability; or
- (b) its physical, chemical or infectious characteristics.

‘Hazard categories’ 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 ‘Manual for Assessing Hazard Categories and Hydraulic Performance of Dams’.

‘High Ecological Waters (HEV)’, as defined by the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* guideline (2000, Volume 1, Page 3.1-10), is an effectively unmodified or other highly-valued ecosystem, typically (but not always) occurring in national parks, conservation reserves or in remote and/or inaccessible locations. While there are no aquatic ecosystems in Australia and New Zealand that are entirely without some human influence, the ecological integrity of high conservation/ecological value systems is regarded as intact.

'Holder', for a mining tenement, means a holder of the tenement under the *Mineral Resources Act 1989*, and the holder of the associated environmental authority under the *Environmental Protection Act 1994*.

'Infrastructure' means water storage dams, levees, roads and tracks, buildings and other structures built for the purpose of the mining activity.

' $L_{A1,adj,15min}$ ' means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 15 minute period when measured using time-weighting 'F'.

' $L_{Aeq, adj, 15 mins}$ ' is the equivalent or energy-averaged, A-weighted sound pressure level, averaged over a time interval of 15 minutes, adjusted for tonal character or impulsiveness.

'Land' in the 'land schedule' of this document means land excluding waters and the atmosphere, that is, the term has a different meaning from the term as defined in the *Environmental Protection Act 1994*. For the purposes of the *Acts Interpretation Act 1954*, it is expressly noted that the term 'land' in this environmental authority relates to physical land and not to interests in land.

'Land use' means the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

'Licensed place' means the mining activities carried out at the mining tenements detailed in this environmental authority.

'm' means metres.

'm/s' means meters per second

'Maximum' means that the measured value of the quality characteristic or contaminant must not be greater than the release limit stated.

'Measures' includes any measures to prevent or minimise environmental impacts of the mining activity such as bunds, silt fences, diversion drains, capping, and containment systems.

'Median' means that the measured values of the quality characteristic must not be greater than the rerelease limit for any more than five out of ten consecutive samples where the time interval between the taking of each consecutive sample is not less than one (1) day.

'mg/L' means milligrams per litre.

'Mining activity' means an activity that is an authorised activity for a mining tenement under the Mineral Resources Act 1989; or another activity that is authorised under an approval under the Mineral Resources Act that grants rights over land.

'Minimise' is to reduce to the smallest possible amount or degree.

'Minimum' means that the measured value of the quality characteristic or contaminant must not be less than the release limit stated.

'minimum data requirements' means the reference data requirements outlined in Table 4.4.2 of the *Queensland Water Quality Guidelines 2009*.

'Progressive Rehabilitation' means Rehabilitation (defined below) undertaken progressively or a staged approach to Rehabilitation as mining operations are ongoing.

'Range' means that 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.

'Receiving environment' in relation to an activity that causes or may cause environmental harm, means the part of the environment to which the harm is, or may be, caused. The receiving environment includes (but is not limited to):

- a) a watercourse or surface waters
- b) groundwater

- c) an area of land that is not specified in **Schedule A – Table A1 (Authorised Mining Activities and Locations)** of this environmental authority.

‘Receiving Waters’ means the waters of the receiving environment.

‘Rehabilitation’ 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.

‘Revegetation’ is the re-establishment of vegetation² of a species and density of cover similar to surrounding undisturbed areas or the landform that existed before mining activities on soil surfaces associated with the construction or Rehabilitation of a Watercourse diversion.

‘RL’ means reduced level, relative to Australian Height Datum.

‘Sensitive place’ means:

- a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises, or
- b) a motel, hotel or hostel, or
- c) an educational institution, or
- d) a medical centre or hospital, or
- e) a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area, or
- f) a public park or gardens.

Note: The definition of ‘Sensitive place’ and ‘commercial place’ is based on Schedule 1 of EPP Noise. That is, a Sensitive place is inside or outside on a dwelling, library and educational institution, childcare or kindergarten, school or playground, hospital, surgery or other medical institution, commercial & retail activity, protected area or an area identified under a conservation plan under Nature Conservation Act 1992 as a critical habitat or an area of major interest, marine park under Marine Parks Act 2004, park or garden that is outside of the mining lease and open to the public for the use other than for sport or organised entertainment. A commercial place is inside or outside a commercial or retail activity.

A mining camp (i.e., accommodation and ancillary facilities for mine employees or contractors or both, associated with the mine the subject of the environmental authority) is not a Sensitive place for that mine or mining project, whether or not the mining camp is located within a mining tenement that is part of the mining project the subject of the environmental authority. For example, the mining camp might be located on neighbouring land owned or leased by the same company as one of the holders of the environmental authority for the mining project, or a related company. Accommodation for mine employees or contractors is a Sensitive place if the land is held by a mining company or related company, and if occupation is restricted to the employees, contractors and their families for the particular mine or mines which are held by the same company or a related company.

For example, a township (occupied by the mine employees, contractors and their families for multiple mines that are held by different companies) would be a Sensitive place, even if part or all of the township is constructed on land owned by one or more of the companies.

‘Stable’ means geotechnical stability of the rehabilitated landform where instability related to the excessive settlement and subsidence caused by consolidation/settlement of the wastes deposited, and sliding/slumping instability has ceased.

‘the Act’ means the *Environmental Protection Act 1994*.

‘µS/cm’ means micro siemens per centimetre.

² Not including a species declared under the Land Protection (Pest and Stock Route Management) Regulation 2003 as a category class 1 pest, category class 2 pest or category class 3 pest.

'Water' is defined under Schedule 4 of the *Water Act 2000*.

'Watercourse' has the same meaning given in the *Water Act 2000*.

'Water quality' means the chemical, physical and biological condition of water.

'Waters' includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), storm water channel, storm water drain, groundwater and any part thereof.

'Wet season' means the period commencing on 1 November each year and ending on 30 April of the following year.

'80th percentile' means that not more than two (2) of the measured values of the quality characteristic are to exceed the stated release limits for any ten (10) consecutive samples.

Environmental Offset definitions

'environmental offset' has the meaning in section 7 of the *Environmental Offsets Act 2014*.

'maximum extent of impact' means the total, cumulative, residual extent and duration of impact to a prescribed environmental matter that will occur over a project's life after all reasonable avoidance and reasonable on-site mitigation measures have been, or will be, undertaken.

'prescribed environmental matters' has the meaning in section 10 of the *Environmental Offsets Act 2014*, limited to the matters of State environmental significance listed in schedule 2 of the *Environmental Offsets Regulation 2014*.

'significant residual impact/s' has the meaning in section 8 *Environmental Offsets Act 2014*.

Appendix 2 - DNRM recommendations for the Project

Water licence - shallow aquifer:

DNRM requires that the proponent comply with the application requirements for a temporary water permit, for consumptive purposes, until the moratorium period is finalised pursuant to section 237 of the *Water Act 2000*.

Water licence - GAB aquifer:

The proponent's application for 500ML per water year of state reserve unallocated water from the GAB Water Resource Plan is currently under assessment against the requirements of the *Water Act 2000*. A revised GAB Water Resource Plan is currently under community consultation. DNRM requires sufficient information about the distances from GAB Springs which was not addressed in the EIS.

AWL

As the EA was applied for before the commencement of the provisions for the as-of-right take of associated water (ie before 6 December 2016), section 334ZP does not apply and the project must obtain an associated water licence (AWL) which would be assessed by DNRM. The AWL would be assessed and conditioned for groundwater impacts, and administered by DNRM, in accordance with sections 1250E to 1250G of the *Water Act 2000*.

Appendix 3 - DAFF recommendations for the project

Biosecurity

Update PWMP and the EMP to align to the priorities of the Regional Biosecurity Strategy for Cape York Peninsula 2016-20 (prepared written under the Biosecurity Act 2014)

Water way barrier

In accordance with Division 3 of the *Fisheries Act 1994*, waterway barrier works are dams, weirs or other barriers across a waterway. Waterway barrier works approvals are associated with waterway crossing outside of the MLA. As all waterway crossings would be within the MLs and managed under the conditions of an EA, separate waterway barrier works approvals are not required to be obtained.

Waterway crossing must be designed and operated in such a way that ensures waterway barriers and impacts to fish passage are avoided.

To ensure there are no adverse impacts to fish species in the waterways within the ML the commitments made in the EIS relating to waterway crossing design are required to be implemented and the design of waterway barriers are in accordance with:

- Austroads – Guide to Road Design Part 5B – Open Channels, Culverts and Floodways and
- the Department of Agriculture and Fisheries (DAF) guideline: Fish passage in streams: Design of stream crossings
- DAF's self-assessable codes (or SDAP Module 5.2 where relevant)

Monitoring of the success of waterway crossings to allow fish movement should be undertaken and adjustments made if impacts are evident.

Appendix 4 - PBSA and QAS recommendations for the Project

Bushfire

PSBA requests that the relevant sections of the draft model code in the State Planning Policy (SPP) be applied to assist in mitigating adverse effects of bushfire. The proponent commits to giving consideration to the draft model code and has committed to consider the code and manage bushfires via a Land Use Management Plan (LUMP) (refer to Section 21 of the SEIS).

Emergency Response Plan

Queensland Ambulance Service requested that they be formally consulted and engaged regarding the proposed ERP so that access strategies and on-site medical capacity be reviewed. The proponent has committed to formally notify and engage with QAS in developing the ERP.

Appendix 5 - DTMR recommendations for project

Guidelines for major development

Note that to assist proponents to manage maritime-related impacts and to identify mitigation strategies, MSQ has developed guidelines for major development proposals which specify the minimum information required by MSQ to evaluate significant development proposals. The preferred format for presentation of this information is through the development of management plans for vessel traffic management; aids to navigation; ship-sourced pollution prevention/spill management. The guideline is available at <http://www.msq.qld.gov.au/Waterways/Major-development-proposals.aspx>.

Undertake a review of shipping and port activities

Once further information is available on the final design of the project, the proponent is required to undertake a review of the shipping and port traffic aspects of the project for both construction and operational phases. The proponent must provide an updated assessment that clearly identifies any necessary safety improvements works, rehabilitation and maintenance costs to mitigate the impacts of project traffic before any work begins. It is strongly recommended that the proponent continues to liaise with the RHM to discuss and resolve these issues in a timely manner.

Plans

Complete, in accordance with MSQ guidelines and with the operation of both SRBP and the Project, the following plans before operations begin:

- Marine Operations Management Plan
- Aids to Navigation Management Plan
- Marine Traffic Management Plan
- Ship Sourced Pollution and Prevention Management Plan
- Pollution and Prevention Equipment and Procedures;
- Cyclone Management Plan

Navigation Channel

Define the location of the navigation channel in consultation with Ports North and RHM. MSQ would then undertake hydrographical surveys and navigational markers would be established and included in relevant plans.

Surveys

Note that the mouth of the Skardon River would be hydrographically surveyed by MSQ at the end of each wet season at the shared expense of operators in the area

Funding

Note that MSQ has commented that it is not in a position to fund any safety improvements that may be required, nor would it be likely that this funding could be made available to undertake the immediate works necessary to ensure the ongoing safety, health and efficiency of the maritime/shipping environment and traffic conditions for the proposal to proceed.

Post-Assessment contact with the Department of Transport and Main Roads

Once the proponent has received final approval and wishes to proceed with the project, it must contact the RHM before any works/ shipping starts, to discuss the shipping safety, traffic and pollution impacts of the project. This includes for the import of any materials for construction. Any management plans or other mitigation measures for these issues required by the RHM and MSQ must be discussed and approved as necessary.

Maritime infrastructure

The proponent must implement all impact mitigation measures necessary to avoid adverse impacts on the safety, condition and efficiency of shipping in Queensland waters. Discussions must take place with the RHM to determine any required measures and an "Aids to Navigation Plan" developed and approved if required. A Maritime Infrastructure Agreement may also be required and need approval from the RHM and MSQ in conjunction with this. Any plans and agreements must be in place and approved before the project begins construction.

Maritime safety, traffic and ship-sourced pollution impact assessments

Discussions must take place with the relevant RHM about maritime safety, traffic and ship-sourced pollution impacts from the project. The following plans must be developed by suitably qualified people to be approved by the relevant RHM if deemed necessary: vessel traffic management, and ship-sourced pollution prevention.

Any plans and agreements must be in place and approved before the project begins construction.

Further information would also be required on the cumulative impacts of the project from a marine transport perspective including any impacts from the transportation of material to construct the project.

Appendix 6 – Recommended tidal works (cyclone moorings) information requirements and conditions

Information requirements

Impacts from the cyclone moorings were not assessed in the EIS. General information requirements for tidal works are outlined in the guideline: *Assessable coastal development; Department of Environment and Heritage Protection; EM2066 v4*. Pre-lodgement advice can be provided.

Further detailed information about the design of the proposed cyclone moorings, location, environmental values, impacts, mitigation measures would be required with the Tidal Works application under Schedule 3, part 1, table 4, item 5(a) of the SP Act and should include (although may not be limited to) the following:

- Provide an Environmental Management Plan in conjunction with the overall project EMP that includes management strategies to minimise impacts on the receiving environment from the construction and operation of the cyclone moorings, including but not limited to:
 - environmental commitments - a commitment by senior management to achieve specified and relevant environmental goals;
 - description of works to be undertaken, including the type of equipment to be used and the location of works;
 - environmental issues and potential impacts;
 - the actual and potential release of any contaminants;
 - the potential impact of these sources and contaminants;
 - actions to be taken to minimise the impacts of the works on the surrounding environment;
 - monitoring of impacts and the outcomes of management measures;
 - contingency plans including the practices and procedures to be employed to restore the environment or to mitigate impacts on the receiving environment; and
 - periodic review of environmental performance and continual improvement.
- Describe whether there could be a reduced overall environmental impact from combining the SRBP cyclone moorings with those proposed for the Project should also be discussed. If so consider the least impacting and safest alternatives for cyclone mooring locations in the Skardon River.
- Provide a revised IMMMP with the application. The IMMMP should identify the cyclone moorings site as a monitoring site for bed and banks erosion and elevated turbidity. Confirmation of the nature of the hardness of the substrate at the site is also required.
- Further water quality, sediment and turbidity monitoring as well as the derivation of water quality triggers are to be undertaken prior to commencement of construction of cyclone moorings. This would include capturing turbidity through logger data from key receiving habitats, as well as from above and below the impact areas.
- A detailed ASS assessment where the pilings are proposed and if ASS is found then the ASS Management Plan is to be updated to address this with appropriate management strategies. This may include the choice of piling installation and methods to minimise ASS disturbance.
- Potential impacts from the piling on marine megafauna including threatened species (QLD) and proposed measures to avoid, minimise and mitigate these impacts.
- Undertake an assessment of the potential impacts of the barge operation in the context of the location of the cyclone moorings proposed in the SEIS. This should include consideration of the number of barge movements to and from the moorings, impacts on bed and banks, marine flora and fauna etc and information about the operating procedures required to minimise these impacts.
- A complete response to the Coastal Protection State Development Assessment Provisions (Module 10) addressing coastal hazard considerations, impacts on coastal resources and impacts on MSES and proposed management and mitigation measures.

Recommended tidal works condition for the proposed installation of cyclone moorings

Note that whilst these conditions are provided to give an indication of the conditions that might apply, additional conditions may be required once the site specific application information is known and assessed.

Condition Number	Model Conditions Library	Condition ID (in model conditions library)	Condition
Tidal works (installation of cyclone moorings)			
1	State Assessment and Referral Agency (SARA) Model	AD01	The development must be carried out generally in

Condition Number	Model Conditions Library	Condition ID (in model conditions library)	Condition
	Conditions V2.3		accordance with the plan shown in Figure 1. Timing: At all times.
2	SARA Model Conditions V2.3	CP06 (modified) (if no RPEQ certified plans supplied with application)	Submit Registered Professional Engineer of Queensland certified plans prepared by a registered engineer to palm@ehp.qld.gov.au or mail to: Department of Environment and Heritage Protection Permit and License Management Implementation and Support Unit GPO Box 2454 Brisbane Qld 4001 Timing: Prior to the commencement of works.
3	SARA Model Conditions V2.3	CP01	For the proposed works only use materials which are free from contaminants as defined under section 11 of the EP Act. Timing: For the duration of the works the subject of this approval.
4	SARA Model Conditions V2.3	CP08	As a result of works the subject of this approval any disturbed or oxidised acid sulfate soil must be treated and managed in accordance with the current <i>Queensland Acid Sulfate Soil Technical Manual: Soil management guidelines</i> , prepared by the Department of Science, Information Technology, Innovation and the Arts, 2014. Timing: For the duration of the works the subject of this approval.
5	SARA Model Conditions V2.3	CP27	Any operator and contractor involved in the works to which this approval relates must: <ul style="list-style-type: none">• be provided a copy of the these referral agency conditions;• install all measures, plant and equipment necessary to ensure compliance with the conditions of this approval;• maintain such measures, plant and equipment in a proper and efficient condition; and• operate such measures, plant and equipment in a proper and efficient manner. Timing: During construction.
6	SARA Model Conditions V2.3	CP29	Should the works become damaged as a result of erosion, flooding or storm tide inundation, the registered landowner(s) of the subject land shall be responsible for the removal of all debris at their own expense. Timing: At all times.
7	SARA Model Conditions V2.3.	CP07 (if no RPEQ certified plans supplied)	Submit "As Constructed drawings" to palm@ehp.qld.gov.au or mail to: Department of Environment and Heritage Protection Permit and License Management Implementation and Support Unit GPO Box 2454 Brisbane Qld 4001 Timing: Within two weeks of the completion of the works
8	Non-model		Pile driving activities must be carried out in a manner that minimises adverse impacts on the surrounding environment, by minimising: <ol style="list-style-type: none">1. disturbance and oxidisation of acid sulfate soils2. impacts to marine fauna, and must include the following:<ol style="list-style-type: none">a) soft-start approach to disperse of any marine fauna

Condition Number	Model Conditions Library	Condition ID (in model conditions library)	Condition
			<p>in the vicinity of proposed works;</p> <p>b) monitoring by an observer prior to commencing and during normal pile driving activities; and</p> <p>c) normal pile driving operations:</p> <ol style="list-style-type: none"> i. must not commence if marine megafauna are observed within 500m of the works; ii. must cease if marine megafauna are observed within 500m of the works. <p>d) Marine based pile driving activities only take place during daylight hours</p>
9	Non Model		Lighting management must be implemented to minimise impacts on nesting and hatchling turtles and other sensitive marine fauna.

Definitions

‘Administering authority’ means the Department of Environment and Heritage Protection or its successor or predecessors.

‘Measures’ has the broadest interpretation and includes:

- Procedural measures such as standard operating procedures for dredging operations, environmental risk assessment, management actions, departmental direction and competency expectations under relevant guidelines
- Physical measures such as plant, equipment, physical objects (such as bunding, containment systems etc.), ecosystem monitoring and bathymetric surveys.