

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

Skardon River Bauxite Project
proposed by Gulf Alumina Limited

June 2016

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

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1 Introduction

This EIS assessment report (assessment report hereafter) provides an evaluation of the environmental impact statement (EIS) process pursuant to chapter 3 of the *Environmental Protection Act 1994* (EP Act) for the Skardon River Bauxite Project proposed by Gulf Alumina Limited (Gulf Alumina). On 20 January 2014, the Department of Natural Resources and Mines (DNRM) approved to include mining bauxite in the existing mining lease (ML) 40082, ML 6025 and ML 40069. Gulf Alumina applied for an amendment to their environmental authority (EA) for bauxite mining within the existing mining leases as the existing EA only allows for mining kaolin and operating an associated pilot plant. The Department of Environment and Heritage Protection (EHP) decided that the proposed amendment is a major amendment under sections 228 and 229 of the EP Act. On 19 May 2014 EHP notified Gulf Alumina that the amendment application requires assessment by EIS.

The draft terms of reference (TOR) were publicly advertised on 8 October 2014 and 11 October 2014. The public consultation period was between 13 October 2015 and Monday 24 November 2014. The final TOR were finalised on 15 January 2015.

The proposed project was referred on 14 August 2014 to the Commonwealth Department of the Environment (DotE; EPBC 2014/7305). On 11 September 2014, the Commonwealth Minister for the Environment determined the proposed project to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions are sections 18 and 18A (listed threatened species and communities), 20 and 20A (listed migratory species) and 23 and 24A (Commonwealth marine areas). The project was assessed under the bilateral agreement between the Commonwealth and the State of Queensland using the EIS prepared under the EP Act. This assessment report contains an assessment of the significance of impacts of the action on the controlling provisions. A copy of this assessment report will be given to the Commonwealth Minister for the Environment, who will decide whether to approve or refuse the controlled action under Part 9 of the EPBC Act.

EHP, as the administering authority of the EP Act, coordinated the EIS process. This assessment report has been prepared and completed pursuant to sections 58, 59 and 60 of the EP Act.

In meeting the requirements of the EP Act, this assessment report describes the proposed project, the places and values likely to be affected by the proposed project. It summarises the key issues associated with the potential adverse and beneficial environmental, economic and social impacts of the proposed project. It also discusses avoidance, planning, management, monitoring and other measures proposed to minimise adverse environmental impacts. It also discusses environmental offsets that would be required as a condition of approval where the proposed project is likely to result in a significant residual impact on prescribed environmental matters under state and Commonwealth legislation. Finally, this assessment report identifies those issues of particular concern that were not resolved or that require specific conditions for the proposed project to proceed.

Section 2 of this assessment report describes the proposed project in order to provide context for the findings of the assessment report. Section 3 outlines the EIS process that was followed for the proposed project and the approvals that would be necessary for its commencement. Section 4 addresses the adequacy of the EIS documents in addressing the TOR, discusses the main issues with regard to the environmental management of the proposed project and outlines the environmental protection commitments made in the EIS documents. Section 5 discusses the suitability of the project and identifies matters required for the proposed project to proceed. Section 6 makes recommendations for conditions for any approval which would set out the operational environmental monitoring, management, offset and assessment reporting requirements for the proposed mine.

The giving of this assessment report to the proponent completes the EIS assessment process for the Skardon River Bauxite Project under section 60 the EP Act.

2 Description of the project

A summary of the project location, project description, site history and infrastructure was provided in Chapter 2—Project approvals, Chapter 4—Project location and Chapter 5—Project description of the EIS. A full discussion on matters associated with the proposed project, such as water management, rehabilitation, etc., is found in section 4 of this assessment report.

2.1 Introduction

The proponent for the Skardon River Bauxite Project proposes to mine bauxite for export. The relevant mining tenures are granted mining leases (MLs) 6025, 40069 and 40082 (Figure 1). The proposal involves mining of a bauxite ore body of 50 million tonnes (Mt). The planned mine production rate would initially be three million tonnes per annum (Mt/a) initially and would rise to five Mt/a subject to market conditions. The project operational life is expected to be 10 years.

The mining lease area covers a total of 3925 hectares (ha), including parts of the Skardon River (Figure 1). Mining and infrastructure area would cover approximately 1453ha. The area to be mined would include portions of the 138ha previously disturbed by kaolin mining (including the decommissioned wet kaolin processing plant area), the airstrip and sections of the north-south haul road. Bauxite products would be transported via the existing haul roads to the Port of Skardon River and transhipped to bulk carriers in deep water beyond the mouth of the river for export. Construction is planned to commence as soon as the EA is granted. It is anticipated that shipping would commence in 2017.

2.2 Project location

The project would be located on Cape York Peninsula, approximately 90 kilometres (km) north of Weipa, in the Parish of Skardon within the Cook Shire. The west coast of the peninsula borders the Gulf of Carpentaria and the east coast borders the Coral Sea and the Great Barrier Reef (GBR). The Wet Tropics of Queensland, an UNESCO World Heritage Area, is located along the northeast coast of Australia (including the Cape York Peninsula) covering approximately 8,900 km² of tropical rainforest. There are no Ramsar wetlands in or around the Cape York Peninsula; the closest is Bowling Green Bay around 20km southeast of Townsville.

The project area is located in the Cape York Regional Plan area, which covers approximately 128,880 square kilometres (km²), with 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.

2.3 Sensitive receptors

The closest sensitive (human) receptors identified within 20km of the project area were the community of Mapoon, approximately 16km southwest of the southernmost ML boundary and 34km southwest of the port infrastructure area, and a number of isolated homesteads located along the coastline between Cullen Point and Mapoon. Cullen Point is approximately 10km southwest of the southernmost ML boundary and the nearest isolated homestead would be 11km southwest of the nearest active pit area.

The EIS for the Bauxite Hills Project showed their accommodation is proposed to be located in the south of their mining lease near the proposed (and existing) camp site for the Skardon River Bauxite Project. The proposed Bauxite Hills Project camp site is treated as a potential sensitive receptor in this assessment.

2.4 Tenures

The project's mining tenures are granted MLs 6025 (1922ha), 40069 (260ha) and 40082 (1743ha). MLs 40069 and 40082 are partially covering the Skardon River (Figure 1).

The proponent also holds or has made application for the following tenements underlying or adjacent to the mining leases:

- exploration permit minerals (EPM) 18242, granted 17/12/2014
- EPM4068, granted 12/08/1985
- EPM18384, granted 17/12/2014
- EPM16755, granted 17/09/2013
- mineral development license (MDL) 425 (Application)
- MDL423 (Application).

2.5 Site history

Australian Kaolin Ltd (Australian Kaolin) started construction of kaolin processing plants and commenced mining and commissioning of the processing plants in 1992. The Australian Kaolin's operation was licensed to mine kaolin, brick clay and quartz. ACC Ecominerals Ltd purchased the mine in 2002 from Australian Kaolin and went into liquidation in July 2010. In January 2012 Gulf Alumina gained full ownership of the three mining leases from ACC Ecominerals Ltd. Gulf Alumina is currently the sole holder of the existing EA for the project's MLs 6025, 40069 and 40082.

Gulf Alumina has a current plan of operations for the Skardon River Bauxite Project in accordance with the EA for the 12 month until February 2017. The Plan covers the decommissioned kaolin mining and processing operation under care and maintenance, processing plant decommissioning and rehabilitation. The kaolin mine and existing infrastructure were included in the EIS assessment where potential interactions occurred between kaolin mine's infrastructure or former mining areas and the proposed bauxite project (e.g. rehabilitation; water release, etc.).

2.6 Mine infrastructure

2.6.1 Existing kaolin mine infrastructure

The existing kaolin mine contains the following infrastructure (Figure 2; Figure 3):

- port infrastructure area (on ML40069); including a barge wharf, bulk diesel storage tank, a bunded laydown yard for oil storage, sediment pond, decommissioned kaolin dry plant area
- accommodation camp
- airstrip
- sewage treatment plant
- wet weather storage and irrigation area
- the decommissioned wet plant area and stock piles to the south of the project area (on ML 6025) including a bioremediation pad, a settle dam and containment dam
- a 15km long haul road (linking the port infrastructure area with the kaolin wet plant area)
- kaolin stockpiles and fluvial and claystone overburden
- existing kaolin pits filled with water near Namaleta Creek crossing (on ML6025)
- water pipeline (between the wet plant area at Namaleta Creek and the water storage tanks at the port area)
- landfill
- borrow pits (near haul road).

The footprint of the kaolin mine that overlaps with the bauxite project is approximately 138ha in size. The EIS stated that the bauxite project proposes to use parts of the existing infrastructure from the kaolin mine, including the haul road, airstrip, accommodation camp and the port infrastructure area. The bauxite resource to be mined would include portions of the areas of the former kaolin mine, including the decommissioned wet plant area to the south of the project area and the existing airstrip. Approximately 25ha of the former kaolin mine is now rehabilitated *Eucalyptus* or *Melaleuca* woodland consisting of a variety of young trees and shrubs (Figure 3).

An overview of the proposed area of bauxite mining and the current footprint of the kaolin mine are shown in Figure 4. The kaolin pits to the south near Namaleta Creek (the raw water pit and claystone pit) would be retained for the life of the mine as a water supply for dust suppression and vehicle washdown activities.

2.6.2 Proposed bauxite mine infrastructure

The proposed life of project activities and infrastructure for the proposed bauxite are:

- a total of 15 bauxite mining pits over the life of the project (10 years)
- use of existing landfill and a new landfill with leachate management, for limited waste disposal
- the upgrade of the existing 15km north-south haul road
- upgrade of the crossing of Namaleta Creek
- a new haul road system south of Namaleta Creek (approximately 1.5km in length)
- temporary branch haul roads to link with the existing haul road
- the upgrade of the existing accommodation camp from 50 beds to 150 beds for the construction workforce and maintained for mining operation
- upgrade of the existing sewage treatment system
- the use of the existing airstrip and relocated airstrip later in mine life
- a process water pumping station at the existing kaolin mine water storage pits with existing pipeline to transfer water to water storage tanks at the port infrastructure area. This pipeline would run adjacent to the existing haul road

- construction of a new sediment pond and retention of the existing sediment pond for stormwater run-off capture from infrastructure and stockpile areas at the port infrastructure area
- power supply by three 1 megawatts (MW) generators fitted on semi-trucks
- new bauxite ore dump facility, crushers, conveyor belt system and bauxite product stockpile facility on the port infrastructure area
- a new wharf/barge loading facility
- the upgrade of the existing boat ramp and jetty infrastructure at the port to improve access for vessel supply of fuel, consumables, materials and site equipment
- a new fuel pipeline would be constructed to transfer fuel from supply vessels to the storage tank(s) and from the tanks to refuel barges
- new workshop, warehouse, administration and crib room on the port infrastructure area
- upgrade of the existing bulk fuel storage if required, new fuel transfer pipeline, diesel transfer tanks, export waste storage and sewage treatment systems at the port infrastructure area
- decommissioning of the kaolin infrastructure
- barging of bauxite to the offshore transshipment location in deep water approximately 15km offshore from the Skardon River mouth, and transfer from barges to bulk carriers
- bulk carrier movements within Australian waters
- bed-levelling at the mouth of Skardon River to a depth of approximately 2.2 metres (m) below lowest astronomical tide (LAT). Bed levelling would involve underwater reprofiling of shallow areas at the seaward extent of the Skardon River mouth by pushing the crests of sand banks into deeper gutters. No dredging is proposed; however, annual maintenance bed levelling may be required.

Figure 4 shows the proposed infrastructure and operation. The main components of the proposed infrastructure are:

2.6.2.1 Port infrastructure area

The existing port infrastructure area is located on ML40069 upstream in the estuary of the Skardon River on ML40069 (Figure 5). It also contains the gazetted Port of Skardon River. The Port of Skardon River was declared a port in February 2002, covering an area of 2489ha. The port manager is Far North Queensland Ports Corporation Limited, trading as Ports North, a company Queensland Government Owned Corporation. As the port manager, Ports North's role is to maintain the port to facilitate trade. To date, limited shipments of kaolin have been shipped via the port. While the Port of Skardon River is currently not operational, the port infrastructure is being used for supplies delivered by barge.

Descriptions in this EIS assessment report referring to project's activities on the Port of Skardon River but as part of the proposed project are described as activities carried out on port infrastructure area to avoid confusion with the gazetted Port of Skardon River.

The existing port infrastructure area contains the following infrastructure (Plate 1):

- a loading ramp, pylons and an attached walkway
- a 2.2-megalitre bulk diesel storage tank, bunded by compacted earth and clay lining (bunding to be upgraded)
- a pipeline installation which enable conveyance of diesel from a barge to the existing bulk diesel storage tank
- a second loading ramp adjacent to the barge loading ramp
- the decommissioned dry kaolin plant
- the retained shed with offices, crib room and toilets
- a sediment pond and drainage bunds
- the existing landfill
- waste management areas
- a Telstra telecommunication tower
- a concrete and besser brick bunded lay down yard for storage of waste oils prior to shipping off site
- a laydown yard for scrap material
- water storage tanks.

As part of the proposed bauxite operations, some of the existing kaolin infrastructure (e.g. dry kaolin plant) would be decommissioned, while other infrastructure would be used for the proposed bauxite operation.

Barge load out / wharf construction

The new wharf and barge loader would be located near the existing boat ramp. This location has been chosen due to the presence of a naturally occurring deep hole in this part of the river.

The proposed barge load out / wharf construction would involve:

- shore abutment for the jetty constructed from local materials supplemented with geotextile fabric interlayers to improve bank stability and locally won rock rip rap for protection against erosion by stream flow or wave action
- fixed shiploader with telescopic boom and probably luffing capability
- light vehicle access via a short single lane jetty to a notional 10m x 10m wharf head, running parallel to the shiploader
- seven separate dolphin structures which would enable the barge to be warped (moved) along the berth under the shiploader
- catwalks to access the dolphins to enable barge mooring lines to be tended
- precast concrete tubs for the dolphin tops and headstocks and precast elements for the wharf and jetty decks.



Plate 1 Port of Skardon River: photos showing the existing boat ramp (left) and aerial view of the existing port infrastructure (right). Photo credit: EHP 2015

The EIS stated that no bed levelling or dredging is proposed for the wharf area. Approximately 45 piles would be required (3 per dolphin, 12 for the jetty and 12 for the wharf head). Piles would be driven off a barge with a hydraulic hammer and but no drilling would be required. No coastal soils and would be exposed to air. The piling campaign would take approximately two months and the entire barge load out construction approximately four months. Construction would involve two barges, one with a 250t crane and piling hammer, and the other a storage / supply barge. In addition there may be two small tug boats and a workboat. Approximately 300m² of marine plants (mangrove communities) would be impacted for the wharf and barge load out construction.

2.6.2.2 Accommodation camp

The project would require approximately 100 employees during construction and 160 employees during operation. Employees would be accommodated in the existing accommodation camp which would be upgraded. Potable water for the camp is sourced from existing pumps accessing shallow groundwater aquifers.

Camp upgrading would involve:

- refurbishment of the existing accommodation camp
- installation of demountable buildings, including bedrooms, kitchen facilities, and ablutions
- civil earth works
- permanent and temporary drainage
- trenching and laying of reticulated services and any other underground pipelines and services
- some vegetation clearing in areas not already cleared for the existing camp and effluent irrigation area
- installation of powerlines.

2.6.2.3 Airstrip / air traffic

The existing airstrip provides routine personnel and freight access, as well as emergency access to the site. The grass is slashed in areas within non-trafficked sections of the airstrip including both ends of the airstrip (i.e. the flight paths). Depending on demand, fly-in/fly-out would be offered from Cairns, Weipa, Mapoon and Bamaga. The disturbed area of the airstrip is approximately 52ha.

The airstrip would be mined towards the end of mine life (year 9 of mining operations). The airstrip would then be moved on to previously mined land, parallel and to the south of the existing airstrip to enable mining of bauxite beneath the current airstrip. As the new airstrip would be on previously mined land, the airstrip area would be backfilled to surface elevation and compacted so that it is suitable for aircraft movements.

2.6.2.4 Haul road

The existing haul road would be upgraded to a two-way road and would include raising the height of the road and construction of more and larger culverts as sections of the current road flood during heavy rainfall events and extended south. Ironstone would be sourced from six existing borrow pits along the haul road or from the fluvial overburden piles (Figure 3). The haul road would be extended south of Namaleta Creek in later years of mine life to access the two proposed mine pit areas south of the creek. The crossing would involve upgrading the existing crossing of Namaleta Creek and constructing a new crossing of a low lying wetland (referred to as 'Tributary 1' hereafter) between proposed bauxite pits 14 and 15 near the eastern boundary of the mining lease (Figure 6). It is anticipated that the upgrading of the Namaleta Creek crossing would use the claystone overburden material for constructing the core of the haul road crossing; and ironstone and/or bauxite to cap the claystone to stabilise the surface against erosion and provide a non-sticky road surface and thereby rehabilitate the overburden from the former kaolin mine.

2.6.2.5 Borrow pits

Eight borrow pits were part of the former kaolin mine project and used for the bulk earthworks and infrastructure phase. These borrow pits are located adjacent the haul road. Six of these pits are utilised for ongoing road maintenance; one of these pits has been rehabilitated while one is currently used as the site landfill.

2.6.2.6 Landfill

The existing landfill is located in one of the eight borrow pits in the port infrastructure area, approximately 500m south west of Skardon River loading ramp and would be used for disposal of metal, plastic or wood scrap from demolition work from kaolin mine decommissioning. It would not be used as part of the proposed bauxite project. Hence, a new landfill would be required for putrescible waste, general waste, and inert waste from construction and operations generated from the bauxite project.

2.6.2.7 Power supply

Power supply would be required for the campsite, offices, water pumping, port operations and other electrical equipment. The annual power supply would have an average capacity of 2MW and would be supplied by three 1MW generators fitted on semi-trucks. Two generators would run continuously sharing the load with the third generator on standby.

2.6.2.8 Communications

A Telstra telecommunication tower is located in the port infrastructure area and linked to the Mapoon exchange and would continue to be used for the bauxite operation.

2.6.2.9 Bulk fuel storage and refuelling

A 2.2-megalitre bulk diesel storage tank (currently bunded by compacted earth and lined with clay), is located in the port infrastructure area. The existing storage tank would be refurbished and subjected to integrity testing to ensure the system has no leaks or faults, and the existing bunded area upgraded so that the base and bund walls are impermeable. Depending on the design of the new storage tank(s), the bunded area would be large enough to contain either at least 110% of a single storage tank or 100% of the largest storage tank plus 10% of the second largest storage tank in multiple storage areas.

2.7 Proposed bauxite mining operation

2.7.1.1 Resource description

The bauxite direct shipping ore (DSO) deposit within the MLs is 16km long and up to 4km wide but the base of the DSO horizon is seldom more than 3 to 5m from surface. The average DSO bauxite thickness ranges between 1.1 and 2.7m, averaging 1.7m. The proposed life of project resource areas and bauxite pits are shown in Figure 6. Resource modelling has shown that DSO bauxite occurs in topographically higher areas above the water table as DSO bauxite resources are absent in coastal sand dunes and low lying swamps and wetlands.

2.7.1.2 Bauxite mining methodology

Mining of bauxite would occur only during the dry season with shut down during heavy rain periods of the wet season, approximately three months from January to March (depending on weather events, weather forecasts, operability and safety). 50Mt of bauxite ore would be mined over a 10 year period using conventional DSO bauxite mining methods.

2.7.1.3 Bauxite stockpiles and product reclaim

Bauxite would be loaded on haul vehicles and stockpiled on a low profile feeder and crusher area located adjacent the haul road loop, from where bauxite would be continually transferred via conveyor to a bauxite product stockpile radial stacker. During the dry season the product bauxite stockpile at the port would increase to a maximum of 150,000t. The stockpile would be gradually depleted over the year and decreased to zero in January so that no stocks are being held during the wet season.

The stockpile area would be well drained to control run-off, allow for rapid turnover of stocks to avoid build-up of wet, sticky ore. The stockpile pad would be designed to drain with an approximate 3% slope towards drainage culverts, sediment interceptor pits and to a sediment pond. The bauxite stockpile area would be surfaced with a compacted layer of export quality DSO bauxite to a depth of 0.3 to 0.5m.

Front end loaders would manage the product stockpile by pushing and heaping the ore up onto the stockpile to maintain a height of up to 15m within 80m of the barge load out conveyor. From there bauxite would be transferred to the barge load out conveyor.

2.7.1.4 Workforce during operation

The workforce may be employed through a contractor. Mining operations would operate on two 12 hours shifts for approximately nine months each year. The EIS stated that the mining operations personnel would work on a 14 day on, seven day off roster flying back to Bamaga, Weipa and Cairns. Maintenance personnel would work either with the mining crews on the 14/7 roster to provide on shift support or as part of a day shift only crew on a nine days on, five days off roster to carry out workshop based maintenance and overhauls.

At full production of 5Mt/a, the average number of operators per crew would be 41 employees and one shift supervisor, resulting in 126 employees across all three crews. The shift maintenance crew at full production would be 18 people across the three crews with a further six on permanent day shift. The total management and technical services team would be approximately 16 people, including seven mining contractor employees. Hence, the total number of mining employees across all rosters and including contractor and owner personnel would be approximately 160.

During the three month wet season shutdown (January to March each year) only 12 maintenance employees and five management and supervisory staff would remain on site.

2.7.1.5 Workforce transport

Access to the project site would be by air due to the very limited road access to the project area. While the project site could be reached from the nearest community, Mapoon, by boat the journey would take more than one hour in a fast boat and Mapoon would not have the necessary accommodation or facilities to cater for the project workforce. Therefore the workforce would be 100% fly-in/fly-out.

It was calculated in the EIS that approximately two flights per week, assuming a 40 seater plane, would be sufficient for the transport of the project workforce. Furthermore, charter flights would be arranged from Cairns directly to the project area, or via Weipa, Bamaga and/or Mapoon. This would allow for the local populations residing in or near Mapoon and Weipa to become part of the workforce. Charter flights are expected to go via Weipa to refuel and collect passengers.

2.7.1.6 Water demand

The water balance in the EIS showed that over an annual period, when the mine is at full production, the estimated water demand would be approximately 390 megalitres per annum. It is proposed that 355 megalitres per annum would be obtained from existing sources, comprising 195 megalitres per annum from the kaolin pits and 160 megalitres per annum from existing shallow aquifer bores. The existing water supply would need to be supplemented with approximately 35ML per annum from new sources (i.e. new shallow aquifer bores). This would require additional subartesian water licence approvals under the *Water Act 2000*. However, the EIS concluded that these new water sources would only be required to meet peak demand during the dry season.

2.7.1.7 Materials, equipment and fuel supply

As the project area is only accessible by barge for heavy and large loads, all equipment and fuel supplies would be barged in,

The EIS described that the total annual supply vessel movements would depend on the stage of the project, with construction requiring more equipment, vehicles and construction materials barges, but less fuel supply vessels, and operations requiring more fuel supply and general cargo supply vessels. It was estimated in the EIS that between 20 and 30 supply vessel movements would be required per annum.

Mining equipment and construction materials would be primarily sourced from within Australia, with some

equipment and materials potentially sourced from other countries. Barge supplies would go through Weipa's port first as it has suitable loading and customs and quarantine facilities. The proposed project would require approximately 10 megalitres of diesel per annum, which would be barged to via approximately 20 fuel supply vessels, carrying 0.5 megalitres fuel each year. Aggregate and crushed rock would be transported by combination of tug and barge, with approximately four barges required per year. Materials, equipment and fuel supply to the project site would be offloaded at the existing port boat ramp.

2.7.1.8 Barge loading

The EIS stated that a new wharf and barge loader would be constructed near the existing boat ramp. This location was chosen due to the naturally occurring deep hole in Skardon River. Space constraints could occur between operation at the new barge load out facility and existing boat ramp; hence coordination of these activities by the site management would be required at certain times.

The EIS stated that DSO bauxite would be loaded from the land to the barge via a cantilevered telescoping boom and a barge loader conveyor. The barge loading conveyor would be fitted with a telescopic chute required to accommodate the tidal movement and minimise spillage and dust while the discharge telescopic chute would be fitted with a deflector plate to enable the load to be placed near flat across the breadth of the barge.

2.8 Off lease operations

While the port and some of the Skardon River are part of existing mining leases (Figure 1), some project activities would occur outside these mining leases, such as barging of bauxite on the Skardon River and offshore transshipment (Figure 5).

2.8.1 Bauxite shipping

Two barges would be used as transshipment vessels to move bauxite from the port to a large bulk carrier (Panamax vessels) which would be anchored in an offshore transshipment area, approximately 15km offshore from the Skardon River mouth. The proposed offshore transshipment area is beyond the defined Coastal Waters administered by the State, but within the Territorial Sea area (Figure 5). Activities within the transshipment area would be subject to approval by the Commonwealth under the EPBC Act.

In moving approximately 5Mt of bauxite per year, approximately 65 bulk carriers would be required per year; which would equate to approximately 1.5 bulk vessels per week. The shipping route of bulk carriers would be via the Gulf of Carpentaria in a north easterly direction, passing north of Arnhem Land (Northern Territory) before traveling via Indonesian waters to the west of West Papua to the final destination (Asian ports / final destination unknown at the stage of the assessment report).

The following product capacities in shipping and transshipment and operational times were proposed:

- each barge would have a 4000 to 7000t capacity
- the two barges would work 24 hours seven days a week with a loading rate up to 2000 tonnes per hour (t/hr): each requiring approximate 3.5 hour load time; 4 hour discharge time; 2 hour travel time each way; and 0.5 hour wait time (resulting in a total of 12 hours per return trip)
- bauxite would be exported by 75,000 deadweight tonne bulk carriers to its destination.

Barges and bulk carriers would not operate during the wet season in which cyclones typically occur in the Gulf of Carpentaria (usually between January and March).

2.8.2 Bed levelling

The EIS stated that the proposed barges would have a draft of 3.5m and hence would be suitable to navigate through Skardon River. However, bed levelling would be required in the mouth of the Skardon River (Figure 5; Plate 5) to a depth of approximately 2.2m below LAT (lowest astronomical tide). This would allow barge movements for approximately 18 hours during a 24 hour period, avoiding low tides. Tug boats would not be required for the proposed barging operations.

Initial bed levelling would be undertaken by one vessel over a period of approximately 120 days, with an option for two vessels over 60 days. Annual maintenance bed levelling (post wet season) would be carried out by one vessel over a period of between 30 to 60 days. Bed levelling would require a tidal works permit under the *Sustainable Planning Act 2009* post-EIS.

2.9 Rehabilitation and decommissioning

Mine site rehabilitation would be undertaken progressively during the life of the mine. Mined areas would be rehabilitated to native woodland. The overall objective of the proposed project is to return the land to a post-mining native vegetation community and/or land use that is stable, self-sustaining, requires minimal maintenance, and protects downstream water quality. The EIS stated further that alternative land use options may be considered by the Traditional Owners in consultation with relevant government stakeholders.

2.10 Project justification

The resources of approximately 50mt of DSO bauxite on the project area would allow a proposed project life of over 10 years. The EIS identified that the economic stimulation generated as a result of wages and additional demand for goods and services would have beneficial effects at the local level. Revenue generated for the state and federal government in the form of taxes and royalties would assist in the funding of a wide range of services to benefit of the community. It was stated that the proposed project would have a beneficial impact on Indigenous people residing in the local area and Cape York region through the provision of increased business opportunities, employment, education and training opportunities.

No beneficiation of bauxite ore and resulting tailings management would be required. As a consequence significantly less water would be required and there would be no impacts associated with tailings management. Furthermore, the EIS stated that the proponent has taken advantage of the existing kaolin infrastructure and existing port facilities to minimise the disturbance areas. In order to minimise the offshore transshipment impact, no fixed offshore infrastructure was proposed in the EIS.

2.11 Neighbouring projects and tenements

A number of other tenements surround the proposed Skardon River Bauxite Project. A brief overview of these is provided below.

2.11.1 Proposed Bauxite Hills Project

ML20676, ML20689 and ML20688 belong to the Bauxite Hills Project, proposed by Aldoga Minerals Pty Ltd's, a wholly owned subsidiary of Metro Mining Limited (Figure 7). The proposed Bauxite Hills Project would include an open cut operation, haul roads and barge loading facility and would produce and transport up to 5mt/a of DSO bauxite over 12 years. Unlike the proposed Skardon River Bauxite Project, the Bauxite Hills Project would involve the development of new mining infrastructure, including several haul roads, an accommodation camp and new barge landing facilities. The proposed Bauxite Hills Project is currently assessed by EIS by EHP.

2.11.2 Other tenements

ML7024, to the south of project area is part of a much larger ML held by Rio Tinto Alcan (RTA) Weipa Pty. Ltd; at the time of writing of this assessment report a greenfield site.

A number of exploration permit minerals (EPMs) overlap with the Skardon River Bauxite Project MLs (Table 1). There are no overlapping exploration permits for coal and petroleum leases, pipeline licences, exploration permits, petroleum or petroleum survey licences.

Table 1 Overlapping tenures (adapted from EIS Table 4-1)

Tenure	Overlapping tenures	Owner
EPM19047	Overlapping ML6025	Oresome Australia Pty Ltd
EPM16899	Overlapping ML6025, ML40069, ML40082	Cape Alumina Pty Ltd
EPM15376	Overlapping ML40069, ML40082	Cape Alumina Pty Ltd
EPM15370	Overlapping ML40082	Oresome Australia Pty Ltd
EPM19001	Overlapping ML40069, ML40082	Oresome Australia Pty Ltd

3 The EIS process

3.1 EIS legislative basis

The EIS for the proposed Skardon River Bauxite Project was assessed under two pieces of legislation, the EP Act and the EPBC Act. These are discussed in more detail below.

3.1.1 Environmental Protection Act 1994

EHP is responsible for the administration and regulation of resource activities under EP Act. Resource activities include mining, petroleum (including coal seam gas), geothermal, and greenhouse gas storage activities. Resource activities that are proposed to be carried out under one or more resource tenures, in any combination, as a single integrated operation are known as resource projects.

A resource project may be required to be assessed through an EIS process under chapter 3, part 1 of the EP Act. An EIS is a written document for a project that is undergoing the EIS process pursuant to the EP Act. The purpose of an EIS and the EIS process, as defined under section 40 of the EP Act, are to:

- assess the potential adverse and beneficial environmental, economic and social impacts of the project
- assess management, monitoring, planning and other measures proposed to minimise any adverse environmental impacts of the project
- consider feasible alternative ways to carry out the project
- give enough information about the matters mentioned above to the proponent, Commonwealth and state authorities and the public
- help the administering authority decide an EA application for which the EIS is required
- give information to other Commonwealth and state authorities to help them make informed decisions
- meet any assessment requirements under the EPBC Act for this project that is a controlled action under the EPBC Act; or a bilateral agreement
- allow the state to meet its obligations under a bilateral agreement (refer to section 3.1.2 of this assessment report).

3.1.1.1 EIS process timeline under the EP Act

Gulf Alumina has applied for an amendment to their EA for bauxite mining within the existing mining leases as the current EA only allows for mining kaolin and operating an associated pilot plant. EHP decided that the proposed amendment is a major amendment under sections 228 and 229 of the EP Act. On 19 May 2014, EHP notified Gulf Alumina that the amendment application requires assessment by EIS.

The EIS process for the proposed Skardon River Bauxite Project was conducted under chapter 3 of the EP Act. Table 2 provides a timeline of the key steps undertaken during the EIS process under the EP Act.

Table 2 Milestones for the Skardon River Bauxite Project under the EP Act EIS process

Step in the EIS process	Section of the EP Act	Responsibility	Date completed
The proponent prepared and submitted a draft TOR to EHP	41	Proponent	25/09/2014
EHP finalised TOR notice and provided it to the proponent	42(1)	EHP	1/10/2014
EHP published the draft TOR notice	43(1)	EHP	<ul style="list-style-type: none"> • 7/10/2014: EHP website • 8/10/2014: The Western Cape Bulletin • 11/10/2014: The Australian
Proponent gave TOR notice to affected and interested persons	43(3)	Proponent	2/10/2014
Comment period for the draft TOR	42(3)	EHP	13/10–24/11/2014
EHP provided comments to the proponent	44	EHP	1/12/2014

Step in the EIS process	Section of the EP Act	Responsibility	Date completed
The proponent responded to comments and made amendments to the draft TOR	45	Proponent	6/01/2015
EHP finalised TOR and provided it to the proponent	46(1)(b-c)	EHP	15/01/2015
EHP published the final EIS notice	46(1)(d)	EHP	<ul style="list-style-type: none"> • 16/01/2015: EHP website • 17/01/2015: The Australian • 21/01/2015: The Western Cape Bulletin
Proponent prepared and submitted the EIS	47	Proponent	13/10/2015
EHP decided to allow the EIS to proceed; decided on minimum period for making of the submissions about the EIS and prepared and gave notice of decision to proponent	49	EHP	13/10/2015
The proponent gave EIS notice to affected and interested persons	51(2)(a)	Proponent	26/10/2015
The proponent published the EIS notice in The Australian and The Western Cape Bulletin; and made the EIS available on a website	51(2)(b)(c) & 52(1)	Proponent	<ul style="list-style-type: none"> • 27/10/15: EHP website • 28/10/15: Western Cape Bulletin • 31/10/15: The Australian
The EIS submission period (at least 30 business days after EIS notice is published)	52(2)(a)	EHP	2/11–11/12/2015
The proponent provided a statutory declaration of compliance with the notice requirements	53	Proponent	28/10/2015
Submissions were forwarded to the proponent	56(1)	EHP	21/12/2016
The period within which the proponent had to prepare a response to submissions was changed by agreement	56(3)(b)	Proponent	28/01/2016
The proponent responded to the submissions, provided any amendments of the EIS; and submitted an EIS amendment notice to EHP	56(2) 66	Proponent	22/03/2016
EHP decided if EIS and response to submissions and submitted EIS were adequate for the EIS process to proceed	56A(2)(4)	EHP	21/04/2016
EHP prepared and gave decision notice to the proponent.	56A(5)	EHP	9/05/2016
EHP prepared the EIS assessment report	57	EHP	17/06.2016
EIS assessment report completed and issued to the proponent completing the EIS process	60(1)	EHP	20/06.2016

3.1.2 Environment Protection and Biodiversity Conservation Act 1999

Projects (“actions”) that will have, or are likely to have, a significant impact on a MNES must be referred to the Commonwealth Minister for the Environment for a decision on whether assessment and approval is required under chapter 4, part 7 of the EPBC Act. The Commonwealth Minister for the Environment then decides under chapter 4, part 7, section 75 of the EPBC Act if the proposed action is a controlled action for significant impacts on MNES and which provisions of chapter 2, part 3 will be controlling provisions for the proposed action.

Projects that have been determined to be controlled actions under the EPBC Act can be assessed by the EIS

process of the EP Act in accordance with the bilateral agreement between the Commonwealth of Australia and the State of Queensland, as provided for by chapter 3, part 5 of the EPBC Act. The bilateral agreement provides for the accreditation of the Queensland EIS processes set out in schedule 1 of the agreement to ensure an integrated and coordinated approach for actions requiring approval under both Commonwealth and state legislation.

Under chapter 4, part 8, section 87(4)(d) of the EPBC Act, the EIS assessment documentation must provide enough information on the relevant impacts of the proposed project and relevant impacts on MNES to allow the Minister for the Environment to make an informed decision whether or not to approve under chapter 4, part 9 (for the purposes of each controlling provision) the taking of the action.

3.1.2.1 EIS process timeline under the EPBC Act

The proposed project was referred on 14 August 2014 to DotE (EPBC 2014/7305). On 11 September 2014, 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 relevant controlling provisions for the project were determined as:

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

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

- The action would involve clearing of approximately 1166ha of vegetation that represents suitable habitat for listed threatened species and communities, including the endangered northern quoll.
- Construction activities and barge access would be likely to have a significant impact on listed threatened species and communities and listed migratory species, including the dugong.
- The establishment and operation of the floating harbour and associated barge access is likely to have a significant impact on the Commonwealth marine environment.

On 15 January 2015, EHP finalised the TOR which included tailored TOR for MNES. The project has been varied on two occasions to correct an administrative error, increase the disturbance area by 235ha and increase the depth and volume of material associated with bed levelling at the mouth of the Skardon River. On 23 October 2015 the proponent submitted the EIS to EHP. EHP, as the assessing agency, reviewed the information provided in the assessment documentation for the proposed project against the information requirements outlined in Appendix 2 of the TOR and relevant aspects of other sections of the EIS.

As per the bilateral agreement, DotE carried out its own review of the EIS assessment documentation and provided EHP with a submission on the EIS on 16 November 2015. DotE also provided comments to EHP on the draft EIS report as required by the administrative arrangements for the bilateral agreement. 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.

3.2 Approvals

3.2.1 Environmental authority under the EP Act

Upon completion of the EIS process under Chapter 3 of the EP Act, any current application process suspended by the EIS process resumes pursuant to their respective law. For the proposed Skardon River Bauxite Project, the major amendments 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.

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:

- ERA 8(3) – Chemical storage - storing 500 m³ or more of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3.
- ERA 33 – Crushing, milling, grinding or screening more than 5000t of material in a year.
- ERA 49 - Boat maintenance and repair – Operating, on a commercial basis, a boat maintenance or repair facility for maintaining or repairing hulls, superstructure or mechanical components of boats or seaplanes.
- ERA 50(1)(a) – Loading or unloading 100t or more of minerals in a day or stockpiling 50,000t or more of minerals within 5km of the highest astronomical tide or 1km of a watercourse.

- ERA 50(2) – Loading or unloading 100t or more of bulk materials in a day or stockpiling bulk materials.
- ERA 60(1)(a) – Waste disposal – operating a facility for disposing of less than 50,000t per year of limited regulated waste and general waste.
- ERA 63(1)(b) – Sewage treatment or operating a sewage pumping station with a total design capacity of more than 40 kilolitres in an hour (100 to 1,500 equivalent persons with treated effluent discharged through an irrigation scheme).

The following notifiable activities prescribed under schedule 3 of the EP Act would also be authorised under the EA as part of the proposed project:

- notifiable activity 1 – abrasive blasting
- notifiable activity 7 – chemical storage
- notifiable activity 20 – landfill
- notifiable activity 23 – metal treatment or coating
- notifiable activity 27 – pest control
- notifiable activity 29 – petroleum product or oil storage
- notifiable activity 37 –waste storage.

The current EA for the project area also lists ‘ERA resource activity for mining clay (20c)’ under schedule 2A of the EP Regulation. ERA 20c is retained for the proposed Skardon River Bauxite Project as ongoing rehabilitation and decommissioning of the kaolin mine would continue. Based on the project description and activities outlined in the EIS, a set of recommended draft conditions have been prepared for the proposed project (Appendix 1).

3.2.2 Other approvals for the project

An overview of the necessary key approvals for the proposed project are summarised in Table 3. These have not been fully assessed in the EIS process.

Table 3 Overview of the key approvals required for the Skardon River Bauxite Project

Approval	Legislation (administering authority)	Detail
Key state approvals		
Granting of mining leases (ML)	<i>Mineral Resources Act 1989</i> (DNRM)	On 20 January 2014, DNRM approved to include mining bauxite on existing ML 40082, ML40069 and ML 6025.
Environmental authority (mining activities) (EA)	<i>Environmental Protection Act 1994</i> (EHP)	Recommended conditions to be incorporated in a draft EA included in the EIS assessment report. EHP will 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. Refer to the recommended conditions in Appendix 1 of this assessment report.
Protected plants permit or an exemption for removal of plants Species management programs Damage mitigation permit	<i>Nature Conservation Act 1992;</i> Nature Conservation (Wildlife Management) Regulation 2006 (EHP)	A permit would be required to clear near threatened, vulnerable or endangered protected plants and their supporting habitat. A damage mitigation permit would possibly be needed to cull and disperse wildlife; remove and relocate wildlife. <ul style="list-style-type: none"> • Species management programs should be in place to ensure adequate management of the animal’s population and habitat where clearing of vegetation or any other works occur that would potentially impact on vegetation which is the potential habitat for fauna: • prior to clearing of listed threatened species • prior to interfering with an animal breeding place.

Approval	Legislation (administering authority)	Detail
<p>Water licence – to take or interfere with water</p> <p>Water permit – to take water (surface water or groundwater) for a activity with a reasonably foreseeable conclusion</p> <p>Riverine protection permit – for the excavation or placement of fill in a watercourse (applies to non-tidal watercourses, lakes and springs)</p>	<p><i>Water Act 2000</i> (DNRM)</p> <p>Water Resource (Great Artesian Basin) Plan 2006</p>	<p>The proponent will need to consult with DNRM on:</p> <ul style="list-style-type: none"> • Approvals required prior to the take of water including water permits to take surface water or groundwater and/or water licence for dewatering groundwater. • A riverine protection permit under the <i>Water Act 2000</i> may be required to excavate or place fill in a watercourse. • Depending on the location of the proposed bores, development approval in addition to water licences may also be necessary. <p>The proposed project would not be extracting water from deep aquifers or impacting these.</p>
<p>Removal, destruction or damage of marine plants</p>	<p><i>Fisheries Act 1994</i> (Department of Agriculture and Fisheries; DAF)</p>	<p>The proponent will need to consult with DAF on:</p> <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 wharf construction of barge operations).
<p>Waterway barrier permit</p> <p>Code for Self-assessable Development – Minor Waterway Barrier Works</p>	<p><i>Forestry Act 1959</i> (DAF)</p>	<p>The proponent will need to consult with DAF concerning potential impacts to fish movements including waterway barrier works.</p>
<p>Biosecurity management strategies, e.g. weed and pest management</p>	<p><i>Land Protection (Pest and Stock Route Management) Act 2002</i>, <i>Chemical Usage (Agricultural and Veterinary) Control Act 1988 (use controls)</i> and <i>Agricultural Chemicals Distribution Controls Act 1966</i> (DAF)</p>	<p>The proponent will need to consult DAF concerning biosecurity management including:</p> <ul style="list-style-type: none"> • Species that are declared under the <i>Land Protection (Pest and Stock Route Management) Act 2002</i> or declared under local government laws need to be identified and managed to guide best practice management and disposal of weeds. • The use of agricultural chemicals or other industrial chemicals would need to be managed to not adversely impact on human health. • Regulation of machinery contaminated with plant pests (e.g. insects) or disease (e.g. fungi) that have the ability to move to, or from, sensitive zones.
<p>Bed levelling:</p> <ul style="list-style-type: none"> • Tidal works <p>Cyclone moorings:</p> <ul style="list-style-type: none"> • Tidal works / Prescribed tidal works • Code for self-assessable development Minor impact works involving the removal, destruction or damage of marine plants (MP06) 	<p><i>Coastal Protection and Management Act 1995</i></p> <p><i>Sustainable Planning Act 2009</i></p>	<p>The proponent will 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.</p> <p>Approvals for bed levelling: A tidal works approval will need to be obtained prior to the commencement of bed levelling activities.</p> <p>However, additional information would be required as part of the tidal works applications (refer to section 4.9.5.3 and Appendix 3 of this assessment report).</p> <p>Approvals for the installation of cyclone moorings: A tidal works or prescribed tidal works approval will 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</p>

Approval	Legislation (administering authority)	Detail
		section 4.9.5.3 and Appendix 3 of this assessment report).
Maritime operations, pollution and safety	<i>Transport Infrastructure Act 1994</i> and <i>Transport Operations (Road Use Management) Act 1995</i> (Department of Transport and Main Roads: Maritime Safety Queensland; MSQ)	The proponent will need to consult with Maritime Safety Queensland (MSQ) and Ports North in the ongoing management of project related maritime operations.
Cultural heritage management plan	<i>Aboriginal Cultural Heritage Act 2003</i> (Department of Aboriginal and Torres Strait Islander and Multicultural Affairs; DATSIMA)	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 unrecorded sites of non-Indigenous cultural heritage significance	<i>Queensland Heritage Act 1992</i> (EHP)	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.
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 areas of regional interest.
Commonwealth approval		
Approval to undertake an action that may impact on MNES	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (DotE): <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 	This assessment report includes an assessment of impacts on MNES as a result of the proposed action. This assessment will 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. This assessment report also includes EHP's recommendations on conditions of approval for the project to manage and offset impacts to MNES not addressed through state imposed conditions).
Indigenous heritage	<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i> (Commonwealth)	Notification to the Commonwealth Department as soon as practical and include location and description of discovery.
Native title	<i>Native Title Act 1993</i> (Commonwealth)	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. The Northern Cape York Group #1 Determination area extends to the high water mark of the southern side of the Skardon River. North Cape York Group #1 holds the recognised native title determination for areas within and project area north of the Skardon River (Registered Native Title Claimants - Federal Court

Approval	Legislation (administering authority)	Detail
		Proceedings QUD157/2011). ML 40082, ML40069 and ML 6025 were granted via the Right to Negotiate process under the <i>Native Title Act 1993</i> .
Offsets (State and Commonwealth)		
Offset requirements for matters of national (MNES) and state environmental significance (MSES)	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> ; EPBC Act Environmental Offsets Policy 2012 (DotE): <ul style="list-style-type: none"> • assessment of MNES Queensland <i>Environmental Offsets Act 2014</i> , Environmental Offsets Regulation 2014, Queensland Environmental Offsets Policy (EHP): <ul style="list-style-type: none"> • assessment of MSES 	Offsets would be required under State and Commonwealth legislation (refer to sections 4.7 and 4.8 of this assessment report). However, under the <i>Environmental Offsets Act 2014</i> 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.

3.3 Consultation program

3.3.1 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 and 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.

3.3.2 Advisory body

EHP invited the following organisations to assist in the assessment of the TOR and EIS by participating as members of the advisory body for the Skardon River Bauxite Project:

- Australian Government Department of the Environment
- Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (TOR), now Department of Aboriginal and Torres Strait Islander Partnerships (EIS)
- Former Emergency Services Centre and Public Safety Business Agency (TOR), now Public Safety Business Agency (Queensland police, fire and emergency services)
- Department of Education, Training and Employment (Strategic Engagement; Infrastructure Strategy Research and Performance)
- Former Department of Local Government, Community Recovery and Resilience (TOR)
- Former Department of State Development, Infrastructure and Planning (TOR)
- Department of Infrastructure, Local Government and Planning
- Department of State Development
- Former Department of National Parks, Recreation, Sport and Racing (TOR), now Department of National Parks, Sport and Racing (EIS)
- Department of Justice and Attorney-General
- Former Queensland Treasury and Trade (TOR)

- Department of Communities, Child Safety and Disability Services
- Queensland Health – Tropical Public Health Unit
- Department of Tourism, Major Events, Small Business and the Commonwealth Games
- Department of Housing and Public Works
- Department of Energy and Water Supply
- Queensland Ambulance Service
- Department of Transport and Main Roads
- Department of Agriculture, Fisheries and Forestry (TOR), now Department of Agriculture and Fisheries (EIS)
- Department of Natural Resources and Mines
- Weipa Town Authority
- Cook Shire Council
- Mapoon Aboriginal Shire Council
- Port of Skardon River (Ports North)
- North Queensland Bulk Ports Corporation Limited
- Former Department of Sciences, Information Technology, Innovation and the Arts (TOR), now Department of Sciences, Information Technology and Innovation (EIS)
- Apudthama Land Trust
- Old Mapoon Aboriginal Corporation
- Cairns and Far North Environment Centre.

3.3.3 Public notification

In accordance with the statutory requirements, public notices were placed in *The Australian* and in *The Western Cape Bulletin* 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: <http://www.ehp.qld.gov.au/management/impact-assessment/eis-processes/skardon-river-bauxite-project.html>
- Gulf Alumina's web site: www.gulfalumina.com.au (EIS only).

3.4 Matters considered in the EIS assessment report

Section 58 of the EP Act requires, when preparing this EIS assessment report, the consideration of the following matters:

- the final TOR for the EIS
- the submitted EIS
- all properly made submissions and any other submissions accepted by the chief executive
- the standard criteria
- another matter prescribed under a regulation.

These matters are addressed in the following subsections.

3.4.1 The final TOR

The final TOR document, issued on 15 January 2015, was considered when preparing this assessment report. While the TOR were written to include all the major issues associated with the proposed project that were required to be addressed in the EIS, they were not exhaustive, nor were they to be interpreted as excluding all other matters from consideration. The TOR also outlined the scope of critical matters that should be given detailed treatment in the EIS.

Where matters outside of those listed in the final TOR were addressed in the EIS, those matters have been considered when preparing this assessment report. Special attention was given how the EIS addressed the matters that have been identified as critical for the proposed project:

- land, flora and fauna; including MSES
- water resources and water quality

- coastal environment
- MNES under the EPBC Act.

3.4.2 The submitted EIS

The submitted EIS was considered when preparing this assessment report. The submitted EIS comprised:

- the EIS that was made available for public submissions from 13 October 2015 to 24 November 2015
- the proponent’s summary of the submissions, received by EHP on 22 March 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 22 March 2016
- any amendments made to the submitted EIS because of the submissions (referred to as the ‘amended EIS’ in this assessment report), received by EHP on 22 March 2016.

In this assessment report, the term ‘EIS’ refers to the combined submitted EIS documents consisting of the Skardon River Bauxite Project EIS and amended EIS documents and response to submissions provided by the proponent.

3.4.3 Properly made submissions

EHP received 18 submissions on the published EIS within the submission period—one from DotE, 14 from state government organisations, as well as four non-government submissions. EHP also made its own submission on the EIS. One submission was received after closing of the submission period but was forwarded to the proponent for their information.

All government agencies that made submissions raising matters identified in their review of the EIS. They were also 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 all submissions are summarised in Table 4. 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 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 the reporting the findings and recommendations in this assessment report.

Table 4 Key matters identified in the submissions

Matter	Item identified in submission
Project description	<ul style="list-style-type: none"> • bed levelling and dredging post cyclone events • bulk diesel storage on the bank of the Skardon River • dust management • cyclone moorings • bushfire mitigation • approvals for ‘activities in the marine environments’, • impacts of waterway barriers • availability and utility of land for agriculture on land identified as agricultural land classification b class land. • adequacy of the runway for emergency and Royal Flying Doctor Service aircraft • weeds and pest management • lack of specific engineering design or management plan • no negative impacts from the proposed mining operations should be transferred onto other tenements
Water	<ul style="list-style-type: none"> • surface water quality impacts • water quality objectives – estuarine and marine • 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 • sediment capture and management

Matter	Item identified in submission
	<ul style="list-style-type: none"> cumulative impacts of the proposed increase of groundwater supply
Ecology	<ul style="list-style-type: none"> marine ecology impact assessment indirect and cumulative impacts to wetlands: Bigfoot Swamp, Lunette Swamp, the Skardon River supratidal wetland and Namaleta creek (freshwater and estuarine zones) offset requirements for MSES and MNES potential habitat to be impacted on MNES species, including marine plants and fish passage rehabilitation strategies in relation to listed threatened and migratory species cumulative impacts on MNES potential impacts due to bed levelling / or port infrastructure on marine plants potential impacts on marine fauna due to increase in vessel movement stygofauna surveys and assessment to species level
Social	<ul style="list-style-type: none"> workforce sourcing and travel requirements for policing purposes – contact and access appropriate and safe transportation of a sick or injured workers proposed 10km and 20km buffers for potential noise, vibration and air quality impacts to sensitive (human) receptors. social impact management and monitoring program resource and Energy Sector's <i>Code of practice for local content</i> capacity for mining services suppliers/providers in the local communities (Aurukun, Mapoon, Napranum, Northern Peninsula Area (NPA) and Weipa) and the broader Cape York region; and for health, emergency and police services in Weipa; and provide strategies to mitigate cumulative impacts on suppliers and services workforce management over the three month closure period decommissioning impacts - economic and physical social impact assessment and access to social services approved Cultural Heritage Management Plan road access to Mapoon Aboriginal and Torres Strait Islander Participation Plan mosquito management plan
Heritage	<ul style="list-style-type: none"> potential impacts on cultural heritage sites

3.4.4 The standard criteria

Section 58 of the EP Act requires that, among other matters, the standard criteria listed in schedule 4 of the EP Act must be considered when preparing the assessment report. The key standard criteria considered for the assessment of the proposed project were:

- the principles of environmental policy as set out in the Intergovernmental Agreement on the Environment (precautionary principle; intergenerational equity; conservation of biological diversity and ecological integrity)
- any applicable Commonwealth, State government plans, standards, agreements or requirements standards, agreements or requirements about environmental protection or ecologically sustainable development
- any applicable environmental impact study, assessment or assessment report
- the character, resilience and values of the receiving environment
- all submissions made by the applicant and submitters
- the best practice environmental management for activities (e.g. an EA)
- the financial implications of the requirements under an instrument, or proposed instrument (e.g. an EA)
- the public interest
- any relevant site management plan
- any relevant integrated environmental management system or proposed integrated environmental management system
- any other matter prescribed under a regulation.

3.4.5 Environmental objectives and performance outcomes

The EIS was assessed 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).

3.4.6 Prescribed matters for EIS assessment report

This assessment report fulfils the requirements of the prescribed matters in Section 9 of the EP Regulation under section 59(e) of the EP Act.

4 Adequacy of the EIS in addressing the TOR

This section of the assessment report discusses the adequacy of the EIS documents (including any amendments made to the submitted EIS) in addressing the final TOR, taking into account critical matters identified in the TOR, key concerns identified in the EIS documents and particularly those of significant interest raised in submissions. The level of detail of the assessment is proportional to the significance of the potential impacts of the project, particularly on environmental values. Matters that need further assessment are identified, particularly those required by the proponent to meet state policy and legislative requirements.

Specifically, the following matters are addressed for each values section:

- a brief outline of the assessment methodology
- a brief outline of the environmental values identified
- statement of impacts as identified in the EIS documents
- adequacy of the avoidance, minimisation and management measures proposed
- assessment on how the proponent responded to the EIS submissions and if amendments addressed the comments adequately
- summary of the adequacy of the EIS chapters, including any outstanding issues identified during the EIS assessment process and any recommendations to address these issues.

4.1 Introduction

EIS Chapter 1 – Project location provided a satisfactory introduction to the function of the EIS and the EIS assessment process; the proponent and its environmental record and environmental policy; the proposed project, its objectives and scope; legislation applicable to the proposed project; social and economic benefits of the proposed project as well as project alternatives; necessary project approvals process and the EIS document structure. The EIS adequately addressed the requirements of the TOR and gave an adequate introduction to the proposed project. EHP recommends that where the proponent's commitments outlined in EIS Appendix 1 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 Section 1.2.

4.2 Project description

The project was comprehensively described in the EIS. An overview of the proposed project is provided in section 2 of this assessment report.

4.3 Climate

The local and regional climatic conditions were described for the proposed project area in the EIS Chapter 9 – Climate. Historical extremes of climate were described and a risk assessment was detailed in EIS Table 9-2 to evaluate the potential impacts to the project post implementation of mitigation measures. Climate information was used in subsequent chapters of the EIS (particularly air and noise) to assist in making predictions about proposed project impacts. These documents were also updated and resubmitted by the proponent as a response to EIS submissions.

4.3.1 Existing environment

The local climate of the area was identified in the EIS as tropical with high rainfall during the wet season and hot, humid conditions during the dry season.

4.3.2 Natural hazards

The EIS identified the following natural hazards for the site: floods, cyclones, storm surge, bushfire and climate change. These are summarised below in further detail. Any risks associated with natural hazards are discussed in the EIS Chapter 23 – Hazards and safety and in section 4.15 – Hazards and safety of this assessment report.

4.3.2.1 Flood Conditions

Flood models used in the EIS identified risk to the proposed haul road crossing across Namaleta Creek and the wharf infrastructure at the port. The Namaleta Creek haul road crossing and associated culverts have been designed for a 1:50 year annual exceedance probability (AEP) design flood standard.

4.3.2.2 Tropical Cyclones and Extreme Winds

The EIS stated that tropical cyclone data showed 16 tropical cyclones within 100km of the project area between 1906 and 2006. There were no extreme category 5 cyclones (= severe tropical cyclones) in the Gulf coast of Cape York north of Weipa in the last 50 years. Five cyclones were tracked close to the project area in the last 20 years; all category 1 or 2 tropical cyclones with wind speeds of less than 165km/hr.

4.3.2.3 Storm surge

Storm surge risk was assessed in the EIS to be reasonably low based on the less intense cyclones recorded for the area and the low likelihood that a severe cyclone crosses at the same time as a spring high tide.

4.3.2.4 Bushfire

The EIS stated that the area is within a 'medium' bushfire risk associated with remnant savannah woodland based on bushfire hazard area maps in the State Planning Policy 2014. The project area was subject to bushfire between two and seven times in the last 15 years.

4.3.2.5 Climate change

The EIS concluded any changes to climate from increased greenhouse gas emissions as part of the proposed project would be within the natural variability of the existing climate due to the relatively short proposed 10 year project life. The land elevation where the proposed port area would be located is in excess of 4m Australian height datum (AHD) and the EIS concluded that sea level rise or storm tide inundation over the 10 year project life would not be an issue.

4.3.3 Conclusion and recommendations

The EIS addressed the requirements of the TOR in describing climate information including extreme values for a range of natural hazards including floods, bushfires and cyclones. The risk assessment of these natural hazards is described in section 4.15 – Hazards and safety of this assessment report.

Impacts of climate patterns in relation to discharges to water, air and the propagation of noise were discussed in the relevant EIS chapters such as EIS Chapter 6 – Water Management, EIS Chapter 19 – Air Quality and Greenhouse Gases, and EIS Chapter 20 – Noise and Vibration and the assessment of these sections are discussed, where relevant, in this assessment report.

Where the proponent's commitments outlined in EIS Appendix 1 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 Section 1.10.

4.4 Land use

This assessment report section on land use addresses the potential impacts on existing land uses associated with the construction and operation of the proposed project and the existing and potential for land contamination of the site. It also details proposed management measures to mitigate impacts on land tenures and uses. Geology, topology and soils were described in EIS Chapter 10 while Land use and land contamination were described in EIS Chapter 11. These documents were updated and resubmitted by the proponent in response to EIS submissions.

Potential impacts on native title rights and interests were discussed in EIS Chapter 24 – Cultural Heritage and Native Title and are summarised in section 4.17 – Cultural heritage of this assessment report.

4.4.1 Existing values

The EIS concluded that the project's operational activities would be the main source of potential impact to land tenures and uses. Land use and land contamination in relation to the proposed project were described in EIS Chapter 11 – Land Use and Land Contamination. The project's construction and operational activities were described in EIS Chapter 5 – Project Description, while rehabilitation and decommissioning were specifically addressed in EIS Chapter 7 – Rehabilitation and Decommissioning.

The project's land tenures and mining infrastructure as well as surrounding tenements and nearest sensitive receptors are summarised in section 2 of this assessment report. The project's granted three MLs (6025, 40069

and 40082) are located within the Old Mapoon Aboriginal Corporation trust area granted under the *Aboriginal Land Act 1991*, referred to as Deed of Grant (formerly in Deed of Grant in Trust (DOGIT)) land. The Namaleta Creek and Skardon River were recognised as unallocated state land. No stock routes subject to the *Land Protection (Pest and Stock Route Management) Act 2002* were identified within the project MLs.

The EIS stated that land uses surrounding the project site consist of bauxite exploration, cultural, recreation, hunting, boating and fishing. No agricultural, logging or pastoral activities are conducting within or close to the project area. The nearest protected area estate is Heathlands Regional Park located approximately 40km north-east of the proposed project. The nearest Strategic Environmental Area, a designated precinct under the Cape York Regional Plan, is located approximately 20km to the southwest of the project and covers an area of the Wenlock basin that is a separate catchment to the Ducie basin of the project site.

4.4.1.1 Topography

The proposed project area is located at the coast, generally low lying and flat with topography rising towards a ridge where bauxite deposits are located: between 5 and 20m AHD elevation where bauxite deposits occur; 3—8m AHD at the port infrastructure area and lower in creek and wetland areas. To the north of the project area is the Skardon River which divides into three principal tributaries to the east. Namaleta Creek drains an east-west orientated swamp which lies at the southern end of the project area. The creek flows west and then at the Mapoon Plain, changes direction sharply to flow to the south through mangroves, to discharge into Port Musgrave to the north of Mapoon. The Port Musgrave estuary also receives water from Dulhunty, Ducie and the Wenlock Rivers.

4.4.1.2 Geology

The EIS stated that the bauxite deposition in the mining footprint is located on part of the Weipa plateau and is partly dissected by drainage channels and consists of deeply weathered profile of bauxite, ferricrete and clay capping the Bulimba Formation. Exploration drilling near Skardon River landing indicated that the Bulimba formation extends about 17m depth and below this are shales and mudstones of the Rolling Downs formation. The unique nature of the bauxite deposits is that they are essentially a result of a deep weathering and oxidation process of the outcropping geology. The EIS described that the formation of the bauxite deposits is by a weathering process called lateritisation. The lateritisation process leads to the formation of relic soils rich in aluminium hydroxides, iron oxides, clays (kaolinite) and immobile elements, such as titanium and zircon. It is the high proportion of aluminium hydroxides (bauxite) that make this material sought after as a raw material for aluminium production.

The underlying sedimentary sequence listed from youngest to oldest was identified in the EIS as:

- Valley Fill Deposits – comprising sands, silty sands and clays (Cainozoic, Quaternary)
- Bulimba Formation – comprising sands and clayey sands (Cainozoic, Tertiary)
- Rolling Downs Group – comprising mainly of clays of marine origin (Mesozoic, Cretaceous).

The project's bauxite plateau, which runs along the ridge between the kaolin pits and the port infrastructure area, is characterised by superficial pisolitic gravels that overlie a sandy clay layer.

4.4.1.3 Soils, including acid sulfate soils

Soil testing was conducted on and adjacent to areas proposed for bauxite mining. The EIS stated that bauxite mining would be conducted on two basic soil types: the red kandosol and the redoxic hydrosol soil types.

Red Kandosol is found on the bauxite plateau with bauxite and lateritic subsoil: Red Kandosols have a topsoil depth of 10 to 20cm; a subsoil between 40 to 50 cm, covering between 1 to 6m of pisolitic bauxite, which is underlain by ironstone. The loamy topsoil is blackened by organic matter, while the subsoil is red with a gravelly structure increasing with bauxite pisolites at depth. The kandosol soil types have low potential to develop accelerated erosion when cleared of vegetation for mining or infrastructure development. The EIS stated that predominantly sandy surface soils, together with the low slopes on the bauxite plateau, facilitate infiltration and reduce the rate of run-off. Drop-off-slope areas, particularly near drainage lines have a higher erosion potential and would be avoided in mining.

Low lying seasonally flooded clay soil areas are redoxic hydrosol (deep duplex or gradational soil over mottled grey clay) associated with swampy areas.

The presence *Melaleuca quinquenervia* along Namaleta Creek indicated a natural presence of acid sulfate soils (ASS) or potential acid sulfate soils (PASS). The EIS concluded that the Namaleta Creek crossing construction may result in small volumes of ASS being exposed. At the port infrastructure area at the Skardon River, some construction activities at the Skardon River banks (for example, pile driving) may also occur in areas of PASS.

4.4.1.4 Site suitability

The Queensland Government's strategic cropping land trigger map does not extend to Cape York Peninsular. *The*

Cape York Peninsular Land Use Strategy (CYPLUS) Project from 1996 and the DAFF Queensland Agricultural Audit (2014) identified agricultural land class B (potential annual or perennial horticulture) on site. The EIS stated; however, that it is unlikely that any crops could be grown on site due to the low mineral content of the soils, the need for high levels of fertiliser application and the provision of irrigation. The EIS also recognised that a significant constraint to cropping and horticulture is the distance to market and associated high transportation costs.

4.4.1.5 Contaminated land

Relevant contaminated land environmental legislation was described in the EIS. A review of the Environmental Management Register and Contaminated Land Register was completed to identify any existing known or potential contamination sources. The EIS found no register in the Contaminated Land Register for the proposed project. However, Lot 11 SP204113 and Lot 13 SP204113 (found on the MLs) were listed in the Environmental Management Register due to activities undertaken on the former kaolin mine.

The following locations of known or potentially contaminated areas from the operation of the former kaolin mine were identified:

- the decommissioned wet plant area near Namaleta Creek in the southern part of the project area contains contaminated soil (from oil spills)
- the dry plant area located in the port infrastructure area contains oil contaminated refuse, waste oil and empty oil drums within bunded areas
- the existing landfill site situated to the west of the former kaolin mine has been used for scrap metal disposal and putrescible waste from the accommodation camp
- the existing sewage treatment plant has a 60 person capacity and treated effluent irrigated a grassed area north of the accommodation camp. During the care and maintenance mode of the site all effluent flows to a small wet weather storage pond
- a grease trap that functions as a septic tank is situated on the southern side of the mine camp and captures all kitchen waste water.

Both lots have been subject to the following notifiable activities as part of the kaolin mining activities:

- notifiable activity 7 – chemical storage
- notifiable activity 20 – landfill
- notifiable activity 29 – petroleum product or oil storage.

A full description of notifiable activities for the proposed project is found in section 3.2.1 of this assessment report.

4.4.2 Impacts and proposed mitigation measures

The major impact on land use was identified as a result of the proposed bauxite mining that would result in the clearing of approximately 1315ha mainly of *E. tetradonta*, for mining and infrastructure. Harvesting of timber prior to bauxite mining was considered in the EIS as logistically difficult with termite damage to mature *E. tetradonta* trees and distance to market seen as major limiting factors. The proposed post-mining land use, once rehabilitation is complete, is to return the land to pre-existing native vegetation communities. Refer to section 4.10 – Rehabilitation and decommissioning of this assessment report.

Impacts on visual amenity were found to be low due to the absence of sensitive receptors and access roads. The EIS concluded that during operation of the mine the landscape character impact level would be low. The impact would be reduced in the longer term through decommissioning and rehabilitation. The sensitivity of recreational users of the area to changes in visual amenity was also assessed as being insignificant due to the transient nature of views.

The EIS considered that ASS / PASS may be encountered during construction of the Namaleta Creek haul road crossing and during wharf construction activities at the Skardon River. It concluded that the area and volume of ASS would only be known once the final details regarding the designs and construction are decided for both areas. The EIS considered that during wharf construction activities it would be possible to keep any PASS below water level decreasing the risk of oxidation and the generation of acid. The proponent stated that once the footprints for wharf facilities are defined and construction methodologies finalised, an additional field investigation would be undertaken to identify ASS or PASS and if required, support the preparation of an ASS Management Plan. Should a detailed ASS Management Plan be required, then additional analysis within the construction footprint would be undertaken in accordance with the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland* (QASSIT, 1998).

Other impacts to land use identified in the EIS included:

- low potential for noise, vibration or dust impacts
- low risk of surface soil, surface water and groundwater contamination from unplanned and uncontrolled

- releases of sediment affected water or other contaminants such as hydrocarbons
- minor impacts to fishing activities in the Skardon River resulting from increased port activity
- non-mining waste and landfill management potentially producing contaminants
- transportation of dangerous goods and hazardous materials
- storage, handling and disposal of hydrocarbons, dangerous goods and hazardous materials
- potential for contaminant mobilisation associated with the decommissioning of the kaolin mine areas
- limited potential for ASS during mining but more during marine construction, noting that it would be unlikely that these would be encountered
- potential impacts on native title rights and interests.

These potential impacts, including the proposed mitigation measures, are discussed in more detail in the relevant sections of this assessment report.

4.4.3 Cumulative impacts

The EIS cumulative impact assessment considered other existing and proposed mines in the region and concluded that the cumulative impacts associated with land use and contamination would be likely limited to the proposed neighbouring Bauxite Hills Project. Cumulative impacts with the proposed Bauxite Hills Project would include impacts on:

- the combined area of land for mining would have the potential to reduce recreational, cultural and hunting areas and would likely to result in a medium (>10 years) to long term (>30 years) reduction in approximately 30km² of accessible land area until post mining rehabilitation is able to restore those areas to a comparable pre-mining land use
- the potential for uncontrolled release of contaminants into natural systems such as surface soils and surface and groundwater systems.

4.4.4 Conclusion and recommendations

The requirements of the TOR in relation to land use were adequately addressed in the amended EIS. The proposed post-mining land use once rehabilitation is complete is to return the land to pre-existing native vegetation communities. The EIS met the environmental objectives and performance outcomes for land and land use assessment under schedule 5 of the EP Regulation. Furthermore, the EIS also applied the legislative and policy context in relation to these requirements under the *Regional Planning Interests Act 2014* and the Cape York Regional Plan. EHP noted that the project's potential impact on land was dealt with across a range of specific chapters. For instance, management measures to address groundwater monitoring in relation to landfill contaminant limits and the bio-remediation pad were described in the EIS Appendix 15 – Surface Water and Groundwater Monitoring Plan. Each of the issues identified, including the proposed mitigation measures, are discussed in more detail in the relevant sections of this assessment report.

The Department of Agriculture and Fisheries (DAF), in its submission on the EIS contended that the loss of agricultural land classification B land should require the proponent to secure land for the permanent and temporary loss of impacted agricultural land; and ensure an 'uplift measure' within recommended conditions of approval. The proponent responded that it would not revise the EIS to reflect these proposed recommendations due to the land not being mapped as an area of regional interest or as a priority agricultural area; that it is not a strategic cropping area and therefore the *Regional Planning Interests Act 2014* would not apply to the proposed project. Furthermore, the proposed post-mining land use, once rehabilitation is complete, is to return the land to pre-existing native vegetation communities. Notwithstanding the comments by the proponent, DAF considers that the matter is not fully resolved. It is recommended that the proponent consults with DAF to resolve outstanding concerns.

In conclusion, mining activities must be carried out in accordance with the recommended conditions outlined in Appendix 1 of this assessment report to avoid any unacceptable impacts on the environmental values identified for the proposed project. Where the proponent's commitments outlined in EIS Appendix 1 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 Sections 1.11 and 1.12.

4.5 Water resources and water quality

A number EIS documents described water resources and water quality of the project area, namely EIS Chapter 12 – Water Values and Quality; EIS Chapter 13 – Hydrology and Hydrogeology; EIS Appendix 13 – Environmental Management Plan (EM Plan); EIS Appendix 14 – proposed draft EA conditions; and EIS Appendix 15 – Surface Water and Groundwater Monitoring Plan. These documents were also updated and resubmitted by the proponent in response to matters raised in the submissions on the EIS.

This section of the assessment report discusses the water quality and water resources of freshwater systems.

Estuarine and marine systems are discussed in section 4.9 – Coastal processes of this assessment report.

4.5.1 Surface water hydrology

The project area is primarily drained by the Skardon River and the Namaleta Creek at altitudes below 50m. An unnamed drainage feature of Namaleta Creek (referred to as Tributary 1) is situated between pits 14 and 15 to the south of the existing crossing of Namaleta Creek (Figure 6). The project area also contains a range of wetlands, including HES and GES wetlands (refer to section 4.6– Fauna and flora of this assessment report).

Catchment run-off in the wet season occurs from late December, as soon as local shallow aquifer and soil water stores are saturated. Surface run-off is relatively low with much of the surface flow occurring as a result of interflow (i.e. water that travels through the unsaturated zone without reaching the water table before discharging to a surface water body or stream) and base flow (i.e. the sustained flow in a stream that comes from groundwater discharge or seepage).

4.5.2 Surface water quality

The environmental values of existing waterbodies were considered high due to the remote location and lack of impact in the general area. The existing kaolin mine was not considered to have modified physical, chemical or other indicators. Overall the aquatic environment was classified in the EIS as containing high environmental values (as per the Environmental Protection (Water) Policy 2009; EPP Water).

Separate WQOs were established for the following four surface water systems:

- Namaleta Creek – freshwater
- Namaleta Creek – estuarine
- Wetlands (e.g. Bigfoot Swamp and Lunette Swamp)
- Skardon River – estuarine.

The EIS stated that some surface water monitoring occurred intermittently in the project area over the past 25 years, primarily to identify potential impacts of the former kaolin mine operations. Monitoring data showed elevated background concentrations of dissolved aluminium and dissolved copper. It was found that nutrients (total nitrogen and total phosphorus) within the wetlands were an order of magnitude higher than levels recorded in Namaleta Creek. Electrical conductivity, turbidity and pH varied across the different systems (freshwater / estuarine / wetlands).

A more comprehensive water monitoring regime started as part of the EIS assessment in February 2015 in order to inform on the site-specific WQOs for the four systems identified above. Hence, the EIS stated that a full suite of site-specific data on WQOs would be provided to EHP for each system once sufficient baseline water quality data is available. The proponent predicted that this would occur by mid to end 2017 based on the proposed sampling regime. In the meantime interim values were proposed in the recommended conditions based on existing monitoring data (where available), model mining conditions and the ANZECC & ARMCANZ (2000) guidelines (refer to Schedule E: Water of Appendix 1).

4.5.3 Surface water levels

Surface water level data was collected for five sites on the project area, including three sites along Namaleta Creek and one each at Bigfoot Swamp and Lunette Swamp. Knowledge of surface water level changes as part of the normal seasonal cycle prior impact would be used to assess potential impacts of mining on surface water levels on the receiving environment, especially wetlands, such as Bigfoot Swamp, Lunette Swamp, and the wetlands along Namaleta Creek.

The EIS concluded from the data collected that surface water level in all locations was seasonally variable with elevated water levels in the period January to April each year coinciding with the wet season. The variation in water level between wet and dry seasons was found to be between 0.88m to 4.2m, depending on the location with seasonal variability in Lunette Swamp and Bigfoot Swamp of 4.2m and 3.0m respectively. It was noted in the EIS that water level responded very directly to rainfall, with an almost immediate response in water level to rainfall events apparent in Namaleta Creek. The response to rainfall of the sites in Lunette Swamp and Bigfoot Swamp was more subdued.

4.5.4 Groundwater aquifers

The bauxite plateau is characterised by superficial pisolitic gravels that overlie a sandy clay layer, 8–12m deep. The aquifer depths towards the ridge line are relatively shallow, and transmissivities are expected to decline sharply with depth in the area.

The following primary aquifers were identified within the project area (from oldest to youngest):

- **Rolling Downs Group** – The Rolling Downs Group in the project area is dominated by mudstone / clays of marine origin. It is regarded as an aquitard or confining layer to the underlying artesian aquifer. It is possible that it extends to depths in excess of 250m in the Skardon River area. In the vicinity of the Weipa borefields it can be in excess of 800m below ground level. Groundwater supplies from the Rolling Downs Formation tend to be low (less than 0.5 L/s) and the water quality brackish to saline.
- **Bulimba Formation** – The Bulimba Formation was formed by the erosion of the Rolling Downs Group. It is of fluvial origin (that is, formed by deposits from rivers and streams), dominated by sands and clayey sands. This formation is deeply weathered (lateritic and ferruginous) and hosts the bauxite resource. The formation of the bauxite deposits formed through by a weathering process called lateritisation (refer to section 4.4.1.2) which lead to the formation of aluminium hydroxides (the DSO bauxite). The Bulimba Formations is incised by sandy, permeable deposits of palaeo-channels and extends to a depth of around 17m below surface near the port infrastructure area. Aquifer recharge is direct through rainfall and is relatively fast. Elsewhere in Cape York, this unit has been found to be a significant source to meet demands of communities, stations and operation usage for the mines at Weipa. In general, water quality from bores within the Bulimba Formation is generally fresh.
- **Alluvium, Valley Cut and Fill Deposits** – Alluvium, valley cut and fill deposits occur within drainage valleys and estuarine areas and comprise clayey and sandy alluvium channel deposits. The valleys containing these deposits are incised within mainly the Bulimba Formation but also in the Rolling Downs Formation. Yields from pumping investigations have indicated a sustainable range of 0.5 to 3 L/s from the sand aquifers. The water quality is fresh with laboratory tests showing total dissolved solids (TDS) level of below 105 mg/L.
- The valley deposits are possibly Pleistocene in age and contain shallow thin sand aquifers. The following sand aquifers in a palaeo-channel were identified along Namaleta Creek and near Lunette Swamp, and potentially near the port (
- Figure 8):
 - **The Bulimba Formation (Namaleta Creek) Sand Aquifer** is a thin shallow palaeo-channel sand aquifer in valley fill deposits and associated with the Namaleta Creek. The Namaleta aquifer is considered to be a meandering palaeo-channel within these valley systems and was also described as the ‘
 - **The Bulimba Formation (Lunette) Sand Aquifer** is a similar aquifer system to the Namaleta Creek sand aquifer, hosted within valley fill deposits that extend towards Lunette Swamp and further along drainage lines towards the coast.
 - A **shallow unconfined aquifer system at the port** infrastructure area has also been identified within the clayey gravel and sand aquifer. Yields from pumping investigations have indicated a sustainable range of 0.5 to 3 L/s from the sand aquifers. The water quality is fresh showing total dissolved solids (TDS) level of below 105 mg/L.
- **Surficial Beach Sand Deposits** – Surficial beach sand deposits occur along beach ridge sands of the Mapoon Plain, an irregular, narrow coastal lowland plain typified by cheniers (beach ridges), and are generally of limited areal extent and thickness, resting on marine muds and clays. They are directly recharged by rainfall infiltration and are likely to drain rapidly in dry season. These are possibly of Pleistocene and Quaternary age. Yields from these thin aquifers are expected to be limited, and any local bores would be vulnerable to the risk of saline intrusion from the sea. This aquifer system is located outside the proposed project impact area.

4.5.5 Groundwater levels

Groundwater level in all aquifers was found to be seasonally variable, with elevated groundwater levels in the wet season each year. The EIS stated that historic groundwater level data in the bauxite plateau displayed a significant seasonal fluctuation which varied between 3.9m and 10m from wet season to dry season, depending on the bore. The groundwater levels in the low lying areas near wetlands and drainage channels are shallow and lie typically at depths of 3m below ground level or less. It was concluded from the data that groundwater level responded very directly to recharge from rainfall, with an almost immediate response in groundwater level to rainfall events in all bores in the Bulimba Formation aquifers. The response to rainfall of the bores in the Rolling Downs Siltstone aquifer was more subdued.

The EIS identified the shallow aquifers (located in the Bulimba Formation) as the most significant aquifer systems in the project area, which can be intersected by palaeo-channels (the alluvium, valley cut and fill deposits) where saturated flow occurs in the palaeo-channels in coarse sand layers that are approximately 3m in depth. These shallow aquifers would be significant to the project as a potential water supply. The water table in the project area is a subdued reflection of the local topography with deeper levels on the bauxite plateau and shallower levels in the low lying drainage areas.

4.5.6 Groundwater quality

The EIS stated that some groundwater monitoring occurred intermittently in the project area over the past 25 years, primarily to identify potential impacts of the former kaolin mine operations. However the EIS also stated that further groundwater monitoring (groundwater level and quality) was undertaken since 2014/2015 in order to understand the reliability of water supply from shallow aquifers and to provide additional data to support this EIS. Some bores logs for bores were originally drilled by Cape Alumina Pty Ltd for the neighbouring Bauxite Hills Project.

WQOs and other monitoring data was obtained from the 20 existing bores. While the majority of the bores are located in the Bulimba Formation, three bores collected data from the deeper Rolling Downs Formation. Data collected so far indicated that pH is slightly acidic in all aquifers, ranging from 4.8 to 6.2 pH units. The weakly acidic pH was described as a reflection of the geology of the site. Electrical conductivity was found to be low; however some the bores intersecting the Bulimba Formation aquifers showed elevated EC which was explained with their proximity to tidally influenced portions of Namaleta Creek and Skardon River. Dissolved metals values are very low across almost all bores in all aquifers, when compared with the ANZECC & ARMCANZ (2000) trigger values. Exceptions, as per the surface water data, were dissolved copper and dissolved zinc. Both were found to be elevated across all aquifers with the highest levels recorded in the Rolling Downs Siltstone Aquifer. The EIS considered that these values of metals reflected the geology of the site. Nutrient values (total nitrogen and total phosphorous) were low across all bores, with no appreciable difference between aquifers. However, the EIS concluded that as there were limited test results for nutrients, additional sampling over time may lead to discernible differences being noted.

More bores would be installed to monitor groundwater and to identify potential impacts in various aquifers: three bores in the Bulimba Formation, and one each in the Namaleta Sand Aquifer, the Bigfoot Swamp Alluvial Sand Aquifer and the Lunette Swamp Alluvial Sand Aquifer systems. It was concluded that although groundwater data collected as part of the EIS showed variances between water quality at different shallow aquifers in the project area, one set of water quality objectives was proposed for all groundwater. As with the surface water WQOs, the EIS proposed interim WQOs until a full suite of site-specific data on groundwater WQOs would be provided to EHP once sufficient baseline water quality data is available.

4.5.7 Wetland hydrology

A conceptual model of the hydrology of the wetlands was provided in the EIS which assumed reasonable hydraulic continuity between the underlying aquifer and surface water. The model included the following factors: run-off, base-flow, seepage, rainfall, evaporation and surface outflow (Plate 2).

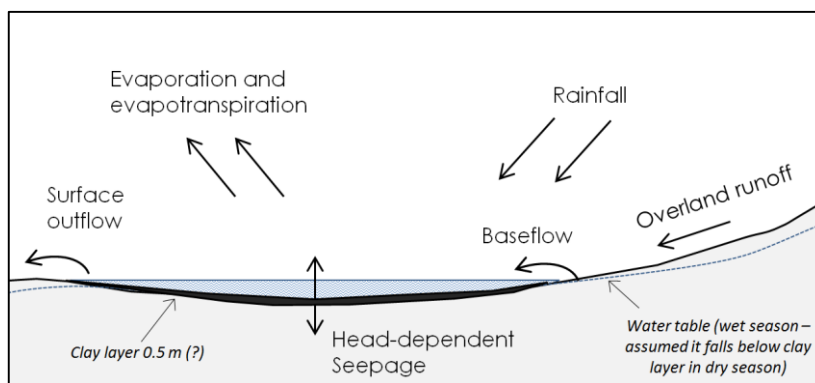


Plate 2 Swamp flow processes (Source: EIS Figure 13-24)

The model was calibrated for Bigfoot Swamp over the period August 2014 to March 2015, for which there were synchronous rainfall, evaporation and field data recorded as daily swamp water levels. The model indicated that Bigfoot swamp is affected by the behaviour of both the groundwater seepage and surface run-off. It was also found that run-off behaviour is potentially highly responsive to the onset of the wet season rainfall. For example, water levels in Bigfoot Swamp were found to vary naturally between the wet season and dry season with approximately 3m higher surface water levels recorded during the wet season. Similarly, information from groundwater levels demonstrated that the bores closest to Bigfoot Swamp fluctuated naturally up to 7m between wet and dry seasons.

4.5.8 Water supply and demand

The EIS identified the shallow aquifers (located in the Bulimba Formation) as the most significant aquifer systems to the project as a potential water supply. The water balance in the EIS showed that over an annual period, when the mine is at full production, the estimated water demand would be approximately 390 megalitres per annum. 355 megalitres per annum would be obtained from existing sources, comprising 195 megalitres per annum from the

kaolin pits and 160 megalitres per annum from existing shallow aquifer bores. The existing water supply would need to be supplemented with approximately 35ML per annum from new sources (i.e. new shallow aquifer bores). This would require additional subartesian water licence approvals under the *Water Act 2000* (Plate 3). However, the EIS concluded that these new water sources would only be required to meet peak demand during the dry season.

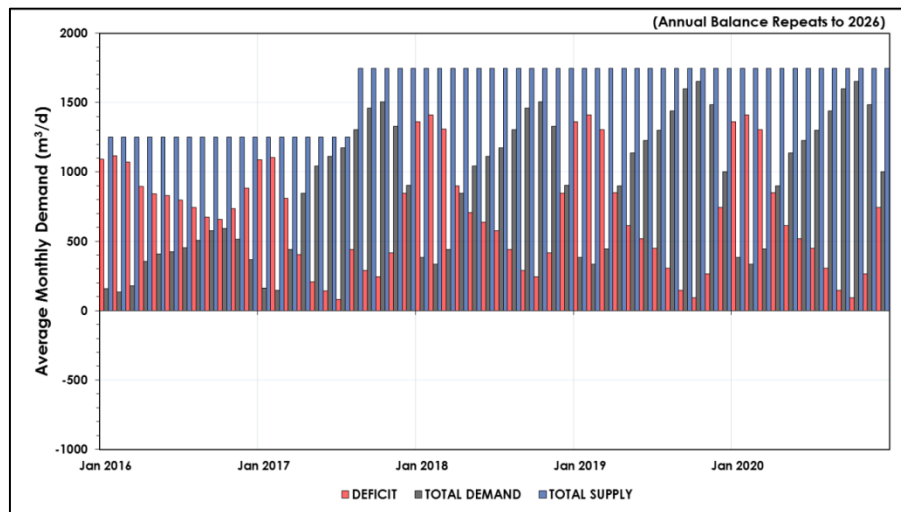


Plate 3 Proposed annual water balance repeats to 2026 (Source: EIS Figure 6-10)

In regards to water demand the EIS concluded that the highest demand would occur annually towards the end of the dry season and was estimated to be 1.6ML per day (Table 5). The existing water supply is capable of producing 1.2ML per day. The EIS concluded that not all of this water supply would be required on a daily basis, particularly in the wet season. The daily water demand changes over the course of a year with low water demand during the wet season and medium to high water demand during the dry season.

Table 5 Summary of the proposed water demand per day (adapted from EIS Table 6-3)

Category	Daily maximum (m ³ /d)	Daily average (m ³ /d)
Potable water	35	29
Dust suppression	1177	718
Dust extinction moisture allowance	374	209
Construction & maintenance	50	38
Washdown - plant & equipment	17	13
Total	1653 (m³/d) [1.6 megalitres]	1006 (m³/d) [1 megalitre]

4.5.9 Potential impacts

4.5.9.1 Impacts on water quality

The following potential impacts were identified in the EIS to surface water quality:

- stormwater run-off with sediment from haul roads, including the Namaleta Creek crossing area
- sedimentation of waterways during construction and vegetation clearing
- uncontrolled release of potentially hydrocarbon and chemical contaminated water from infrastructure areas
- low risk of uncontrolled release of water with high sediment loads from bauxite mining areas.

4.5.9.2 Impacts on groundwater quality

The following potential impacts were identified in the EIS to groundwater quality:

- localised impacts to groundwater quality hydraulically down-gradient from the landfill, treated effluent

irrigation area and bio-remediation pad through seepage

- uncontrolled release of potentially hydrocarbon and chemical contaminated water from infrastructure areas
- possible saline water ingress resulting from extraction of water from kaolin storages, borefield pumping for project water supply and mining of pits

4.5.9.3 Impacts on run-off

The EIS concluded that as a result of mining, during the wet season there would be a decrease in surface run-off and an increase in base-flow from increased aquifer recharge; and that during the dry season there would be an increase in base-flow as water was released from aquifer storage with limited surface run-off. The catchments most affected would be the catchments where the mining footprints would proportionally higher than the surrounding environment. An elevated recharge to the aquifer was predicted and a reduction of surface run-off over the wet season. The higher recharge rates would increase aquifer storage during the wet season, and when combined with reduced evaporative losses, lead to higher dry season base-flow rate particularly in the early years following clearing. However, the EIS stated that once an area is subject to rehabilitation, wet season run-off would decrease by less than 1% compared to pre-mining (natural) conditions.

4.5.9.4 Impacts on groundwater levels

The EIS groundwater modelling demonstrated that there were a number of complex interactions of project impacts on groundwater hydrology that may result in either increases or decreases to groundwater levels.

The following potential impacts were identified in the EIS to groundwater levels:

- short term, local drawdown in groundwater levels near mining areas
- little or no effect was identified from the supply of water from bores to the north of the project area
- temporary drawn down to between 0.1 and 0.2 m on the southern water supply bores on the reach of Namaleta Creek adjacent to existing kaolin mine
- potential drawdowns of 0.4m at reaches of the Namaleta creek immediately adjacent to the former kaolin mine due to mining of the pits and water supply from the Namaleta bore field.

Once rehabilitation has commenced the modelling concluded that recovery (elevation) in groundwater levels would occur as both active mining areas and progressive rehabilitation areas would exist in close proximity simultaneously, the modelled impacts on groundwater levels vary between drawdown and increased elevation.

4.5.9.5 Impacts on wetland hydrology

The project area and surrounding vicinity contained several ecological significant wetlands which may be indirectly affected by the proposed mining operations. The ecology of the wetlands is summarised in section 4.6.1.5, the impacts on the wetland hydrology are summarised below.

Groundwater modelling was undertaken in the EIS to simulate conditions of wetland systems, including Namaleta Creek, Lunette Swamp, Bigfoot Swamp, the supratidal wetland along the Skardon River South Arm; and wetland complexes to the west. The model considered the potential impacts of mining and water usage on local hydrogeology and its interaction with surface water bodies. Groundwater conditions were simulated for these wetlands in the years where pits would be operating locally under the mine plan.

Depending on mining and rehabilitation phases, potential drawdown or elevation (increased recharge) of groundwater were predicted:

- Namaleta Creek: between 0.4m drawdown and 0.2m elevation
- Lunette Swamp: between 0.1m drawdown and 0.1m elevation
- Bigfoot Swamp: between 0.1m drawdown and 0.3m elevation
- Skardon River South Arm supratidal wetland: between 0.2m and 0.3m drawdown
- wetland complexes to the west of Lunette and Bigfoot swamps: no modelled changes in groundwater levels.

Following mining and progressive rehabilitation, the modelling showed an increase of groundwater at Namaleta Creek, Lunette Swamp, Bigfoot Swamp and Skardon River by between 0.1m and 0.3m.

Groundwater levels and associated recharge and run-off behaviour in the areas under rehabilitation have been observed to stabilise after a decade, once rehabilitation is mature. The EIS concluded that progressive and final rehabilitation of mined areas would be important to promote the re-establishment of recharge to groundwater system to restore pre-mining seasonal behaviour.

The EIS concluded that little or no impacts would occur on the wetlands as groundwater and surface water levels fluctuate naturally between the seasons. It was stated in the EIS that information collected from bore water levels demonstrated that the groundwater levels closest to Bigfoot Swamp fluctuate up to 7m over the wet season and dry season. Similarly, surface water levels at Bigfoot Swamp were found to be approximately 3m higher during the wet

season. Nevertheless, the proponent committed to ongoing groundwater monitoring and modelling in order to improve understandings of the local hydrogeological regime and to support identification and prediction of potential impacts of mining and groundwater use in supply.

4.5.10 Cumulative impacts

The EIS identified the only project considered to have a cumulative impact with the Skardon River Bauxite Project would be the proposed neighbouring Bauxite Hills Project. It was concluded that the proposed Bauxite Hills Project is not located within the Namaleta Creek or Lunette Swamp catchments and hence there would be no cumulative impacts to surface water or groundwater quality in Namaleta Creek and Lunette Swamp systems.

Based on publically available information at the time of the EIS being written (i.e. the Bauxite Hills Project EPBC Act Referral), the Bauxite Hills Project would include mine pits surrounding Bigfoot Swamp. Therefore, the EIS concluded that there would be the possibility of cumulative water quality impacts on Bigfoot Swamp dominated by Bauxite Hills Project's activities. As Bigfoot Swamp occurs in close proximity to Bauxite Hills Project's mining leases, it is expected that both project proponents would undertake ongoing monitoring of water levels and quality and implement any management measures or investigations required based on the monitoring results.

The EIS concluded that the Skardon River Bauxite Project would not impact the catchments to the east of Skardon River South Arm where the mining is proposed for the Bauxite Hills Project. Nevertheless, the Skardon River South Arm (estuarine environment) may be impacted by run-off from both the west, mainly from the Skardon River Bauxite Project, but also small areas of the Bauxite Hills project, and from the east (Bauxite Hills Project). Hence, the EIS proposed 100m buffers around the fringing supratidal wetland area along the Skardon River South Arm, where this buffer extends into Gulf Alumina's mining lease. The EIS concluded that this area would be subject to ongoing and cooperative monitoring to establish if impacts are occurring and the potential cause of impacts. Hence, Gulf Alumina would seek to cooperate and consult with Bauxite Hills on all aspects of water management, water monitoring, identification of potential cumulative impacts and measures to mitigate impacts.

The EIS assessed cumulative impacts on the hydrology of wetlands based on Bauxite Hills Project's publically available information (EPBC Act Referral) which determined that Bauxite Hills Project would not impact on Lunette Swamp, Namaleta Creek or the Skardon River. Hence, the Skardon River Bauxite Project's EIS also concluded that there could be no cumulative impacts on these wetlands. However, modelling from both projects predicted impacts on Bigfoot swamp with an increase in groundwater levels of approximately 0.2m, as a result of the respective mining activities of each project. However, as groundwater levels (up to 7m) and surface water levels (up to 3m) of Bigfoot swamp are higher during the wet season, the EIS concluded that the cumulative impacts would not have large impacts on Bigfoot Swamp.

The EIS concluded that it would be expected that Bauxite Hills would implement a similar vegetation and aquatic ecology monitoring program in Bigfoot Swamp, with information shared between both proponents. Gulf Alumina committed to cooperate with the proponent of Bauxite Hills Project on implementation of management measures should these be required.

4.5.11 Mitigation measures

A wide range of mitigation measures were proposed in the EIS to ensure protection of surface and groundwater quality and the protection of environmentally sensitive areas. Mitigation measures were proposed for the following areas: mine pits, mine site sediment management, mine site sediment pond management, port infrastructure area, effluent irrigation area, erosion and sediment control, permanent haul roads, creek and tributary crossings, wetland water levels and saline water ingress. The EIS concluded that the risks to surface water and groundwater hydrology would be low to medium and that with the implementation of proposed mitigation measures, environmental objectives and performance outcomes would be achieved.

The EM Plan presented in EIS Appendix 13 provided a consolidated description of the proposed mitigation and management measures. The full list of commitments were summarised in EIS Appendix 1 – Commitments Register. The main mitigation measures proposed included, but were not limited to:

- A Surface Water and Groundwater Monitoring Plan was developed in EIS Appendix 15 that would also be part of a Receiving Environment Monitoring Program and would be used to:
 - monitoring of groundwater levels for all bores
 - monitoring of particular potential impacts on Namaleta Creek and Tributary 1 construction crossings; releases from kaolin mine water storages; salinity levels in estuarine / freshwater zones of Namaleta Creek; and potential groundwater contamination at the port infrastructure area from the landfill, bioremediation pad and from hydrocarbon management
 - identify potential groundwater contamination at the treated effluent irrigation area
 - detect saline water incursion
 - inform operational decisions such as borefield pumping

- develop criteria for determining whether the project has resulted in a 'change' in water quality
 - inform management and mitigation measures for impacts identified through monitoring.
- Development of an Erosion and Sediment Control Plan covering all aspects of the project including clearing, construction, operations, rehabilitation and decommissioning. The Erosion and Sediment Control Plan would be approved by a suitably qualified person (such as a Certified Professional in Erosion and Sediment Control).
- Run-off would be managed from the following mine domains:
 - mine pits
 - port infrastructure area
 - other infrastructure and activities (e.g. construction activities, haul roads, limited soil stockpiles).
- Groundwater monitoring bores would be installed up-gradient and down-gradient of the following project activities with the potential to contaminate groundwater:
 - landfill near the port
 - bioremediation pad – currently located near the former kaolin mine wet plant area but proposed for relocation to the landfill area at the port once prior to mining in this area (year 2 or 3)
 - hydrocarbon storage at the port
 - effluent irrigation area.
- Rainfall run-off entering the pits would be drained internally and contained within the pit, to be lost as evaporation and as recharge to local aquifers.
- Due to the nature of bauxite mining (shallow pits to approximately 6m depth, located at the top of localised catchments and hydrogeology of pit areas allowing seepage from pits) there would be no requirement for external storage and release of water captured within pits; hence surface water run-off would not occur as the mine floor (during and post-mining) would lie below the surrounding terrain.
- Monitoring of sediment deposition volumes to identify if a clean out would be required to provide sufficient storage for sediment loading in run-off and improve storage availability where in-pit sediment ponds are in use for dust suppression.
- Stormwater drains through the groundwater system; enhanced by deep ripping of the mine floor (prior to the wet season). Placement of soil and bauxite waste on the mine floor would be even and parallel to the mine floor topography, which should be closely parallel to the original land surface.
- The edges of mining areas would be battered down to a 1:5 slope and re-vegetated as for the mine floor. Erosion within mined areas would be negligible due to the generally flat or gently sloping terrain.
- Clearing and mining would not be carried out in areas of steep drop-off slope from the general terrain – expected generally to be within 100m of waterways and swamps.
- Ripping would be conducted along contour lines, or offset to direct water away from valleys, using Keyline principles (i.e. management of the topography to control run-off).
- Should a low area be (erroneously) mined on the edge of a mining area, with potential to allow out-flow of stormwater, earth bunds and silt traps would be constructed, as well as strategic contour banks on the mine floor to direct flow away from the area. All structures would be stabilized with establishment of grass cover, trees and shrubs.
- Resource surveys have been undertaken to inform the location of economic bauxite resources. This has resulted in accurate delineation of pits areas which avoid:
 - buffer zones around wetland and watercourses
 - low lying areas with the potential to require erosion and sediment control measures to prevent outflow from pits
 - unnecessary clearance of vegetation in areas that would not be mined.
- Annual vegetation clearing, windrowing and burning in advance of proposed mining within the same year (i.e. during the dry season) with limited potential for erosion following clearing activities. Following clearing and prior to mining, these areas would be stabilised by allowing regrowth of grasses and shrubs and to maintain viability of the soil for plant growth.
- Erosion mitigation measures specifically relevant to waterways and wetlands.
- Installation of a new sediment pond, and retention of the existing sediment pond for stormwater run-off from infrastructure and stockpile areas at the port infrastructure area (including the bauxite stockpile, paved areas, workshops and haul roads). These sediment ponds would be cleaned annually prior to the wet season.
- Drainage and erosion control would be implemented as a part of operational activities using measures such as erosion control blankets, check dams, filter fences and rock mattresses. Monitoring of erosion and sediment control structures would be carried out both pre- and post-wet season and following any significant events.
- Upgrade of the existing Namaleta Creek crossing: Currently, it is restricting normal flow during the height of the wet season. The upgrade would be designed to minimise impacts to fish passage, to support haul truck movements and to allow water flow in the creek. The culverts and deck level of the crossing were sized for a 1:50 year AEP design flood standard and would meet a design flood level of 1:100 years. Silt traps would be installed.

- To prevent any instream impacts including sedimentation to Namaleta Creek and the mapped HES wetland during the construction of haul road crossing, construction activities would be scheduled for the dry season, when the potential for impact is minimised due to low or no flow conditions when temporary impoundments are not expected to be required when working within the in-stream environments. This strategy would also part of avoiding disturbance of acid sulfate soil.
- Crossing of Tributary 1 (between pits 14 and 15): The design of the crossing would be in accordance with the *Department of Agriculture and Fisheries' Code for Self-assessable Development – Minor Waterway Barrier Works* and would ensure that all surfaces are adequately stabilised following the completion of the haul road construction, including revegetation of exposed embankment areas and temporary erosion and sediment control until construction is completed or drainage feature banks have been stabilised.
- Permanent haul roads would be designed in consideration of the *Department of Transport and Main Road's Road Drainage Manual* (2015) which provides technical guidance on road drainage, erosion, environmental and sediment control.

The proponent committed to the following actions should monitoring identify impacts on water quality and associated vegetation and aquatic ecology (in accordance with the proposed Vegetation and Aquatic Ecology Monitoring Program) over a period of 12 months (i.e. a wet season and dry season):

- Identification of the cause of the impact and implement management measures (e.g. engineering controls)
- Wetlands: where, over a period of three or more months, monitored water levels within swamps exceed the 90th percentile or fall below the 10th percentile of the modelled water levels, an investigation into the potential cause of the variance would be conducted.

The proponent committed to undertake the following mitigation measures where activities would result in a short term change (e.g. over a period of 12 months) in bore water levels affecting wetland and groundwater dependent ecosystems:

- cessation of pumping water from aquifers with hydrological connection to the groundwater dependent ecosystems
- changing the location of mining away from the affected groundwater dependent ecosystems and commence rehabilitation of the nearer mining area
- reducing mining activities in areas with potential for impact until such time as groundwater dependent ecosystems hydrology is restored
- increasing buffer zones around groundwater dependent ecosystems if it is found that the proposed buffer zones provide insufficient protection.

The EIS stated that should activities be demonstrated to have a long term impact on water quality and associated vegetation and aquatic ecology despite the implementation of management measures, then offsets would be proposed for significant residual impacts to MSES and MNES. Long term impacts would be measured over the operational life of the mine comparing vegetation and aquatic ecology pre mining to post mining (refer to section - Fauna and flora of this assessment report.

4.5.12 Conclusion and recommendations

Water resources and water quality were identified as critical matters in the TOR. Mitigation and management measures and commitments were proposed in the EIS to protect environmental objectives and performance outcomes of table 1, schedule 5 of the EP Regulation and the environmental values identified in the EPP (Water). The TOR and submissions received on water resources and water quality were addressed adequately in most parts. This assessment identified a number of matters, some of which require attention by the proponent:

4.5.12.1 Water quality objectives

EHP and the Department of Science, Information Technology and Innovation (DSITI) reviewed the proposed triggers, limits and sampling frequency proposed by the proponent in the EIS. Physical parameter data from surface water has been obtained in the EIS for some systems (e.g. from Namaleta Creek and freshwater wetlands) for a limited number of parameters (EC, pH, TDS and turbidity) since 2008. Since 2015 monitoring has included these parameters and selected metals. Data has been collected in the Skardon River since 2011. Relevant WQOs were identified where possible from locally relevant data and alternatively where the minimum data requirements to derive locally relevant WQOs were not met, default triggers were applied (ANZECC & ARMCANZ, 2000). In some instances there was only sufficient data to derive interim water quality objectives for some parameters. The proponent has committed to collecting additional monitoring data and establishing additional monitoring sites and groundwater bores. Additionally, DSITI recommended a requirement to measure water hardness (as CaCO₃) as a monitoring parameter as water hardness influences the toxicity of a number of metals. For example, the hardness of waters in Namaleta Creek may be lower than the range for which standard triggers have been derived for some metals which may result in increased toxicity.

In determining appropriate conditions to protect the environmental values of the receiving waters EHP must consider EP Act standard criteria and the character and the resilience of the receiving environment. The receiving environment for this proposed project is essentially unmodified (HEV water). In some location the receiving environment could be considered slightly modified due to the former kaolin mine.

The following guidelines have been used by EHP to recommend conditions stated in Schedule E: Water and Schedule F: Groundwater of Appendix 1:

- Section 6(2) of the EPP (Water), which prescribes two levels of ecosystem protection applicable when the receiving environment is essentially unmodified:
 - high ecological value waters—the biological integrity of an aquatic ecosystem that is effectively unmodified or highly valued
 - slightly disturbed waters—the biological integrity of an aquatic ecosystem that has effectively unmodified biological indicators, but slightly modified physical, chemical or other indicators.
- Section 14 of the EPP (Water), which prescribes the management approach to achieve ecosystem protection. These are:
 - high ecological value waters—the measures for the indicators for all environmental values are maintained
 - slightly disturbed waters—the measures for the slightly modified physical or chemical indicators are progressively improved to achieve the water quality objectives for high ecological value water.
- Section 7 of EPP (Water) which prescribes in the absence of site specific documents the *Queensland Water Quality Guidelines* (2009), as preferred means of establishing water quality objectives and applying appropriate guidelines.
- The *Queensland Water Quality Guidelines* (2009) for highly and slightly disturbed waters:
 - For water quality trigger levels and limits for groundwater potentially affected by the landfill, port, effluent disposal and bioremediation areas (Table F4 and F5 in Schedule F: Groundwater of Appendix 1) to identify physico-chemical stressors, such as turbidity and salinity to set triggers and limits not deviating from natural 20th, 50th and 80th percentiles. For toxicants such as aluminium, the recommended triggers and limits meet ANZECC & ARMCANZ (2000) trigger values that provide 99 percent species protection.

The recommended conditions in Schedule E: Water and Schedule F: Groundwater of Appendix 1 have applied this approach and used locally developed reference condition where available. The recommendations include a requirement for the proponent to undertake a Receiving Environment Monitoring Program (REMP) to develop site-specific WQOs (Schedule E: Water of Appendix 1).

4.5.12.2 Groundwater bores and hydrology model

EHP noted that the hydrology model to assess potential impacts on wetlands was based on groundwater bores located in the Bulimba and Rolling Downs formations. However, it is unclear from the EIS if bores at the wetlands are located in the palaeo-channels. Hence, the proponent has to ensure that the proposed new groundwater bores in Lunette Swamp and Bigfoot Swamp are located within the palaeo-channels to ensure appropriate monitoring of these aquifers to ascertain impacts on the wetland hydrology from mining.

In conclusion, mining activities must be carried out in accordance with the recommended conditions outlined in Appendix 1 of this assessment report to avoid any unacceptable impacts on the environmental values identified for the proposed project. Where the proponent's commitments outlined in EIS Appendix 1 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 Sections 1.13 to 1.15.

The proponent should update the following EIS documents to ensure consistency with recommended conditions:

- Environmental Management Plan (EIS Appendix 13)
- Surface Water and Groundwater Monitoring Plan (EIS Appendix 15)
- Vegetation and Aquatic Ecology Monitoring Plan (EIS Appendix 16)
- Marine Monitoring Plan (EIS Chapter 17)
- EIS Commitment Register (EIS Appendix 1).

4.6 Flora and fauna

A number of EIS documents described flora and fauna of the project area, namely EIS Chapter 13 – Hydrology and hydrogeology; EIS Chapter 15 – Terrestrial ecology; EIS Chapter 16 – Aquatic ecology and stygofauna; EIS Chapter 17 – Coastal processes; EIS Chapter 18 – Marine ecology; EIS Appendices 5, 6, 7, 8 and 12: containing the specialists assessment report on terrestrial and aquatic ecology, including MSES and MNES; EIS Appendix 16 – Vegetation and Aquatic Ecology Monitoring Plan. These documents were also updated and resubmitted by the proponent as a response to EIS submissions.

This section of the assessment report summarises the EIS conclusions for the terrestrial, aquatic and marine ecology. Matters of national environmental significance are discussed separately in section 4.8; and estuarine and marine systems are discussed in section 4.9 – Coastal processes of this assessment report.

4.6.1 Existing environmental values

The EIS identified the project area to be dominated by large tracks of *Eucalyptus tetrodonta* woodland, interspersed by waterways and wetlands. These are summarised briefly below.

4.6.1.1 Regional ecosystems

The EIS stated that according to Queensland certified regional ecosystem (RE) mapping (version 8) the proposed mining lease area contains 3457ha of remnant vegetation and 369ha non-remnant vegetation. Approximately 94% of the project area (excluding non-remnant) consisted of *E. tetrodonta* woodland (RE 3.5.2). All REs are listed as 'least concern' under the *Vegetation Management Act 1999* (VM Act) and 'no concern at present' under EHP's biodiversity mapping, with the exception of RE 3.2.10 (*E. tetrodonta*, *Corymbia clarksoniana* +/- *E. brassiana* woodland) which is listed as 'of concern' under biodiversity status. The proponent has adopted the certified RE maps for purpose of the EIS, although field surveys found some differences to the certified RE maps.

4.6.1.2 Terrestrial flora species

No flora species listed under the *Nature Conservation Act 1992* (NC Act) were found within the project area. Three species of plants of interest to conservation because of their limited distribution or restricted habitat requirements were found during the field surveys. These plants that are no longer listed under Queensland or Commonwealth legislation but remain poorly known:

- *Tinospora esiangkara*: a slender twining vine – found at the northern end of the lease on the western side of the haul road
- *Nepenthes mirabilis*: a herbaceous pitcher plant – a small population found on the northern banks of Namaleta Creek
- *Heterachne baileyi*: a small inconspicuous grass – a small population of approximately 150 individuals was found at the edge of woodland dominated by *E. tetrodonta* at the northern end of the project area.

Based on desktop review, the EIS identified several grass species listed under the NC Act with the potential to occur in the project area:

- *Paspalum multinodum* (near threatened) is known to occur on seasonally inundated, cracking clay plains with sedges and mangrove or near-coastal affiliated plants. The EIS concluded that it is highly unlikely that *P. multinodum* would occur on the land identified to be mined.
- *Lepturus geminatus* (near threatened) is known to occur in RE 3.2.10, which is potentially subject to approximately 76ha of mining (Table 7). The EIS concluded that the species, if present, could be impacted.
- *Dallwatsonia felliana* (endangered) is known to occur in woodland characterised by *Melaleuca saligna* and *Asteromyrtus symphyocarpa* in a wetland setting, such as Lunette Swamp, Bigfoot Swamp and Namaleta Creek wetlands. The EIS concluded that these wetland areas would not be impacted by the project and hence mining activities would not impact on *D. felliana*.

4.6.1.3 Terrestrial fauna species

Desktop searches as well as field searches identified either the occurrence (i.e. found on site) or the potential occurrence of several listed threatened terrestrial fauna species under the NC Act (). All of the listed threatened terrestrial species under the NC Act, except the beach-stone curlew, are also listed as threatened under the EPBC Act. An assessment of impacts for MNES species is found in section 4.8 of this assessment report. While some of the species either have been found to occur on site or may be possible to occur on site, not all species would be impacted by the proposed project (e.g. beach stone-curlew). Hence, the EIS further identified the potential habitat available in the project area which may be impacted by the project (project footprint).

Table 6 Listed threatened terrestrial fauna species under the NC Act, assessment of likelihood of occurrence and potential habitat to be impacted (adapted from EIS Chapter 15, EIS Table 15-13 and EIS Appendix 5)

Species	NC Act class ¹	Likelihood of occurrence	Potential habitat (ha) identified within the project footprint (i.e. areas to be cleared for mining activities)
Bare-rumped sheathtail bat (<i>Saccolaimus saccolaimus</i>)	Endangered	Possible	1209
Red goshawk (<i>Erythrorchis radiatus</i>)	Endangered	Possible	Nesting habitat: 179 Foraging habitat: 1209
Beach stone-curlew (<i>Esacus giganteus</i>) listed as <i>Esacus magnirostris</i> in the NC Act	Vulnerable	Found adjacent	0
Eastern curlew (<i>Numenius madagascariensis</i>)	Vulnerable	Possible	0
Masked owl (northern subspecies) (<i>Tyto novaehollandiae kimberlii</i>)	Vulnerable	Possible	Nesting: 1209 Foraging: 0 (forages in riverine gallery forest)
Spectacled flying-fox (<i>Pteropus conspicillatus</i>)	Vulnerable	Possible	1209
False water rat, water mouse (<i>Xeromys myoides</i>)	Vulnerable	Possible	0
Palm cockatoo (<i>Probosciger aterrimus</i>)	Near threatened	Found on site	1209
Chestnut dunnart (<i>Sminthopsis archeri</i>)	Near threatened	Possible	1209
Radjah shelduck (<i>Tadorna radjah</i>)	Delisted*	Found adjacent	0
Papuan sheathtailed bat (<i>Saccolaimus mixtus</i>)	Delisted*	Found on site	1209
Ghost bat (<i>Macroderma gigas</i>)	Vulnerable	Considered unlikely to occur**	–

¹NC Act Class – Conservation status under the NC Act.

*EHP notes that two of the species have been delisted since the EIS was written

**The EIS excluded the ghost bat as not likely to occur on site as it lacks the roosting habitat required by the ghost bat (large caves, mines or deep rock fissures). Furthermore, targeted surveys in 2014 and generic fauna surveys in 2010 and 2015 did not confirm presence of the species

4.6.1.4 Waterways

The EIS stated that the project area is primarily drained by the Skardon River and Namaleta Creek. The Skardon River is a predominantly estuarine system, consisting of freshwater systems within its upper reaches. Namaleta Creek is a localised drainage and tidally influenced, where mangrove communities begin approximately one kilometre west (downstream) of the existing crossing of Namaleta Creek. An unnamed drainage feature of Namaleta Creek (referred to as Tributary 1) is situated between pits 14 and 15 to the south of the existing crossing of Namaleta Creek (Figure 9). Skardon River and Namaleta Creek are categorised containing high environmental values (HEV); waters in which the biological integrity of the water is effectively unmodified or highly valued (HEV waterways). Refer also to section 4.9 – Coastal Processes in this assessment report for the ecological assessment of Skardon River.

4.6.1.5 Wetlands and waterbodies

The EIS used a range of different wetland mapping systems to identify wetlands in the project area, such as EHP's *WetlandInfo* mapping; *EHP's map of referable wetlands*; *EHP's Vegetation Management Act wetlands* and the *Directory of Important Wetlands in Australia* (DIWA). Field surveys were used to confirm mapped wetlands and

waterbodies and/or to identify unmapped wetlands. None of the wetlands are classified as MNES, although they are recognised as nationally important wetlands (DIWA).

A wide range of waterbodies was found to exist on the project site, some of which are classified as HES wetlands or general ecological significance (GES) wetlands based on referrable wetlands (wetland management areas), including Bigfoot Swamp and Lunette Swamp (Figure 9). A range of associated wetlands and waterbodies were found to be associated with Namaleta Creek, including estuarine, palustrine and lacustrine waterbodies (Figure 10).

For the purpose of describing freshwater and estuarine wetlands and assessing potential impacts, the EIS used the following wetland groupings:

- Lunette Swamp (GES wetland)
- Bigfoot Swamp (HES wetland)
- Namaleta Creek (freshwater sections; GES wetlands)
- Tributary 1 (HES wetland)
- supratidal wetlands to the west of the Skardon River South Arm (HES wetland)
- wetland complex to the west (HES wetland)
- wetland complex to the north of the project area (HES wetlands).
- Skardon River estuarine areas (HES wetlands)
- Namaleta Creek estuarine areas (HES wetlands).

The EIS stated that all wetlands were considered to be shallow aquifer groundwater dependent ecosystems and are recharged by surface water during the wet season and maintained during the dry season by seasonally perched groundwater recharge. The components of the hydrological cycle of wetlands (rainfall, run-off, recharge and base-flow, are summarised at a conceptual level in section 4.5.7 – Wetland hydrology of this assessment report based on information from the EIS.

4.6.1.6 Aquatic flora

No aquatic flora species listed under the NC Act were found within the project area. However, the *WetlandMaps* Tool identified the threatened wetland indicator species *Lycopodiella limosa* (near threatened under the NC Act) was recorded within Ducie drainage basin (within 50km of the project area). The EIS concluded that *Lycopodiella limosa* would have a moderate likelihood of occurrence on the project site.

4.6.1.7 Aquatic fauna

One listed threatened aquatic fauna species under the NC Act was found to be present on the project area: the estuarine crocodile (*Crocodylus porosus*) – near threatened. Several EPBC Act species were identified as likely to occur within the Skardon River. These are described in section 4.8 - MNES.

The macroinvertebrate communities found during field surveys were attributed in the EIS to be representative of undisturbed systems within the catchment and sampling period (monsoon season). A total of seven species of fish were captured and/or observed, including barramundi which require connectivity with the sea. None of the fish species identified are listed as threatened under the NC Act or EPBC Act.

4.6.1.8 Stygofauna

Four morpho-species were found within two higher taxa Oligochaetes and Acarina. The EIS stated that all stygofauna species recorded during the survey would likely have broad environmental tolerances and would be widely distributed in the southern Skardon River and Namaleta Creek catchment areas. Hence it was concluded that the recorded stygofauna are unlikely to be restricted to the project area and the cumulative impact areas with the Bauxite Hills project and consequently the likelihood of major impacts to stygofauna would be low.

4.6.1.9 Marine habitats

The Skardon River and adjacent inshore and off-shore areas encompassed several marine habitats (including saltmarsh, mangroves, seagrass, rocky reef, oyster reef, coral reef, and broad areas of intertidal and sub tidal soft substrates) as being either bare or variably colonized by macroinvertebrates and macroalgal communities.

4.6.1.10 Marine and estuarine fauna

Desktop searches carried out as part of the EIS identified the following listed threatened marine fauna under the NC Act:

- 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): highly 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): 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 project activities.

EPBC Act listed threatened marine species are summarised separately in section 4.8 of this assessment report. All of these species, except the estuarine crocodile, are also listed under the EPBC Act. No marine fauna field work was carried out as part of the EIS.

4.6.1.11 Weeds and pests

The EIS identified several weed species adjacent to heavily or frequently disturbed areas of the mining leases (i.e. former kaolin mine) but not along the edges of the existing haul road. The most serious weeds included *Hyptis suaveolens* (horehound), which has colonised a small area of land not much greater than 0.5 ha adjacent to the northern end of the haul road and the potentially problematic *Passiflora foetida* (stinking passionflower) on mounded soil near the former dry kaolin plant at the port infrastructure area. None of these introduced plants have dispersed beyond the original footprint of disturbed land. None of these species were listed as declared pest plant under the *Land Protection (Pest and Stock Route Management) Act 2002*.

The following pests were present on the site:

- pigs (*Sus scrofa*)
- dingo/wild dog (*Canis lupus familiaris* or *C. l. dingo*)
- cane toad (*Rhinella marina*) – the species was ubiquitous throughout the project site;
- Asian house gecko (*Hemidactylus frenatus*).

Pigs and dogs are classified as class 2 pests under the *Land Protection (Pest and Stock Route Management) Act 2002*.

The EIS identified a risk of transfer of pest species from other Australian ports where they have been introduced, and direct introduction via ballast water discharge or hull fouling from international trading vessels.

4.6.2 Potential impacts

4.6.2.1 Impacts on vegetation communities

The mining lease area covers a total of 3925ha, including parts of the Skardon River (Figure 1). Mining and infrastructure area would cover approximately 1453ha. The EIS stated that the area to be mined would include portions of the 138ha previously disturbed by kaolin mining, the airstrip and sections of the north-south haul road; while a further 1314ha would need to be cleared, consisting of remnant and non-remnant vegetation. Approximately 300m² of marine plants (mangrove communities) would be impacted for the wharf and barge load out construction and approximately 1ha of HES wetlands would be cleared for the Namaleta Creek crossing (upgrade to the existing crossing) and southern haul road crossing of Tributary 1 between Pits 14 and 15 (Figure 9).

It is noted that EIS calculations shown in EIS Chapter 15 on vegetation communities to be cleared did not include wetland communities along the proposed southern haul road or the vegetation communities to be cleared for the new wharf as they were stated in other EIS chapters. The proposed extent of clearing in these areas was included in this assessment report for accuracy (Table 7). It is also noted that the specialist report in EIS Appendix 5 stated clearing of 1374ha. For the purpose of the assessment report, the EIS Chapter 15 figures were used as shown in the table below.

Table 7 Regional ecosystems found in the project area to be impacted by the proposed project (adapted from EIS Table 15-2 and Table 15-10 and EIS Chapters 15 to 17)

Regional ecosystem	Description	VM Act class ¹	Biodiversity status ²	Total area on project site (ha)	Area to be cleared (ha)
3.5.2	<i>Eucalyptus tetradonta</i> , <i>Corymbia nesophila</i> tall woodland on deeply weathered plateaus and remnants	Least concern	No concern at present	2153	1126
3.2.10c	<i>Eucalyptus tetradonta</i> , <i>Corymbia clarksoniana</i> +/- <i>E. brassiana</i> woodland on stabilised dunes	Least concern	Of concern	365	76
3.3.50/ 3.5.22c	<i>Melaleuca viridiflora</i> low open woodland on current alluvial drainage lines / <i>Corymbia clarksoniana</i> + <i>Erythrophleum chlorostachys</i> + <i>Corymbia</i> spp. + <i>Eucalyptus</i> spp. woodland on plains	Least concern / Least concern	No concern at present / No concern at present	31	6
3.3.64a/ 3.3.9	<i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i> open sedgeland in drainage swamps in dunefields / <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	175	1*
3.1.1a / 3.1.3	Closed forest of <i>Rhizophora stylosa</i> +/- <i>Bruguiera gymnorhiza</i> (occurs as outer mangroves) Ceriops tagal +/- <i>Avicennia marina</i> low closed forest (extensive on intertidal areas)	Least concern / Least concern	No concern at present / No concern at present /	216	0.03**
non-remnant	--	--	--	369	105
Total vegetation clearing					1314.03***

¹VM Act Class – Conservation status under the VM Act.

²Biodiversity status – Conservation status under the EP Act

*These wetland communities are mapped as MSES wetlands.

**Ground-thruthing identified mangroves at the proposed new wharf which were not mapped on EHP's certified RE map.

Mangroves are classified as marine plants and hence are classified as MSES.

***According to EHP's calculation. The EIS stated 1314ha in Table 15-10, not including the proposed clearing of mangroves.

4.6.2.2 Impacts on terrestrial flora and fauna

The following potential impacts for terrestrial flora and fauna were identified:

- connectivity
- loss and modification of wildlife habitat
- habitat fragmentation and barriers to movement
- mortality of fauna species
- edge effects.

The EIS concluded that due to the low probability of listed threatened flora species occurring in the project disturbance area there would be no significant impacts to listed threatened flora species.

In regards to listed threatened terrestrial fauna species the EIS concluded that potential impacts would be mainly due to the clearing of vegetation, especially as a reduction in ecological function and some interruption of connectivity between remnant patches not affected by mining. The EIS concluded that loss of connectivity would

have the capacity to disrupt ecological function (fauna movements, plant gene flow) through the landscape in the short to medium-term, until some level of vegetation recovery has resulted in at least a shrub layer over cleared land.

Loss of fauna habitat was also identified following the loss of live trees, tree hollows, foraging resources (flowering trees and shrubs), ground layer habitats (fallen timber, bush rock and well-developed leaf litter). This would result in the loss of sheltering, foraging, nesting and roosting habitat available in the project area (Table 6). Associated direct impacts with the loss of vegetation were identified as displacement of fauna into surrounding areas resulting in competition for resources such as breeding structures such as suitable nest sites and hollows. Local populations of hollow-dependent species, especially listed threatened species, could be impacted, such the palm cockatoo or the bare-rumped sheath-tail bat.

The conclusions drawn in the EIS were that although potential nesting, breeding and/or roosting habitat for fauna would be available for these species, these habitats occur in abundance within a much greater area of land elsewhere surrounding the site. Therefore, the EIS considered it unlikely that the removal of hollow-bearing trees from the site would constitute a significant impact to locally occurring hollow-bearing dependent species.

According to the EIS, important habitats and vegetation types (e.g. wetlands) would not be directly impacted and would be protected through environmental buffers and retention of vegetation; although an impact of approximately 1ha of MSES would be impacted due to the construction of the wharf and the southern haul road (refer to section 4.7).

The impacts of fauna injury or mortality during vegetation clearing and collisions with vehicles or machinery were identified as minor in the EIS as they would be mitigated to a large extent through pre-clearing surveys and close supervision of clearing activities. Similarly, the EIS stated that the potential of weed infestation resulting from the edge effect would be managed through site cleanliness and progressive rehabilitation of mining areas.

4.6.2.3 Impacts to aquatic flora and fauna

The two proposed crossings at Namaleta Creek and Tributary 1 may impact on fish movements. However, the EIS stated that the design of the crossing would be in accordance with DAF's Code for Self-assessable Development – Minor Waterway Barrier Works which is designed to minimise impacts to fish passage. The EIS concluded that the upgraded crossing would result in the hydrology of the area more closely resembling its pre-disturbance condition. Impacts from sedimentation may also occur but would be mitigated by dry season construction activities and the application of a Surface Water and Groundwater Monitoring Program.

4.6.2.4 Hydrological impacts to wetland ecology

Modelling of impacts to wetland hydrology are summarised in section 4.5.9.5 and impacts on surface water and groundwater quality in sections 4.5.9.1 and section 4.5.9.2 of this assessment report. The EIS stated that as mining progresses there would be a short term, local drawdown in groundwater levels near mining areas; however, once rehabilitation has commenced recovery (elevation) in groundwater levels would occur. Following mining and progressive rehabilitation, groundwater would be elevated at Namaleta Creek, Lunette Swamp, Bigfoot Swamp and Skardon River by between 0.1m and 0.3m. However, the EIS also stated that taking into account that groundwater and surface water levels fluctuate naturally between the seasons, with groundwater fluctuations found at Bigfoot swamp up to 7m between and surface water levels approximately 3m higher during the wet season, little or no hydrological impacts would occur on the wetlands. Hence, it was concluded that impacts on wetland function as well as aquatic and fringing vegetation health would be negligible.

A reduction in local base-flow would have the potential to change normal tidal behaviour that could result in increased seasonal saline excursion upstream. Potential impact of saline water ingress on aquatic ecology would be also monitored. A Vegetation and Aquatic Ecology Monitoring Plan was presented in EIS Appendix 16 proposing an aquatic ecology monitoring program (aquatic fauna comprising macroinvertebrates and fish) and vegetation (all terrestrial vegetation and aquatic vegetation associated with wetlands and watercourses). Water monitoring data and ecological monitoring data would also be considered in combination to assess impacts on the receiving environment.

Impacts of sediments on the aquatic environment are summarised in section 4.14 – Flooding and regulated structures, and impacts on water quality due to waste are outlined in section 4.13 - Contamination and waste management of this assessment report.

4.6.2.5 Impacts to marine fauna

Impacts on marine flora and habitats due to wharf construction; changes to marine water quality or sediment quality from mining, construction, port activities or maritime operations; vessel wave action on shoreline vegetation; exposure of acid sulfate soils; increased sediment in marine waters impacting marine habitat are summarised in sections 4.5 (Water resources and quality), section 4.9 (Coastal processes) and section 4.14 (Flooding and regulated structures) of this assessment report. Hence, this section focuses on impacts on marine fauna.

The following impacts on marine fauna were identified in the EIS:

- changes in lighting potentially affecting marine fauna behaviour
- noise in the underwater environment potentially affecting marine fauna behaviour (e.g. piling noise during wharf construction)
- risk of direct strike of vessels on marine fauna
- potential for changes to marine water quality or sediment quality from mining, construction, port activities or maritime operations impacting marine habitat
- vessel wave action potentially affecting on shoreline vegetation
- risk of increased abundance and distribution of marine pests.

The EIS concluded that the project would not have any significant impacts on listed threatened marine species. Impacts from lighting on turtles was considered low in the EIS, so were impacts from boat strike on marine fauna given the slow speed of barge movements within the operational port limits. However, the EIS identified the potential for permanent or temporary hearing loss or behavioural responses in cetaceans, dugongs and turtles (to a lesser extent) from underwater piling noise. Therefore underwater noise mitigation measures (e.g. soft start procedure; impact cushions of plywood, nylon or other material; and/or bubble curtains) during the two month piling program were proposed in the EIS.

Predation of turtle nests by pigs and entanglement in discarded fishing nets were identified as a threat to turtles and the proponent proposed feral pig control and ongoing discussions with the Land and Sea Rangers, EHP and DotE.

Impacts on sawfishes and the spartooth shark are discussed in section 4.8 – MNES.

4.6.3 Cumulative impacts

4.6.3.1 Cumulative impacts on terrestrial ecology

Cumulative impacts were assessed based on the combined operations of Skardon River Bauxite Project and the Bauxite Hills Project. The EIS concluded that there would be no significant cumulative impacts on the terrestrial ecology as no listed threatened species were found on both project areas due to:

- the implementation of buffers and corridors to sensitive vegetation (riparian, wetlands and mangroves) which would reduce habitat fragmentation and ensure landscape connectivity is maintained between projects
- high mobility of conservation significant species (listed as possible in this habitat), that could access other habitat areas
- availability of *E. tetradonta* across the broader landscape that is not fragmented by other developments
- rehabilitation of mined areas.

Hence, no significant cumulative impacts on fauna due to the removal of *E. tetradonta* habitat were identified in the EIS.

The EIS stated that secondary cumulative impacts (hydrology, fire, weeds and pests) to fauna throughout the operational phases of the projects would be mitigated through commitment to management measures. Clearing of large tracts of *E. tetradonta* habitat could reduce connectivity and corridor linkages across that landscape if not maintained.

The proponent committed to cooperate and consult with Bauxite Hills Project to adopt strategic and adaptive management approaches for ecological impacts and the sharing of rehabilitation approaches. The EIS further stated that sharing of infrastructure, including port infrastructure, is subject to commercial arrangements and would be undertaken where this is commercially possible.

4.6.3.2 Cumulative impacts on aquatic ecology (including wetlands)

Cumulative impacts on wetlands due changes in hydrology are summarised in section 4.5.9.5 of this assessment report. It was concluded in the EIS that the proposed Bauxite Hills Project is not located within the Namaleta Creek or Lunette Swamp catchments and hence there would be no cumulative impacts to surface water or groundwater quality in Namaleta Creek and Lunette Swamp systems. The Skardon River Bauxite Project would not impact the catchments to the east of Skardon River South Arm where the mining is proposed for the Bauxite Hills project. However, the EIS stated that the Skardon River South Arm (estuarine environment) may be impacted by run-off from both the west, mainly from the Skardon River Bauxite Project, but also small areas of the Bauxite Hills Project, and from the east (Bauxite Hills Project). The EIS also outlined that publically available information from the Bauxite Hills Project (e.g. the EPBC referral) showed a proposed haul road and port within 100m of the Skardon River. To mitigate impacts, the EIS committed to buffers around the fringing supratidal wetland area along the Skardon River South Arm, where this buffer extends into Gulf Alumina's mining lease. The EIS also outlined potential cumulative impacts of both projects within upper catchment of the wetland complex to the west and north-

west of both mining leases in terms of surface water quality impacts. The EIS stated that potential cumulative impacts to surface water quality in wetlands would be subject to ongoing and cooperative monitoring to establish if impacts are occurring and the potential cause of impacts.

The proponent committed to seek to cooperate and consult with Bauxite Hills on all aspects of water management, water monitoring, identification of potential cumulative impacts and measures to mitigate impacts. The proponent also committed to cooperate and consult with Bauxite Hills Project to adopt strategic and adaptive management approaches for ecological impacts and the sharing of rehabilitation approaches.

4.6.3.3 Cumulative impacts on marine ecology

Based on the combined operations of Skardon River Bauxite Project and the Bauxite Hills Project the EIS identified the following potential cumulative impacts on marine ecology:

- underwater noise impacts through construction of a second wharf
- increased vessel traffic in Skardon River (up to 4000 movements per year): vessel strike, increased sedimentation, impacts on water quality, erosion on river bank due to propeller wash and vessel wake
- lighting
- clearing of marine plants (MSES; e.g. mangroves)
- introduced marine pests
- accidental spills and releases
- increased bulk carrier traffic.

Cumulative impacts on increased vessel movements, water quality, sedimentation, vessel movements, spills etc. are summarised in sections 4.5 – Water resources and quality; section 4.9 – Coastal processes; section 4.13 – Contamination and waste management; and section 4.14 – Flooding and regulated structures of this assessment report. The EIS concluded that none of these cumulative impacts pose a threat to the marine environment following mitigation measures proposed.

Impacts on marine fauna due to underwater noise (piling) identified in the EIS are discussed in section 4.12 – Noise and vibration. The EIS proposed several mitigation measures (e.g. bubble curtains) which would reduce the impacts on marine fauna. The EIS concluded no cumulative impacts due the separation distance between ports and low potential for simultaneous construction.

The proponent committed to cooperate and consult with Bauxite Hills on all aspects of ecological management.

4.6.4 Mitigation measures

Several management and mitigation measures were proposed in the EIS:

- Buffers zones and connectivity: Buffer zones protect wetlands and wetland associated ecosystems were proposed in the EIS consistent with the *Queensland Wetland Buffer Planning Guideline* (DERM 2011). Connectivity corridors that would not be directly impacted by mining would provide important corridors for the movement of a diversity of native wildlife species
- Progressive rehabilitation using native vegetation.
- Fire management.
- Habitat management: such as spotter catcher during targeted pre-clearance surveys; qualified environmental officer or nominated person would oversee vegetation clearing work; undertaking regular monitoring of excavations for trapped fauna; implementing speed restriction; restricting clearing of vegetation for mining and infrastructure only; undertaking pre-clearance surveys for listed threatened flora species; undertaking regular monitoring of the health and condition of retained vegetation and habitat and rehabilitation areas.
- Weed and pest management (including feral pig control).
- Species Management Plans and a Species Management Program would be developed considering pre clearance and clearance mitigation strategies. Based on the potential species habitat identified in the EIS species management plans may be prepared for:
 - red goshawk
 - masked owl
 - palm cockatoo
 - northern quoll
 - spectacled flying-fox
 - bare-rumped sheathtail bat
 - black-footed tree rat
 - Papuan sheathtail bat
 - chestnut dunnart
 - *Lepturus geminatus*
 - *Cajanus mareebensis*

- turtles: in consultation with Traditional owners, EHP, and DotE.
- Environmental training for staff and contractors
- Vegetation and Aquatic Ecology Monitoring Plan: Monitoring wetlands and watercourses, but also some terrestrial ecosystems at risk of indirect impacts (e.g. change to hydrology) compared to reference sites.
- Surface Water and Groundwater Monitoring Program and ongoing groundwater modelling.
- Controls to prevent accidental release of chemicals and hydrocarbon and fuel (refer to sections 4.9 and 4.13 of this assessment report).
- Underwater noise mitigation measures (during piling; refer to section 4.12.2.2 – Underwater noise).
- Mangrove pre-clearance survey.
- Marine Vessel Operations Plan identifying restricted access areas and speed zones.
- Monitoring of turbidity, seagrasses, pest species and bank vegetation.
- Pre-disturbance surveys of the proposed off-shore mooring areas.

4.6.4.1 Vegetation and Aquatic Ecology Monitoring Plan

The EIS proposed a Vegetation and Aquatic Ecology Monitoring Plan to identify any potential impacts on HES wetlands. The EIS stated that should any impacts be detected through monitoring, the following mitigation measures would be implemented:

- ceasing pumping water from aquifers with hydrological connection to the wetlands
- altering the location of mining away from the affected wetland and commence rehabilitation of the nearer mining area
- reducing mining activities in areas with potential for impact until such time as wetland hydrology is restored.
- increasing buffer zones around wetlands if it is found that the proposed buffer zones provide insufficient protection.

4.6.5 Conclusion and recommendation

Terrestrial and aquatic (marine and freshwater) ecology were identified as critical matters in the TOR. Survey methods and desktop searches were used in the EIS to identify biodiversity values on the project area. The EIS acknowledged that the project area is located within an environment containing HES and HEV terrestrial, aquatic and marine/estuarine values. The proponent proposed a range of management and mitigation measures as well as commitments to ensure protection of environmental values identified on site. The TOR and submissions on the EIS concerning potential impacts on flora and fauna were addressed adequately in most parts. While substantially agreeing with the findings in the EIS this assessment identified a number of matters, some of which require attention by the proponent:

EHP notes that the EIS impact assessment included HES wetlands, in particular Lunette Swamp and Bigfoot Swamp. EHP also notes that the EIS concluded that there would be no significant changes to the hydrology of these systems and that the proponent has outlined a Vegetation and Aquatic Ecology Monitoring Plan to identify any potential impacts and proposed mitigation measures if any impacts are detected. EHP accepted this conclusion but highlights the fact that while modelled changes to water levels may be within the natural range; it is also the seasonal timing, the frequency and duration of inundation that may influence impacts. Hence, EHP recommends conditions to ensure the protection of these HES wetlands (see Schedule E: Water of Appendix 1). However, it must be noted, that if any impacts occur on these systems despite all mitigation measures and commitments, rehabilitation of the wetlands would be required and an assessment to determine whether offsets under the EO Act would apply in accordance with Queensland's Environmental Offset Policy (pursuant section 4 – wetlands and watercourses– of the *Significant Residual Impact Guideline*).

The EIS stated that there is an abundance of nesting and roosting habitat on and around the project site for listed threatened species and identified that 1209ha of threatened species habitat occurs on the project site associated with the area of *E. tetradonta* woodland. Mature hollow bearing trees are likely to occur in locations within this woodland. No field surveys were carried out targeting mature hollow-bearing trees in the woodland to provide an informed and refined estimation on where the mature hollow-bearing trees are likely to be. Hence, the clearing of 1209ha of the *E. tetradonta* woodland containing potential habitat is deemed by EHP to be a significant residual impact on local populations of listed threatened fauna (e.g. red goshawk, bare-rumped sheath-tail bat, masked owl). EHP recommends the proponent to carry out a fine scale survey of the project site to establish if hollow-bearing trees occur in areas that would be cleared. As these species are also MNES, EHP recommends offsets for these species under the EPBC Act (refer to section 4.8 and Appendix 2 of this assessment report).

Review of the EIS identified a high potential for impacts on the marine environments, including marine ecology. The Skardon River is classified as HEV waters supporting listed threatened and marine species. The re-development of a port and the proposed barge movements (up to 2000 annually) would impact on the environmental values associated with the Skardon River, despite the management and mitigation measures proposed. Hence, EHP recommends offset are required for a number of marine species under the NC Act and the EPBC Act (refer to

section 4.8 of this assessment report).

The proponent is reminded that regardless of the commitments provided, pre-clearing surveys will need to be carried as required under the NC Act to identify any breeding places (including for species not listed as threatened). Should any breeding places be identified as part of these surveys, species management plans will be required.

EHP notes the commitment to prepare species management plans for species identified in section 4.6.4 of this assessment report (red goshawk; masked owl; palm cockatoo; northern quoll; spectacled flying-fox; bare-rumped sheath-tail bat; black-footed tree rat; Papuan sheath-tail bat; chestnut dunnart; *Lepturus geminatus*; *Cajanus mareebensis*; turtles).

The species management plans for terrestrial species must include as a minimum:

- The protection of woodlands, wetlands, riparian and estuarine areas and their buffers from mining and associated infrastructure. The buffer system as a minimum must comply with condition G4 in Schedule G: Land and rehabilitation of Appendix 1.
- The appropriate management of retained habitats for fauna including appropriate fire regimes, weeds, management of edge effects.
- Requirement for pre-clearance surveys to identify hollows or other breeding, roosting and nesting sites for fauna on land.
- For the red goshawk; a requirement that pre clearance surveys are undertaken within 1km of water courses or wetlands.
- For the bare-rumped sheath-tail bat; a requirement to undertake an additional pre-clearance targeted bat survey, using broad spectrum acoustic monitoring and methods that would most likely result in the detection of this species.
- If any nests/breeding places (particularly for bare-rumped sheath-tail bat, red goshawk or masked owl) are found within mining areas, a 200m buffer around the nesting tree must not be mined until the end of the breeding season (being until fledglings / offspring no longer use the nest / roost for habitat).
- Consideration of breeding/nesting places for the black-footed tree rat and the palm cockatoo, which are listed under the EPBC Act and were found during EIS surveys. Impacts on breeding places must be avoided.
- Mitigation measures such as the introduction of additional hollows in retained bushland.
- Plans relating to the relocation of crocodiles, if required due to safety concerns (e.g. risk to persons), must occur in consultation with EHP.

No management plans for cetaceans were proposed despite that potential noise impacts on cetaceans during the wharf constructions were identified in the EIS (refer to section 4.12.2.2 – Underwater noise). While suitable mitigation measure and commitments were proposed in the EIS, EHP recommends that a species management plan for cetaceans should also be prepared together with the proposed turtle management plan, containing management and mitigation measures for all potential impacts (such as boat strike, but especially noise impacts as a result of the proposed piling activities). EHP also recommends conditions to ensure the protection of marine fauna during piling (H8 in Schedule H: Coastal structures of Appendix 1).

The species management plan for marine fauna (marine fauna management plan) should include as a minimum:

- Requirements of the Nature Conservation (Wildlife Management) Regulation 2006.
- Procedures for how the 500m exclusion zone for marine fauna will be achieved including monitoring and reporting to gauge its effectiveness.
- Recording all species found on a website or on a suitable database which can be provided to EHP on request.
- Enforcement of a 6 knot maximum speed limit for vessels in the Skardon River, and its mouth, to allow marine fauna to avoid vessels. If monitoring finds that fauna are being affected and speeds are too fast, then the project should seek to reduce the speeds to what will result in fewer impacts on marine fauna.
- Management of lighting to minimise impacts on marine waters and turtles.
- Management of pile driving so that impacts to marine fauna are minimised (see condition H8 in Schedule H: Coastal structures of Appendix 1).
- Management of litter and debris so that these are not eaten by marine fauna.
- Links to the marine works EM Plan so that marine fauna are assisted and protected in the event of a contamination or spill.
- Ensure that access to turtle breeding places is restricted and feral animals that threatened turtle nests are managed.
- The proponent must develop, implement and submit to the EHP the species management plans prior to the commencement of any coastal or marine works associated with the project.

EHP acknowledged the commitment that further sampling of freshwater aquatic flora and fauna and other proposed

monitoring programs would be carried out prior to the commencement of construction and operations.

Where the proponent's commitments outlined in EIS Appendix 1 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 Sections 1.14, 1.16 – 1.19; and 1.27.

4.7 Matters of state environmental significance

The EIS assessed the potential impacts of the project on prescribed environmental matters (matters of state environmental significance; 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 EA under the EP Act 1994 is a prescribed activity for the purposes of the *Environmental Offsets Act 2014* (EO Act).

The EO Act requires offsets to compensate for residual impacts on MSES. The EIS identified the prescribed environmental matters under the EO Act that are MSES that may be impacted by the project. A significant impact assessment was undertaken to determine if any significant residual impacts would occur on the following MSES:

- 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)
- waterway providing for fish passage
- marine plants.

4.7.1.1 Regulated vegetation (intersecting a watercourse)

This MSES is only relevant to watercourses shown on the *VM Act watercourse map*. Namaleta Creek is the only mapped VM Act watercourse relevant to the assessment. The EIS in Section 16.9.2 adopted the incorrect distance from the defining bank for this subregion and therefore; hence, the conclusion that there would be no clearing of regulated vegetation within the defining banks is incorrect.

The project area is located within the Cape York Peninsular bioregion and within the Weipa plateau biogeographic subregion. Therefore, and as described in Appendix 3 of the Queensland Environmental Offsets Policy V1.1 (QEOP), the defined distance from a watercourse stream order 1 in the Cape York Peninsular bioregion is 25m from the defining bank (not the centre line). The project may have an impact on regulated vegetation within 25m of the defining bank of the watercourse.

Notwithstanding this, the area of impact of regulated vegetation 25m from the defining bank is expected to be very small and when considering the structural category of RE 3.3.64 (very sparse)/3.3.9 (mid-dense) a significant residual impact under the QEOP *Significant residual impact guideline* (2014) is unlikely. EHP is satisfied that the project would not have a significant impact on regulated vegetation.

4.7.1.2 Regulated vegetation (intersecting a wetland)

The EIS stated that the project would have a significant impact on the following regulated vegetation (intersecting a wetland):

- 0.5ha of for clearing of the Namaleta Creek crossing
- 0.5ha for the clearing of the southern haul road crossing in Tributary 1 wetland.

EHP is satisfied that there would be a significant residual impact of 1ha of regulated vegetation (RE 3.3.64a/3.3.9) intersecting a wetland and hence, offsets for this impact on MSES would be required.

4.7.1.3 Wetland (HES wetland)

Under schedule 2 of the EO Regulation a wetland of HES shown on EHP's map of referable wetlands is a MSES. The EIS stated that the only HES wetland impacted by the project would be clearing of 0.5ha HES wetland in Tributary 1 for the southern haul road crossing. The impacted area of 0.5ha also overlaps with the impact on the MSES regulated vegetation (intersecting a wetland) as described in section 4.7.1.1 above. As the clearing of 0.5ha of vegetation in Tributary 1 already requires offsets for clearing the MSES regulated vegetation (intersecting a wetland), no further offsets are required.

Mining operations were proposed in close proximity to HES wetlands Bigfoot Swamp, Lunette Swamp and supratidal wetlands. The EIS concluded that there would be no direct or indirect impacts on these wetlands (refer to

section 4.5.9.5). 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 (Schedule E: Water of Appendix 1). The proponent must note that in case monitoring would show that impacts cannot be avoided and mitigated and residual significant impacts would occur on these HES wetlands, offsets would be required at a later stage.

4.7.1.4 Wetland (HEV waters)

Under schedule 2 of the EO Regulation a wetland in HEV waters is a MSES. The wetlands within and surrounding the project area were considered in the EIS to be HEV waters, including Namaleta Creek. 0.5ha of HEV water would be impacted by the Namaleta Creek crossing. The impacted area of 0.5ha also overlaps with the impact on the MSES regulated vegetation (intersecting a wetland) as described in section 4.7.1.1 above. As the clearing of 0.5ha of vegetation for the Namaleta Creek Crossing already requires offsets for clearing the MSES regulated vegetation (intersecting a wetland), no further offsets are required.

4.7.1.5 Protected wildlife habitat

The EIS identified nine terrestrial fauna (Table 6) and nine marine species (section 4.6.1.10) listed as endangered and vulnerable under the NC Act with a possible or confirmed occurrence within the project area. The EIS only provided information on the residual impacts on the terrestrial species and the estuarine crocodile but not for the marine fauna.

All of the listed threatened terrestrial fauna species under the NC Act, except the beach-stone curlew, are also listed as threatened under the EPBC Act. The EIS concluded that the criteria for assessing significance under the EPBC Act for fauna is similar to the Queensland significant residual impact criteria, and hence the conclusions reached for each species about significant residual impacts has been taken to apply to both Commonwealth and State matters in the EIS. EHP is satisfied with that approach, although does not agree with the conclusions for some species.

The EIS concluded that there were 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 spectacled flying fox, false water rat; eastern curlew; beach stone-curlew; estuarine crocodile, provided avoidance and mitigation measures were put in place.

However, EHP is not satisfied that there is unlikely to be a significant residual impact on habitat for the following wildlife on the basis that the loss of habitat would disrupt ecologically significant locations (breeding and feeding), that there is suitable habitat on site, and as there is uncertainty about the absence of the species or conversely, their presence cannot be disproved:

Red goshawk (endangered)

The EIS concluded that the project would not have a significant impact on the red goshawk. However, the EIS also stated that the project has the potential to result in the loss of 1209ha of foraging habitat and 179ha of nesting habitat in the project's footprint area. The closest red goshawk record is from near Weipa, approximately 40km south of the project area. The loss of 1209ha of foraging habitat and 179ha of nesting habitat would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to be in decline.

The proponent is required to manage impacts to breeding places for this species in a species management program under the NC Act. Notwithstanding management and mitigation measures, EHP concluded that there is likely to be a significant residual impact on 1209ha of breeding and feeding habitat and that offsets would be required under the EO Act.

However, since this species is also listed as endangered under the EPBC Act an assessment was carried out in section 4.8 of this assessment report and offsets would need to be delivered as per the requirements of the approval under the EPBC Act.

Bare-rumped sheath-tail bat (endangered)

The EIS concluded that the project would not have a significant impact on the bare-rumped sheath-tail bat. However, the EIS also stated that the project has the potential to result in the loss of 1209ha of habitat in the project's footprint area.

Notwithstanding management and mitigation measures, EHP concluded that there is likely to be a significant residual impact on 1209ha of breeding and feeding habitat and that offsets would be required under the EO Act.

However, since this species is also listed as critically endangered under the EPBC Act, an assessment was carried out in section 4.8 of this assessment report and offsets would be delivered as per the requirements of the approval

under the EPBC Act.

Masked owl (vulnerable)

The EIS concluded that the project would not have a significant impact on the masked owl. However, the EIS also stated that the project has the potential to result in the loss of 1209ha of nesting habitat in the project's footprint area.

Notwithstanding management and mitigation measures, EHP concluded that there is likely to be a significant residual impact on 1209ha of breeding and feeding habitat and that offsets would be required under the EO Act.

However this species is also listed as vulnerable under the EPBC Act, an assessment was carried out in section 4.8 of this assessment report and offsets would be delivered as per the requirements of the approval under the EPBC Act.

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 4.8 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 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 Skardon River Bauxite Project and the Bauxite Hills Project.

Notwithstanding management and mitigation measures, EHP concluded that there is likely to be impacts to 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 map and quantify and the EO Act required offsets for significant impacts to habitat for MSES wildlife, not a direct impact to the species.

EHP is therefore recommending 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 4.8.6).

Because the Australian Government will impose a condition requiring offsets for the same matter, the proponent will not be required to provide offsets again under the EP Act.

4.7.1.6 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 Namaleta Creek and Tributary 1 crossings would be the only potential waterway barriers constructed as part of the project. The spatial data layer *Queensland Waterways for Waterway Barrier Works* showed that both crossing would a moderate risk of impact for fish passage. The EIS also concluded that the upgraded Namaleta Creek crossing would improve fish passage compared to the current crossing design and that based on aerial imagery and site knowledge and surveys, the EIS stated that Tributary 1 was not considered to be a watercourse providing for fish passage. The EIS concluded that the project would not have a significant residual impact on fish passage as it would be constructed in accordance with DAF's *Code for Self-assessable Development – Minor Waterway Barrier Works*, and hence the project would not result in any negative outcomes for fish populations. EHP is satisfied with the proponent's conclusions that there will not be a significant residual impact of waterway providing for fish passage.

4.7.1.7 Marine plants

Marine plants within the meaning of the Fisheries Act are classified as MSES. The EIS identified potential impacts on the marine plants, mangroves and seagrasses.

The construction of the proposed wharf would require disturbance of fringing mangrove of a maximum of 300m²; however, trimming of vegetation is proposed for construction purposes wherever possible. DAF reviewed the amended EIS and was satisfied that the loss of 300m² of mangrove would result in a significant residual impact and that offsets consistent with the EO Act would be required.

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 clearance 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, no offsets are required at this stage. However, should significant impacts on seagrass occur due to project activities (either because of vessel impacts or due to increased turbidity from run-off) and mitigation measures are unsuccessful, offsets would be required at a later stage.

4.7.2 MSES offsets

Offsets are applicable for the project under the EP Act and EO Act for the unavoidable clearing of habitat for protected wildlife species (red goshawk, masked owl, and bare-rumped sheath tailed bat), regulated vegetation (intersecting a watercourse), regulated vegetation (intersecting a wetland), wetlands (HES/HEV), and marine plants (clearing of mangroves). These are summarised in Table 8 below.

Table 8 Matters of state environmental significance likely to be impacted by the proposed project

MSES prescribed Matter	Description	Significant residual impact (ha) requiring an offset
Regulated vegetation (intersecting a wetland) <ul style="list-style-type: none"> VMA Act wetlands 	RE 3.3.64/3.3.9 (70/30): <ul style="list-style-type: none"> 3.3.64: <i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i> open sedgeland in drainage swamps in dune fields. 3.3.9: <i>Lophostemon suaveolens</i> open forest on streamlines, swamps and alluvial terraces. 	1ha, consisting of: <ul style="list-style-type: none"> 0.5ha of for Namaleta Creek (south side) 0.5ha for the Tributary 1 wetland crossing)
Wetland (HES Wetland) <ul style="list-style-type: none"> a HES wetland shown on the map of referable wetlands 	RE 3.3.64/3.3.9 (70/30). <ul style="list-style-type: none"> 3.3.64: <i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i> open sedgeland in drainage swamps in dune fields. 3.3.9: <i>Lophostemon suaveolens</i> open forest on streamlines, swamps and alluvial terraces. 	0.5ha As the clearing of 0.5ha of vegetation in Tributary 1 already requires offsets for clearing the MSES regulated vegetation (intersecting a wetland), no further offsets are required.
Wetland (HEV Waters) <ul style="list-style-type: none"> a wetland in high ecological value waters 	RE 3.3.64/3.3.9 (70/30). <ul style="list-style-type: none"> 3.3.64: <i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i> open sedgeland in drainage swamps in dune fields. 3.3.9: <i>Lophostemon suaveolens</i> open forest on streamlines, swamps and alluvial terraces. 	0.5ha As the clearing of 0.5ha of vegetation for the Namaleta Creek Crossing already requires offsets for clearing the MSES regulated vegetation (intersecting a wetland), no further offsets are required.
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)* 	Terrestrial wildlife habitat: 1209ha* Further surveys are required to identify actual protected wildlife habitat per species.
Marine plants <ul style="list-style-type: none"> mangroves and saltmarsh communities 	RE 3.1.1a / 3.1.3 <ul style="list-style-type: none"> Closed forest of <i>Rhizophora stylosa</i> +/- <i>Bruguiera gymnorrhiza</i> (occurs as outer mangroves) <i>Ceriops tagal</i> +/- <i>Avicennia marina</i> low closed forest (extensive on intertidal areas) 	0.03ha

*Species were also identified as MNES to be offset by Commonwealth approval requirement under the EPBC Act. Refer to section 4.8.6 of this assessment report. If the Commonwealth imposed an offset condition for a prescribed environmental matter after the State has already imposed an offset condition, the proponent can apply to the lower level of government having the duplicating offset requirements removed provided the condition is for the same or substantially the same prescribed impact and prescribed environmental matter.

4.7.3 Conclusions and recommendations

Offsets are applicable for the project under the EP Act and EO Act for the unavoidable clearing of 1ha of regulated vegetation (intersecting a wetland) and 0.03ha of marine plants listed in Table 8 and in the recommended conditions in Schedule G: Land and rehabilitation of Appendix 1.

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 section 4.7.1.5 above are also listed as threatened under the EPBC Act; EHP recommends to DotE to impose a condition requiring offsets for substantially the same matters. Hence, the proponent will not be required to provide offsets again under the EP Act. Refer to section 4.8.6 of this assessment report for the assessment of MNES offset requirements.

The EIS did not include an offset strategy. However, an offset strategy would be required to propose offsets consistent with the requirements of the EO Act and EPBC Act. Some of these offsets proposed under the EPBC Act would effectively account for offsets required under the EP Act. Any outstanding offsets for unavoidable impacts to MSES will 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.

4.8 Matters of national environmental significance

A number of EIS documents were used to assess MNES, namely EIS Chapter 26 – Matters of national environmental significance; EIS Chapter 15 – Terrestrial ecology; EIS Chapter 16 – Aquatic ecology and stygofauna; EIS Chapter 17 – Coastal processes; EIS Chapter 18 – Marine ecology; EIS Appendices 5, 6, 7, 8 and 12: containing the specialists report on terrestrial and aquatic ecology, MNES. These documents were also updated and resubmitted by the proponent as a response to EIS submissions.

This section of the assessment report summarises the EIS conclusions for MNES, identifies impacts and the likelihood of impacts of the proposed project on the controlling provisions and provides recommendations to DotE.

4.8.1 Existing environmental values (as identified in the EIS)

The following section is a summary of the predicted occurrence in the project area of the controlling provisions for the project based on database searches in the EIS.

4.8.1.1 Threatened Ecological Communities

The EIS did not identify any threatened ecological communities (TEC) in the project area. The only TEC that is found on western Cape York is 'A community of native species dependent on natural discharge of groundwater from the Great Artesian Basin TEC'. The nearest mapped springs are 50km northeast of the project site in the Jardine River catchment.

4.8.1.2 Terrestrial Flora

An EPBC Act Protected Matters Search in a 25km buffer around the centroid of the mining leases (provided in the EIS) yielded seven listed threatened terrestrial flora species:

- *Cajanus mareebensis* - endangered
 - *Calophyllum bicolor* - vulnerable
 - *Cepobaculum carronii* (an orchid) - vulnerable
 - *Dendrobium bigibbum* (Cooktown orchid) - vulnerable
 - *Dendrobium johannis* (Chocolate tea tree orchid) - vulnerable
 - *Vappodes lithocola* (dwarf butterfly orchid, Cooktown orchid) - endangered
 - *Vappodes phalaenopsis* (Cooktown orchid) - vulnerable
- (Note: *The D. bigibbum* complex has been separated into the genus *Vappodes* and the Cooktown orchid has been given the new name of *Vappodes phalaenopsis*. All discussion about the Cooktown orchid (*Dendrobium bigibbum*) applies to *Vappodes lithocola* and *Vappodes phalaenopsis*.)

None of these species were identified in the EIS field surveys which were conducted in the potential impact area.

4.8.1.3 Terrestrial Fauna

The same EPBC Act Protected Matters Search yielded seven fauna species that were listed as threatened when the project was declared to be a controlled action:

- bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatus*) – critically endangered
- golden-shouldered parrot (*Psephotus chrysopterygius*) – endangered
- red goshawk (*Erythrorchis radiatus*) – vulnerable
- masked owl (northern subspecies) (*Tyto novaehollandiae kimberlii*) – vulnerable
- northern quoll (*Dasyurus hallucatus*) – endangered
- spectacled flying-fox (*Pteropus conspicillatus*) – vulnerable
- water mouse (*Xeromys myoides*) – vulnerable.

Of the species that were predicted to occur, the EIS stated that the red goshawk, masked owl, golden-shouldered parrot, northern quoll and bare-rumped sheath-tail bat were either known or had the potential to occur on site. Species that were considered unlikely to occur were not considered in the EIS to be at risk of impacts from the project.

4.8.1.4 Migratory and marine birds

Sixteen migratory and marine bird species were identified in the EPBC Act Protected Matters Search. Species that were confirmed as present in the EIS were the little tern (*Sterna albifrons*), lesser frigate bird (*Fregata ariel*), eastern great egret (*Ardea alba*), cattle egret (*Ardea ibis*), rainbow bee-eater (*Merops ornatus*), and the rufous fantail (*Rhipidura furifrons*).

The EIS stated that the barn swallow (*Hirundo rustica*) was not recorded but was expected to be present. Species that were identified as likely to occur in the EIS were the fork-tailed swift (*Apus pacificus*), eastern osprey (*Pandion cristatus*), black-faced monarch (*Monarcha melanopsis*), spectacled monarch (*Monarcha trivirgatus*), satin flycatcher (*Myiagra cyanoleuca*), and the oriental cuckoo (*Cuculus optatus*). The red-rumped swallow (*Cecropis daurica*), bar-tailed godwit (*Limosa lapponica*), and Latham's snipe (*Gallinago hardwickii*), were considered in the EIS as unlikely to occur in the project area.

4.8.1.5 Estuarine and riverine fauna

The EIS stated that estuarine crocodile (*Crocodylus porosus*), listed as marine and migratory under the EPBC Act, is widespread throughout northern Australia including the Gulf of Carpentaria. The species is present in the Skardon River and Namaleta Creek.

The EIS EPBC Act Protected Matters Search identified the critically endangered spartooth shark (*Glyphis sp. A/Glyphis glyphis*), the vulnerable largetooth sawfish (*Pristis pristis*), the vulnerable dwarf sawfish (*Pristis clavata*), and the vulnerable green sawfish (*Pristis zijsron*) as having the potential to occur in the project area. The EIS concluded that it was plausible that the spartooth shark occurs in both the Skardon River and Namaleta Creek. The sawfish species were considered in the EIS likely to occur in the Skardon River.

4.8.1.6 Marine fauna

The EIS stated that the Skardon River and the coastal, inshore and offshore areas where vessels would operate have mangrove and saltmarsh estuarine vegetation communities, seagrass, rocky reef, oyster reef, coral reef and soft substrates supporting benthic communities. These habitats support several marine species that are known or likely to occur at the project area including dugong, inshore dolphins, marine turtles and sea snakes.

The dugong (*Dugong dugon*) is listed as a marine and migratory species under the EPBC Act. The EIS stated that the dugong is known to occur in Port Musgrave at low densities. It also stated that the amount of seagrass in the Skardon River estuary was insufficient to sustain a population of dugong and that the area was not important dugong habitat.

The EIS concluded that several dolphin species (listed as marine and migratory species) are likely to occur in the project area: the Indo-Pacific humpback dolphin (*Sousa sahalensis*), Australian snubfin dolphin (*Orcaella heinsohni*), pantropical spotted dolphin (*Stenella attenuata*), and the Indian Ocean bottlenose dolphin or Indo-Pacific bottlenose dolphin (*Tursiops aduncus*).

The EIS stated that the flatback turtle (*Natator depressus*) (vulnerable), olive ridley turtle (*Lepidochelys olivacea*) (endangered), and the hawksbill turtle (*Eretmochelys imbricata*) (vulnerable) all nest along western Cape York beaches. The flatback turtle is the most common species. The EIS concluded that the loggerhead turtle (*Caretta caretta*) (endangered) may feed in the area, and that the green turtle (*Chelonia mydas*) (vulnerable) was unlikely to be supported by the biomass of seagrass and algae in the Skardon River. The EIS considered that the leatherback turtle (*Dermochelys coriacea*) (endangered) was not likely to be present and did not require assessment.

4.8.1.7 Commonwealth marine areas

The EIS stated that the Commonwealth marine area stretches from 3 to 200 nautical miles from the coast. The transshipment facility where bauxite would be transferred from barges to bulk carriers is located within the Commonwealth marine area. The EIS stated that the benthic habitats in the transshipment area were dominated by sandy substrates and had a 'low live cover'.

4.8.1.8 Conclusion

EHP considers that, based on information provided in the EIS documentation, and in consideration of the submissions made on the EIS, that the specific environmental values that form the controlling provisions for the project have been adequately identified and described.

4.8.2 Listed threatened species not included in this EIS assessment report

The project was declared a controlled action on 11 September 2014. Three species were listed after the project was declared a controlled action: the black-footed tree rat, (*Mesembriomys gouldii rattoides*) listed as vulnerable on 18 June 2015, the palm cockatoo (*Probosciger aterrimus macgillivrayi*) listed as vulnerable under the EPBC on 31 October 2015, and the Eastern curlew (*Numenius madagascariensis*) listed as critically endangered on 25 May 2015 (species was previously listed as migratory). These species cannot be considered as MNES matters in this assessment process because they were not listed as threatened when the project was declared to be a controlled action.

The black-footed tree rat and palm cockatoo have been recorded within the project site from fauna surveys conducted by the proponent.

4.8.3 Proposed mitigation measures

The EIS proposed measures to avoid or mitigate impacts on MNES. These are summarised in Table 9 and Table 10.

Table 9 Potential impacts of the project on terrestrial MNES and proposed mitigation measures (adapted from EIS Chapter 26)

Potential impacts	Proposed mitigation measures
Clearing vegetation <ul style="list-style-type: none"> loss and fragmentation of habitat loss of connectivity edge effects 	<ul style="list-style-type: none"> restrict clearing of vegetation for mining and infrastructure to minimum amounts needed vegetation removal restricted to the prescribed mining stages identified in the disturbance footprint land mapped in buffer zones not disturbed, cleared or modified qualified environmental officer to oversee vegetation clearing Environmental Supervisor to manage operations likely to have an impact on natural features in the mine area implement rehabilitation plan to establish final land use of native vegetation (except for infrastructure retained by Traditional Owners)
Impacts on fauna and fauna habitat	<ul style="list-style-type: none"> species management plans developed to address potential impacts on conservation significant fauna ecologist/spotter catcher to conduct fauna surveys, particularly for breeding and roosting species, before vegetation clearing occurs <ul style="list-style-type: none"> red goshawk surveys within 1km of riparian gallery forest, on month before clearing (200m buffer around tree if found for duration of nesting) relocate 'at risk' species to habitat as close as possible to the area in which they were found (unless advised otherwise in a species management plan). undertake a clearing plan, nest box plan and/or species relocation plans where necessary undertake preclearance surveys to clearly identify vegetation to be retained on work plans and flagging/ fencing on site prior to works. provide environmental buffer zones surrounding wetlands and watercourses to reduce edge effects from mining
Surface and groundwater hydrology: <ul style="list-style-type: none"> changes to surface run-off and base-flow use of shallow aquifer water for mine water supply changes to the hydrogeological regime from clearing and mining. 	<ul style="list-style-type: none"> implement Surface Water and Groundwater Monitoring Plan implement Vegetation and Aquatic Ecology Monitoring Plan implement mitigation if monitoring shows changes to wetland hydrology <ul style="list-style-type: none"> cease pumping water from aquifers with hydrological connection to wetland move mining away from affected wetland and commence rehabilitation reduce mining activities in areas with potential for impacts on wetlands increase buffer zones around wetlands if they are found to be inadequate.

Potential impacts	Proposed mitigation measures
<p>Surface and groundwater quality:</p> <ul style="list-style-type: none"> • uncontrolled release of water from mining areas • stormwater run-off from haul roads • sedimentation of watercourses from clearing and construction activities • chemical or hydrocarbon spills • seepage to groundwater from landfill, bioremediation pad or effluent irrigation area 	<ul style="list-style-type: none"> • mine site water management to prevent or control releases of sediment affected water • implementation of erosion and sediment control plan • design and management of landfill, bioremediation pad and effluent irrigation area in accordance with regulatory requirements • sensitive environmental area buffer zones • store regulated waste appropriately • prohibit vehicle and machinery refuelling with 100m of a watercourse or open drain and minimise operation near waterways • bund refuelling and hydrocarbon and chemical storage areas and manage run-off using interceptor pits • ensure advanced secondary sewage treatment • design features to prevent spills of contaminants and provide spill response plans and adequate management materials and equipment • surface and groundwater monitoring plan to measure potential impacts (in receiving waterways, wetlands and groundwater) • implement surface water and groundwater monitoring training for all staff on safety and response procedures
<p>Hydrological changes:</p> <ul style="list-style-type: none"> • changes to run-off and base-flow • groundwater drawdown 	<ul style="list-style-type: none"> • progressive rehabilitation of native vegetation • monitoring of surface water and groundwater bores and sensitive environmental areas
<p>Introduction and spread of weeds and pests</p>	<ul style="list-style-type: none"> • implement Weed and Pest Management Plan • minimise potential for weed and pest introduction • control outbreaks • focus on port area

Table 10 Potential impacts of the project on estuarine and marine MNES and proposed mitigation measures (adapted from EIS Chapter 26)

Potential impacts	Proposed mitigation measures
<p>Disturbance of estuary habitats for speartooth shark and sawfish</p>	<ul style="list-style-type: none"> • avoid and minimise disturbance • define operational areas, fixed vessel routes and speed limit zones
<p>Marine turtle disturbance</p>	<ul style="list-style-type: none"> • bed levelling separated from potential turtle foraging areas • defined vessel access channels and go slow zones • limitation of access to turtle nesting beaches • possible feral animal control and marine debris removal
<p>Clearing and fragmentation of marine vegetation:</p> <ul style="list-style-type: none"> • loss of habitat • loss of connectivity • edge effects 	<ul style="list-style-type: none"> • undertake targeted preclearance surveys for specific species • upgrade existing Namaleta Creek crossing to improve upstream connectivity for sawfish and speartooth shark
<p>Disturbing benthic habitats:</p> <ul style="list-style-type: none"> • construction impacts • propeller wash from loaded vessels once they leave the transshipment area to 	<ul style="list-style-type: none"> • monitor turbidity, deposition and benthic light availability during construction • time construction during spring tides so sediments are dispersed more readily • offshore transshipment area located in area where sediments are mostly sand with low density of benthic communities • no permanent structures at transshipment area • barge activities not proposed near rocky reef habitats

Potential impacts	Proposed mitigation measures
join shipping lanes	
<p>Water quality:</p> <ul style="list-style-type: none"> interaction with acid sulfate soils changes to hydrological regime from port construction/ bed levelling sedimentation and erosion from construction and propeller wash spills ballast water discharge 	<ul style="list-style-type: none"> extended baseline water quality monitoring program developed to support management and continued during operation monitor impacts on marine water quality throughout Skardon River estuary during port construction <ul style="list-style-type: none"> use silt curtains if necessary and have breaks during construction to allow sediment dispersal monitor impacts of bed levelling on water quality and suspend operation if thresholds exceeded monitor of water quality and erosion impacts from propeller wash including baseline monitoring acid sulfate soil management plan developed if necessary pre-clearing surveys and clearing supervision for mangroves and saltmarsh onsite emergency spill response ballast water of vessels in bulk carriers to adhere to relevant national and international standards aimed at preventing the spread of invasive species monitor marine pest species in the Skardon River establish operation standards for bulk fuel storage and handling
Weeds and pests	<ul style="list-style-type: none"> implement Weed and Pest Management Plan
Lighting	<ul style="list-style-type: none"> only essential lighting included in the development light design to limit turtle impacts including light shrouding, lowest intensity lighting for the task and light mounting low in the vertical plane turtle friendly lighting used where necessary: long wavelength, low pressure sodium or LEDs automated systems to reduce unnecessary lighting intense lights or clusters of lights avoided where possible minimise use of red lights, no use of white lights that emit ultraviolet and limited use of strong blue or green spectral elements inspections, audits and corrective management of light sources educate staff about marine turtles
<p>Noise:</p> <ul style="list-style-type: none"> pile driving vessel engine noise 	<ul style="list-style-type: none"> pile construction mitigation measures
Vessels hitting marine fauna	<ul style="list-style-type: none"> barge speed restricted to 4 to 6 knots in the Skardon River

4.8.4 Potential ecological impacts on EPBC Act listed species and Commonwealth marine areas

This section provides the results of EHP's assessment of the potential impacts of the project on the controlling provisions. Details of the assessment of impacts on individual listed threatened species are provided in Appendix 2 – Listed threatened species information for MNES.

4.8.4.1 Threatened flora

The EIS stated that seven threatened flora species were predicted in the EIS to occur in the project area. Five of these species are orchids which may occur in adjacent wetter habitats: they are associated with *Melaleuca* species and are unlikely to occur in the eucalypt woodlands that would be cleared for the project. Similarly, *Calophyllum bicolor* is associated with evergreen rainforests with permanently wet organic substrates which do not occur on the project site.

According to the EIS the only species that may occur on site is *Cajanus mareebensis*, a prostrate trailing annual herb in the family Fabaceae (legume, pea or bean family) that occurs in *Eucalyptus/Corymbia* grassy woodlands. The species occurs on Cape York but records are from sites well south of the project area. The EIS concluded that this species is unlikely to occur on the mine blocks but marginal suitable habitat is present along the existing haul

road passing through ML40082.

EHP is satisfied that the project is unlikely to have a significant impact on listed threatened flora species. Nevertheless, EHP recommends that pre-clearing surveys should be carried out at each stage of mine development to identify and manage any threatened plants that may be present in the clearing footprint (Appendix 2).

4.8.4.2 Terrestrial fauna

The primary activity that has the potential to impact on terrestrial MNES is the clearing of 1209ha of remnant vegetation (refer to section 4.6.2.1 of this assessment report). EHP considers these vegetation communities are likely to contain tree hollows and foraging resources that would provide habitat for the bare-rumped sheath-tail bat, the northern quoll, the masked owl, and the red goshawk. The EIS also identified the golden-shouldered parrot (*Psephotus chrysopterygius*) as potentially present.

DotE advised EHP that significant impacts on the spectacled flying-fox and water mouse were considered unlikely at DotE's referral decision stage. This information was confirmed after the EIS was published. Hence, no assessment of these species was required to be undertaken for this project.

Listed species considered by this assessment that would be, or are likely to be, impacted by the project are:

Red goshawk

The EIS stated that targeted and generic surveys did not confirm the presence of the red goshawk in the project area but that suitable habitat exists on site. It stated that the species was recorded in 2011 about 350km to the south-east and that it was possible the species was present. In addition to this record, EHP and Rio Tinto Australia are currently jointly monitoring a known red goshawk nest near Weipa, about 40km south of the ML boundary. This assessment considers that, based on these records and the likely presence of habitat, the red goshawk is likely to occur in the project area.

Threats to the species identified in the *Approved Conservation Advice for Erythrorhynchus radiatus (red goshawk)* (Threatened Species Scientific Committee, 2015) of relevance 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.

The *National recovery plan for the red goshawk Erythrorhynchus radiatus* (Queensland Department of Environment and Resource Management, 2012) (red goshawk recovery plan) states that forest fragmentation that removed >25% of hunting habitat within 4km of nests had a significant impact on nesting success by reducing the output of fledged young. The plan also noted that all identified nest trees have been within 1km of permanent water.

The potential red goshawk habitat in the project area is highly likely to contain foraging, breeding, roosting and dispersal habitat. The woodland habitat may also contain hollow-bearing trees that are potential breeding habitat for prey species. The red goshawk is a specialist bird predator and the diet is dominated by hollow nesting species such as parrots and lorikeets, as well as species that feed on nectar from sources like profuse blossom of large eucalypts.

The EIS buffered the Skardon River and south arm by 1km to determine the amount of area impacted by mining. However, parts of the proposed mine pits 1, 2 and 3 (Figure 6) are within this area and EHP considers that clearing for these pits may lead to the direct loss of 179ha of potential nesting habitat.

The cumulative impacts of the Skardon River Bauxite Project and the Bauxite Hills Project would need to be considered in relation to the loss of suitable foraging habitat and significantly more nesting habitat. The EIS proposes mitigation measures that limit the area of clearing to the minimum extent needed for the mine and would put in place clearing controls to avoid and minimise impacts on threatened fauna. Due to the potential presence of foraging and possibly nesting habitat, and that the project will involve clearing this habitat, EHP considers that there is the potential that the project impacts on this species (refer to Appendix 2).

Masked owl

The EIS stated that the masked owl mostly occupies coastal and upland areas and has a general habitat preference for riparian gallery forest, rainforest and mangrove areas that are available outside of the project footprint. It also stated that the main habitat requirements are tall trees with suitable hollows for nesting and roosting and adjacent areas for foraging. The EIS identified 1209ha of vegetation that is potential masked owl nesting habitat. It did not list any potential habitat within the project footprint for foraging as it stated that foraging habitat is restricted to riverine gallery forest.

Targeted broadcast (playback) surveys were conducted for the species during the wet seasons in 2010 and 2015 only. The EIS stated that no masked owls were confirmed on site or have a high likelihood of occurrence. It stated that there is a very small possibility that individuals may be located on or adjacent to the site as it is within the known range of the species and suitable habitat exists.

The project may have the following potential project impacts on the masked owl: the loss of habitat by clearing woodland vegetation for the construction and operation of the mine; 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 increased human presence.

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. 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 the masked owl because of the loss of nesting and roosting habitat (refer to Appendix 2).

Bare-rumped sheathtail bat

The bare-rumped sheathtail bat occurs in woodland and tall open forests where it roosts in hollows of *Eucalyptus* and *Melaleuca*, including *E. tetradonta*. The life history and ecology of this species are poorly known with few records in existence.

The species was not found in the project area during surveys. The survey methodology using full spectrum call recording over a period of 14 nights and in varied locations was appropriate. However, the Survey guidelines for Australia's threatened bats (Commonwealth of Australia, 2010) state that the calls of the bare-rumped sheathtail bat are very similar (due to large call variation) to several other bat species and that surveying calls was a minimum requirement. Analysis of bat calls, while confirming the presence of certain species, could not rule out the presence of the bare-rumped sheathtail bat.

The loss of hollow-bearing trees from Australian forests and woodland is a recognised threatening process for a range of fauna: hollows are a limiting breeding resource for birds and arboreal mammals. Hollows in mature eucalypts that occur throughout the project site would represent the most important microhabitat feature that could be lost as a result of clearing. Therefore, the size and distribution of patches of woodland with hollow-bearing trees throughout the project site should be determined in order to adequately assess project impacts and determine appropriate environmental offsets.

The EIS did not provide specific information about presence of hollow-bearing trees in the eucalypt woodland. The EIS did not provide specific information about presence of hollow-bearing trees in the eucalypt woodland. EHP considers that there is a high likelihood that the woodland that is to be cleared would contain hollow-bearing trees.

Therefore, 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 the bare-rumped sheathtail bat because of the loss of roosting and breeding habitat (refer to Appendix 2).

Northern quoll

Baited camera traps were used in targeted surveys for the northern quoll, with a total trapping effort of 616 trap nights. No northern quolls were identified on the project site.

The EIS stated that the northern quoll is unlikely to occur on the project site due to the absence of complex rocky outcrops, known refugia for the species and the fact that the species was believed to have become locally extinct on Cape York following the arrival of cane toads in the early 1990's. The EIS noted that the species has been recorded 100km south of the project area (Scherger Air Base) in 2013 and concluded that the species has persisted in this area due to the availability of more suitable habitat (e.g. complex rocky outcrops).

The *National recovery plan for the northern quoll* (*Dasyurus hallucatus*) (Commonwealth of Australia, 2010) states that the occurrence of northern quolls on the Queensland coast, particularly in areas where cane toads are present, is related to the availability of rocky habitats which may also serve to ameliorate fire impacts.

The EIS concluded that if the quoll is present in the project area, it is unlikely to occur in the sparse, frequently burned woodland areas proposed to be cleared, and more likely to use the more complex habitats around wetlands and waterways outside of the clearing footprint. The EIS committed to implement a species management program in the unlikely event the species is identified during clearance.

EHP is satisfied that the project site is not likely to contain important habitat for the species and that the project is unlikely to have unacceptable impacts on the northern quoll (refer to Appendix 2).

Golden-shouldered parrot

The golden-shouldered parrot has been found in two areas on Cape York: Artemis Station (350km southeast) and Staaten River National Park (600km south) of the project area.

The EIS described golden-shouldered parrot habitat as open, wet or dry tropical savannah woodlands with an upper stratum dominated by *Melaleuca* spp. or *Eucalyptus* spp. and a lower stratum dominated by *Schizachyrium* spp., *Thaumastachloa* spp., *Sorghum plumosum* (plume sorghum) and *Eriachne burkittii*. Within these community types, the species uses a fine mosaic of different vegetation types.

The species tends to favour recently burned habitats because foraging is easier, as grass seed is exposed, and predators are more easily avoided. Fire may be needed to maintain habitat structure. The parrots also need to visit water daily, and are likely to abandon areas that are not within 2km source of water.

In the known range, gravel slopes provide early wet season foraging refuges. They also need termite mounds in which to build nests, mainly in the mounds of *Amitermes* spp..

The EIS concluded that the species is unlikely to occupy the project area because it is outside the known distribution and lacks critical habitats that appear to be required for the life history of the species.

EHP is satisfied that the project is unlikely to have unacceptable impacts on this species.

4.8.4.3 Migratory and marine bird species

The EIS identified that the project area has habitat that would be important for migratory shorebirds and that the eucalypt woodland is potential habitat for terrestrial migratory birds.

The EIS concluded that the project would have localised impacts only and would be unlikely to affect the identified important shorebird habitat in the lower Skardon River estuary which is mainly outside the project area. The EIS stated that access to shorebird feeding, roosting and beach nesting areas by mining employees would be restricted to minimise disturbance to visiting birds.

The EIS concluded that the migratory birds that occur in terrestrial areas are relatively common and widely distributed species and extensive areas of habitat (woodland, wetland and riparian) would remain in the broader area. The EIS stated that the project would not have a significant impact on any listed migratory terrestrial species.

The streaked shearwater (*Calonectris leucomelas*) was not considered in the EIS assessment. EHP was advised by DotE that the species should be assessed in the EIS process. The streaked shearwater is a marine species that occurs over pelagic and inshore waters. In northern Australia it is usually found in offshore waters more than 18km from the mainland (*Species group report card – seabirds: North Marine Bioregional Plan* (Commonwealth of Australia, 2012)). The species does not nest in Australia. The streaked shearwater is unlikely to be impacted by mining operations but may be found around the transshipment area. The risks posed to the species by shipping include oil pollution and collision with vessels but these are considered to be 'of less concern'. (*Species group report card – seabirds: North Marine Bioregional Plan; Commonwealth of Australia, 2012*).

EHP considers that the project is unlikely to have unacceptable impacts on migratory and marine bird species.

4.8.4.4 Estuarine and riverine species

The estuarine crocodile is widely distributed throughout Cape York and down the east coast in areas where disturbance from human activities is much greater than in the project area. 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 spartooth shark is likely in Namaleta Creek and possibly in the Skardon River. 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.

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 (3600 – 4000 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 spartooth 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 (refer to Appendix 2).

4.8.4.5 Marine species

The EIS stated that proposed development would not disturb offshore reef habitats; and supply vessels and general shipping would remain clear of these areas. The proposed port is about 10km upstream of suitable turtle nesting habitat and would involve a relatively small amount of disturbance of potential habitats along the river bank.

EHP notes that if the Skardon River Bauxite Project and the Bauxite Hills Project would operate at the same time, the volume of mine related vessel traffic in the relatively narrow Skardon River that would exceed the current traffic in and out of Weipa, a much larger estuary. To minimise impacts it is recommended that port construction in the Skardon River should be consolidated in one location, and that vessel traffic be rationalised to minimise impacts on all species using the estuary.

Marine turtles

Flatback and olive ridley turtles have been recorded nesting on beaches north and south of the Skardon River (Queensland Wildnet database). The hawksbill turtle has been recorded to the north. The most common species in the Port Musgrave area is the flatback turtle and the proposed bed levelling is within 500m of the nearest beach record of a flatback turtle.

If bed levelling is not carried out during turtle nesting periods it is unlikely to affect turtle nesting behaviour. A known disturbance to turtle nesting in other areas is people using beaches for recreation e.g. 4WD vehicle use for sport or to get to fishing areas. The mitigation proposed for the project included restricting recreational access to beaches and this should be managed accordingly.

EHP research staff stated that marine turtles move along the coast and the estuary is a potential foraging area, particularly for the green turtle. The cumulative impact on the vessel traffic from the Skardon River Bauxite Project and the Bauxite Hills Project in the estuary and across the inshore coastal path of turtle movements is unknown. The large volume of traffic may disrupt the behaviour of turtles. The risk of vessel strike is relatively low but still present. The EIS stated that barge speed would be limited but also stated that speeds may vary depending on safety issues and the results of monitoring erosion in the estuary.

The transshipment area would be approximately 15km offshore. Light at the transshipment area 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.

Dolphins

Potential impacts on cetaceans identified in the EIS included boat strike and underwater noise disturbance. If vessels using the estuary and marine areas travel slowly then boat strike is a low risk. However, the disturbance impact of greatly increased vessel traffic, and associated noise pollution, on the behaviour of cetaceans is not known.

Based on figures supplied in the EIS, piling required for port construction would generate noise that would be likely to disturb, or provoke a behavioural response in, cetaceans within 5km of the port. This noise disturbance would be expected to last two months.

There is a possibility that the long-term increase in vessel activity as well as construction disturbance, particularly in the confined area of the estuary, would affect cetacean use of the area.

Dugong

Dugongs have been recorded in the project area and may forage in the estuary where seagrass beds occur. The area is regarded as a medium-high importance dugong area by the Cape York Natural Resource Management Group (Cape York turtle and dugong regional plan (Turtle and dugong task force)) but is not considered an important feeding ground. Anthropogenic noise and acoustic disturbance is cited as one threatening process as well as loss of seagrass beds resulting from coastal developments.

The Skardon River estuary is a confined area compared to the Wenlock River estuary and the potential impact on dugong use of the area from the large increase in vessel traffic that would happen when the Skardon River Bauxite Project and the Bauxite Hills Project are operating is unknown.

Conclusion (marine species)

In conclusion, EHP considers that the project is unlikely to disturb marine turtle nesting in the area if the proposed mitigation measures are put in place to control access to beaches during turtle nesting seasons. 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.

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.

Similarly, 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 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 (refer to Appendix 2).

4.8.4.6 Commonwealth marine areas and cyclone moorings

Two barges would be used as transshipment vessels to move bauxite from the port to a large bulk carrier (Panamax vessels) which would be anchored in an offshore transshipment area, approximately 15km from the Skardon River mouth, in the Commonwealth marine area. The EIS stated that project activities would not occur near the offshore reef habitats that are within the Commonwealth Marine area. Supply vessels and general shipping would also stay clear of these reefs.

EHP noted above that the EIS did not make provisions for barges travelling to the transshipment area to be covered. EHP understands that bauxite would be kept moist during the transport which would minimise dust emissions, but recommends further commitments by the proponent to ensure that no environmental harm to listed threatened marine species would occur at the transshipment area due to any dust emissions. EHP concludes that with the implementation of proposed mitigation measures to manage barge and transshipment vessels and anchoring, EHP considers that the project is unlikely to have unacceptable impacts on the Commonwealth marine areas.

As the Gulf of Carpentaria is prone to tropical cyclones, the EIS assessed suitable locations for cyclone moorings for two barges and one supply vessel in the Skardon River. Possible mooring locations were identified in the upper arms of the Skardon River, located in long narrow waterways (refer to section 4.9.2.6 of this assessment report for further information). The EIS concluded that cyclone moorings, irrespective of their location, would be unlikely to create a significant impact on the marine environment, with safety of mooring vessels being the primary consideration in their design and location. The EIS further stated that assessment would be carried out under the *Code for self-assessable development Minor impact works involving the removal, destruction or damage of marine plants MP06* for installation of navigation aids (e.g. channel markers) and cyclone moorings. EHP recommends that the proponent should submit an assessment of impacts of cyclone mooring infrastructure on MNES prior to commencing construction.

4.8.5 Cumulative impacts on listed threatened species and marine areas

The proposed Bauxite Hills Project, a similar project to the Skardon River Bauxite Project, would also undertake activities within the Skardon River and offshore. It is noted that the Bauxite Hills project, if approved, would mine the land on both sides of the Skardon River Bauxite Project area and that the mining lease adjacent to the southern border (ML 7024 for bauxite and kaolin) is held by Rio Tinto Australia Weipa Pty Ltd (refer to section 2.11 of this assessment report).

The EIS stated that it is unlikely that the removal of hollow-bearing trees from the site would result in a significant impact to hollow-dependent species because similar nesting / roosting habitat occurs in abundance within a much greater area of land surrounding the site. However, EHP in its assessment of impacts considers that clearing tall, hollow-bearing trees in the mine footprint may result in impacts on the masked owl, bare-rumped sheath-tail bat and the red goshawk because there is a possibility that the activity would remove potential breeding / nesting and roosting habitat for the species or their prey, or both (refer to section 4.8.4.2).

There would be a significant increase in vessel traffic in the Skardon River when the Skardon River Bauxite Project and the Bauxite Hills Project operate concurrently. Primarily this would be due to a number of vessel movements for both removal of product (bauxite) and the shipping in of supplies and personnel. The disturbance to estuarine and marine species created by both projects operating concurrently is likely to be much greater than that for each project alone. If practical, this cumulative impact could be partly mitigated by a consolidation of port infrastructure at the existing port site and rationalisation of vessel movements.

Bed levelling is only proposed for the Skardon River Bauxite Project. Propeller wash and run-off from the sediment

dams presented the largest potential risk to water quality resulting in turbidity and potential adverse impacts to seagrasses that in turn provide resources for marine fauna (refer to section 4.6.2.5). The EIS stated the project would involve 100 bulk carrier and supply vessels per year operating in the Gulf of Carpentaria, an increase of about 3% on total large vessel movements.

The proponent has committed to cooperate and consult with the Bauxite Hills Project to adopt strategic and adaptive management approaches for ecological impacts and the sharing of rehabilitation approaches. The EIS further stated that sharing of infrastructure, including port infrastructure, is subject to commercial arrangements and would be undertaken where this is commercially possible.

4.8.6 EPBC offset requirements

The EIS considered that there would be no significant residual impacts to MNES from activities associated with the project and hence no offsets for the controlling provisions were provided in the EIS.

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 masked owl, bare-rumped sheath-tail bat and the red goshawk. This clearing has the potential to remove breeding habitat for the species or their prey, or both.

The EIS stated that 1209ha 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 bare-rumped sheath-tail bat, masked owl, and red goshawk. An offset proposal based on the outcomes of pre-clearance surveys should be submitted, in accordance with the EPBC Act Environmental Offsets Policy. (refer to Appendix 2).

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 (refer to Appendix 2). 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 (refer to Appendix 2).

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 by offsets from both these projects.

4.8.7 Conclusion and recommendations

A total of 1209ha of eucalypt woodland, potential fauna habitat, is proposed to be cleared to mine bauxite. A port would be constructed and operated in the estuarine and marine environment known to contain a number of listed species. The project has the potential to have an impact on terrestrial, estuarine and marine habitats and on species dependent on these areas.

All listed threatened species and communities in the terrestrial and marine environments that were present or considered likely to occur in the project area were subject to an impact assessment. All recovery plans, threat abatement plans and approved conservation advices relevant to these species were considered in the assessment process (refer to Appendix 2).

4.8.7.1 Terrestrial flora

The EIS concluded that the potential impact of the project on EPBC Act threatened flora is low, as 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 (refer to section 4.8.4.1). 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 plants 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.

4.8.7.2 Terrestrial fauna

EHP concluded that there is a possibility that the proposed clearing of eucalypt woodland which includes tall, potentially hollow-bearing trees would remove potential breeding / nesting and roosting habitat, or both, for masked

owl, red goshawk and the bare-rumped sheath-tail bat, as well as breeding habitat for prey species (refer to section 4.8.4.2 and Appendix 2).

Due to the identified potential project impacts on these species, the proponent may need to provide offsets consistent with the EPBC Act Environmental Offsets Policy for the following species:

- bare-rumped sheath-tail bat – critically endangered
- red goshawk – vulnerable
- masked owl (northern subspecies) – vulnerable.

EHP recommends that the proponent should carry out detailed vegetation assessments in the clearing footprint to identify areas of potential high value fauna habitat notably tall, hollow-bearing trees that function as breeding / nesting and roosting habitat for threatened species or their prey. This vegetation assessment is needed in order for the proponent to determine whether residual significant impacts to red goshawk, masked owl and bare-rumped sheath-tail bat are likely and an offset is required in accordance with the EPBC Act Environmental Offsets Policy.

4.8.7.3 Migratory species

The EIS considered it is unlikely that the project would have a significant residual impact on migratory bird species. There is little high value habitat for marine species and waders in areas that would be directly affected by the project, and the terrestrial species are common, widespread species for which a large area of habitat would remain around the project site. EHP is satisfied that the project is unlikely to have unacceptable impacts on listed migratory species (refer to section 4.8.4.3).

4.8.7.4 Estuarine, riverine 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 (sections 4.8.4.4, 4.8.4.5 and Appendix 2). 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 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.

4.8.7.5 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.

Light impacts on marine fauna

The proposed project lighting plan should be subject to approval by EHP marine fauna research staff.

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 DoE for approval by the Minister for the Environment prior to start of the project.

Commitments

Where the proponent's commitments outlined in EIS Appendix 1 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.

4.9 Coastal processes

A number of EIS documents described coastal processes in relation to the proposed project: EIS Chapter 13 – Coastal processes; EIS Appendix 8 – Marine ecology and coastal processes; EIS Appendix 17 – Coastal processes supplementary report; EIS Appendix 15 – Surface Water and Groundwater Monitoring Plan. These documents were also updated and resubmitted by the proponent as a response to EIS submissions.

The proposed barge loading, bauxite shipping and bed levelling operations are summarised in sections 2.7 and 2.8 of this assessment report. Marine ecology is described in section 4.6.1.9 and section 4.6.1.10 of this assessment report.

4.9.1 Physical marine and estuarine environments

4.9.1.1 Marine 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 classified as a tidal creek with low freshwater input and low-gradient, seaward-sloping coastal flats. These systems are primarily influenced by tidal currents. The mudflats which surround the creeks tended to be high relative to the tidal planes, with seawater being mainly confined to the tidal channels except during high tide or spring tides. Although influenced by freshwater flooding during the monsoonal wet season, these flows decrease quickly due to the very limited drainage that occurs from the catchment.

Desktop reviews were undertaken in the EIS for the area potentially impacted by the project, including published literature by third parties, environmental studies for the EIS, environmental studies for other projects in the region, and historical data and reports from the project area. An assessment of coastal processes and the physical marine environment was undertaken for the Skardon River estuary, including assessment of the ebb bar beyond the mouth of the Skardon River. The assessment included tides, storm tide, tidal currents, river flows, bathymetry and morphology, shoreline and bank evolution, marine water quality, sediment and acid sulfate soils.

Bathymetry and morphology was found to be relatively stable over the course of bathymetry surveys dating back to 1998. The channel alignment was constant with variation in depth of the channel at the river mouth attributable to localised sediment movements. Particle size (gravel, sand, silt/clay) generally decreased in silts and clays and increased in sands from upstream to downstream locations nearer the river entrance. Entrance and offshore samples confirm a dominant sand profile, including the proposed bed levelling area. The conditions presented at the river entrance reflected active nearshore bar conditions with extensive sorting of sediment fractions by wind, waves and currents leading to a dominant coarser sediment fraction. With the exception of some arsenic detected at the proposed wharf area and within the upper estuary, the mean of all other metals analysed in the sediment remained below the ANZECC & ARMCANZ (2000) screening criteria. Nutrients in the sediments showed a general decline in concentration between upstream locations and the river entrance with a strong correlation found with sediment particle size. Ten surface sediment samples (river bottom and banks) were assessed for ASS and PASS, extending from the upper river reaches to the entrance and immediate offshore sediments. No assessment was carried out at the wharf construction area but approximately 250m upstream to a depth of 6m. Results showed a low ASS potential in the material.

4.9.1.2 Estuarine environment of the Skardon River

The Skardon River is characterised as a HEV waterway with little anthropogenic impacts (mainly recreational fishing). The environmental objective of a HEV waterway is 'no change to existing'. The EIS stated that 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.

Water quality (including turbidity) of the estuary was found to be highly variable over tides and seasons. It was concluded in the EIS that due to the strong tidal currents, the Skardon River and the tidal creeks were highly turbid due to the large tidal ranges. Freshwater drops rapidly in the river given the very limited drainage catchment, increasing during the monsoonal wet season. A combination of vessel based and logger based water quality physico-chemical and chemical marine water quality investigations were undertaken for the EIS within the Skardon River (from the ebb tidal delta beyond the mouth to upstream Skardon River South Arm). Two data loggers recorded temperature, pH, dissolved oxygen, salinity, depth and turbidity. The EIS concluded that the chemical and physiochemical water properties of the Skardon River were driven by wet and dry season conditions as well as tidal movements, weather conditions and rainfall.

Turbidity was shown in the EIS to have a natural variability in the Skardon estuary. Salinity within the Skardon River was dependent upon season (wet/dry) and distance upstream from the entrance. pH reduced as sites progressed up the estuary with a strong correlation between tidal influence and pH. Dissolved oxygen was influenced by the tides and reduced as distance from the entrance increased. A high correlation between dissolved oxygen and tidal exchange was identified. Total nitrogen and total phosphorous concentrations remained well over the adopted ANZECC & ARMCANZ (2000) screening criteria within the Skardon River. Arsenic and zinc recorded elevated concentrations compared to cadmium, chromium, copper, lead and nickel. Copper and zinc levels were above ANZECC & ARMCANZ (2000) criteria levels. However, while concentrations were elevated for some analytes, the EIS concluded that the broad maintenance of these ratios across all locations were indicative of natural ambient conditions. Hydrocarbons remained non detectable from all survey locations during both the wet and dry seasons.

The physicochemical data collected during vessel based water quality surveys represented the upper 0.5m of the water column, and was conducted over a limited timeframe at each sampling location. The survey events did not coincide with significant wet season event based run-off periods, and as such, peak turbidity was not captured within the available data set. Ongoing monitoring is proposed by the proponent to capture turbidity from logger data from key receiving habitats in detailed time series.

4.9.2 Potential impacts

Modelling and calculations were undertaken in the EIS to predict impacts from bed levelling on sediment transport and longshore sediment movement, vessel wake wave impacts and propeller wash impacts, as well as impacts on the water quality of the marine and estuarine systems.

Key impacts of the project in regards to the marine and estuarine environment were identified in the EIS due to:

- construction of the wharf
- port operations (sediment run-off; bulk fuel, chemical release and spills)
- barge movements (propeller wash, wave impacts on the estuarine environment; cyclone mooring)
- bed levelling near the mouth (ebb bar) of the Skardon River
- acid sulfate soil impacts due to bed levelling and proposed wharf construction
- offshore transshipment area and bulk carrier impacts.

4.9.2.1 Construction of wharf

The EIS stated that piling construction would be limited to approximately two months, minimising disturbance in comparison to other wharf construction methods. Impacts from the port development would be small and restricted to the areas directly adjacent to the structures and as the area already has marine port facilities present, the EIS concluded that impacts on coastal processes would not be significant. Impacts on underwater noise on marine fauna due to piling are discussed in section 4.12 – Noise and vibration and section 4.6 – Fauna and flora of this assessment report.

The EIS concluded that the proposed wharf construction and development across mangrove communities and intertidal areas would impact water quality over the short term during piling and construction vessel support (2 to 4 months) but impacts would be localised to the immediate construction area. Supply, construction barges and support vessel movements would induce propeller wash in shallow waters which could result in localised sediment erosion, entrainment of these materials within the water column and propagation of turbid water plumes. No dredging or excavation of sediments was proposed in the EIS for the port area.

The most sensitive receiving habitats identified in the EIS were seagrasses located on the opposite river bank

(approximately 230m away) and upstream of the proposed works along the southern bank (~500m). The EIS stated that turbid waters released during construction would be dispersed by currents predominately along the southern shoreline. Given ambient currents of 0.2 to 0.3m/sec sediment plumes may intersect seagrass habitats within 30 to 40 minutes of the flood tide. It was concluded that due to strong directional currents within the Skardon River, water quality along the northern shoreline would not be at risk during construction processes.

4.9.2.2 Sediment run-off

According to the EIS, the port infrastructure area would contain two sediment ponds which have release points located at the downslope end of these structures. Due to high rainfall events during the wet season, the sediment ponds could overflow and release sediments from the ponds into the Skardon River (refer to section 4.14 – Flooding and regulated structures on the impact assessment of sediment run-off into Skardon River).

4.9.2.3 Bulk fuel, chemical release and spills

The potential for sediment and water quality contamination during construction and operations was identified in the EIS. The handling and storage of bulk hydrocarbons during construction was considered one of the greatest risks. The port area would require refurbishing the existing bulk diesel storage tank (2,200,000L) at the bank of the Skardon River. The EIS stated that management and operation of bulk fuel handling facilities at the port would be considered an important environmental consideration during operations. Significant fuel volumes would be utilised by the port operations (barges and support vessels). Handling and storage of other fuels for mining operations would also be undertaken. The EIS concluded that although the potential impact for chemical release and contamination is significant (particularly bulk material release) the likelihood of any substantive impact was considered low with the implementation of design and controls to Australian standards. A program of monitoring and environmental auditing would be undertaken to ensure water quality and the systems designed to protect it are maintained throughout operations.

All vessel based sewage would be transferred to dedicated on-shore facilities. No disposal of sewage or bilge would be undertaken within the marine environment. Potential impacts from bulk fuel, chemical release and spills are discussed in more detail in section 4.13 of this assessment report.

4.9.2.4 Impacts due to propeller wash

The EIS described that two barges would be used as transshipment vessels to move bauxite from the port to a large bulk carrier (Panamax vessels) at a transshipment site (Figure 1). Barges transporting bauxite from the port to the bulk carrier would be during a 24 hour period in the dry season (approximately April to December). Current, bed shear stress and erosion rate were found to vary with distance behind the propeller. Modelling showed that vessel wake waves generated by barges would be small by the time they reach the Skardon River banks. Furthermore, no resuspension of existing bed material due to propeller wash at mean high water was predicted in the EIS, including at the ebb bar. If speed is limited to the barges travelling at 4 to 6 knots down the centre line of the channel, the EIS concluded that any erosion due to propeller wash would be limited to the middle of the channel. Bow waves were predicted not to impact the banks of the Skardon River.

Propeller wash on the river bed at the proposed wharf were found to impact a distance of approximately 125m behind the vessel over a width equal to the vessel width (20m). The predicted erosion zone would be adjacent to the existing barge ramp with existing scour holes that are the result of previous propeller wash erosion.

The EIS results showed that suspended sediment concentrations of less than 3mg/l were expected at the barge and mid river sites due to the propeller wash erosion, while at the ebb bar site they would be 40mg/l. The higher suspended sediment concentrations at the ebb bar site would not occur for long as the sediment is predominantly made up of sand and as such would quickly settle out (medium sized sand settles at 0.03m/s) once the barge has passed. No resuspension of existing bed material would occur at mean high high water.

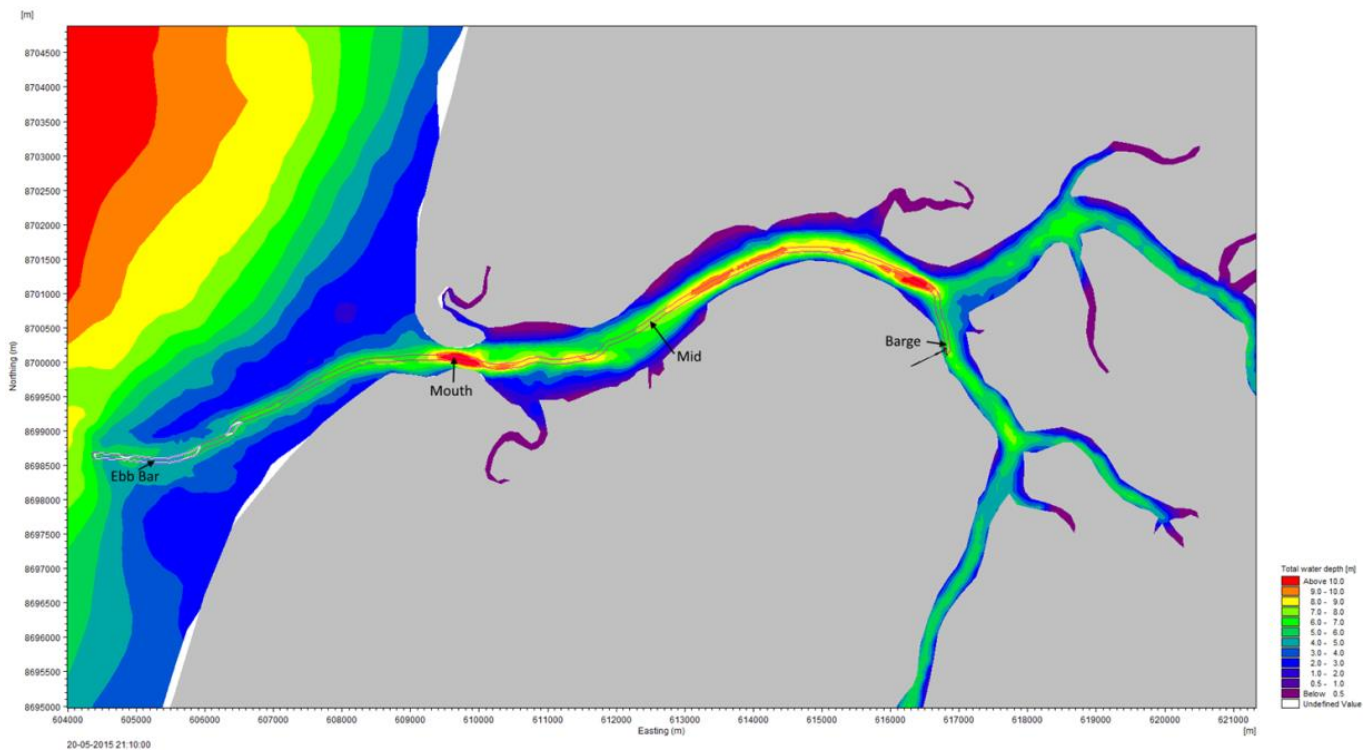


Plate 4 Figure showing the Skardon River with water depth and areas of predicted propeller wash impacts (Source: EIS Figure 17-30)

The EIS concluded that:

- Propeller wash from the barges would result in erosion of the bed in the proposed navigation channel in the mid, upstream and ebb bar areas of the Skardon River (Plate 4). The highest potential for erosion would occur over the ebb bar as this area was the shallowest and therefore would experience the highest bed velocities due to the propeller wash. The erosion would be limited by the sediment properties.
- Erosion resulting from the propeller wash of the barge would be predominantly within the centre of the navigation channel (predicted maximum width of approximately 20m). The only area where an impact outside of the navigation channel would occur adjacent to the wharf when the barges manoeuvre onto and off the wharf.
- Upstream areas would have highly consolidated sediment under the softer surface layer and hence, any erosion resulting from the propeller jet would be significantly reduced once the softer surface sediment has been eroded.
- Along the ebb bar where the highest bed shear stresses were predicted due to propeller wash, it would be likely that, as the sand sized sediment is eroded by the propeller wash, the bed would become armoured as coarser gravel sized sediment is left (material on the ebb bar is up to 25% gravel). This would protect the bed from future erosion.

4.9.2.5 Impacts due to vessel wake waves

Impacts due to vessel wake waves were assessed for barges travelling along the Skardon River when fully laden (e.g. draft of 3.92m) and calculating the sections of the navigation channel which lie within the smallest river channel cross-sectional area. The EIS concluded that small wave height resulting from the vessel wakes would be primarily a result of the relatively low vessel speeds adopted for navigation of the Skardon River. Hence it was concluded in the EIS' specialist report that it is important that 6 knots would be adopted as the maximum speed within the Skardon River to ensure no impacts would occur from vessel wake waves.

4.9.2.6 Cyclone moorings

As the Gulf of Carpentaria is prone to tropical cyclones, the EIS assessed suitable locations for cyclone moorings for two barges and one supply vessel. Possible mooring locations were identified in the upper arms of the Skardon River, located in long narrow waterways. The EIS stated that additional site specific investigations, including hydrographic survey and benthic assessment, would be undertaken prior to the location being confirmed. The moorings are configured as fore-and-aft so as to reduce movement of vessels and hence the heavy ground chains, minimising damage to the seabed and any benthic flora and fauna, offshore reef habitats, sensitive marine areas,

marine species and/or MNES. The EIS concluded that cyclone moorings, irrespective of their location, would be unlikely to create a significant impact on the marine environment, with safety of mooring vessels being the primary consideration in their design and location.

The EIS stated that assessment would be carried out under the *Code for self-assessable development Minor impact works involving the removal, destruction or damage of marine plants MP06* for installation of navigation aids (e.g. channel markers) and cyclone moorings as these locations are off-lease.

4.9.2.7 Bed levelling

The EIS investigated and compared bed levelling and dredging options for removal of the ebb tidal delta area near the mouth of the river (Plate 5). The assessment concluded that bed levelling would result in similar, or lesser, environmental impacts than dredging due to lower suspended sediment concentrations and smaller plume extent during the activity. Potential impacts of the change in bathymetry would be similar regardless of whether bed levelling or dredging would be adopted which was quantified through numerical modelling in the EIS. Based on this outcome, the EIS concentrated on the assessment and bed levelling, including potential impacts on the marine environment.

The EIS compared the function of the bed-leveller with that of the bulldozer or grader on land. Bed levelling would be required in two areas (Plate 5) in the ebb tidal delta area. To allow sufficient navigation across this area, the proponent proposed to lower the bed elevations to -2.2m LAT, which would require the movement of 40,700m³ of associated volumes to be moved in 'Area 1', and 5750m³ in 'Area 2' (Plate 5). The EIS stated that areas and volumes were calculated using the bathymetric data collected during the April 2015 survey and a channel width of 70m. Analysis of the preceding survey from September 2009 showed a similar volume of material, indicating that limited sediment accretion has occurred in the channel over this period.

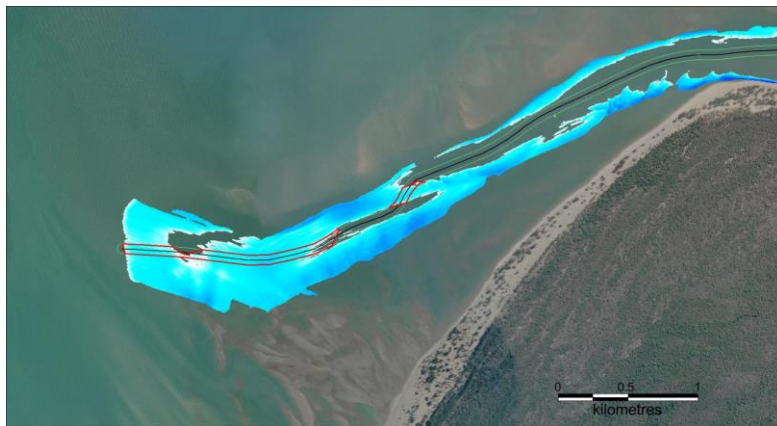


Plate 5 Proposed bed levelling areas (Source: EIS Figure 17-2)

The main findings of the bed levelling impact assessment were described in EIS as follows:

- Bed levelling would allow barge movements at the ebb bar for approximately 18 hours during a 24 hour period, avoiding low tides.
- A total of 46,460m³ of material would be required to be removed to achieve the designed depth of -2.2m LAT.
- Bed levelling was found to be a feasible option for achieving the required design depths, for a predicted duration of 120 days.
- The change in bathymetry of the ebb bar would result in small and localised changes to tidal currents and waves. The changes would be restricted to the ebb bar and do not influence the Skardon River.
- Bed levelling activity would result in a small, localised plume with peak suspended sediment concentrations of up to 40mg/l during the majority of the bed levelling activity.
- The plume extent during bed levelling was limited to the area directly offshore of the ebb bar with the residual flow (ebb flow) of the Skardon River.
- Bed levelling of the offshore edge of the ebb bar (furthest west of Area 1) would have an increased plume extent and suspended sediment concentrations due to the increased amount of fine grained material (silt and clay) in the sediment of this area (6% compared to 1% at the other areas of Area 1 and Area 2). Bed levelling of this area would occur for approximately three weeks.
- Peak suspended sediment concentrations at the location of the bed levelling activity could reach up to 300mg/l, although the median suspended sediment concentrations offshore of the ebb bar was predicted to be less than 25mg/l over the duration of the bed levelling.
- The bed levelling activity would not result in any impacts to the longshore sediment transport at the shoreline to the south or around the ebb bar adjacent to the Skardon River.

- 2009 and 2015 bathymetric surveys indicated that the channel in the ebb bar has remained relatively stable with limited accretion occurring. Based on this and the predicted propeller wash resulting from the barges over the ebb bar, ongoing maintenance of the -2.2m LAT design depth over the ebb bar would be not required during operations in the dry season.
- However, accretion could occur during the summer months when no operations are planned. Seasonal hydrographic survey would be required to inform the requirements for maintaining navigability of the bar.
- Any subsequent bed levelling maintenance activity would be expected to have similar or lesser impacts to those reported in this assessment.
- A risk was identified that a large cyclonic event could result in changes to the ebb bar configuration which could require dredging to reopen the channel.
- Despite the longer duration bed levelling (compared to dredging) the EIS concluded that it would result in less impact to any marine flora or fauna as the resultant plume would be of lower concentration, and less likely to extend within the Skardon River or to sensitive receptors.

4.9.2.8 Acid sulfate soil

Marine sediments disposed to land or left above the tidal inundation plane (while not proposed for the project) may present a risk of PASS impact and subsequent risk of acid leachate generation. No ASS/PASS assessments were carried out in the wharf construction area. The EIS concluded that the area and volume of ASS would only be known once the final details regarding the designs and construction methodology are decided for both areas. The EIS further concluded that during wharf construction activities, PASS would remain below water level and therefore not oxidise and generate acid.

4.9.2.9 Transshipment area and bulk carriers

Impacts due to propeller wash were assessed for bulk carriers (Panamax cargo vessels) at the transshipment area taking into account predicted maximum velocity adjacent to the propeller of 6.5m/s (12.6 knots). The EIS concluded that erosion would occur for a distance of up to 250m from the propeller when the vessel is laden, while no erosion is predicted when the vessel is unladen.

The sediment composition at the transshipment site was found to be approximately 15% gravels, 25% coarse sand, 50% fine to medium sand and 10% silt and clay. The silt, clay and fine to medium sand are would be resuspended by the maximum bed current speeds from the propeller wash, while sediment coarser than this (40% of the bed sediment) would only be transported short distances as bedload. The EIS concluded that fine grained sediment would be eroded from the bed in the area impacted by the propeller wash, while the coarser grained sediment would remain with local bedload transport occurring, resulting in a sea bed that would become armoured with coarser sediment protecting the sediment below from further erosion.

The process of erosion from propeller wash would lead to periodic short term increases in turbidity (every 4 to 5 days). Benthic communities would also be disturbed to some extent either by deposition or winnowing of finer sediments.

4.9.3 Cumulative impacts

The EIS identified potential cumulative impacts to coastal processes and the physical marine/estuarine environment with the neighbouring Bauxite Hills Project. This proposed Bauxite Hills Project would have similar impacts to the Skardon River Bauxite Project, such as barging of bauxite to an offshore transshipment of bauxite to bulk carriers. Unlike the Skardon River Bauxite Project, the Bauxite Hills Project proposed to construct a new port (approximately 1.5km upstream of the existing Port of Skardon) and mining of bauxite from areas surrounding the Skardon River. However, the Bauxite Hills Project did not propose bed levelling (or other means of increasing the depth of the channel across the ebb bar) and therefore there would be no cumulative impacts from bed levelling.

The EIS concluded that the operational scenario would present a substantial increase in barge traffic should both projects overlap. To meet the basic annual tonnages and weekly bulk carrier loading targets, up to 100 barge movements would be required within the Skardon River each week (3600 – 4000 movements annually). These movements would be accompanied by additional movements associated with fuel and materials supply. In comparison, the EIS stated that Port of Weipa experiences approximately 1000 movements along the channel (in and out) annually.

The proposed offshore transshipment locations for both projects would be located several kilometres apart, though the passage for barges exiting the Skardon River for the transshipment area would be relatively similar over most of its length. The EIS concluded that there would be the potential for cumulative impacts from propeller wash during departure of the bulk carriers. However, as no significant benthic habitat was identified in the transshipment areas cumulative impacts would not be significant. Cumulative impacts on marine water quality, through ship-sourced pollution would be possible but mitigated through ship-source pollution prevention plans and management of ballast water.

4.9.4 Mitigation measures

The environmental objective of a HEV waterway (Skardon River) is 'no change to existing'. 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 estuarine water quality would be undertaken throughout the estuary during construction and operation, including locations within the 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 Marine Monitoring Plan for the Skardon River and offshore area proposed the following:

- 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.

It was concluded in the EIS that with the implementation of the proposed marine infrastructure design and construction, operational plans and mitigation measures, the risk of impacts to coastal processes and the physical marine and estuarine environment would be low to medium.

The following management and mitigation measures were proposed:

- **Wharf construction:**

The EIS stated that the selection of piling construction over infill construction or causeway methods for wharf infrastructure presented a significant impact minimisation measure as:

 - short term and long term impacts associated with permanent habitat loss (e.g. mangroves) would be significantly reduced
 - hydrological regimes would not be impacted to any significant extent, e.g. the open design structure would allow the passage of tidal waters and seasonal flood flows
 - interaction with ASS and PASS would be minimised
 - passage of fauna residing in and adjacent to the mangrove habitats would not be substantially constrained
 - the fisheries resource values of the project area would be maintained.
- **Sediment run-off (sediment ponds):**
 - Release points for the sediment ponds have been designed to be as far away from Skardon River as possible given the constraints of collecting run-off downstream of port infrastructure area, above the Skardon River flood zone, and with 100m separation distance to the mangroves and Skardon River.
 - The monitoring program for the port sediment ponds included:
 - monitoring of sediment pond water quality prior to any controlled releases during the operational period
 - monitoring of sediment pond water quality during the wet season
 - monitoring of Skardon River water quality during releases
 - determination of whether the project is resulting in a 'change' in water quality
 - monitoring of marine ecology should water quality monitoring indicate a change in water quality
 - management measures if a change in water quality and ecology is identified.
 - Release criteria were included in the EIS: The release characteristics of sediment ponds would be reviewed once operational to ensure water quality data is collected during periods of high risk.
 - Annual clean out sediments in the sediment pond prior the wet season.
- **Bulk fuel, chemical release and spills:**
 - The existing storage tank would be refurbished and subjected to integrity testing to ensure the system has no leaks or faults, and the existing bunded area upgraded so that the base and bund walls would be impermeable.
 - A program of monitoring and environmental auditing would be undertaken to ensure water quality and the systems designed to protect it are maintained throughout operations.

- The mine vehicle wash at the new workshop would be a fully bunded / internally drained wash bay, with wash waters recycled internally via a silt trap and a triple interceptor to remove oily water and sediments prior to reuse.
- The refuelling point would comprise of an impermeable base and bund, with a ramp over the bund for access. Refuelling would be undertaken with various controls to minimise leaks and spills.
- The workshop would include a degreasing station and triple interceptor to capture any spillages and remove oily materials from any wash waters.
- A regulated and hazardous waste facility would be located in the existing cleared area to the south of the workshop, comprised of an impermeable bunded base, and roofed to exclude rainfall.
- A Surface Water and Groundwater Monitoring Plan was prepared which included monitoring of groundwater bores in the port area, including up-gradient and down-gradient of the fuel storage to provide information on potential contamination, which would be investigated and remedial measures implemented as required.
- The Oil Spill Contingency Plan would be updated so that the proponent would be the first responder. Currently, first strike oil spill equipment is housed in the bagging shed, which is near the boat ramp area, around 60m from the river's edge. This response plan would be agreed with MSQ and Ports North, considering the level of risk and response capabilities.
- **Propeller wash and wave impacts:**
 - Implementation of vessel management, including speed and areas of operations (maximum of 6 knots within the Skardon River).
 - Barges using a defined navigation channel (centreline) to minimise the extent of disturbance from propeller wash.
 - Barge movements would be controlled to minimise propeller wash.
 - Passage over or immediately adjacent to seagrass habitats would be limited.
 - River bank position and bank vegetation monitoring would be undertaken should there be any indication of potential changes resulting from the vessel wake waves.
 - Design features to prevent spills of contaminants and response plans for spills of contaminants
 - Ongoing marine/estuarine water quality and sediment monitoring.
- **Cyclone mooring:**
 - Additional site specific benthic and hydrographic surveys are required to optimise the location and design of the cyclone moorings.
- **Bed levelling:**
 - Material would be relocated in a westerly direction, wherever practical, to replicate the natural bed form migration and to help minimise the requirement for repeat bed levelling.
 - Water quality monitoring would be undertaken during bed levelling during the first 2-3 weeks of activity
 - Monitoring would be compared to modelling predictions to ensure processes remain as anticipated and sensitive down current habitats are protected.
 - Habitat condition thresholds would be developed for the nearshore reef systems during baseline data collection programs and a reactive approach to bed levelling management would be developed.
 - Should turbidity, deposition or benthic light parameters exceed habitat condition thresholds at sensitive habitats, works would be suspended until conditions recover.
 - Hydrographic surveys would be undertaken of the ebb bar channel after each summer to monitor the bed elevations in the channel and inform if additional maintenance bed levelling is required for navigational purposes.
- **Acid sulfate soil management:**
 - Once the footprints for wharf facilities are defined and construction methodologies finalised, additional field investigation would be undertaken to identify ASS or PASS and if required, the preparation of an ASS Management Plan.
 - Should a detailed ASS Management Plan be required, then additional analysis within the construction footprint would be undertaken in accordance with the QASSIT guideline.
- **Transshipment area:**
 - Bulk carriers would operate in the offshore transshipment area where benthic cover is approximately 0.5%.
 - Loading zones would be controlled so that, over time, the sea bed would become armoured with coarser sediment protecting the sediment below from further erosion.
- **Compliance** with ballast water management regulations.

Proposed monitoring of the marine habitats is described in section 4.6.4 of this assessment report.

4.9.5 Conclusion and recommendations

Based on information provided in the submitted EIS, EHP concluded that one of the major impacts of the proposed project would be impacts on the coastal and estuarine environments. This is mainly due to the relative pristine

condition of the Skardon River which is classified as a HEV waterway with little anthropogenic influence. Risks and impacts would include changes in water quality, contamination, sedimentation and turbidity, but also impacts on the marine and estuarine flora and fauna (refer to section 4.6 – Flora and fauna and section 4.8 – Matters of national environmental significance of this assessment report).

Cumulative impacts with the proposed doubling of barge traffic in the Skardon River due to the neighbouring proposed Bauxite Hills Project would only exacerbate potential impacts on this environment. Risk management associated with cumulative impacts would require a coordinated approach between both proponents.

The mitigation and management measures presented in the EIS addressed most of the environmental objectives and performance outcomes of table 1 and 2, schedule 5 of the EP Regulation and the environmental values identified in the EPP (Water).

The TOR and submissions received on the coastal environment were addressed adequately in most parts. This assessment identified a number of matters, some of which require attention by the proponent:

4.9.5.1 Estuarine water quality and sediment monitoring

The EIS was based on limited amount of monitoring and a lack of data collection points. Furthermore, the proponent did not collect data during the wet season event based run-off periods, and as such, parameters, especially peak turbidity, were not available to be reviewed during the EIS assessment project. Ongoing monitoring and further collection points (survey sites) were proposed by the proponent, including capturing turbidity through logger data from key receiving habitats, as well as from above and below the impact areas (e.g. port). Monitoring of pre-impacts would need to be undertaken prior to commencement of construction of port facilities and bed levelling activities.

The review of the EIS and the proponent's response to EHP's submission did not adequately address impacts of turbidity from the sediment ponds on the receiving waters. However, it is noted that although the potential impacts from sediments in the receiving waters (Skardon River) have not been evaluated, an acceptable measurement for turbidity (total suspended solids (TSS) of 50 mg/L) has been included on releases and in the receiving environment (refer to Schedule E: Water of Appendix 1). Further monitoring would provide site-specific turbidity background levels for Skardon River during all seasons and following this information, the release criteria in the EA could be revised.

4.9.5.2 Propeller wash and wave impacts

It is noted that calculations provided in EIS Appendix 17 regarding erosion caused by barge movement have assumed a maximum barge speed of 6 knots. EIS Appendix 17 also noted that "*it is important that 6 knots is adopted as the maximum speed within the Skardon River to ensure no impacts from vessel wake waves*". It was further noted in the assessment of the EIS that the Vessel Speed Access Plan proposed speeds of up to 8 knots. Revision of vessel speeds would need to be adjusted if impacts are greater than predicted. Furthermore, the proposed Vessel Speed Access Plan would need to be revised to include a maximum speed of 6 knots.

4.9.5.3 Dredging and bed levelling

The proponent stated in the response to EHP's submission on further information on dredging post-cyclone, that there would be a low likelihood of needing dredging to reopen the mouth of the Skardon River for barge operations. EHP notes that the proponent understands that a separate EA would be required if dredging would be required and that an application may delay access to the port post-cyclone and require assessment against the relevant provisions of the EP Act, which would result in a decision to either approve or refuse the application. Given that the proponent stated that the risk that an EA would be required is low, EHP is satisfied that the proponent is aware of the risk they take in not applying for dredging.

The proponent provided a comparison of the potential impacts of bed levelling and dredging and a discussion of the logistical difficulties and the feasibility of undertaking dredging at this location. The modelling undertaken follows generally accepted practice and provided EHP with confidence that there would not be unacceptable environmental impacts to the receiving environment.

However, as bed levelling would be off-site and hence not be conditioned as part of the EIS, a tidal works approval application would need to be required post-EIS. As part of this, the proponent should be aware that further information on bed shear stress; sedimentation rates and the likely impacts of sedimentation and turbidity on benthic taxa; a hydrographic survey of the areas to be bed levelled; an EM Plan outlining proposed works; equipment to be used and monitoring and management actions; as well as further analysis and comparisons of the impacts of dredging and bed levelling may be required in the tidal works approval application. EHP has proposed conditions as recommended tidal works condition for the proposed bed levelling activities and installation of cyclone moorings in Appendix 3 of this assessment report.

4.9.5.4 Acid sulfate soils

The coastal developments proposed could have the potential to intersect ASS and PASS materials. Where soil excavation is proposed, consideration of risks from ASS or PASS should be incorporated into the development design. ASS sampling should be undertaken prior to construction. Depending on the detailed findings of additional field study, development of an ASS Management Plan may be required (refer to Schedule G: Land and rehabilitation of Appendix 1).

4.9.5.5 Recommendations

Based on the abovementioned matters to be addressed, EHP recommends the following:

- 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 port facilities and bed levelling activities.
- Sediment pond releases following storm events: Due to lack of information currently on site-specific turbidity and TSS values, the proposed condition state monitoring frequency for TSS following a storm event must be carried out within 2 hours of release (refer to Schedule E: Water of Appendix 1).
- A site specific TSS value for the kaolin pit releases would need to be provided.
- 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
- Barge vessel speed is not to exceed 6 knots in the Skardon River 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 update all documents, including but not limited to the Vessel Speed Access Plan, to include a maximum speed of 6 knots.
- 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.
- Any dredging would require an application and approval of an EA to conduct an ERA16 prior to any dredging being undertaken post-cyclone or otherwise. The application and approval process for a dredging EA may result in delays in accessing the port facility by barge post-cyclone and that such an application and require assessment against the relevant provisions of the EP Act which would result in a decision to either approve or refuse the application. EHP has proposed conditions as recommended tidal works condition for the proposed bed levelling activities and installation of cyclone moorings in Appendix 3 of this assessment report.
- ASS sampling must be undertaken prior to construction. Depending on the detailed findings of additional field study, development of an ASS Management Plan may be required.

In conclusion, mining activities must be carried out in accordance with the recommended conditions outlined in **Appendix 1** of this assessment report to avoid any unacceptable impacts on the environmental values identified for the proposed project. Where the proponent's commitments outlined in EIS Appendix 1 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 Section 1.18.

4.10 Rehabilitation and decommissioning

Rehabilitation and decommissioning was addressed mainly in EIS Chapters 5 – Project description; EIS Chapter 7 – Rehabilitation and decommissioning; EIS Appendix 1 – Commitments Register; EIS Appendix 13 - EM Plan. These EIS documents were updated and resubmitted by the proponent as a response to EIS submissions.

4.10.1 Rehabilitation approach

The EIS stated that the rehabilitation goals and objectives were based on schedule 5, table 2 of the EP Regulation and the EHP's *Guideline – Rehabilitation requirements for mining projects*. The EIS stated that decommissioning and rehabilitation of the former kaolin mine operations did not form part of the EIS as these activities were already approved under the existing EA and plan of operations. The proposed post-mining land use, once rehabilitation is complete, is to return the land to pre-existing native vegetation communities.

Rehabilitation goals outlined in the EIS included returning the project area to a stable and self-sustaining landform with a productivity level that conforms to a defined final land use through effective mine closure planning, establishment of key performance indicators, stabilisation of landforms and revegetation with suitable native species.

The proponent committed to progressively rehabilitate the mine floor (i.e. after backfilling with subsoil and topsoil) and other disturbance areas not required for the duration of operations. Once operations are completed, all infrastructure would be decommissioned (except for infrastructure retained by Traditional Owners) and disturbance areas rehabilitated, and the objective would be to return the area to a similar condition to that which existed prior to mining. As mining occurs progressively across the leases, rehabilitation of mined areas is planned to occur within 12 months following mining of a pit. Progressive rehabilitation would also include the rehabilitation of areas disturbed during construction that are not required for ongoing operations.

As part of the native title agreement with the registered Native Title Claimants, the following infrastructure would be kept and not rehabilitated:

- airstrip
- road from Skardon River port landing to Namaleta Creek and the airstrip
- the kaolin mine pits with the pipeline to the port infrastructure area
- dry plant shed at port infrastructure area, unless removed by the new owner
- accommodation camp, unless removed by the new owner
- other infrastructure erected as part of the proposed bauxite mining operation.

4.10.1.1 Vegetation clearing

EIS Chapter 5 stated that experience of other bauxite projects on Cape York has shown that it is best to clear and grub vegetation as soon as possible after the wet season which is typically at the end of March or April. The EIS further stated that it is more likely to undertake annual vegetation clearing, windrowing and burning a year or so in advance of proposed mining, with the determination of what areas are to be cleared subject to ongoing review depending on the proposed areas of mining.

Similarly, topsoil would be removed on an annual basis ahead of mining. Therefore, since these areas would be cleared, grasses and small shrubs would be allowed to regrow between the vegetation clearing campaigns to minimise erosion and to maintain viability of the soil for plant growth.

4.10.1.2 Topsoil harvesting and management

According to the EIS, the topsoil (generally between 100 and 200mm thick) would be harvested by scrapers over the nine month mining period each year. Grass and light regrowth from the clearing would be harvested with the topsoil and would help to promote regrowth in the rehabilitation areas.

During the first month of mining the EIS estimated that a stockpile of approximately 30000 bank cubic metres (bcm) of topsoil would be necessary but within a month of commencing bauxite mining there would be enough mined out pit area and backfilled with subsoil to allow topsoil to be hauled straight from harvesting to final placement in the rehabilitation areas.

4.10.1.3 Subsoil removal and management

The average subsoil thickness in the project area was stated to be around 0.6m, ranging between 0.1m and 2m. Subsoil removal would be scheduled over the full nine month mining period each year. During the first month of Year 1 it was estimated in the EIS to stockpile approximately 70,000bcm of subsoil until sufficient DSO bauxite has been mined to provide mined out areas for subsoil placement.

4.10.1.4 Post-mining landform

The DSO bauxite normally forms more than half the depth of mining so the post mining landform after placement of the mined topsoil and subsoil would be below the level of the original landform. The EIS concluded that after one month of mining it would be possible to surcharge mined out areas with subsoil, rather than forming out of pit stockpiles, without rising above the pre-mining topography.

4.10.2 Potential impacts

The EIS concluded that rehabilitation and decommissioning are key measures to mitigate the impacts of mining. However, potential impacts have been identified that could occur across the disturbance area during rehabilitation and closure, including the potential of:

- increased abundance of pest animal / weed species
- reduced or increased fauna and flora species abundance and/or diversity
- increased sediment loads in watercourses resulting from ineffective restoration of drainage lines, with adverse effects on aquatic fauna and habitats, although the EIS concluded this to be unlikely as the landscape would be lowered and stormwater would exit as base flow (groundwater seepage)
- contamination of groundwater caused by contaminated seepage.

The EIS also identified potential impacts after mine closure, if not appropriately managed or mitigated:

- revegetated habitat not suitable for native fauna and flora to colonise after decommissioning – insufficient cover and nesting sites in the first 10 years of regenerating vegetation
- failure to achieve self-sustaining vegetation mine areas, leading to reduced ecological function and curtailed ecosystem development, although successful rehabilitation is expected after 10 years
- potential for weed and pest species to colonise
- contamination of groundwater by seepage from site infrastructure areas if these are not decommissioned
- retention of surface water flow after rainfall in rehabilitated mine pits, with consequent downstream impacts, although this is unlikely as the landscape would be lowered and stormwater would exit as base-flow
- sediment run-off from mine areas and turbidity, although this was considered as unlikely as landscape lowered and stormwater would exit as base flow and revegetation would limit sediment run-off.

4.10.3 Proposed rehabilitation measures

The EIS and EM Plan proposed progressive rehabilitation that would be achieved through a suite of environmental management plans including (but not limited to):

- Rehabilitation Management Plan
- Soils Management Plan
- Erosion And Sediment Control Plan
- Weed And Pest Management Plan
- Water Management Plan.

The proposed rehabilitation process would include:

- maintaining or constructing a stable land form in mined areas
- respreading of topsoil and subsoil across the mine floor
- ripping the mined floor, immediately after soil placement to facilitate root penetration and water absorption
- seeding with appropriate seed mix prior to the wet season to maximise the benefits of rainfall
- ensuring no surface water run-off from the mine floor, both pre and post revegetation
- appropriate fire management
- establishment of reference sites across a range of undisturbed vegetation types in order to compare baseline data with revegetation (rehabilitation areas) site data, and subsequently measure community change over time
- annual monitoring of revegetation sites in the early dry season.

4.10.3.1 Completion criteria in mine site rehabilitation

The EIS committed to completion criteria and indicators that would be developed for:

- key species indicators, including framework species, such as a mature upper canopy that is made up of around 70% of the naturally dominant tree species, mainly *E. tetradonta* and *Erythrophleum chlorostachys*
- vegetation cover
- erosion and sediment loss
- soil quality
- geotechnical stability of rehabilitated areas
- quality of water run-off
- engineering standards and certifications for decommissioned and rehabilitated infrastructure
- remediation of any contaminated land.

Early indicator species would be used to determine whether regeneration processes are progressing towards a sustainable end-point ecosystem. The EIS conclude that it is expected that a sustainable ecosystem would be achieved within 10 years.

4.10.4 Decommissioning and mine closure

The proponent committed to develop a Mine Closure Plan prior to final bauxite extraction to achieve ecologically sustainable development as required by the EP Act, the fundamental objective of which is to attain operationally and economically feasible closure while taking into account community priorities, environmental requirements and sustainability of the rehabilitation and the final land use. Rehabilitation and decommissioning strategies would be implemented to meet the criteria agreed upon as part of the Rehabilitation Management Plan. The EIS concluded that following mine closure in accordance with the Mine Closure Plan and Rehabilitation Management Plan, all rehabilitation goals and objectives are expected to be achieved.

4.10.5 Conclusion and recommendation

Rehabilitation objectives for the project area include the return the land to pre-existing native vegetation communities. The EIS adequately proposed methods and objectives for the progressive rehabilitation of disturbed lands. It is understood that as part of the native title agreement some infrastructure may be kept pending discussions with the registered Native Title Claimants.

The TOR and submissions received on rehabilitation and decommissioning were addressed adequately and a range of mitigating and management measures, as well as commitments were proposed by the proponent. These measures were used by EHP to propose recommended conditions in Schedule G: Land and rehabilitation of Appendix 1. Where the proponent's commitments outlined in EIS Appendix 1 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 Sections 1.6 and 1.8.

4.11 Air quality

The air shed and management of likely air impacts were described in EIS Chapter 19 – Air Quality and Greenhouse Gases. Detailed air quality studies were undertaken and reported in EIS Appendix 9 – Air Quality. These documents were also updated and resubmitted by the proponent in response to matters raised in the submissions on the EIS.

4.11.1 Existing values

In terms of human receptors, the EIS identified closest sensitive receptors located at Cullen Point approximately 10km southwest of the southernmost mining lease and 30km from the bauxite material stockpiles and port infrastructure area at the Skardon River (refer to section 2.3 of this assessment report). At the time of release of the EIS the location of the neighbouring Bauxite Hills' accommodation camp was unknown.

In the absence of suitable background air quality data from the project site, the EIS stated that background air quality levels were based on other similar locations on the western Cape York Peninsula, such as Weipa and these levels were considered to be a reasonable estimate of existing air quality in the project area. According to the EIS, the existing environmental values for air were defined using inferred meteorological conditions and climate data, local terrain, landscape features and land uses, and the location of sensitive receptor dwellings. The EIS used meteorological monitoring data from the Bureau of Meteorology Weipa Airport weather station, which is located approximately 80km south of the proposed project area, as characteristic of long-term climate for the Skardon River region. No on-site meteorological data was collected to support the EIS assessment. The EIS stated that the prevailing wind direction would be dominated by winds from an east to south-east direction. The EIS described the surface atmospheric pressure as dominated by low pressures features during wetter summer months and generally by high pressure features during the winter months.

The EIS stated that the former on-site kaolin mine would have been a source of dust when it was operating but has been under care and maintenance for some time and any dust emissions are managed in accordance with the existing EA. Bushfires would periodically degrade the existing air quality by contributing dust and smoke. They occur mainly during the dry season when winds are predominately from the south-east and particulate material would be blown towards the Gulf of Carpentaria.

4.11.2 Impacts

The EIS identified wind-blown dust as the most significant pollutant to be emitted during the construction and operational phases of the proposed project. The EIS considered the following mining activities as potential sources of emissions to air:

- land clearing and burning of cleared vegetation
- topsoil stripping
- loading trucks with topsoil and subsoil using front-end loaders and trucks
- dumping top soil and subsoil at stockpile area(s)
- excavation of bauxite material
- loading trucks bauxite material using front-end loaders and trucks
- dumping bauxite material at stockpile area(s)
- haul truck movements of topsoil, subsoil and bauxite material on unpaved roads
- wind erosion of exposed stockpile topsoil, subsoil and bauxite area
- barge loading of bauxite material at the port
- ship-loading of bauxite at sea.

The EIS stated that no on-site air quality monitoring was conducted for the proposed project. Furthermore, no

dispersion modelling of dust emissions was conducted for the proposed project due to the assessed low risk of air quality impacts from the proposed project. Instead, the EIS used Rio Tinto Alcan Group's South of Embley¹ Project's EIS air quality assessment, including the dispersion model for dust emissions, to determine air quality risks for the proposed project. The EIS estimated dust emissions and stated that the magnitude of emissions is likely to be similar between the two projects. Accordingly, the proposed project's dust air quality impacts were inferred from the South of Embley Project's EIS air quality assessment report.

According to the EIS the nearest sensitive receptor is 11km to the closest proposed active mining area. The EIS concluded that the inferred air quality impacts from the proposed project operating in isolation were not predicted to occur beyond 5km from mining areas and that ground-level concentrations at sensitive receptors would not exceed air quality criteria.

4.11.3 Cumulative impacts

At the time of writing the EIS, cumulative impacts could not be fully assessed as the adjacent Bauxite Hills Project's EIS assessment process has not been completed. Hence, it was assumed that the proposed Bauxite Hills Project would undertake similar mining activities as the proposed project. The EIS stated that air quality impacts from the Bauxite Hills Project were assumed not to occur beyond 2.5km from their mining activities. The EIS concluded that cumulative air impacts would not occur beyond 7.5km from both projects and predicted ground-level concentrations at sensitive receptor location at Cullen Point and Mapoon would not exceed the air quality criteria/objectives as a result of cumulative impacts.

The EIS concluded that if approved, the Bauxite Hills Project proposed accommodation camp would be the nearest sensitive receptor to the proposed Skardon River Bauxite Project. The Skardon River Bauxite Project would implement appropriate dust mitigation measures to ensure that ground-level air quality criteria/objectives for human health and well-being are not exceeded at the proposed accommodation camp.

The EIS concluded that due to the predicted low dust emissions from the proposed project area from mining activities and the predominant south easterly wind taking particulate matter offshore, there is a predicted low risk of nuisance impacts to identified sensitive receptors.

4.11.4 Mitigation measures

The EIS stated that appropriate dust emission control measures would be implemented to manage the potential impacts to human health and wellbeing and the environment, sensitive receptors locations including proposed accommodation camps and dwelling at Cullen Point and Mapoon.

The EIS stated that the following minimum dust mitigation measures would be implemented during both the construction and operational phases of the proposed project, including:

- minimising cleared areas and retaining existing vegetation
- allowing regrowth of grasses and shrubs in areas cleared of tall vegetation
- ensuring rehabilitation proceeds as soon as is practicable after works are completed to minimise the duration of exposure of disturbed areas
- minimising the use of topsoil and subsoil stockpiles
- watering of haul roads and bauxite, topsoil and subsoil stockpiles
- use of dust suppressants on haul roads, where necessary
- progressive rehabilitation of disturbed areas
- fitting the barge loading conveyor with a telescopic chute required to accommodate the tidal movement and minimise spillage and dust
- the conveyor would have sprayers to control dust along its length and spill trays beneath the conveyor in sections which are not drained to the port sediment pond
- sprayers would be installed along the conveyor to reduce dust both during conveying and when moving from the telescopic chute to the barge
- implementation of a regular maintenance schedule to clean up dust in order to avoid release to waters
- implementing speed limits via posted speed limit signs on project area unsealed roads
- ensuring vehicles keep to marked trafficable areas which would be maintained in a damp and compacted condition to enhance safety and minimise dust emissions.

¹ Now known as Rio Tinto's Amrun project

The EIS identified that the combustion of diesel fuel from the project's fleet vehicles, machinery and generators exhaust emissions would be a source of air pollutant emissions. Exhaust emission would include:

- emissions of oxides of nitrogen
- carbon monoxide
- particulate matter (PM 2.5µm and PM10µm)
- sulfur dioxide
- carbon dioxide
- trace amounts of volatile organic compounds.

The EIS stated that the emissions from mine's fleet vehicles would not be significant and the proponent would maintain all fleet vehicles and machinery to be used during the construction and operational phases of the project in accordance with the manufacturer's specifications to minimise exhaust emissions.

The EIS concluded that as the Skardon River Bauxite Project and the Bauxite Hill Project propose separate accommodation camps, both companies would be required to come to a mutual agreement that would involve suitable operational controls to reduce dust emissions including:

- construction methods for the camp accommodation to limit dust within accommodation units
- timing and location of mining activities
- air quality monitoring at camps
- development of appropriate responsive management plans to alter mining activities should air quality levels at the camps not achieve compliance with EA conditions.

The proponent committed to implement a complaints management system so that any identified incidents or nuisance complaints would be investigated and implementation of corrective treatments.

4.11.5 Conclusion and recommendations

The EIS adequately addressed the TOR and submissions received on the EIS, as well as the environmental air quality objectives and performance outcomes stated in schedule 5, table 1 of the EP Regulation. The EIS has adequately established that the main air quality concern is the emission of fine particulates from various project sources, including construction, mining, haulage, stockpiling, material transfer and load-out activities. The EIS adequately described suitable mitigation and management measures and commitments to minimise emissions of contaminants to air. Based on the proponent's information EHP recommends conditions in Schedule B: Air of Appendix 1. Where the proponent's commitments outlined in EIS Appendix 1 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.

The EIS assessment identified a number of matters which require attention by the proponent:

- EHP noted that in regards to impacts from ship-loading of bauxite at sea, the EIS did not make and provisions for barges to be covered and no information was provided if any cover would be proposed for the conveyer belt at the transshipment area. It is industry best practice for barges to have conveying system fully or partly covered. EHP understands that bauxite would be kept moist during the transport which would minimise dust emissions, but EHP recommends further commitments by the proponent to ensure that there are no impacts on listed threatened marine species in the vicinity of the transshipment area due to dust emissions.
- EHP also noted that the air emissions of the three 1MW power generator appeared to be very high compared to the best practice emissions of reciprocating internal combustion engines. EHP advises that suitable power generators should be used which are compliant with best practice emissions. The proponent has verbally agreed to these requirements, hence it is recommended that the proponent would update the EIS Commitments Register.

In conclusion, mining activities must be carried out in accordance with the recommended conditions outlined in Appendix 1 of this assessment report to avoid any unacceptable impacts on the environmental values identified for the proposed project. Where the proponent's commitments outlined in EIS Appendix 1 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 Section 1.20, including the changes stated above.

4.12 Noise and vibration

The noise background and management commitments for mitigating identified likely noise impacts were described in EIS Chapter 20 – Noise and Vibration as well as the Appendix 13 – EM Plan. Detailed noise studies were undertaken and described in EIS Appendix 10 – Noise and Vibration, Noise Impact Assessment report. No blast

noise and vibration impact assessment was required. These documents were also updated and resubmitted by the proponent in response to matters raised in the submissions on the EIS.

4.12.1 Existing values

No on-site background noise monitoring was measured on the project area. The EIS inferred ambient and background noise levels for the proposed project from noise monitoring data measured as part of the noise and vibration impact assessment for the Pisolite Hills Bauxite Project EIS (Pisolite Hills Project). Maximum noise levels of up to 43.1 A-weighted decibels (dB(A)) were recorded for the Pisolite Hills Project which were attributed to natural sources such as insect and bird activity rather than anthropogenic sources such as mining or transport activities, and were characterised as ambient noise levels typical of the summer noise environment for the region.

4.12.2 Impacts

4.12.2.1 Sensitive receptors

The EIS used sound power levels from proposed construction plant and equipment to calculate the potential noise impact levels at the closest sensitive receptor (refer to section 2.3). At the time of release of the EIS the location of the neighbouring Bauxite Hills' accommodation camp was unknown.

The maximum noise impact from construction works was calculated to be 20.4dB(A). The EIS stated that this level would be significantly below the project's construction noise criteria following EHP's *Planning for noise guideline*². Mining activities would include the operation of various plant and equipment during the construction phase of the proposed project. The EIS stated that mining operations would not require blasting to remove subsoil material. Therefore there would be no vibration impacts associated with blasting from mining. Vibration from other source such as mine vehicles, machinery and equipment were assessed as a low impact due to the separation distance to the nearest sensitive receptors. The EIS predicted the maximum noise impact from mine operations, including the port, on-site power generation, and aircraft take-off and landing noise to be 18.6dB(A). This level was assessed as significantly below the project's construction and operational noise criteria.

The EIS identified that both the proposed project and the Bauxite Hills Project would likely generate noise levels at the adjacent accommodation camp in excess of the selected noise criteria. The EIS identified the need for both projects to seek agreement to effectively manage any potential noise impacts at their respective accommodation camps. The EIS also stated that any agreement should address proposed construction methods at the accommodation camps, scheduling and location of mining activities, noise monitoring and management actions to adjust mining activities when noise levels are not compliant with EA conditions.

Hence, the EIS concluded that the overall project risks from noise and vibration to existing sensitive receptors as low while risk from noise associated with the proposed location of accommodation camps on the Skardon River and Bauxite Hills projects was identified as medium. The risk associated with noise emissions from the proposed project to land animals was considered low. The EIS did not identify any critical breeding or roosting habitat for any listed threatened fauna likely to be impacted by project noise emissions.

4.12.2.2 Underwater noise

According to the EIS, underwater noise emissions from the proposed project's pile driving, barge and boat activities would likely impact the local marine environment. During the project's operational phase, noise sources from operational vessels would include barge movements, bed-levelling and mine supply vessels. The EIS identified vessel movements during the project's construction and operational phase of the project would likely cause behavioural change in marine mammals (e.g. cetaceans, dugongs and turtles) in the immediate vicinity of the operating vessel.

The EIS stated that during the port construction phase of the proposed project underwater piling noise could potentially permanently or temporarily affect hearing loss or behaviour responses in marine mammals. The EIS estimated approximately 42 piles would be required to construct the proposed project's dolphins, jetty and wharf head. The EIS estimated that noise disturbance from port piling activities would be completed within a two month period. The EIS stated that port pile driving activities may cause hearing loss in cetaceans within 200m, and temporary hearing loss and behaviour change, including avoidance actions within 1000m to 2000m of the activity.

² Available from <https://www.ehp.qld.gov.au/assets/documents/regulation/ts-gl-planning-for-noise-control.pdf>

4.12.3 Cumulative impacts

The EIS assessed the cumulative impacts noise emissions from the proposed project and the adjacent proposed Bauxite Hill Project. The EIS based the cumulative impact assessment on conservative assumptions that determined that the noise levels at Mapoon would be 3 dB(A) higher than those generated by the proposed project in isolation and concluded that any noise impacts would be below the operational and construction noise criteria. At the time of submitting the EIS and the response to submissions, the EIS for Bauxite Hills Project had not been publically notified. Hence an assessment on the location of Bauxite Hills' accommodation camp was not considered in the Skardon River Bauxite Project's EIS.

4.12.4 Mitigation measures

4.12.4.1 Sensitive receptors

The EIS stated that inferred noise modelling and the separation distance between for the project area and the nearest existing sensitive receptors, no mitigation controls would be required to achieve compliance with noise criteria.

The EIS identified that the separation distance of both project accommodation camps from proposed adjacent mining activities would require further detailed assessment. The EIS did however identify locations on adjacent Bauxite Hills project areas where the accommodation camps could be located without the need for mitigation measures to achieve compliance with noise criteria. The EIS suggested that both project proponents would need to come to a mutual agreement that would address proposed construction methods at the accommodation camps, scheduling and the location of mining activities. Specific noise monitoring and management actions would need to be developed to adjust mining activities when noise levels are not compliant with noise criteria.

The EIS listed management practices or strategies that would be adopted to minimise noise emissions on the project area including:

- all equipment would be properly serviced and maintained
- all mobile equipment (e.g. bulldozers, graders, frontend loaders, dump truckers, scrapers, light vehicles, sonic drills and pit pumps) would be fitted with appropriate silencing and muffler equipment to reduce sound power levels
- all fixed plant (e.g. diesel generators) would be housed in sound attenuating enclosures
- management, monitoring and reporting of plant and equipment sound power levels to ensure compliance with noise criteria at identified sensitive receptors
- implementation of a process for documenting, assessment reporting and correcting any non-conformances
- developing and implementing a noise complaint management system
- carrying out noise monitoring in accordance with the Environmental Protection (Noise) Policy 2008 (EPP Noise) and update noise abatement measures in the event that monitoring shows that noise levels exceed relevant noise criteria.

The EIS stated that should noise emission from the project be identified as impacting on critical habitat listed threatened animals, the following mitigation measures would be implemented including:

- ensuring all plant and equipment is regularly maintained
- conducting regular noise emissions monitoring
- using low noise emission plant and equipment
- shut-down equipment when not in use.

4.12.4.2 Underwater noise

The EIS proposed the following mitigation measures for piling construction noise to reduce the potential for adverse impacts on marine animals including:

- undertaking pile driving activities during daylight hours only
- designation of a 500m safety exclusion zone around piling works
- ensuring that a suitably trained observer conducts observations for marine animals prior to works commencing and during piling activities
- implementing a pre-piling start-up observation procedure
- carrying out a soft-start piling start-up procedures to allow marine mammals to leave the area
- implanting of a stand-by operations procedure
- installing impact cushions between the top of the pile and the hammer to reduce sound pressure levels
- installing a surrounding vertical bubble curtain to reduce noise transmission of pile driving noise emissions.

The EIS stated that once the port construction phase is complete specific underwater noise mitigation measures

are not proposed during the operational phase of the proposed project.

4.12.5 Conclusion and recommendations

The EIS provided a satisfactory assessment of the potential impacts to the acoustic environment. The EIS identified and adequately described the environmental values to be protected with respect to noise, in accordance with the EPP (Noise), as being the protection of the health and biodiversity of ecosystems, human health and well-being and the amenity of the community. The TOR and submissions were addressed adequately in most parts.

This assessment identified a number of matters which require attention by the proponent:

4.12.5.1 Cumulative noise impacts on accommodation camps for the Skardon River Bauxite Project and the Bauxite Hill Project

Since the proponent submitted the amended EIS and response to submissions, the EIS for the proposed Bauxite Hill Project has been publically notified. In the Bauxite Hills' EIS the proposed accommodation camp location was shown to be side by side to the existing Skardon River accommodation camp.

EHP notes that as the project would not be operating during the summer months, the noise measurements outlined in the EIS should be taken as indicative and do not necessarily provide an accurate indication of representative background noise levels. EHP further notes that the proposed noise predictions for Skardon River Bauxite Project would exceed noise levels for health and well-being recommended by World Health Organisation at the currently proposed location of the Bauxite Hills accommodation camp. Given that both accommodation camps are proposed to be located side by side and that no noise modelling was undertaken for these sites in the Skardon River Bauxite Project EIS, EHP considers it necessary that specific additional noise mitigation would need to be implemented by both proponents. The lack of representative background noise levels, the location of the proposed accommodation camp for the Bauxite Hills Project and the cumulative impacts of both projects should be considered in finalising noise conditions that would need to be applied to protect health and amenity values. Recommended noise conditions to be used as a draft of what could be applied to the Skardon Project are outlined in D of Appendix 1.

4.12.5.2 Noise impacts on cetaceans

Noise impacts on cetaceans during the wharf constructions have been identified and suitable mitigation measures were proposed as outlined above; however, a species management plan for cetaceans must be prepared to ensure that potential impacts from noise impacts during the piling activities would be managed appropriately.

Some of the proponent's commitments outlined in EIS Commitment Register Section 1.21 are inconsistent with the recommended conditions and need to be amended. Once amended, the proponent should implement the commitments as stated.

4.13 Contamination and waste management

This section addresses the impacts from potential contamination and waste and details proposed management measures to ensure that any waste transported, generated, or received as part of carrying out the activity would be managed in a way that protects all environmental values. Contamination and waste were described in EIS Chapter 8 – Non-mining waste management; EIS Chapter 11 – Land use and land contamination; EIS Appendix 13 – EM Plan; and sections in EIS Chapters 5, 6, 10, 17, 22 and 23. These documents were also updated and resubmitted by the proponent as a response to EIS submissions.

4.13.1 Existing and potential contamination

The EIS stated that web based searches of EHP's Contaminated Land Register and Environmental Management Register identified that two lots found within the project MLs (i.e. Lot 11 SP204113 and Lot 13 SP204113) were listed on the Environmental Management Register but not on the Contaminated Land Register. The EIS stated that these notifiable activities are almost certainly related to the former kaolin mine activities, including the former kaolin wet and dry plant, existing kaolin stockpiles, kaolin water storage dams, historical chemical storage area(s), existing bioremediation pad (in the former wet plant area), landfill(s), petroleum product or oil storage area(s), and sewage treatment plant (at the accommodation camp).

The EIS concluded that for decommissioned kaolin mine areas (some of which may have existing contamination within them) potential exists for contaminants to become mobilised during proposed construction and operational activities.

The potential for contamination impacts identified as part of the proposed bauxite project activities in the EIS included:

- transportation of dangerous goods and hazardous materials

- storage, handling and disposal of hydrocarbons dangerous goods and hazardous materials
- bio-remediation of contaminated soils
- non-mining waste generation, storage, handling and disposal.

No bauxite beneficiation would be undertaken as part of the proposed project, therefore no processing plant rejects or tailings would be generated during operations.

4.13.2 Non-mining waste streams

Non-mining waste streams were identified in the EIS. The EIS considered that the following activities may produce wastes:

- construction activities
- vegetation clearing and earthworks
- office and administrative activities
- crib rooms and meal rooms
- on site transfer and storage of chemicals, fuels and other hydrocarbons
- maintenance of site vehicles and machinery
- water treatment plant, if required for potable water
- accommodation camp
- sewage treatment plant
- ship-sourced waste.

4.13.3 Potential impacts

The EIS identified the following potential impacts of non-mining waste:

- water pollution caused by release or spills of solid or liquid waste either directly to receiving waters or indirectly via run-off from waste contaminated sites
- land and water contamination caused by spills or inappropriate waste disposal to soil
- groundwater contamination caused by spills of solid or liquid waste
- littering due to unsuitable storage and containment measures for general waste
- odour caused by inappropriate storage and/or treatment of putrescible waste
- increased vermin and potential spread of disease due to inappropriate storage of waste
- reduced visual amenity due to improper storage of waste
- waste of raw materials
- waste of embedded energy and increase in greenhouse gas emissions
- consumption of landfill space
- risks to human health and safety through poor management of hazardous materials.

4.13.4 Mitigation measures

The EIS stated that the waste management hierarchy would be the primary mechanism to ensure sustainable waste management during all phases of the proposed project. Waste avoidance and reduction would be achieved through the consideration of alternative products, implementation of appropriate technology and procurement processes. To maximise re-use opportunities wastes would be segregated and stored in designated areas on site. Waste items generated by the project that may be reused include timber pallets and scrap metal.

Investigations regarding waste reuse would be ongoing throughout the project life. A Waste Management Plan for mining and non-mining waste would be developed, including schematic diagrams of processes to be used at each stage, indicating each waste stream, its proposed management and the areas where it would be managed. The Waste Management Plan would be developed prior to construction and operations. The EIS stated that the proposed management measures contained in the Waste Management Plan would be assessed against the waste hierarchy, and describe how the measures would achieve the standards, set and detail objectives that would be monitored, audited and managed.

4.13.4.1 Waste handling, storage and disposal

The EIS stated that waste storage areas would be bunded or have a suitable containment system in place for the type of waste to be stored. The containment systems would ensure wastes are contained and do not cause environmental harm including surface water and groundwater contamination.

A separate regulated and hazardous waste facility would be located in the existing cleared area to the south of the workshop, comprised of an impermeable bunded base, and roofed to exclude rainfall. This facility would house waste oil, oil and chemical drums, and other hazardous or regulated waste materials prior to removal off-site by

barge.

Waste transport would be contracted to operators with the appropriate licences, transportation vehicles and methods of transport. Road transport of waste streams would not be practical due to the condition of roads and tracks that connect to the project area. The proponent committed to audit the licences of the relevant vessel operators to ensure that they are licensed to carry the types and volumes of waste generated.

Regulated wastes generated during construction, operation, decommissioning and rehabilitation would be transported off-site by a licensed waste contractor to a facility licensed to accept regulated waste for either recycling or disposal. All loading and unloading of liquid regulated wastes would only take place in bunded areas capable of containing and allowing the recovery of any spillage.

Non-regulated wastes would be recycled or remediated on site prior to disposal. Where appropriate to do so, non-regulated wastes would be disposed of at on-site landfill sites.

4.13.4.2 Bulk fuel storage and refuelling

A 2.2-megalitre bulk diesel storage tank (currently bunded by compacted earth) is located in the port infrastructure area next to the existing boat ramp. The EIS stated that the existing storage tank would be refurbished and subjected to integrity testing to ensure the system has no leaks or faults, and the existing bunded area upgraded so that the base and bund walls are impermeable. The design, storage and handling of fuel at the site would be undertaken in accordance with relevant standards.

A new fuel pipeline would be constructed to transfer fuel from supply vessels to the storage tank(s) and from the tanks to refuel barges. The fuel pipelines would be designed to minimise the risk of accidental release of fuel through safety features such as shut down mechanisms in the event of an emergency. Fuel unloading would be continually monitored during operations.

4.13.4.3 Existing and new landfills

The landfill would receive construction wastes, demolition waste, grease trap waste, solid inert waste, putrescible wastes and domestic garbage; and green wastes.

An existing landfill is situated in a previous borrow pit to the west of the former kaolin dry plant and would be used for disposal of metal, plastic and wood scrap from the decommissioned kaolin mine. Material from kaolin mine demolition would be non-putrescible and inert, and the existing landfill provides available capacity for this waste. Groundwater bores would be established up-gradient and down-gradient of the existing landfill to monitor potential contamination sources. The EIS stated that bunds would be maintained / upgraded around the perimeter of the landfill to divert surface flows away from the landfill. When the landfill cell has attained maximum storage capacity or is no longer proposed for use, it would be capped with kaolin clay overburden material and compacted to effectively limit infiltration of stormwater. A cover of bauxite waste material, subsoil and topsoil would then be placed for revegetation.

A new landfill would be required for putrescible waste, general waste, and inert waste from construction and operations. It is not proposed to continue use of the existing landfill for the bauxite project. The new landfill would be designed by appropriately qualified person to relevant standards incorporating impermeable base, leachate collection system, landfill top capping and growth medium for cell closure, gas monitoring and collection system, and groundwater monitoring systems.

The landfill would be designed and constructed to allow for:

- Location of the base liner and collection systems above the seasonal groundwater table.
- Final completion resulting in a raised and rounded, vegetated mound that would shed water easily.
- Leachate collection system capable of collecting leachate from the entirety of the landfill area: comprising of a high-permeability drainage layer (coarse aggregate or geosynthetic), perforated collection pipes, a collection sump, and geotextiles to protect any geomembrane and prevent clogging of the drainage layer.
- New groundwater monitoring bores to allow for early warning of leachate drainage or groundwater contamination.
- Gas monitoring wells to determine gas production levels and type, both of which would allow for better understanding of the landfill processes occurring throughout its life.
- No burning of waste at the landfill.

4.13.4.4 Rehabilitation and decommissioning wastes

At the rehabilitation and decommissioning phase, a comprehensive assessment of waste would be undertaken to identify the most appropriate measures to manage the remaining waste on the project site. Site infrastructure would generally be decommissioned and demolished in line with the post mine land use (unless prior arrangements are agreed with the traditional owners of the land to retain any items of infrastructure).

Any construction facilities that are decommissioned following construction phases would also be managed in accordance with the waste management hierarchy and the controls described above for construction wastes. Areas of potential contamination would be investigated and managed / remediated if required.

The EIS stated that following cessation of deposition of waste in the landfill, post-closure management of the landfill would be conducted for a period of 10 years or until the administering authority determines that the landfill unit and surrounding site are stable and that no release of waste materials, leachate, landfill gas or other contaminants that may cause environmental harm is likely. A Site Management Plan, including final land use would be developed for the landfill at least 12 months before the expected final receipt of waste in the landfill unit.

4.13.4.5 Sewage Management

Sewage effluent managed on-site would be treated to a standard suitable for irrigation or reuse. A separator/grease trap is currently situated on the southern side of the existing mine accommodation for collection of kitchen waste water. This system would be upgraded and linked to the sewage treatment system.

The existing sewage treatment plant would be upgraded to cater for up to 150 people. The plant would treat waste water to a secondary level, though clear effluent, which is irrigated over a 3ha fenced-off grassed area, north of the camp, more than 800m from any drainage lines and 1400m from the nearest wetland, Lunette Swamp. The Model for Effluent Disposal Using Land Irrigation (MEDLI) was used to model the effluent stream from sewage treatment facilities through to the irrigation area and to inform appropriate conditions (refer to Schedule G: Land and rehabilitation of Appendix 1). Where required, biosolids (sludge) in the sewage treatment system tanks would be pumped out and the sludge spread on the bioremediation pad. The remediated sludge material from the bioremediation pad would be capped and rehabilitated progressively through the project life.

A wet weather storage would provide a back-up effluent storage, should it be required during the wet season when workforce numbers and effluent loads would be reduced (approximately 80% reduction). This pond has the capacity to take effluent discharge for up to 24 days, at the existing level, including allowance for storm surge.

4.13.4.6 Ship-sourced Pollution Prevention Management Plan

A Ship-sourced Pollution Prevention Management Plan would be implemented to manage release of ballast water, introduction of exotic marine organisms, release of shipping waste, spill management, and prevention of release of any substances from shipping.

4.13.5 Conclusion and recommendations

The EIS provided a satisfactory assessment of the potential impacts due to contaminating and waste on the environment. The EIS identified and adequately described the environmental values to be protected and proposed mitigation and management. The TOR and submissions received on contamination and waste management were addressed adequately in most parts, but there are several issues identified by EHP in regards to landfill management and leachate generation, landfill closure and rehabilitation and water management.

These issues were previously identified by EHP and DSITI during the EIS submission period and provided to the proponent for its response. Review of the proponent's response and amendments to the EIS identified some issues based on the fact, that the proposed project is situated in a location containing high environmental values. Due to the high connectivity and permeability and seasonal high groundwater table of the shallow aquifer systems on the bauxite plateau, any contamination or impacts from waste could have unacceptable impacts on the receiving environment (HEV waterways, HES wetlands, etc.). While the proponent's response to submissions and amendments to the EIS have not completely addressed every issue, they were considered adequate for the EIS to progress to the EIS assessment report stage as some of these issues can be appropriately conditioned until site-specific information is available to amend (if necessary) the imposed conditions. The proponent is also required to develop a waste management plan and a post-closure management plan.

4.13.5.1 Landfill management and leachate generation

The proponent has provided more information about closure of the landfill units. However, the amended EIS described the landfill cover system only in general terms of the soil material that may be employed but no detail was provided on the minimum layer thickness, slopes and hydraulic conductivities that normally are used to describe cover systems. The thickness of landfill liner system for the new landfill unit was also not provided. It is therefore uncertain as to whether this would provide sufficient environmental protection in the long-term.

Typically for a clay lined landfill, this would be a minimum of 600–900mm, depending upon permeability of host soils and depth to groundwater. Given the high permeability and seasonal high groundwater table, a thickness of 900mm compacted in layers to achieve a permeability of 1×10^{-9} m/s or less is appropriate.

4.13.5.2 Leachate management during wet season

Another issue identified related to how the waste in certain areas would be managed during the wet season/closure/cyclone period and how potential contamination from run-off and seepage into the groundwater would be managed.

The proponent advised general outline of a leachate collection system but advised it would be designed at a later date by a suitably qualified person. Leachate was also proposed to be used in dust suppression or irrigation. There are no details of how leachate would be managed in the wet season (e.g. storage, water collected in trenches) and what happens when it is too wet for irrigation and there is no need to suppress dust.

4.13.5.3 Bioremediation pad

EIS Section 11.9.8 contained details of stormwater management for the bioremediation pad, located near the landfill. The area would be bunded to prevent run-on stormwater entering the area. However, water would be able to pond and collect within the bunded area where soil treatment is occurring. The amended EIS did not provide information on what would happen to this water which is expected to be potentially contaminated. Groundwater monitoring (landfill management and leachate generation)

Derivation of groundwater trigger background concentrations/ aquatic ecosystem toxicant trigger value

In the review of the EIS, EHP had concerns in regards to the proposed groundwater contaminant limits of contaminant Al, Cu, Pb and Zn. EHP recommended obtaining a filtered result to compare to the aquatic ecosystem toxicant trigger value for 99% species protection or a pertinent background concentration, whichever is higher. Total results are expected to comply with drinking water guidelines (except if naturally in excess of this).

The amended EIS proposed water quality objectives for some indicators (e.g. Cu and Zn) that are greater than the ANZECC & ARMCANZ (2000) trigger values. Values derived from 80th percentiles have been proposed. It is not clear if these values are derived from the upper most aquifer or a combination of bores. Reference data need to relate to the aquifer that it is screened in. Information is thus needed on what locations and what aquifer or aquifers the results are obtained from. Furthermore, the proponent needs to commit to a maximum contaminant concentration for groundwater at the edge of the permitted groundwater attenuation zone.

The proponent also questioned in its response having to comply with any maximum concentration at point of groundwater compliance for the landfill and waste treatment/disposal sites. Typically, 120% of maximum value has been applied for other projects. There are several other indicators that have been incorrectly applied (e.g. the groundwater concentration limit provided for naphthalene is incorrect; total organic carbon needs to be included as an indicator).

Groundwater monitoring in relation to the bioremediation pad and landfill

Bioremediation of contaminated soils is described in EIS as using an indicator of “when hydrocarbon odour becomes undetectable” as the objective for successful treatment of soils contaminated by petroleum hydrocarbons is unacceptable. Sniffing would only detect volatile short chain hydrocarbons and does not align with recognised standards.

Successful land treatment should entail monitoring for and complying with environmental investigation levels and management limits for petroleum hydrocarbons and BTEX compounds in the *National Environmental Protection (Assessment of Site Contamination) Measure 1999*³. Where the material is to be used as soil conditioner such as in site rehabilitation, it should comply with the relevant Australian standards viz. AS4454 - Australian Standard 4454 Composts, soil conditioners and mulches (2012), or its most recent version. The latter addresses other contaminants and waste materials likely to be added to the bio-remediated material (EIS section 11.9.8). This is on the basis that the treated material would be used for woodland revegetation as proposed.

It is stated in the amended EIS that bioremediation would only be undertaken in the dry season but this is considered unrealistic for hydrocarbon contaminated soils as longer chain petroleum hydrocarbons particularly are expected to take longer to degrade than the time available. Hence wet season management measures need to be developed.

4.13.5.4 Waste handling and storage

EIS Sections 11.9.5 and 11.9.7 outlined how key infrastructure on which wastes would be generated and managed

³ Available from: <https://www.legislation.gov.au/Details/F2013C00288>

would be implemented. Truck refuelling, workshops and truck wash down generates regulated waste such as fuel spills and oily waste water. Storage of regulated waste creates potential for spillage to contaminate soil.

The proposal is for these areas to be clay lined and clay banded. Clay lining these areas does not prevent generation of contaminated land, as discussed above and hence is not considered acceptable. Surfacing of regulated waste storage, refuelling areas, servicing and truck wash down sites must be stored in a suitably concrete banded and lined containment system.

4.13.5.5 Bulk diesel storage at the bank of the Skardon River

EHP provided comment that clay lining bulk diesel storage tanks and other fuels and chemical storages was not sufficient to prevent contamination of soil or any waters. The amended EIS advised that “impermeable base and banding material will be sourced from local clay (e.g. existing kaolin overburden stockpiles) and spread, shaped and compacted to achieve a permeability of 1×10^{-9} m/s or less.” There is no advice of thickness of clay or testing to confirm placement.

Whilst a compacted clay liner may impede flow through the soil better than more porous substrates or uncompacted clay, it is not impermeable to fuel and any spillage would create contaminated soil and breach likely EA conditions. Furthermore, it is best practice that tanks should not be placed directly in clay soils, as many clay soils accelerate corrosion. Instead, tanks should be placed in an inert material first, such as sand⁴. Hence, the proponent’s proposed clay lining is not considered acceptable. Bulk diesel must be stored in a suitably concrete banded and lined containment system.

4.13.5.6 Recommendations

EHP recommends the following to address identified matters above and recommended conditions to ensure appropriate protection of the identified environmental values:

- Where no relevant Australian Standard exists, all materials must be stored within an effective on-site containment system that prevents contamination of land or waters. Materials must be stored in a suitably concrete banded and lined containment system. Landfill, stormwater, leachate and ponding must be managed that they do not cause environmental harm, released directly or indirectly to any waters (refer to Schedule A: General; Schedule C: Waste; Schedule E: Water; and Schedule F: Groundwater of Appendix 1).
- Management plan should be updated to include measureable outcomes for establishing success of bioremediation and landfill, including wet season management measures for the bioremediation area addressing how stormwater falling on the area would be managed.
- Further water quality monitoring and the derivation of water quality triggers must be provided to EHP by the proponent for surface water and groundwater (e.g. clarification of the derivation of groundwater trigger background concentrations; refer to Schedule E: Water and Schedule F: Groundwater of Appendix 1).
- Further monitoring bores would need to be installed up-gradient and down-gradient of landfill and bioremediation areas (refer to Schedule F: Groundwater of Appendix 1).

In conclusion, mining activities must be carried out in accordance with the recommended conditions outlined in Appendix 1 of this assessment report to avoid any unacceptable impacts on the environmental values identified for the proposed project. Where the proponent’s commitments outlined in EIS Appendix 1 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 Sections 1.9 and 1.12; and other relevant sections applicable to contamination and waste management.

4.14 Flooding and regulated structures

This assessment report section deals with flooding and regulated structures associated with the construction and operation of the proposed project and risk and the adverse impacts from flooding hazards or dam failure. Flooding and regulated structures were described in EIS Chapters 6, 9, 14 and 23. These documents were also updated and resubmitted by the proponent as a response to EIS submissions.

Flood models were developed for the Skardon River and Namaleta Creek. No regulated structures were proposed for the project; however, a risk assessment and management and mitigation measures for the proposed sediment

⁴For more information refer to <http://epa.nsw.gov.au/resources/clm/2008552ServStations.pdf>

ponds were provided in the EIS.

4.14.1 Potential impacts

4.14.1.1 Flooding

Results from the EIS flood modelling concluded that flooding would not interact with, or impact on, project infrastructure and activities (i.e. mining areas), as these would be situated above modelled flood levels. The only infrastructure to be below flood levels would be the Namaleta Creek crossing and wharf infrastructure at the port.

4.14.1.2 Kaolin pits water storages

As described in section 4.5.8 – Water supply and demand of this assessment report the former kaolin pits to the south near Namaleta Creek (the raw water pit and claystone pit) would be retained for the life of the mine as a water supply for dust suppression and vehicle washdown activities (Figure 3). These pits receive their water from groundwater infiltration and surface run-off during rain events. The proponent stated that experience showed that the fluvial pit (which is one of the kaolin pits) has not been overtopped during past wet season rainfall events as it is managed through authorised releases during the wet season as part of the existing EA.

4.14.1.3 Sediment ponds

In-pit sediment ponds

The EIS proposed sediment ponds to be located within the mining pits which would collect the sediment run-off from the disturbed mining areas. Modelling carried out as part of the EIS identified that basin surface area was determined as a function of the inflow rate and the target particle settling velocity. The EIS concluded that in-pit sediment ponds would occupy a small portion of each pit and that the pit itself would act to capture any run-off should the sediment basins overtop. The in-pit sediment ponds would be also used to meet local demand for water (e.g. dust suppression) thereby reducing the need for supply from other sources.

Sediment ponds on the mining infrastructure area

The port infrastructure area would contain two sediment ponds which have release points located at the downslope end of these structures: an existing sediment pond to the south of the existing mine infrastructure area and a new one to be built to the north of the proposed new wharf (Figure 4). The new sediment pond would be constructed to capture run-off from disturbance areas, including the bauxite stockpile, paved areas, workshops and haul roads. The EIS reported on the results of a preliminary risk assessment and concluded that the new sediment pond is not expected to be a regulated dam. However, the EIS also stated that following detailed design and prior to construction the sediment pond would be subject to a regulated dam assessment by a suitably qualified and experienced person in accordance with the EHP's *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (2014).

4.14.2 Cumulative impacts

Flood modelling carried out for the neighbouring Bauxite Hills Project showed low risks from flooding of activities and infrastructure proposed by Bauxite Hills. The Bauxite Hills Project would not be located within potential flood zones of Namaleta Creek; but some of the proposed haul roads and Bauxite Hills Project's proposed port infrastructure in the Skardon River may be below flood levels. Therefore the EIS for the Skardon River Bauxite Project concluded that any increase in flooding of Namaleta Creek and / or the Skardon River would occur with both projects operating and is unlikely to result in cumulative impacts.

4.14.3 Mitigation measures

4.14.3.1 Flooding

According to the EIS, flooding of mine pits or infrastructure areas containing contaminants (e.g. hydrocarbons) could have the potential to release sediments and contaminants into local waterways. All mine pits and the port infrastructure area (other than the wharf) would be situated above the 1:100 year flood level. It was concluded in the EIS that this would minimise the risk of release of:

- hazardous materials or contaminants from the port infrastructure area as a result of flooding of port infrastructure area by the Skardon River
- sediment from sediment ponds at the port infrastructure area
- sediment from mine pits.

The proposed Namaleta Creek crossing would be designed to be in accordance with the standards and guidelines and appropriate dissipation and protection measures in order to:

- improve the hydrology of the crossing area more closely resembling its pre-disturbance condition, thereby improving ecological function, including fish passage
- prevent flooding for a 1:50 year flood event.

Namaleta Creek crossing would be designed in accordance with the standards and guidelines and appropriate dissipation and protection measures would be required to lower velocities downstream of culverts in the main stream and possibly on the flood plain as well.

The modelling also showed that there would be no impacts on the existing kaolin mine water storages (the kaolin pits) for a 1:50 year flood event with exception of the fluvial pit (Figure 3). For flood events greater than 1:50 years flooding may impact on the existing kaolin pits. The EIS concluded that any release would be managed in accordance with existing EA conditions as part of the kaolin mine. Wharf infrastructure would be designed to withstand flooding in the Skardon River as well as tidal movements and storm surge.

The EIS risk assessment of the likelihood and significance of flooding impacts concluded, considering implementation of management measures that the risks from flooding and to flood behaviour would be low. Hence, the EIS concluded that the proposed project design, including selection of location for activities and infrastructure, and measures to mitigate impacts from flooding and to flood behaviour would result in the project achieving the relevant environmental objectives and performance outcomes.

4.14.3.2 Kaolin pits

The kaolin pits to the south near Namaleta Creek (the raw water pit and claystone pit) would be retained for the life of the mine as a water supply for dust suppression and vehicle washdown activities.

4.14.3.3 In-pit sediment ponds

In-pit sediment pond design would be carried out in accordance with best practice approaches and as part of an Erosion and Sediment Control Plan, including but not limited to:

- regular inspection at the conclusion of the wet season (April-May).
- monitoring of sediment deposition volumes
- clean outs(if required) to provide sufficient storage (prior to the wet season).

4.14.3.4 Sediment ponds (port infrastructure area)

During the approximately nine months of operation per year, mining activities could result in some sedimentation in the port infrastructure area due to the use of haul roads, use of infrastructure areas and bauxite stacking, transfer, stockpiling and loading. The EIS concluded that as operations are conducted during periods of least rainfall controlled releases could occur when water quality discharge criteria are achieved. Furthermore, sediment ponds would be cleaned out annually (likely October/November) at the end of the dry season when the ponds would have dried out.

The EIS argued that during the wet season, which can experience high rainfall events, the bauxite stockpile would be reduced to zero (hardstand stockpile pad remains) and there would be no haul truck movements, and sedimentation is substantially reduced. Hence, it is likely that the water released from the sediment ponds during the summer would have limited suspended sediment. The EIS proposed a sediment pond design based on the *International Erosion Control Association Manual (2008)*.

The sediment ponds, according to the EIS, would incorporate overflow weirs, overflow drainage stabilised structures, and flow spreaders to ensure that no erosion would be caused by discharge events (overflows or controlled release). Frequent inspections of the drainage structures would be undertaken to provide early warning of any issues requiring rectification while a detailed inspection of all drainage structures (and the pond integrity) would be carried out each dry season.

The proposed overflow point of the proposed sediment pond would be located at least 100m from the mangroves and 150m from the Skardon River and flows through *Eucalyptus tetradonta* woodland. The EIS concluded that overflow from the sediment ponds would spread over this grassed native vegetation area resulting in dissipation of flows and a reduction in velocity and erosion potential. Furthermore, it was stated in the EIS that overflow events would occur during wet season rainfall events; however, these would be minimised through the following proposed measures:

- discharging through the nominated overflow weir
- managing releases to prevent scouring (e.g. rock spillways)
- maximising the distance through which discharges flow through vegetation prior to entering the Skardon River, thereby allowing for additional sediment control.

It was concluded in the EIS that given the scale of the estuary compared to the scale of the catchments of the port area sediment ponds, and high natural variation in estuary turbidity, any releases from the sediment pond would

have a minimal impact on the marine environment. During the operational period, controlled releases would only occur when water quality in the sediment ponds achieve local water quality objectives (i.e. achieves 'no change' criteria in comparison to population (baseline) percentile distributions) for the physico-chemical parameters against which compliance would be assessed.

The proposed monitoring program for releases from the port sediment ponds are discussed in section 4.5 – Water resources and water quality and in section 4.9 – Coastal processes of this assessment report. Potential impacts on flora and fauna due to sediment releases are summarised in section 4.6 – Flora and fauna and in section 4.8 – Matters of national environmental significance.

4.14.4 Conclusion and recommendations

The TOR and submissions received on flooding and regulated structures were addressed adequately in most parts. The mitigation and management measures presented in the EIS addressed most of the environmental objectives and performance outcomes of tables 1 and 2, schedule 5 of the EP Regulation.

This assessment identified a number of matters, some of which require attention by the proponent:

4.14.4.1 Kaolin pit releases

The EIS stated that management of kaolin pits, that are subject to the risk of flooding and management, would be undertaken in accordance with the existing plan of operations and existing EA conditions for the kaolin mine. However, EHP's review of the existing EA conditions as part of the EIS process identified outdated release conditions and hence the EA conditions drafted as part of the bauxite operations have been updated to incorporate appropriate release condition in compliance with environmental objectives and performance outcomes of table 1, schedule 5 of the EP Regulation and the environmental values identified in the EPP (Water). Interim WQOs were recommended until sufficient data is collected and provided to EHP to amend the EA and a future review of interim trigger levels will be necessary once sufficient monitoring data is available to develop locally relevant trigger values (Schedule E: Water; Appendix 1).

4.14.4.2 Sediment pond: Sediment capture and management

As part of the review of the EIS during the EIS public submission period, EHP recommended to the proponent to use EHP's *Stormwater guideline – Environmentally relevant activities*, 2014 (EM368), as a guide to appropriately design the sediment pond to be located at the HEV Skardon River.

In their response to EHP's submission, the proponent stated that they would not take on EHP's Stormwater guideline as it does not apply to resource activities. However, the proponent did amend the design based on the *International Erosion Control Association Manual* (2008) which they considered would be suitable for a basin with a design life for over 6 months, discharging to sensitive waters, based on the 85th percentile, five day storm event

EHP reviewed the proposed sediment pond design and concluded that it is inappropriate for the scale of operation and location (wet tropics with high rainfall events during summer). The 5 day storm design following the *International Erosion Control Association Manual* (2008) is typically used as design criteria for high efficiency sediment basins. They are generally used for smaller projects and in practice, these design storm criteria are typically smaller than the 1 in 10 year 24 hour storm event as they exclude very high rainfall periods. EHP recommends that the minimum design standard of the erosion and sediment control ponds should be designed to capture rainfall during a 1:10 ARI 24 hour storm event (refer to Schedule E: Water of Appendix 1). Where the proponent's commitments outlined in EIS Appendix 1 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 Sections 1.15 and 1.24; and other relevant sections.

4.15 Hazards and safety

Hazards and safety was covered in EIS Chapter 14 (flood modelling and potential impacts from flooding from watercourses); EIS Chapter 23 (potential hazards and risks to people and property); EIS Chapter 9 (risks associated with extremes of climate, including temperature extremes, droughts, tropical cyclones, storm surges and bush fire risk). These documents were also updated and resubmitted by the proponent as a response to EIS submissions.

4.15.1 Existing values

The EIS assessed potential hazards and risks to people and property in the form of a preliminary risk assessment, including external and on site risks; transport risks; potential for mosquito breeding sites; construction, operation and decommissioning phases of the project; analysis of the identified hazards, examining individual and collective likelihood and consequences of each identified hazard involving injuries and fatalities to workers and to the public;

and quantitative levels of risk.

No impacts on the nearest sensitive receptors were identified in the EIS due to the distance between the proposed project and the nearest receptors (refer to section 2.3). Furthermore, the EIS stated the limited use of the Skardon River for recreational and commercial fishing purposes and no permanent users of water downstream of the project. The beach at the Skardon River mouth is frequently used by tourists in the dry season getting access through the bush tracks that intersect the existing haul road.

The EIS stated that access to the beach for tourists would be allowed by crossing of the haul road only. The crossing point would be signed and demarcated with access procedures requiring strict compliance. There would be no authorised use of the haul road by tourists. Management measures have been proposed to reduce transport risks to low or medium.

4.15.2 Potential hazard, risk impacts and mitigation measures

A preliminary hazard and risk assessment on non-routine hazards associated with the project was conducted in the EIS in accordance with the Australian / New Zealand Standards. Potential hazards, their cause and consequences were identified and risk treatment and management measures were proposed to mitigate these risks. The risk assessment for each potential hazard considered residual risk (i.e. risk after mitigation) with a view to identifying any residual high or extreme risks requiring additional mitigation.

Table 11 provides a summary of the identified hazards and a summary of proposed mitigation measures. The risk analysis concluded that with the application of proposed mitigation and management measures the residual risks associated with hazards identified with the project would be medium or low. The EIS also stated that due to the remote location of the site and poor road access, it is vital that the on-site emergency response capabilities would be able to deal with the above incidents. For any major medical emergency, the proponent would use local or regional air rescue services such the Royal Flying Doctor Service and/or the Horn Island Rescue Helicopter.

Table 11 Summary of preliminary risk analysis (adapted from text in EIS Chapter 23 and EIS Table 23-5)

Activity and identified hazards	Proposed mitigation measures	Risk level
Transporting personnel, equipment and material to and from the site and within site: <ul style="list-style-type: none"> aircraft accident; supply vessel accident; vehicle accident (onsite only); spill, leak of liquid or fumes; and excessive dust 	<ul style="list-style-type: none"> complying with regulatory requirements, maritime safety, and pollution control legislation avoiding times of high risk natural events (e.g. cyclones) onsite traffic management procedures (speed, fatigue, alcohol and drugs, and secure loading of material on transport vehicles) spill management all weather roads, watering roads, wind breaks to control dust 	Medium – low
Transport of fuel to and within site; bulk storage of fuel: <ul style="list-style-type: none"> fire; spill; leak; and explosion 	<ul style="list-style-type: none"> fuel transfer procedures from supply vessel to tank and from tank to barges design of fuel transfer equipment in accordance with Australian Standards Traffic Management Plan Emergency Management Plan fuel storage designed and operated in accordance with Australian standards staff training refer to section 4.9.4 of this assessment report 	Medium – low
Construction and operation <ul style="list-style-type: none"> fire; excessive dust; and erosion; excessive dust; landslide; wildlife (e.g. snake bites); vehicle accident; fire 	<ul style="list-style-type: none"> Erosion And Sediment Control Plan awareness of site personnel regarding potential hazards Emergency Response Plan road design, signage, speed limits, vehicle maintenance, roll over bars, training and traffic management fire breaks control of ignition sources via procedures, training, exclusion of public 	Medium – low

Activity and identified hazards	Proposed mitigation measures	Risk level
	<ul style="list-style-type: none"> • Fire Management Plan • dust control measures • mining operations cease during high risk natural events (e.g. cyclones) 	
Waste management including storage, transfer and disposal: <ul style="list-style-type: none"> • uncontrolled release of contaminants 	<ul style="list-style-type: none"> • appropriate design of waste storage facilities (refer to section 4.13 of this assessment report) 	Medium – low
Infrastructure activities including management of water run-off from the bauxite infrastructure area, and the accommodation camp: <ul style="list-style-type: none"> • fire and/or release of contaminants 	<ul style="list-style-type: none"> • complying with relevant standards and operational procedures • appropriate design, inspection and maintenance of water management infrastructure, including after extreme rainfall events • accommodation camp designed in accordance with relevant standards and operational procedures implemented 	Medium – low
Decommissioning including remediation of contaminated land: <ul style="list-style-type: none"> • release of contaminants (leaching) 	<ul style="list-style-type: none"> • remediation of contaminated land prior to mine closure and surrender of land 	Low
Interaction with the following external factors including: tourists on the land; recreation and commercial boats in the Skardon River; Bauxite Hills Project's project haul roads and project barges; and feral animals and wildlife: <ul style="list-style-type: none"> • sabotage and protest; disease outbreak; vehicle accident; multiple vessels in Skardon River; potential intersection of haul roads from the Skardon River Bauxite Project and the Bauxite Hills Project; barges operating from both projects in the same navigation channel ; and interaction with cattle; livestock and wildlife 	<ul style="list-style-type: none"> • Security Management Plan and fencing • manage interaction with tourists on the land • manage interaction with recreation and commercial boats in Skardon River through maritime vessel safety controls • manage interaction with Bauxite Hills' haul roads and barges through: traffic control measures; Traffic Management Plan; liaison with Bauxite Hills; and implement maritime vessel safety controls • manage interaction with feral animals and wildlife • Mosquito Management Plan 	Medium – low

4.15.3 Conclusion and recommendation

The EIS adequately addressed the requirements of the final TOR with regard to hazard and safety risks associated with the project. The residual risks to people and property were reduced to low and medium with the implementation of proposed mitigation measures. Based on the EIS information provided, recommended conditions were drafted across several schedules in Appendix 1. Where the proponent's commitments outlined in EIS Appendix 1 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 Sections 1.15 and 1.24; and other relevant sections.

4.16 Transport and maritime operations

A transport assessment for the project was provided in EIS Chapter 22 which included an assessment of the impacts of road, air and marine operations. EIS Chapter 5 described activities within the port and vessel movements (barges and bulk carriers). Also, EIS Chapter 3 assessed the risks associated with transport hazards and safety. These documents were also updated and resubmitted by the proponent as a response to EIS submissions.

4.16.1 Road transport

The EIS impact assessment was carried out in accordance with TMR's *Guidelines for Assessment of Road Impact of Development* (TMR, 2006). The EIS concluded that access to the project area by road is extremely difficult and that the public roads and tracks are in a poor state. Road access is only possible during the dry season. Hence, it was concluded that road access would not be practical and that the only practical means of transporting workers and light goods to the project area would be by air. Heavy and large loads, equipment and fuel would be transported to and from the site by barge.

4.16.2 Air transport

Due to the inaccessibility of the project by road, the project workforce would be transported to the site by air and accommodated in a workers camp at the project area. Section 2.7.1.5 of this assessment report provides a description of workforce travel to the project area by charter flights.

The EIS concluded in its impact assessment that the project would have an insignificant impact on the Cairns Airport and a minor impact on the Weipa Airport. Furthermore, the EIS stated that potential impacts on the Mapoon airstrip and the Northern Peninsula Airport would be well within the airports capacities and would be offset by the employment opportunities provided. For residents of Mapoon access, to the site, as identified by the EIS, could be by boat or by bus to Weipa connecting with flights to the mine site.

4.16.3 Barge operations

As described in section 2.7.1.7 of this assessment report, the project area would be only accessible by barge for heavy and large loads, equipment and fuel supplies as the economic alternative.

It was estimated in the EIS that approximately 2000 barge movements would be required annually for transporting bauxite and some additional barge movements associated with fuel and materials supply.

4.16.4 Maritime operations

The EIS stated that the project would result in approximately 65 bulk carrier vessel movements per annum for the export of DSO bauxite (refer to section 2.8.1 of this assessment report). The EIS estimated the number of cargo ships and bulk carrier vessels to go through the Gulf of Carpentaria and Torres Strait to be between 3,500 and 4,000 per annum. The EIS stated that the project would increase the total number of movement by approximately 3% and hence the proposed increase in vessel movements in the Gulf of Carpentaria would not be significant.

4.16.5 Third party operations

The EIS identified a range of recreational and commercial fisheries activities, as well as commercial tour operators in the Skardon River, the adjacent foreshore areas and within the Gulf of Carpentaria.

4.16.6 Potential impacts

The EIS identified the following potential impacts due to the project's maritime operations:

- vessel collision, either with another vessel, infrastructure or the shoreline
- vessel grounding in shallow waters
- interruption or delays of third party vessel operations (e.g. commercial or recreational fishing vessels)
- fisheries exclusion zone around port operations
- accidental release of oil or fuel (refer to sections 4.9 and 4.13 of this assessment report)
- release of ship-sources pollutants
- changes to marine water quality and impacts to marine and coastal habitats and species (refer to sections 4.5, 4.6, 4.7, and 4.9 of this assessment report).

The EIS stated that a risk assessment for transport related residual impacts (i.e. impacts after implementation of mitigation measures) were undertaken and no high or extreme residual risks were identified. The medium risks include vessel collision, interruption to third party vessel operations, accidental release of oil or fuel, and release of ship-sources pollutants.

4.16.7 Cumulative impacts

The EIS assumed that the Bauxite Hills Project would result in a similar number of barge movements and would also barge bauxite to an offshore transshipment area for loading to bulk carriers. Hence, predicted vessel movement in the Skardon River would be up to 4000 barge movements per year (11 to 14 movements per day). Cumulative impacts of vessels on marine ecology and coastal processes of the Skardon River and on the marine environment

of the transshipment area were assessed in sections 4.6.3.3 and in section 4.9.3 of this assessment report.

4.16.8 Mitigation measures

The EIS stated a range of mitigation and management measures, including but not limited to:

- The existing Oil Spill Contingency Plan and First-Strike Oil Spill Response Plan will be reviewed and updated as required. The Oil Spill Contingency Plan will be updated so that Gulf Alumina will be the first responder (refer to section 4.9.4 of this assessment report).
- The parties to the existing Oil Spill Contingency Plan and First-Strike Oil Spill Response Plan would be updated following consultation with MSQ and Ports North.
- The Oil Spill Contingency Plan and First-Strike Oil Spill Response Plan would include a response plan in the event of spill of all fuel in the storage tanks that is not contained within the bunded area. This response plan would be agreed with MSQ and Ports North, considering the level of risk and response capabilities.
- The proponent committed to undertake further consultation with MSQ, Regional Harbour Master and Ports North on detailed navigation design (including required navigation aids), marine operations systems, vessel management, and pollution controls.
- Implementation of Maritime Management Plans, including a Vessel Traffic Management Plan, an Aids to Navigation Management Plan and a Ship Sourced Pollution Prevention Management Plan.

Furthermore, the EIS stated that Ports North also have responsibilities under the *Transport Infrastructure Act 1994* and *Transport Operations (Marine Pollution) Act 1995* for the safe and efficient management of the port and its infrastructure, and for managing pollution from shipping activities.

4.16.9 Conclusion and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to transport related aspects of the project. A number of barging / shipping related issues have been identified in various sections of this assessment report, such as impacts on the water quality of the HEV Skardon River, impacts on marine / estuarine species and marine habitats, and impacts due to accidental spill of oil and fuel into the Skardon River. These have been discussed in the relevant sections of this assessment report.

The EIS also adequately addressed most of relevant comments on transport and marine operations in submissions received on the EIS. However, EHP received a review of the proponent's response to submissions and the amended EIS from the Queensland Ambulance Service (QAS). In their review of the proponent's response to their submission they advised EHP that:

- Access to the mining site via road is difficult and QAS identified that that support from the Royal Flying Doctor Service or the Horn Island Rescue Helicopter may be required in an emergency. QAS requested Gulf Alumina to provide a best access road map to the mining site should a QAS road response from either Weipa or Bamaga Ambulance Stations be required.
- QAS requested further that the proponent acknowledges the difficulties surrounding an ambulance road access. Should road access by QAS be initiated, the proponent must ensure appropriate directional signage is in place from the border of their ML through to the mine site to guide the responding vehicle.

EHP recommends the proponent to contact QAS to discuss the issues outlined above. Furthermore, where the proponent's commitments outlined in EIS Appendix 1 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 Sections 1.4; 1.6; 1.23; and other relevant sections.

4.17 Cultural heritage

EIS Chapter 24 of the EIS assessed environmental values relevant to indigenous and non-indigenous cultural heritage at the project area. The EIS described potential impacts of the project on cultural heritage values and outlined proposed mitigation measures. These documents were also updated and resubmitted by the proponent as a response to EIS submissions.

4.17.1 Indigenous cultural heritage

4.17.1.1 Native Title claimants

The project's granted three MLs are located within the Old Mapoon Aboriginal Corporation trust area granted under the *Aboriginal Land Act 1991*, referred to as Deed of Grant (formerly in Deed of Grant in Trust (DOGIT)) land. The EIS identified the following relevant Aboriginal parties who also hold Native title claimants covering the project area:

Ankamuthi People: 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.

The North Cape York Group #1 holds the recognised native title determination for areas within and project area north of the Skardon River (Registered Native Title Claimants - Federal Court Proceedings QUD157/2011). The Northern Cape York Group #1 Determination area extends to the high water mark of the southern side of the Skardon River.

ML 40082, ML40069 and ML 6025 were granted via the Right to Negotiate process under the *Native Title Act 1993*.

4.17.1.2 Public consultation

The EIS stated that the proponent initiated discussions with the indigenous community in October 2008 following acquisition of the tenures. The proponent engaged with representatives of the Warrangku and Tjungundji peoples and representatives of Old Mapoon Aboriginal Corporation. Negotiations included the potential for an Indigenous Land Use Agreement and future royalty entitlements for the Mapoon Deed of Grant in Trust lands. Other negotiations were held with the Cape York Land Council as well as consultations with State agency representatives on native title and land trust issues, and agencies engaged in identifying opportunities for Aboriginal employment and training.

Negotiations included a cultural heritage agreement, together with a package of employment, training and contracting opportunities available for the Ankamuthi People and any local Aboriginal people from the Western Cape. The EIS stated that ongoing consultation would occur on the management of cultural heritage with the relevant Aboriginal groups. Furthermore, it was stated that the proponent continues to work closely with Old Mapoon Aboriginal Corporation as the trustee for the lands which underlie the project area on the southern side of the Skardon River and the Apudthama Land Trust as the trustees for the neighbouring lands on the northern side of the Skardon River.

4.17.2 Identified cultural heritage sites

Two Aboriginal cultural heritage sites were recorded on the Department of Aboriginal and Torres Strait Islander Partnerships cultural heritage register within the project area. The EIS stated that these sites are possible shell midden sites located on the project area but outside the project disturbance area. These sites would be managed in accordance with the CHMP that has been negotiated between the proponent and the Ankamuthi People. The EIS further stated that any information regarding other potential cultural heritage sites identified through cultural heritage surveys was considered sensitive and hence was not presented in the EIS.

4.17.3 Non-indigenous cultural heritage

The EIS did not identify any items of significance in the project area based on searches of the following statutory and non-statutory registers and historical records.

The EIS stated that should sites of historical cultural heritage significance are discovered throughout the life of the project, management measures are proposed to minimise potential project impacts on heritage values including avoidance, a detailed site assessment and development of site specific management plans.

4.17.4 Potential impacts

The EIS stated that ground disturbance (e.g. mining and mine infrastructure) and dust or sediment mobilisation could have the following adverse impacts on cultural heritage:

- damage or destruction to sites or features extending or hidden below topsoil
- damage or destruction of potential heritage values
- alteration of cultural landscape of associated heritage values.

4.17.5 Mitigation measures

The EIS concluded that the project would have a low impact on cultural heritage. All potential impacts to Aboriginal cultural heritage values would be managed in accordance the CHMP, which sets out a process for the management of Aboriginal cultural heritage within the project area. These included:

- ongoing communication and involvement with the Aboriginal party
- a process for including Aboriginal people, associated with the development areas, in protecting and managing Aboriginal cultural heritage
- processes for mitigating, managing and protecting identified cultural heritage sites and objects in the project

area, including associated infrastructure developments, during both the construction and operational phases of the project

- provisions for managing the accidental discovery of cultural material, including burials
- a clear recording process to assist initial management and recording of accidental discoveries
- monitoring and auditing requirements in the event cultural heritage discoveries are made
- a cultural heritage induction for project staff
- a conflict resolution process.

The EIS further stated that in the event non-indigenous heritage values would be discovered, an assessment by a suitably qualified person, including site survey and consultation with key local stakeholders would be conducted to determine the best management strategy for the site and to prepare a site-specific management plan if required.

4.17.6 Conclusion and recommendations

The EIS adequately addressed the TOR and submissions received on the EIS and provided an acceptable assessment of cultural heritage for the project and proposed adequate mitigation measures to minimise potential impacts on indigenous and non-indigenous cultural heritage places. Where the proponent's commitments outlined in EIS Appendix 1 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 Section 1.25.

4.18 Social and economic

EIS Chapter 25 described the social and economic baseline environment for the local and regional areas that may be impacted by the project, the potential social and economic impacts and proposed measures to mitigate impacts. Cumulative impacts from nearby projects were also considered. Also, EIS Chapter 3 discussed the proponent's stakeholder engagement and consultation activities undertaken during the EIS process and outcomes. These documents were also updated and resubmitted by the proponent in response to matters raised in the submissions on the EIS.

4.18.1 Existing social and economic values

The EIS stated that project area and its surrounds has iconic natural areas and a variety of regional landscapes of high conservation value together a rich Indigenous heritage and a wealth of natural assets, particularly mineral resources.

Community consultation with local communities was carried out which identified the following stakeholder concerns and community values:

- improvement in the economic development of local communities such as developing training and employment opportunities for the community
- promoting social programs to improve the health and education of local communities
- protecting the maintaining the integrity of areas with important natural and cultural values.

The EIS stated that the social and economic assessment included baseline Australian Bureau of Statistics (ABS) data for the study area that included the following areas: Aurukun Local Government Area (LGA); Cairns LGA; Cook LGA; Mapoon LGA; Napranum LGA; Northern Peninsula Area Region LGA and Weipa Town LGA. Also, data from Cape York Region and Queensland were provided as contextual information.

As outlined in sections 2.7.1.4 and 2.7.1.5 of this assessment report, 100% of the workforce would be fly-in/fly-out with approximately 60% of the workforce coming from Cairns and an anticipated 40% from Aurukun, Mapoon, Napranum, the Northern Peninsula Area and Weipa. The EIS stated that the project would employ approximately 100 workers during construction and about 160 workers during the operations phase.

4.18.2 Potential social and economic impacts

The EIS concluded that the implementation of proposed mitigation and management measures the project would overall have a positive impact on native title Traditional Owners and local Aboriginal people through the provision of royalties and the increased business opportunities, employment, education and training opportunities. The impacts to the closest sensitive receptor (refer to section 2.3 of this assessment report) from visual amenity, noise, air quality and water quality were predicted to be insignificant. The EIS stated positive economic impacts from the project, including but not limited to royalty payments, federal and state taxes, and creation of jobs.

4.18.3 Cumulative impacts

The EIS considered the effects of the project in combination with the ongoing Rio Tinto Alcan's South of Embley project and the proposed adjoining Bauxite Hills Project. The most significant cumulative effect identified where that the project could cause moderate increase in demand on health services and emergency services such as ambulance, police, sea rescue and fire services. However, with the implementation of proposed mitigation measure the cumulative effect would have a low impact on the socio-economic environment. Furthermore, the EIS stated that positive impacts of the project would significantly outweigh any potential negative cumulative impact.

4.18.4 Mitigation measures

Measures were proposed in the EIS to mitigate negative socio-economic impacts or to enhance the beneficial socio-economic impacts of the project, including:

- implementation of onsite mitigation measures to avoid or minimise impacts related to visual amenity, noise, air quality and water resources that are detailed in sections of this assessment report
- actively encourage local and regional residents to take up employment opportunities at the project through the procurement of contractors who enhance employment opportunities for all groups including underrepresented groups. The procurement of contractors would include an Indigenous Training Program and a Preferential Contracting Policy as described in the section 31 Deed and Ancillary Agreement for local Aboriginal people under the Commonwealth Native Title Act 1993
- for tenders relating to a Contracting Opportunity, give first preference to tenders from a local Aboriginal business and thereafter to the tender who best involves Traditional Owners and local Aboriginal business in its tender. These recruitment and business development measures would be delivered through a Local Aboriginal Opportunity Plan
- implementing a workers code of conduct that requires workers being respectful of the communities within which they work and visit
- having strict alcohol controls applied to the accommodation camp and ensuring no alcohol is brought into the site in contravention of the accommodation camp codes and having alcohol support program for workers.

The proponent committed to preparing a Consultation Plan which would include consultation with the local Aboriginal Shire Councils of Napranum, Mapoon and the Northern Peninsula Area; identification of social concerns; responding to stakeholder issues raised; and providing feedback to stakeholders in relation to their issues and how they have been addressed. Furthermore, the EIS stated that the proponent would monitor the progress and effectiveness of mitigation strategies relating to social impacts and ensure stakeholder input is considered as part of the ongoing implementation process.

4.18.5 Conclusion and recommendations

The EIS adequately addressed the TOR and provided an acceptable assessment of the potential social and economic impacts of the project and proposed adequate strategies to mitigate the potential impacts. The EIS also adequately addressed most of submissions received on the EIS. However, EHP received a review of the proponent's response to submissions and the amended EIS from the Department of State Development (DSD; the lead agency for social impact assessment). In their review of the proponent's response to their submission they advised EHP that:

- Proponent committed in the EIS to 'prepare a Consultation Plan within three months of Gulf Alumina being provided and EIS assessment report under the EP Act'. DSD acknowledged this commitment but outlined that a timeframe should be set by the proponent; that the Consultation Plan will be available for public comment prior finalisation and once finalised, that it will be publically available and accessible.
- The proponent stated in its response to DSD that it will develop a "Code of Conduct for workers 'Zero tolerance' for drug and alcohol use whilst working, monitored through mandatory drug and alcohol testing", but that the "accommodation camp is likely to serve alcohol under with a limit per person per day". DSD requested a justification on the proposed restricted wet camp and the commitment to develop a drug and alcohol support and awareness program for workers.
- The proponent's response did not resolve social impacts concerns raised by DSD in regards to cumulative impacts on social impacts. DSD requested a clearer understanding of how cumulative impacts have been considered; the consultation and negotiation undertaken across community and industry; development of specific mitigation strategies; and how the proponent will work with existing and future projects in the region.
- Further clarification is required on how the proponent will work with QPS to manage and mitigate identified impacts (e.g. access to the remote location of the proposed project).

Recommendations

EHP recommends the proponent to contact DSD to discuss the issues outlined above. Furthermore, where the proponent's commitments outlined in EIS Appendix 1 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 Sections 1.6 and 1.26.

5 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 Gulf Alumina about the proposed Skardon River Bauxite 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.

The EIS has adequately addressed the published TOR, and has outlined a range of mitigation measures which, if applied, would substantially avoid or minimise adverse environmental, social and economic impacts. The majority of government and community concerns were covered satisfactorily in the version of the EIS that was released for public review in 2015 and subsequently in the proponent's responses to the submissions, which together comprise the submitted EIS.

However, a number of actions, in addition to those committed to by the proponent, are required to be completed. Notably, the proponent must provide an offset proposal to the Commonwealth Department of the Environment for residual impacts on MNES identified in this report. Offsets under Queensland's EO Act also apply. Other matters require attention by the proponent. These are clearly stated in section 4 of this report.

Notwithstanding the need for the proponent to address these matters no issues of sufficient magnitude have been identified during the EIS assessment process that is 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. Consequently, the project has been determined to be suitable to proceed.

In addition, this assessment acknowledges the potential for significant cumulative impacts, particularly on wetlands and the Skardon River, due to the duplication of bauxite transport, storage, loading and transshipping activities proposed for both the Skardon River Bauxite Project and the Bauxite Hills Project. The high ecological value of the environment affected by this infrastructure and activities has been clearly identified in the EIS documents for both projects. EHP strongly recommends that proponents for both projects cooperate to develop a single suite of infrastructure for bauxite movement from the mining sites (i.e. haul roads), stock piling, loading and barging in the Port of Skardon River. Given that there is existing infrastructure on ML40069 in the Port of Skardon River, EHP considers that an essential outcome of negotiations between Gulf Alumina Limited and Aldoga Minerals Pty Ltd is the shared use of this infrastructure.

6 Recommendations for conditions for any approval

As required by section 59(d) of the EP Act, this assessment report recommends conditions that would need to be met for any approvals or permits required for the project, including environmental authority conditions under the EP Act and conditions under other legislation applicable for the proposed project.

6.1 Environmental Protection Act 1994

Appendix 1 of this assessment report contains recommended conditions based on EHP's model mining conditions (EHP, 2016). These conditions have been tailored, where necessary, for the proposed project. The recommended conditions outlined in Appendix 1 are considered necessary 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. Once the project is approved, the proponent is required to update the monitoring plans, the EM Plan and the EIS Commitment Register stated in the EIS to ensure consistency with final EA conditions.

6.2 Approvals under other legislation

A number of other approvals for the project, other than those under the EP Act, have been identified in section 3.2.2 of this assessment report. Where possible, advice and recommendations have been made concerning key matters regulated by these approvals. Specific conditions for these approvals would be developed during the relevant application and assessment processes under the relevant legislation. Recommendations for tidal works condition for the proposed bed levelling activities and installation of cyclone moorings have been provided in Appendix 3.

7 Approved by

Chris Loveday

17 June 2016

Signature

Date

Chris Loveday
Director, Impact Assessment and Operational Support
Department of Environment and Heritage Protection
Delegate of the chief executive
Environmental Protection Act 1994

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Figures

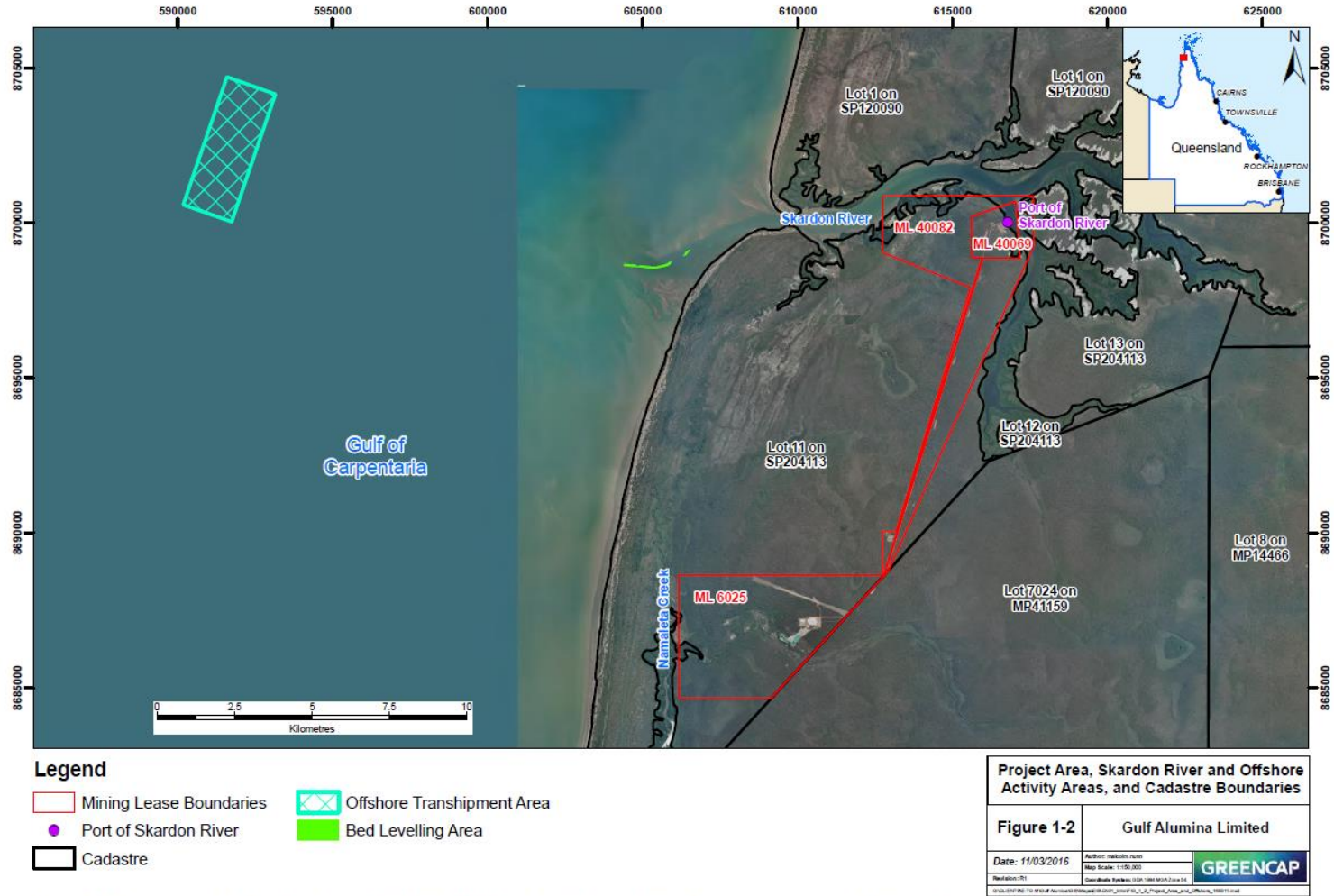
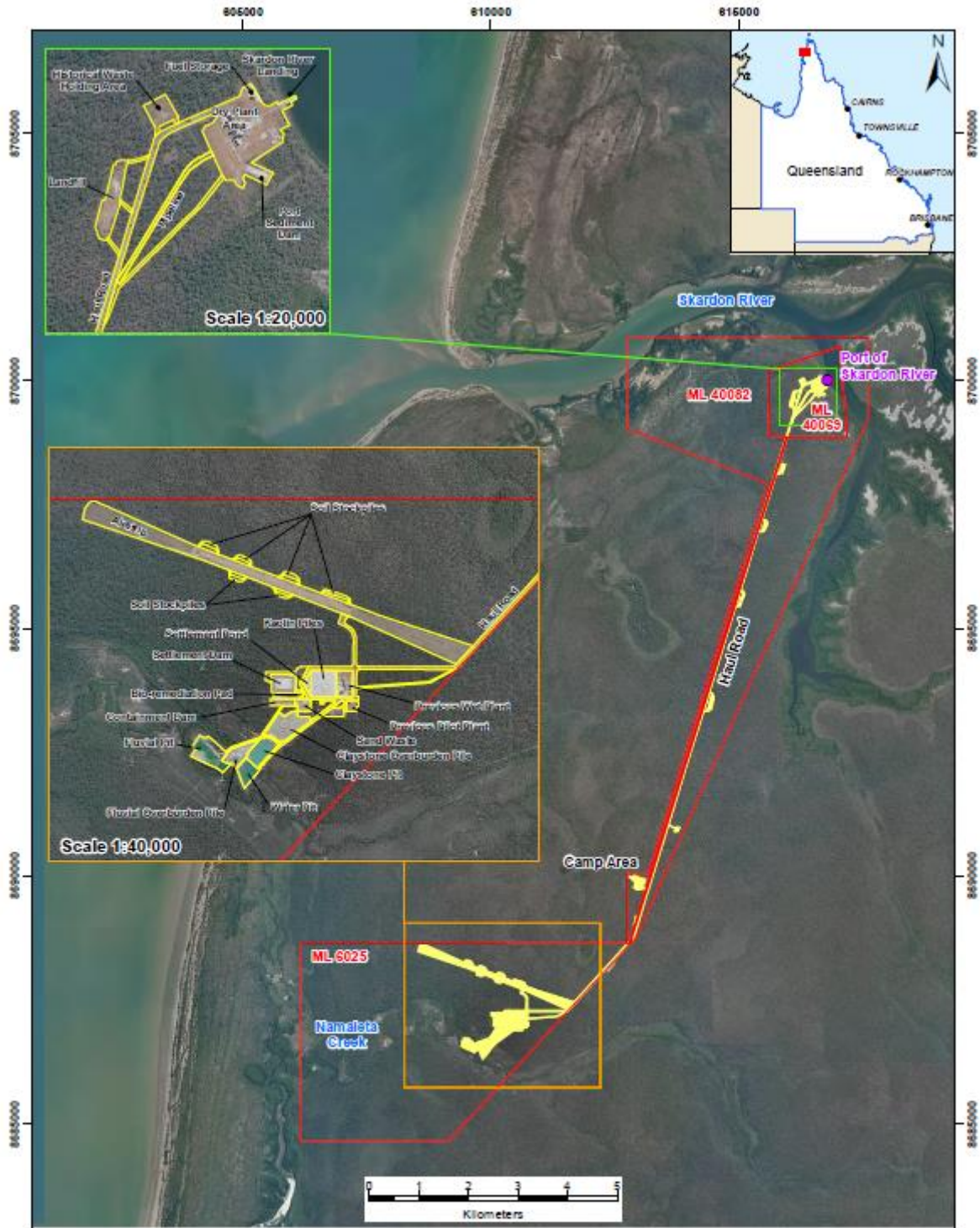


Figure 1 Skardon River Bauxite Project location and mine layout (Source: EIS Figure 1-2)



Legend

- Mining Lease Boundaries
- Existing Disturbance Footprint
- Port of Skardon River

Existing Kaolin Mine Footprint	
Figure 5-1	Gulf Alumina Limited
Date: 15/03/2015	Author: [Name] Map Area: 1:20,000
GREENCAP	

All comments in plan or relation to the data (including accuracy, reliability, completeness or suitability) and content in this document (including without limitation, details in respect) for any time, damage or loss (including consequential damage) arising in any way or for reliance upon this data. Data must not be used for other marketing or for use in breach of privacy laws. Images sourced from Google Earth (2015), Sentinel 2 (Satellite) (2015), State Resources and Energy Development (SRD) (2015).

Figure 2 Figure showing the existing kaolin mine footprint (Source: EIS Figure 5-1)

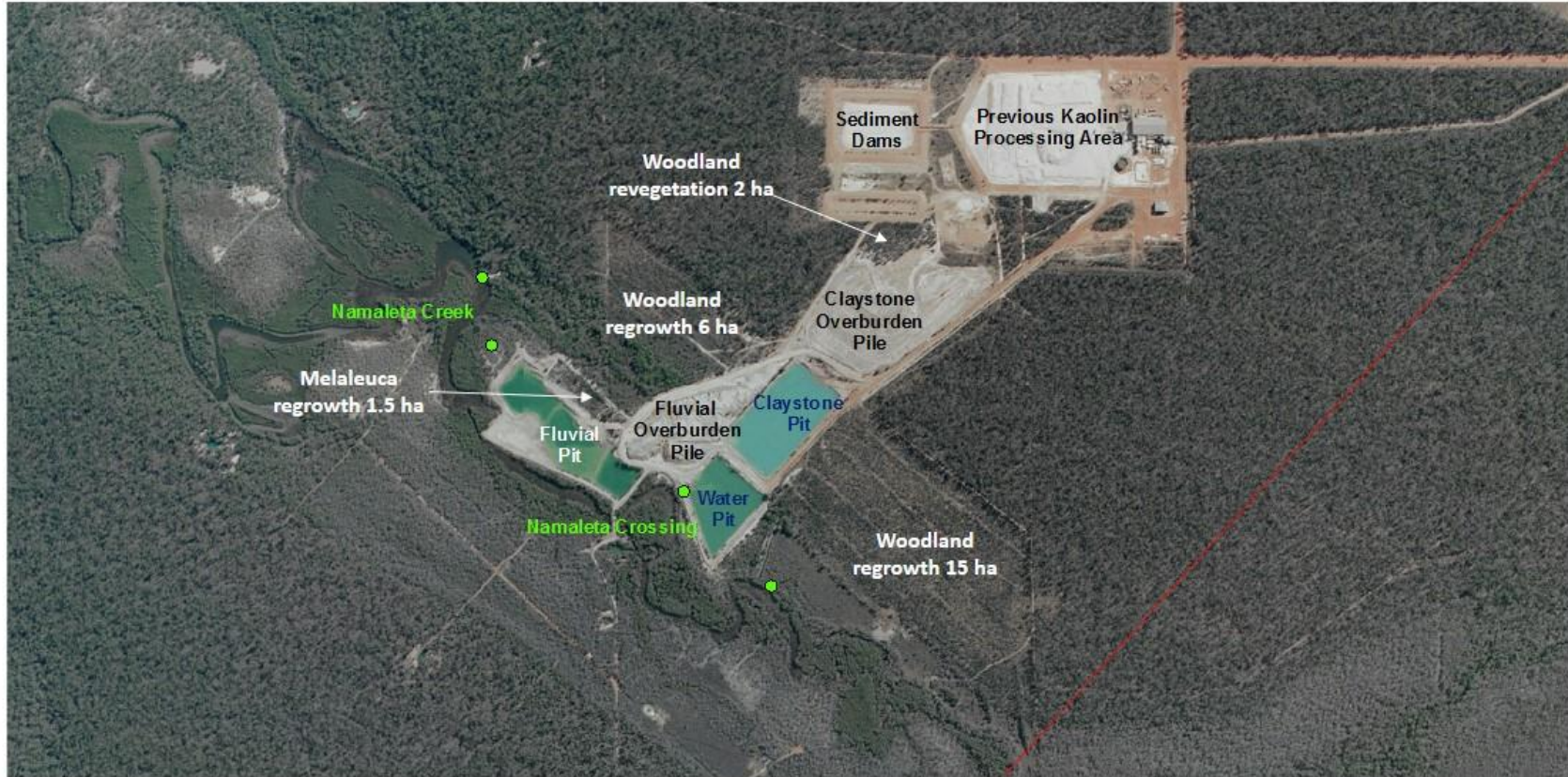


Figure 3 Figure showing the decommissioned kaolin wet plant, the sediment ponds, Namaleta crossing and rehabilitated woodland (Source: Figure provided by proponent post-EIS)

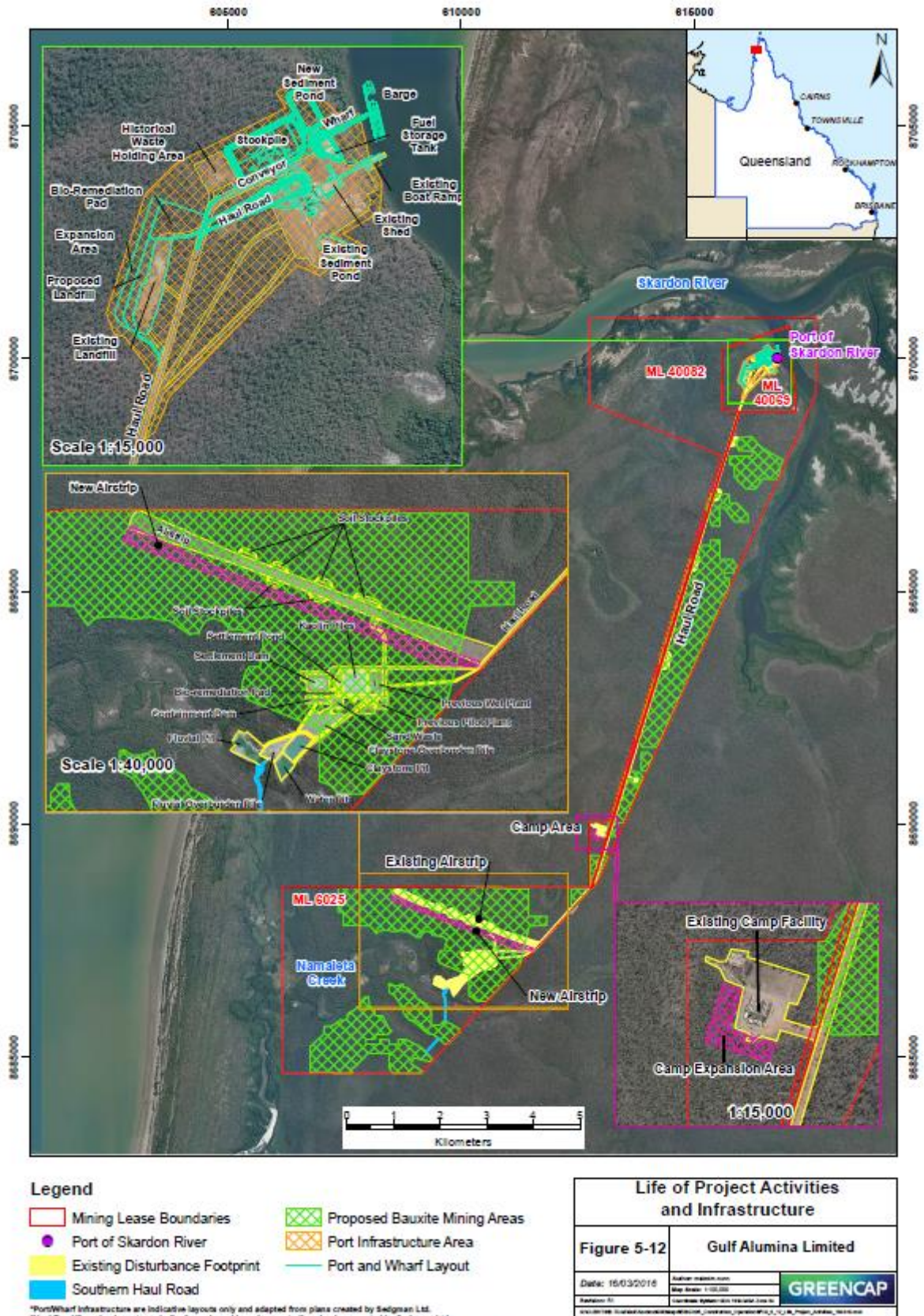


Figure 4 Figure showing the proposed life of project activities and infrastructure (Source: EIS Figure 5-12)

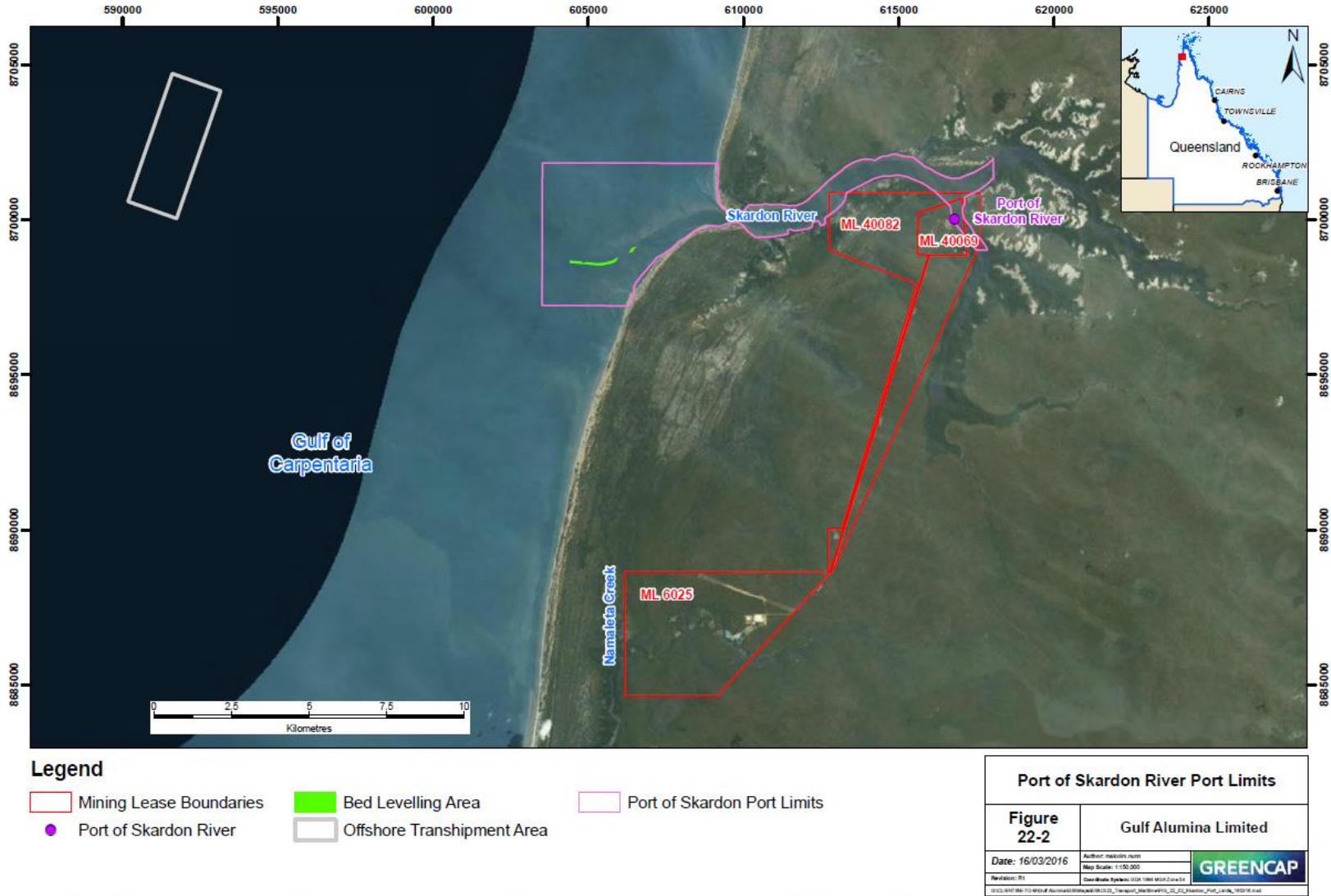


Figure 5 Figure showing the Port of Skardon Port limits, proposed areas of bed levelling and transshipment (Source: EIS Figure 22-2)

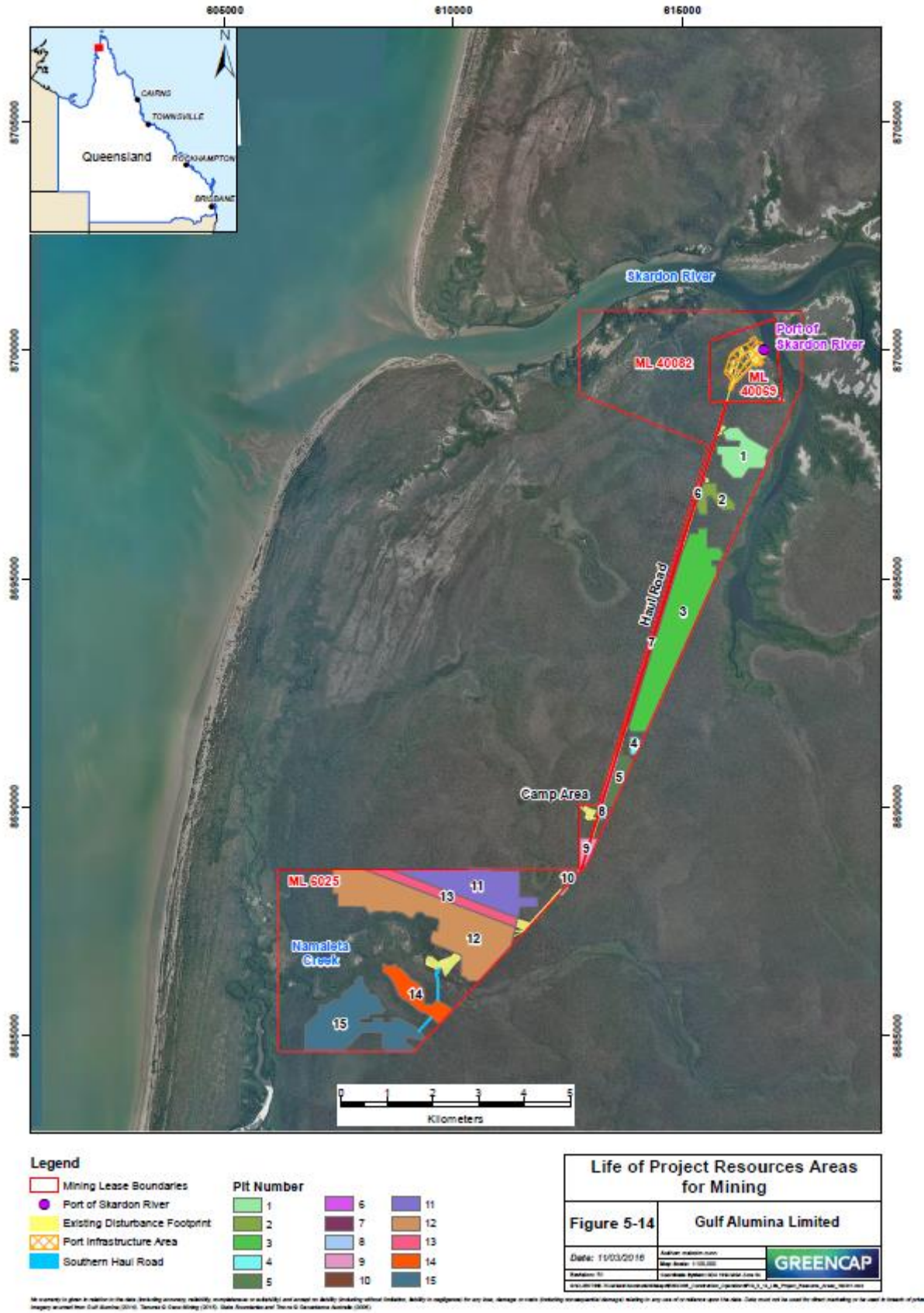


Figure 6 Figure showing life of project resource areas for mining (Source: EIS Figure 5-14)

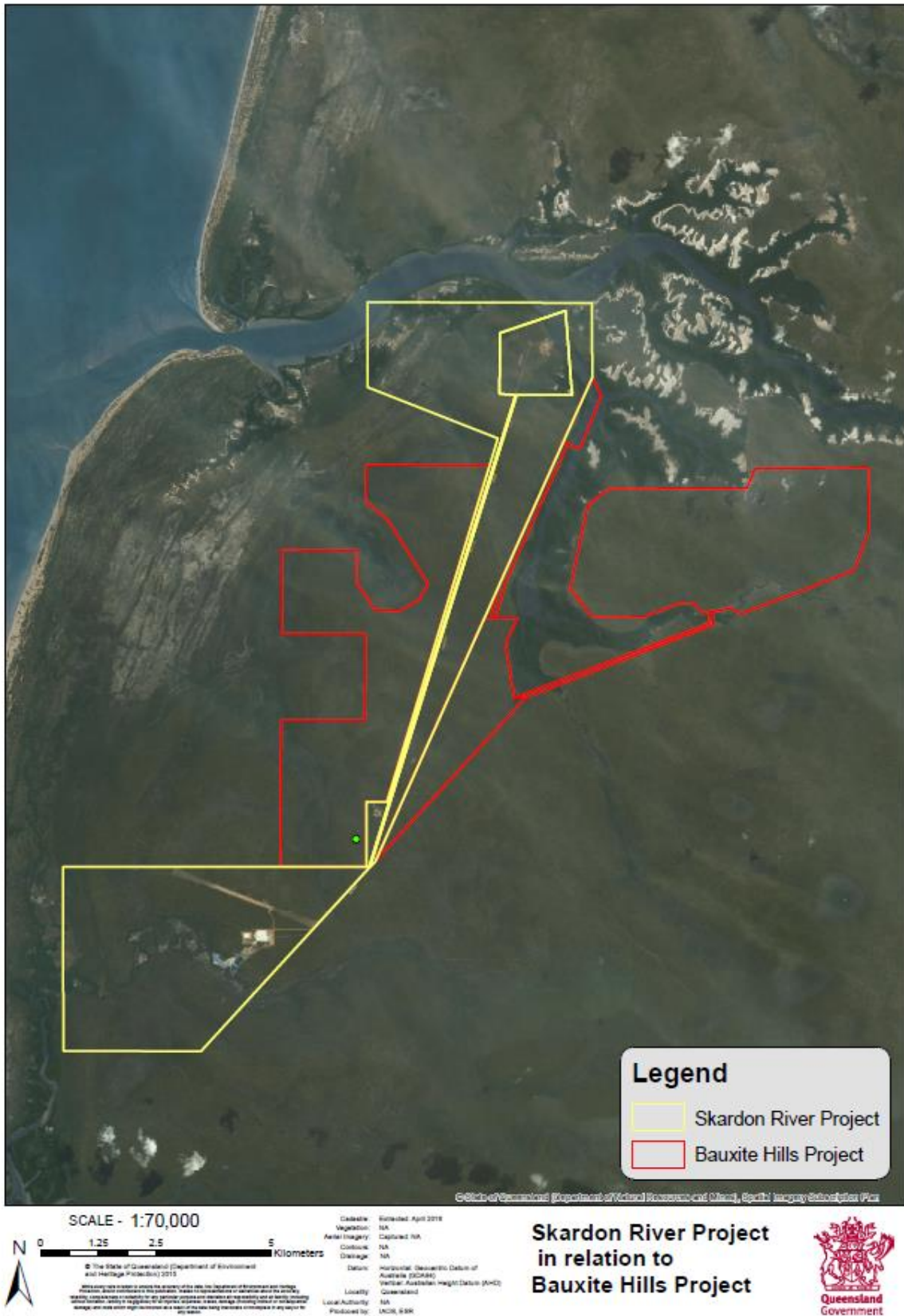
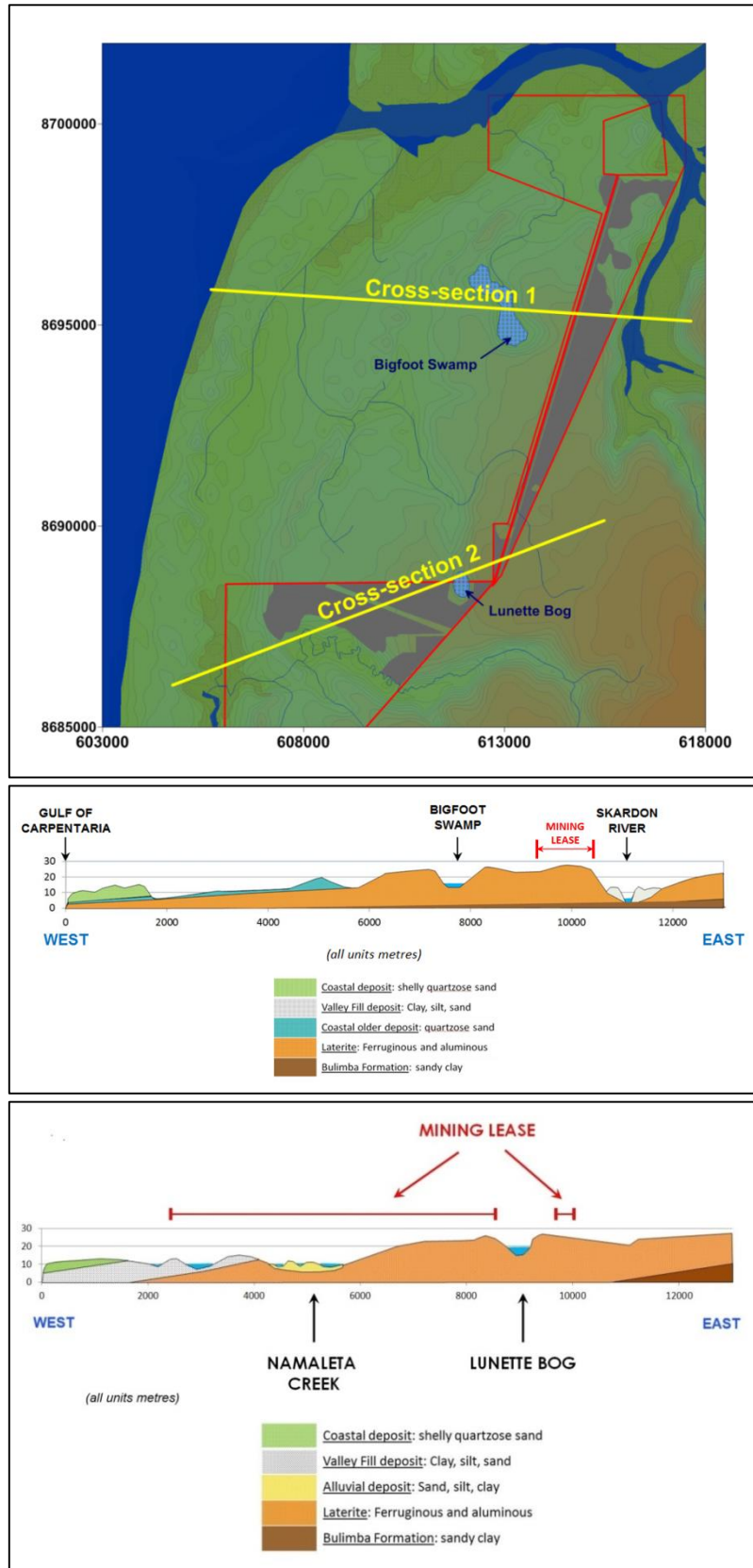
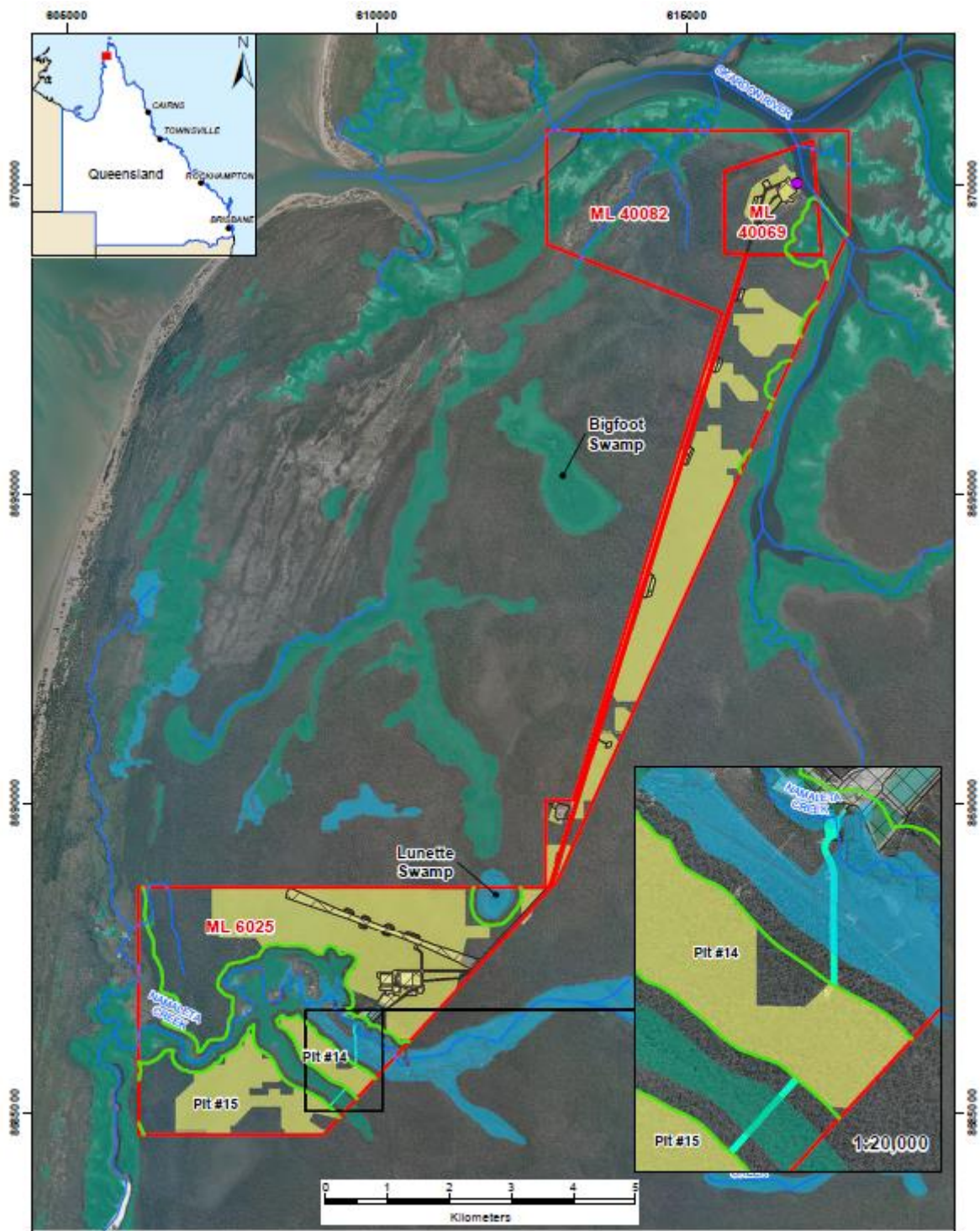


Figure 7 Figure outlining the tenements from proposed Skardon River Bauxite Project to the neighbouring proposed Bauxite Hills Project



**Figure 8 Cross sections 1 and 2 (Source: EIS Figures 13-5, 13-6 and 13-7)
 Laterite: Indicating area of bauxite deposits
 (the ferruginous and aluminous section) within the Bulimba Formation**



- Legend**
- Port of Skardon River
 - Mining Lease Boundaries
 - Watercourses
 - Existing Disturbance Footprint
 - Project Footprint
 - Southern Haul Road
 - Wetland Buffer
 - Wetland Management Area**
 - HES Wetland
 - GES Wetland

Referrable Wetlands - Wetland Management Areas	
Figure 16-7	Gulf Alumina Limited
Date: 15/03/2016	Author: mabon.com
Scale: 1:50,000	Map Area: 100,000
GREENCAP	

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Figure 9 Figure showing referrable wetlands (Source: EIS Figures 16-7)

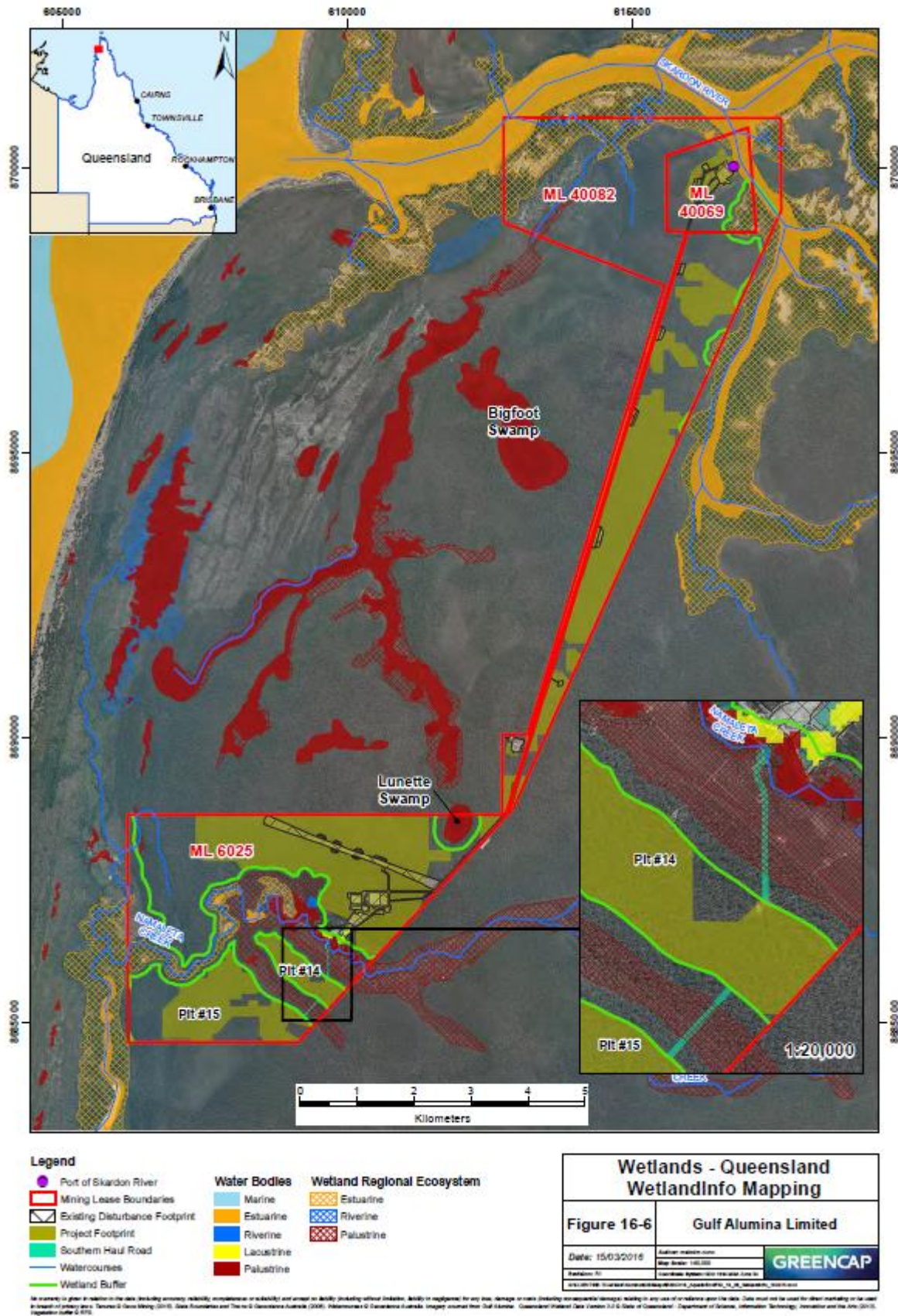


Figure 10 Figure showing wetlands as identified in WetlandInfo (Source: EIS Figures 16-6)

Appendix 1 – Recommended conditions for the Skardon River Bauxite Project environmental authority (resource activities)

**Recommended conditions for the Skardon River Bauxite Project
for a draft environmental authority
*Environmental Protection Act 1994***

**THESE RECOMMOMENDED CONDITIONS CAN BE CHANGED BY THE
ADMINISTERING AUTHORITY PRIOR TO ISSUING TO
GULF ALUMINA LIMITED**

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>In carrying out the mining activities the environmental authority holder must comply with Table A1 - Authorised Mining Activities and locations and the following plans provided in Schedule K – Maps and plans:</p> <ul style="list-style-type: none"> • Schedule A - Figure 1 - Skardon River Project Infrastructure layout —Mine Area • Schedule A - Figure 2 - Skardon River authorised Kaolin mine footprint • Schedule A - Figure 3 - Offshore transshipment location • Schedule A - Figure 4 - Skardon River Port infrastructure area • Schedule A - Figure 5 - Skardon River Wharf infrastructure area • Schedule A - Figure 6 - Landfill, Bioremediation Pad and Groundwater monitoring bores • Schedule A - Figure 7 - Skardon River Mine Camp, sewage treatment plant, irrigation area and storage areas

Table A1 - Authorised Mining Activities and Locations

Mine Domain	Mine Feature Name	Tenure Type and Number	Location (MGA 94 MGA - Zone 54)		Maximum disturbance area (ha)
			Easting	Northing	
Port and Wharf Infrastructure	Existing Shed (Dry Plant)	ML40069	TBA ²	TBA ²	TBA ²
	New Workshop	ML40069	TBA ²	TBA ²	TBA ²
	Hazardous Materials Storage Area	ML40069	TBA ²	TBA ²	TBA ²
	Truck wash Bay	ML40069	TBA ²	TBA ²	TBA ²
	Conveyor	ML40069	TBA ²	TBA ²	TBA ²
	Wharf	ML40069	TBA ²	TBA ²	TBA ²
	Boat ramp	ML40069	TBA ²	TBA ²	TBA ²
	Bulk Diesel storage tank (Fuel Storage Tank)	ML40069	TBA ²	TBA ²	TBA ²
	Stockpile	ML40069	TBA ²	TBA ²	TBA ²
	LV overpass	ML40069	TBA ²	TBA ²	TBA ²
Wet plant	Existing Airstrip	ML6025	TBA ²	TBA ²	TBA ²
	New Airstrip	ML6025	TBA ²	TBA ²	TBA ²
	Kaolin overburden piles	ML6025	TBA ²	TBA ²	TBA ²
	Claystone Overburden piles	ML6025	TBA ²	TBA ²	TBA ²
	Fluvial overburden pile	ML6025	TBA ²	TBA ²	TBA ²
	Sand Waste	ML6025	TBA ²	TBA ²	TBA ²
	Bio-remediation Pad 1 ¹	ML6025	610284	8687075	0.15
Waste	Existing Landfill	ML40069	616081	8699621	1.85ha
	Proposed Landfill	ML40069	616037	8699629	0.84ha
	Landfill expansion area	ML40069	616030	8699704	1.21ha
	Bio-remediation Pad 2 (Port Area)	ML40069	616156	8699830	1.46ha
	Historical Waste Holding Area	ML40069	TBA ²	TBA ²	TBA ²
	Landfill 3 (old landfill)	ML40082	TBA ²	TBA ²	TBA ²
Water storages	Sediment Pond 1 ¹	ML40069	TBA ²	TBA ²	TBA ²
	Sediment Pond 2	ML40069	TBA ²	TBA ²	TBA ²
	Claystone Pit	ML6025	TBA ²	TBA ²	TBA ²
	Water Pit	ML6025	TBA ²	TBA ²	TBA ²

	Fluvial Pit	ML6025	TBA ²	TBA ²	TBA ²
	Wet plant Settlement pond ¹	ML6025	TBA ²	TBA ²	TBA ²
	Wet plant sediment dam ¹	ML6025	TBA ²	TBA ²	TBA ²
	Wet plant Containment dam ¹	ML6025	TBA ²	TBA ²	TBA ²
Bauxite Mine Pits	Mine pit 1	ML40082	TBA ²	TBA ²	TBA ²
	Mine Pit 2	ML40082	TBA ²	TBA ²	TBA ²
	Mine Pit 3	ML40082	TBA ²	TBA ²	TBA ²
	Mine Pit 4	ML40082	TBA ²	TBA ²	TBA ²
	Mine Pit 5	ML40082	TBA ²	TBA ²	TBA ²
	Mine Pit 6	ML40082	TBA ²	TBA ²	TBA ²
	Mine Pit 7	ML40082	TBA ²	TBA ²	TBA ²
	Mine Pit 8	ML40082	TBA ²	TBA ²	TBA ²
	Mine Pit 9	ML40082	TBA ²	TBA ²	TBA ²
	Mine Pit 10	ML6025	TBA ²	TBA ²	TBA ²
	Mine Pit 11	ML6025	TBA ²	TBA ²	TBA ²
	Mine Pit 12	ML6025	TBA ²	TBA ²	TBA ²
	Mine Pit 13	ML6025	TBA ²	TBA ²	TBA ²
	Mine Pit 14	ML6025	TBA ²	TBA ²	TBA ²
	Mine Pit 15	ML6025	TBA ²	TBA ²	TBA ²
Roads	Haul road	ML40069	TBA ²	TBA ²	TBA ²
Topsoil stockpiles	TBA	TBA	TBA ²	TBA ²	TBA ²
Borrow Pits	TBA	TBA	TBA ²	TBA ²	TBA ²
Pipeline corridors	TBA	TBA	TBA ²	TBA ²	TBA ²
Mine Camp	Accommodation camp	ML6025	TBA ²	TBA ²	TBA ²
	Wet weather effluent storage	ML6025	TBA ²	TBA ²	TBA ²
	Sewage Treatment Plant	ML6025	TBA ²	TBA ²	TBA ²
	Irrigation Area	ML6025	TBA ²	TBA ²	TBA ²
	Grease Trap	ML6025	TBA ²	TBA ²	TBA ²

Table A1 - Authorised Mining Activities and locations notes:

1. These structures sit within an area designated for future extraction of bauxite. The administering authority must be notified upon removal of these structures due to bauxite extraction.
2. To be provided to the administering authority by (insert 3 months from date of EA issue).

Condition number	Condition
A3	<p>The environmental authority holder 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; and b) maintain such measures, plant and equipment in a proper and efficient condition; and c) operate such measures, plant and equipment in a proper and efficient manner; and 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.
Financial assurance	
A4	<p>The activity must not be carried out until the environmental authority holder has given financial assurance to the administering authority as security for compliance with this environmental authority and for any costs or expenses, or likely costs or expenses, mentioned in section 298 of the <i>Environmental Protection Act 1994</i>.</p>
A5	<p>The amount of financial assurance must be reviewed by the holder of this environmental authority when a plan of operations is amended or replaced.</p>
A6	<p>Financial assurance must be lodged in the amount and form within the time required by the administering authority.</p>
Monitoring	
A7	<p>Except where specified in another condition of this environmental authority, all monitoring data, records, reports, sampling results and plans required by this environmental authority must be kept for a period of at least five (5) years.</p>
A8	<p>When requested by the administering authority, monitoring must be undertaken within a timeframe nominated by the administering authority to investigate any potential environmental harm at any sensitive or commercial place, and the results must be provided to the administering authority within 14 days following completion of monitoring.</p>
A9	<p>Upon request from the administering authority, copies of any item identified in condition A7 must be provided to the administering authority's nominated office within 10 business days, or an alternative timeframe agreed between the administering authority and the environmental authority holder.</p>
A10	<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 on which the sample was taken; b) the time at which the sample was taken; c) the monitoring point at which the sample was taken; d) the results of all monitoring and details of any exceedances of the conditions of this environmental authority; and e) data must be provided to the administering authority in the specified electronic format upon request.
A11	<p>Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this environmental authority should be reviewed for effectiveness in minimising the likelihood of environmental harm on an annual basis, and amended if required, unless a particular review date and amendment program is specified in the plan, system or program.</p>
A12	<p>Where monitoring is a requirement of this environmental authority, ensure that a competent person(s) conducts all monitoring</p>

Chemicals and flammable or combustible liquids	
A13	Spillage of all chemicals, waste oils and flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm.
A14	All piping and infrastructure associated with the loading and unloading of petroleum and diesel products must be designed, constructed and maintained in accordance with the latest edition of AS1940—The storage and handling of flammable and combustible liquids.
A15	All waste materials, explosives, hazardous chemicals, corrosive substances, toxic substances, gases and dangerous goods must be stored and handled in accordance with the current Australian standard, where such is applicable. Where no relevant Australian Standard exists, all materials must be stored within an effective on-site containment system that prevents contamination of land or waters. Materials must be stored in a suitably concrete bunded and lined containment system.
Risk management	
A16	The holder of this environmental authority must develop and implement a risk management system for mining activities which complies with the content requirement of the Standard Risk Management (ISO31000:2009), or the latest edition of an Australian standard for risk management, by (Insert date 3 months from date of issue) .
Notification of emergencies, incidents and exceptions	
A17	<p>The environmental authority holder must notify the administering authority by written notification within 24 hours, after becoming aware of any emergency, monitoring result (this includes a trigger limit) or incident which results in the release of contaminants not in accordance, or reasonably expected to not be in accordance with, the conditions of this environmental authority.</p> <p>Notification to the administering authority must be provided to the administering authority Pollution Hotline on 1300 130 372 and PollutionHotline@ehp.qld.gov.au.</p> <p><i>Note: Successive or intermittent releases occurring within 24 hours of the cessation of any individual release can be considered part of a single release event and do not require individual notification for the purpose of compliance, provided the relevant details of the release are included within the notification provided in condition A16.</i></p>
A18	<p>Within 10 business days following the initial notification of an emergency or incident, or another date agreed to by the administering authority, the environmental authority holder must provide further written advice to the administering authority, including the following:</p> <ol style="list-style-type: none"> release commencement and cessation date/time; details regarding the compliance of the release with the conditions of this environmental authority (i.e. contaminant limits, natural flow, discharge volume); the reason for the release; the location of the release/release points the total volume of the release and which (if any) part of this volume was non-compliant; identification of any environmental harm as a result of the non-compliance; outcomes of actions taken at the time to prevent or minimise unlawful environmental harm proposed actions to prevent a recurrence of the emergency or incident. <p>For matters pertinent to a water release event, in addition to the above information, provide the following information:</p> <ol style="list-style-type: none"> release rate and natural flow rate in receiving waters; all in-situ water quality monitoring results.
A19	An emergency response/contingency plan must be developed and implemented by (Insert date 3 months from date of issue) , in accordance with the most recent version of ISO 14001 standard.

Complaints	
A20	<p>The environmental authority holder must notify the administering authority when a complaint is lodged and record all 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; and h) person responsible for resolving the complaint.
A21	<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 no later than 10 business days after the end of the timeframe nominated by the administering authority to undertake the investigation.</p>
Third-party reporting	
A22	<p>The environmental authority holder must:</p> <ul style="list-style-type: none"> a) within one year of the commencement of this environmental authority, 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-yearly intervals, from the completion of the report referred to above; and c) provide each report to the administering authority within 90 days of its completion.
A23	<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>
A24	<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 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 conditions I1 to I30, the time specified in that condition; and 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.
Meteorological monitoring	
A25	<p>The environmental authority holder must establish and maintain an automatic weather station to measure and record wind speed, wind direction, temperature and rainfall intensity by (Insert date 3 months from date of issue).</p>
Commitments	
A26	<p>All commitments found in <i>Schedule L - Skardon River Bauxite Project - Appendix 1 – Commitments Register</i>, must be implemented by the environmental authority holder.</p> <p><i>Note: If there is an inconsistency between a commitment and a condition of this environmental authority, the environmental authority condition prevails.</i></p>

Schedule B: Air

Schedule B: Air	
Condition number	Condition
B1	Discharges of contaminants to air, must be in accordance with Tables B1 - Release points (air) and B2 - Contaminant limits (air).

Table B1 - Release points (air)

Release point	Release point description	Source description	Minimum release height (metres above ground)	Minimum exit gas temperature (oC)	Minimum efflux velocity (m/s)
RP1	Power generation unit 1	1MW Generator – Operations	4m	325	10m/s
RP2	Power generation unit 2	1MW Generator - Operations	4m	325	10m/s
RP3	Power generation unit 3	150Kw Generator – Mine camp	4m	300	10m/s
RP4	Power generation unit 4	150Kw Generator – Port	4m	300	10m/s

Condition number	Condition
B2	Implement an air monitoring program. In accordance with the ' <i>Air Quality Sampling Manual</i> ' as published by the administering authority, by (Insert date 3 months from date of issue) that can determine the requirements of Table B1- Release points (air) and Table B2- Contaminant Limits (air) are being complied with.

Table B2 - Contaminant limits (air)

Contaminant	Release point	Maximum Release limit for each unit	Release limit units	Minimum monitoring frequency
CO	RP1 and RP2	1	g/sec	All release points must be monitored at least immediately after commissioning of the mine site and thereafter only when requested by the administering authority.
	RP3 and RP4	1	g/sec	
NO _x	RP1 and RP2	3.5	g/sec	
	RP3 and RP4	2	g/sec	

Table B2 - Contaminant limits (air) notes:

1. Within 3 months of commissioning of the mine site, the environmental authority holder must conduct air emission monitoring to demonstrate compliance with air emission limits listed in Table B1.

Condition number	Condition
B3	<p>Dust and particulate matter emissions generated by mining activities must not exceed the following levels when measured at any sensitive or commercial place:</p> <ul style="list-style-type: none"> c) 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. d) 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. d) A concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometres (PM2.5) 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. e) 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. <p>Ambient air quality monitoring may be conducted using an alternative method which is permitted in the most recent version of the 'Air Quality Sampling Manual' as published by the administering authority.</p>
B4	<p>If monitoring indicates exceedance of the relevant limits in condition B3 then the environmental authority holder must:</p> <ul style="list-style-type: none"> a) address the exceedance; and b) immediately implement dust abatement measures so that emissions of dust from the activity do not result in further environmental harm.
Odour nuisance	
B5	<p>Subject to condition B6 the release of noxious or offensive odour (s) or any other noxious or offensive airborne contaminant(s) resulting from the mining activity must not cause environmental harm at any sensitive or commercial place.</p>
B6	<p>If monitoring indicates condition B5 is not being met then the environmental authority holder must:</p> <ul style="list-style-type: none"> a) address the exceedance; and b) Immediately implement odour abatement measures so that emissions of odour from the activity do not result in further environmental harm.
Light	
B7	<p>Lighting management must be implemented at the port and barging operations to minimise impacts on nesting and hatchling turtles and other sensitive marine fauna.</p>

Schedule C: Waste

Schedule C : Waste	
Condition number	Condition
C1	Only general waste generated on site must be disposed of into the waste disposal trench facilities identified in Table C1 – Location of approved landfills and in Schedule K – Maps and Plans; Schedule A - Figure 6 - Landfill, Bioremediation Pad and Groundwater monitoring bores.

Table C1 - Location of approved landfills

Identification	Easting (MGA94 zone 54)	Northing (MGA94 zone 54)	Description
Landfill 1	0616109	8699700	Landfill approved within ML40069
Proposed Landfill	616037	8699629	
Landfill expansion area	616030	8699704	

Condition number	Condition
C2	Leachate and stormwater runoff that has been in contact with waste materials in the landfill, bio-remediation pad or waste storage areas must not be used for the purposes of irrigation, dust suppression or release to the receiving environment.
Waste Management Plan	
C3	The holder of the environmental authority must develop and implement a Waste Management Plan (WMP) by (insert date 3 months from date of issue) , in accordance with the commitments outlined under section 1.9 (Chapter 8 - Non-mining waste) of <i>Schedule L - Skardon River Bauxite Project - Appendix 1 – Commitments Register</i> .
Regulated and hazardous waste storage	
C4	Excluding temporary storage for a period not exceeding 6 months, all regulated waste must be removed from the site to a location authorised to accept regulated waste.
C5	Regulated waste awaiting collection for offsite disposal must be stored in a way that does not cause environmental harm.
Storage of tyres	
C6	Tyres stored awaiting disposal or transport, must be stockpiled in volumes less than 3m in height and 200m ² in area and at least 10m from any other tyre storage area.
C7	All reasonable and practicable fire prevention measures must be implemented, including removal of grass and other materials within a 10m radius of a tyre storage area.
New (proposed) landfill and expansion area	

C8	Landfill 1 must from (Insert date 1 month from date of issue) only accept construction and demolition waste that cannot be removed for scrap or recycling.
C9	The proposed new landfill and landfill expansion area must be designed and construction implemented by a suitably qualified person.
C10	The new landfill and future landfill facilities must incorporate base and side liners of 900 mm thickness of clay, compacted in layers to achieve a permeability of not more than 1×10^{-9} m/s or equivalent.
C11	A leachate collection system must be designed by an appropriately qualified person and installed and maintained to: <ul style="list-style-type: none"> a) collect leachate generated in the landfill unit; b) direct the collected leachate out of the landfill into an appropriate leachate storage facility; c) restrict the height of the leachate above the liner system to a maximum level of 300 mm ; and d) ensure leachate is not released to the receiving environment.
C12	The active waste disposal area must be constructed and operated to minimise the generation of leachate by implementing reasonable and practicable measures to minimise stormwater infiltration into landfilled waste.
C13	Excepting necessary burning of cleared vegetation in a manner that avoids environmental harm, waste must not be burnt.
Bioremediation pad	
C14	The only wastes permitted to be processed on site to render them less hazardous are: <ul style="list-style-type: none"> a) grease trap, biosolids and cardboard waste to produce soil conditioner and by bioremediation up to a maximum 200 tonnes or more of compost or soil conditioners in a year ; and b) soils contaminated by petroleum hydrocarbon carbons by bioremediation. .
C15	All bioremediation must take place on the bio-remediation pads identified in Table C2 - Location of bio-remediation pads and identified in Schedule K - Maps and Plans; Schedule A - Figure 2 - Skardon River authorised Kaolin mine footprint and Schedule A - Figure 6 - Landfill, Bioremediation Pad and Groundwater monitoring bores.
C16	Bio-remediation pads must be provided with an impermeable base and bunded to exclude run-on stormwater from areas external to the pads.
C17	Stormwater falling on the bioremediation pads must be collected and managed as leachate and must not be released to any waters.

Table C2 - Location of bio-remediation pads

Bio-Remediation Pad	Easting (MGA94 zone 54)	Northing (MGA94 zone 54)	Description
1	610284	8687075	Previous wet plant area
2	616156	8699830	Port area

Condition number	Condition
C18	<p>Material being subject to bioremediation must not be removed from the bioremediation pad until the following outcomes have been demonstrably met:</p> <ul style="list-style-type: none"> a) Where remediating grease trap waste, biosolids and cardboard waste, compliance with the latest edition of AS4454-2012—Composts, soil conditioners and mulches. b) Where remediation hydrocarbon contaminated soils, compliance with the environmental screening levels for Total Petroleum Hydrocarbon fractions F1 to F4 inclusive and BTEX and PAH compounds as prescribed in Table 1B(6) of the schedule 2 of the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM). Criteria for areas of ecological significance shall apply if remediated material is placed near wetlands or waterways otherwise open space criteria shall apply.
C19	<p>A monitoring program, consistent with the standard AS4454-2012—Composts, soil conditioners, mulches and, for contaminated soils, the ASC NEPM must be undertaken to demonstrate compliance with the prescribed outcomes in C16.</p>
C20	<p>Records must be kept of the results of the monitoring program and the locations where remediated materials are placed.</p>
Rehabilitation	
C21	<p>When the deposition of waste to the landfill unit ceases, a final capping system to the landfill unit must be designed by an appropriately qualified person and installed to minimise:</p> <ul style="list-style-type: none"> a) infiltration of water into the landfill unit and water ponding on the surface; and b) the likelihood of any erosion occurring to either the final capping system or the landfilled materials.
C22	<p>Land that has been disturbed for waste disposal activities must be rehabilitated in a manner such that:</p> <ul style="list-style-type: none"> a) suitable species of vegetation for the location are established and sustained for earthen surfaces b) potential for erosion is minimised c) the quality of water, including seepage, released from the site does not cause environmental harm d) potential for environmental nuisance caused by dust is minimised e) the final landform is stable and protects public safety f) the contaminant concentrations within the final capping layer are appropriate for the final land use and in accordance with the <i>'National Environmental Protection (Assessment of Soil Contamination) Measure 1999.'</i>
C23	<p>Following cessation of deposition of waste in the landfill unit, a landfill post-closure management plan must be implemented for a period of 10 years or until the administering authority determines that the landfill unit and surrounding site are stable and that no release of waste materials, leachate, landfill gas or other contaminants that may cause environmental harm is likely.</p>
C24	<p>The landfill post-closure management plan must include measures to:</p> <ul style="list-style-type: none"> a) maintain the structural integrity and effectiveness of the final capping system; b) maintain and operate the leachate collection system; c) maintain the groundwater monitoring system and monitor quality of groundwater at a frequency sufficient to detect any release of contaminants to groundwater; and d) maintain and operate the landfill gas monitoring system.

Schedule D: Noise

Schedule D : Noise	
Condition number	Condition
D1	The environmental authority holder must ensure that noise generated by the mining activities does not cause the criteria in Table D1 – Noise limits to be exceeded at a sensitive place or commercial place.

Table D1 – Noise limits

Sensitive place						
Noise level dB(A) measured as:	Monday to Saturday			Sundays and public holidays		
	7am to 6pm	6pm to 10pm	10pm to 7am	9am to 6pm	6pm to 10pm	10pm to 9am
L _{Aeq, adj, 15 mins}	CV = 50 AV = 5	CV = 45 AV = 5	CV = 40 AV = 0	CV = 45 AV = 5	CV = 40 AV = 5	CV = 35 AV = 0
L _{A1, adj, 15 mins}	CV = 55 AV = 10	CV = 50 AV = 10	CV = 45 AV = 5	CV = 50 AV = 10	CV = 45 AV = 10	CV = 40 AV = 5
Commercial place						
Noise level dB(A) measured as:	Monday to Saturday			Sundays and public holidays		
	7am to 6pm	6pm to 10pm	10pm to 7am	7am to 6pm	6pm to 10pm	10pm to 7am
L _{Aeq, adj, 15 mins}	CV = 55 AV = 10	CV = 50 AV = 10	CV = 45 AV = 5	CV = 50 AV = 10	CV = 45 AV = 10	CV = 40 AV = 5

Table D1 – Noise limits notes:

1. CV = Critical Value
2. AV = Adjustment Value
3. To calculate noise limits in Table D1:
If $bg \leq (CV - AV)$: Noise limit = $bg + AV$
If $(CV - AV) < bg \leq CV$: Noise limit = CV
If $bg > CV$: Noise limit = $bg + 0$
4. In the event that measured bg ($L_{A90, adj, 15 mins}$) is less than 30 dB(A), then 30 dB(A) can be substituted for the measured background level
5. bg = background noise level ($L_{A90, adj, 15 mins}$) measured over 3-5 days at the nearest sensitive receptor
6. If the project is unable to meet the noise limits as calculated above alternative limits may be calculated using the processes outlined in the "Planning for Noise Control" guideline.

Condition number	Condition
Monitoring and reporting	
D2	Where requested to undertake monitoring, noise monitoring and recording must include the following descriptor characteristics and matters: <ul style="list-style-type: none"> a) $L_{AN,T}$ (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins); b) background noise L_{A90}; c) $L_{Aeq, adj, 15 mins}$ d) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels; e) atmospheric conditions including temperature, relative humidity and wind speed and directions; f) effects due to any extraneous factors such as traffic noise; g) location, date and time of monitoring; and h) if the complaint concerns low frequency noise, Max $L_{pLIN,T}$ and one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range.
D3	If monitoring indicates exceedance of the limits in Table D1- Noise Limits, then the environmental authority holder must: <ul style="list-style-type: none"> a) address the exceedance, and b) immediately implement noise abatement measure so that emissions of noise from the activity do not result in further environmental harm.
D4	The method of measurement and reporting of noise level must comply with the latest edition of the administering authorities Noise Measurement Manual.

Schedule E: Water

Schedule E : Water	
Condition number	Condition
Release of contaminants to waters	
E1	Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters as a result of the authorised mining activities, except as permitted under the conditions of this environmental authority.
E2	Final site specific limits and trigger values for all parameters listed in tables E2 - Contaminated water release limits and Table E4 – Receiving water contaminant trigger investigation levels and limits (with the exception of oil or grease) must meet the minimum reference data requirements as per Table 4.4.2 of the <i>Queensland Water Quality Guidelines</i> , and be provided to the administering authority by 1 June 2017.
E3	The minimum reference data requirements as per Table 4.4.2 of the <i>Queensland Water Quality Guidelines</i> must be collected during the 2016/2017 wet season.
E4	The release of contaminants to waters must only occur from the release points specified in Table E1 – Contaminated water release points, sources and receiving waters and depicted in Schedule E - Figure 1 - Surface water monitoring locations for Skardon River and Schedule E - Figure 2 - Surface water monitoring locations for Namaleta Creek and Tributary 1.

E5	The release of contaminants to waters in accordance with condition E4 must not exceed the release limits stated in Table E2 - Contaminated water release limits when measured at the monitoring points specified in Table E1 - Contaminated water release points, sources and receiving waters for each quality characteristic and at the nominated frequency.
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Table E1 - Contaminated water release points, sources and receiving waters

Release point (RP)	Easting MGA94, zone54	Northing MGA94, zone 54	Contaminated water source and location	Monitoring point	Receiving waters locations
Port area sediment ponds					
S13	616718	8699703	Stormwater from port sediment pond 1 ¹	At release point	Skardon River
S14	616520	8700248	Stormwater from port sediment pond 2 ¹		
Release point (RP)	Easting MGA94, zone54	Northing MGA94, zone 54	Contaminated water source and location	Monitoring point	Receiving waters locations
Kaolin mine water storage ponds					
S3	609803	8686458	Stormwater from Raw Water Pit ¹	At release point	Namaleta Creek
S5	609409	8686750	Stormwater from western sump of Fluvial Pit ¹		

Table E1 - Contaminated water release points, sources and receiving waters notes:

1. Schedule E – Figure 1 - Surface water monitoring locations for Skardon River
2. Schedule E – Figure 2 - Surface water monitoring locations for Namaleta Creek and Tributary 1.

Table E2 - Contaminated water release limits

Quality characteristic	Unit	Release limits	Monitoring frequency
Port area sediment ponds			
Turbidity	NTU	20 or 120 percent of turbidity value measured contemporaneously at upstream reference, whichever is higher.	Daily during release event (the first sample must be taken within 2 hours of commencement of release)
pH	pH units	Maximum of 8.5 or 80 th percentile of reference, whichever is the higher.	
		Minimum of 7 or 20 th percentile of reference ⁽¹⁾ , whichever is the lower	
Total suspended solids (TSS)	mg/L	50	

Quality characteristic	Unit	Release limits	Monitoring frequency
Aluminium (filtered)	µg/L	2.1 or 80 th percentile of reference, whichever is higher.	
Benzene	µg/L	600	
Toluene	µg/L	110	
Ethylbenzene	µg/L	50	
Xylenes	µg/L	<i>Ortho</i> – 200 <i>Meta + Para</i> – 190	
Naphthalene	µg/L	2.5	
Total petroleum hydrocarbons C6 – C9	µg/L	20	
Total petroleum hydrocarbons C10 – C36	µg/L	100	
Surface slicks, visible evidence of oil or grease	No visible film observable		
Kaolin mine water storage ponds			
Turbidity	NTU	120 percent of turbidity value measured contemporaneously at upstream reference site; TBA.	Daily during release event (the first sample must be taken within 2 hours of commencement of release)
Electrical conductivity (EC)	µS/cm	120 percent of EC value measured contemporaneously at upstream reference site; TBA.	
Total dissolved solids (TDS)	mg/L	120 percent of TDS concentration measured contemporaneously at upstream reference site; TBA.	
pH	pH units	Minimum of 4.8	
		Maximum of 7.1	
Total suspended solids (TSS)	mg/L	50	
Aluminium (filtered)	µg/L	If pH < 6.5 - 0.8	

Quality characteristic	Unit	Release limits	Monitoring frequency
		If pH \geq 6.5 - 27 or 80 th percentile of reference, whichever is higher.	
Benzene	$\mu\text{g/L}$	600	
Toluene	$\mu\text{g/L}$	110	
Ethylbenzene	$\mu\text{g/L}$	50	
Xylenes	$\mu\text{g/L}$	<i>Ortho</i> – 200 <i>Meta + Para</i> – 190	
Naphthalene	$\mu\text{g/L}$	2.5	
Total petroleum hydrocarbons C6 – C9	$\mu\text{g/L}$	20	
Total petroleum hydrocarbons C10 – C36	$\mu\text{g/L}$	100	
Surface slicks, visible evidence of oil or grease	None visible		
Any other contaminant that may cause environmental harm	Not present in concentration that may cause environmental harm		

Condition number	Condition
E6	The holder must ensure stream flow gauging stations are installed, operated and maintained to determine and record stream flows at the locations specified in Table E3 - Release contaminant trigger investigation levels, potential contaminants
E7	Notwithstanding any other condition of this environmental authority, the release of contaminants to waters in accordance with condition E4 must only take place during periods of natural flow determined by the stream gauging stations required by condition E6.
E8	The daily quantity of contaminated water released from each release point must be measured and recorded.
E9	Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build-up of sediment in such waters.
E10	The environmental authority holder must have the 20th and 80th percentile of reference data calculated for each quality characteristic defined in Table E2 - Contaminated water release limits at all times.
E11	The 80th percentile of reference data calculated for each quality characteristic defined in Table E2- Contaminated water release limits must be provided to the administering authority on request.

Receiving environment monitoring	
E12	The quality of the receiving waters must be monitored at the locations specified in Table E3 - Receiving water upstream reference sites and downstream monitoring points for each quality characteristic and at the monitoring frequency stated in Table E4 - Receiving water contaminant trigger investigation levels and limits and depicted in Schedule E - Figure 1 - Surface water monitoring locations for Skardon River and Schedule E - Figure 2 - Surface water monitoring locations for Namaleta Creek and Tributary 1.
E13	<p>If quality characteristics of the receiving water at the downstream monitoring points specified in Table E3 - Receiving water upstream background sites and downstream monitoring points exceed any of the trigger levels specified in Table E4 – Receiving water contaminant trigger investigation levels and limits during a release event the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and:</p> <ul style="list-style-type: none"> a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no action is to be taken, or b) where the downstream results exceed the upstream results 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 <ul style="list-style-type: none"> 1. details of the investigations carried out 2. actions taken to prevent environmental harm. <p><i>Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with condition E11 b), no further reporting is required for subsequent trigger events for that quality characteristic.</i></p>
E14	The environmental authority holder must have the 80 th and 95 th percentile of reference data calculated for each quality characteristic defined in Table E4 – Receiving water contaminant trigger investigation levels and limits at all times.
E15	The 80 th and 95 th percentile of reference data calculated for each quality characteristic defined in Table E4- Receiving water contaminant trigger investigation levels and limits must be provided to the administering authority on request.
E16	All monitoring of waters and water quality must be in accordance with the most recent version of the monitoring and sampling manual published by the Administering Authority.

Table E3 - Receiving water upstream reference sites and downstream monitoring points

Monitoring points	Easting MGA94, zone54	Northing MGA94, zone 54	Receiving waters location description
Upstream reference monitoring points			
Skardon River			
S15	TBA ⁴	TBA ⁴	TBA ⁴ m upstream of the S13 RP ^{2,3}
S16	TBA ⁴	TBA ⁴	TBA ⁴ m upstream of the S14 RP ^{2,3}
Namaleta Creek – Freshwater section			
S1	610491	8685825	TBA ⁴ m upstream of the S3 RP ^{2,3}
S2	609949	8686287	TBA ⁴ m upstream of the S3 RP ^{2,3}
S21	609494	8685155	Tributary 1 upstream of creek crossing and mining area ^{2,3}
Namaleta Creek – Estuarine section			
TBA ⁶	TBA ⁶	TBA ⁶	TBA ⁶

Monitoring points	Easting MGA94, zone54	Northing MGA94, zone 54	Receiving waters location description
TBA ⁶	TBA ⁶	TBA ⁶	TBA ⁶
Downstream monitoring points			
Skardon river			
TBA ⁵	TBA ⁵	TBA ⁵	TBA ⁵ m downstream of S13 and S14 ^{2,3}
TBA ⁵	TBA ⁵	TBA ⁵	TBA ⁵ m downstream of S13 and S14 ^{2,3}
Namaleta Creek – Freshwater section			
S6	609392	8686912	Approximately 150m downstream of release point S5 ^{2,3}
S8 /S9	609654 / 609644	8686412/ 8686416	TBA ⁴ m downstream of release point S3 ^{2,3}
S22	608085	8686580	Tributary 1 - TBA ⁴ m downstream of confluence with Namaleta Creek ^{2,3}
Namaleta Creek – Estuarine section			
S7	607021	8685776	TBA ⁴ m downstream of Pits 14 and 15, zone between freshwater and estuarine systems ^{2,3}
S20	608243	8686784	TBA ⁴ m downstream of Pits 14 and 15, zone between freshwater and estuarine systems ^{2,3}

Table E3 - Receiving water upstream reference sites and downstream monitoring points notes:

1. The data from reference monitoring points must not be used where they are affected by releases from other mines.
2. Schedule L – Figure 1: Surface water monitoring locations
3. Schedule L – Figure 1: Surface water monitoring locations for Namaleta Creek and Tributary 1.
4. To be provided to the administering authority by *(insert 3 months from date of EA issue)* but prior to mining activities commencing.
5. Additional receiving water downstream monitoring locations must be placed in the Skardon River downstream of release points S13 and S14. One of these must be placed at the boundary of ML40082. Information to be provided to the administering authority no later than *(insert 3 months from issue date of EA)* but prior to mining activities commencing
6. Additional upstream reference monitoring locations must be placed in the estuarine section of Namaleta creek, upstream of the confluence. Information to be provided to the administering authority no later than *(insert 3 months from issue date of EA)* but prior to mining activities commencing

Table E4 – Receiving water contaminant trigger investigation levels

Quality characteristic	Unit	Trigger levels	Monitoring frequency
Skardon River			
Turbidity	NTU	20 or 80 th percentile of test site within not greater than 80 th percentile of reference, whichever is higher.	TBA
pH	pH Units	Minimum 7.0 or 20 th percentile of test site not less than 20 th percentile of reference site, whichever is lower	
		Maximum 8.5 or 80 th percentile of test site not greater than 80 th percentile of reference, whichever is higher.	
Total Suspended Solids	mg/L	80 th percentile of test site not greater than 80 th percentile of reference, whichever is higher.	
Aluminium (filtered)	µg/L	2.1 or 80 th percentile of test site not greater than 80 th percentile of reference, whichever is higher.	
Surface slicks, visible evidence of oil and grease	None visible		
Skardon River			
Turbidity	NTU	80 th percentile of test site not greater than 4.59 or 80 th percentile of reference, whichever is higher.	Daily during release event (the first sample must be taken within 2 hours of commencement of release)
EC	µS/cm	80 th percentile of test site not greater than 32.85 or 80 th percentile of reference ¹³ , whichever is higher.	
Total Dissolved Solids	mg/L	80 th percentile of test site not greater than 31 or 80 th percentile of reference, whichever is higher.	
pH	pH units	Minimum 20 th percentile test site not less than 4.8	
		Maximum 80 th percentile of test site not less than 5.5	
Total Suspended Solids	mg/L	80 th percentile of test site not greater than 80 th percentile of reference	
Aluminium (filtered)	µg/L	0.8 or 80 th percentile of reference, whichever is higher.	
Skardon River			
Turbidity	NTU	20 or 80 th percentile of test site not greater than 80 th percentile of reference, whichever is higher.	Daily during release event (the first sample must be taken within 2 hours of commencement of release)
pH	Range	Minimum 7 20 th percentile of reference, whichever is lower.	
		Maximum 8.5 or 80 th percentile of test site not greater than 80 th percentile of reference, whichever is higher.	
Total Suspended Solids	mg/L	80 th percentile of test site not greater than 80 th percentile of reference, whichever is higher.	
Aluminium (filtered)	µg/L	2.1 or 80 th percentile of reference, whichever is higher.	
Surface slicks, visible evidence of oil of	None visible		

Quality characteristic	Unit	Trigger levels	Monitoring frequency
grease			

Condition number	Condition
E17	All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.

Receiving environment monitoring program (REMP)

E18	<p>The environmental authority holder must develop and implement a Receiving Environment Monitoring Program (REMP) (insert date 3 months from date of EA issue) to monitor, identify and describe any adverse impacts to surface water and groundwater environmental values, quality and flows due to the mining activity. This must include monitoring the effects of the mine on the receiving environment periodically (under natural flow conditions), through the wet and dry seasons, 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"> • the Skardon River; • Namaleta Creek; • Connected or surrounding waterways; • Wetlands (including Bigfoot, Lunette Swamp and Skardon River Supra tidal wetlands); • Groundwater. <p>The REMP must encompass any sensitive receiving waters or environmental values downstream of the authorised mining activity that will potentially be affected (directly or indirectly) by release of contaminants to waters.</p> <p>The REMP must be designed and implemented in order to demonstrate that the environmental values of Lunette Swamp and Bigfoot Swamp are comparable to (or better than) pre development conditions.</p> <p><i>Note: The environmental values of wetlands are defined under section 81A of the Environmental Protection Regulations 2008.</i></p>
E19	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.

Water management plan

E20	A Water Management Plan (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 by (insert 3 months from date of EA issue).
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Integrated Marine Monitoring Program

E21	<p>An Integrated Marine Monitoring Program (IMMP) must be developed by an appropriately qualified person, and implemented by the environmental authority holder by the (insert 3 months from date of EA issue). 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.
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Vegetation and Aquatic Ecology Monitoring Plan

E22	<p>A Vegetation and Aquatic Ecology Monitoring Plan (VAEMP) must be developed by an appropriately qualified person and implemented by the environmental authority holder by (insert 3 months from date of EA issue). The VAEMP must:</p> <ul style="list-style-type: none"> • Measure any adverse impacts on species richness; • Measure species abundance; • Measure aquatic flora and fauna; • include all ecosystems within and surrounding wetlands and watercourses of the Skardon River, Namaleta Creek, Lunette Swamp and Bigfoot Swamps.
Stormwater and water sediment controls	
E23	<p>A certified Erosion and Sediment Control Plan (ESCP) must be developed by a Certified Professional in Erosion and Sediment Control and implemented by the environmental authority holder (insert 3 months from date of EA issue).</p> <p><i>Note: For all stages of the mining activities on the site, the ESCP must minimise erosion and the release of sediment to receiving waters and contamination of stormwater.</i></p>
E24	All disturbed mining areas not yet rehabilitated, and areas cleared in preparation for mining, must be included in the ESCP required by condition E23 no later than 1 November each year and implemented by the environmental authority holder prior to the wet season commencing.
E25	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.

Schedule F: Groundwater

Schedule F : Groundwater	
Condition number	Condition
F1	The environmental authority holder must not release contaminants to groundwater.
Monitoring program and reporting	
F2	An appropriately qualified person(s) must design a ground water monitoring program that will establish the pre-disturbance groundwater quality and levels and identify potential impacts of mining activities on the groundwater system and groundwater dependant ecosystems. The groundwater monitoring program must be submitted to the administering authority at least 30 business days prior to the commencement of the activity.
F3	<p>The groundwater monitoring program required by condition F2 must be capable of determining the pre-disturbance groundwater levels and groundwater quality for at least the following locations and situations:</p> <ol style="list-style-type: none"> Reference bore locations hydraulically up-gradient and compliance bore locations down-gradient of all mining activities, waste disposal areas, waste treatment areas, and hazardous waste storage and handling areas; All the hydrogeological units/aquifers that have the potential to be affected by mining activities, including paleo-channels suspected of interacting with groundwater dependant ecosystems; Wetlands including Lunette Swamp, Big Foot Swamp and Skardon River Supra tidal wetland; Groundwater abstraction location(s) for potable water supply; Sources of contaminants such as chemical and fuel storages or refuelling areas, to monitor the storages integrity and effectiveness of management measures. <p><i>Note: If a monitoring point effectively characterises water quality and potential impacts in for more than one above purpose/location, then a single monitoring point for those locations is acceptable.</i></p>
F4	The environmental authority holder must implement the groundwater monitoring program required by condition F2 prior to mining activities commencing.

F5	Final site specific limits and trigger values for all parameters listed in table F2 - Groundwater quality triggers and limits (with the exception of those for interpretation purposes) must meet the minimum reference data requirements as per Table 4.4.2 of the <i>Queensland Water Quality Guidelines</i> , and be provided to the administering authority by 1 June 2017.
F6	Groundwater quality and levels must be monitored at the locations and frequencies defined in Table – F1 Groundwater monitoring locations and frequency and Table F3 - Groundwater level monitoring and Schedule F – Figure 1 - Groundwater monitoring locations mining areas, Schedule F – Figure 2 - Groundwater monitoring locations treated effluent irrigation areas and Schedule F – Figure 3 - Groundwater monitoring locations port infrastructure areas for quality characteristics identified in Table F2 - Groundwater quality triggers and limits and Table F3 - Groundwater level monitoring.
Groundwater triggers, limits and exceedance investigation – Mining areas, treated effluent areas and port infrastructure areas	
F7	Groundwater levels when measured at the monitoring locations specified in Table F3 - Groundwater level monitoring must not exceed the groundwater level limits specified in Table F3 - Groundwater level monitoring.
F8	Groundwater monitoring results from compliance bores identified in Table F1- Groundwater monitoring locations and frequency must not exceed any of the limits defined in Table F2 - Groundwater quality limits.
F9	<p>If quality characteristics of groundwater from compliance bores identified in Table F1- Groundwater monitoring locations and frequency exceed any of the trigger levels stated in Table F2- Groundwater quality triggers and limits or exceed any of the groundwater level limits stated in Table F3- Groundwater level monitoring, the holder of this environmental authority must compare the compliance monitoring bore results to the reference bore results and;</p> <ul style="list-style-type: none"> a) where the compliance bore result is the same or a lower value than the reference bore result, then no action is to be taken, or b) where compliance bore result exceeds the reference bore result, then 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; <ul style="list-style-type: none"> 1. details of the investigations carried out; and 2. actions taken to prevent environmental harm. <p><i>Note: Where an exceedance has occurred and is being investigated, in accordance with condition F8 b), no further reporting is required for subsequent trigger events for that quality characteristic</i></p>

Table F1 - Groundwater monitoring locations and frequency

Monitoring point	Location MGA94 – Zone 54)			Aquifer screened (mbgl) ⁷	Minimum Monitoring frequency
	Description	Easting	Northing		
Mining Areas ³					
Reference bores⁶					
G1	Near Lunette Swamp and camp – used for potable camp water supply	611810	8687604	3-9 (BF); 9-12 (LSA)	Quarterly
G9	Near haul road, west of Pit 3	614121	8692982	11.75-14.75 (BF)	
G10	Near haul road in line with Bigfoot Swamp	614846	8695174	8.9-11.9 (BF)	
G15	New bore upgradient of Lunette Swamp	614307	8689722	TBA ⁹	
G16	New bore upgradient of Pits 14 and 15	610300	8685023	TBA ⁹	
C2	Near Bigfoot Swamp	613940	8695676	TBA ⁹	
Compliance bores					
G2	Former kaolin mine wet plant area	610596	8687043	11-14 (BF & AND)	Quarterly

G3	North of Namaleta Creek	609635	8686879	4-12 (BF & AND)	
G4	Namaleta South	609339	8686392	1-6 (BF & AND)	
G5	Port Area	616612	8699558	4-10 (BF)	
G6	West end of airstrip	608861	8688522	6-8 (BF)	
G7	West of mining, Beach road	606990	8688615	6-10 (BF)	
G8	North of airstrip	609603	8690668	6-10 (BF)	
G11	Skardon River	615671	8695166	8.95-11.95 (BF)	
G12	Downstream Namaleta Creek	609468	8686946	6-12 (BF & AND)	
G13	Downstream Namaleta Creek	609329	8687070	6-12 (BF & AND)	
G14	Downstream Namaleta Creek	609155	8687232	6-12 (BF & AND)	
G17	Near proposed water supply production bores at the Port area	615305	8698170	TBA ⁹	
G18	Near proposed Namaleta borefield, south of Namaleta Creek	609807	8685933	TBA ⁹	
G29	Downgradient of Bigfoot Swamp	612793	8697010	TBA ⁹	
G30	Downgradient of Lunette Swamp	611696	8690871	TBA ⁹	
C1	West of proposed mining	612629	8690559	15-21 (RDS)	
C3	Skardon River	615194	8692649	15-21 (RDS)	
Treated Effluent Irrigation Area ⁴					
Reference bores⁶					
G19	Upgradient bore1 of effluent irrigation area	613064	8689880	TBA ⁹	Quarterly
Compliance bores					
G20	Downgradient bore of effluent irrigation area	612967	8689918	TBA ⁹	Quarterly
G21	Downgradient bore of effluent irrigation area	612981	8689986	TBA ⁹	
Port Infrastructure Area ⁵					
Reference bores ⁶					
G22	Upgradient of existing and proposed landfills	616130	8699666	TBA ⁹	Quarterly
G25	Upgradient of bioremediation pad	616247	8699833	TBA ⁹	
G28	Upgradient of all Port infrastructure	616543	8699875	TBA ⁹	
Compliance bores					
G23	Downgradient of existing landfill; upgradient of proposed landfill	616069	8699674	TBA ⁹	Quarterly
G24	Downgradient of existing and proposed landfills	616007	8699683	TBA ⁹	

G26	Downgradient of bioremediation pad and proposed landfill	616066	8699867	TBA ⁹	
G27	Downgradient of hydrocarbon storage tanks and Port infrastructure	616665	8700108	TBA ⁹	

Table F1 - Groundwater monitoring locations and frequency notes:

1. Monitoring is not required where a bore has been removed as a direct result of the mining activity.
2. RL must be measured to the nearest 5cm from the top of the bore casing.
3. Schedule F – Figure 1: Groundwater monitoring locations mining areas.
4. Schedule F – Figure 2: Groundwater monitoring locations treated effluent irrigation areas.
5. Schedule F – Figure 3: Groundwater monitoring locations port infrastructure areas.
6. Reference sites must:
 - a. Have be hosted and screened in the same flow regime
 - b. Be from the same bio-geographic and climate region
 - c. Have similar geology, soil types and topography
 - d. Not be so close to the test site that any disturbance at the test site also results in a change at the reference site
7. BF means Bulimba Formation; LSA means Lunette Sand Aquifer; ADN means Alluvial Deposits Namaleta Creek; RDS means Rolling Downs Siltstone;
8. Construction of all bores must be logged, records of logs kept and bore top casings surveyed to 0.01 m Australian Height Datum
9. To be provided to the administering authority within (*insert 3 months from date of EA issue*) but prior to mining activities commencing.

Table F2 – Groundwater monitoring and limits – mining and associated activities (excluding port, sewage effluent disposal, land fill and bioremediation areas)

Parameter	Unit	Groundwater Limits
Aluminium (dissolved & total)	µg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Arsenic (dissolved & total)	µg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Cadmium (dissolved & total)	µg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Calcium	mg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Carbonate/Bicarbonate (CO ₃ /HCO ₃)	mg/L	Monitored for interpretation purposes
Chromium (VI) (dissolved & total)	µg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Copper (dissolved & total)	µg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Chloride	mg/L	Monitored for interpretation purposes
Chloride to Sulfate Ratio		20 th percentile of test site >= lower 75% confidence limit of background 20 th percentile
Dissolved oxygen	% saturation	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Iron (dissolved & total)	mg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Lead (dissolved & total)	µg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile

Parameter	Unit	Groundwater Limits
Magnesium	mg/L	Monitored for interpretation purposes
Manganese (dissolved & total)	mg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Mercury (dissolved & total)	mg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Nickel (dissolved & total)	mg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
pH (field measured)	unit	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
	unit	20 th percentile of test site >= lower 75% confidence limit of background 20 th percentile
Potassium	mg/L	Monitored for interpretation purposes
Redox potential	mV	Monitored for interpretation purposes
Sodium	mg/L	Monitored for interpretation purposes
Sulphate	mg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Specific conductance	µS/cm	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Suspended solids	mg/L	Monitored for interpretation purposes
Temperature	degrees C	Monitored for interpretation purposes
Total dissolved solids	mg/L	80 th percentile of test site <= upper 75% confidence limit of background 80 th percentile
Turbidity	NTU	Monitored for interpretation purposes
Vanadium (dissolved)	µg/L	80 th of test site <= upper 75% confidence limit of background 80 th percentile
Zinc (dissolved)	µg/L	80 th of test site <= upper 75% confidence limit of background 80 th percentile
Total petroleum hydrocarbons C6 – C9	µg/L	1 µg/L Maximum
Total petroleum hydrocarbons C10 – C36	µg/L	3 µg/L Maximum
Benzene	µg/L	25 µg/L Maximum
Ethylbenzene	µg/L	20 µg/L Maximum
Toluene	µg/L	2.5 µg/L Maximum
Xylenes	µg/L	1 µg/L Maximum
Naphthalene	µg/L	3 µg/L Maximum

Table F2 – Groundwater monitoring and limits notes the following associated requirements

1. Construction of all bores must be logged, records of logs kept and bore top casings surveyed to 0.01 m Australian

Height Datum

2. Monitoring bores must be installed in compliance with relevant Australian standards.
3. Monitoring must be in accordance with methods prescribed in the latest edition of the Administering Authority's Water Quality Sampling Manual
4. At least 8 samples from suitably screened reference bores are necessary to determine background water quality.
5. Minimum monitoring frequency is quarterly
6. Total petroleum hydrocarbons, BTEX (benzene, toluene, ethylbenzene and xylenes) and naphthalene need only be monitored in areas where fuels and waste petroleum hydrocarbons are stored or dispensed and vehicle workshop areas
7. Chloride sulfate ratio is calculated for areas where acid sulfate soil may be disturbed.
8. "80th of test site \leq upper 75% confidence limit of background 80th percentile" - This limit means that 80th percentile value of a potentially impacted site being tested must not exceed the upper 75% confidence value for the 80th percentile calculated from the corresponding background monitoring bore(s).
9. "20th percentile of test site \geq lower 75% confidence limit of background 20th percentile" - This limit means that 20th percentile value of a potentially impacted site being tested must not be less than the lower 75% confidence value for the 20th percentile calculated from the corresponding background monitoring bore(s).
10. 75% confidence limits are calculated in accordance with Queensland Water Quality Guidelines 2009 Appendix D, See High Ecological Value Waters section.
11. Total metals and metalloids apply to waters suitable for potable water supply.
12. \leq means must be less than or equal to
13. \geq means must be greater than or equal to.

Table F3 - Groundwater level monitoring

Monitoring location ²	Groundwater level limits
Bigfoot Swamp TBA	Median of test site over November to April is not less than the lower 75% confidence limits of the median background level established prior to any disturbance; <u>AND</u> Minimum \geq lowest background level.
Lunette Swamp TBA	
Skardon River supratidal wetlands TBA	

Table F3 - Groundwater level monitoring notes:

1. Regard must be had to rainfall likely falling over each season in apply this limit. For example, a breach would not occur if rainfall in a period was significantly less than that experienced in establishing reference conditions.
2. To be provided to the administering authority within (*insert 3 months from date of EA issue*) but prior to mining activities commencing.
3. Construction of all bores must be logged, records of logs kept and bore top casings surveyed to 0.01 m Australian Height Datum
4. Monitoring bores must be installed in compliance with relevant Australian standards.
5. Monitoring must be in accordance with methods prescribed in the latest edition of the Administering Authority's Water Quality Sampling Manual
6. At least 8 samples from suitably screened reference bores are necessary to determine background water quality.
7. Minimum monitoring frequency is quarterly
8. Total metals and metalloids apply to waters suitable for potable water supply.
9. \leq means must be less than or equal to
10. \geq means must be greater than or equal to.
11. Where groundwater level is greater than the land surface, such as above perching layers, that elevation must be measured accurate to 0.01 m Australian Height Datum.

Condition number	Condition
Groundwater triggers, limits and exceedance investigation – Landfill and bioremediation areas	
F10	<p>The holder must monitor groundwater elevation and quality characteristics in <i>Table F4 - Groundwater Quality Trigger Levels – Land fill and Bioremediation Areas</i> and <i>Table F5 - Groundwater Quality Limits – Land fill and Bioremediation Areas</i> in aquifers potentially affected by the activity in bores hydraulically down gradient of the land-filled waste and bioremediation activities (compliance bores) and assess any deviations in groundwater quality from that monitored in corresponding hydraulically up-gradient or background locations (reference bores). The assessments must include:</p> <ol style="list-style-type: none"> 1. Whether median groundwater quality in compliance bores exceeds or falls below the corresponding 80th and 20th percentile values for the quality characteristics in <i>Table F4 - Groundwater Quality Trigger Levels – Land fill and Bioremediation Areas</i> obtained from monitoring results in reference bores; 2. Whether groundwater quality in compliance bores exceeds groundwater quality limits in <i>Table F5 - Groundwater Quality Limits – Land fill and Bioremediation Areas</i>; and 3. Using groundwater elevations to infer and chart groundwater contours and flow directions and determine validity of reference bore locations.
F11	<p>The activities must not cause exceedance of any groundwater quality limit in <i>Table F5 – Groundwater quality limits – land fill, port, effluent disposal and bioremediation areas</i>.</p>
F12	<p>In the event that any groundwater quality trigger levels or limits prescribed in <i>Table F4 - Groundwater Quality Trigger Levels – Land fill, Port, Effluent Disposal and Bioremediation Areas</i> or <i>Table F5 - Groundwater Quality Limits – Land fill, Port, Effluent Disposal and Bioremediation Areas</i> have been exceeded, then the holder must carry out the following actions:</p> <ol style="list-style-type: none"> 1. Report the breach of the trigger level(s) or groundwater quality limits to the administering authority; 2. Review the effectiveness of leachate management practices at the landfill and bioremediation area for effectiveness in minimising leachate formation and escape; 3. Implement more frequent monitoring, for example monthly, of the relevant water quality indicator(s) at the relevant leachate detection site(s) until the issue is resolved; 4. Evaluate potential causes of the exceedance; 5. Carry out monitoring at relevant environmentally sensitive receptors to investigate potential for environmental harm to be caused; 6. Excepting where caused by natural or extraneous factors, implement prompt remedial actions whether public safety risks from potential landfill gas migration through soils need to be re-evaluated; and 7. Promptly report actions taken and results of monitoring and assessments to the administering authority, but in no case more than 14 days after actions have been taken or additional monitoring has been conducted, as the case may be. <p><i>Note: In the event that the exceedance is considered to constitute a continuation of a reported exceedance already being addressed by ongoing remedial actions already notified to the administering authority, then the holder need only report the result under clause (1), the fact that the exceedance relates to an issue currently being remediated and any further actions (if any) to resolve the issue and minimise the likelihood of environmental harm.</i></p>
F13	<p>All monitoring of groundwater must:</p> <ol style="list-style-type: none"> 1. include monitoring of groundwater elevation accurate to 0.05 metres AHD; 2. be made in accordance with methods prescribed in the latest edition of the administering authority's Water Quality Sampling Manual; 3. be conducted at least at the minimum frequency of quarterly for the water quality characteristics in <i>Table F4 - Groundwater Quality Trigger Levels – Land fill and Bioremediation Areas</i> and <i>Table F5- Groundwater Quality Limits – Land fill and Bioremediation Areas</i>

Table F4 – Groundwater quality trigger levels – land fill, port, effluent disposal and bioremediation areas

Quality Characteristic	Compliance Bore Statistic	Trigger Level from Reference Bore
Ammonia (as N) mg/L	Median of test site ¹	80 th percentile of background ²
Aluminium (dissolved & total) µg/L		
Arsenic (dissolved & total) µg/L		
Cadmium (dissolved & total) µg/L		
Calcium mg/L		
Carbonate/Bicarbonate (CO ₃ /HCO ₃) mg/L		
Chromium (VI) (dissolved & total) µg/L		
Copper (dissolved & total) µg/L		
Chloride mg/L		
Iron (dissolved & total) mg/L		
Lead (dissolved & total) µg/L		
Magnesium mg/L		
Manganese (dissolved & total) mg/L		
Mercury (dissolved & total) mg/L		
Nickel (dissolved & total) mg/L		
Nitrate + Nitrite (as N) mg/L		
Nitrogen Total (as N) µg/L		
Phosphorus Total (as P) µg/L		
pH (field measured)		
Potassium mg/L		
Sodium mg/L		
Sulphate mg/L		
Specific conductance µS/cm		
Total dissolved solids mg/L		
Total Organic Carbon mg/L		
Vanadium (dissolved) µg/L		
Zinc (dissolved) µg/L		
Suspended solids mg/L	Interpretive purposes	
Temperature degrees C		

Turbidity (NTU)	
Dissolved oxygen % saturation	
Redox potential mV	

Table F4 – Groundwater quality trigger levels – land fill, port, effluent disposal and bioremediation areas notes:

1. “median of test site” means the running median value for the hydraulically down-gradient test site, calculated from the most recent 8 quarterly groundwater monitoring results as required under this development approval. If less than 8 results are available, it is the running median is to be calculated once two or more consecutive results are available, using available data, until the full 8 results are available.
2. “80th percentile of background” means the running 80th percentile value for the relevant hydraulically up-gradient or background monitoring site calculated from the most recent 8 quarterly groundwater monitoring results as required under this development approval. If less than 8 results are available, it is the running median is to be calculated once two or more consecutive results are available, using available data, until the full 8 results are available.
3. “20th percentile of background” means the running 20th percentile value calculated from of the same data set used to calculate the 80th percentile of background value.
4. Background bores must be slotted in the same aquifer as bores of compliance being tested to enable representative comparisons
5. “Interpretive purposes” means the quality indicator is monitored to assist interpretation of results only

Table F5 – Groundwater quality limits – land fill, port, effluent disposal and bioremediation areas

Quality characteristic	Limit	Limit type
Ammonia (as N) mg/L	120% of highest background value ¹	Maximum
Aluminium (dissolved & total) µg/L		
Arsenic (dissolved & total) µg/L		
Cadmium (dissolved & total) µg/L		
Chromium (VI) (dissolved & total) µg/L		
Copper (dissolved) µg/L		
Iron (dissolved) mg/L		
Lead (dissolved) µg/L		
Manganese (dissolved) µg/L		
Mercury (dissolved & total) mg/L		
Nickel (dissolved & total) mg/L		
Nitrate + Nitrite (as N) mg/L		
Nitrogen Total (as N) µg/L		
Phosphorus Total (as P) µg/L		
Sulphate mg/L		
Specific conductance µS/cm		
Total dissolved solids mg/L		
Total Organic Carbon mg/L		

Vanadium (dissolved) µg/L		
Zinc (dissolved) µg/L		
pH (field measured)	0.5 pH units more than the highest background value ¹	
	0.5 pH units less than the highest background value ¹	
Escherichia coli cfu/100 ml	Nil - If E coli found in reference bores, 120% of highest background value ¹ applies	
Total petroleum hydrocarbons C6 – C9 µg/L	Maximum 25 µg/L	
Total petroleum hydrocarbons C10 – C36 µg/L	Maximum 100 µg/L	
Benzene µg/L	1 µg/L	
Ethylbenzene µg/L	3 µg/L	
Toluene µg/L	25 µg/L	
Xylenes µg/L	20 µg/L	
Napthalene µg/L	2.5 µg/L	

Table F5 – Groundwater quality limits – land fill, port, effluent disposal and bioremediation areas notes:

1. "Highest background value" means the highest monitored value of the water quality characteristic, measured in that aquifer from the last eight quarterly sampling results at the corresponding hydraulically up-gradient or background monitoring site in the groundwater monitoring system.
2. BTEX means benzene, toluene, ethyl benzene and xylenes.

Condition number	Condition
Bore construction and maintenance and decommissioning	
F14	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.
Effluent irrigation area	
F15	Groundwater monitoring must be undertaken to ascertain potential impact of releases of treated sewage effluent to the effluent irrigation area. The monitoring network must include assessment of groundwater elevations and inferred flow directions, background water quality and potential impacts on down gradient ground water quality for total phosphorus, total nitrogen, oxidised nitrogen and <i>Escherichia coli</i> .
F16	The irrigation of sewage effluent must not adversely affect suitability of use of groundwater for drinking water supply or cause environmental harm to any groundwater dependant ecosystem.

Schedule G: Land and rehabilitation

Schedule G : Land and rehabilitation	
Condition number	Condition
G1	Land disturbed by mining must be rehabilitated in accordance with Table G1 - Rehabilitation requirements – Bauxite Mine and Table G2 - Rehabilitation requirements – Kaolin mine and the Revegetation Management Plan (RMP) approved prior to commencement of bauxite extraction.

Table G1 - Rehabilitation requirements – Bauxite mine

Mine domain	Rehabilitation goal	Rehabilitation objectives	Indicators	Completion criteria
Mine Floor	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Landform design meets the following design requirements. Slope angle does not exceed 12°. Edges battered to 1:5 slope.
			Erosion.	Evidence in the Final Rehabilitation Report (FRR) that the runoff management systems area stable at closure and exhibit characteristics for long term stability.
		Site is safe for humans and animals now and in the foreseeable future.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the FRR that slopes are safe and exhibit characteristics for long term stability.
	Non-polluting	Seepage will not cause environmental harm. No surface runoff from mined areas.	Runoff, surface and groundwater quality is monitored for 'standard' water quality parameters	Monitoring meets trigger criteria. Receiving waters have water quality in accordance with the environmental authority.
				Certification by an appropriately qualified person that surface water and groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
	Stable landform	Erosion rates are managed to levels that do not compromise post-mine land use	Slope angle and length.	Evidence in the FRR that the rehabilitated slopes have been designed to the following specifications. Slope gradient of <12° with a top soil cover. (Applicable to edges only).
Erosion is managed in accordance with an Erosion and Sediment Control Plan.				Erosion controls functioning as intended, monitored and amended as required.

			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.	
		Mine area slopes are geotechnically stable	No geotechnical failure.	Mine edges will be designed, shaped and capped with topsoil and revegetated in accordance with the Revegetation Management Plan (RMP).	
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Scarified surface to be seeded with an appropriate seed mix and weed species to be controlled	Percent foliage cover recorded in line with RMP.	
			Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.	
			Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in the RMP.	
				Vegetation types and densities are comparable with the relevant reference site.	
		Self-sustaining	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land- use.	<p>Certification in the FRR that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following:</p> <ul style="list-style-type: none"> ● soil salinity content is <0.6 dS/m; ● soil pH is between 5.5 and 8.5; ● soil exchange sodium percentage (ESP) is <15%; ● nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts; and ● adequate macro and micro-nutrients are present according to pre mining levels.

			Physical properties of topsoil to support the proposed vegetation and land-use.	Suitable topsoil and subsoils that have been stripped prior to mining will be applied to the mine floor.
			Topsoil thickness.	Surface and subsoils are rehabilitated in accordance with Soils Management Plan. Certification in the FRR that topsoil has been re-spread according to pre-mining depths or within depth range described in the Soils Management Plan.
		Groundwater levels stabilise following rehabilitation.	Groundwater levels	Implement long term groundwater monitoring plan and compare groundwater levels pre and post mining and rehabilitation. Certification by an appropriately qualified person that groundwater levels at monitoring locations are not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.

			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
Mine domain	Rehabilitation goal	Rehabilitation objectives	Indicators	Completion criteria
Port infrastructure area, haul roads, airstrip, and camp	Safe	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies). Structural, geotechnical and hydraulic adequacy	Certification by an appropriately qualified person in the FRR that slopes are safe and exhibit characteristics for long term stability.

				<p>A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards.</p>
				<p>For infrastructure that is not retained, landform design meets the following design requirements. Slope angles not to exceed 5o – 6o.</p>
				<p>For any dams, landform design meets the following design requirements. Walls left in place will be graded where necessary such that slope angles do not exceed 10°.</p>
		<p>Site is safe for humans and animals now and in the foreseeable future.</p>	<p>Appropriate decommissioning of infrastructure.</p>	<p>Certification by an appropriately qualified person in the FRR that the infrastructure has been decommissioned and rehabilitated. Infrastructure has been removed unless stakeholders have entered into formal written agreements for their retention. Access to the area is conducive of the intended purpose of the post-mining land use.</p>
Non-polluting	Runoff from infrastructure areas contained on site until water quality suitable for release.		Downstream surface water quality.	<p>Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.</p>
				<p>Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.</p>
			Groundwater quality.	<p>Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.</p>

			Final landform water storages, if any, are contained on-site, with no over flows into external surface water systems until water quality suitable for release.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
		Hazardous or contaminated material or areas are identified and managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the FRR includes predictions about future changes and that the specified cover thickness is in place.
	Evidence in the FRR that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.			
	Any metals or materials that may contaminate the site (e.g. batteries, waste oils etc.) will be removed from site and disposed of at an appropriately licensed waste disposal facility Wastes that have the potential to cause contamination through seepage will be disposed of in cells within the landfill that will contain any contaminated seepage.			
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Contaminated areas may undergo on-site remediation, removal to an appropriately licensed waste disposal facility or encapsulation on-site to prevent the release of contaminants. Any contaminated land is remediated. Evidence in the FRR that measures required in site contaminated land investigation report have been implemented. Certification of remediation.
	Stable landform	Landform design achieves erosion rates that do not compromise post-mine land use.	Slope angle and length.	Evidence in the FRR that the rehabilitated slopes for infrastructure areas have been designed to the following specifications. Slope angles not to exceed 5o – 6o. Erosion is managed in accordance with an Erosion and Sediment Control Plan.

			Engineered structures to control water flow.	Evidence in the FRR that required water control measures are in place and functioning. Drainage control through ripping, profiling or the provision of erosion control structures will be undertaken.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform. Scarified surface to be seeded with an appropriate seed mix and weed species to be controlled.
			Dimensions and frequency of occurrence of erosion of rills and gullies.	Evidence in the FRR that the dimensions and frequency of occurrence of erosion rills and gullies are no greater than that in comparable reference site(s).
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in the RMP.
				Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
		Self-sustaining	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land use.

		Physical properties of topsoil to support the proposed vegetation and land use.	Certification in the FRR that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
		Topsoil thickness.	Certification in the FRR that topsoil has been re-spread according to the depths required in the Soils Management Plan.
		Site soil characteristics.	Certification in the FRR that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the Australian Soil and Land Survey Field Handbook (National Committee on Soil and Terrain 2009).
	Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
		Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
		Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
	Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
		Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.

			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas in no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas in no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Infrastructure is dismantled / decommissioned and removed unless approved for use by another party.	No infrastructure remains on site unless requested by the landholder for beneficial use.	Mining support infrastructure will be decommissioned, dismantled and removed upon completion of the mining operations. Any concrete bases and footings will be removed and the area ripped, reshaped and topsoil applied before revegetation.
				Following decommissioning, infrastructure areas will require deep ripping, profiling, application of topsoil and seeding.
				Water pipelines may be retained, by agreement, for future use by landholders, local government or another project; or where removal of buried infrastructure would create more environmental damage than leaving in-situ. If they are not retained, infrastructure will be removed from site and disturbance corridors will undergo deep ripping, profiling, application of topsoil and seeding. Water in any water storages will meet water quality objectives for the intended water use.

Table G2 - Rehabilitation requirements – Kaolin mine

Mine domain	Rehabilitation goal	Rehabilitation objectives	Indicators	Completion criteria
Kaolin borrow pits and kaolin exploration pits	TBA ¹	TBA	TBA	TBA
Kaolin water storage pits (Claystone pit, water pit, and fluvial pit), Sewage treatment plant (including irrigation area)	TBA	TBA	TBA	TBA
Overburden piles (Fluvial, Claystone and Kaolin).	TBA	TBA	TBA	TBA

Table G2 - Rehabilitation requirements – Kaolin Mine notes:

1. TBA: to be included in the final EA as per current plan of operations.

Condition number	Condition
G2	The environmental authority holder must utilise vegetation for beneficial uses in the course of carrying out extraction activities, where beneficial uses are exhausted, the holder may burn vegetation cleared provided the activity does not cause environmental harm at any sensitive place or commercial place, nor adversely affect wetlands and other sensitive ecosystems.
Contaminated Land	
G3	The environmental authority holder must minimise the potential for contamination of land by hazardous contaminants.
Buffer zones	
G4	The environmental authority holder must not conduct mining activities within the buffer zones presented in Schedule G – Figure 2 – Buffer zones and : <ol style="list-style-type: none"> within 100m of Lunette Swamp; within 500m of Bigfoot Swamp; within 100m of Namaleta Creek and Tributary 1 (excluding authorised crossings); within 100m of supratidal wetlands to the west of the Skardon River South Arm; and within 500m of wetland complexes to the west and north of the project area.

Rehabilitation Management Plan and progressive rehabilitation	
G5	<p>The environmental authority holder must develop, implement and submit to the administering authority a Rehabilitation Management Plan (RMP) within one year from commencement of bauxite extraction and include:</p> <ol style="list-style-type: none"> a) schematic representation of final landform including, slope and cover designs, drainage designs and the agreed post mining land and/or infrastructure use with the landowner/holder and the administering authority; b) revegetation methods inclusive of plant species selection, soil ameliorants/amendments, surface preparation and method of propagation; c) materials balance including available topsoil and subsoil; d) geotechnical, geochemical and hydrological studies; e) chemical, physical and biological properties of soil and water; f) a rehabilitation schedule integrated with the mine plan schedule; g) rehabilitation goal, rehabilitation objective, indicators and measurable completion criteria for each agreed post mining land use within each domain that enables determination of rehabilitation success; h) description of experimental design for monitoring of reference and rehabilitated areas inclusive of statistical design; i) a rehabilitation monitoring program based on a statistically sound, mutually agreed sampling design; j) programs for maintenance of rehabilitation as required to achieve the nominated rehabilitation objective; and k) on-site revegetation trials which test: <ol style="list-style-type: none"> 1. selected species, 2. seeding rates, 3. establishment methodologies, and 4. the feasibility of the use of felled timber for fauna refuge in rehabilitation areas.
G6	Rehabilitation of mined panels must commence progressively and within 12 months of each panel being completed in accordance with the RMP.
G7	<p>The environmental authority holder must review and update the RMP in the following circumstances:</p> <ol style="list-style-type: none"> a) the rehabilitation schedule changes with the mine plan schedule; b) based on outcomes of on-site revegetation trials; and c) based on 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.
Land Use Management Plan (LUMP)	
G9	<p>The holder of this environmental authority must develop, implement and submit to the administering authority a Land Use Management Plan (LUMP) by the (insert date 3 months from EA issue date). The LUMP must include:</p> <ol 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.
Acid Sulphate Soils	
G10	Areas identified as Potential Acid Sulphate Soils (PASS) must have field surveys conducted by an appropriately qualified person prior to any disturbance occurring in order to identify if the soils are Acid Sulphate Soils (ASS) and if so must be managed in accordance with condition G11.
G11	An Acid Sulphate Soil Management Plan (ASSMP) must be developed in accordance with the latest edition of the Queensland Acid Sulphate Soil Technical Manual and implemented by the environmental authority holder to treat and manage ASS, to prevent the release of contaminants to water and land.
Exploration	
G12	All exploration activities carried at the licensed place must comply with each of the standard environmental conditions contained in the most recent version of the Code of Environmental Compliance for Exploration and Mineral Development projects.
Environmental offsets	

G13	Significant residual impacts to prescribed environmental matters are not authorised unless the impact(s) is specified in Table G3 - Significant residual impacts to prescribed environmental matters.
G14	An environmental offset made in accordance with the <i>Environmental Offsets Act 2014</i> and Queensland Environmental Offsets Policy, must be undertaken for the maximum extent of impact to each prescribed environmental matter authorised in Table G3 - Significant residual impacts to prescribed environmental matters prior to the disturbance occurring, unless a lesser extent of the impact has been approved in accordance with condition G15.
G15	Prior to the commencement of any impacts to a prescribed environmental matter for which an environmental offset is required by condition G13, a report completed by an appropriately qualified person that contains an analysis of the estimated maximum extent of impact to each prescribed environmental matter must be provided to the administering authority.
G16	The report required by condition G15 must be approved by the administering authority before the notice of election, if applicable, is given to the administering authority.
G17	The notice of election for the environmental offset required by condition G16, if applicable, must be provided to the administering authority no less than three months before the proposed commencement of the significant residual impacts for which the environmental offset is required.

Table G3 - Significant residual impacts to prescribed environmental matters

Prescribed environmental matter	Location (MGA94, zone 55)	Maximum extent of impact
Regulated Vegetation		
Regulated vegetation (intersecting a wetland) and VMA Act wetlands: RE 3.3.64/3.3.9 (70/30): <ul style="list-style-type: none"> 3.3.64: <i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i> open sedgeland in drainage swamps in dune fields. 3.3.9: <i>Lophostemon suaveolens</i> open forest on streamlines, swamps and alluvial terraces. 	TBA ¹	1ha, consisting of: <ul style="list-style-type: none"> 0.5ha of for Namaleta Creek (south side) 0.5ha for the Tributary 1 wetland crossing)
Wetlands and watercourses		
Wetland (HES Wetland): a HES wetland shown on the map of referable wetlands: RE 3.3.64/3.3.9 (70/30). <ul style="list-style-type: none"> 3.3.64: <i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i> open sedgeland in drainage swamps in dune fields. 3.3.9: <i>Lophostemon suaveolens</i> open forest on streamlines, swamps and alluvial terraces. 	TBA	0.5ha ²
Wetland (HEV Waters): a wetland in high ecological value waters RE 3.3.64/3.3.9 (70/30). <ul style="list-style-type: none"> 3.3.64: <i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i> open sedgeland in drainage swamps in dune fields. 3.3.9: <i>Lophostemon suaveolens</i> open forest on streamlines, swamps and alluvial terraces. 	TBA	0.5ha ²

Protected wildlife habitat		
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)³ bare-rumped sheath-tail bat (endangered)³ masked owl (vulnerable)³ 	TBA	1209ha ³
Marine Plants		
Marine plants: mangroves and saltmarsh communities: RE 3.1.1a / 3.1.3 <ul style="list-style-type: none"> Closed forest of <i>Rhizophora stylosa</i> +/- <i>Bruguiera gymnorhiza</i> (occurs as outer mangroves) <i>Ceriops tagal</i> +/- <i>Avicennia marina</i> low closed forest (extensive on intertidal areas) 	TBA	0.03ha

Table G3 - Mine Significant residual impacts to prescribed environmental matters notes:

1. TBA: to be included in the final EA as per current plan of operations.
2. There is overlap between the prescribed environmental matters and one offset area may acquit the offset required for both matters. Double counting of offset obligations is not intended.
3. Species were also identified as MNES to be offset by Commonwealth approval requirement under the EPBC Act.

Condition number	Condition
Sewage effluent	
G18	All sewage effluent released to land must be monitored at the frequency and for the parameters and meet the release limits specified in Table G4 - Contaminant release limits to land.
G19	Sewage effluent may only be released to land in accordance with the conditions of this approval at the location within the nominated area identified in Schedule A - Figure 7 - Skardon River Mine Camp, sewage treatment plant, irrigation area and storage areas and Schedule G – Figure 1 - Treated effluent irrigation area and groundwater monitoring bores.

Table G4 - Contaminant release limits to land

Contaminant	Unit	Release limit	Limit type	Frequency
5 day Biochemical oxygen demand (BOD ₅)	mg/L	20	Maximum	Monthly
Total Suspended Solids	mg/L	30		
Total Nitrogen	mg/L as Nitrogen	30		
Total Phosphorus	mg/L as Phosphorus	15		
E-coli	Organisms/100mL	1000		
pH	pH units	6.0 – 9.0.	Range	

Condition number	Condition
G20	The application of sewage effluent to land must be carried out in a manner such that: <ul style="list-style-type: none"> a) vegetation is not damaged; b) there is no surface ponding of treated sewage effluent; and c) there is no run-off of treated sewage effluent.
G21	Sewage effluent used for irrigation must not cause spray drift or over spray to any sensitive or commercial place.
G22	If areas irrigated with sewage effluent are accessible to employees or the general public, prominent signage must be provided advising that sewage effluent is present and care should be taken to avoid consuming or otherwise coming into unprotected contact with the sewage effluent.
G23	The daily volume of sewage effluent released to land must be measured and records kept of the volumes of sewage effluent released.
G24	When circumstances prevent the irrigation or beneficial reuse of sewage effluent such as during or following rain events, sewage effluent must be directed to a wet weather storage or alternative measures must be taken to store/lawfully dispose of sewage effluent.
G25	A minimum area of 10,000 m ² of land, excluding any necessary buffer zones, must be utilised for the irrigation and/or beneficial reuse of treated sewage effluent.
G26	When weather conditions or soil conditions preclude the release of treated sewage effluent to land, treated sewage effluent must be directed to wet weather storage of at least 800 m ³ or be lawfully removed from the site.

Schedule H: Coastal structures

Schedule H: Coastal Structures	
Condition number	Condition
Transfer of Bauxite	
H1	The environmental authority holder must ensure the transfer of bauxite from vehicles and vessels used for transporting minerals and bulk materials leave the mining lease(s) with appropriate load preparation to prevent spillage and/or loss of particulate matter and/or windblown dust during transport.
H2	The transfer of minerals and bulk materials to barges at the Skardon River port must be carried out in a manner that minimises the likelihood of release of minerals or bulk materials to the atmosphere or waters.
H3	The environmental authority holder must capture and pump any contaminated runoff from the barge loading conveyor belt catch tray to the Skardon River port sediment ponds.

Construction of Port of Skardon River wharf	
H4	<p>An Environmental Management Plan (EMP) for construction of the Port of Skardon River wharf must be developed and implemented by the environmental authority holder by (insert 3 months from date of EA issue). The EMP must include management strategies to minimise impacts on the receiving environment, including but not limited to:</p> <ul style="list-style-type: none"> a) environmental commitments - a commitment by senior management to achieve specified and relevant environmental goals; b) description of works to be undertaken, including the type of equipment to be used and the location of works; c) environmental issues and potential impacts; d) the actual and potential release of all contaminants; e) the potential impact of these sources and contaminants; f) actions to be taken to minimise the impacts on the receiving environment; g) monitoring of contaminant releases including contaminant release locations and conducting environmental impact assessments; h) contingency plans including the practices and procedures to be employed to restore the environment or to mitigate impacts on the receiving environment; and i) periodic review of environmental performance and continual improvement.
H5	The environmental authority holder must not commence wharf construction unless the holder has submitted to the administering authority design drawings certified by a Registered Professional Engineer of Queensland (RPEQ).
H6	The holder of this environmental authority must construct the wharf in accordance with the certified design drawings referred to in Condition H5.
H7	<p>A report from an RPEQ must be submitted to the administering authority within three (3) months of completion of wharf construction certifying that:</p> <ul style="list-style-type: none"> a) The wharf construction (including any other associated works) have been constructed in accordance with the drawings referred to in Condition H5; b) The works: <ul style="list-style-type: none"> 1. are structurally adequate for the anticipated use; 2. comply with all relevant codes including the administering authority's operational policy.
Pile Driving program	
H8	<p>Pile driving activities must be carried out in a manner that minimises adverse impacts on the surrounding environment, including marine fauna, and must include the following:</p> <ul style="list-style-type: none"> a) soft-start approach to disperse of any marine fauna in the vicinity of proposed works; b) monitoring by an observer prior to commencing and during normal pile driving activities; and c) normal pile driving operations: <ul style="list-style-type: none"> 1. must not commence if turtles, dugongs or cetaceans are within the exclusion zone specified under the environmental management plan as required in condition H4; 2. must cease if turtles, dugongs or cetaceans are within the exclusion zone specified under the environmental management plan as required in condition H4.

Schedule I: Regulated structures

Schedule I: Regulated Structures	
Condition number	Condition
Assessment of consequence category	
I 1	<p>The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with <i>the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)</i> at the following times:</p> <ul style="list-style-type: none"> a) prior to the design and construction of the structure, if it is not an existing structure; or b) prior to any change in its purpose or the nature of its stored contents.

I 2	A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.
I 3	Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the <i>Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)</i> .
Design and construction of a regulated structure	
I 4	Conditions I5 to I9 inclusive do not apply to existing structures.
I 5	All regulated structures must be designed by, and constructed ⁵ under the supervision of, a suitably qualified and experienced person in accordance with the requirements of the <i>Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)</i> .
I 6	Construction of a regulated structure is prohibited unless: <ul style="list-style-type: none"> a) the holder has submitted a consequence category assessment report and certification to the administering authority; and b) certification for the design, design plan and the associated operating procedures has been certified by a suitably qualified and experienced person in compliance with the relevant condition of this authority.
I 7	Certification must be provided by the suitably qualified and experienced person who oversees the preparation of the design plan in the form set out in the <i>Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)</i> , and must be recorded in the Register of Regulated Structures.
I 8	Regulated structures must: <ul style="list-style-type: none"> a) be designed and constructed in compliance with the <i>Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)</i>; b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of: <ol style="list-style-type: none"> 1. floodwaters from entering the regulated dam from any watercourse or drainage line; and 2. wall failure due to erosion by floodwaters arising from any watercourse or drainage line. c) must meet the hydraulic performance criteria stated in Table I 1 - Hydraulic Performance Criteria for Regulated Structures.
I 9	Certification by the suitably qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure, and state that: <ul style="list-style-type: none"> a) the 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure b) construction of the regulated structure is in accordance with the design plan.

Table I 1 - Hydraulic Performance Criteria for Regulated Structures

Name of Regulated Structure	Spillway Capacity AEP	Design Storage Allowance AEP	Mandatory Reporting Level AEP
TBA ¹	TBA	TBA	TBA
TBA	TBA	TBA	TBA
TBA	TBA	TBA	TBA

Table I 1 - Hydraulic Performance Criteria for Regulated Structures notes:

1. TBA – to be announced based on the outcome of the final consequence assessment undertaken in accordance with the conditions of this environmental authority.

⁵ Certification of design and construction may be undertaken by different persons.

Condition number	Condition
Notification of affected persons	
I 10	<p>All affected persons must be provided with a copy of the emergency action plan in place for each regulated structure</p> <ul style="list-style-type: none"> a) for existing structures that are regulated structures, within 10 business days of this condition taking effect; b) prior to the operation of the new regulated structure; and c) if the emergency action plan is amended, within 5 business days of it being amended
Operation of a regulated structure	
I 11	<p>Operation of a regulated structure, except for an existing structure, is prohibited unless the holder has submitted to the administering authority in respect of regulated structure, all of the following:</p> <ul style="list-style-type: none"> a) one paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition I6; b) a set of 'as constructed' drawings and specifications; c) certification of the 'as constructed drawings and specifications' in accordance with condition I9; d) where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan; e) the requirements of this authority relating to the construction of the regulated structure have been met; f) the holder has entered the details required under this authority, into a Register of Regulated Structures; and g) there is a current operational plan for the regulated structure.
I 12	<p>Each regulated structure must be maintained and operated, for the duration of its operational life until decommissioned and rehabilitated, in compliance with the current operational plan and, if applicable, the current design plan and associated certified 'as constructed' drawings.</p>
Mandatory reporting level	
I 13	<p>Conditions I14 to I15 inclusive only apply to Regulated Structures which have not been certified as low consequence category for 'failure to contain – overtopping'.</p>
I 14	<p>The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of that dam, it is clearly observable.</p>
I 15	<p>The holder must, as soon as practicable but within forty-eight (48) hours of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.</p>
I 16	<p>The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated dam.</p>
I 17	<p>The holder must record any changes to the MRL in the Register of Regulated Structures.</p>
Design storage allowance	
I 18	<p>The holder must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken prior to 1 July of each year.</p>
I 19	<p>By 1 November of each year, storage capacity must be available in each regulated dam (or network of linked containment systems with a shared DSA volume), to meet the Design Storage Allowance (DSA) volume for the dam (or network of linked containment systems).</p>
I 20	<p>The holder must, as soon as practicable but within forty-eight (48) hours of becoming aware that the regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, notify the administering authority.</p>
I 21	<p>The holder must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.</p>

Annual inspection report	
I 22	Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.
I 23	At each annual inspection, the condition and adequacy of all components of the regulated structure must be assessed and a suitably qualified and experienced person must prepare an annual inspection report containing details of the assessment and include a recommendations section, with any recommended actions to ensure the integrity of the regulated structure or a positive statement that no recommendations are required.
I 24	The suitably qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the <i>Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933)</i> .
I 25	The holder must within 20 business days of receipt of the annual inspection report, provide to the administering authority: <ul style="list-style-type: none"> a) The recommendations section of the annual inspection report; and b) If applicable, any actions being taken in response to those recommendations; and c) If, following receipt of the recommendations and (if applicable) recommended actions, the administering authority requests a copy of the annual inspection report from the holder, provide this to the administering authority within 10 business day of receipt of the request.
Transfer arrangements	
I 26	The holder must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to any Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.
Transitional arrangements	
I 27	All existing structures that have not been assessed in accordance with either the Manual or the former Manual for Assessing Hazard Categories and Hydraulic Performance of Dams must be assessed and certified in accordance with the Manual within 6 months of amendment of the authority adopting this schedule.
I 28	All existing structures must subsequently comply with the timetable for any further assessments in accordance with the Manual specified in Table I2 - Transitional hydraulic performance requirements for existing structures, depending on the consequence category for each existing structure assessed in the most recent previous certification for that structure.
I 29	Table I1 - Transitional hydraulic performance requirements for existing structures ceases to apply for a structure once any of the following events has occurred: <ul style="list-style-type: none"> a) it has been brought into compliance with the hydraulic performance criteria applicable to the structure under the Manual; or b) it has been decommissioned; or c) it has been certified as no longer being assessed as a regulated structure.
I 30	Certification of the transitional assessment required by conditions I28 and I29 must be provided to the administering authority within 6 months of amendment of the authority adopting this schedule

Table I2 - Transitional hydraulic performance requirements for existing structures

Compliance with criteria	High	Significant	Low
>90% and a history of good compliance performance in last 5 years	No transition required	No transition required	No transitional conditions apply. Review consequence assessment every 7 years.
>70%-≤90%	Within 7 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Within 10 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	No transitional conditions apply. Review consequence assessment every 7 years.

>50-≤70%	Within 5 years unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Within 7 years unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Review consequence assessment every 7 years.
≤50%	Within 5 years or as per compliance requirements (e.g. TEP timing)	Within 5 years or as per compliance requirements (e.g. TEP timing)	Review consequence assessment every 5 years.
Regulated levee designed to prevent the ingress of clean flood water <100% compliant	Within 5 years unless otherwise agreed with the administering authority.		

Schedule J: Definitions

Key terms and/or phrases used in this document are defined in this section and **bolded** throughout this document. Applicants should note that where a term is not defined, the definition in the EP Act, 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 EP Act.

‘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.

‘Authority’ means environmental authority (mining activities) under the EP Act.

‘Background’, with reference to the water schedule means the average of samples taken prior to the commencement of mining from the same waterway that the current sample has been taken.

‘Chemical’ means:

- an agricultural chemical product or veterinary chemical product within the meaning of the *Agricultural and Veterinary Chemicals Code Act 1994* (Commonwealth), or
- a dangerous good under the Australian Code for the Transport of Dangerous Goods by Road and Rail approved by the Australian Transport Council, or
- a lead hazardous substance within the meaning of the Workplace Health and Safety Regulation 1997, or
- 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
- any substance used as, or intended for use as:
 - a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product, or
 - a surface active agent, including, for example, soap or related detergent, or
 - a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide, or
 - a fertiliser for agricultural, horticultural or garden use, or
 - a substance used for, or intended for use for mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater, or
 - manufacture of plastic or synthetic rubber.

‘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.

'Cubic meter (m³)' means the volume of dry gaseous contaminant that occupies 1 cubic meter at a temperature of zero degrees Celsius and an absolute pressure of 101.3 kilopascals.

'Disturbance' of land includes:

- compacting, removing, covering, exposing or stockpiling of earth
- breemoval or destruction of vegetation or topsoil or both to an extent where the land has been made susceptible to erosion
- carrying out mining within a watercourse, waterway, wetland or lake
- the submersion of areas by tailings or hazardous contaminant storage and dam/structure walls
- 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
- releasing of contaminants into the soil, or underlying geological strata.

'EC' means electrical conductivity.

'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': A state where 'balance' is achieved despite changing variables.

'Functional design' is a document that contains 'conceptual' information about the design, operation and revegetation criteria of a watercourse diversion that addresses the outcomes stated in the conditions on the environmental authority relating to the diversion. The document should include, but not be limited to:

- geomorphic and vegetation assessment of the existing watercourse
- hydrologic conditions of the existing watercourse
- the proposed watercourse diversion route
- results from hydrologic, hydraulic and sediment transportation modelling used in the design of the diversion.

'Functionality': the purpose that something is designed or expected to fulfil.

'General waste' means:

- Construction wastes and demolition waste;
- Solid inert waste;
- Putrescible wastes and domestic garbage;
- Green wastes; and
- 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—

- its quantity, concentration, acute or chronic toxic effects, carcinogenicity, teratogenicity, mutagenicity, corrosiveness, explosiveness, radioactivity or flammability; or
- its physical, chemical or infectious characteristics.

'Hazard category' means a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in 'Manual for Assessing Hazard Categories and Hydraulic Performance of Dams'.

'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 EP Act.

'Infrastructure' means water storage dams, levees, roads and tracks, buildings and other structures built for the purpose of the mining activity.

'LA1,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'.

'LAeq, 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 EP Act. For the purposes of the *Acts Interpretation Act 1954*, it is expressly noted that the term 'land' in an 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.

'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' includes all activities undertaken, including prescribed environmentally relevant activities, carried out under this authority, that relate to the mining project.

'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.

'Mining activity or mining activities' includes all resource extraction activities and authorised Environmentally Relevant Activities (ERAs) listed on the environmental authority.

'NATA' means National Association of Testing Authorities, Australia.

'Natural flow' means the flow of water through waters caused by nature.

'Non-polluting' means having no adverse impacts upon the receiving environment.

'Noxious' means harmful or injurious to health or physical wellbeing, other than trivial harm.

'Offensive' means causing reasonable offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive, other than trivial harm.

'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 watercourse
- groundwater
- an area of land that is not specified in **Schedule A – Table A1 (Authorised Mining Activities and Locations)**.

'Receiving waters' means the waters into which an environmental authority authorises releases of mine affected water.

‘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 an environmental authority and, where relevant, includes remediation of contaminated land.

‘Release event’ means a surface water discharge from mine affected water storages or contaminated areas on the licensed place.

‘Reference’ means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

‘Residual void’ means an open pit resulting from the removal of ore and/or waste rock which will remain following the cessation of all mining activities and completion of rehabilitation processes.

‘Revegetation’ is the re-establishment of vegetation 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 mean sea level as distinct from depths to water.

‘self-sustaining’ means not requiring on-going intervention and maintenance to maintain functional riverine processes and characteristics

‘Sensitive place’ means:

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises, or
- a motel, hotel or hostel, or
- an educational institution, or
- a medical centre or hospital, or
- a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area, or
- a public park or gardens.

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.

‘Suitably qualified and experienced person’ means a person who is a Registered Professional Engineer of Queensland under the provisions of the *Professional Engineers Act 2002*, who has an appropriate level of expertise in the structures, geomechanics, hydrology, hydraulics and environmental impact of watercourse diversions.

An **appropriate level of expertise** includes:

- demonstrable competency, experience and expertise in:
 - investigation, design or construction of watercourses diversions
 - operation and maintenance of watercourse diversions
 - geomechanics with particular emphasis on channel equilibrium, geology and geochemistry

- hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology
- hydraulics with particular reference to sediment transport and deposition and erosion control
- hydrogeology with particular reference to seepage and groundwater
- solute transport processes and monitoring thereof, or
- sufficient knowledge and experience to certify that where the suitably qualified and experienced person has relied on advice and information provided by other persons with relevant expertise*:
 - they consider it reasonable to rely on that advice and information
 - the expert providing the advice and information has knowledge, competency, suitable experience and demonstrated expertise in the matters related to watercourse diversions.

Persons with relevant expertise include:

- Geomorphologist: person who has demonstrated competency and relevant experience in stream geomorphology and watercourse diversions.
- Geotechnical Expert: person who has demonstrated competency and relevant experience in geotechnical assessment of soil characteristics suitable for watercourse diversions.
- Vegetation Expert: person who has demonstrated competency and relevant experience in the identification, role and function of vegetation with watercourses and adjoining floodplains, and has demonstrated competency and relevant experience in revegetation of watercourse diversions and adjoining floodplains. .
- Groundwater Expert: person who has demonstrated competency and relevant experience in groundwater systems.
- Surface Water Expert: person who has demonstrated competency and relevant experience in hydrology.
- Engineer: person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Persons Act 2002* or has similar qualifications under a respected professional registration association, and has demonstrated competency and relevant experience in design and construction of watercourse diversions.
- Soils Expert: person who has demonstrated competency and relevant experience in soil classification including the physical, chemical and hydrologic analysis of soil.

'the Act' means the *EP Act*.

'µS/cm' means micro Siemens per centimetre.

'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 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, and groundwater and any part thereof.

'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.

Regulated Structure definitions

'Affected person' is someone whose drinking water can potentially be impacted as a result of discharges from a dam or their life or property can be put at risk due to dwellings or workplaces being in the path of a dam break flood.

'Annual exceedance probability or AEP' the probability that at least one event in excess of a particular magnitude will occur in any given year.

'Annual inspection report' means an assessment prepared by a suitably qualified and experienced person containing details of the assessment against the most recent consequence assessment report and design plan (or system design plan);

- against recommendations contained in previous annual inspections reports;
- against recognised dam safety deficiency indicators;
- for changes in circumstances potentially leading to a change in consequence category;
- for conformance with the conditions of this authority;
- for conformance with the 'as constructed' drawings;
- for the adequacy of the available storage in each regulated dam, based on an actual observation or observations taken after 31 May each year but prior to 1 November of that year, of accumulated sediment,

state of the containment barrier and the level of liquids in the dam (or network of linked containment systems);

- for evidence of conformance with the current operational plan.

‘Assessed’ or ‘assessment’ by a suitably qualified and experienced person in relation to a consequence assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit of the assessment:

- exactly what has been assessed and the precise nature of that determination;
- the relevant legislative, regulatory and technical criteria on which the assessment has been based;
- the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
- the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.

‘Associated works’ in relation to a dam, means:

- operations of any kind and all things constructed, erected or installed for that dam; and
- any land used for those operations.

‘Authority’ means an environmental authority or a development approval.

‘Certification’ means assessment and approval must be undertaken by a suitably qualified and experienced person in relation to any assessment or documentation required by this Manual, including design plans, ‘as constructed’ drawings and specifications, construction, operation or an annual report regarding regulated structures, undertaken in accordance with the Board of Professional Engineers of Queensland Policy Certification by RPEQs (ID: 1.4 (2A)).

‘Certifying, certify or certified’ have a corresponding meaning as ‘certification’.

‘Construction or constructed’ in relation to a dam includes building a new dam and modifying or lifting an existing dam, but does not include investigations and testing necessary for the purpose of preparing a design plan.

‘Consequence’ in relation to a structure as defined, means the potential for environmental harm resulting from the collapse or failure of the structure to perform its primary purpose of containing, diverting or controlling flowable substances.

‘Consequence category’ means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933).

‘Dam’ means a land-based structure or a void that contains, diverts or controls flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works.

‘Dam crest volume’ means the volume of material (liquids and/or solids) that could be within the walls of a dam at any time when the upper level of that material is at the crest level of that dam. That is, the instantaneous maximum volume within the walls, without regard to flows entering or leaving (for example, via spillway).

‘Design plan’ is a document setting out how all identified consequence scenarios are addressed in the planned design and operation of a regulated structure.

‘Design storage allowance or DSA’ means an available volume, estimated in accordance with the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933) published by the administering authority, must be provided in a dam as at 1 November each year in order to prevent a discharge from that dam to an annual exceedance probability (AEP) specified in that Manual.

‘Designer’ for the purposes of a regulated dam, means the certifier of the design plan for the regulated dam.

‘Development approval’ means a development approval under the *Integrated Planning Act 1997* or the *Sustainable Planning Act 2009* in relation to a matter that involves an environmentally relevant activity under the EP Act.

‘Emergency action plan’ means documentation forming part of the operational plan held by the holder or a nominated responsible officer, that identifies emergency conditions that sets out procedures and actions that will be followed and taken by the dam owner and operating personnel in the event of an emergency. The actions are to minimise the risk and consequences of failure, and ensure timely warning to affected persons and the implementation of protection measures. The plan must require dam owners to annually review and update contact information where required.

'Existing structure' means a structure that prior to <<insert date when EA is issued with new dam manual conditions>> meets any or both of the following, a structure:

- with a design that is in accordance with the <date and version> Manual for Assessing Consequence Categories and Hydraulic Performance of Structures and that is considerably in progress;
- that is under considerable construction or that is constructed.

'Extreme Storm Storage' means a storm storage allowance determined in accordance with the criteria in the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933) published by the administering authority.

'Flare pit' means containment area where any hydrocarbon that is discovered in an over-pressured reservoir during a drilling operation is diverted to, and combusted. The flare pit is only used during the drilling and work over process on a petroleum well.

'Flowable substance' means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.

'Holder' means:

- where this document is an environmental authority, any person who is the holder of, or is acting under, that environmental authority; or
- where this document is a development approval, any person who is the registered operator for that development approval.

'Hydraulic performance' means the capacity of a regulated dam to contain or safely pass flowable substances based on the design criteria specified for the relevant consequence category in the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933).

'Levee' means an embankment that only provides for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from releases from other works, during the progress of those stormwater or flood flows or those releases; and does not store any significant volume of water or flowable substances at any other times.

'Low consequence dam' means any dam that is not a high or significant consequence category as assessed using the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933).

'Mandatory reporting level or MRL' means a warning and reporting level determined in accordance with the criteria in the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933) published by the administering authority.

'Manual' means the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933) published by the administering authority, as amended from time to time.

'Modification or modifying' (see definition of 'construction')

'Operational plan' includes:

- normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA);
- contingency and emergency action plans including operating procedures designed to avoid and/or minimise environmental impacts including threats to human life resulting from any overtopping or loss of structural integrity of the regulated structure.

'Register of Regulated Structures' includes:

- Date of entry in the register;
- Name of the structure, its purpose and intended/actual contents;
- The consequence category of the dam as assessed using the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933);
- Dates, names, and reference for the design plan plus dates, names, and reference numbers of all document(s) lodged as part of a design plan for the dam;
- Name and qualifications of the suitably qualified and experienced person who certified the design plan and 'as constructed' drawings;
- For the regulated dam, other than in relation to any levees –
 - The dimensions (metres) and surface area (hectares) of the dam measured at the footprint of the dam;
 - Coordinates (latitude and longitude in MGA94) within five metres at any point from the outside of the dam including its storage area

- Dam crest volume (megalitres);
- Spillway crest level (metres AHD).
- Maximum operating level (metres AHD);
- Storage rating table of stored volume versus level (metres AHD);
- Design storage allowance (megalitres) and associated level of the dam (metres AHD);
- Mandatory reporting level (metres AHD);
- The design plan title and reference relevant to the dam;
- The date construction was certified as compliant with the design plan;
- The name and details of the suitably qualified and experienced person who certified that the constructed dam was compliant with the design plan;
- Details of the composition and construction of any liner;
- The system for the detection of any leakage through the floor and sides of the dam;
- Dates when the regulated dam underwent an annual inspection for structural and operational adequacy, and to ascertain the available storage volume for 1 November of any year;
- Dates when recommendations and actions arising from the annual inspection were provided to the administering authority;
- Dam water quality as obtained from any monitoring required under this authority as at 1 November of each year.

‘Regulated structure’ means any structure in the significant or high consequence category as assessed using the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933) published by the administering authority. A regulated structure does not include:

- a fabricated or manufactured tank or container, designed and constructed to an Australian Standard that deals with strength and structural integrity of that tank or container;
- a sump or earthen pit used to store residual drilling material and drilling fluid only for the duration of drilling and well completion activities;
- a flare pit.

‘Residual drilling material’ means waste drilling materials including muds and cuttings or cement returns from well holes and which have been left behind after the drilling fluids are pumped out.

‘Spillway’ means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the dam, normally under flood conditions or in anticipation of flood conditions.

‘Structure’ means dam or levee.

‘Suitably qualified and experienced person’ in relation to regulated structures means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 2002*, and has demonstrated competency and relevant experience:

- for regulated dams, an RPEQ who is a civil engineer with the required qualifications in dam safety and dam design
- for regulated levees, an RPEQ who is a civil engineer with the required qualifications in the design of flood protection embankments.

Note: *It is permissible that a suitably qualified and experienced person obtain subsidiary certification from an RPEQ who has demonstrated competence and relevant experience in either geomechanics, hydraulic design or engineering hydrology.*

‘System design plan’ means a plan that manages an integrated containment system that shares the required DSA and/or ESS volume across the integrated containment system.

‘Void’ means any constructed, open excavation in the ground.

‘Watercourse’ has the meaning in Schedule 4 of the EP Act and means:

- a river, creek or stream in which water flows permanently or intermittently—
 - in a natural channel, whether artificially improved or not; or
 - in an artificial channel that has changed the course of the watercourse.
- Watercourse includes the bed and banks and any other element of a river, creek or stream confining or containing water.

‘Waters’ includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and banks of a watercourse, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater.

‘Water year’ means the 12-month period from 1 July to 30 June.

‘Wet season’ means the time of year, covering one or more months, when most of the average annual rainfall in a region occurs. For the purposes of DSA determination this time of year is deemed to extend from 1 November in one year to 31 May in the following year inclusive.

Biodiversity Offset definitions

‘designated precinct’ has the meaning in Part 5 section 15(3) of the Regional Planning Interests Regulation 2014 and means:

- for a strategic environmental area mentioned in section 4(1) – the area identified as a designated precinct on the strategic environmental area map for the strategic environmental area; or
- if a strategic environmental area is shown on a map in a regional plan – the area identified on the map as a designated precinct for the strategic environmental area.

‘environmental offset’ has the meaning in section 7 of the *Environmental Offsets Act 2014*.

‘existing authority’ has the meaning in section 94 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.

‘notice of election’ has the meaning in section 18(2) *Environmental Offsets Act 2014*.

‘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’ has the meaning in section 8 *Environmental Offsets Act 2014*.

‘strategic environmental areas’ has the meaning in section 11(1) of the *Regional Planning Interest Act 2014*.

Schedule K: Maps and plans

Schedule A - General

- Schedule A - Figure 1 - Skardon River Project Infrastructure layout —Mine Area
- Schedule A - Figure 2 - Skardon River authorised Kaolin mine footprint
- Schedule A - Figure 3 - Offshore transshipment location
- Schedule A - Figure 4 - Skardon River Port infrastructure area
- Schedule A - Figure 5 - Skardon River Wharf infrastructure area
- Schedule A - Figure 6 - Landfill, Bioremediation Pad and Groundwater monitoring bores
- Schedule A - Figure 7 - Skardon River Mine Camp, sewage treatment plant, irrigation area and storage areas

Schedule E - Water

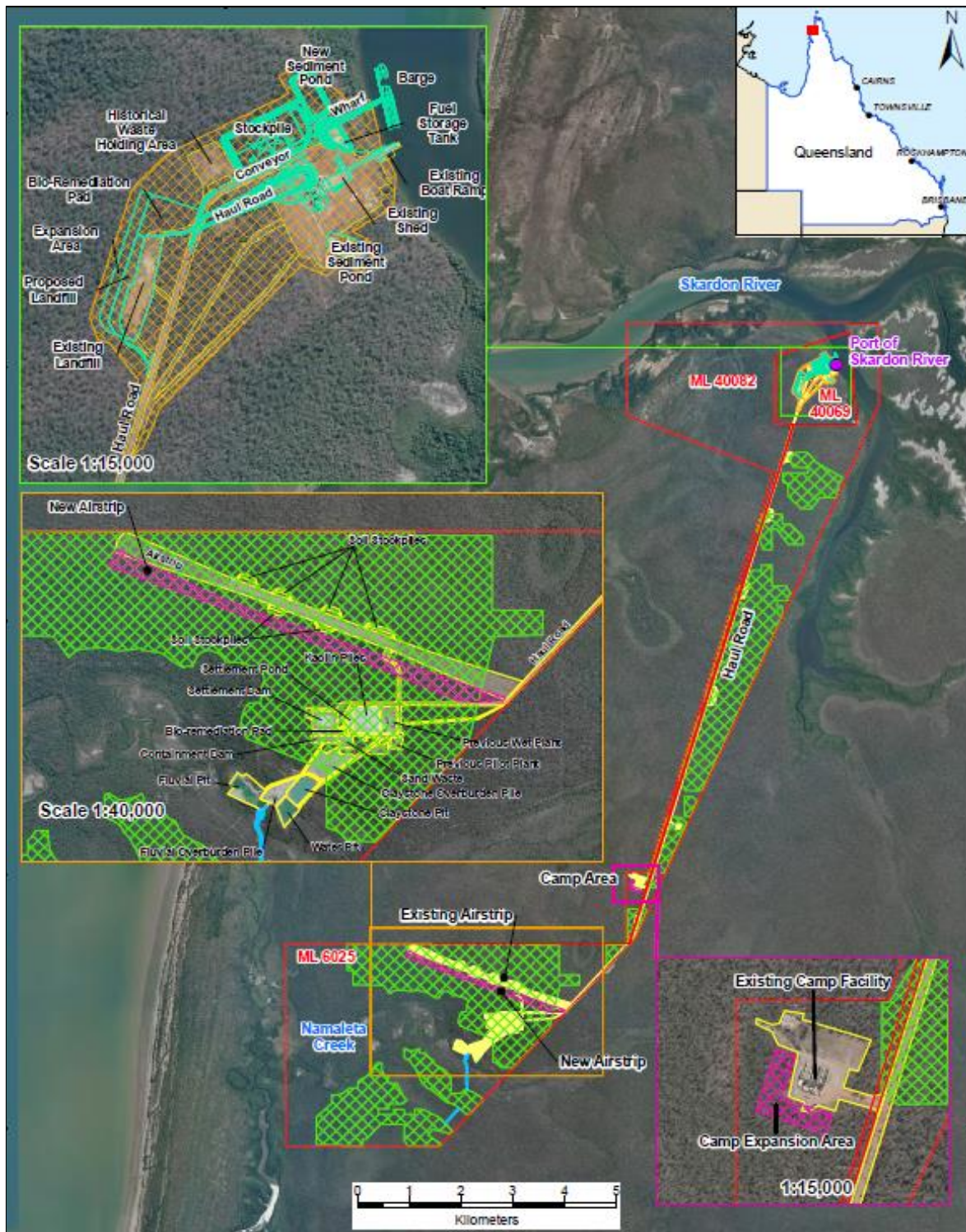
- Schedule E - Figure 1 - Surface water monitoring locations for Skardon River
- Schedule E - Figure 2 - Surface water monitoring locations for Namaleta Creek and Tributary 1

Schedule F - Groundwater

- Schedule F – Figure 1 - Groundwater monitoring locations mining areas
- Schedule F – Figure 2 - Groundwater monitoring locations treated effluent irrigation areas
- Schedule F – Figure 3 - Groundwater monitoring locations port infrastructure areas

Schedule G - Land

- Schedule G – Figure 1 - Treated effluent irrigation area and groundwater monitoring bores
- Schedule G – Figure 2 – Buffer Zones



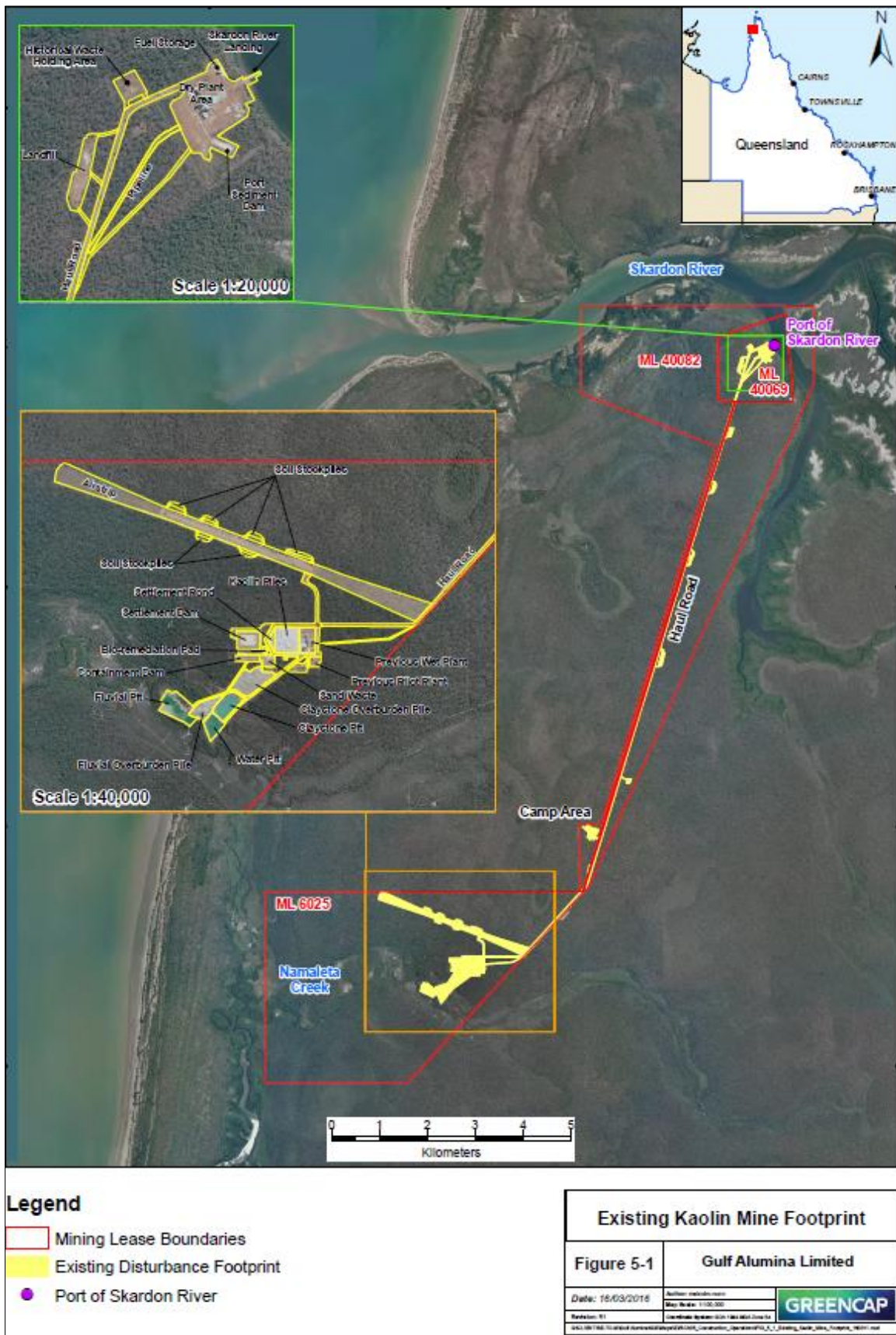
Legend

- Mining Lease Boundaries
- Port of Skardon River
- Existing Disturbance Footprint
- Southern Haul Road
- Proposed Bauxite Mining Areas
- Port Infrastructure Area
- Port and Wharf Layout

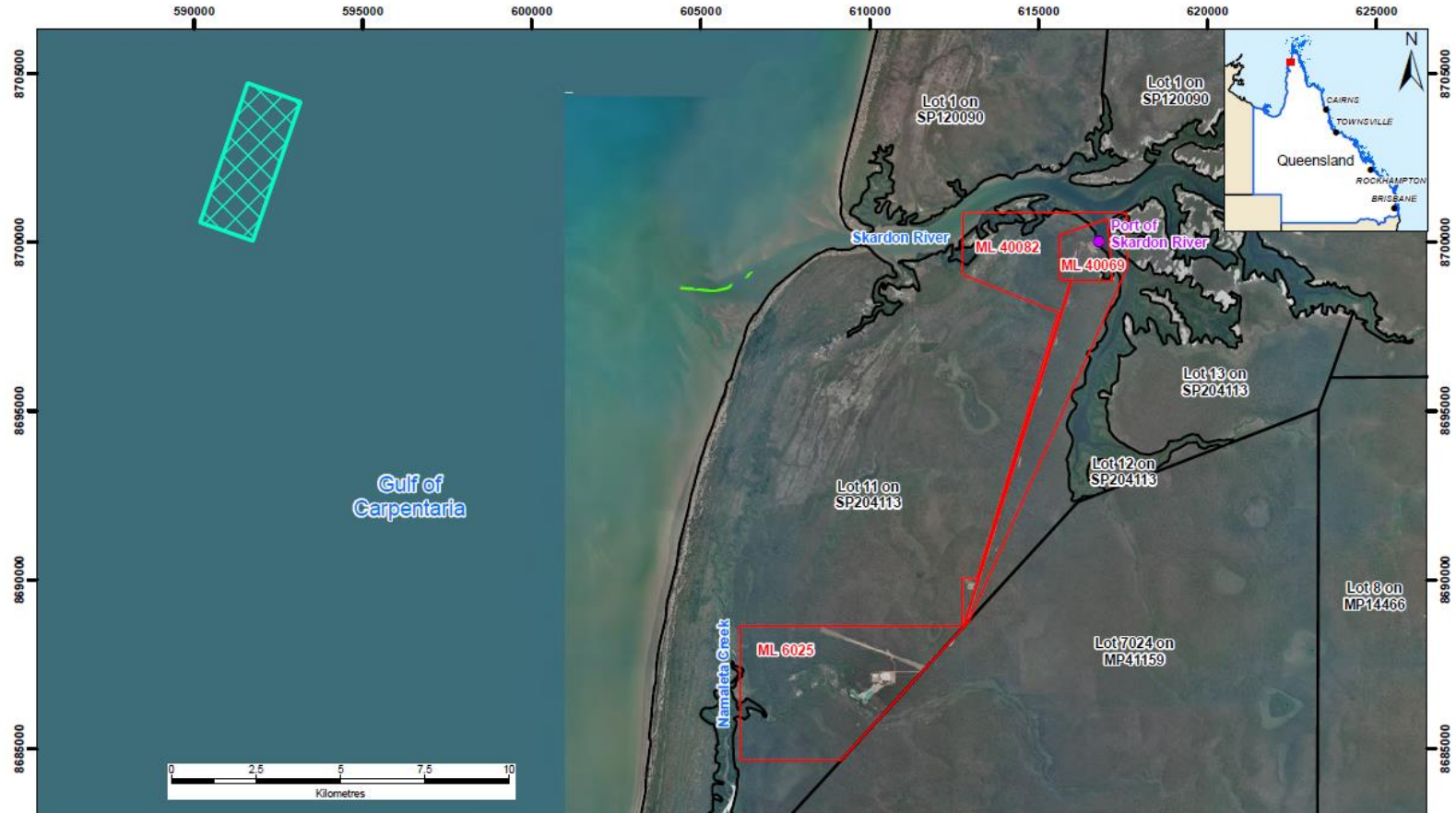
Port/Wharf infrastructure are indicative layouts only and adapted from plans created by Sedgman Ltd.
Haul Road/Crossings layouts are indicative only and based on centrelines in plans created by Sedgman.
Responsibility for errors in relation to the data including accuracy, reliability, completeness or suitability, and created on behalf of (including without limitation, liability is not limited to any loss, damage or costs (including consequential damages) resulting in any use of or reliance upon this data. Data must not be used for third marketing or for other purposes.

Life of Project Activities and Infrastructure	
Figure 4-13	Gulf Alumina Limited
Date: 15/03/2016	Author: [redacted]
Revision: 01	Map Scale: 1:50,000

Schedule A - Figure 1 - Skardon River Project Infrastructure layout —Mine Area (Source: EIS Figure 4-13)



Schedule A - Figure 2 - Skardon River authorised Kaolin mine footprint (Source: EIS Figure 5-1)



Legend

- Mining Lease Boundaries
- Offshore Transshipment Area
- Port of Skardon River
- Bed Levelling Area
- Cadastre

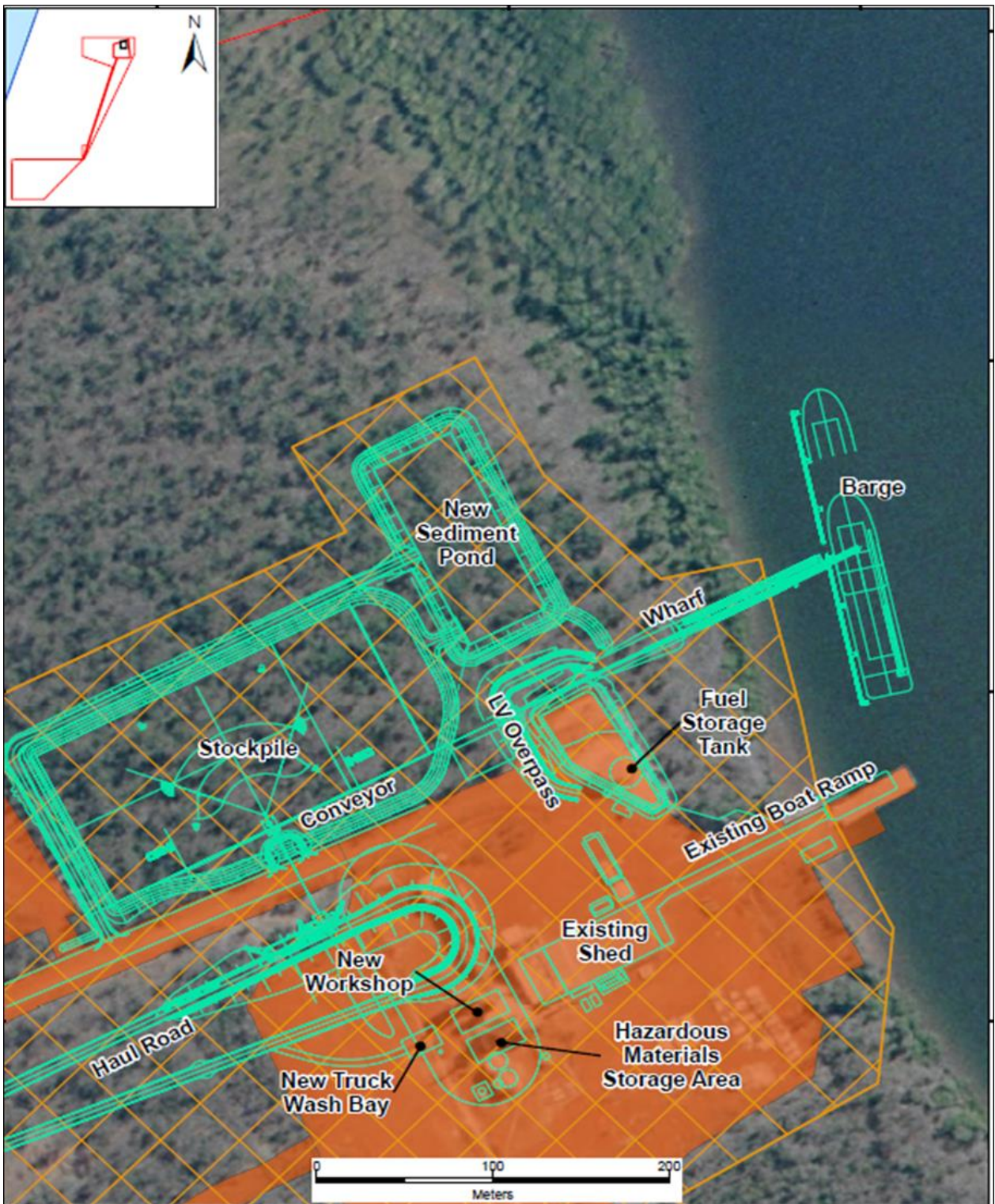
Project Area, Skardon River and Offshore Activity Areas, and Cadastre Boundaries	
Figure 1-2	Gulf Alumina Limited
Date: 11/03/2016	Author: [unreadable]
Revision: 01	Scale: 1:100,000
[unreadable]	

No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws. Imagery sourced from Gulf Alumina (2014), Tecknor © Geos Mining (2015), State Boundaries and Towns © Geoscience Australia (2006), Cadastre © State of Queensland - Department of Natural Resources and Mines (2015).

Schedule A - Figure 3 - Offshore transshipment location (Source: EIS Figure 1-2)



Schedule A - Figure 4 - Skardon River Port infrastructure area (Source: EIS Figure 5-8)



Legend

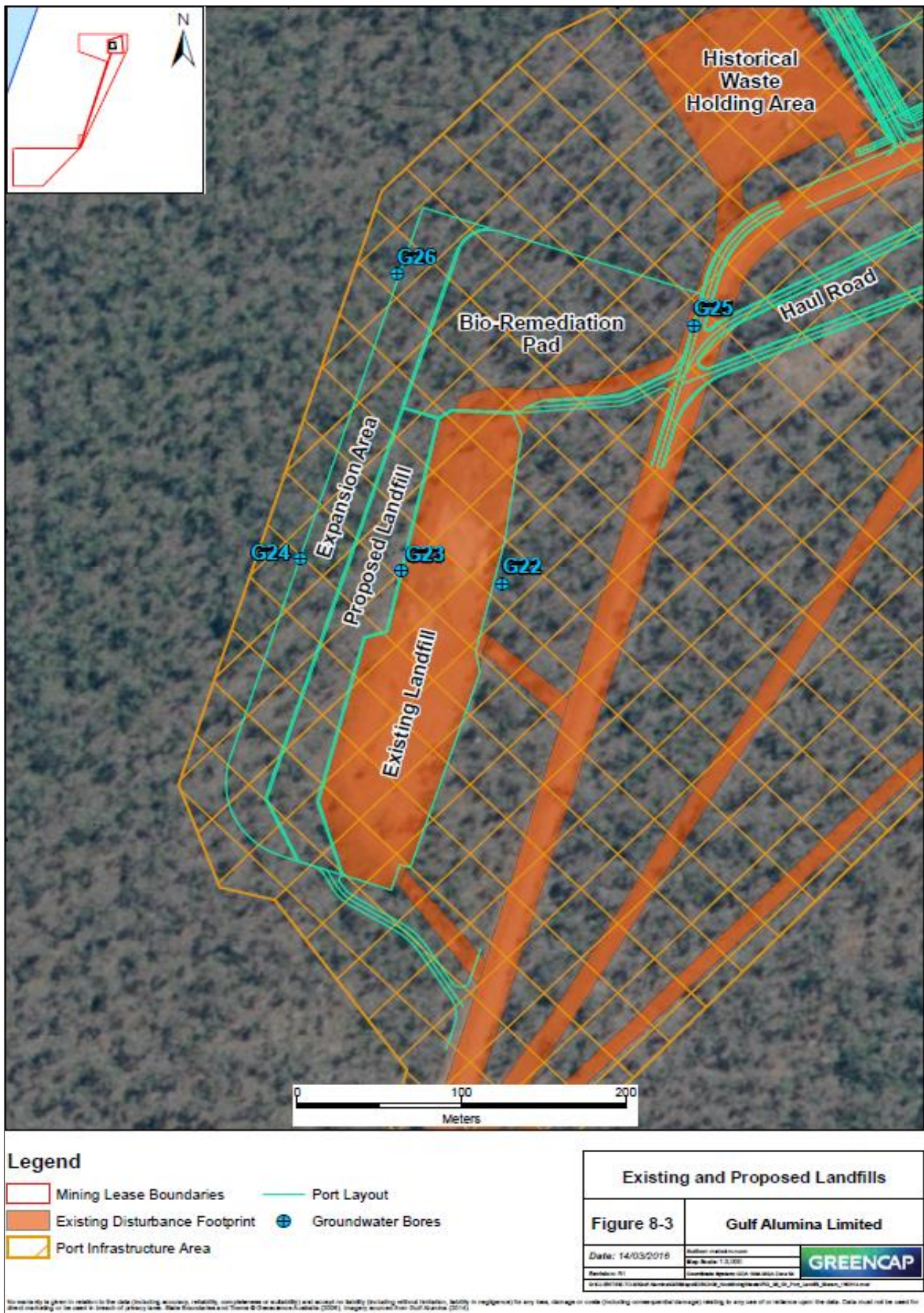
- Mining Lease Boundaries
- Existing Disturbance Footprint
- Port Infrastructure Area
- Port Layout

*Port/Wharf infrastructure are indicative layouts only and adapted from plans created by Sedgman Ltd.

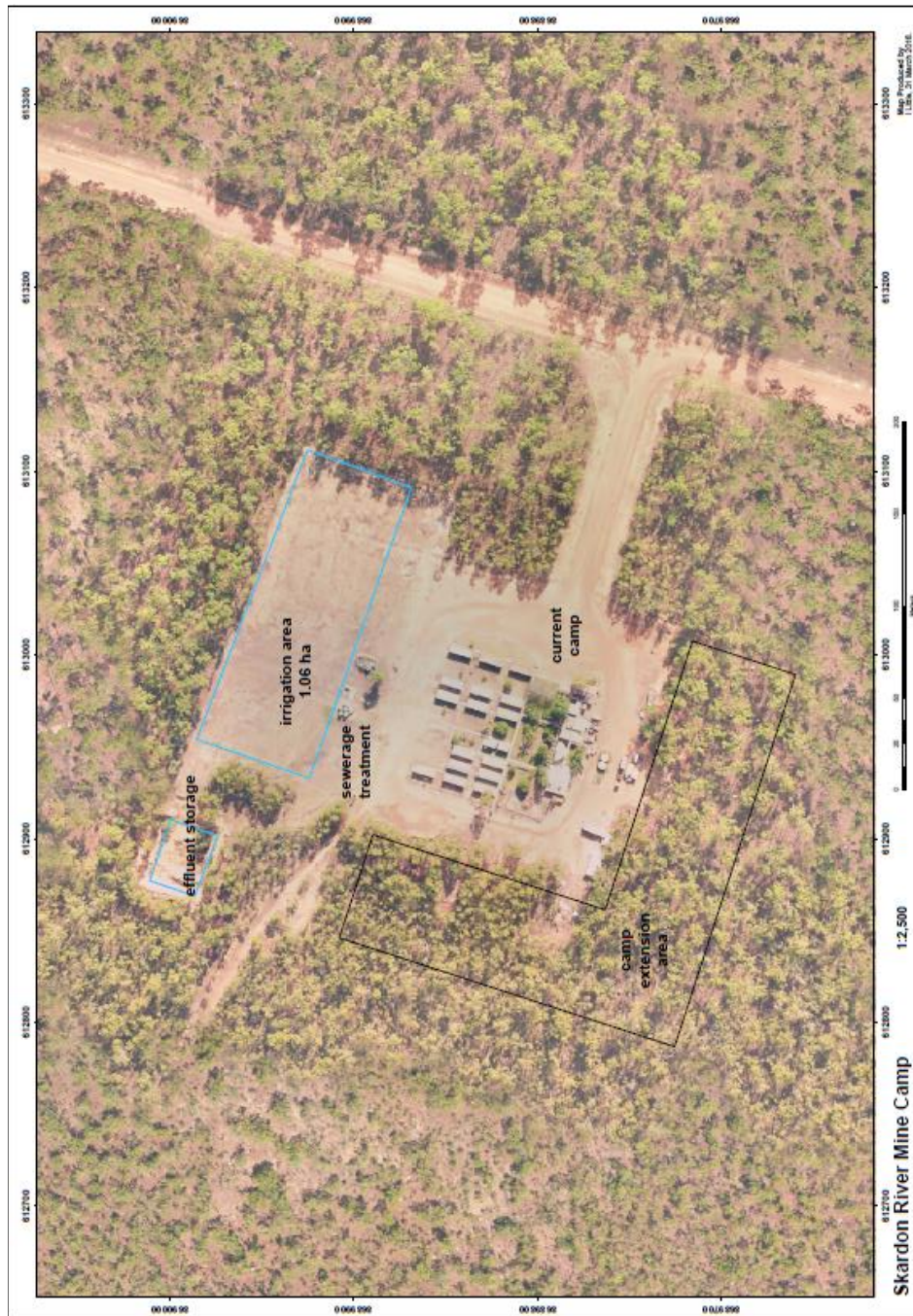
No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including reasonable legal costs) resulting in any use of or reliance upon the data. Data must not be used for third marketing or be used in breach of privacy laws. Back Grounders a/s © 2016. Images sourced from Google Earth (2016).

Wharf Layout	
Figure 5-9	Gulf Alumina Limited
Date: 15/03/2016	Author: [redacted]
Revision: 01	Map Scale: 1:2,000

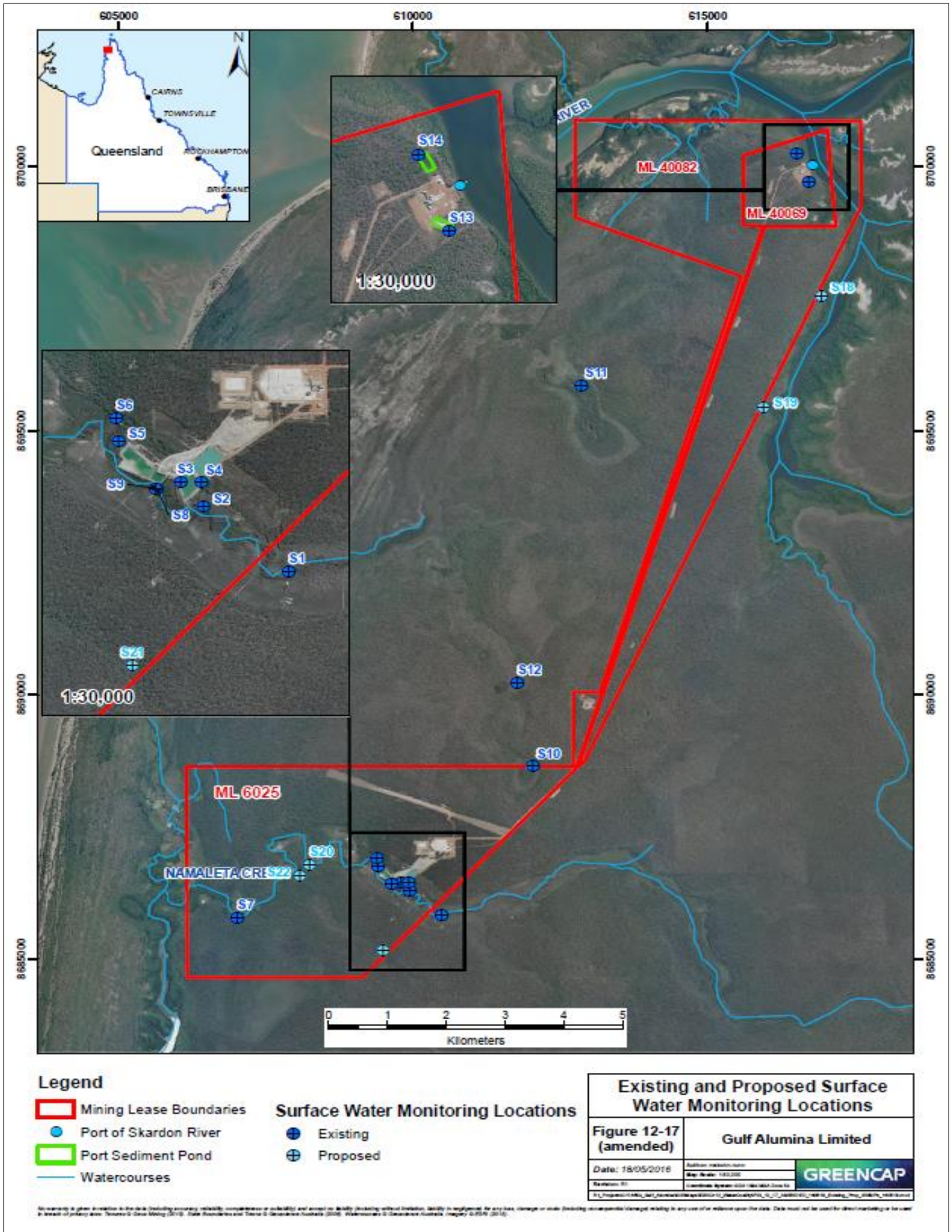
Schedule A - Figure 5 - Skardon River Wharf infrastructure area (Source: EIS Figure 5-9)



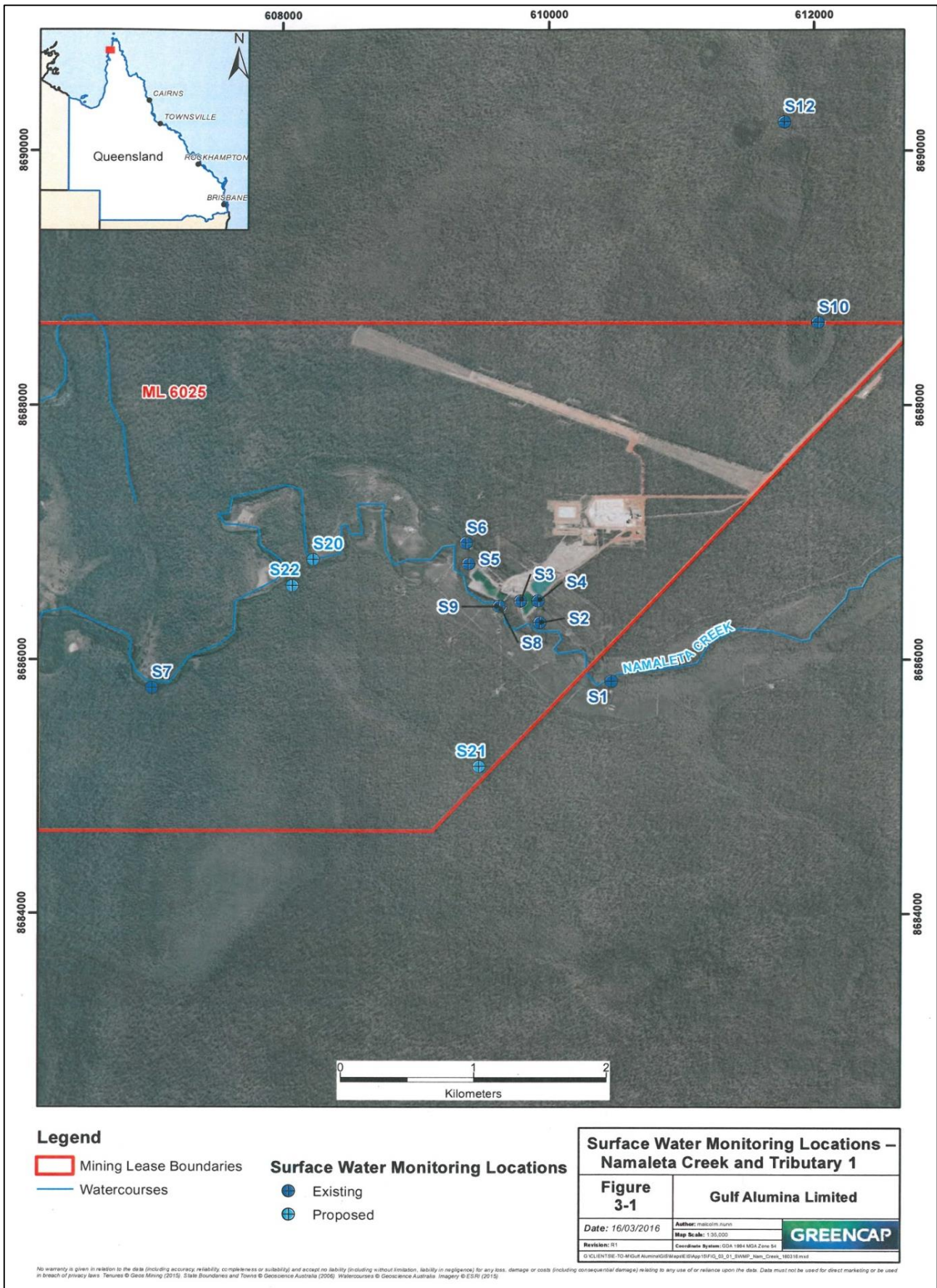
Schedule A - Figure 6 - Landfill, Bioremediation Pad and Groundwater monitoring bores
(Source: EIS Figure 8-3)



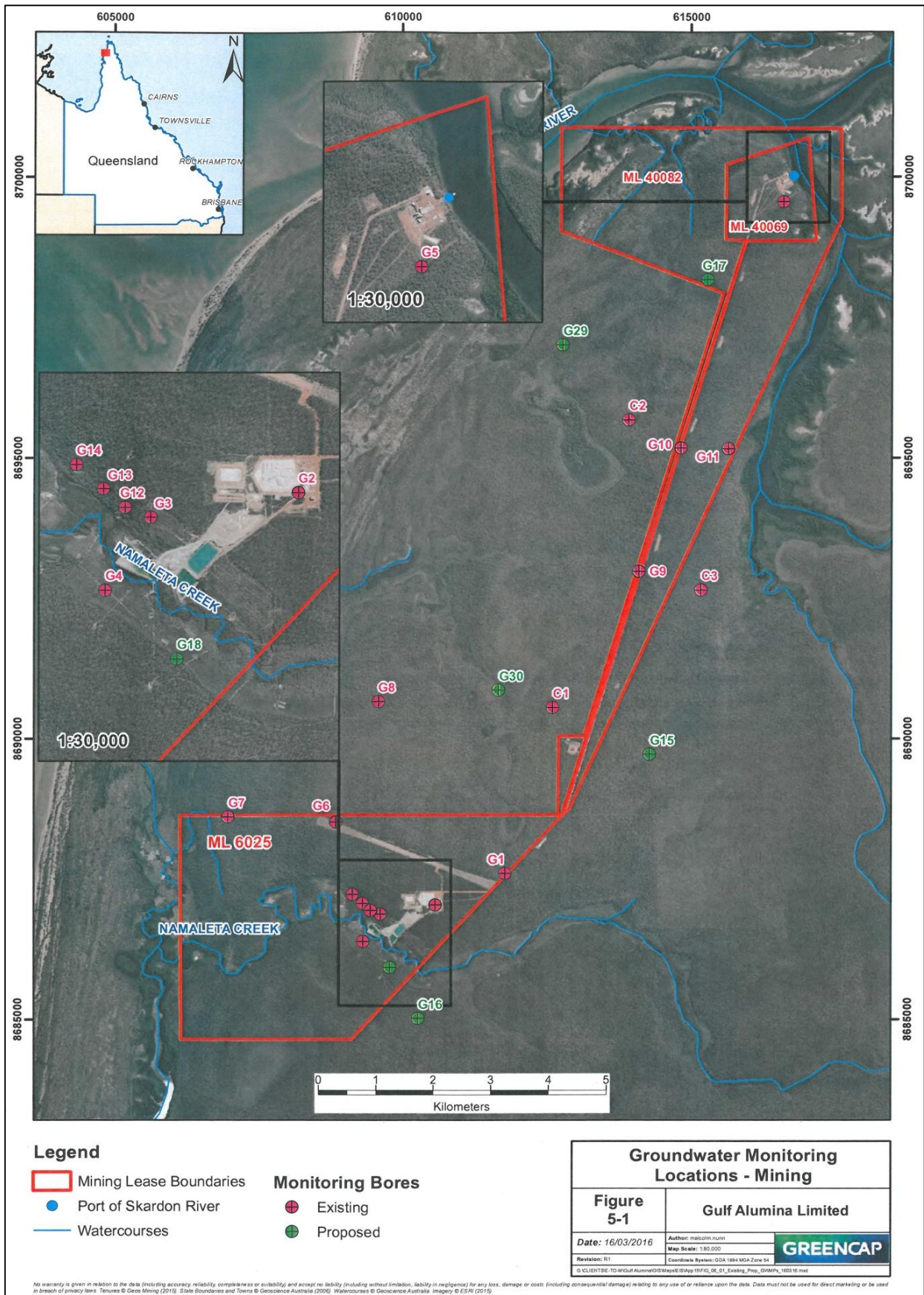
Schedule A - Figure 7 - Skardon River Mine Camp, sewage treatment plant, irrigation area and storage areas (Source: Figure provided by proponent post-EIS)



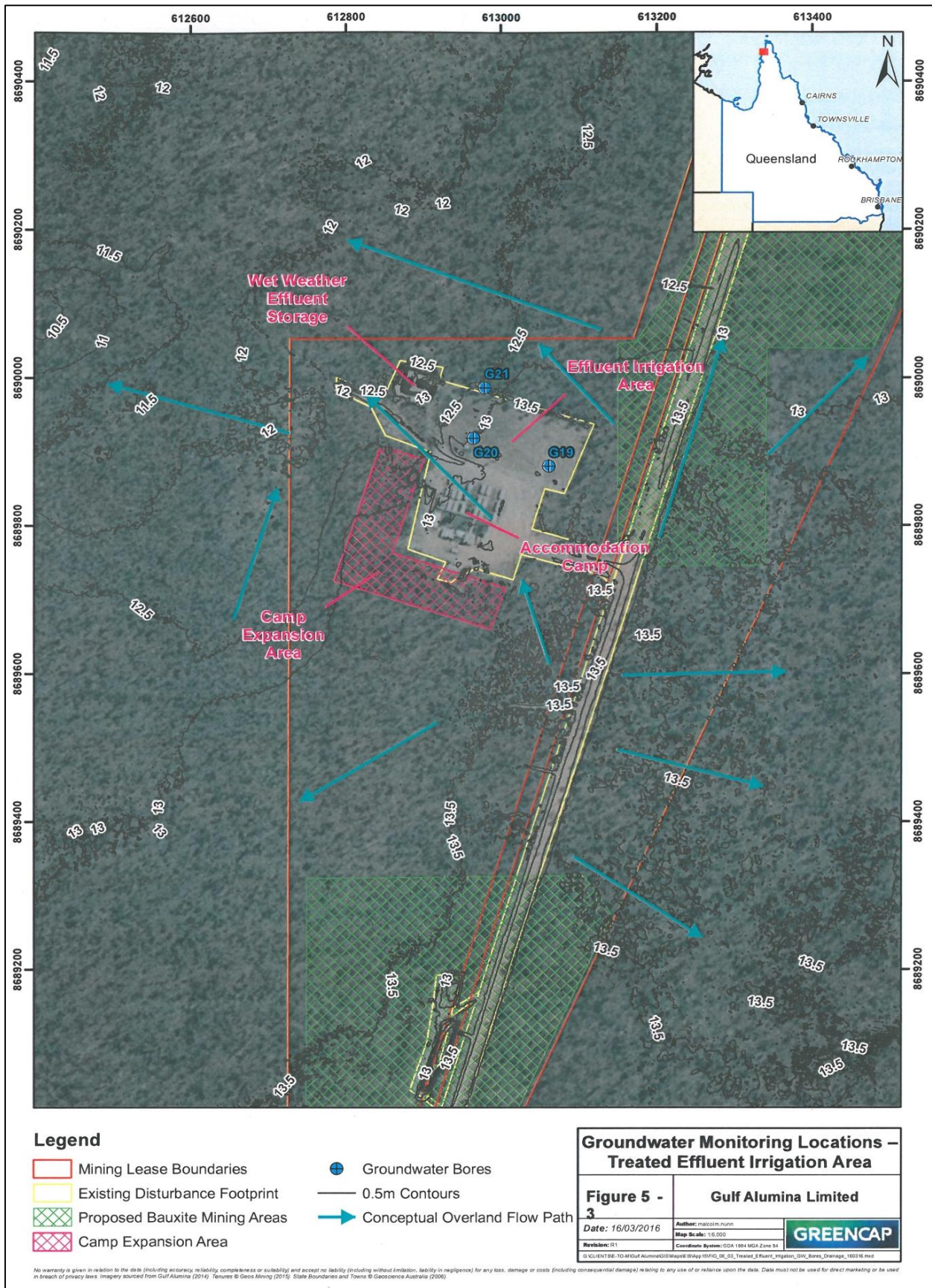
Schedule E - Figure 1 - Surface water monitoring locations for Skardon River (Source: EIS Figure 12-17) (Source: EIS Figure 12-17)



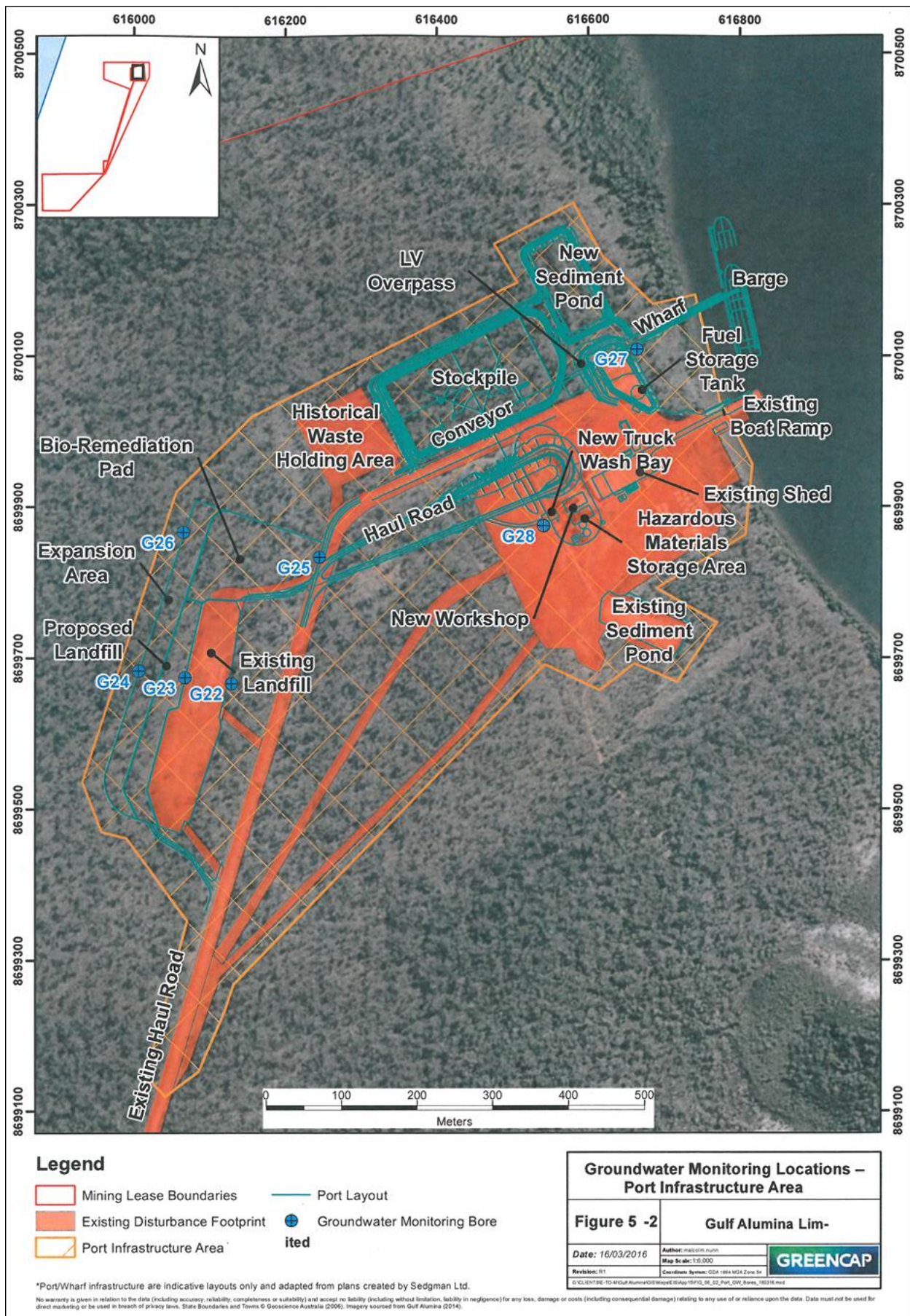
Schedule E - Figure 2 - Surface water monitoring locations for Namaleta Creek and Tributary 1 (Source: EIS Figure 3-1)



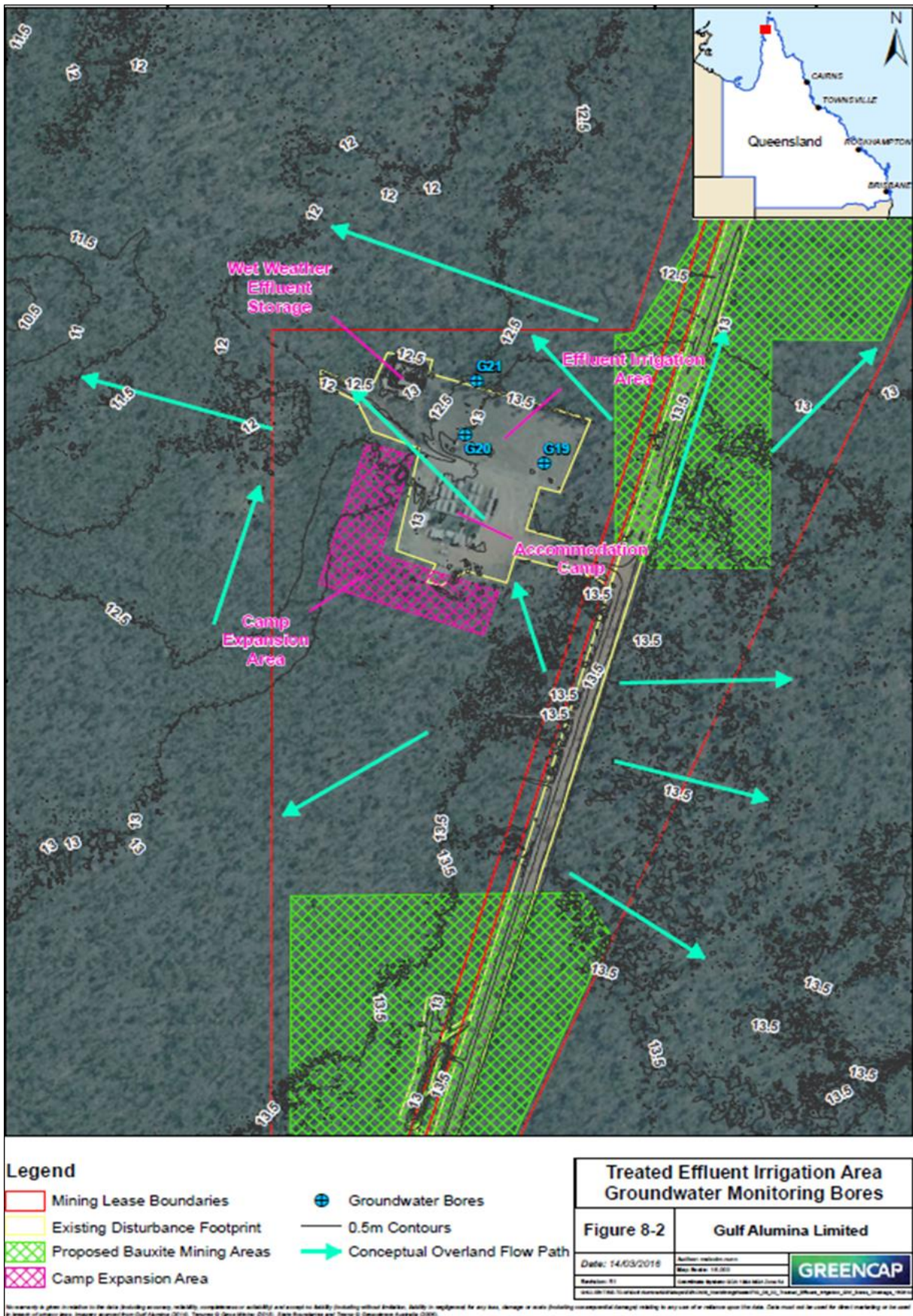
Schedule F – Figure 1 - Groundwater monitoring locations mining areas (Source: EIS Figure 5-1)



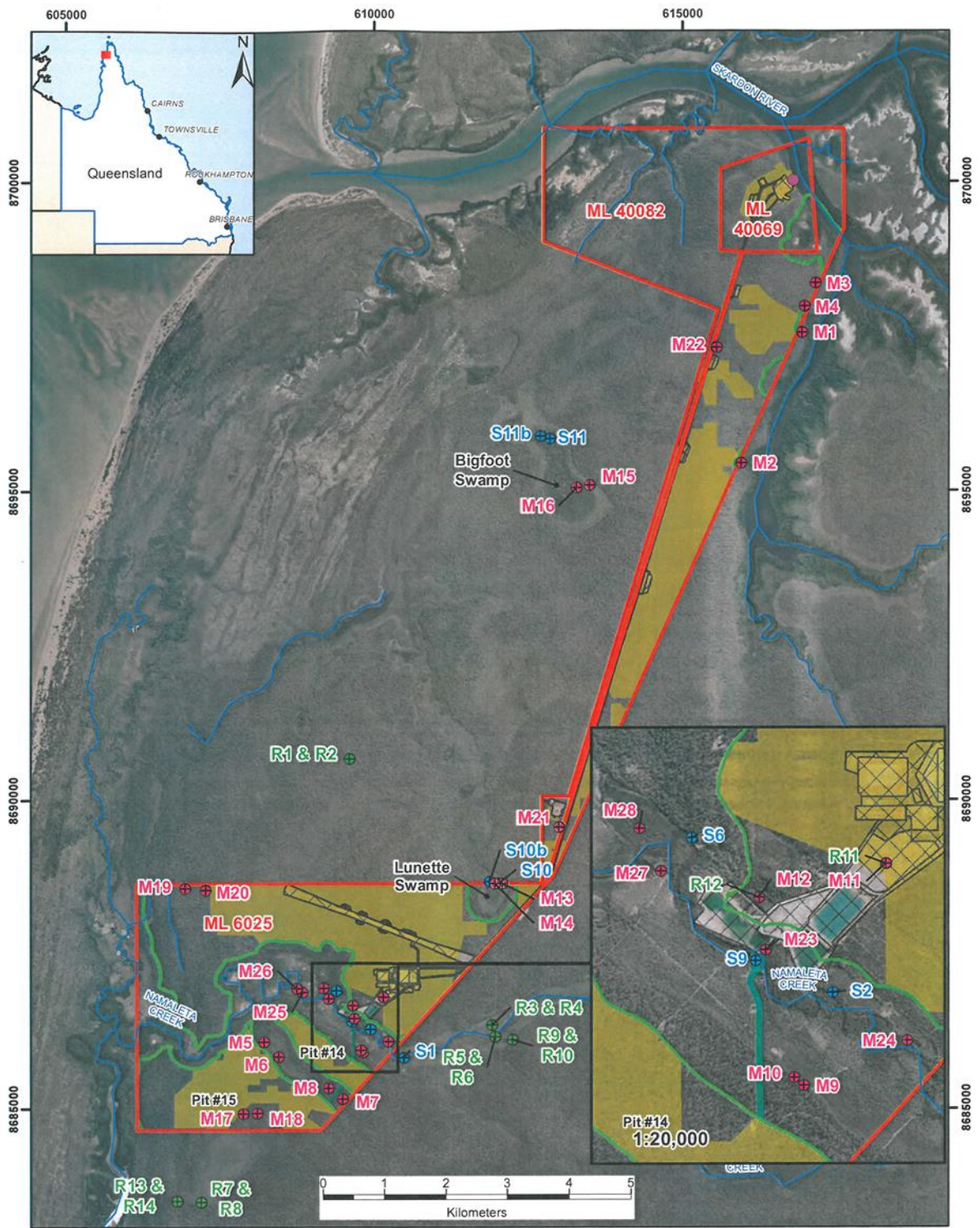
Schedule F – Figure 2 - Groundwater monitoring locations treated effluent irrigation areas (Source: EIS Figure 5-3)



Schedule F – Figure 3 - Groundwater monitoring locations port infrastructure areas (Source: EIS Figure 5-2)



Schedule G – Figure 1 - Treated effluent irrigation area and groundwater monitoring bores (Source: EIS Figure 8-2)



- Legend**
- Port of Skardon River
 - ▭ Mining Lease Boundaries
 - ▭ Existing Disturbance Footprint
 - ▭ Project Footprint
 - ▭ Southern Haul Road
 - Watercourses
 - Wetland Buffer
 - ⊕ Proposed Aquatic Ecology Monitoring Locations
 - ⊕ Vegetation Monitoring Site
 - ⊕ Paired Monitoring Site
 - ⊕ Reference Site

Proposed Vegetation and Aquatic Ecology Monitoring Locations	
Figure 13-1	Gulf Alumina Limited
Date: 16/03/2016	Author: mscdm.nmh
Revision: R1	Map Scale: 1:80,000
Coordinate System: GDA 1984 MGA Zone 54	
GRENCAP	
© CLIENT'S USE TO MINDALUMINA'S MAPS & GIS. File: FIG_13_01_Proposed_Veget_and_Aquatic_Monitoring_160316.mxd	

*Haul Road/Crossing layouts are indicative only and based on centrelines in plans created by Sedgman Ltd.
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Schedule G – Figure 2 - Buffer zones (Source: EIS Figure 13-1)

Appendix 2 – Listed threatened species information for MNES

The following profiles for listed threatened ecological communities and species impacted by the project were collated from information provided in the EIS and subsequent amended EIS; information provided by specialists from EHP; as well as information provided by DotE.

This information is prepared for the Minister for the Environment in order to give appropriate information to help the Minister make informed decisions on the potential impacts on MNES for the proposed Skardon River Bauxite Project.

Recommendations are provided based on the impacts as identified within the EIS and the assessment of the project. However, DotE has not yet completed the assessment of this project and is yet to determine the acceptability of identified and potential impacts on MNES.

Northern quoll (*Dasyurus hallucatus*)

EPBC Act Listing Status: Endangered

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 guidelines for the endangered northern quoll, Dasyurus hallucatus* (quoll referral guidelines; Commonwealth of Australia, 2011)).
4. Critical habitat includes:
 - 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 guidelines state that the habitat for the species is likely to occur at Cape York where the project is located.
6. The EIS considered that the species was unlikely to occur at the project site because rocky outcrops, known refugia for the species, are not present and the species was thought to have become locally extinct after cane toads arrived. The EIS also stated that quolls have been found recently in *Eucalyptus tetradonta* woodland within 100km of the site. There are older records in the *Queensland Wildnet* database from near Mapoon, 30km south of the site. Based on recent records, the EIS concluded that habitat for the species may occur in the project area and an assessment of project impacts on the species was therefore carried out as part of the EIS.
7. Major threats to northern quoll populations on Cape York 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:
 - *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

8. The EIS concluded that it is unlikely that the northern quoll occurs on site and that clearing of eucalypt woodland for the project would not result in a significant residual impact the northern quoll.
9. The EIS concluded that the 1209ha of *Eucalyptus* and *Corymbia* woodland considered to be potential quoll habitat is primarily foraging and dispersal habitat. The understorey in eucalypt woodland is typically burned frequently and would provide less favourable foraging habitat for quolls than other habitats in the area.
10. The EIS stated that the project area is 'surrounded by continuous, largely homogenous tracts of high quality remnant vegetation that would not be fragmented, and therefore the population would not be impacted'. However, EHP considers that cumulative impacts on fauna from all mining projects need to be considered in the assessment process, particularly the timing of mining phases and how they would affect the spatial arrangement of remnant and rehabilitating vegetation in the area and its value as habitat for threatened species.
11. The EIS also stated that a proposed extensive corridor system 'will ensure that habitat functionality and faunal movement is maintained to external boundaries and not confine individuals within or external to the site'. As in the previous point, EHP notes that this would only work if corridor systems are coordinated with the adjacent mining projects. Setting of disturbance limits in environmental authorities for all mines in the area would help to ensure landscape connectivity across all mine projects.
12. Long-term impacts on northern quoll habitat may be mitigated by environmental rehabilitation with the goal of reinstating a woodland community that resembles the existing *E. tetradonta* woodland and by ensuring that landscape connectivity is maintained throughout the proposed mining operations (on Skardon River and adjacent leases).
13. A species management program (a *Nature Conservation Act 1992* (Qld) requirement for project impacts on animal breeding places) should be developed to manage impacts on potential northern quoll breeding habitat.
14. Considering the mitigation measures proposed in the EIS, including vegetation rehabilitation, and based on the preparation of a species management program aimed at managing potential northern quoll habitat in the project area, EHP considers that the project is unlikely to have unacceptable impacts on the species.

Red goshawk (*Erythrorchis radiatus*)

EPBC Act Listing Status: Vulnerable

Distribution and population

15. The red goshawk is very sparsely dispersed across coastal and sub-coastal Australia, from the western Kimberley to north-east NSW. North-east Queensland and eastern Cape York Peninsula are considered strongholds for the species in eastern Australia. The distribution of the red goshawk is not severely fragmented.

Habitat

16. The *National Recovery Plan for the Red Goshawk* *Erythrorchis radiatus* (Queensland Department of Environment and Resource Management, 2012) (red goshawk recovery plan) states that foraging habitat for the species is intact, extensive woodlands and forests with a mosaic of vegetation allowing fast manoeuvring flights. In northern Queensland, the species is mainly associated with extensive, uncleared vegetation, especially riparian, forest and woodland communities that contain a mix of eucalypt, ironbark and bloodwood species. Nesting habitat tends to tall, mature trees within 1km of permanent water, often near rivers or clearings.

Population in development area and region

17. The *Environmental Reporting Tool* (Commonwealth of Australian, 2015) records the red goshawk as present on the Cape York peninsula where the project is located.
18. The EIS stated that suitable habitat for the red goshawk exists on site and that the species was recorded in 2011 about 350km to the south-east so it was possible the species was present.
19. EHP and RTA Weipa are currently jointly monitoring a known red goshawk nest on mining lease ML 7031 about 40km south of the Skardon River project site. Given this information, EHP considers that it is likely that the species occurs in the project area.

20. Threats to the species identified in the *Approved Conservation Advice for Erythrotriorchis 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 species, and the impacts of altered fire regimes.

Impacts of the proposed action

21. The EIS stated that the project will remove 1209ha of potential foraging and nesting habitat of the red goshawk. Because of similar habitat being available across the region, the EIS concluded that the project would be unlikely to lead to a long term decrease in the size of the population.
22. The EIS stated that there is a lack of suitable nesting habitat in the project site: some nesting habitat is located along the Skardon River.
23. The red goshawk recovery plan states that nesting habitat is a subset of foraging habitat; that the home range of a breeding adult male is approximately 200km²; and that the density of breeding pairs is one per 10km of creek or river in core areas. A desktop assessment of the project site shows about 12km of waterway within the project area.
24. The EIS stated that if a red goshawk nest is found during pre-clearing surveys, the nest would be undisturbed until the end of breeding season, when clearing could resume.
25. The cumulative impacts of both Skardon River mine and the adjacent Bauxite Hills mine would mean double the loss of suitable foraging habitat and significantly more nesting habitat, because more of Bauxite Hills project area is near waterways.
26. In addition to clearing foraging habitat, the project would remove an unknown amount of potential prey species breeding habitat in the form of hollow-bearing trees.
27. Notwithstanding the proposed mitigation measures, including vegetation rehabilitation and clearing controls, EHP considers that there is a real chance or possibility that the project may impact on the red goshawk by removing potential breeding and foraging habitat for the species and breeding habitat for prey species, if it will involve clearing hollow-bearing trees.

Bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatus*)

EPBC Act Listing Status: Critically endangered

Distribution and population

28. Information on distribution and population size of the bare-rumped sheath-tail bat is limited. The few records in Queensland are from the east coast, from Ayr north to Coen on Cape York.
29. Habitat modelling suggests the species mainly occurs in coastal regions, to less than 40km inland.
30. The *Commonwealth listing advice on ten species of bats* (Threatened Species Scientific Committee, 2001) states that the species 'has undergone, is suspected to have undergone or is likely to undergo ... a very severe reduction in numbers'.

Habitat

31. The bare-rumped sheath-tail bat occurs mostly in lowland areas, typically in a range of woodland, forest and open environments. Roosts at Iron Range, Queensland have been found in *E. tetradonta* woodland near gallery rainforest and rainforest. Evidence suggests that the species forages over habitat edges like forest clearings and edges of rainforest.
32. Confirmed maternity roosts in Australia are in hollows of eucalypt species, including *E. tetradonta* (*National recovery plan for the bare-rumped sheath-tail bat Saccolaimus saccolaimus nudicluniatus* (Environmental Protection Agency, 2007). While cave roosting occurs overseas it has not been recorded in Australia

Population in development area and region

33. The *Environmental Reporting Tool* (Commonwealth of Australia, 2015) records the species as present on the Cape York peninsula where the project is located.
34. The species was not recorded during field surveys using acoustic detectors. However, the *Survey guidelines for Australia's threatened bats* (Commonwealth of Australia, 2010) state that the calls of the bare-rumped

sheath-tail bat are similar to several other species. Analysis of bat calls, while confirming the presence of certain species, could not rule out the presence of the bare-rumped sheath-tail bat.

Impacts of the proposed action

35. The EIS concluded that 1209ha of potential habitat for the bare-rumped sheath-tail bat is present in the project area, although the quality of this habitat would depend on the distribution of tree hollows.
36. The bare-rumped sheath-tail bat recovery plan lists habitat loss, particularly the loss of potential roost trees as a threat to populations. In the project area, removal of hollow-bearing trees within the development footprint has the potential to have a significant residual impact on the species.
37. A species management program (a requirement for project impacts on animal breeding places under Queensland's *Nature Conservation Act 1992* (NC Act)) should be developed for areas of higher potential breeding habitat.
38. Notwithstanding the proposed mitigation measures, including vegetation rehabilitation and clearing controls, EHP considers that there is a real chance or possibility that the project may impact on the species if it will involve clearing hollow-bearing trees which are important maternity roosting habitat.
39. Within the clearing footprint, the proponent should map areas of hollow-bearing trees that would provide good quality bare-rumped sheath-tail bat habitat.

Masked owl (northern) (*Tyto novaehollandiae kimberli*)

EPBC Act Listing Status: Vulnerable

Distribution and population

40. In Queensland, the masked owl occurs on Cape York, along the southern rim of the Gulf of Carpentaria, and south to the Atherton Tablelands and the Einasleigh-Burdekin divide (*Approved conservation advice for Tyto novaehollandiae kimberli (masked owl (northern))* (Threatened Species Scientific Committee, 2015). However, the distribution is poorly known. The southern limit of the Queensland subspecies may be as far south as Mackay.

Habitat

41. In northern Australia, the masked owl has been recorded from riparian forest, rainforest, open forest, *Melaleuca* swamps and mangroves edges, and also in cultivated areas along the margins of sugar cane fields.
42. The species preys on small mammals, typically gallery forest and woodland with a grassy understorey. Roosts include tree hollows, caves and dense foliage 3 to 8 m above the ground.

Population in development area and region

43. The *Environmental Reporting Tool* (Commonwealth of Australia, 2015) records the species as present on the Cape York peninsula where the project is located.
44. The masked owl was not recorded from EIS field surveys using broadcast (playback) surveys that are recommended in the *Survey guidelines for Australia's threatened birds* (Commonwealth of Australia, 2010). The species also was not recorded during recent surveys for the South of Embley mine. Nevertheless, the species may occur on or adjacent to the site because it is in the known distribution of the species and suitable habitat is present.
45. Major threats to masked owl on Cape York include land clearing, habitat degradation caused by altered fire regimes and grazing by livestock and feral animals, and the spread of weeds (particularly introduced pasture grasses). The decline in the populations of small to medium-sized endemic mammals across northern Australia may have reduced food availability for birds such as the masked owl. The *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) is relevant to management of the masked owl in the project area.

Impacts of the proposed action

46. Long-term impacts on masked owl habitat may be mitigated by environmental rehabilitation with the goal of reinstating a woodland community that resembles the existing *E. tetradonta* woodland and by ensuring that landscape connectivity is maintained throughout the proposed mining operations (on Skardon River and adjacent leases).

47. The EIS also proposes buffers around all sensitive areas, including riparian gallery forest that is a preferred habitats of the species.
48. A species management program (a NC Act requirement for project impacts on animal breeding places) should be developed for areas of potential breeding habitat for the masked owl such as patches of taller, hollow-bearing trees.
49. The EIS concluded that 1209ha of potential habitat is present in the project area, although the quality of this habitat would depend on the distribution tree hollows. The EIS stated that preferred foraging habitat does not occur in the project footprint.
50. Removal of hollow-bearing trees within the development footprint has the potential to impact on the species. The proponent should carry out a fine scale survey of the project site to establish if hollow-bearing trees occur in areas that would be cleared.
51. Notwithstanding the proposed mitigation measures, including vegetation rehabilitation and clearing controls, EHP considers that there is a real chance or possibility that the project may impact on the species if it will involve clearing hollow-bearing trees which are important breeding habitat.

Speartooth shark (*Glyphis glyphis*)

EPBC Act Listing Status: Critically endangered

Distribution and population

52. The *Approved conservation advice for Glyphis glyphis (speartooth shark)* (Threatened Species Scientific Committee, 2014) states that the species has been recorded on both sides of Cape York, in Port Musgrave (Wenlock and Ducie rivers) and Princess Charlotte Bay (Bizant River). The species also occurs in the Adelaide and Alligator River systems in the Northern Territory. There is little information on current population sizes of any sawfish or river shark species in Australia, but populations have declined recently and some species are thought to no longer occur in some parts of their former range. Remaining populations are isolated.

Habitat

53. The speartooth shark inhabits freshwater river systems, estuaries and inshore areas. The main habitat of juvenile and sub-adults is large tropical river systems. Because they have a similar life history to bull sharks, adults are assumed to live outside rivers in coastal marine environments. Adult speartooth sharks have recently been captured near Port Musgrave.

Population in development area and region

54. The *Environmental Reporting Tool* (Commonwealth of Australian, 2015) and the *Sawfish and river sharks multispecies recovery plan* (Commonwealth of Australia, 2015) record the species as present on Cape York where the project is located.
55. In the project area, juvenile sharks have been reported in waterways between Port Musgrave and Mapoon and it is likely that pupping occurs there too.
56. The *Sawfish and river sharks multispecies recovery plan* (Commonwealth of Australia, 2015) states that for all sawfish and river sharks, 'all areas where aggregations of individuals have been recorded displaying biologically important behaviour such as breeding, foraging, resting or migrating, are considered critical to the survival of the species unless population survey data suggests [sic] otherwise'.
57. The *Approved Conservation Advice for Glyphis glyphis (speartooth shark)* (Threatened Species Scientific Committee, 2014) and the recovery plan list commercial, recreational and illegal fishing activities, and habitat degradation and modification as the principal threats to all sawfish and river shark species. Habitat modification includes river and estuarine barriers to movement.
58. There are no threat abatement plans that are relevant to this species.

Impacts of the proposed action

59. The EIS concludes that that main impact of mine development and operation on estuarine areas would be 'movement of bauxite barges, supply barges and miscellaneous small vessel activity supporting the project'.
60. The EIS stated that it is not plausible that the species would be affected by artificial lighting, underwater noise or shipping movements. The proponent is proposing to operate the project outside the key pupping period for the speartooth shark (October/December) and construction would be targeted for the early dry season.

61. When operational, there would be a substantial increase in barge traffic in the Skardon River if both Bauxite Hills and Skardon River projects 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 (3600 – 4000 movements annually). Traffic would also include additional movements for fuel and materials supply.
62. Development of Port Musgrave by mining companies, with proposed dredging activities in the Ducie and Wenlock Rivers, is considered a potential threat to the speartooth shark population in this system (*North Marine Bioregional Plan* (Commonwealth of Australia, 2008)).
63. The EIS stated that ‘benthic habitats within the proposed barge navigation channel do not represent significant habitat. Disturbance at these locations via anchoring, bed levelling or by way of propeller wash is not predicted to be a significant impact to these marine species.’ However, the EIS does not provide evidence to support this assertion. EHP noted that no targeted surveys of potential habitat on or adjacent to the project site have been undertaken for this species.
64. EHP considers that there is a lack of certainty about the status and distribution of populations of the speartooth shark on Cape York peninsula. The species is critically endangered and populations are isolated so each estuary that supports a breeding population is an important population. The potential impact of disturbance from increased vessel traffic, and other mining activities, on the shallow water habitat of the speartooth shark is unknown.
65. Given the lack of certainty about the likely presence of the species in the Skardon River and potential for project impacts, EHP considers there is a real chance or possibility that the project may impact on the species.
66. EHP recommends that the proponent provide a financial offset in the form of a research and monitoring program for the speartooth shark, consistent with the objectives of the *Sawfish and River Sharks Multi Species Recovery Plan*. Research and monitoring would determine how the species may be using waterways in and adjacent to the project site, determine if project activities affect the species, and establish appropriate management and mitigation measures.

Dwarf sawfish (*Pristis clavata*); green sawfish (*Pristis zijsron*); largetooth sawfish (*Pristis pristis*)

EPBC Act Listing Status: Vulnerable/migratory

Distribution and population

67. The range of the dwarf sawfish in Queensland is considered to extend from Cairns and around Cape York peninsula (*Commonwealth conservation advice on Pristis clavata (dwarf sawfish)*; Threatened Species Scientific Committee, 2009). However, while species is confirmed from the Pine River on the western coast of Cape York there are no records for the east coast. There is not enough data to estimate population size of adult dwarf sawfish but the lack of east coast records suggests a range contraction and therefore a reduction in population size.
68. The green sawfish was known historically from Western Australia to NSW. It no longer occurs in NSW and southern Queensland, having suffered a range contraction of 30%. In Queensland the species is now found only north of Cairns and is most commonly known from the Gulf of Carpentaria (*Listing advice for Pristis zijsron (green sawfish)*; Threatened Species Scientific Committee, 2008), although in low numbers and with highly variable occurrence.
69. The largetooth sawfish may potentially occur in all large rivers across northern Australia, where it is confined to main channels. In Queensland it is known from several drainages in the southern Gulf of Carpentaria (*Approved conservation advice for Pristis pristis (largetooth sawfish)*; Threatened Species Scientific Committee, 2014).
70. The total population of the largetooth sawfish is unknown. Populations should be considered as discrete populations, even though the species is highly mobile.

Habitat

71. The dwarf sawfish inhabits shallow coastal waters and estuarine habitats. The species does not occur in freshwater areas, being restricted to brackish and salt water.
72. Estuaries are nursery areas for the dwarf sawfish and juveniles remain in these areas to three years of age. Adults are known to seasonally migrate back to inshore areas although it is not clear how far they move offshore.
73. The green sawfish likes muddy bottom habitats and has been recorded in inshore marine waters, estuaries, river mouths and along sandy and muddy beaches. All sites where the species is present are subject to tidal influence with high flow.
74. In the Queensland the green sawfish is found in the same areas as the largetooth sawfish and speartooth shark in Port Musgrave.
75. The largetooth sawfish is a marine and estuarine species with a juvenile period in freshwater. The preferred habitat for the species is mud bottoms of river embayments and estuaries. They are usually found in turbid channels of large rivers over soft mud.

Population in development area and region

76. The *Environmental Reporting Tool* (Commonwealth of Australian, 2015) records all three species as present in Cape York peninsula where the project is located.
77. EHP received advice from CSIRO marine fauna research staff that the species are likely to occur in both the Skardon River and Namaleta Creek.
78. There are no threat abatement plans that are relevant to sawfish species.

Impacts of the proposed action

79. The *Sawfish and river sharks multispecies recovery plan* (Commonwealth of Australia, 2015) lists commercial, recreational and illegal fishing activities, and habitat degradation and modification as the principal threats to all sawfish and river sharks. The toothed rostrum of sawfish makes them highly susceptible to capture in nets.
80. Habitat modification is also identified as a threat to all species, although it is regarded as a less serious threat for the dwarf sawfish. The green sawfish is considered to be sensitive to disturbance. The proposed action would greatly increase potential disturbance of sawfish and their habitat in the estuary of the Skardon River.
81. When operational there would be a substantial increase in barge traffic if both Bauxite Hills and Skardon River projects overlap. 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 (3600 – 4000 movements annually). This traffic would include additional movements for fuel and materials supply.
82. Given the lack of certainty about the status of populations of sawfish in the project area and the potential for project impacts, EHP considers that there is a real chance or possibility that the project may impact on sawfish species.
83. EHP recommends that the proponent provide a financial offset in the form of a research and monitoring program for sawfish species, consistent with the objectives of the *Sawfish and River Sharks Multi Species Recovery Plan*. Research and monitoring would determine how the species may be using waterways in and adjacent to the project site, determine if project activities affect the species, and establish appropriate management and mitigation measures.

Flatback turtle (*Natator depressus*); olive ridley turtle (*Lepidochelys olivacea*); hawksbill turtle (*Eretmochelys imbricata*)

EPBC Act Listing Status for the flatback turtle: Vulnerable / marine / migratory

EPBC Act Listing Status for the olive ridley turtle: Endangered / marine / migratory

EPBC Act Listing Status for the hawksbill turtle: Vulnerable / marine / migratory

Distribution and population

84. The flatback turtle is found only in tropical waters in northern Australia. The species only nests in Australia with four genetic stocks are recognised. In the north-west Gulf of Carpentaria it nests on the mainland and on Crab, Deliverance and Kerr islands. The flatback turtle is the most commonly recorded species nesting in the project area (*Queensland Wildnet database*).
85. There are no estimates of population size of the flatback turtle and no population trend data are available.
86. The olive ridley turtle is a pelagic species and there is no concentrated nesting recorded in Australia. Scattered nesting occurs in the Gulf of Carpentaria and the species has been recorded on beaches north and south of the Skardon River mouth (*Queensland Wildnet database*).
87. The hawksbill turtle is found in tropical, subtropical and temperate waters in all oceans of the world. Nesting is mainly on tropical beaches and the key nesting and inter-nesting areas are in Australia. The species occurs in the project area (*Queensland Wildnet database*).

Habitat

88. Adult flatback turtles inhabit soft bottom habitat over the continental shelf of north Australia. They require sandy beaches to nest and share nesting and foraging habitats with other marine turtle species.
89. Olive ridley turtle hatchlings disperse into offshore currents and have a pelagic phase of unknown length. Small juveniles and adults reside in coastal areas of northern Australia.
90. Hawksbill turtles spend the first five to ten years in pelagic areas then settle and forage in tropical tidal and sub-tidal coral and rocky reef habitats.

Population in development area and region

91. The *Environmental Reporting Tool* (Commonwealth of Australian, 2015) records all species as present in Cape York peninsula where the project is located.
92. All species have been recorded on the mainland beaches north and south of the mouth of the Skardon River. Based on records in the *Queensland Wildnet database* the flatback turtle is by far the most common species nesting in the area.

Impacts of the proposed action

93. Threats to all turtle species include bycatch in fisheries (particularly commercial), coastal development, nest predation by feral animals, unknown levels of Indigenous harvest, marine debris, loss of habitat and deteriorating water quality (Recovery plan for marine turtles in Australia (Commonwealth of Australia, 2003). Human activity on nesting beaches and light pollution are also recognised impacts. The *Threat abatement plan for the impacts of marine debris on vertebrate marine life* (DEWHA, 2009) is relevant to management of the turtles on Cape York. The *Threat abatement plan for predation by feral cats* (Department of Environment, 2015) is also relevant to the hawksbill turtle.
94. Impacts on nesting beaches as a result of the project are more likely to be a result of the increase in human population in the area associated with development projects, and the use of beaches for recreation, mainly 4WD beach driving. The EIS stated that development of the project would mean access to beaches for recreational purposes would be limited for safety reasons, which would also benefit nesting turtles.
95. Nesting behaviour is unlikely to be affected by bed levelling activities and vessel traffic in the Skardon River, particularly if the former does not happen during nesting seasons.
96. Marine turtles move up and down the west coast of Cape York during nesting and non-nesting periods and some may use the Skardon River estuary for foraging (pers. comm. EHP marine fauna research staff). Mine development in this area is likely to significantly increase disturbance of estuarine and coastal areas that

provide habitat for turtles, particularly from increased shipping traffic. There is a lack of certainty about the potential impact of this increase in disturbance on turtle behaviour and use of the area.

97. Given the lack of certainty about the status of populations of marine turtles in the project area and the potential for project impacts on turtle use of the coastal and estuarine area, EHP considers that there is a real chance or possibility that the project would have a significant impact on these species.
98. EHP recommends that the proponent provide a financial offset in the form of a research and monitoring program for marine turtles, consistent with the objectives of the Recovery Plan for Marine Turtles in Australia. Research and monitoring would determine how the species may be using waterways in and adjacent to the project site, determine if project activities affect the species, and establish appropriate management and mitigation measures.

Dugong (*Dugong dugon*)

EPBC Act Listing Status: Marine /migratory

Distribution and population

99. The dugong occurs in coastal and inland waters across northern Australia from Shark Bay in Western Australia to Moreton Bay in southern Queensland. The eastern Gulf of Carpentaria, especially the Wellesley Island area, supports Queensland's third largest dugong population (*Species report card – dugong: North Marine Bioregional Plan; Commonwealth of Australia, 2012*).
100. Biologically important areas for the dugong have not been identified in the North Marine Region. However, the project area is considered a medium to high importance area for dugong by the Turtle and Dugong Task Force (supported by Cape York Natural Resource Management); although it is not identified as a feeding ground hot spot.

Habitat

101. The dugong is a seagrass specialist. Dugong feeding aggregations usually occur in large seagrass meadows within wide, shallow, protected bays.
102. Dugongs also feed in offshore seagrass habitats where the continental shelf is wide. In a 2007 aerial survey, 32% of dugong sightings in the Queensland Gulf of Carpentaria coast were in Commonwealth waters.

Population in development area and region

103. The *Environmental Reporting Tool* (Commonwealth of Australia, 2015) records all species as present in Cape York peninsula where the project is located.
104. The *Threat abatement plan for the impacts of marine debris on vertebrate marine life* (DEWHA, 2009) is relevant to management of the dugong on Cape York.

Impacts of the proposed action

105. Threats to the dugong include habitat degradation, entanglement in fishing gear and shark netting, pollution, Indigenous hunting, vessel strike and noise disturbance (*The action plan for Australian mammals; CSIRO Publishing, 2012*).
106. Habitat modification is identified as a threat to the dugong. Impacts of the loss of seagrass beds are delayed reproduction, starvation and immigration from affected areas. When operational there would be a substantial increase in barge traffic if both Bauxite Hills and Skardon River projects overlap. This increase in disturbance in the relatively narrow Skardon River estuary, compared to Weipa and Mapoon areas, may affect dugong use of the area.
107. Given the lack of certainty about the status of populations of dugong in the project area and the potential for project impacts on turtle use of the coastal and estuarine area, EHP considers that there is a real chance or possibility that the project would have a significant impact on these species.
108. EHP recommends that the proponent provide a financial offset in the form of a research and monitoring program for marine turtles. Research and monitoring would determine how the species may be using waterways in and adjacent to the project site, determine if project activities affect the species, and establish appropriate management and mitigation measures.

Indo-Pacific humpback dolphin (*Sousa sahalensis*); Australian snubfin dolphin (*Orcaella heinsohni*)

EPBC Act Listing Status: Cetacean/migratory

Distribution and population

109. The Australian snubfin dolphin occurs in shallow coastal and estuarine waters across northern Australia. Data suggest that they occur in small, localised populations but information is too limited to conclude there is fragmentation of populations.
110. The Indo-Pacific humpback dolphin occurs along the north Australian coastline from Exmouth Gulf to the NSW/Queensland border. Along the east coast the distribution appears continuous, and there are few records between the Gulf of Carpentaria and Western Australia. The species occurs in relatively shallow, inshore areas.

Habitat

111. The Australian snubfin dolphin inhabits coastal and estuarine waters, often in association with mangroves. Most sightings are close to waterway entrances and upstream in some tidal rivers, in a water depth of up to 10m. However they do occur offshore (*Species group report card – cetaceans: North Marine Bioregional Plan*; Commonwealth of Australia, 2012).
112. The Indo-Pacific humpback dolphin is found in a wider range of habitats: coastal lagoons, enclosed bays with mangrove forests and seagrass beds, open coastal waters and rocky and coral reefs.

Population in development area and region

113. The *Environmental Reporting Tool* (Commonwealth of Australia, 2015) records both species as present in Cape York peninsula where the project is located.
114. EHP marine fauna research staff considers that the project area is important for the Australian snubfin dolphin.

Impacts of the proposed action

115. Threats to inshore dolphins include habitat degradation, bycatch in fishing gear, competition with fisheries, pollution, vessel traffic, illegal killing and wildlife tourism (human activity).
116. There are no threat abatement plans that are relevant to management of the species in the project area. *The Australian national guidelines for whale and dolphin watching* (Department of the Environment and Heritage, 2005) provide information about minimising disturbance caused by human activities in areas where cetaceans are present.
117. Habitat modification is identified as a threat to the inshore dolphins. Habitat modification includes noise pollution and harassment. When operational there would be a substantial increase in barge traffic if both Bauxite Hills and Skardon River projects overlap. The impact of this increase disturbance in the relatively narrow Skardon River estuary on dolphin use of the area is unknown.
118. Given the lack of certainty about the likely presence of the species in the Skardon River and potential for project impacts, EHP considers that further information is required to determine if and how the species may be using waterways in and adjacent to the project site and that appropriate management and mitigation measures are implemented.
119. EHP, in consultation with DotE, recommends that the proponent contribute to a research and monitoring program for the inshore dolphins. The findings of the research and monitoring program would provide a basis for mitigation and corrective actions for potential impacts, if required.

Appendix 3 – Recommended tidal works conditions

Recommended tidal works condition for the proposed bed levelling activities and installation of cyclone moorings

Condition Number	Model Conditions Library	Condition ID (in model conditions library)	Condition
All tidal works (bed levelling, installation of cyclone moorings)			
1	State Assessment and Referral Agency (SARA) Model Conditions V2.3	AD01	The development must be carried out generally in accordance with the plan shown in Figure 5. Timing: At all times.
2	SARA Model Conditions V2.3	CP06 (modified)	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	Model Operating Conditions ERA16- Extractive and Screening Activities V2	G9	The activity must be undertaken in accordance with written procedures that: <ul style="list-style-type: none"> • identify potential risks to the environment from the activity during routine operations, closure and an emergency; • establish and maintain control measures that minimise the potential for environmental harm; • ensure plant, equipment and measures are maintained in a proper and effective condition; • ensure plant, equipment and measures are operated in a proper and effective manner; • ensure that staff are trained and aware of their obligations under the EP Act; and • ensure that reviews of environmental performance are undertaken at least annually. Timing: At all times.
5	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.
6	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

Condition Number	Model Conditions Library	Condition ID (in model conditions library)	Condition
			<p>conditions;</p> <ul style="list-style-type: none"> • 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. <p>Timing: During construction.</p>
7	Model Operating Conditions ERA16- Extractive and Screening Activities V2	CD7 (modified)	<p>Prior to the commencement of tidal works, an Environmental Management Plan (EMP) for the activity must be developed and implemented, and the EMP must contain the following:</p> <ul style="list-style-type: none"> • Clearly stated aims and objectives. • Description of tidal works operations including: <ul style="list-style-type: none"> ○ type of equipment to be used in tidal works; and ○ volume of material to be moved, and duration and timing of the bed levelling campaign. • Maps or plans showing: <ul style="list-style-type: none"> ○ legend, north arrow and scale; ○ boundaries of tidal works operations; ○ estimated or modelled zone of influence of sediment plumes; ○ location of designated disposal sites for bed levelled material; ○ location of sensitive receptors; and ○ all monitoring locations. • A detailed description of sediment plume-associated monitoring program including: <ul style="list-style-type: none"> ○ sampling regime and methods; and ○ monitoring sites. • A detailed description of the assessment methodology to provide data in relation to trigger values that will define alert levels. • Clearly set out data handling and evaluation procedures that demonstrate how exceedance of alert levels will be determined. • Management actions to be initiated if alert levels are exceeded. <p>Timing: Prior to the commencement of works.</p>
8	–	–	<p>A copy of the EMP must be submitted to the administering authority at least 20 business days prior to the commencement of the tidal works and, if necessary, be amended in accordance with any comments made by the administering authority.</p> <p>Timing: Prior to the commencement of works.</p>
9	–	–	<p>Provide to the administering authority written notification of the date when tidal works will commence at least five (5) business days prior to establishing a new bed levelling activity.</p> <p>Timing: Prior to the commencement of works.</p>
10	SARA Model Conditions V2.3	RA03 (modified)	<p>The facilities for the activity must include a storage area for hazardous contaminants with secondary containment systems to prevent any release of contaminants from the system, or containers within the system, to land, ground water, or surface waters.</p>

Condition Number	Model Conditions Library	Condition ID (in model conditions library)	Condition
11	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.
Bed levelling specific tidal works condition			
12	SARA Model Conditions V2.3	CP23	A hydrographic survey must be prepared by a registered surveyor of the bed levelling area and the immediate adjacent area likely to be affected by the bed levelling and submitted 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 and within two weeks of the completion of the works.
Cyclone mooring specific tidal works condition			
13	SARA Model Conditions V2.3.	CP07	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

Definitions

Administering authority means the Department of Environment and Heritage Protection or its successor or predecessors.

Alert level represent tiers in a hierarchy of increasing environmental risk and are defined by trigger values. Three alert levels (low, moderate, and high) are typically used in a management action framework to indicate adverse conditions and guide management responses that aim to prevent and minimise environmental harm.

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.

Sediment plume-associated monitoring (SPAM) means environmental monitoring associated with risk management of **sediment plume-associated impacts**.

Sensitive receptor includes biological sensitive receptors together with other environmental values sensitive to the effects of dredge-generated sediment plume-associated impacts.

Trigger values are physicochemical, parameter-specific measurement values used to indicate a condition where an environmental value or sensitive receptor may be at low, moderate or high risk, or some other risk-related indicator.

Zone of Influence of a sediment plume is, in its broadest application, defined by the dredge footprint and the area beyond the **dredge footprint** where at least some level of sediment plume-associated impacts are expected to

occur. The overall *zone of influence* may be broken down into more risk-relevant sub-categories, such as the Zone of Unavoidable Loss (the dredge footprint and immediately adjacent areas), the *zone of moderate impact*, or the *zone of marginal impact*, with each zone being defined according to its purpose or role in environmental management.