Pisolite Hills mine and port project

Initial Advice Statement

27 September 2012

ABN 88 107 817 694

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1. INTRODUCTION

1.1 Background

Cape Alumina Limited's (Australian Securities Exchange (ASX) Code: CBX) proposed integrated Pisolite Hills bauxite mine and port project is located on western Cape York, Queensland. The proposed mine is located approximately 50 kilometres north-east of Weipa and 40 kilometres south-east of the community of Mapoon (see Figure 1-1). The proposed port facility is located on the shores of the Ducie River, ten kilometres east of Mapoon. A transport corridor will link the mine development to the port and supporting infrastructure adjacent to the Ducie River. Cape Alumina will barge bauxite to off-shore bulk carriers for transhipment (see Figure 1-2).

Figure 1-1: Location of Cape Alumina's proposed Pisolite Hills mine and port project.

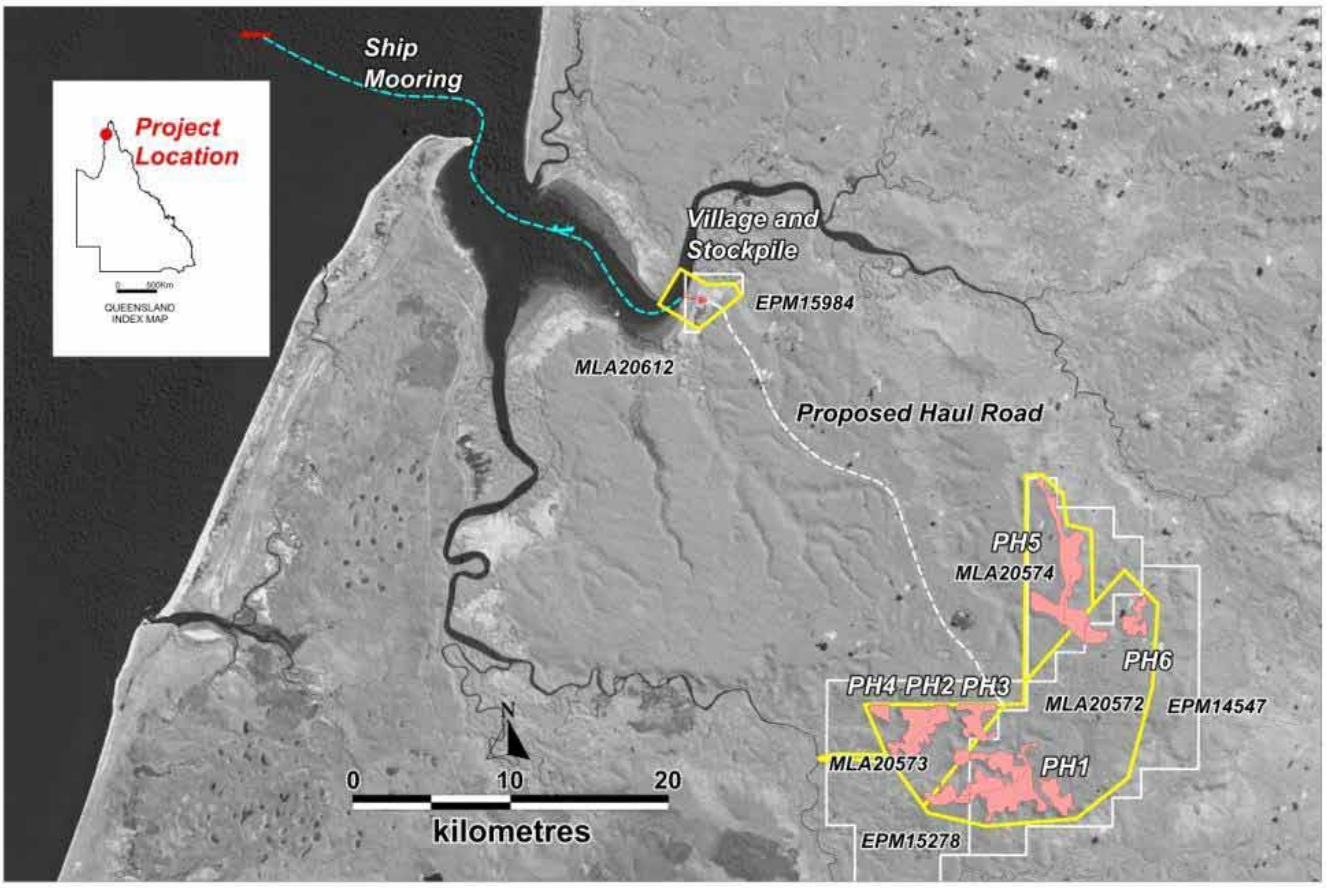

Figure 1-2: Overview of Cape Alumina's Pisolite Hills mine and port project on western Cape York, Queensland.

The Pisolite Hills resource is estimated to be 134.6 Million tonnes (Mt) of *in-situ* bauxite, including the Musgrave deposit. Overall, this resource has the potential to yield up to seven Million tonnes per annum (Mtpa) of dry-product bauxite over a 15-year period. Cape Alumina's studies show that the project would boost economic activity by $1.2 billion in Net Present Value (NPV) terms, and create or sustain more than 1,700 direct and in-direct jobs over the mine's 15-year life. The boost to the Far North Queensland economy alone would be more than $600 million in NPV terms. The project is also a strategic opportunity for the Traditional Land Owners and Aboriginal people of Mapoon and other western Cape York communities as it provides them with a rare opportunity to gain social and economic independence and prosperity.

1.2 Purpose and scope of the Initial Advice Statement

This Initial Advice Statement (IAS) has been prepared for submission to the Coordinator-General to support the project's case for declaration as a significant project under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). This IAS provides details on the project, relevant planning schemes and policy frameworks, the potential effects on relevant infrastructure, employment opportunities, potential environmental effects, the local, State and Commonwealth government requirements for the project, the level of investment, and the strategic significance of the project – in

accordance with the requirements of the SDPWO Act. Potential management and mitigation options identified during preliminary studies are also provided. These will be further explored during the preparation of an Environmental Impact Statement (EIS) for the project.

In summary, key considerations for seeking the significant project declaration under the SDPWO Act include:

- ✓ **Relevant planning schemes or policy frameworks** - The project area is subject to an array of planning schemes and policy requirements, including frameworks that are currently under review.

- ✓ **Potential effects on infrastructure** – The project will require provision of significant infrastructure in three key locations, as set out in section 3 of this IAS, including the upgrading of the Mapoon airstrip, which will be available for use by the local population, and the construction of a ferry jetty at Mapoon.

- ✓ **Employment opportunities** – The project represents a strategic and rare opportunity to boost local employment and business opportunities for the indigenous communities on western Cape York. Cape Alumina will directly employ a construction workforce of approximately 200 people during the mine development phase and up to 260 persons during the mine's operational phase. There will be many indirect employment opportunities that will arise from the direct jobs that Cape Alumina will create. Local residents will be employed where possible and indigenous employment targets established during the Indigenous Land Use Agreement (ILUA) process. Other staff will be obtained from regional areas and travel to site on a Fly-In, Fly-Out (FIFO) basis. In addition, the project will support existing strategies to improve education and training opportunities on Cape York to further strengthen the capabilities of participants in the region.

- ✓ **Level of investment** – The design and construction of the Pisolite Hills integrated mine and port project is estimated to be between $300 and $400 million.

- ✓ **Potential environmental effects** – Several significant terrestrial and marine species have been identified within the project footprint. This includes marine species such as the Speartooth Shark, several Sawfish, and habitats including the groundwater dependent ecosystems of the perennial springs which occur adjacent to proposed bauxite resource areas.

- ✓ **Complexity of local, State and Commonwealth requirements for the project** – The project will be likely to trigger a large number of complex and overlapping approvals, as outlined at Table 5-1 of this IAS. Approvals will be required not only for the mine activity itself, but also associated transport infrastructure (including port facilities), mine accommodation, water supply and upgrades required to existing infrastructure. In addition, a complex arrangement of land tenure underlies the proposed project site. This includes Dead of Grant In Trust (DOGIT) lands, and existing mining and pastoral leases.

2. THE PROPONENT

Cape Alumina is Australia's leading pure-play bauxite company, evaluating one of the country's largest under-developed, export-quality bauxite deposits. Established in 2004, the Brisbane-based company controls approximately 1,900 square kilometres of exploration tenements on western Cape York. This is the largest tenement holding in the region outside the Rio Tinto Alcan (RTA) mining leases. Cape Alumina's business model is based on the establishment of an independent bauxite supply business to feed the growing market for traded bauxite into China.

Cape Alumina is a responsible corporate citizen that works collaboratively with all of its stakeholders to deliver sustainable, profitable bauxite mining projects that also have positive social, economic and environmental outcomes for the local community and broader Australian public. Cape Alumina is committed to creating employment and genuine social and economic benefits for local indigenous communities near its project sites. The company's future growth will be based on a significant increase in the company's bauxite resource base, cash flow from bauxite exports and organic expansion.

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3. THE PROPOSAL

3.1 Scope of the project

The mine will operate via open pit ore extraction using front end loaders. Bauxite will be beneficiated (involving screening, ore sizing and water washing) and transported to the Ducie River stockpile facility awaiting transhipment to bulk carriers via a barging facility located on the Ducie River. Allowing for a progressive ramp-up in production over an initial five-year period, the Pisolite Hills project is targeting a production rate of seven Mt of beneficiated, dry-product bauxite over an expected mine life of approximately 15 years.

3.2 Location

The project overlaps a portion of Bertiehaugh Pastoral Lease and mining leases ML 7024 (RTA Weipa Pty Ltd) and ML 7031 (Alcan South Pacific Pty Ltd). It is between 2.8 and 15 kilometres to the north and east of the Wenlock River. The Ducie River runs to the north of the project area. The mine site can be accessed from Weipa via the Telegraph Road and an access track which passes through Bertiehaugh Station, extending to Stones Crossing in the south (Figure 3-1). Access to the Port Musgrave section of the project site is via the Mapoon Road heading north from Weipa to Mapoon.

The project footprint is defined by the following lease areas (see Figure 1-2):

- Pisolite Hills – EPM 14547, EPM 15278, MLA 20572, MLA 20573, MLA 20574.
- Port Musgrave – EPM 15984 and MLA 20612.

EPM = Exploration Permit for Minerals. MLA = Mining Lease Application.

Within these lease areas key infrastructure that will be necessary for this project includes:

- Mine area – surface water abstraction pipe work and pump station from the Wenlock River, raw water and process water storage dams, beneficiation plants, in-pit overland conveyors and transfer station.
- Port area – overland conveyors, bauxite stockpile, stockpile stacker and reclaimer, access roads, barge loading facilities, berthing dolphins, barge loading wharf, ferry jetties, equipment marshalling area and landing barge ramp.
- Port area – service infrastructure such as a mine village, administration buildings, laboratory, stores and light and heavy vehicle workshops.
- Port area – power plant and fuel storage, water treatment and water storage.

In addition to these lease areas, the project will require the development of infrastructure within the township of Mapoon (Mapoon Transport Hub), and access over the RTA mining leases for the transport of bauxite between the mine and port facilities via a haul road and conveyor corridor (see Figure 3-1).

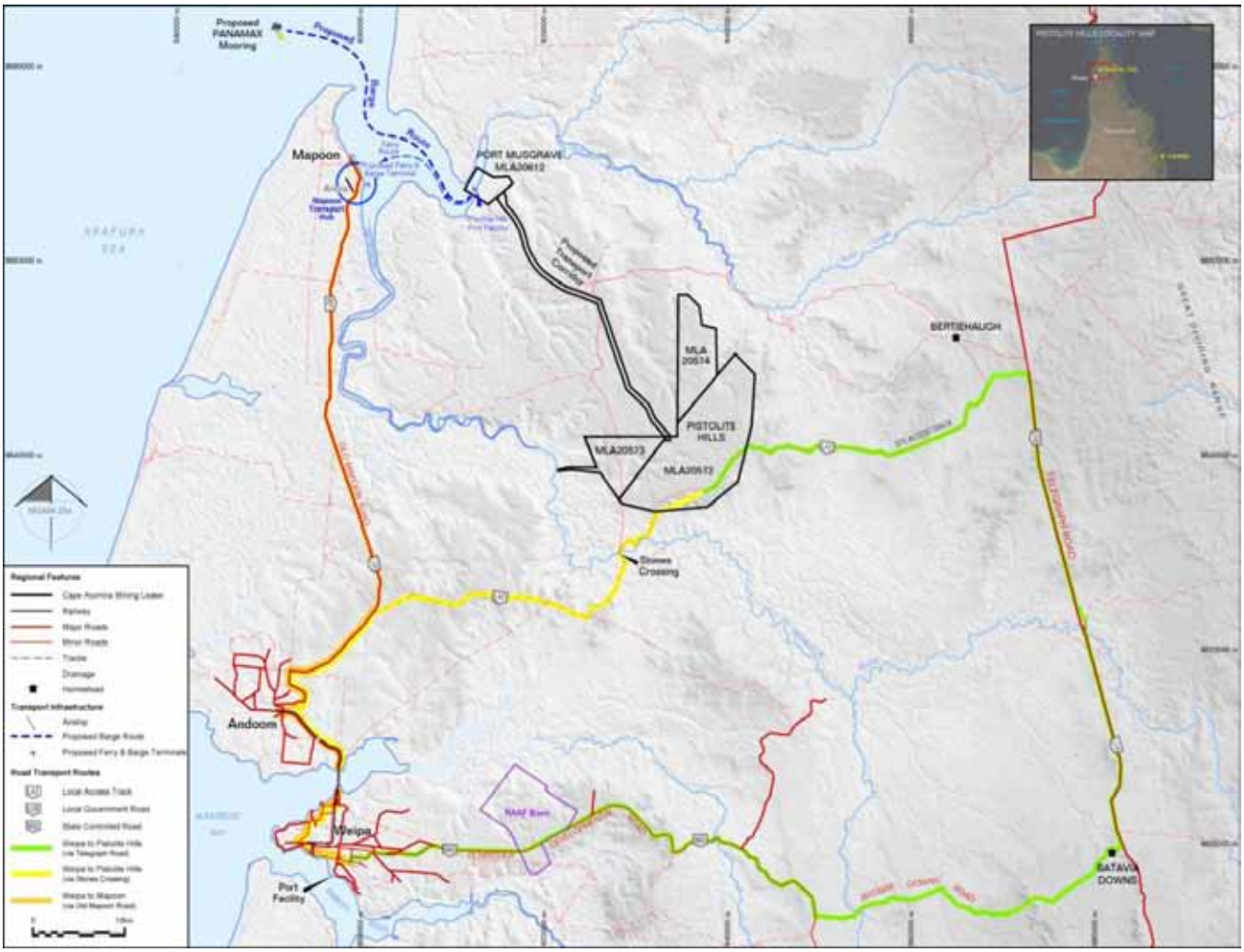

Figure 3-1: Location of Pisolite Hills mine and port project elements.

Bauxite will be exported via a barge route through Port Musgrave for transhipment off-shore from Cullen Point. Dredging will be required over approximately four kilometres of the 32 kilometre barge route as it passes through Port Musgrave to the transhipment area (Figure 3-1).

The track to the Telegraph Road through Bertiehaugh Station would also be upgraded during early construction works to enable safe access and to secure a land-based link to Weipa for safety purposes (note: once constructed, primary access to the project site during construction and operations will be via the barge and passenger ferry terminals which will link the Port Musgrave barge facility to Mapoon and roads south to Weipa). Details of the lots and plans underlying the project mining tenements and associated land ownership are provided in Table 3-1 and Figure 3-2.

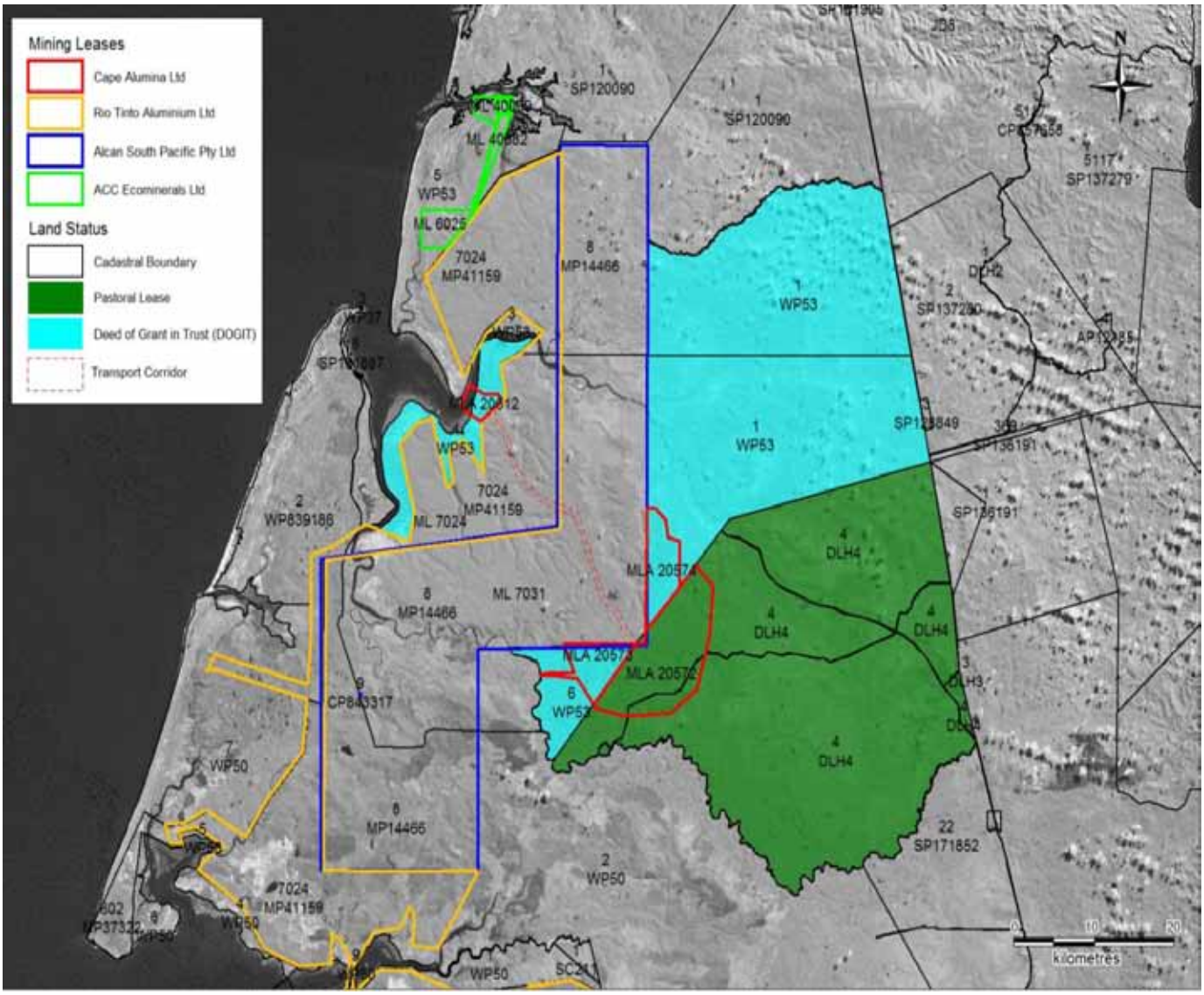

Figure 3-2: Cadastral, mining and pastoral leases in the project area.

3.3 Tenure

The cadastral information for the project is presented in Table 3-1 below and Figure 3-2 above.

Name of affected person or company	Property description	Project area	Tenure
Silvester Blanco, Mapoon Shire Council and Edwin Ralph Woodley Trustee	Lot 4 WP53	Port	DOGIT MLA 20612
Silvester Blanco, Mapoon Shire Council and Edwin Ralph Woodley Trustee	Lot 6 WP53	Mining area	DOGIT MLA 20574
Silvester Blanco, Mapoon Shire Council and Edwin Ralph Woodley Trustee	Lot 2 WP839186	Mapoon Transport Hub	DOGIT MLA 20573
RTA Weipa Pty Ltd	ML 7024	Haul road / overland conveyor	Granted Mining Lease MLA20612
Alcan South Pacific Pty Ltd	ML 7031	Haul road / overland conveyor	Granted Mining Lease
Silverback Properties Pty Ltd (Bertiehaugh Station)	Lot 4 SP222990	Mining area and access road	Term Lease for pastoral purposes MLA 20612 MLA 20572 MLA 20573 MLA 20574
Local council State of Queensland	Road reserves		MLA 20612 MLA 20572 MLA 20573 MLA 20574
State of Queensland	Ducie River		MLA 20612

Table 3-1: Lot and plan details of the Pisolite Hills mine and port project area.

3.3.1 Mining lease applications

Cape Alumina has three granted Exploration Permits for Minerals (EPMs) over the project area. Within these, the company has lodged four Mining Lease Applications (MLAs). The bauxite resources for the project will be developed within the MLAs. Details of the mining tenements are listed in Table 3-2 below. No petroleum related tenures exist on or directly adjacent to the project site.

Mining tenement	Project area	Holder/applicant	Status	Expiry
EPM 14547	Exploration	Cape Alumina Ltd	Granted	19/04/2016
EPM 15278	Exploration	Cape Alumina Ltd	Granted	30/09/2012 Renewal pending
EPM 15984	Exploration	Cape Alumina Ltd	Granted	23/02/2014
MLA 20572	Mining	Cape Alumina Ltd	Application	Not applicable
MLA 20573	Mining	Cape Alumina Ltd	Application	Not applicable
MLA 20574	Mining	Cape Alumina Ltd	Application	Not applicable
MLA 20612	Port / Mining	Cape Alumina Ltd	Application	Not applicable

Table 3-2: Mining tenures over the Pisolite Hills mine and port project area.

3.3.2 Local government

Approximately half of the project area lies within Deed of Grant in Trust (DOGIT) lands, administered by trustees appointed by the Queensland Government (part of MLA 20573, part of MLA 20574 and part of MLA 20612). The remainder of the land lies within the jurisdiction of the Cook Shire Council (MLA 20572, part of MLA 20574, part of MLA 20573 and part of MLA 20612).

3.3.3 Native title

Two native title claimants are registered over the proposed project area (see Table 3-3 below).

Mining tenement	Project area	Holder/Applicant
MLA 20572	Mining	No overlap with native title determination application
MLA 20573	Mining	Northern Cape York Group #2 (Tribunal No QC11/3)
MLA 20574	Mining	Northern Cape York Group #2 (Tribunal No QC11/3)

MLA 20612	Port/Mining	Northern Cape York Group #1 (Tribunal No QC11/2) Northern Cape York Group #2 (Tribunal No QC11/3)

Table 3-3: Native title summary over the Pisolite Hills mine and port project area.

3.4 Land use

The proposed mining leases at Pisolite Hills (MLA 20573, MLA 20574 and MLA 20612) cover DOGIT lands which are administered by trustees appointed by the Queensland Government. The mining lease applications cover 12,360 hectares of Bertiehaugh Cattle Station. This equates to 9.16 percent of the overall pastoral lease. The actual land on the Bertiehaugh Cattle Station pastoral lease that is proposed to be mined is 2,053 hectares. This equates to 1.5 percent of the overall pastoral lease, which will be fully and progressively rehabilitated and revegetated throughout the life of the mine.

The proposed port facility, stockpile, administration and accommodation facilities are to be located within Mapoon DOGIT land and MLA 20612. The proposed road and overland conveyor linking the mine and port development will traverse existing Rio Tinto leases. The proposed barge and ferry facility at Mapoon (Mapoon Transport Hub) is also located on Mapoon DOGIT land. A brief description of the land use surrounding the project is below:

- North – areas to the north of the project site include mining lease and DOGIT lands. The areas are presently undeveloped. The former Department of Environment and Resource Management (now Department of Environment and Heritage Protection - DEHP) describe the present land use as conservation and natural environment.
- South – lands between Mapoon and Weipa fall within Rio Tinto mining leases and DOGIT land. DEHP describe existing land use between Mapoon and Andoom as conservation and natural environment.
- East – portions of the land within and to the east of the mine area are classified as pastoral land use (Bertiehaugh Station). The land is largely undeveloped, with minor improvements in the form of access roads, dams and fences. DEHP describe existing land use as conservation and natural environment. Bertiehaugh Station is an active grazing property. The property has also been the subject of exploration activities in recent times. The Steve Irwin Wildlife Reserve (SIWR) has been recently gazetted over Bertiehaugh Station.
- West – to the west of the site is the Gulf of Carpentaria and waters of Port Musgrave. This includes State and Commonwealth waters.

3.5 Project needs, justification and alternatives

3.5.1 Need

China is the largest alumina producer and consumer but is short in bauxite, which is being consumed at an ever increasing rate. Indonesia, China's biggest external provider of bauxite, has legislated to restrict bauxite exports and has laws that encourage down-stream processing in Indonesia. As a

result, bauxite prices are increasing based on the growing Chinese market, and China is looking for a reliable, alternative, long-term supply of high-quality bauxite. Western Cape York is to become China's preferred source of bauxite, and Cape Alumina is uniquely positioned to meet this demand.

Cape Alumina's business model is based on the establishment of an independent bauxite supply business to feed the growing market for traded bauxite into China. Key features of the bauxite at the Pisolite Hills area includes:

- ✓ Cape Alumina's product is located within the world-class western Cape York bauxite province, which is characterised by high-quality, export-grade bauxite.
- ✓ The bauxite deposits are very shallow, free-digging bauxite with minimal overburden thickness and very low strip ratios, which suggests that mining costs will be low.
- ✓ Cape Alumina bauxite has ready access to ship borne trade and is close to the Asia-Pacific market.
- ✓ The bauxite has a high alumina content compared to other Australian bauxite provinces (outside Weipa region).
- ✓ The lower Bauxite to Alumina ratio reduces overall shipping and refinery input costs.
- ✓ Cape Alumina bauxite is well-suited for low and high temperature alumina refineries.
- ✓ Global demand for bauxite will remain strong over the long-term.

3.5.2 Justification

The proposed project has an estimated mine life of 15 years and a planned mining commencement date of late 2014 or early 2015. During this period, both local and regional areas will expect to benefit from the project through:

- ✓ Economic benefits – the project will assist with the economic stability of the local region, provide economic benefits and employment opportunities and generate export trade dollars for Queensland. The estimated establishment cost of the project is estimated to be between $300 and $400 million.
- ✓ Local trade benefits – during the project's construction phase, equipment, goods and services will be purchased locally as much as possible, and from Queensland suppliers. During the mine's operational phase the procurement of local equipment, goods, consumables and services will also be conducted, thereby further enhancing the economic health of both the local region and Queensland. Opportunities for Indigenous owned and operated businesses to provide services will be enhanced.
- ✓ Training opportunities – as a result of the need for skilled staff, various training opportunities will arise for staff working on the project.
- ✓ Provision of infrastructure – the construction of a ferry jetty at Mapoon and upgrading of the Mapoon airstrip will enhance the infrastructure available for use by the local population and provide a long-term economic infrastructure legacy for the region.
- ✓ Employment – Cape Alumina will directly employ a construction workforce of approximately 200 persons during the mine development phase and up to 260 persons during the mine's operational phase. Local residents will be employed where possible. Other staff will be obtained from regional areas and travel to site on a FIFO basis.

3.5.3 Alternatives

The following project alternatives have been identified to-date and will be further refined during the EIS:

- Location for product export.
- Access channel.
- Project operational base location.
- Product transportation methods and corridors.
- Mining and production methods.
- Reject fines disposal and overburden management.
- Location of additional infrastructure.
- Water resources.
- Management and disposal of waste.

The following sections describe the alternatives in further detail.

Location for product export

The adopted export location is from a proposed facility on the Ducie River. An alternative location for export was considered within the existing Port of Weipa. However, this option was not selected for the following reasons:

- The heavy vehicle traffic required to transport bauxite from either Mapoon or Pisolite Hills to the Port of Weipa was considered to pose an unacceptable impact upon the local environment and incur additional costs for road upgrades.
- Obtaining access to and leasing additional capacity for exporting bauxite from the Port of Weipa did not prove cost effective.
- Transporting product to the Port of Weipa either via the road network or marine routes would add another product handling step to the export process and therefore incur additional costs.
- The operation of multiple shipping schedules at a shared port could result in delays to product export.

Access channel

Two channel alignment options were considered during the development of the proposed barge access channel. The preferred route had the physical advantage of a naturally deep, two-way channel between Cullen Point and Red Beach, and less dredging. The alternative route was investigated based on a shorter distance and easier manoeuvrability (that is, larger radius bends) for the barges. However, following discussions with barge operators, the preferred route was easily manoeuvrable and the naturally deeper water allowed for passing without extra dredging being required. In addition it was considered likely that the alternative route would capture more silt and require more maintenance dredging.

Project operational base location

Two sites were considered for locating the operational infrastructure:

- Adjacent to the mine at Pisolite Hills.
- Co-located with the port facilities at Port Musgrave.

Port Musgrave was selected as the preferred site for the main operational infrastructure, due to the following location benefits:

- Less potential pressure on adjacent perennial springs at the mine site.
- Less daily travel time for site personnel.
- Lower vehicle maintenance costs.
- Reduced diesel consumption.
- Non-productive infrastructure footprint reduced for the mine area.
- Reduced traffic on the haul road.
- Haul road maintenance costs lowered.

Product transportation methods and corridors

The following product transportation methods were considered for the project as follows:

- Road transport of bauxite from Pisolite Hills to Port Musgrave
- Conveyor transport of bauxite from Pisolite Hills to Port Musgrave.

The final decision on product transport is yet to be made. However, initial assessments have identified that an overland conveyor may present lower operating costs, lower fuel consumption, improved road safety and reduced environmental impacts. The EIS will continue to review these options.

Mining and production methods

The following mining and production method options are being considered for the project:

- Conventional truck and loader operation.
- Surface mining and short-haul truck
- In-pit dry screening utilising truck and loader
- Direct shipping of unprocessed ore.
- Front end loader, in-pit conveying, wet beneficiation, trunk and overland conveyors.

At present, a conventional open-pit bench-mining operation is preferred. Front end loaders and mobile conveyors would be employed to transport bauxite from the mine face to the beneficiation plant. Loaders and dump trucks will be used to transport bauxite from remote and difficult-to-access areas of the mine to the plant and to assist with product blending from multiple locations.

Reject fines disposal

The following reject fines disposal and overburden management options were considered for the project:

- Conventional thickener and fines dam;
- Reject fines slurry pumped directly to external fines dam;
- Reject fines slurry pumped directly to internal fines dam; and
- Progressive in pit return of fines to the mine void.

The use of thickeners and standalone fines dams outside the footprint of the mine void are no longer under consideration due to potential environmental impacts. The present preferred option is for the disposal of fines from the washing and screening processes to an in pit fines disposal area. These will be broad low height purpose built dams designed to receive the practical life of mine needs for defined areas of the mining project. As such, several fines disposal areas would be located within the project's resource footprint over the course of development. The EIS will define the preferred handling of fines.

Location of additional infrastructure

In addition to the situation of the mine's operational base, various infrastructure arrangements were considered for the project as follows:

- Upgrade of Agnew Airstrip.
- Establishment of a new airstrip adjacent to mouth of Ducie River.
- Establishment of Mapoon Transport Hub, including an upgrade of Mapoon airstrip.
- Fuel storage at Pisolite Hills.
- Mapoon fuel storage.
- Fuel storage adjacent to the Ducie River.

In order to minimise environmental impacts, and facilitate improved community infrastructure, construction of the Mapoon Transport Hub and upgrade to the existing Mapoon Airstrip was the preferred option. Bulk fuel storage is preferred for location at the Ducie River facility, adjacent to the administration, stockpile and workshop facilities. Bulk fuels would be provided via barge transport so as to minimise local road network impacts and ensure fuel access through the wet season. Pisolite Hills was not selected as a suitable site for bulk fuel storage, because of the presence of adjacent perennial springs. The facilities adjacent to the Ducie River were selected as the best option for fuel storage as this is adjacent to the proposed power generation plant.

The reason for selecting the Mapoon Transport Hub as the main staff transport option are:

- Reduced capital cost.
- Opportunities for establishing local service providers.
- Community benefits from airport upgrade.
- Reduces footprint occupied in the mine area.

- Long-term economic infrastructure legacy benefits for the Mapoon and western Cape York community.

Water resources

Three water sources (for both mining and potable uses) were considered for the project as follows:

- Groundwater.
- The Wenlock River.
- Flood water harvesting and storage within dams.

From an environmental impact standpoint, the abstraction of surface water from the Wenlock River below the extent of tidal influence is the preferred option for process water requirements (waters of the Wenlock River remain fresh many kilometres downstream from the point of tidal influence due to strong flow volumes throughout the year). This option also provides a more ecologically sustainable approach to water supply for the project, as the impact upon groundwater resources will be minimised. The EIS will explore the water supply options in further detail, including a combination of potential water source options to minimise impact and maximise efficiency of the processes water operations. This review will include details of water recycling. Smaller volumes of potable water will be obtained from shallow groundwater wells and treated for domestic purposes.

Management and disposal of waste

A number of waste management disposal options (apart from management of the reject fines) have been considered:

- On-site land filling of liquid and solid wastes.
- Disposal of liquid and solid wastes off-site.
- Use of the local Mapoon landfill.
- Use of Weipa, Cairns and Townsville domestic, commercial and industrial waste management facilities.
- Use of on-site composting for organic wastes.
- Off-site disposal of sewage and grey water.
- On-site treatment of sewage and grey water.

The off-site disposal of most solid wastes that are generated by the project is the preferred option, in order to minimise the potential environmental impacts posed by on-site waste management. The domestic, commercial and industrial waste management facilities available at Weipa have been selected as the most suitable off-site destination for the project's wastes due to its location and processing capacity. The landfill site at Mapoon offers limited capacity for receiving the various wastes that will be generated by the project. The on-site treatment of sewage and grey water was selected, because this approach removes the potential for spillage of these waste streams during transport (including road traffic accidents) and the costs associated with off-site treatment. All other liquid wastes, including waste oils, will be sent to Weipa for disposal and treatment.

Do nothing option

As mining is a major source of income for the Australian economy, if the project were not to proceed, a significant mineral resource (bauxite) would remain unutilised. Therefore the local, state and national economies would forego the economic benefits that could be derived from the project. The project also represents a major source and diversification of potential income for the region – in particular for the Traditional Land Owners and local Aboriginal people of western Cape York who are among the State's most disadvantages residents. The project represents a unique opportunity for many of these people to gain social and economic independence and prosperity.

3.6 Project elements

3.6.1 Water access

Allocation of access to suitable quality and volumes of water is a significant project requirement for Pisolite Hills. Options are presently being considered regarding water sourcing. Water sources are likely to include a combination of groundwater, surface water and water abstracted from below the point of tidal influence in the Wenlock River (salinity <200-300us/centimetres). It is understood that via long standing agreements to water access under the Commonwealth Aluminium Corporation Pty Ltd Agreement Act 1957, potential limitations may exist to accessing ground and surface water resources within the region.

3.6.2 Mapoon transport hub

To support the development of the Pisolite Hills project via the provision of both locally sourced and Fly-in-Fly-out (FIFO) labour inputs, the development of a barge and ferry facility and upgrade to the existing airstrip at Mapoon is proposed. The barge and ferry facility would provide access for equipment, supplies and personnel to and from the project's operations. The upgraded airstrip would provide FIFO access direct from Cairns as well as providing significantly enhanced transport capability for the local Mapoon community.

3.6.3 Shipping access, dredging and disposal

The development of a navigation channel and application for dredging and disposal at sea represents a significant external infrastructure requirement. Detailed investigations have been undertaken to identify the most appropriate channel alignment and location of an off-shore disposal ground for dredged material which minimises impacts during the capital works program, as well as during ongoing maintenance activities.

3.7 External infrastructure requirements

Local equipment, materials and labour supply will utilise the existing road networks established within the region (primarily Mapoon and the roads through to Weipa). Other equipment would be barged to site via Cairns, Weipa or Townsville. The supply of fuel will be via direct import or via existing supply chains within Cairns or Weipa. Transfer of bulk fuels will be via barges to the Ducie River facility.

Waste management services would target utilisation of the existing facilities at Weipa. FIFO services will be established between Cairns and Mapoon. It is presently proposed that connections will be established weekly during construction, and twice weekly during operations.

3.8 Project timeline

Allowing for the development of an EIS and approvals process during 2012 and 2013 and construction during 2014, the Pisolite Hills mine and port project is scheduled for first production during late 2014 and early 2015. The Port Musgrave mine area will be developed towards the end of year one (2014) and throughout year two (2015) targeting an estimated one-and-a-half Mt of dry-product bauxite. Construction of key project elements will occur throughout this period. Bauxite mining at the Pisolite Hills mine area will initially begin at approximately three Mtpa of dry-product in year three (2016) of the project. This will be increased to five Mtpa in year four (2017) and then to full capacity of seven Mtpa reached in year five (2018). Figure 3-3 below illustrates the proposed mining sequence, by year, for the Port Musgrave and the Pisolite Hills mine areas.

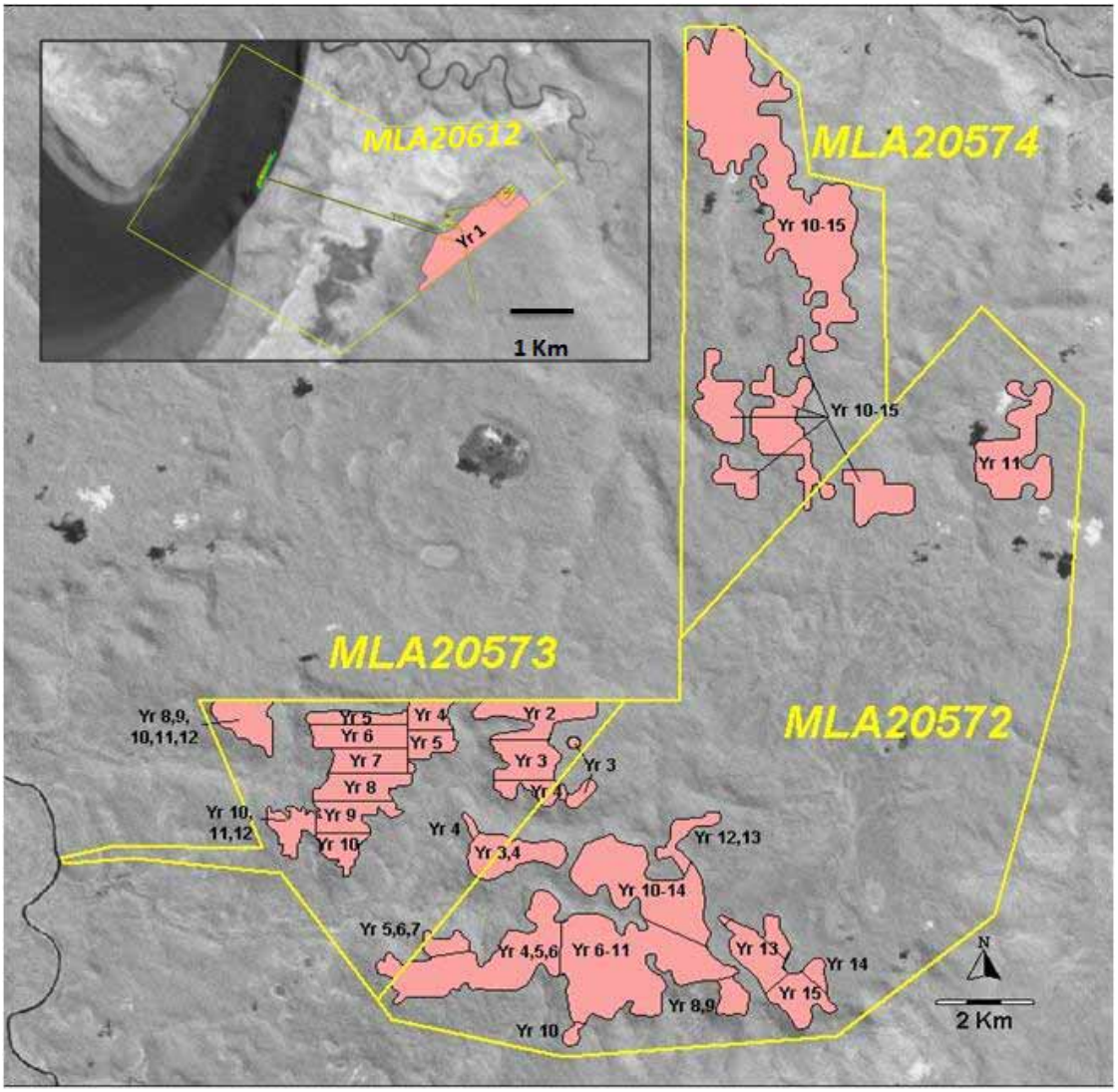

Figure 3-3: Proposed mining sequence at the Pisolite Hills mine and port project, including the Musgrave deposit.

3.9 Construction

Construction of the project will be staged over a number of years, with the timing dependant on when ramping up of production occurs. Construction stage one (Port Musgrave) will be conducted on MLA 20612 and lands within the Mapoon township (location of the Transport Hub). A transport corridor linking Port Musgrave with the Pisolite Hills mine area will also be constructed during stage one within ML 7024 and ML 7031 (these leases are operated by Rio Tinto). Construction and operational access will be negotiated with Rio Tinto. Construction stage two (Pisolite Hills) will be undertaken within the boundaries of MLA 20572, MLA 20573 and MLA 20574.

3.9.1 Stage one – Port Musgrave

Earth moving equipment will be initially transported by road via Bertiehaugh cattle station into the Pisolite Hills area to facilitate construction at the Port Musgrave site. Roads will be cleared sufficiently to allow access for construction. As the project infrastructure develops, primary access for construction will be via the barge and ferry facilities located at Port Musgrave on the Ducie River.

The following outlines key elements of stage one construction.

Bauxite loading wharf, barge landing and passenger ferry access

In order to facilitate the bauxite handling process and development of the project, a number of facilities are to be constructed at the barge loading facility on the Ducie River, including:

- Installation of dolphins and a small jetty for berthing vessels.
- Ferry jetty with connection road to the causeway road.
- Landing barge ramp and mooring for 200 t barge.
- Construction of a concrete lay-down area for movement on and off the landing barge.
- Area lighting.

The proposed layouts of the barge loading facility and associated infrastructure are presented in Figure 3-4 below.

Causeway conveyor and roadway

In order to connect the bauxite stockpile at Port Musgrave infrastructure area with the barge loading facility, a causeway will be constructed. The causeway will have a top width of 13 metres to accommodate a two-way road together with the bauxite load-out conveyor (see Figure 3-4, Figure 3-5 and Figure 3-6). The causeway will be approximately 1.6 kilometres in length, from the stockpile pad to the barge loading facility. Locally sourced fill material (from the adjacent ore body pit floor area) will be utilised to construct the causeway. The causeway's flanks will be armoured with locally quarried ironstone to inhibit erosion.

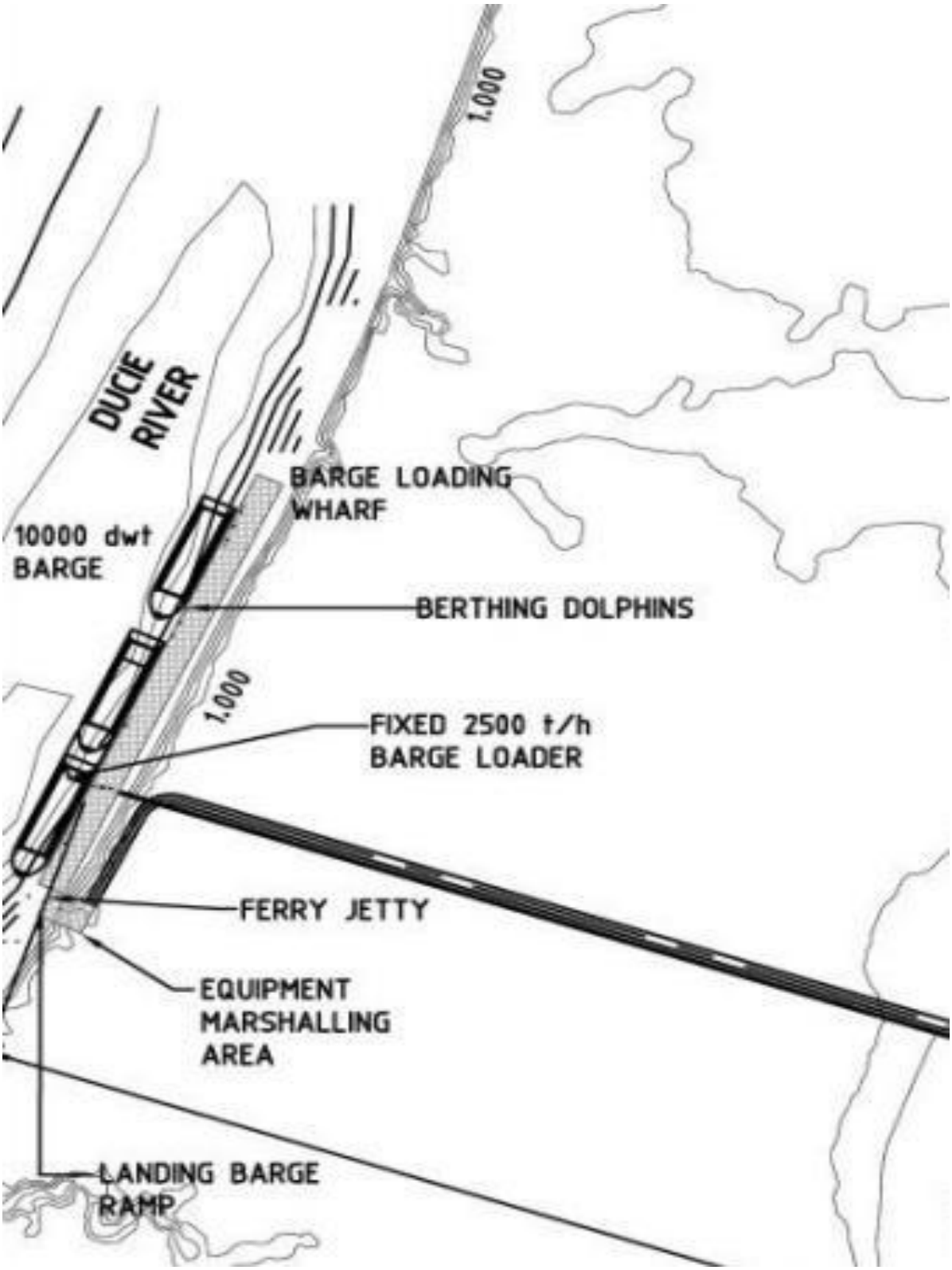

Figure 3-4: Port Musgrave infrastructure concept layout – Wharf.

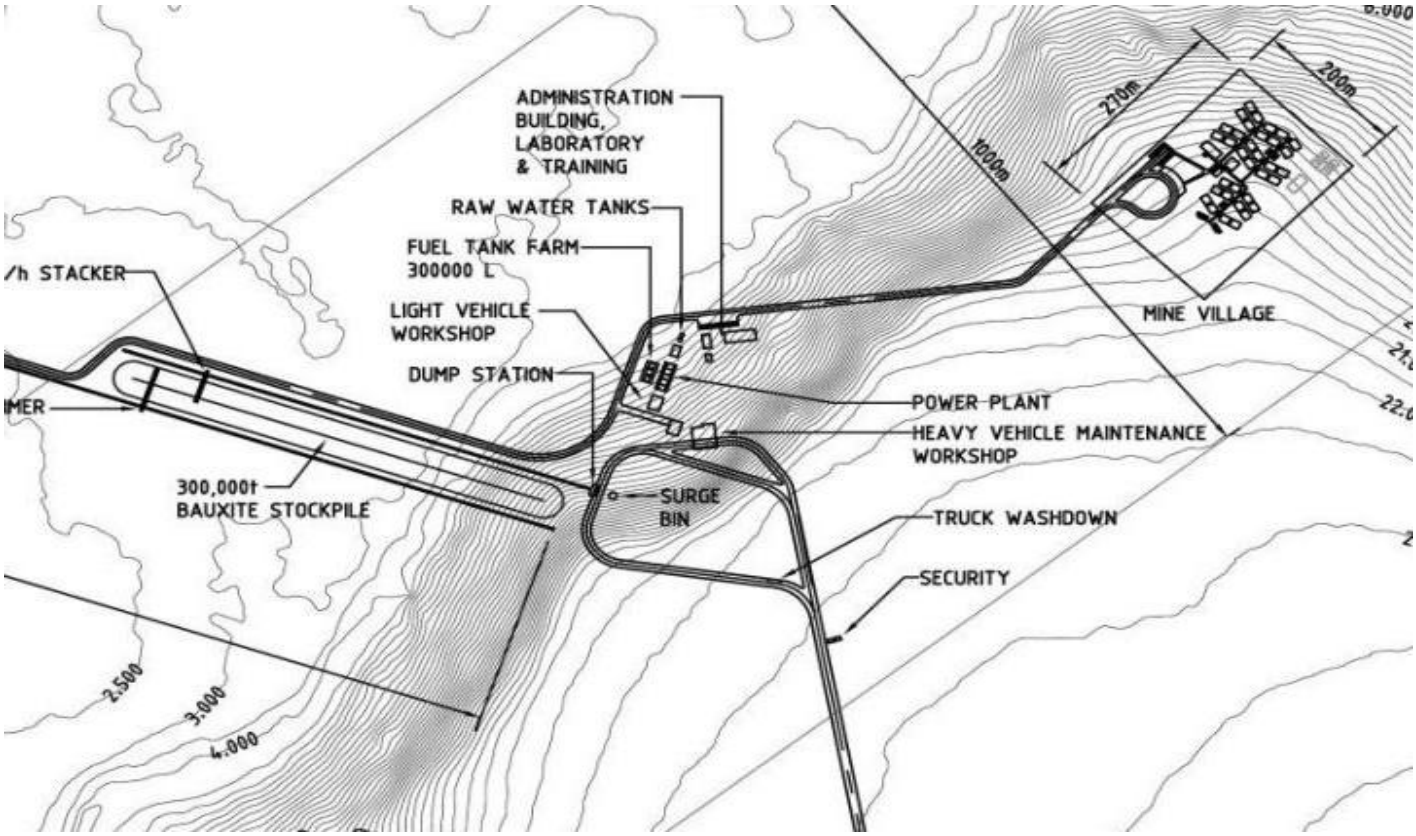

Figure 3-5: Port Musgrave infrastructure conceptual layout (stockpile, operations, and mine village).

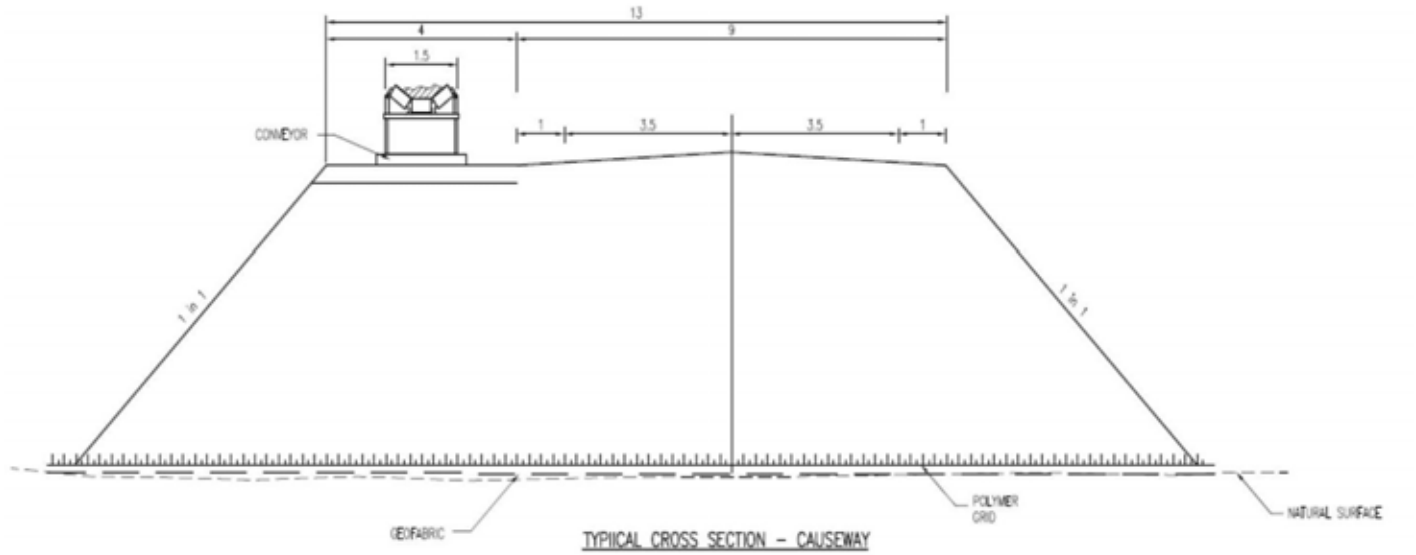

Figure 3-6: Causeway conceptual design.

Bauxite stockpile

The stockpile will be located on a prepared pad constructed from selected fill material from the Port Musgrave mine area. The stockpile will be 600 metres long, 50 metres wide and 18 metres high. There will be provision to selectively stack and blend product from different ore bodies.

Mapoon Transport Hub

A Transport Hub will be developed at Mapoon in order to facilitate movement of heavy plant and equipment by landing barge and to transfer personnel to and from the mine site by passenger ferry. The Mapoon airstrip will be upgraded. The Transport Hub concept will consist of the following:

- FIFO facilities for mine staff utilising an upgraded Mapoon airstrip.
- Barge landing for receiving and dispatching goods and equipment for use at the mine.
- Passenger ferry landing for transport of mine staff to and from the mine and the airstrip.
- Car park and lay down area.

Layout concepts are presented in Figure 3-7 below.

Figure 3-7: Proposed passenger ferry and barge landing of the Mapoon Transport Hub.

Access channel

The proposed navigation channel is based upon the 10,000 Dead Weight Tonnage (DWT) barge. The bathymetry of the preferred route limits the volume of dredging to approximately 230,000 cubic metres. Dredging would occur over a channel length of only approximately four kilometres, out of the total transit distance of 32 kilometres (that is, the distance between the barge loading facility on the Ducie River to the transhipment grounds in the Gulf of Carpentaria). Access to the barge and ferry landing facility of the Mapoon Transport Hub does not require dredging.

The minimum depth for the barge channel is -5 mLAT (depth in metres below lowest astronomical tide). The width of the proposed navigation channel is 106 metres wide between the barge berth and adjacent to Nameleta Creek. The channel widens to 121 metres to allow passing of vessels between Namaleta Creek and the entrance through the Cullen Point bar. It is proposed that construction of the channel would be via a trailing suction hopper dredge. Following dredging of the channel, navigation aids (floating or fixed) would be installed to mark the channel alignment. The proposed access channel alignment is presented in Figure 3-8 below.

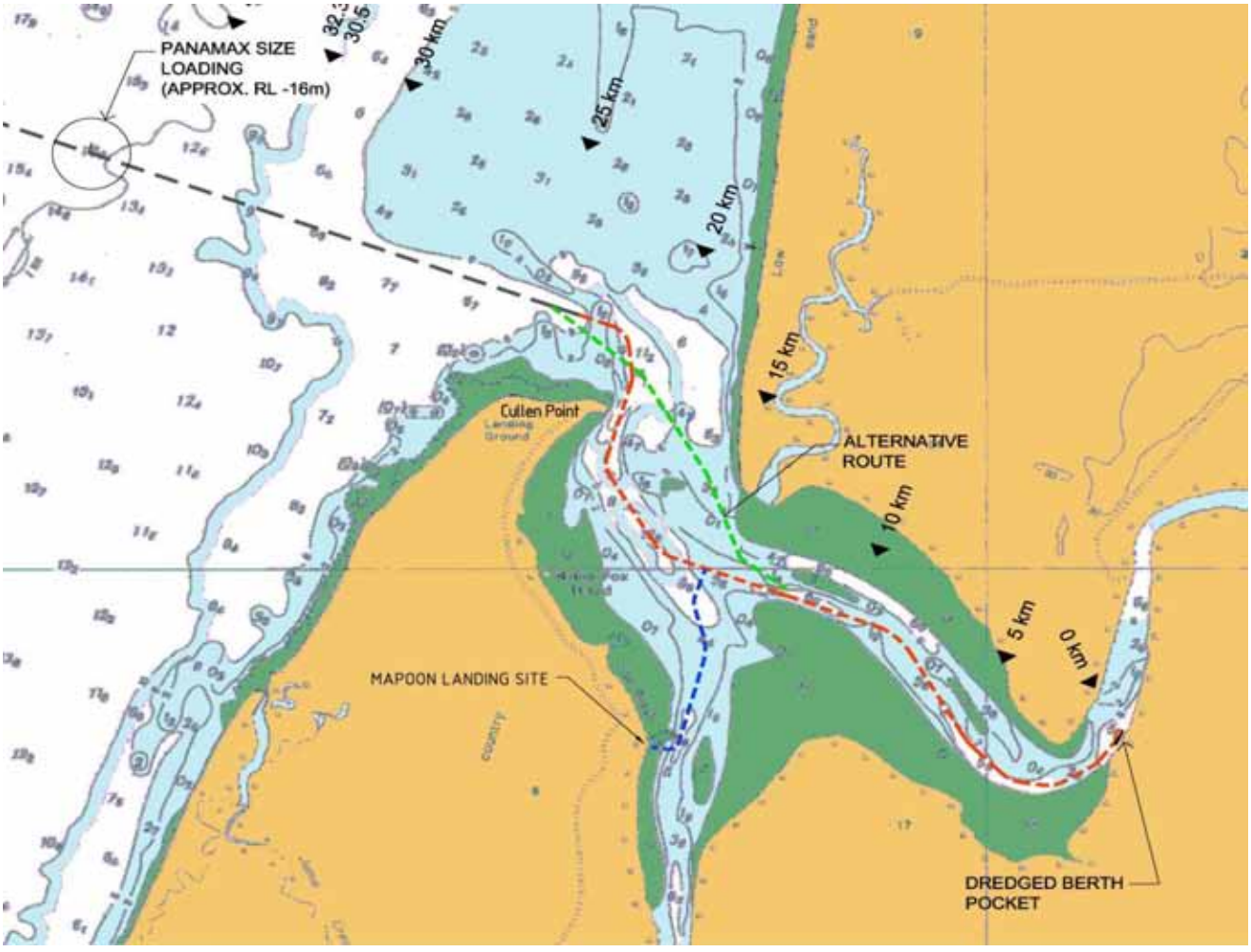

Figure 3-8: Proposed channel alignment (red and blue proposed alignments).

Transport corridor

A transport corridor linking Port Musgrave area and the Pisolite Hills mine area will be developed and include the following components:

- Unsealed mine access road approximately 34 kilometres long from Pisolite Hills to the port. This road will be designed to accommodate general mine traffic and low level usage of 350 t road-trains.
- Overland conveyor running parallel to the mine access road transporting bauxite to the port stockpile.

Process water

A water supply review is currently in progress to finalise options for securing the process water requirements of the Pisolite Hills project. The preferred raw-water abstraction and storage system (including two raw-water dams) will be constructed during stage one, with a third dam constructed during stage two in order to provide for the full capacity of the mine. The presently preferred option, sourcing water from the Wenlock River, will consist of surface water abstraction pipework, a pumping station and a water transfer network back to the Pisolite Hills beneficiation plants. Layout concepts are presented within Figure 3-9 below.

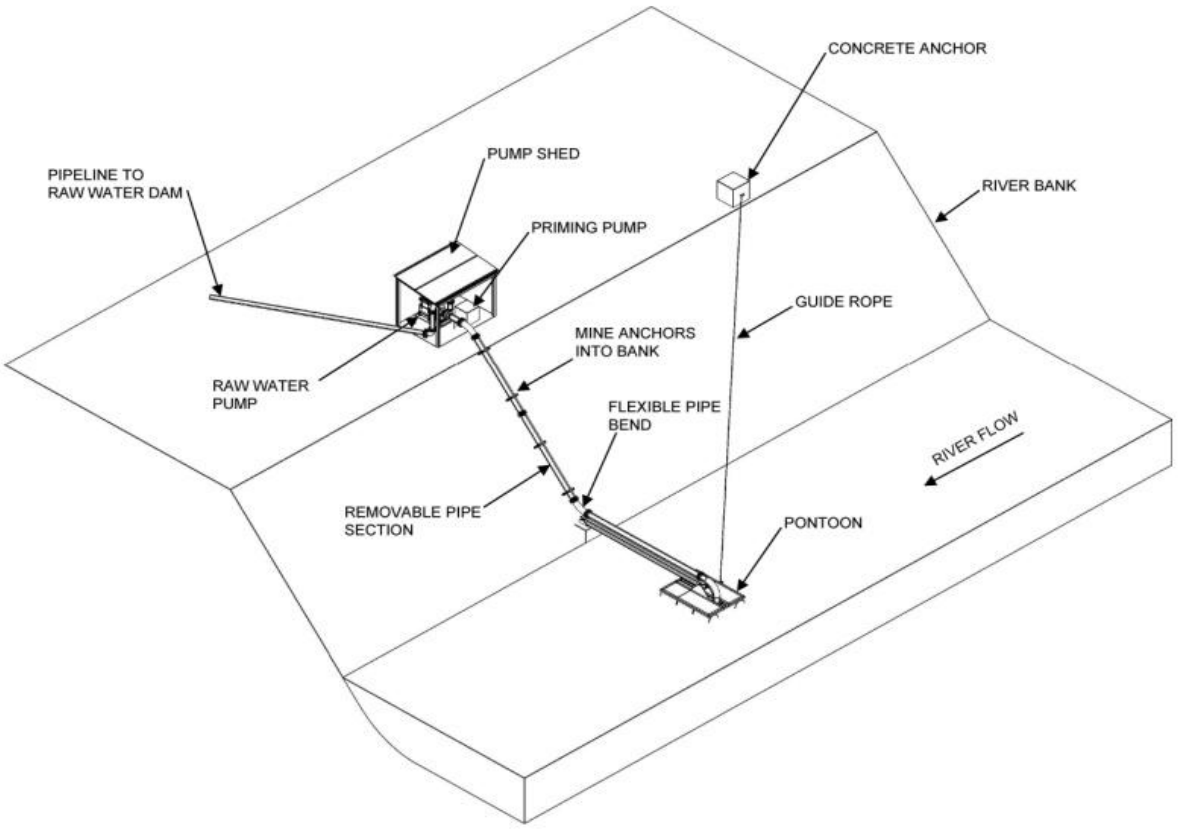

Figure 3-9: Conceptual layout of the Wenlock River pumping station.

Potable water

The water requirements for the Port Musgrave accommodation and administration areas will be provided via a shallow groundwater borefield adjacent to the accommodation development. Water at the Pisolite Hills mine area will also be sourced from shallow groundwater. Both sources of water will be treated via skid mounted portable treatment plants.

Sewage

Packaged Sewage Treatment Plants (STPS) will be constructed at Port Musgrave and the mine area. Effluent will be treated to Class B/A+ according to the Queensland Water Recycling Guidelines (2005) before being spray irrigated over suitable areas which will not impact surface or groundwater resources.

Airstrip

An upgrade of the existing Mapoon airstrip suitable for light aircraft would be included for the transport of personnel only. The airstrip will consist of a small unsealed runway approximately 1,200 metres long, 20 metres wide with a 25 metre turning node at each end of the runway and an open, roofed area suitable for limited equipment storage and waiting area. The airstrip will be constructed to meet the Royal Flying Doctor Service of Australia minimum standards. In order to facilitate the take-off and landing of Dash 8-300 aircraft at Mapoon, the following upgrades to the existing Mapoon airstrip are likely to be required:

- Airside infrastructure and facilities.
- Windsock, signal circle.
- Markers – gables, cones.
- Runway markings.
- Communications.
- Lighting.
- Access road.
- Car parking.
- Passenger waiting area.
- Fencing.
- Maintenance and management processes.

Mine accommodation village

During the construction of the accommodation village, personnel will be housed in temporary accommodation at Port Musgrave in a portable construction camp which can accommodate up to 200 staff. Upon its completion, the construction workforce will use the mine accommodation village. The following amenities are proposed to be provided:

- Transport terminus and locker room.
- Central facility including a coffee room, TV room, games room, gym and internet café.
- Village administration office including a training room and first aid room.
- Meeting / multi-function room.
- Kitchen sized to feed 100 persons on each shift.
- Dining room to accommodate 100 persons at one sitting.
- Recreation facilities (located within the central facility) including three TV / coffee lounges, two games rooms, gym and internet café.
- Convenience store (located within the central facility).
- First aid room (located within the central facility).
- Shared laundry.
- Maintenance facility and gardener's shed.
- Sports facilities including tennis court with fencing and lighting and a 25-metre lap pool.
- Four barbecue pavilions.
- Parking for 20 operations vehicles.
- Gatehouse at the village entrance.

3.9.2 Stage two – Pisolite Hills

The preliminary development of the Pisolite Hills mine area will occur during stage two. Vegetation clearance, topsoil removal and stockpiling and construction of access roads will all be conducted within the associated MLs. During stage two of construction, the first of two beneficiation plants will be constructed. The following plant, conveyors and other mining equipment will be progressively installed and commissioned:

- Bauxite mine with in-pit conveyors.
- Beneficiation plants together with fines handling infrastructure networks.
- Process water storage dams and pipe networks.
- Associated amenities, offices, workshops.
- Access roads within the mining lease.
- Raw water dams for water piped from the Wenlock River.

Conceptual layouts for the construction of the Pisolite Hills mine area are provided in Figure 3-10 below.

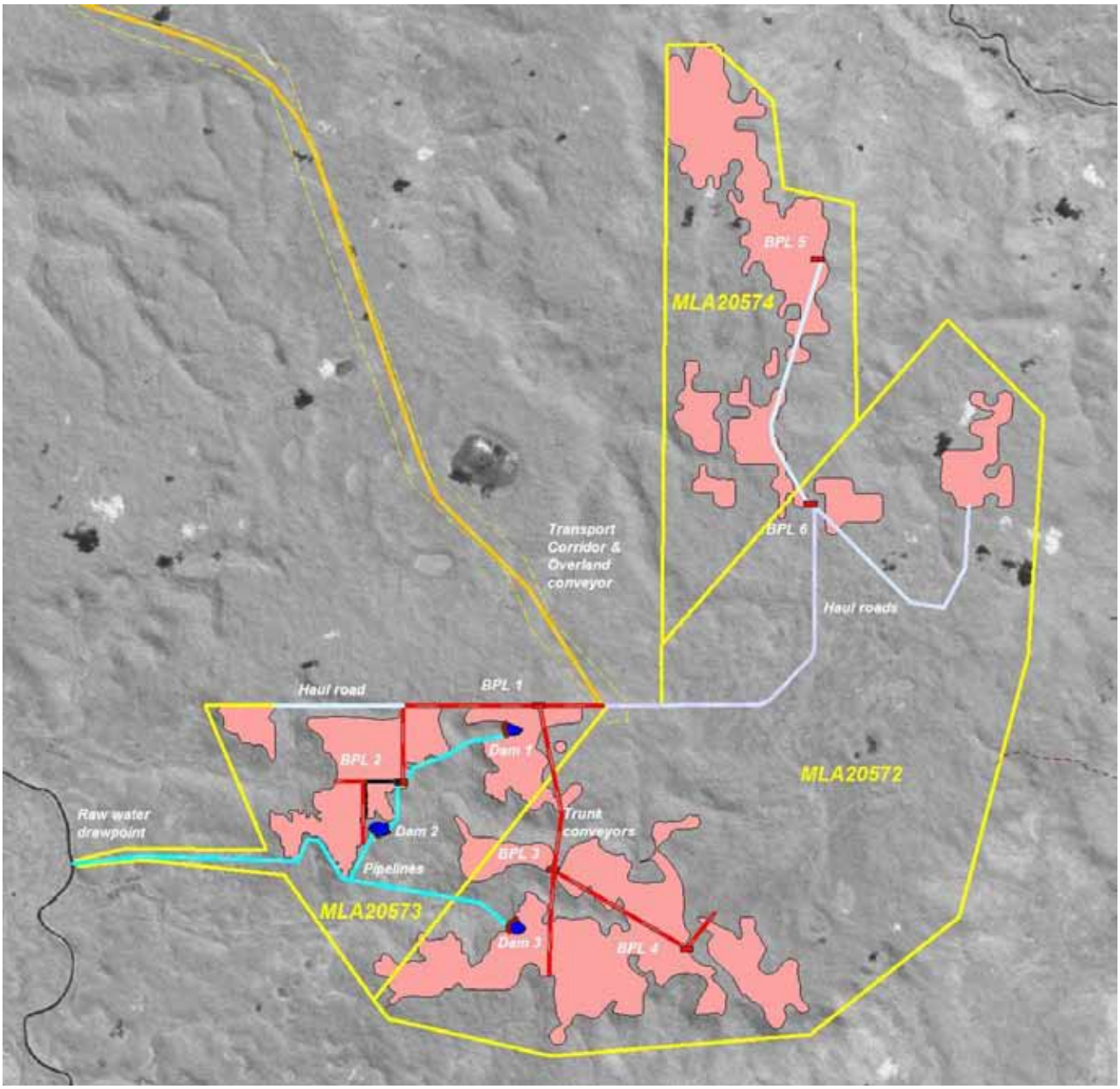

Figure 3-10: Conceptual layout of stage two constructions at the Pisolite Hills mine area.

3.10 Operations

Key elements in the proposed mining cycle including clearing, excavation, beneficiation, transport, management of reject fines, stockpiling, barge loading and transhipment are described below.

3.10.1 Land clearing

Each of the areas that are to be mined will be progressively cleared of trees and vegetation at a schedule considered best for the processes of regeneration. Topsoil will be removed from each mine panel and stockpiled as close as possible to each panel, as per the requirements of the rehabilitation

plan. Following topsoil removal, the overburden will be removed via Front End Loader (FEL) and stockpiled adjacent to the panel that is to be mined (see Figure 3-11 below).

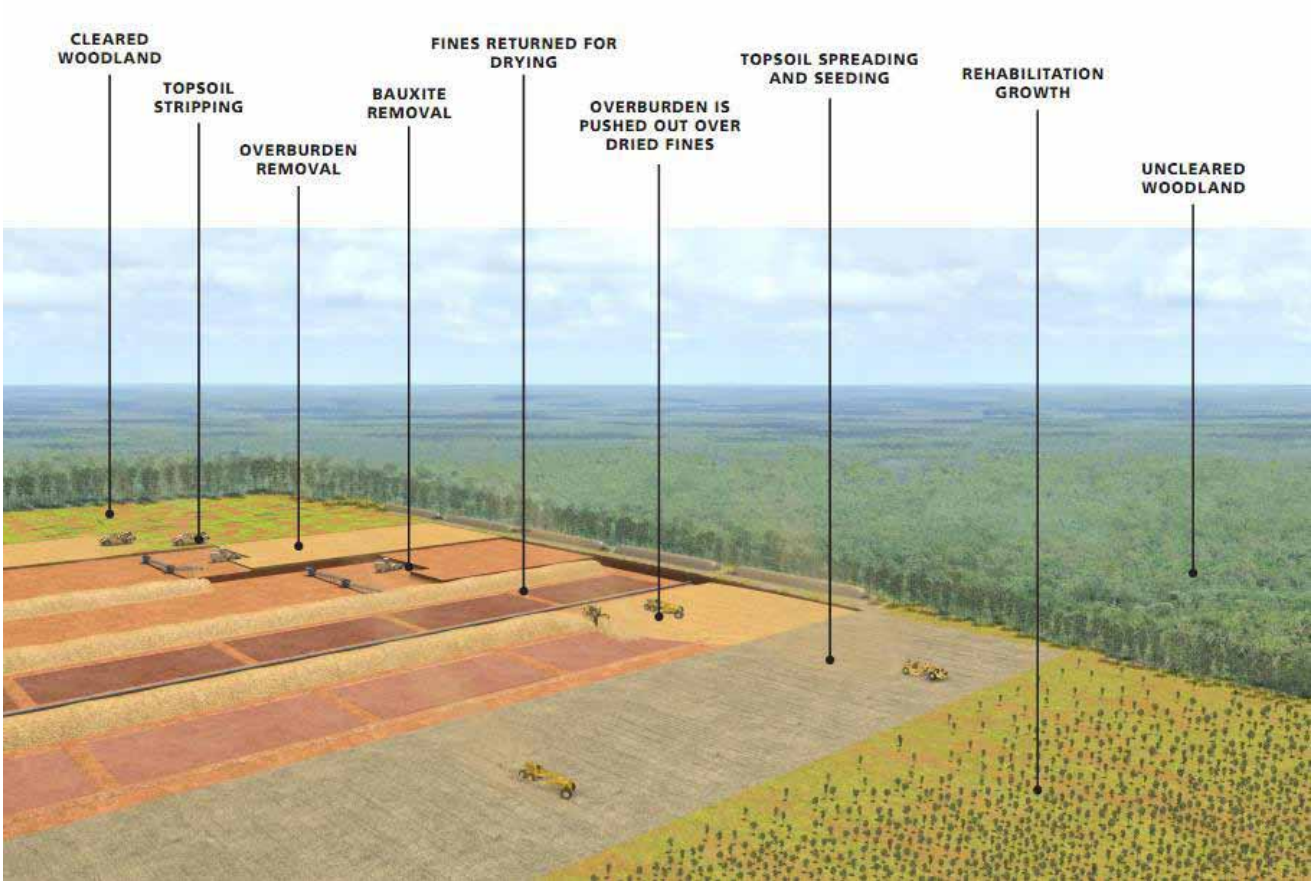

Figure 3-11: Mine staging diagram showing clearing, mining and progressive rehabilitation.

3.10.2 Bauxite mining

The Pisolite Hills project includes the development of seven bauxite ore resources (PH1 through to PH6 and the Musgrave deposit which is adjacent to the Ducie River facility). The mining method chosen for the Pisolite Hills deposit is a conventional open-pit bench mining operation. Panels may range between 70 to 100 metres wide by 1,000 metres to 3,000 metres long. The panels will be developed up to the depth of the ore body – an average of approximately 2 to 3 metres. The ore will be mined by FEL at the mine face at a nominal rate of 1,000 tph. The FEL will dump into a hopper for primary screening to remove oversize materials and debris. The hopper is mounted on a mobile face conveyor that tracks parallel to the advancing mining face. In-pit and overland conveyors will be used to transport the mined bauxite from each mine panel to beneficiation plants. Some ore reserves may not be suited to the development of conveyor systems so haul roads will be constructed between these ore reserves and the beneficiation plants. The extent of haul road development is to be minimised via final mine staging and design where practical to do so.

3.10.3 Bauxite beneficiation

Freshly mined ore will be delivered into the primary crusher at the beneficiation plant. Useable material from the primary crusher will be conveyed to the screening plant (this initial screen does not require the use of water).

Once separated from wood, rock and debris, the mined bauxite will be wet screened. The wet screening process employs sets of metal screens of particular mesh sizes that allow the commercially viable bauxite to be segregated from the rest of the soil material. Application of water to remove fines delivers a washed product for export. The resulting products from the wet screen beneficiation processes include the washed bauxite, coarse reject fines, and washwater incorporating fine sand, silt and clay fractions recovered with the water matrix. Washwater will be returned to the process water dams for recycling within the beneficiation process. Reject fines will be pumped to the fines holding dams to be constructed within the resource footprint.

3.10.4 Transport of beneficiated bauxite

The screened and washed bauxite will be transported from the beneficiation plants to the Ducie River barging facility via an overland conveyor or haul road that will be constructed along a primary transport corridor (see Figure 3-12 below).

Figure 3-12: Proposed conveyor alignment and access road.

3.10.5 Fines disposal areas

The Pisolite Hills EIS will further assess options of returning the washed fines to the mine void or to in-pit disposal dams. In selecting the preferred approach the EIS will consider issues such as rehabilitation, post mine landform, water recycling and groundwater management. The ultimate option for fines disposal will be that which best mitigates potential impacts to groundwater resources. Groundwater modelling is being undertaken to support the preferred design.

3.10.6 Stockpiling

A stockpile of 200,000 - 300,000 tonnes will be maintained near the proposed barge facility on the Ducie River. This material will be supplied via conveyor or haul road from the beneficiation plants. A stacker-reclaimer will be used to maintain the stockpile. There will be provision to selectively stack and blend product from different ore bodies to best manage ore quality for shipment. Bauxite ore will be transported from the stockpile to the barge loading facility via a conveyor system, running along a causeway across the saltpan and through the fringing mangroves which boarder the Ducie River. This conveyor will allow barges to be loaded quickly and efficiently by having an operational capacity of 4000-5000 tph. Figure 3-13 below shows the Proposed bauxite stockpile showing conveyor, bauxite stockpile and stacker-reclaimer.

Figure 3-13: Proposed bauxite stockpile showing conveyor, bauxite stockpile and stacker-reclaimer.

3.10.7 Barge facility and transhipment

Self-propelled, self-unloading barges of 10,000 tonnes capacity will be used for transhipment of bauxite to Panamax or Cape class bulk carriers. These barges will be approximately 130 metres long, 30 metres wide and operate a loaded draft of four metres. The barge facility would also be used for the transport of bulk fuels. A conceptual figure of the barge loading facility is shown in Figure 3-14 below.

Locations for the mooring of Panamax or Cape class vessels for the transhipment barging operation have been proposed off-shore from Port Musgrave, ranging in depths from -17mLAT to -20m LAT. Vessels will be loaded at anchor using the self-unloading barges (see Figure 3-15). No installed structures are proposed at these mooring grounds.

Figure 3-14: Concept of the bauxite barge loading facility on the Ducie River.

Figure 3-15: Concept drawing for self-unloading barges to be used for the transhipment of bauxite to waiting bulk carriers. Insert: Similar operations in the Spencer Gulf, SA – CSL Australia.

3.10.8 Rehabilitation and decommissioning

The rehabilitation program will progressively rehabilitate the land as mining is completed. Cape Alumina will:

- Ensure the area is safe.
- Consult with stakeholders on post-mining land-use.
- Progressively rehabilitate the site.
- Minimise the area cleared for mining.
- Reshape the land disturbed by mining to re-create a landform similar to what existed before mining.
- Reinstate natural drainage patterns.
- Minimise the potential for erosion.
- Rehabilitate the area with plant species consistent with post-mining land-use.
- Meet all statutory requirements.
- Monitor and maintain rehabilitated areas.

The rehabilitation program at the Pisolite Hills mine and port project will not only include the revegetation of disturbed land but also incorporate the following:

- Rehabilitation planning and reporting.
- Planning of soil handling.
- Seed collection, cleaning and storage.
- Rehabilitation monitoring.
- Rehabilitation maintenance (including weed and pest control).
- Completion and success criteria development and application.

3.10.9 Stormwater management

The main objectives of the proposed stormwater management are:

- Divert surface run-off from adjoining areas around the initial mine excavations and facilities precincts.
- Minimise impact on mine operations.
- Control erosion and sedimentation on rehabilitated areas.
- Minimise sediment loads in storm runoff.
- Minimise impact on natural drainage lines.

Stormwater management plans (SWMPs) will be developed with the main aim of minimising water quality impacts, and hydrological impacts that may be attributable to the development.

3.10.10 Water resource management

Water demand

The water demands for various sectors of the project site have been estimated as follows:

- Port Musgrave Mine Village / Accommodation Camp and infrastructure areas – raw water will be obtained from a local borefield and treated. Some of this water will be employed to cool the power generation plant, for the truck wash system, dust control and fire service. Potable quality water will be generated via a water treatment plant at a rate of 300 litres per person per day (l/p/d).
- Mine area process water - the main use of water in the mine area will be to supply the two beneficiation plants with a washing medium and for dust suppression. It is anticipated that the rate of water usage by each beneficiation plant will be approximately 877 t/h (proposed use of two beneficiation plants when at full production).
- Mine services area fire water – required flow of water = 180 m^3/hr (50 l/s) at a water pressure of 350 kilo Pascals (kPa).
- Mine Village fire water – required flow of water = 180 m^3/hr (50 l/s) at a water pressure of 350 kPa. Planned reserve of fire hydrant water = 4h and fire sprinklers = 90 mins.

Storage

Once the water has been abstracted from each source and treated, it will be stored as follows:

- Port Musgrave Mine Village / Camp and infrastructure areas – will be stored in two tanks, each of 500m³ capacity. A portion of the utility water will be treated in a potable water treatment plant (30m³/day) to produce drinking quality water. Treated water will be stored in two dedicated potable storage tanks of 15m³ capacity.
- Mine area process water - Wenlock River water will be pumped via the raw water pipeline (approximately eight kilometres in length) to the raw water dam whose storage capacity will be approximately 1500 ML (storage split between two or three dams).
- Mine services area fire water – water held in the raw water dam will act as a supply of fire water when required, at a flow rate of 180m^3/hr (50l/s) and a water pressure of 350 kPa.
- Mine Village fire water – fire water will be stored in a dedicated section of the two 500m³ storage tanks referred to above.

Recycling

The following water conservation and recycling initiatives are proposed for the Pisolite Hills mine site and Port Musgrave:

- Recycling of beneficiation and reject fines disposal water back into the process water ponds.
- Collection of stormwater runoff from the bauxite plateau in the raw water storage dam.
- Collection of building-roof run-off into rainwater storage tanks and use as non-potable water (for example, that which is required for flushing toilets and garden watering).

3.11 Workforce requirements

Table 3-4 below provides a summary of the direct labour force that will be engaged during the construction, commissioning, operation, rehabilitation and decommissioning phases of the project.

Project phase	Numbers	Accommodation	Transport	Employment
Site Clearance	20	Camp	Fly from Cairns to Weipa, drive to the Pisolite Hills site via Peninsula Development road and Bertiehaugh Station road.	Temporary
Construction	200	Camp	Fly from Cairns to Weipa, drive to the Pisolite Hills site via Peninsula Development road and Bertiehaugh Station road. Once construction of barge berth and causeway complete, access will be as for operations.	Temporary
Commissioning	10	Mine village	Fly from Cairns to Mapoon, ferry to Port Musgrave.	Permanent Cape Alumina operations staff plus contractors and equipment vendors.
Operations	260	Mine village	Fly from Cairns to Mapoon, ferry to Port Musgrave.	Permanent
Rehabilitation	During operations	Mine village	Fly from Cairns to Mapoon, ferry to Port Musgrave.	Permanent
Decommissioning	12	Mine Village	Fly from Cairns to Mapoon, ferry to Port Musgrave.	Permanent

Table 3-4: Summary of direct workforce numbers, accommodation, transport and employment.

3.11.1 Fly-in Fly-Out

The project workforce will be developed from a combination of locally sourced employees and regionally sourced employees based on a FIFO system. The project area is remote with access to local residential workforce at Mapoon and Weipa. Under the ILUA that Cape Alumina will negotiate with the Traditional Land Owners, Cape Alumina plans to employ up to 25 percent of Traditional Land Owners and local Aboriginal people, with the option to increase this target as the project progresses and the 25 percent milestone is reached. The remainder of the employment opportunities will be filled by FIFO direct from Cairns and the Far North Queensland region.

4. EXISTING ENVIRONMENT, IMPACTS AND MANAGEMENT

4.1 Overview

Potential impacts from the project may include the following.

Construction

- Disturbance to terrestrial and marine vegetation due to infrastructure development.
- Disturbance to terrestrial and marine species.
- Modification to surface water features.
- Surface erosion and reduction in water quality.
- Modification to coastal processes from dredging.
- Reduced marine water quality from dredging, dredge spoil disposal and disturbance to Acid Sulphate Soils (ASS).
- Modification to visual amenity through construction of all project elements.
- Accidental pollution.
- Noise and vibration including piling for the marine construction.
- Dust emissions.
- Construction traffic (marine and land based).
- Construction process wastes.

Operation

- Noise and dust generation from fixed and mobile plant.
- Disturbance of terrestrial vegetation during mine development.
- Disturbance to terrestrial and marine species.
- Water extraction from the Wenlock River.
- Potential alterations to the groundwater regime.
- Surface erosion and water quality impacts.
- Maintenance dredging.
- Pollution and spill events.
- Altered surface hydrology within the mine footprint.

4.2 Land use

4.2.1 Existing environment

The project footprint is underlain by DOGIT lands, pastoral lease and adjacent mining leases. Grazing is undertaken within Bertiehaugh Station with the remainder of the land being undeveloped. The nearest township is located at Mapoon.

4.2.2 Impacts and management

Rehabilitation will be progressive over the life of the mine. The final landform will be developed to maintain existing surface and groundwater regimes. Future land use targets include conservation and grazing. Discussions will be had with the traditional owners and local pastoralists with regards to the final design. Cape Alumina will prepare a detailed land rehabilitation management plan which will guide the process of progressive rehabilitation and decommissioning.

4.3 Geology, soils and sediments

4.3.1 Existing environment

Geology

Bauxite occurs on plateaux as the upper part of the geological sequence. Alluvial deposits of silt, clay and minor sand occur in the gullies and valleys associated with rivers and creek systems draining the plateaux. The bauxite is formed from weathering and leaching of shales and siltstones of the underlying Bulimba Formation and Lower Rolling Downs Group. This has resulted in a classic lateritic profile; the upper bauxite layer grades at depth into ferricretes which in turn grade into mottled kaolinite and silty clays with some sandy clay layers (primary groundwater holding strata, and includes sand and gravel aquifers). These clays grade into the parent rock, generally dark grey shales and siltstones. Figure 4-1 below provides a schematic of the geological formations which occur beneath the bauxite ore bodies of the project area.

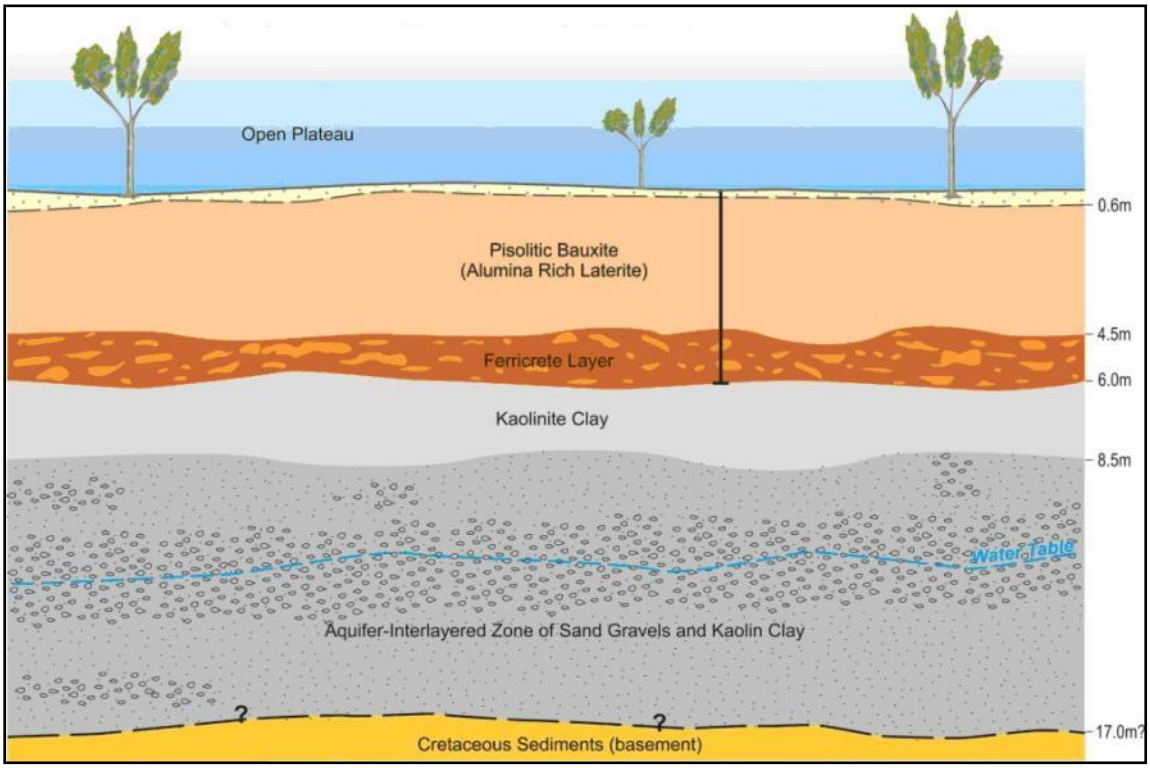

Figure 4-1: Schematic of the lithological profile beneath the bauxite plateaux at Pisolite Hills.

Soils

The project site is covered by six different soil types classified as the Tepiti, Ducie, Evans, Mapoon, Dulhunty and York Soil Management Units (see Figure 4-2).

The Tepiti Soil Management Unit consists of a brown, grey/brown sandy clay to a depth of approximately 20 centimetres before transitioning to a strong red, red/brown clay loam. This soil is found predominately on the upper areas of the plateau and supports vegetation communities of Darwin Stringybark Woodland and is the dominant soil type of the region.

The Ducie Soil Management Unit consists of a sandy loam in the upper horizon becoming a light clay to clay loam at depth. The soil is grey brown to grey and is moderately acidic. The soil is found in the depressions and drainage lines of the plateau and is often inundated during the wet season. It supports vegetation communities of Broadleaved Teatree Open Woodland and Weeping Teatree Drainage Swamp.

The Evans Soil Management Unit consists of a brown sandy clay transitioning abruptly at a depth of 30 centimetres to a yellow/red clay loam. It is found on the edge slopes of the plateau. It supports vegetation communities of Darwin Stringybark Woodland.

The Mapoon Soil Management Unit consists of a sandy clay but displays a prominent colour change at a depth of approximately 20 centimetres. This soil is found high on the plateau, inter dispersed with the Tepiti Soil Management Unit and supports vegetation communities of Darwin Stringybark Woodland.

The Dulhunty Soil Management Unit consists of a clay loam in the upper horizon transitioning to a medium clay in the lower horizon. This soil is moderately acidic and has a low fertility. This soil contains more alluvial material than other soils on the project site and is found in the lower drainage lines. This soil supports vegetation communities of Fringing Riparian Forest.

The York Soil Management Unit consists primarily of recent alluvial deposits found on often inundated flats. The surface soil can be described as grey clay, with high concentrations of chloride and elevated electrical conductivity readings. These characteristics are consistent with regular inundation from brackish water. These soils are naturally saline and are moderately acidic. The soil supports vegetation communities of mangrove low, closed-forest fringing the watercourse lines and bare patches or small halophytes dominating most other areas.

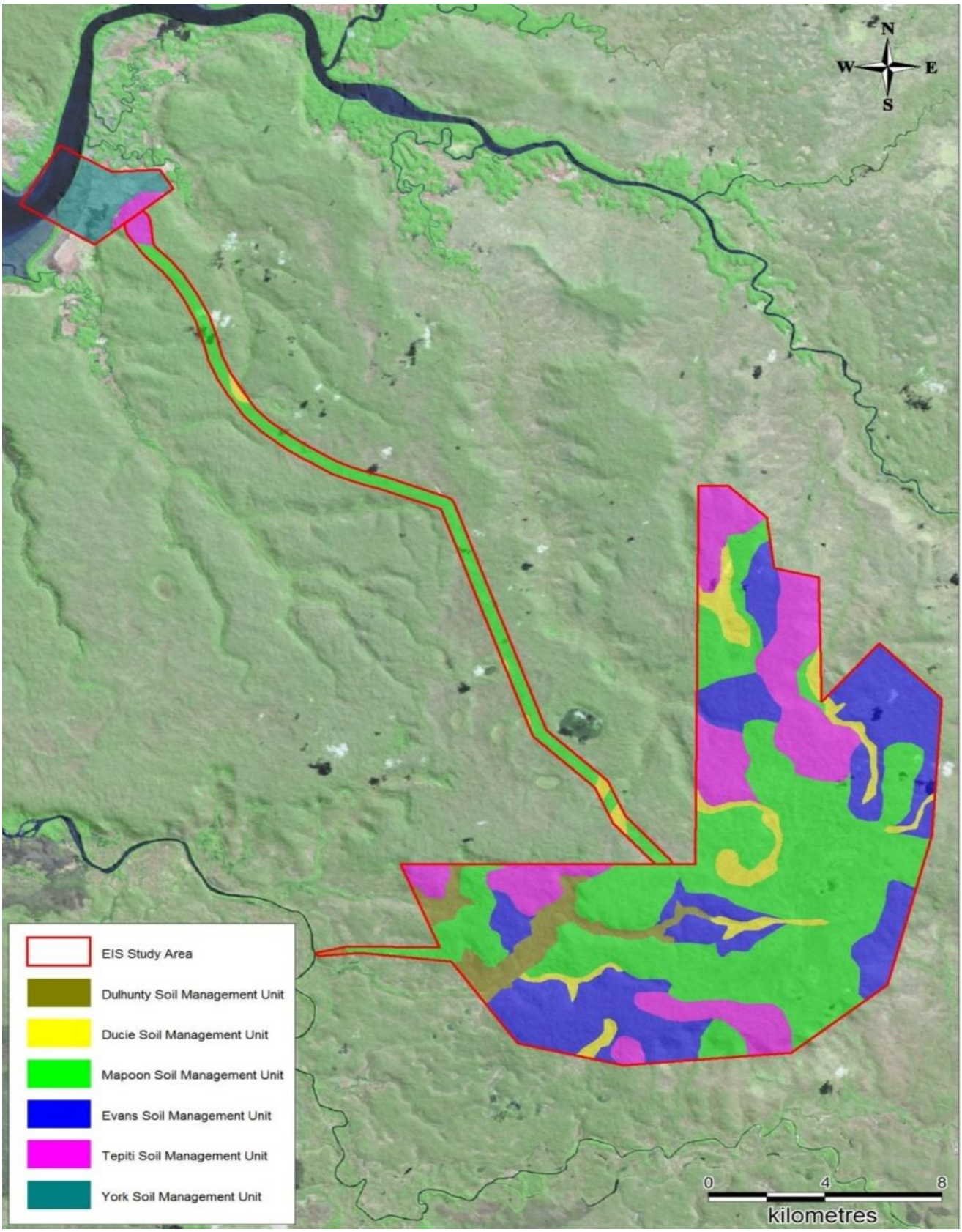

Figure 4-2: Soils of the Pisolite Hills mine and port project area.

Acid Sulphate Soils

The Australian Soil Resource Information System (ASRIS), developed by the CSIRO, has provided predictive ASS mapping throughout the project area (see Figure 4-3). From the ASRIS mapping the port, stockpile area and causeway have the potential for the occurrence of ASS. Mangrove, saltpan and saltmarsh habitats contain the greatest potential for ASS, decreasing within the grasslands through to the base of the escarpment. The remainder of the project infrastructure, including the transport corridor and mine development, have an extremely low probability of containing ASS due to their elevation and soil characteristics. Low lying wetlands and blind drainages may create conditions with the potential for ASS, though the project footprint does not disturb these locations.

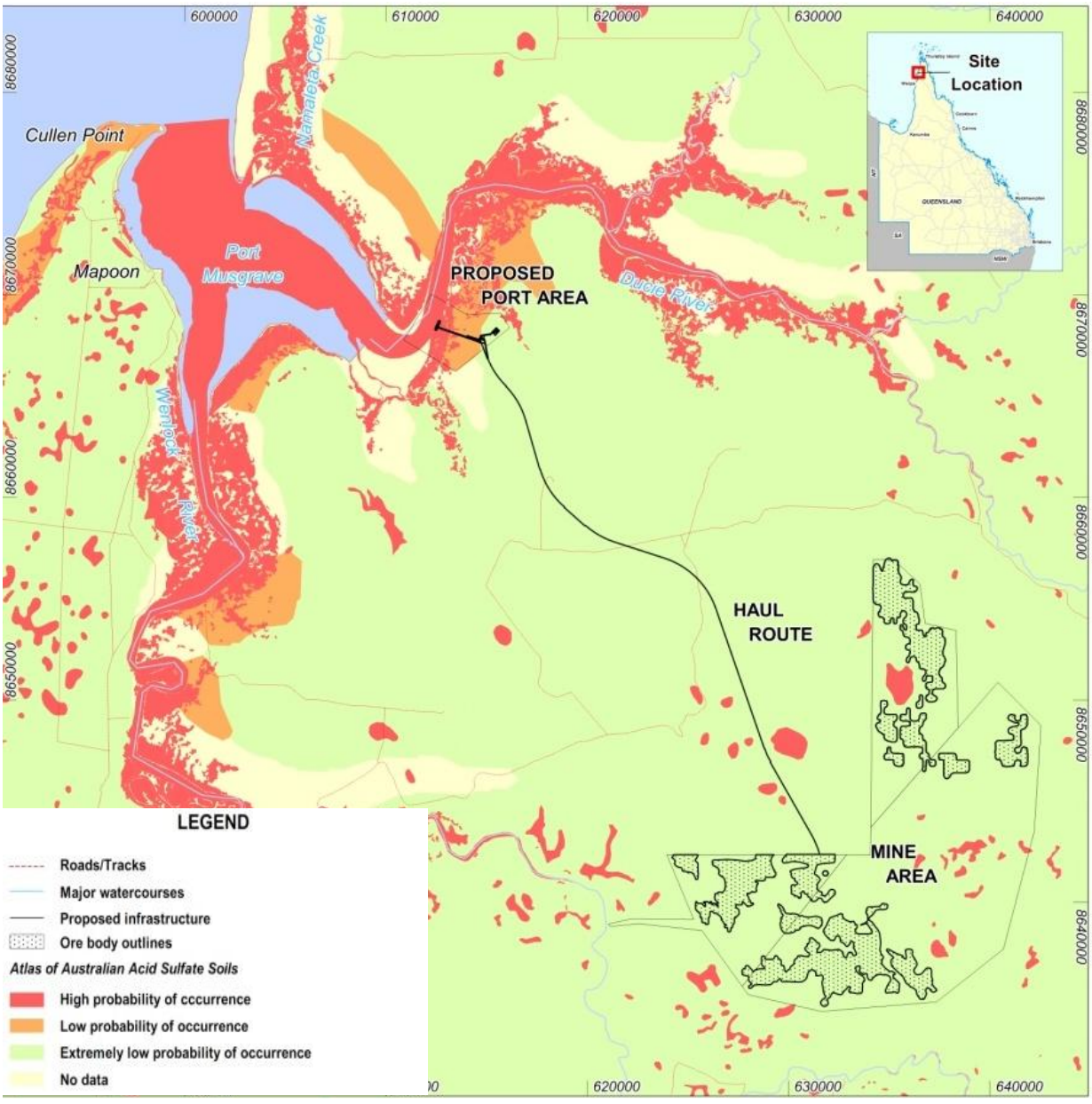

Figure 4-3: Predicted distribution of Acid Sulphate Soils (ASS) in the Pisolite Hills mine and port project area.

Contamination

Cape Alumina has conducted a screening assessment for basic contaminants, including metals and hydrocarbons. Results conclude soils represent background conditions with no evidence of previous contamination impacts.

Dredge sediments

Investigations have been completed by Cape Alumina within the proposed dredge areas of Port Musgrave. Sediment sampling was conducted in accordance with the National Assessment Guidelines for Dredging (NAGD). Confirmation was received from the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) that the sediments presented no chemical restrictions to unconfined ocean disposal.

4.3.2 Impacts and management

Acid sulphate soils

While a comprehensive assessment of ASS could not be supported at this early stage due to an absence of detailed layouts, implementation of an ASS investigation according to the required guideline standards is recommended within the Environmental Management Plan (EMP), this will include the development of an ASS management plan. Pre-construction surveys of the port, causeway alignment, and proposed stockpile area, will be undertaken and treatment incorporated into earthworks design where required.

Contamination

Cape Alumina has completed an analysis of contaminating processes and activities for consideration during the construction and operational phases of the Pisolite Hills project. Key contaminating processes during construction include fuel transport, storage and handling, infield equipment maintenance and general waste management, including management of sewage wastes from the camp. Operational management issues also include fuel transport, storage and handling (above ground storage and fuel pipeline networks). Workshop facilities will be constructed, and a dedicated sewage treatment and irrigation systems installed. Wastes from these facilities may have the potential for contamination. Marine operations, including refuelling, fuel offloading and general port operations can also lead to marine contamination. A complete risks assessment will be completed as part of the EIS and a management plan developed for the management, control and monitoring of key processes. Monitoring and validation surveys during site decommissioning and rehabilitation will also be described.

Dredge sediments

An approved sediment monitoring program will be developed to support periodic maintenance dredging campaigns. This program will be developed in compliance to the National Assessment Guidelines for Dredging (NAGD).

4.4 Surface water

4.4.1 Existing environment

Waterways

The study area comprises an extensive plateau system that extends approximately 40 kilometres from the mine leases to Port Musgrave, numerous creeks drain to the Wenlock River to the south and west or north to the Ducie River. The proposed southern mine areas, PH1 to PH4, are located within broad plateaux and encroach into several local catchment including Ling Creek, Sandfly Creek, Charger Creek and other minor creeks draining to the Wenlock River to the south and west. The proposed northern mine areas, PH5 and PH6, are located along ridgelines near the headwaters of Bertiehaugh Creek, Catfish Creek, Packers Creek and other creeks draining northwards to the Ducie River. The location of the mining project and the major watercourses are presented in Figure 4-4 below.

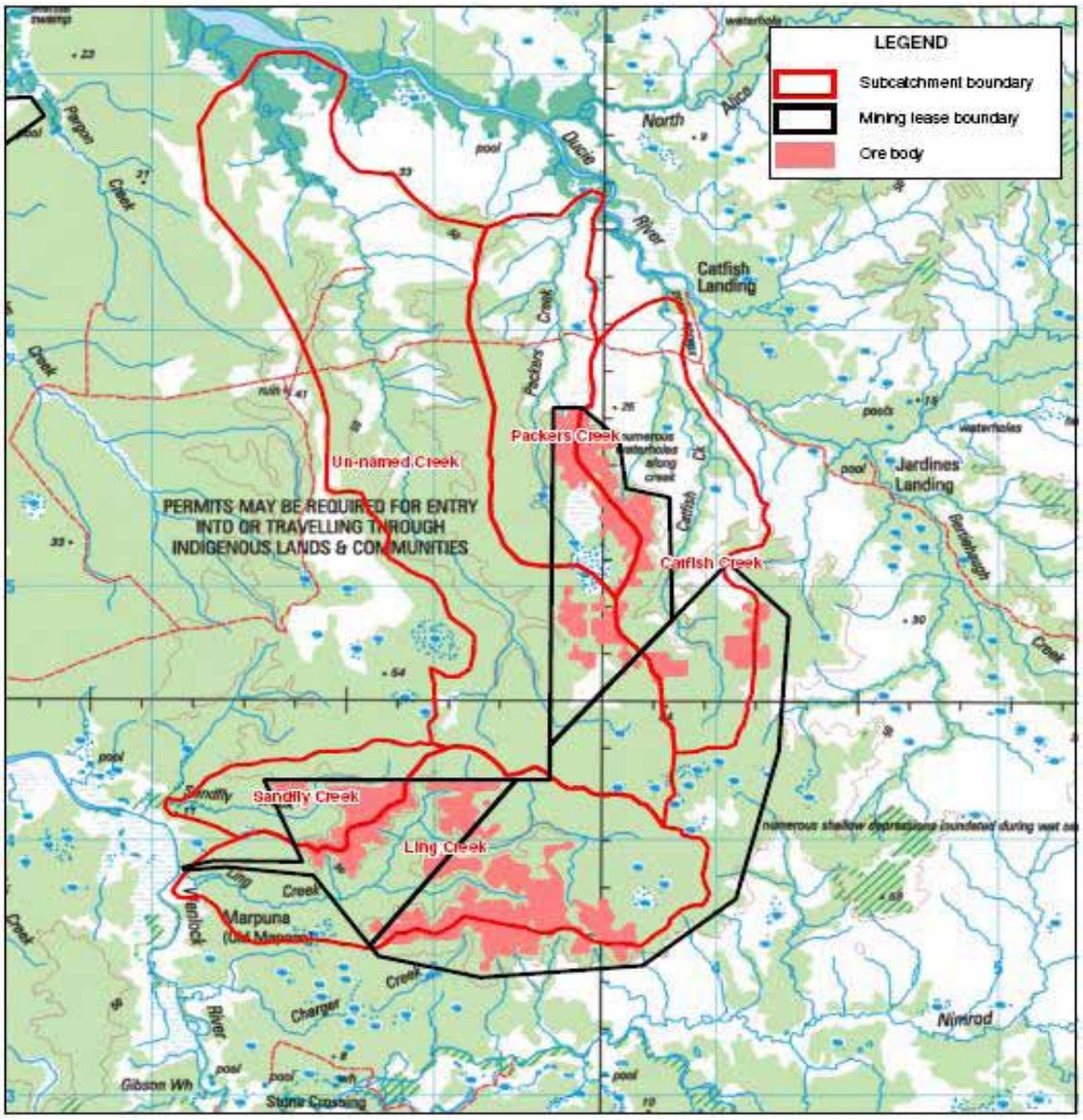

Figure 4-4: Waterways and catchments of the Pisolite Hills mine area.

Ling Creek and Sandfly Creek are the main waterways within the proposed southern mining area. Although these creeks are fed by perennial groundwater springs, surface flow to the Wenlock River ceases during the dry season, though the spring waters continue to flow within the bed sediments. Pools and runs have formed immediately downstream of the spring systems. These features remain during the dry season, restricting as the season progresses, along with the springs discharge volumes. Field inspections indicate that the creeks draining to the Ducie River from the northern mine area do not exhibit similar surface spring expressions and flow only during the wet season and for a short time after.

The Wenlock River is tidal below Stone Crossing, approximately 17 kilometres upstream of Ling Creek. This is due to the tidal prism which forces freshwater back upstream. The proposed water extraction point in the Wenlock River is influenced by this tidal prism, though remains fresh throughout the year.

Water quality

The sampling has shown that the streams and springs are not contaminated, and represent natural water conditions.

Flooding

Flooding of coastal plains, saltmarsh and mangrove communities occur every wet season, this will include the proposed port infrastructure area, the ferry and barge facility of the Mapoon Transport Hub and the water extraction point within the Wenlock River. The mine area, transport corridor and infrastructure developments behind the export stockpile will remain above the extent of seasonal inundation.

4.4.2 Impacts and management

Hydrology and water quality

Key potential impacts on surface waters arising during construction and operation include:

- Changes to the catchment area and hydrology of the Pisolite Hills mining area, including run-off and infiltration.
- Clearing of vegetation and exposure of soils and sub soils to erosive forces.

The proposed development does not incorporate any direct release of effluent or waste water discharges to the surrounding waterways. The irrigation of treated effluent will be fully utilised on-site as part of the facility landscaping. The use of washwater in the bauxite beneficiation process will maximise recycling and reuse. However, large proportions will be lost to surficial groundwater as part of the replacement of washed fines to the fines disposal dams. Given the identified rapid percolation of surface water from rainfall to the underlying gravel aquifer of the Bulimba formation, it is likely that washwater will make its way to groundwater reserves under a similar process.

The process of washing the bauxite does not release any contaminants of potential concern. Samples taken, washed and analysed under laboratory conditions as part of earlier Pisolite Hills project investigations resulted in water quality of a standard suitable for direct surface water release (ANZECC/ARMCANZ, 2000).

The proposed surface water mitigation and management measures to be implemented to minimise changes in flow, erosion and sedimentation include:

- Modelling changes to surface run-off and infiltration and preparing a mine landform which minimises changes to existing hydrological regimes.
- Construction of low bunds or excavation of drains to divert runoff from upslope areas around work areas.
- Erection of silt fences around the perimeter of areas where vegetation has been removed in preparation for mining of ore.
- Surface runoff from work areas to be directed to temporary sediment traps.
- Construction of flow spreaders at discharge outlets to prevent concentrated flow.

Flooding

The export port, Mapoon Transport Hub, and the raw water pumping facility for the mine are the only components of the project located on the floodplain and potentially at risk during major flood events. A flood study has addressed flooding at the port facilities as well as projected change in water levels in the Gulf resulting from climate change.

The proposed minimum design levels provide adequate freeboard for flood events significantly larger than the adopted design flood and also account for the adopted design flood with a 300 millimetre rise in sea level due to projected sea level rise and or higher storm surge water levels.

Post development analysis has also been undertaken to assess the impacts of dredging the proposed navigation channel, construction of the bauxite loading facility and access causeway on the Ducie River and the barge and passenger ferry terminal at Mapoon. No impacts to existing hydrology have been identified.

It is proposed to remove the raw water pumps from the Wenlock River off-take prior to the commencement of the wet season each year in order to prevent flood damage to the raw water pumping facility.

4.5 Marine water

4.5.1 Existing environment

Typical of northern Australian estuaries, both the chemical and physiochemical water properties of Port Musgrave are driven by wet and dry season conditions. The dry season extends for approximately eight months of the year and as such these rivers receive minimal freshwater input for the majority of the year (Ridd and Stieglitz, 2002). Both rivers are described as partially well-mixed

tidal estuaries (Wolanski, 1986, Wolanski and Ridd, 1986). During the dry season water cycles in the rivers are driven by evapotranspiration (Wolanski and Ridd, 1986) which leads to an increase in salinity within the estuaries as the dry season progresses (Wolanski and Ridd, 1986; Cyrus and Blaber, 1992; Ridd and Stieglitz, 2002). Turbidity is also influenced by the seasonal rainfall with turbidity levels lower during the dry season, particularly towards the end of the season (Cyrus and Blaber, 1992).

Monitoring showed that dry season salinity of the Port Musgrave estuary and lower reaches of the Wenlock River and Ducie River ranged between 34.7 parts per thousand (ppt) and 37.9 ppt. This is substantially different to the wet season range of 0.33 ppt to 33.4 ppt. Turbidity ranged between 0.0 nephelometric turbidity units (ntu) and 600 ntu, being the lowest during the dry season (mean - 13.5ntu) compared to the wet season (mean - 65.4ntu). In addition to a broad seasonal variability, physical water quality parameters including salinity, turbidity, pH and oxygen concentration also change substantially during the change of tide. Waters draining the extensive mangrove systems of the Wenlock and Ducie Rivers can exhibit rapid fluctuation in these parameters in a matter of hours.

Chemical water quality conditions exhibit no apparent affects associated with historical or existing land use. In the absence of adjacent anthropogenic inputs, naturally occurring elevations in nutrients (ammonia and phosphorous) and some metals are considered a feature of these biologically productive, turbid and tidally dominated tropical estuary system.

4.5.2 Impacts and management

Water quality

Impacts to marine water quality are likely to be encountered during both dredging of the channel and facility operation. The processes of dredging, off-shore disposal, wharf construction and development of the causeway across the saltmarsh will impact water quality over the short term to varying degrees. Impacts to long-term water quality during operation will include maintenance dredging, barge and vessel movements.

Although water quality will be impacted during these processes (particularly via release of sediment), the actual receptors are the prevailing benthic assemblages, which have developed their distribution according to physical substrates and a complex relationship of prevailing water quality regimes. In the case of seagrass, the role of water quality variation, and changes in available light, appear to drive a substantial seasonal change in distribution (approximately 600 hectares (ha) during the wet season to approximately 1,200 ha during the dry season). This opportunistic response to improved conditions is facilitated by a general improved water quality regime following the end of the wet season.

Overall, the affects upon water quality during construction and operation of the proposed development are considered of minor impact. Risks associated with the spillage of chemicals are considered low, with the handling of hydrocarbons at the wharf possibly the largest risk factor. However, given the standard practices applied to the design and operation of handling facilities, available response strategies and clean-up procedures would provide suitable management in the unlikely event of a release or spill.

4.6 Coastal processes

4.6.1 Existing environment

Port Musgrave is set in a tropical region, land-backed by western Cape York, and exposed to the waters of the Gulf of Carpentaria. The region has a strong seasonal climate (wet and dry) and is within northern Australia's cyclone zone, two key parameters which drive estuary dynamics. Tides within the Gulf of Carpentaria are semi-diurnal in the north, decreasing rapidly towards diurnal in the south. The Port Musgrave tides are mixed but mainly diurnal.

Ryan *et al* (2003), describe Port Musgrave estuary in their conceptual models of *Australian Estuaries and Coastal Waterways as a Tide Dominated Estuary (TDE).* This type of estuary is formed through deposition of sediments from both the catchment and marine sources partially infilling a coastal embayment. Tidal action, more so than waves and wave induced currents, transports sediment into the estuary where sheltered conditions eventually allow the heavier fractions to settle out of suspension. Tide dominated estuaries are usually highly turbid due to the strong tidal currents allowing finer sediments to remain in suspension during spring tide phases. This is clearly demonstrated within Port Musgrave.

Port Musgrave is relatively large and measures approximately 110 square kilometres in area. The distance across the entrance, from Cullen Point to the dunes in front of Namaleta Creek, is approximately 3.5 kilometres. At the widest part of the estuary this increases to 10 kilometres, measured from Namaleta Creek entrance across to the mouth of the Wenlock River. The Cullen Point bar shallows to -5mLAT, though sand ridges central to the bar crossing may attain depths of -2mLAT. The bathymetry at the entrance and within Port Musgrave is complex and features numerous sand shoals and bars. Surface grab samples indicate coarser gained sands nearest the entrance at Cullen Point, increasing in silt and clay content as locations progress into the estuary and the Ducie and Wenlock River systems.

Two channels originate from the river flows of the Wenlock and Ducie Rivers, joining before exiting Port Musgrave at Cullen Point. The deepest section of the estuary is located just inside the main entrance nearest Cullen Point. As the estuary narrows upstream, the channels reduce in depth and are variably obstructed by shallow shoals and bars. Mud flats fringe the estuary and are relatively wide at the confluence of the Ducie and Wenlock Rivers.

The following (WorleyParsons Coastal Process Study, 2009) provides a description of key coastal processes and sediment movement patterns referenced to the notations within Figure 4-5.

1. Longshore coastal sand transport.
2. Fluvial supply to coast including scour at estuary entrance.
3. Creek or stream fluvial supply and accretion in mangrove swamps.
4. Tidal overbank exchange with mud flats and shoals.
5. Mud-flat deposition and accretion and upstream sand shoal deposition.
6. Tidal current and littoral supply deposition.
7. Natural bypassing across entrance.

8. Offshore exchange and loss from sediment laden flood waters.
9. Flood plume and turbid water from estuary outflow.

Figure 4-5: Coastal processes and sediment movements of Port Musgrave.

4.6.2 Impacts and management

The existing conditions and proposed modifications to the Port Musgrave estuary via dredging have been assessed using hydrodynamic models. Based on the results modelled, dredging an access channel to -5.0mLAT will have very low impacts upon the flushing and hydrodynamics of the estuary. Some local changes in current speed and associated fine sediment mobilisation and deposition are likely to occur at and immediately adjacent to the areas dredged. Changes in currents speed are considered of minor consequence, being localised to the dredged areas. It is anticipated that the natural seasonal processes of flood flows and episodic cyclone activity will act to continually restore pre-development conditions. Consequently, annual maintenance dredging will be required to maintain a navigable channel to -5mLAT. A rapid recovery would be anticipated following cessation of maintenance dredge at the close of the project.

Changes in tidal height and estuary flushing can be particularly problematic to ecosystem processes. The modelled results return only minor changes due to the proposed access channel, equivalent to less than 0.5 percent change in flushing capacity and no reportable change in tidal height. Sensitivity

testing using deeper dredge depths (to -7mLAT) concluded that at -5.0mLAT, the channel design was well within safe limits to maintain hydrological properties of the Port Musgrave Estuary and the Ducie and Wenlock River systems.

Sediment deposition as a result of dredging will occur primarily within the proposed channel alignment, with a minor rate predicted (1-2 centimetres) over adjacent mud and sand flats, up to a distance of 500-700 metres from the channel. Greater deposition within the channel itself may occur to a depth of 10 centimetres. Habitats within the foot print of the dredge plume may experience deposition of less than 1 centimetre during the eight-week dredge program. Regular tidal exposure, wind and wave action and tidal currents will ensure that seagrass habitats are not smothered by the fine sediment, with the study area favouring processes of fine sediment resuspension and mobilisation, rather than deposition. Coastal hydrodynamic modelling will be continued throughout the EIS process to assess the ecological affects of plume dispersion from dredging.

4.7 Groundwater

4.7.1 Existing environment

The Pisolite Hills study area is underlain by two regional aquifer systems:

- Shallow aquifers associated with the Bulimba Formation.
- Deep artesian aquifers (GAB) associated with the Rolling Downs Group.

Only the shallow aquifers associated with the Bulimba Formation are considered to be of significance to the project. The Bulimba Formation is an unconfined aquifer system and recharge occurs primarily from infiltration of rainfall though the permeable, pisolitic laterite caps on the plateaux. In the Weipa area where the Bulimba Formation forms a highly permeable aquifer, much of the infiltrating rainfall is taken up as storage in the underlying sand aquifer.

Cape Alumina has installed 26 monitoring wells within the southern project area and is preparing to install a further 10 within the northern project area during 2012. Findings from monitoring conducted within the southern wells adjacent to the spring systems demonstrate the rapid recharge experienced within the gravel aquifer of the Bulimba Formation (see Figure 4-6). While in this example groundwater rose into the bauxite, the majority of bores reported maximum groundwater levels within the underlying clays and did not enter the bauxite profile. Two wells are associated with this figure, a deeper well into the underlying gravels (PH1- MB1) and a shallow well into the bauxite (PH1-MB2).

The springs within the project area occur around the edge of the eroded escarpments and form the headwaters of a number of creeks draining the plateaux. The springs are considered to be associated with the Bulimba Formation and are not associated with upward leakage from the deep aquifers of the GAB (the artesian water has greater salinity). The locations of the springs are shown in Figure 4-7. Similar spring systems are located on the RTA leases to the north and west of the Pisolite Hills project.

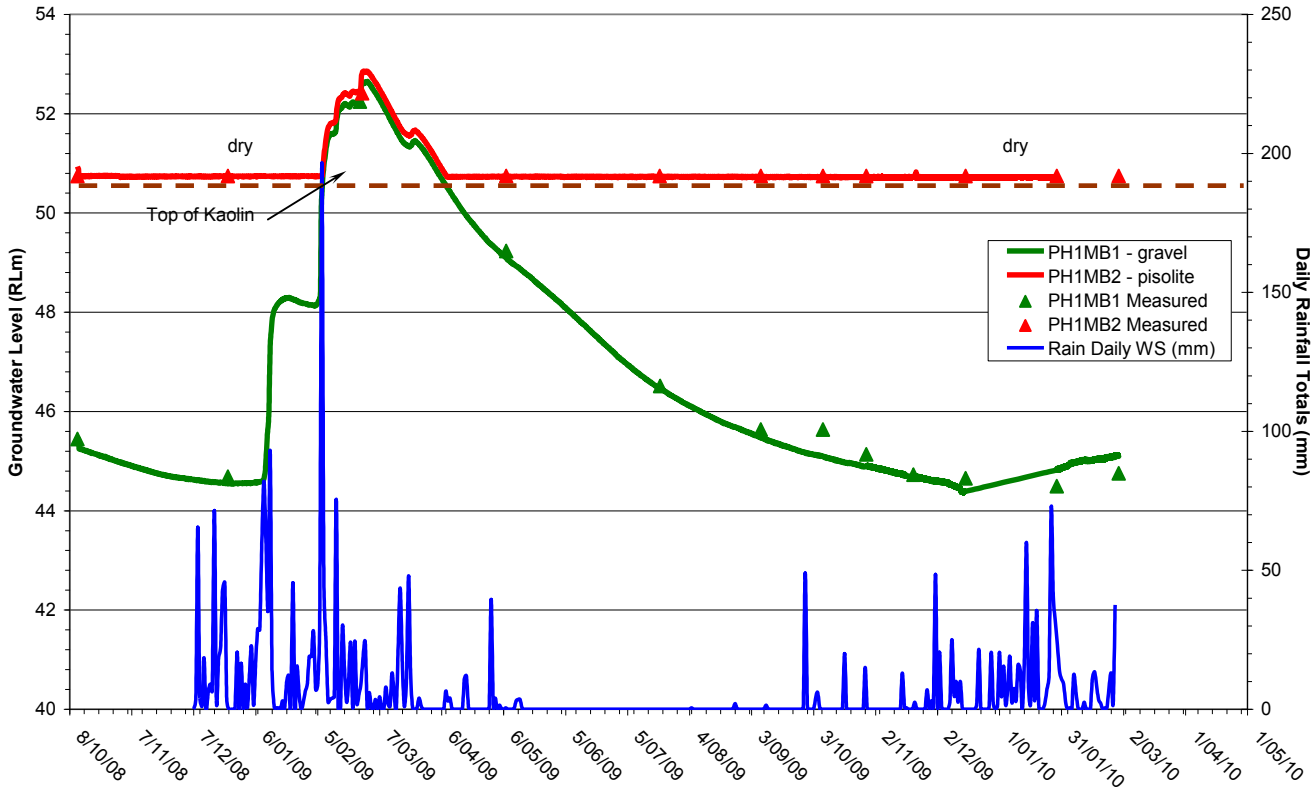

Figure 4-6: Hydrograph of Monitoring Bores at Centre of the PH1 Plateau – Pisolite Hills (2008-2010).

Monitoring of groundwater since November 2008 has shown 'dry' season water levels beneath the PH1 plateau are about eight metres higher than those beneath the PH2 plateau suggesting that the gravel aquifer systems beneath each plateau are not interconnected. This infers that activities potentially impacting groundwater of the springs would be similarly localised in nature.

The monitoring results over the 2008-09 wet season showed that groundwater levels rose relatively rapidly following rainfall in January through to March once the ground became sufficiently wet by approximately 400 millimetres of rainfall in December. Groundwater levels rose between two and seven and half metres during January and February in response to approximately 1,200 millimetres of rainfall. The rises in water levels were greatest near the centres of each plateau, with lesser rises at the lower edges of each plateau. The rises occurred over periods as short as a few days, indicating rapid infiltration through the upper soil layers.

Groundwater levels fell steadily after the end of significant rainfall in March as the stored water was drained out of the plateau, principally via the springs near the heads of the local creeks. The rate of fall varied from up to one and half metres per month during March and April and reduced to approximately 0.3 metres per month by September.

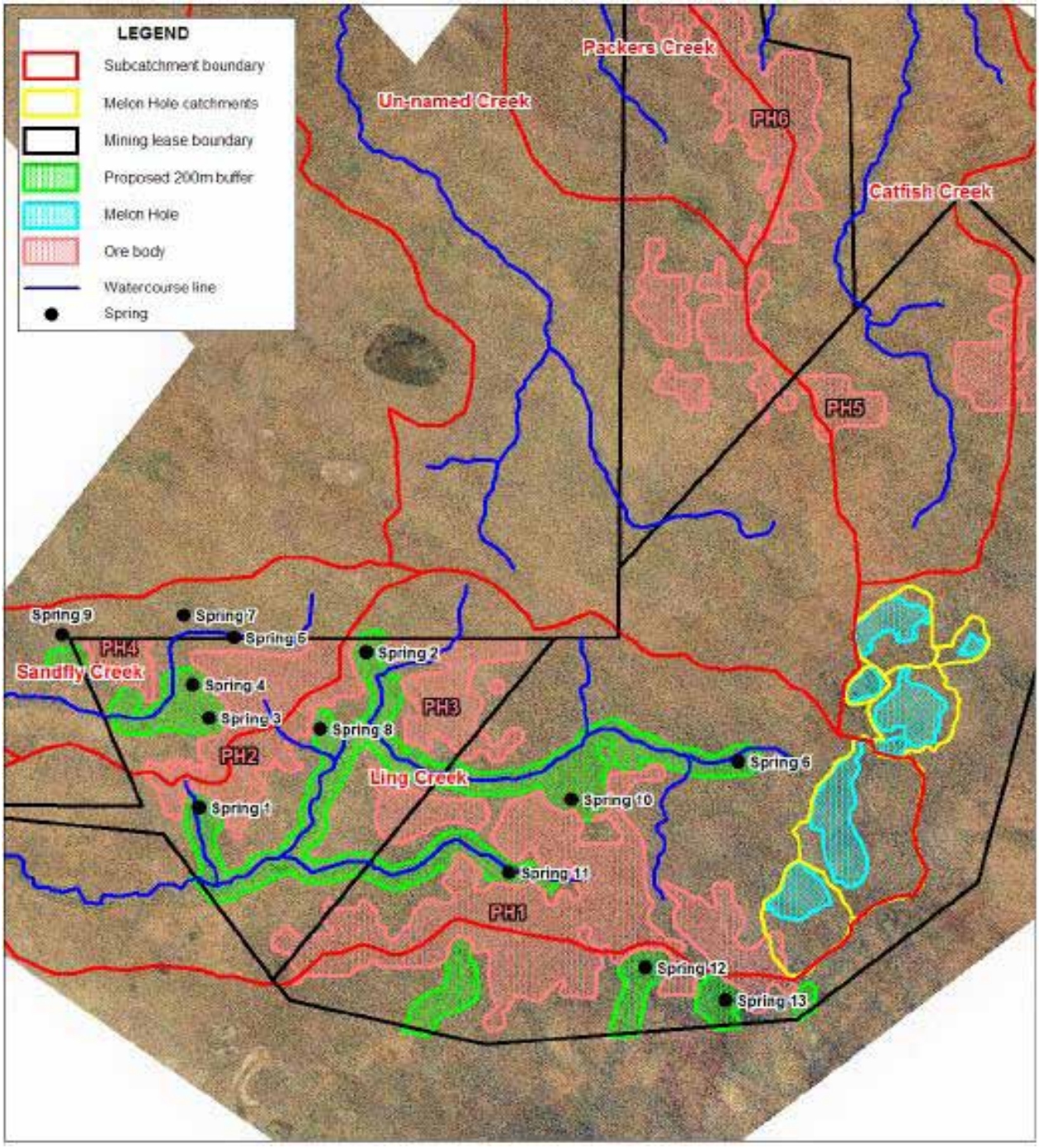

Figure 4-7: Location of springs at the Pisolite Hills mine and port project.

Water quality

Spring and groundwater samples have been collected over a 12-month period from the bauxite plateau areas. Results indicate that both the spring and groundwater has a low concentration of total dissolved solids (TDS) and consequently the concentrations of all major anions and cations are low. The TDS of the groundwater generally ranges from 21-54mg/L but with occasional higher values, the maximum recorded TDS being 150mg/L at PHS01MB1. The spring water ranges from 14-41mg/L with

one value of 108mg/L at Spring 12 (S12). Both the spring and groundwater samples are slightly acid to acidic. Chemical analyses indicate that the spring water discharge is sourced from the sand and gravel aquifer underlying the kaolin layer. Although several parameters exceeded the adopted quality criteria, the groundwater conditions are that of an unimpacted groundwater system.

4.7.2 Impacts and management

The proposed bauxite mining development has potential to impact the groundwater regime:

- Potential extraction of water resources from the Bulimba Formation and localised drawdown of resources.
- Mining and fines placement has the potential to alter permeability and recharge.
- Seepage of water from washed fines may enter the aquifer potentially altering water quality.

Four management principles have established a framework by which groundwater is to be managed. A summary of the principles follows:

- Groundwater extractions should be managed within the sustainable yield of aquifers.
- Priority should be given to ensure that sufficient groundwater is available at all times to identified GDEs.
- Modelling should be conducted to quantify potential changes and design mitigation and management.
- Planning, approval and management of developments should aim to minimise adverse affects on groundwater by maintaining natural patterns, not polluting or causing changes to groundwater quality and rehabilitating degraded groundwater systems.

Groundwater modelling has been undertaken to help define potential impacts to groundwater resources. Modelling will be continued as part of this EIS to develop the most appropriate mitigation and control measures.

4.8 Noise and vibration

4.8.1 Existing environment

The project area is undeveloped and represents background noise conditions. Mapoon is the nearest community receptor, being located approximately 12 kilometres from the Ducie River export facility and approximately two kilometres from the proposed route for export barges.

4.8.2 Impact and management

Noise and vibration affects may be attributable to mining operations conducted at Pisolite Hills, via extraction, beneficiation, and transportation of the bauxite to the Ducie River export facility. Operation of the workshops, product handling infrastructure and accommodation areas will also generate a general increase in ambient noise levels. Based upon available information the primary source of

noise will be the diesel engine power plant and emergency generators, and the passage of export barges past the Mapoon township.

Noise and vibration impacts from the project will be assessed against the DEHP EcoAccess Guidelines “Planning For Noise Control”, EPP Noise 2008, DEHP ‘Background Plus’ criteria and “Assessment of Low Frequency Noise”.

Following the conduct of noise modelling, recommendations will be developed for the conduct of construction based and operational noise monitoring near sensitive receptors to confirm predictions.

4.9 Air

4.9.1 Existing environment

The project is located within a rural environment with respect to its air shed, and with the exception of ambient events such as seasonal fires and the mobilisation of dust during the dry season, no substantial emissions are observed.

4.9.2 Impacts and management

Mining, operation of conveyors, and movement of mine vehicles on unsealed roads will generate dust emissions. Product handling and loading of the bauxite onto barges and transhipment vessels will also generate dust (though the beneficiation process will minimise dust generation from the product). Dust emissions from the project will be assessed against typical DEHP dust deposition guidelines and Environmental Protection (Air) Policy 200. Measures to minimise emissions will be proposed.

The project will also generate greenhouse emissions from electricity generation and fuel use associated with conveyor operations, vehicle usage, dredging and shipping, accommodation and workshops. Greenhouse gas emissions will be quantified and measures to reduce emissions recommended. Construction and operational monitoring will be undertaken to confirm modeling predictions.

4.10 Terrestrial ecology

4.10.1 Existing environment

Ecosystems

The proposed mining operations are located on bauxite plateaux. The landscape of the plateaux is generally very flat, with uniform vegetation of tall eucalypt woodland (see Figure 4-8). This woodland is characterised by vegetation 20 - 30 metres in height and exhibits moderate density. The transport corridor linking the proposed mine with the infrastructure, stockpile and export facility on the Ducie River also traverses tall eucalypt woodland.

Figure 4-8: Typical view of tall eucalypt woodland.

Drainage lines surround the plateaux, leading down to ephemeral creek lines and associated melaleuca wetland systems. Melaleucas are located within low-lying terrain, associated with the coastal fringe, lowland drainage lines and depressions within the landscape (Figure 4-9). It is also located throughout the site on depositional plains and seasonally inundated swamps and blind drainages. It is typically comprised of Paperbark Tea-tree with eucalypt in the order of 10-15 metres in height.

Figure 4-9: Typical view of open melaleuca woodland.

Several perennial springs are associated with the plateaux surrounding the southern resource areas of the Pisolite Hills project. The occurrence of groundwater springs, both ephemeral and perennial, is commonly associated with the bauxite plateaux of Cape York. Some 12 springs located within the southern half of the Pisolite Hills development area (and many more over adjacent lands) create a mosaic of closed rainforest and riparian vegetation communities along streams supported by the spring discharge (see Figure 4-10).

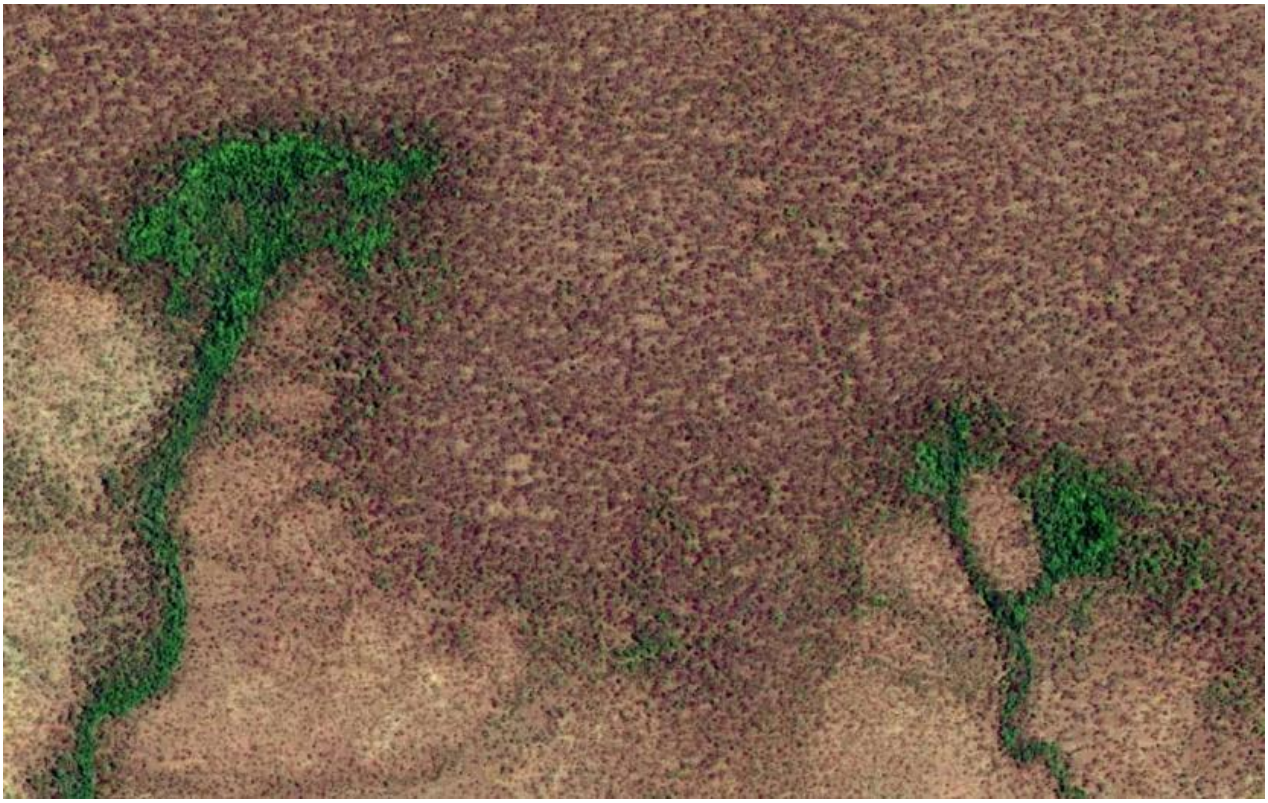

Figure 4-10: Perennial groundwater springs of the Pisolite Hills plateau.

Ling Creek is the major drainage feature in the southern section of the project area with several spring features located within its headwaters. Catfish Creek (located in the Ducie River catchment) constitutes the major drainage feature in the northern section of the project area. Catfish Creek did not flow during the survey, though standing pools were common throughout the creek (see Figure 4-11).

Aquatic habitat associated with the creeks on the project area was considered to be of moderate environmental value. Pig wallows, pig tracks, occasional bank degradation from grazing pressure and a single access track crossing offered evidence of some minor catchment disturbance.

Grasslands (see Figure 4-12) are located between the bottom of the eucalypt plateau and the intertidal salt marsh communities. Grasslands are seasonally inundated by floodwaters though remain above the extent of tidal inundation.

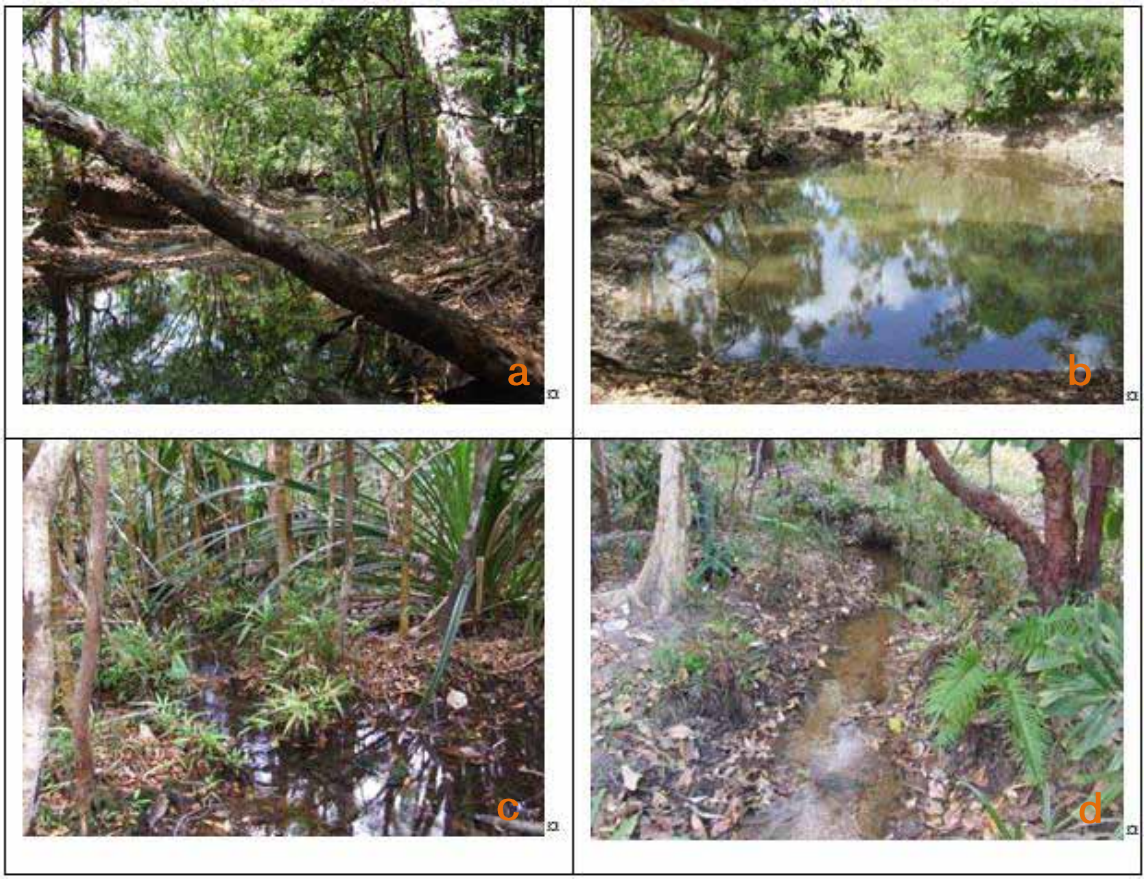

Figure 4-11: Ling Creek (a), Catfish Creek (b), Spring Headwaters (c), Spring Run (d).

Figure 4-12: Grassland landward of the saltpan and saltmarsh communities of the Ducie River.

Flora – Mine and transport corridor

Six mappable vegetation communities were identified on the mine and transport corridor area, including Darwin Stringybark Woodland, Weeping Teatree Drainage Swamp, Broad-leaved Teatree Open Woodland, Fringing Riparian Forest, Semi-deciduous Notophyll Vine Forest and perennial spring ecosystems. With the exclusion of the springs, the corresponding Regional Ecosystem classifications for each of the remaining five communities are 'Not Listed' under the *Environment Protection and Biodiversity Conservation 1999* status, 'Not of Concern' under the *Vegetation Management Regulation 2000* status and 'No Concern at Present' under the Department Environment and Heritage Protection Biodiversity status.

There is no published scientific information defining the perennial springs, and neither the physical structure of the springs, nor the communities they contain, are clearly described in the Regional Ecosystem database. The perennial springs of the project area have been investigated by Cape Alumina, and will be further described as part of this EIS.

A total of 392 flora species were recorded from the six mappable vegetation communities on the project area. Nine plants of conservation significance, listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and / or Queensland's Nature Conservation and Wildlife Regulation 2006 were recorded on the project area. The species of conservation significance are:

- *Acacia calyculata* - listed as Rare under the Nature Conservation (Wildlife Management) Regulation 2006.
- *Acacia fleckeri* - listed as Rare under the Nature Conservation (Wildlife Management) Regulation 2006.
- Springwood (*Calophyllum bicolour*) listed as Vulnerable under both the *Environment Protection and Biodiversity Conservation Act 1999* and Nature Conservation (Wildlife Management) Regulation 2006.
- *Crudia papauana* listed as Rare under the Nature Conservation (Wildlife Management) Regulation 2006.
- Brown Antelope Orchid (*Dendrobium johannis*) listed as Vulnerable under both the *Environment Protection and Biodiversity Conservation Act 1999* and Nature Conservation (Wildlife) Regulation 2006.
- *Gardenia scabrella* listed as Rare under the Nature Conservation (Wildlife Management) Regulation 2006.
- *Macaranga polyadenia* listed as Rare under the Nature Conservation (Wildlife Management) Regulation 2006.
- *Nepenthes mirabilis* listed as Endangered under the Nature Conservation (Wildlife Management) Regulation 2006.
- *Spathoglottis plicata* listed as Vulnerable under both the *Environment Protection and Biodiversity Conservation Act 1999* and Nature Conservation (Wildlife Management) Regulation 2006.

Three flora species that were unable to be identified in the field were collected and specimens subsequently sent to Queensland's Herbarium for identification. These species were unable to be identified to the species level and were determined by the Herbarium to be undescribed species. The plants include the *Anisomeles* species, *Polygala* species and *Zornia* species.

Flora – Port development area

Nine Least Concern Regional Ecosystems (REs) are present within the proposed project area, including dense mangrove forests and low closed mangrove forests. An expansive saltpan largely devoid of vegetation separates the native grasslands and sedgelands which extends to the foot of a lateritic plateau characterised by tall eucalypt forests on the mid and upper slopes. Dense paperbark and palm woodlands are located on the footslopes of the plateau along the fringe of the grasslands. Vegetation within the project area is generally in very good to good condition with little evidence of disturbance and minimal weed infestation. Disturbance is limited to recent vehicle track construction on the upper slopes of the plateau and grazing and feral animal use which was most concentrated in the moist paperbark woodlands at the base of the plateau. No significant weed infestations were identified during the survey.

A total of 57 flora species were identified from the project area during the field survey including four non-native species from 28 genera. None of the recorded flora species were listed under the EPBC Act and/or NCA as Critically Endangered, Endangered, Vulnerable or Rare. No Threatened Ecological Communities listed under the EPBC Act, nor Endangered or Vulnerable Regional Ecosystems listed under the VMA were recorded from the port and infrastructure development area. All flora ecosystems have been recorded as Least Concern Regional Ecosystems listed under the VMA.

Fauna – Mine and transport corridor

A combined total of 139 species were recorded on the project area during the field component of the assessment, comprising 14 amphibians, 35 reptiles, 63 birds and 27 mammals. Nine of these species hold conservation status under the *Environment Protection and Biodiversity Conservation Act 1999* and / or the *Nature Conservation (Wildlife Management) Regulation 2006*, while an additional five species are listed as pests under the *Land Protection (Pest and Stock Route Management) Act 2002*. The Palm Cockatoo (*Probosciger aterrimus*) and Papuan Sheathtail Bat (*Saccolaimus mixtus*), both recorded on the project area during site visits, are listed as Rare under Schedule 3 of Queensland's *Nature Conservation (Wildlife Management) Regulation 2006*. Both species are considered common throughout their respective home ranges. The project area does not offer exclusive habitat for these species nor is it at the limit of their range. Both species are widespread throughout the northern reaches of Cape York Peninsula.

Seven bird species, namely the Pacific Baza (*Aviceda subcristata*), White-bellied Sea-eagle (*Haliaeetus leucogaster*), Brown Falcon (*Falco berigora*), Nankeen Kestrel (*Falco cenchroides*), Australian Hobby (*Falco longipennis*), Brolga (*Grus rubicundus*) and Rainbow Bee-eater (*Merops ornatus*) hold a Migratory status under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* due to species' respective taxonomic family or genus blanket migratory listing. All species are highly transient and are known to be intermittent inhabitants of the project area. The

project area does not offer any exclusive nesting sites, unique or unusual habitat favoured by the observed migratory species.

Five pest species listed under the *Land Protection (Pest and Stock Route Management) Act 2002* were observed on the project area during the assessment, being the Cane Toad (*Rhinella marina*), Black Rat (*Rattus rattus)*, Dingo (*Canis familiaris dingo*), Feral Cat (*Feline cattus*) and Feral Pig (*Sus scrofa*) the latter three of which are declared as Class 2 pests under the Act. All species were observed to be common on the project area and were trapped, sighted and / or noted from a wide selection of localities throughout the project area.

Fauna – Port development area

A review of fauna databases identified a large number of fauna species that have been recorded from, or that may potentially utilise habitat within, the wider study area. A total of 309 vertebrate fauna species were identified from databases (16 amphibians, 47 reptiles, 202 birds and 44 mammals). During the field assessment 63 terrestrial fauna species were recorded, comprising one amphibian, seven reptiles, 44 birds and 11 mammals. Two hold conservation status under the Environment Protection and Biodiversity Conservation Act 1999 and / or the Nature Conservation (Wildlife Management) Regulation 2006. These were:

- Saltwater Crocodile (*Crocodylus porosus*), observed on mudflats adjacent to mangroves in the vicinity of the ore loading site and on Pargon Creek.
- Black-necked Stork (*Ephippiorhynchus asiaticus*), two to three individuals observed in grassland and saltpan habitat on three occasions.

One fauna species identified as regionally significant was recorded during the field assessment:

- Two individuals of the Australian Bustard *(Ardeotis australis*) were observed in sedgeland habitat.

Three bird species listed as Migratory under the *Commonwealth's Environment Protection and Biodiversity Conservation Act 1999* were recorded in the vicinity of the project area during the field assessment:

- Rainbow Bee-eater (*Merops ornatus*) in paperbark swamp and grassland habitat at four locations.
- Rufous Fantail (*Rhipidura rufifrons*) in mangrove forest at site HA04.
- White-bellied Sea-eagle (*Haliaeetus leucogaster*) overflying saltpan habitat.

A wader survey of the wider Port Musgrave area was conducted from 15-19 March 2009 (Wheller and Seymour 2009). This survey endeavoured to survey all shorelines of Port Musgrave but concentrated particularly on three areas:

1. The mouth of Namaleta Creek and surrounding shores.
2. The lower Ducie River in the vicinity of the wharf site.

3. The mouth of the Wenlock River.

Based on the criteria outlined in the draft EPBC significant impact guidelines, Port Musgrave meets the requirements for nationally important habitat for migratory shorebirds because 16 species of migratory shorebird were recorded. In addition, Port Musgrave qualifies as nationally important habitat for four species of shorebird because at least 0.1 percent of their East Asian-Australasian flyway population were recorded: Greater Sand Plover (*Charadruis leschenaultii*), Great Knot (*Calidris tenuirostris*), Whimbrel (*Numenius phaeopus*) and Terek Sandpiper (*Xenus cinereus*).

Two introduced species were recorded (from visual observation, tracks, scats or sign) in the vicinity of the project area during the field assessment:

- European cattle (*Bos taurus*) was identified from tracks in paperbark swamp.
- Pigs (*Sus scrofa*) were observed on two occasions in paperbark swamp habitat. In addition, extensive areas of damage from pig rooting were observed in sedgeland habitat.

Protected areas

The proposed project area does not transect or lie adjacent to National or Conservation Parks, State Forests and Forest Reserves, or Marine Parks.

The recently gazetted Steve Irwin Wildlife Reserve (SIWR) extends over the Bertiehaugh Cattle Station. With the exception of zones surrounding the perennial spring ecosystems identified within the southern resource area, all of the lands within ML 20572 have been excluded from the boundary of the SIWR.

4.10.2 Potential impacts and management

The construction and operational phases of the project necessitates the disturbance of native woodlands over the bauxite resources, and along access corridors for the establishment of conveyors, service roads, haul roads and general access. Woodland habitats over the proposed infrastructure facilities at the port development area will also be cleared, though on a reduced footprint to the areas to be mined. Grassland habitats will also be disturbed for construction of the bauxite stockpile and causeway crossing the salt marsh. Where access corridors cross drainage lines, and alternative crossing cannot be made, fringing riparian habitats may be cleared to enable crossing.

The disturbance of land on the project site may cause the following impacts:

- Removal of mature vegetation and fallen timber.
- Altering habitat complexity and removing refuges.
- Altered fire regimes.
- Topsoil removal, loss and compaction.
- Increased soil erosion potential.
- Introduction of weeds and pest animals.

- Increased physical disturbance (potentially of greater consequence at the port and administration facility on the Ducie River due to continual disturbance processes).

Cape Alumina will ensure a sustainable approach for any land clearing, including the use of pre-clearing surveys, to identify any sensitive vegetation, and resident fauna species that can be successfully relocated.

Mitigation options

The following mitigation measures are recommended to minimise the potential impact of the proposed development on flora and fauna values of the project area:

- Limit land clearing to the minimum possible extent where practicable.
- Remove vegetation in a staggered sequence to allow fauna species to relocate off site.
- Restrict the clearing of native vegetation in watercourses for infrastructure crossings.
- Prohibit clearing within the perennial springs.
- Restrict construction activities to dry weather conditions where practicable.
- Undertake a pre-clearing survey of all proposed clearing activities within remnant vegetation areas and riparian areas prior to construction to identify any potential significant flora species. Where populations are identified, the development layout should be relocated or redesigned where practicable so as to avoid damage or loss of these populations.
- Where the development layout cannot be relocated, a translocation plan will be developed and implemented to relocate populations of significant species to designated vegetation buffer areas (of suitable habitat) within the project area so as to ensure there is no net loss of significant flora species for the site. The translocation plan will include contingency plans involving propagation of significant species to ensure no net loss in population and monitoring programs.
- Develop and implement a fire management plan including an ecologically appropriate burning regime for the project area and surrounds.
- Pre-clearing inspections are to be conducted by a qualified fauna spotter to identify potential nesting, roosting or refuge sites.
- Develop a pest management plan, including actions to control feral pest populations (dogs, cats, cane toads, cattle, horses and pigs), prevent new species being introduced to the area and eradicate any new feral species associated with project activities.

4.11 Marine ecology

4.11.1 Existing environment

Ecosystems

Mangroves fringe the shores of the Wenlock and Ducie Rivers, for many kilometres upstream of the estuary mouth at Port Musgrave (see Figure 4-13). The width of the mangrove systems varies according to the location of tidal drainages and the height of the adjacent flood plains. It is a dense, closed forest community dominated by Large-leaved Orange Mangrove and Long-styled Stilt

Mangrove along the river and channels, and Yellow Mangrove and Northern Grey Mangrove along its landward fringe and upper intertidal areas.

Figure 4-13: Typical view of mangrove community landscape.

Saltmarsh and saltpans (see Figure 4-14) extend from the seaward edge of the grassland communities of the floodplain to the rear of the proposed wharf structures which mark the commencement of the mangrove communities fringing the Ducie River. Vegetation on the saltpan is sparse, low lying and generally exhibits an average height of 30 - 50 centimetres. This is a salt tolerant community, adapted to harsh conditions and regular inundation by tidal waters.

Soft sediment habitats cover the majority of the benthic habitat within the intertidal and subtidal areas of Port Musgrave (approximately 5,200ha).

Over the two seasonal baseline surveys conducted, four species of seagrass were represented (see Figure 4-15 and 4-16). These included:

- *Halodule uninervis.*
- *Halophila ovalis.*
- *Halophila decipiens.*
- *Enhalus acoroides.*

In total, 689.3 ± 388.2 ha of seagrass habitat was mapped in the wet season (April) and 1295.8 ± 637.5 ha in the dry season (September). Results of surveys conclude that the seagrass of Port Musgrave vary in density and distribution seasonally and display a substantial adaptation to broad physical changes in salinity, deposition and light associated with the wet and dry seasons.

Whilst dominated by sandy and muddy substrates, turbid coral and rocky reef habitat does occur within the inshore and offshore environs surrounding Port Musgrave. Dog Reef is located along Cullen Point where Port Musgrave exits to the Gulf of Carpentaria. Patchy live hard and soft coral cover has been observed along its deepest fringe, although algal and sponge species remain dominant. Kerr Reef is situated approximately 16 kilometres north-north west of the Cullen Point bar, and supports a higher hard coral cover. Several deep water sponge reefs have been recorded offshore from Cullen Point Located in water depths from 15 metres to 20 metres.

Figure 4-14: Saltmarsh habitats near the rear of the mangrove community.

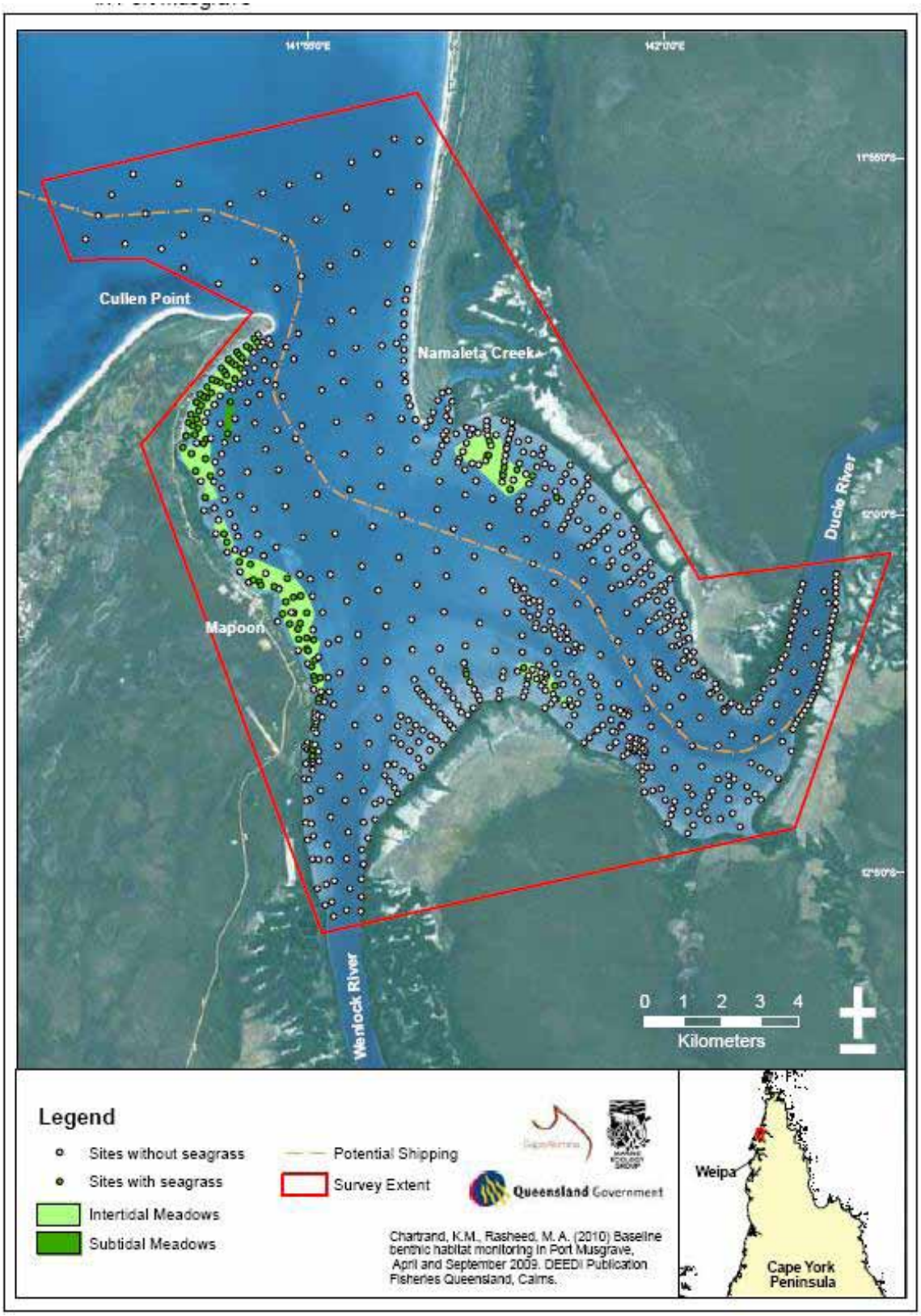

Figure 4-15: Location of wet season (April) baseline 2009 seagrass assessment sites and seagrass meadows in Port Musgrave.

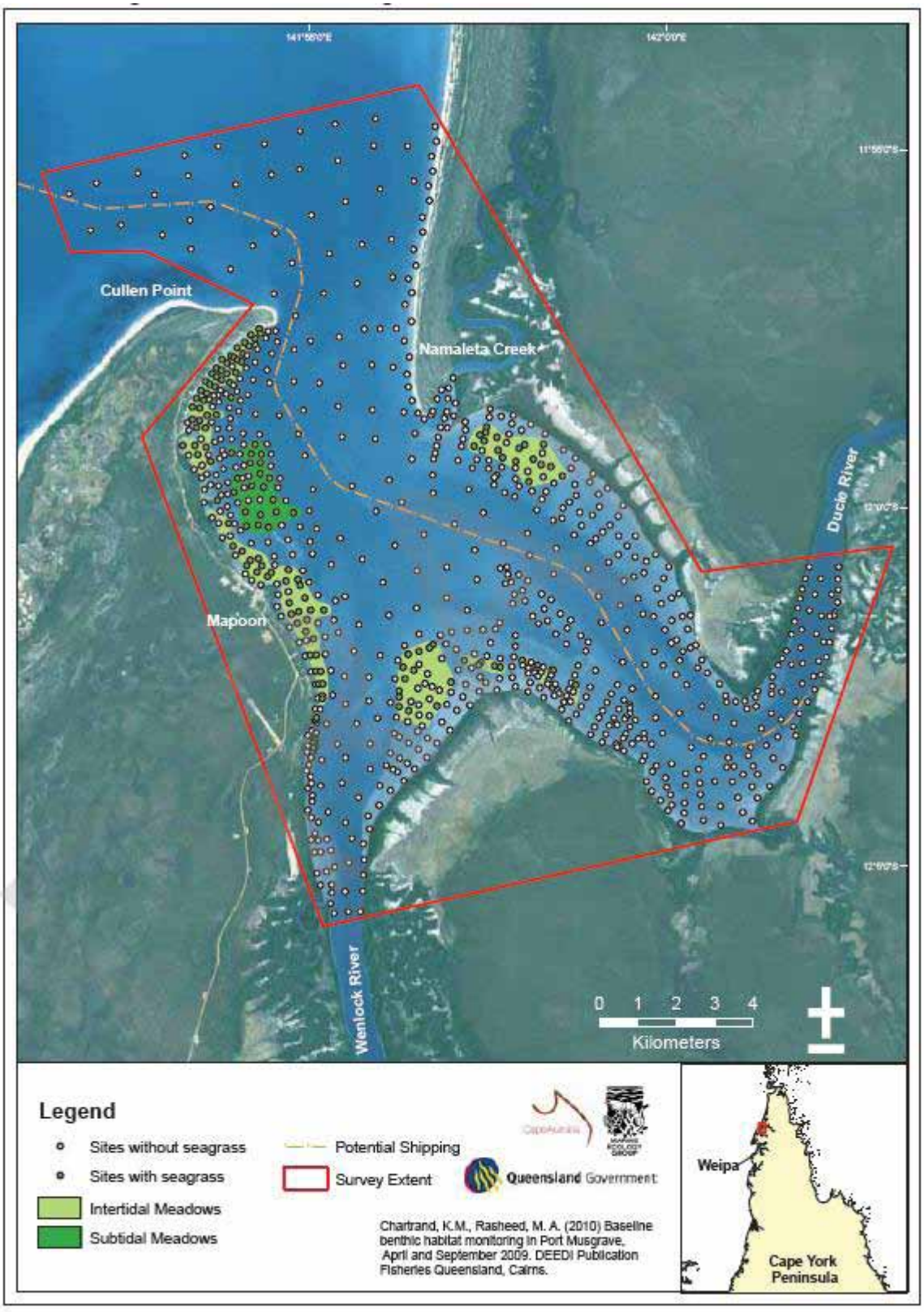

Figure 4-16: Location of dry season (September) baseline 2009 seagrass assessment sites and seagrass meadows in Port Musgrave.

Fauna

The fish assemblages of the Port Musgrave estuary have not previously been well studied. Cape Alumina has supported an extensive study undertaken by the Marine Ecology Group of the Department of Agriculture Fisheries and Forestry. The Port Musgrave survey was undertaken over three sampling events in 2009 at three locations within Port Musgrave (Ducie River, Wenlock River, and Namaleta Creek). From these studies 126 species were identified, of which there were:

- 72 fish.
- 29 shark and rays.
- six reptiles.
- two cetaceans.
- five jellyfish
- 12 crustaceans.

The EPBC Protected Matters Online Search tool returned a number of marine threatened and migratory species. These included 12 species of National Environmental Significance (NES), 15 migratory species and 71 Other Protected Matter species. The marine species and their corresponding NES category are:

National Environmental Significance

- Whales - two species (endangered, vulnerable)
- Turtles - six species (endangered, vulnerable)
- Sharks - four species (vulnerable)

Migratory species

- Whales - four species
- Dolphin - two species
- Dugong - one species
- Reptiles - seven species
- Sharks - one species

Other Protected Matters

- Whales - four species
- Dolphins - seven species
- Dugong - one species
- Reptiles - 27 species
- Fishes- 32 species

The habitat requirements of the NES threatened species and the marine migratory species identified in the searches and an assessment of the availability of that habitat in the Port Musgrave Study Area is

summarised in Table 4-1 below. The status of these species under the Queensland Nature Conservation Act 1992 (NC Act) is also included.

The EPBC Protected Matters Report did not include two elasmobranchs that are known to inhabit Port Musgrave: Speartooth Shark (*Glyphis glyphis*) and Narrow Sawfish (*Anoxypristis cuspidate*). Speartooth Shark is listed under the EPBC Act as critically endangered and has been reported to inhabit the Wenlock River, Ducie River and surrounding waters of Port Musgrave (Peverell *et al*. 2006). The Speartooth Shark is also protected under the Queensland Fisheries Act 1995 and Regulations 2008 as are all species of Sawfish and one finfish species *Epinephelus lanceolatus* (Queensland Groper) that also occurs in Port Musgrave. The Narrow Sawfish is not listed under the EPBC Act, but considered endangered by the International Union for the Conservation of Nature (IUCN) IUCN Red List (IUCN 2007).

The Irrawaddy Dolphin (*Orcaella brevirostris*) was listed in the EPBC Protected Matters Report. It is thought that in northern Australian waters this species is now considered to be the Australian Snubfin Dolphin (*Orcaella heinsohni*). In addition two other species of Bottlenose Dolphins, *Tursiops aduncus* and *Tursiops truncatus*, listed as Marine Migratory Species under the EPBC Act were not included in the EPBC Protected Matters Report, although they are known to occur in the area.

Table 4-1: Key marine species of conservation significance likely to occur at or adjacent to the location of the proposed development.

Species name	Common name	EPBC Act status[1]	NCA status[2]	Survey status and reported occurrences	Habitat requirements of species	Likelihood of occurrence and habitat availability in Port Musgrave.
Mammals						
Balaenoptera musculus	Blue Whale	E M	Not listed	Not detected	Blue whales are predominantly found offshore and are known to seasonally migrate around the Australian coastline (DEH 2005). The only known areas of significance to Blue Whales are feeding areas around the southern continental shelf, notably the Perth Canyon, in Western Australia, and the Bonney Upwelling and adjacent upwelling areas of South Australia and Victoria (DEH 2005). There are no records of Blue Whale sightings or stranding in the Gulf of Carpentaria (DEWR 2009).	Highly unlikely to occur in Port Musgrave.
Megaptera novaeangliae	Humpback Whale	V M	V	Not detected	Humpback whales are predominantly found offshore and are known to seasonally migrate around the Australian coastline. Calving is thought to occur in two locations; the Great Barrier Reef in Queensland and south of the Kimberley in Western Australia. Two out of seven recognised southern hemisphere populations spend winter in warm shallow northern Australian waters where the species breed (Van Dyck and Strahan 2008). There are no records of Humpback Whale sightings or stranding in the eastern Gulf of Carpentaria (DEWR 2009).	Highly unlikely to occur in Port Musgrave.

Species name	Common name	EPBC Act status[1]	NCA status[2]	Survey status and reported occurrences	Habitat requirements of species	Likelihood of occurrence and habitat availability in Port Musgrave.
Balaenoptera edeni	Byrde's Whale	M	Not listed	Not detected	Bryde's Whales have a global distribution in tropical and temperate waters in both oceanic and inshore waters. They have been recorded from all Australian states except the Northern Territory and the inshore animals appear to be limited to the 200 m isobar, resident in areas with suitable prey stocks of pelagic shoaling fishes (DEWHA 2009). There are no records of Bryde's Whale sightings or stranding in the eastern Gulf of Carpentaria (DEWR 2009).	Highly unlikely to occur in Port Musgrave.
Dugong dugong	Dugong	M	V	Not detected	Dugong have a global distribution and are known to inhabit tropical and subtropical coastal and island waters. In Australia, Dugong are known from Shark Bay in Western Australia (Marsh et al. 2002) across northern Australia and south to the north coast of New South Wales. Dugongs are abundant at many locations in the GoC and are usually associated closely with seagrass beds which they feed upon. A major proportion of dugongs in the GoC occur in the region of the Wellesley Islands, the Sir Edward Pellew Group, and Blue Mud Bay. Of the estimated 27602 (± 3110) Dugongs in the Gulf of Carpentaria, only 15% occur in the waters of the Queensland coast, reflecting the much greater area of seagrass along the Northern Territory coast (Saalfield and Marsh 2004).	Highly likely to occur. Habitat suitable to this species was present within the Port Musgrave study area. Anecdotal hunting records from Traditional Owners residing in Port Musgrave strongly suggest they have a seasonal abundance within Port Musgrave (G. Manatan, Mapoon Aboriginal Community Resident pers. comm. 2009).
Orcinus orca	Killer Whale, Orca	M	Not listed	Not detected	Killer whales have a global distribution and are found predominantly in cooler waters. There is only one sighting record of this species in the Northern Territory (Chatto & Warneke 2000). There are no records of Killer Whale sightings or stranding in the Queensland section of the Gulf of Carpentaria (DEWR 2009).	Unlikely to occur in Port Musgrave.

Species name	Common name	EPBC Act status[2]	NCA status[3]	Survey status and reported occurrences	Habitat requirements of species	Likelihood of occurrence and habitat availability in Port Musgrave.
Orcaella heinsohni	Australian Snubfin Dolphin	M	R (for *Orcaella brevirostris*)	**Detected**	The Australian Snubfin Dolphin is endemic to Australia but may also occur in Papua New Guinea (Beasley et al. 2005). Previously the Australian Snubfin Dolphin was identified incorrectly as the widely distributed Irrawaddy dolphin (*Orcaella brevirostris*). In Australia this species occurs in shallow coastal areas often near estuary and river mouths from southern Queensland to northern Western Australia (Van Dyck and Strahan 2008). The species is known to occur in the Gulf of Carpentaria.	**Known to occur** Habitat suitable to this species was present within the Port Musgrave study area.
Sousa chinensis	Indo-Pacific Humpback Dolphin	M	R	**Detected**	Indo-Pacific Humpback Dolphins usually inhabit shallow coastal waters of less than 20 m depth and are often associated with rivers and estuarine systems, enclosed bays and coastal lagoons, including those that have been highly modified for human use (Corkeron et al. 1997; Hale et al. 1998). This species has been recorded during marine turtle surveys around the Weipa region (Col Limpus, DERM pers. comm. 2009).	**Known to occur** Habitat suitable to this species was present within the Port Musgrave study area.
Tursiops aduncus and Tursiops truncatus	Bottlenose dolphins	M	R	[1]**Detected**	Wide ranging species that occurs in inshore and nearshore coastal waters to a depth of approximately 50 m.	**Known to occur** Habitat suitable to this species was present within the Port Musgrave study area. The species was observed in Port Musgrave during field investigations by WorleyParsons.

Species name	Common name	EPBC Act status[2]	NCA status[3]	Survey status and reported occurrences	Habitat requirements of species	Likelihood of occurrence and habitat availability in Port Musgrave.
Reptiles						
Caretta caretta	Loggerhead Turtle	E M	E	Not detected	Warm temperate to tropical marine areas world wide. Area around Port Musgrave is a known migration route (IOSEA 2009). Preferred habitat is rocky reef and they feed mainly on molluscs and crabs (Wilson and Swan 2003; C. Limpus, DERM pers. comm. 2009). Known as a bycatch species in the Northern Prawn Fishery that operates offshore in marine waters (Stobutzki et al. 2002).	May occur Habitat suitable to this species was present within the Port Musgrave study area.
Chelonia mydas	Green Turtle	V M	V	[1]**Detected**	Coastal waters in particular seagrass beds. The Wellesley Island area in the south-western corner of the GoC is a significant nesting site (Limpus and Miller 2008) The area around Port Musgrave is a known migration route (IOSEA 2009; C. Limpus DERM pers. comm. 2009). Juveniles are carnivorous and adults graze on sea grasses and seaweeds (Wilson and Swan 2003). Known as a bycatch species in the NPF that operates offshore in marine waters (Stobutzki et al. 2002).	**Known to occur.** Habitat suitable to this species was present within the Port Musgrave study area. Indigenous hunting tag returns confirm distribution (C. Limpus, DERM pers. comm. 2009)
Dermochelys coriacea	Leatherback Turtle	E M	E	[1]**Detected**	Open ocean areas from temperate to tropical areas where it breeds in mid-eastern Queensland, eastern Malaysia and Central America (TSSC 2008). Area around Port Musgrave is a known migration route (IOSEA 2009). Feeds mainly on gelatinous marine invertebrates (Wilson and Swan 2003).	**Known to occur.** Habitat suitable to this species was present within the Port Musgrave study area. Known to inhabit Port Musgrave (C. Limpus, DERM pers. comm. 2009).

Species name	Common name	EPBC Act status[2]	NCA status[3]	Survey status and reported occurrences	Habitat requirements of species	Likelihood of occurrence and habitat availability in Port Musgrave.
Eretmochelys imbricata	Hawksbill Turtle	V M	V	Not detected	Open ocean areas around the world from temperate to tropical areas. Hawksbill turtle nesting sites occur on islands adjacent to Arnhem Land and north-eastern Cape York. The main feeding habitat for the species tends to be tidal and sub-tidal reefs (Limpus and Miller 2008; Limpus 2009). Area around Port Musgrave is a known migration route and known nesting site (IOSEA 2009). They prefer hard substrate supporting mixed algae and soft invertebrate communities (C. Limpus, DERM pers. comm. 2009).	May occur Habitat suitable to this species was present within the Port Musgrave study area.
Lepidochelys olivacea	Pacific Ridley, Olive Ridley	E M	E	[1]**Detected**	Tropical oceans of Atlantic, Indian and Pacific. Australian distribution restricted to Northern Territory and Cape York Peninsula (Wilson and Swan 2003). Inhabits coastal waters including but not limited to reefs. The species forages in benthic habitats over a range of depths from a few metres to hundreds of metres, and consumes crabs, molluscs and other benthic invertebrates (Wilson and Swan 2003). Area around Port Musgrave is a known migration route, feeding and nesting site (IOSEATURTLES 2009, C. Limpus, DERM pers. comm. 2009). Known as a bycatch species in the NPF that operates offshore in marine waters (Stobutzki et al. 2002).	**Known to occur.** Habitat suitable to this species was present in the Port Musgrave study area. Low density nesting is known to occur in Port Musgrave (C. Limpus, DERM pers. comm. 2009)

Species name	Common name	EPBC Act status[2]	NCA status[3]	Survey status and reported occurrences	Habitat requirements of species	Likelihood of occurrence and habitat availability in Port Musgrave.
Crocodylus porosus	Saltwater Crocodile	M	V	**Detected**	Global distribution from South East Asia to northern Australia (Read et al. 2007). The species is thought to be close to extinction in Indochina and its distribution in Australia extends from Gladstone on the Queensland east coast to Broome in Western Australia (M. Read, GBRMPA pers. comm. 2009). Saltwater crocodiles are semi-aquatic and inhabit reefal, coastal, and inland waterways throughout tropical and temperate Australia. They can be found hundreds of kilometres upstream in rivers (Read et al. 2004a). The Wenlock and Ducie River systems have specifically been classified as being excellent to good nesting habitat with high population densities of animals (Messel et al. 1981; Read et al. 2004a).	**Known to occur** Habitat suitable to this species was present in the Port Musgrave study area. Immature and mature specimens recorded in March, June and November surveys.
Natator depressus	Flatback Turtle	V M	V	**Detected**	Restricted distribution in Australia from the Kimberley coast in Western Australia to Queensland's east coast. Coastal waters including but not limited to shallow water habitats. Nesting is confined to Australia with scattered but significant nesting occurring on the western beaches of Cape York (Bell 2003). The species forages in shallow inshore areas and feeds on soft corals, sea cucumbers, and jellyfish (Wilson and Swan 2003). Area around Port Musgrave is a known migration route, feeding and nesting site (IOSEATURTLES 2009, C. Limpus, DERM pers. comm. 2009). Known as a bycatch species in the NPF that operates offshore in marine waters (Stobutzki et al. 2002).	**Known to occur** Habitat suitable to this species was present in the Port Musgrave study area. A single nest has been recorded in Port Musgrave (C. Limpus, DERM pers. Comm. 2009)

Species name	Common name	EPBC Act status[2]	NCA status[3]	Survey status and reported occurrences	Habitat requirements of species	Likelihood of occurrence and habitat availability in Port Musgrave.
Sharks						
Glyphis glyphis	Speartooth Shark	CE	Not listed	**Detected**	In Australia the species is restricted to tidal rivers and estuaries within Northern Territory (NT) and Queensland. Known from six rivers/creeks in the NT and Wenlock River and Ducie River in Queensland (Stevens et al. 2005, Peverell et al. 2006). Historically known from Bizant River and Normanby River on Queensland east coast (Peverell et al. 2006). Known range extends into three distinct geographical locations, Van Diemen Gulf (NT), Port Musgrave (Qld Gulf of Carpentaria) and Princess Charlotte Bay (east coast Qld). Speartooth shark population is estimated to occur over a total habitat area of 502kilometre^2 (Stevens et al. 2005).The species is known to tolerate salinity concentrations of between 0 to 35 ppt (L. Jnr Squire, Cairns Marine pers comm. 2009).	**Known to occur.** Habitat suitable to this species was present in the Port Musgrave study area. Immature specimens caught in March, June and November 2009 surveys.
Pristis clavata	Dwarf Sawfish	V	Not listed	**Detected**	Global distribution restricted to Australian waters. Species known from Port Musgrave in Queensland Gulf of Carpentaria to the Pilbara in Western Australia (Peverell, et al. 2005, Stevens et al. 2005). There are no records of Dwarf Sawfish on Queensland east coast (Stevens et al. 2005). The species is known to inhabit inshore coastal waters (water 2–3 m depth) and estuarine systems (Peverell et al. 2005; Thorburn et al. 2007 Known as a bycatch species in the NPF that operates offshore in marine waters (Stobutzki et al. 2002).	**Known to occur.** Habitat suitable to this species was present in the Port Musgrave study area. Immature specimens caught in March, June and November 2009 surveys.

Species name	Common name	EPBC Act status[2]	NCA status[3]	Survey status and reported occurrences	Habitat requirements of species	Likelihood of occurrence and habitat availability in Port Musgrave.
Pristis microdon	Freshwater Sawfish	V	Not listed	**Detected**	Freshwater sawfish are thought to have a global distribution (DEWHA 2009). In Australia the species is known from the Fitzroy River in Western Australia to Princess Charlotte Bay on the east coast of Queensland (Peverell et al. 2005; Last and Stevens 2009). The species inhabits freshwater rivers, inshore and offshore coastal waters (Last and Stevens 2009). Known as a bycatch species in the NPF (Stobutzki et al. 2002).The species is known to tolerate salinity concentrations of between 0 to 35 ppt (L. Jnr Squire, Cairns Marine pers. comm. 2009).	**Known to occur.** Habitat suitable to this species was present in the Port Musgrave study area. Immature and mature specimens caught in March, June and November surveys.
Pristis zijsron	Green Sawfish	V	Not listed	**Detected**	Green Sawfish are known from the northern Indian Ocean. Although their current population status is unknown it is believed they may be extinct from south-east Asia (Stevens et al. 2005). In Australia Green Sawfish are more abundant in the tropics although they range into temperate waters as far south as Perth on the west coast and Sydney on the east coast (Last and Stevens 2009). The species inhabits inshore and offshore coastal waters (Peverell et al 2005; Last and Stevens 2009). Known as a bycatch species in the NPF (Stobutzki et al. 2002).	**Known to occur**. Habitat suitable to this species was present in the Port Musgrave study area. Immature and mature specimens caught in March, June and November 2009 surveys.

Species name	Common name	EPBC Act status[2]	NCA status[3]	Survey status and reported occurrences	Habitat requirements of species	Likelihood of occurrence and habitat availability in Port Musgrave.
Rhincodon typus	Whale Shark	V	Not listed	Not detected	Whale sharks have a global distribution and are known to inhabit warm temperate waters, with a preference for pelagic environments near the edge of the continental shelf (Last and Stevens 2009). Critical habitat in Australia includes Ningaloo Reef in Western Australia, the Coral Sea and Christmas Island (DEWHA 2009). Areas with high nutrient levels and seasonal availability of tropical krill and baitfishes may form critical habitat (DEWHA 2009). Whale sharks are known to inhabit inshore coastal waters that are turbid and are seasonally influenced by freshwater during the tropical wet season (monsoonal weather pattern).	May occur Habitat suitable to this species was present within the Port Musgrave area though habitat within the vicinity of the proposed development is shallower than the species preferred depth range.

1) Validated record of occurrence from other sources outside this study.

2) EPBC Status Codes = Critically Endangered (CE), Endangered (E), Vulnerable (V), Migratory (M).

3) NCA Status Codes = Endangered (E), Vulnerable (V), Rare (R).

Fisheries

The commercially important species found in the Port Musgrave surveys were; Barramundi (*Lates calcarifer*), Blue Threadfin Salmon (*Eleutheronemna teradactylum*), King Threadfin Salmon (*Polydactylus macrochir*), Blacktip Shark complex(*Carcharhinus limbatus/tilstoni*) and juvenile Grey Mackerel (*Scomberomorus semifasciatus*). Species of recreational importance such as Giant Queenfish (*Scomberoides commersonnianus*) and Barramundi were identified and these stocks currently support commercial charter operations.

The Northern Prawn Fishery (NPF) targets Banana Prawn (*Fenneropenaeus merguiensis)* and Tiger Prawns (*Penaeus esculentus* and *Penaeus semisulcatus)* and extends off Australia's northern coast. Port Musgrave and the adjacent waters offshore to the area are likely to be important to the sustainability of Queensland's NPF area of operation.

The fisheries resources of Port Musgrave, Ducie River and Wenlock River are important to the Traditional Owners for customary and dietary purposes (Woodley, Mapoon Aboriginal Shire Council Trustee pers. comm, 2009). Giant Mud crabs are of particular importance to the Mapoon Aboriginal Community as a stable food source and potential income earner. Mapoon Aboriginal Shire Council currently posses a Community commercial fishing licence. However this fishing licence is currently not being used.

4.11.2 Impacts and mitigation

Habitats

Minor clearing of mangrove and salt marsh habitats will occur at the proposed Ducie River Port site and Mapoon barge and ferry facility. No physical removal of seagrass is proposed from dredging or port facility construction. However, mobilisation of sediments during the dredging process has the potential to reduce light and lead to increased fine sediment deposition over adjacent benthic habitats. Baseline seagrass surveys demonstrated highly variable communities, species composition, biomass and areal coverage (wet season 600ha, dry season 1200ha). Broad fluctuations in ambient light availability and total suspended solids are naturally occurring within these habitats.

Inshore mixed reef habitats will not be impacted by the proposed development. Plume modelling for dredging indicates no water quality affects will be experienced at nearby Dog Reef, which is the largest of the inshore reef systems. Oyster reef identified within the bottom of the Ducie River will be affected by dredging plumes during construction.

High density hard coral communities are located many kilometres to the north of Cullen Point at Kerr Reef. Some lower density coral reef is also associated with Dog Reef adjacent to Cullen Point. Plume modelling predicts no impact at these habitats.

Very small percentages of available soft sediment habitats will be disturbed within the proposed dredge footprint and berthing pockets for the bauxite export wharf. Recovery of soft sediment habitats

is rapid, and, following removal of dredging and vessel operations, complete recovery can be anticipated.

Hydrodynamic modelling is being conducted to define the extent of plume and sediment deposition affects resulting from dredging of the proposed access channel. Findings will be detailed within the EIS.

Fauna

During the project, physical interaction with marine species of significance will be primarily based upon movement of bauxite barges, supply barges, passenger ferries and miscellaneous vessel activity supporting the project during construction and operation. Habitat clearing at the proposed Port and barge and ferry facilities may lead to a minor interaction, although the bulk of works are intertidal. Dredging will induce changes to water quality for short periods of time during construction and periodically as a result of maintenance dredging. Key impacting processes relevant to significant marine species have been defined as:

- Habitat clearing.
- Facility construction.
- Initial capital dredging.
- Ongoing maintenance dredging.
- Vessel movement and general marine disturbance.

Management measures to minimise the interaction between the project and marine fauna species will be developed as part of the EIS.

Fisheries

The proposed development will not create a significant loss of habitat (intertidal or sub tidal), and the passage of fish within and between freshwater, estuarine and marine systems will not be influenced by barriers. Preliminary assessment indicates that dredging will not result in a significant impact to seagrass of the study area. Existing commercial fishing operations will not be displaced.

Cape Alumina will be implementing a no-take policy at all their operational facilities to mitigate localised increases in recreational fishing pressure by Cape Alumina employees. While it is recognised that improved access and increases in pressure from visitors to the region will occur, management is presently facilitated by size limits, bag limits, limitation of fishing gear and closures, monitored and regulated by The Department of Agriculture, Forestry and Fisheries. Recreational fishing effects directly attributable to the proposed operations are likely to be low.

Introduced marine pests

Australia maintains protocols to minimise the risk of marine pest incursions and the early detection of an incursion if one occurs. There is a National System for the Prevention and Management of Marine Pest Incursions which includes three major components:

- Prevention.
- Emergency response.
- Ongoing control and management of existing pests.

Extensive surveying for marine pest species has been undertaken at the nearby Port of Weipa, with no marine pest incursions having been recorded (Hoedt *et al*, 2001; PCQ, 2007). The risk of introduction of marine pests by the proposed project is likely to be reduced compared to the current risks associated with operations at the Port of Weipa. This is primarily due to the fact that ships are remaining offshore, and not entering the estuarine and inshore waters of Port Musgrave, where a range of additional habitat refuges exist.

Ships servicing the Pisolite Hills operations will be required to manage ballast waters inline with the existing management strategy. Recently released guidance into the design, operation and reporting of marine pest monitoring within Australia has been published by the Australian Government Department of Agriculture Fisheries and Forestry. Documents include the Australian marine pest monitoring guidelines and Australian Pest Monitoring Manual. Cape Alumina Limited will follow these documents in establishing a practical monitoring, management and reporting program for introduced marine pests.

4.12 Indigenous and non-indigenous cultural heritage

4.12.1 Existing environment

Indigenous

Indigenous cultural heritage is provided protection in Queensland under the *Aboriginal Heritage Act 2003*. Three cultural heritage assessment reports were commissioned by Cape Alumina, in order to identify the Indigenous cultural heritage values within the lease areas. These three reports assessed different leases as well as infrastructure components of the Pisolite Hills project. All reports included both desktop assessment and field survey. These reports are:

- Keys, B. 2009 Initial Cultural Heritage Assessment of Proposed Mine Development Areas (within EPM 15278, 15984 & 14547) Wenlock/Ducie River, Western Cape York.
- Woolfe, R. 2007 An Archaeological survey of Part of Mineral Lease EPM 15278. Wenlock River, Western Cape York.
- Morrison, M. And McNaughton, D. 2009 Cultural Heritage Assessment of Proposed Cape Alumina Haul Road Development, Palm Creek Area, Western Cape York Peninsula.
- Additional survey was undertaken by Tibaldi throughout 2009 and includes three short memos:
- Wet Season Environmental Survey – Camp Site Cultural Heritage Clearance (February 2009)

- Wet Season Environmental Survey – North Ling Creek Helipad Expansion (March 2009)
- June Field Trip – Lidar Survey (June 2009)

Detailed results and management recommendation are under consideration as part of the proposed EIS. Survey of the proposed Port facility and associated infrastructure is yet to be undertaken with respect to indigenous cultural heritage. This work will be updated as part of the EIS process.

Non-indigenous heritage

Specific study has not yet been undertaken for non-indigenous cultural heritage within the study area. However, remnants of the Angew Airstrip adjacent to the corridor and historical grazing activities provide a general indication of previous landuse. Some evidence of early bauxite exploration (post the 1950s) has been identified at the southern boundary of the Agnew Airfield. This site includes a rusting vehicle and a scattering of metal and glass objects.

4.12.2 Impacts and management

Indigenous cultural heritage management plan

A cultural heritage management plan (CHMP) will be prepared to detail the ongoing management of cultural heritage management for the Pisolite Hills project. The CHMP defines the following overriding principles of cultural heritage management:

- The recognition, protection and conservation of Aboriginal Cultural Heritage is the primary and mutual objective of the Parties and should be based on respect for Aboriginal knowledge, culture and traditional practices.
- Aboriginal people should be recognised as the primary knowledge holders of the significance of Aboriginal Cultural Heritage.
- It is important to respect, preserve and maintain knowledge, innovations and practices of Aboriginal communities and to promote understanding of Aboriginal Cultural Heritage.
- Activities involved in recognition, protection and conservation of Aboriginal Cultural Heritage are important because they allow Aboriginal people to reaffirm their obligations to 'law and country'.
- There is a need to establish timely and efficient processes for the management of project activities that may harm Aboriginal Cultural Heritage so that project activities can proceed in a timely and efficient manner.

Non-indigenous cultural heritage

Following the review of potential non-indigenous cultural heritage values conducted as part of the EIS, a management plan would be established should study findings identify sites of particular significance.

4.13 Social and economic environment

4.13.1 Existing environment

Population size and growth

Mapoon has an estimated residential population (ERP) of 266 people, and Weipa and Napranum 3,320 and 930 respectively. Table 4-2 provides a comparison of local, regional and state-wide population and growth.

Locality	Estimated Residential Population			Average growth rate	
	2004	2008	2009	2004-2009	2008-2009
Mapoon	239	263	266	2.2%	1.1%
Weipa	2,577	3,291	3,320	5.2%	0.9%
Napranum	855	928	930	1.7%	0.2%
Far North Queensland	235,921	262,896	269,650	2.7%	2.6%
Queensland	3,900,910	4,308,570	4,425,103	2.6%	2.7%

Source: Office of Economic and Statistical Research, Queensland Regional Profiles – Far North Statistical Division, viewed on 29 April 2010.

Table 4-2: Comparing population size and growth.

Age profile

Within those communities closest to the project, Mapoon and Weipa both had high proportions of people aged 15 to 24 years, who may benefit from increased access to employment opportunities locally.

Cultural diversity

At the 2006 Census, 91.2 percent of the population in Mapoon identified as Aboriginal or Torres Strait Islander. This figure was 92.7 percent for Napranum and 17 percent for Weipa. The Indigenous population of the study area is therefore high when compared with Far North Queensland (14.3 percent) and Queensland (3.3 percent).

Housing

Being situated over Deed of Grant of Land in Trust (DOGIT) for 'Aboriginal Reserve Purposes' land cannot be purchased by individuals, businesses or governments. The Mapoon community is therefore supported by a social housing system.

Social and recreational services

Weipa Township provides a wide range of community services and facilities to serve the needs of local residents and those living across western Cape York, including education, health sport and recreation and government services. The Mapoon community also hosts a range of basic community services and facilities to serve the lower-order needs of local residents.

Education

There are currently no childcare or kindergarten facilities located in Mapoon, although plans are underway to construct a centre which will accommodate 29 children. In Weipa, the Weipa Day Care Centre provides care for children between the ages of 0 and 12, and is currently being expanded to create additional capacity.

The Western Cape College provides primary and secondary school facilities for communities across the Cape York Peninsula. The College has campuses in Mapoon and Weipa. The Mapoon Campus provides schooling for children from pre-prep to Year 6.

Employment and Training

Community Enterprise Australia administers and manages the Community Development Employment Program (soon to renamed Remote Jobs and Communities Program) for Mapoon and has a local office in Mapoon.

Health

The study area has access to a range of health, aged care and emergency services and facilities, which cater for the needs of communities in the surrounding regional area.

Sport, recreation and leisure

There is a large sport and recreation centre in Mapoon with indoor ball game courts and space allocated for a football oval to be developed in the future. Sport and recreation programs are delivered by the Police and Citizens Youth Club (PCYC) to promote healthier lifestyles in Mapoon. Activities such as Auskick, rugby league, touch football and basketball are delivered in the community.

Fishing is a significant recreation activity for the people of Mapoon, as demonstrated by the Mapoon Aboriginal Community Fisheries Resources Assessment (October 2009). Local Mapoon community members represented 52 percent of survey participants, of which 86 percent actively fished. Fishing

was not only seen as a means to obtain food but an opportunity to spend quality time with family and friends. This is representative of the importance local communities afford to fishing as a communal / social activity.

Community and cultural facilities

The study area has access to a range of community and cultural groups and facilities which provide law and order, behavioural, community, culture and heritage, and religious services. These include a PCYC in Mapoon that promotes healthier lifestyles and improved social behaviour through recreational and cultural activities. Mapoon also has a women's and men's group to discuss local issues, as well as a Church of the Living God facility.

Shopping

The Mapoon Township has a store that provides basic food and day-to-day goods. Many residents choose to travel to Weipa for their weekly shopping.

Transport and access

The study area is serviced by a range of transport options, including road, air and barge facilities. The road from Weipa to Mapoon is 81 kilometre of sealed and unsealed road.

4.13.2 Impacts and management

The following potential social and socioeconomic impacts and benefits associated with the Pisolite Hills development have been identified:

- Opportunities for local and Indigenous employment, vocational education and training.
- Opportunities for local procurement, business development and indirect job creation.
- Longer-term return of Mapoon resident population through increased opportunities.
- Increased corporate social responsibility investment in the local community.
- Potential for improved social service provision in local communities.
- Potential for reduced demand for police services.
- Upgrade of Mapoon airstrip and improved transport access.
- Disturbance to current land uses and lifestyles of existing residents.
- Potential land acquisition.
- Increased demand for health and emergency services.
- Impact on community values relating to the environment and fishing.
- Impact on local availability of skills and workforce.
- Safety risks for local residents and tourists using the local and regional road network.
- Increased demand for schooling and education services.
- Increase in alcohol and drug use.

A social impact assessment will be undertaken within the EIS. A Social Impact Management Plan will be developed that will detail the management and mitigation measures for the project.

4.14 Traffic and shipping

4.14.1 Existing environment

The following existing road infrastructure is present in the regional location of the project site:

- Peninsula Developmental Road – unsealed.
- Mapoon Road – unsealed.
- Un-named road which runs from Mapoon Road to Pisolite Hills via Stones Crossing on the Wenlock River – unsealed.
- Un-named road which runs from Peninsula Development Road through Bertiehaugh Homestead and then south to join the gazetted Stone's Crossing Road.
- 'Stone's Crossing' Road which runs from Mapoon Rd to Pisolite Hills – unsealed and unformed in parts.

No existing road infrastructure is present within the proposed mine, transport corridor or port development area.

A single-lane small boat-ramp at Cullen Point, Mapoon represents the nearest, existing public-access marine-transport facility to the project Site. This ramp was installed by the Department of Transport in 2008. The nearest commercial port facilities are at located at Weipa, 50 kilometres south-west of the project area.

Two aerodromes (Agnew and Mapoon) are within an acceptable distance to the project site; however they do not meet the applicable standards that would allow Dash 8-300 aircraft to land and take off at these locations.

4.14.2 Impacts and management

Road transport

The potential impacts upon state controlled roads and local government roads and privately controlled road networks will be minimal. Bulk equipment, supplies and passenger transport to the project area will be conducted via air and sea. Upgrade of the access track through Bertiehaugh Station is proposed to enable access of construction equipment and supplies during the early stages of construction. Following this period all access will be via the completed barge and ferry access facilities. Maintenance of the access track through Bertiehaugh Station to Telegraph Road is proposed to facilitate site safety requirements.

Air transport

Charter flights from Cairns to Mapoon will be used to transport personnel to and from the project via an upgraded airstrip at Mapoon. Therefore, the potential impacts upon State controlled, Commonwealth-controlled and privately-owned airports will be minimal.

Marine transport

It is proposed that new marine facilities will be developed at Port Musgrave and Mapoon designed specifically for the project. Therefore, the project will have minimal impact upon current privately owned or port-authority operated ports. Transport impact assessments will be completed as part of the EIS.

4.15 Visual amenity

4.15.1 Existing environment

The current Mapoon urbanised area is characterised by basic urban infrastructure spread out in a bushland setting. The town has a population of approximately 300 people and has a primary school, nursing station, council office and small shop providing fuel and food. Figure 4-17 shows a typical house within the town of Mapoon. The lands surrounding Mapoon are undeveloped and reflect natural ecosystems and landscapes of the region. With the exception of Cullen Point, and vessel based views on Port Musgrave or the river systems, the proposed developments will not be readily observable from Mapoon. The proposed mine and transportation corridors will not be observable by the general public.

Figure 4-17: Residential dwelling at Mapoon.

4.15.2 Impacts and management

The following mitigation measures are recommended to reduce the visual impacts of the project:

- Use suitable lighting and shields to minimise light spillage;
- Retain as much mangrove foreshore as practicable at both the port facility and at Mapoon landing;
- Ensure rehabilitation occurs as soon as practicable as per the rehabilitation plan; and
- When practicable, use visually neutral colours on structures and plant which are visible from sensitive receptors.

Visual impact assessments and mitigation requirements will be developed as part of the EIS where required.

5. LEGISLATION AND APPROVALS

A number of legislative instruments are relevant to the development of the Pisolite Hills project, both Commonwealth and State.

5.1 Commonwealth legislation

Relevant legislation may include, but is not limited to those outlined within Table 5.1. Cape Alumina has previously referred the Pisolite Hills project to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) under the requirements of the *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).* The project was determined to be a 'controlled action' assessable under an EIS process.

In addition to legislative controls, the project may also need to address various agreements, including:

- China–Australia Migratory Bird Agreement (CAMBA);
- Japan–Australia Migratory Bird Agreement (JAMBA);
- Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA);
- Wetlands of international importance (Ramsar); and
- Sea dumping (London Protocol).

5.2 Queensland legislation

Relevant Queensland legislation may include, but is not limited to those outlined within Table 5.1. The commonwealth assessment is to be undertaken in parallel with the state EIS assessment proposed under the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

5.2.1 Wild river declaration and the Cape York Regional Plan

Part of the area of the proposed resource is currently impacted by the Wild Rivers Declaration for the Wenlock River. The Queensland Government has announced that it intends to replace the Wild Rivers declarations with a statutory Cape York Regional Plan, which also includes a 'Bioregion Management Plan'. A scoping paper for the Bioregion Management Plan is currently undergoing public consultation. Government has announced that consultation on the draft plan will commence in the first half of 2013 (see Media Statement of The Hon Andrew Powell dated 28 June 2012).

Cape Alumina acknowledges that the statutory regional planning exercise for Cape York, including the area of Cape Alumina's mining lease application, is currently being developed. The EIS will be assessed based on the statutory regime that applies at the time the EIS is provided to the Coordinator-General.

5.2.2 Queensland approvals

Approvals requirements will vary between on-lease and off-lease development, however Queensland approvals to be considered during the EIS process may include but are not limited to:

- Development approvals under the *Sustainable Planning Act 2009*, including for:
    - Building works.
    - Approvals under the relevant planning schemes.
    - Environmentally relevant activities.
    - Tidal works.
    - Taking or interfering with water.
    - Operational work within a coastal management district.
    - Operational work for the removal, destruction or damage of a marine plant.
- Water licences and permits under the *Water Act 2000*.
- Permits under the *Nature Conservation Act 1992.*
- Environmental authority under the *Environmental Protection Act 1994*.

Table 5-1: Commonwealth and State legislation

Commonwealth legislation	Administering authority	Approval trigger	Approval type	Relevance to project
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Department of Sustainability, Environment, Water, Population and Communities (DSEWPC)	Action which has, or is likely to have, a significant impact on a Matter of National Environmental Significance (MNES).	Approval of the 'controlled action'. Separate EIS approval under a parallel assessment process.	The project has been determined to be a "controlled action" and must be assessed and approved under the EPBC Act.
Energy Efficiency Opportunities Act 2006	Department of Resources, Energy and Tourism	Assess energy reduction opportunities and minimise energy use.	Annual report required once project approved.	Requirements of the Act need to be considered during the project planning stage.
Native Title Act 1993 NT Act	The Attorney- General's Department and Minister for Families, Housing, Community Services and Indigenous Affairs	The project may traverse land upon which Native Title occurs.	Compliance with the *NT Act*, including the need for relevant notifications or agreements under the Act will be addressed in the EIS. This may include development of a ILUA for the project.	Management of native title issues.
Environment Protection (Sea Dumping) Act 1981	DSEWPC	Dredging and disposal of material within commonwealth waters.	Sea dumping permit.	Capital and maintenance dredging works.
Quarantine Act 1908	Australian Quarantine and Inspection Service	Ballast water from ships, an important source of marine pests, is regulated under the Quarantine Regulations 2000.	Port operations.	Management of vessels servicing the Pisolite Hills project.

State legislation	Administering authority	Approval trigger	Approval type	Relevance to project
Aboriginal Cultural Heritage Act 2003	Department of Environment Heritage Protection (DEHP)	Activity that has the potential to harm Aboriginal cultural heritage.	Cultural Heritage Management Plan (CHMP).	Proponent has to comply with the cultural heritage 'duty of care' and take all reasonable and practicable measures to protect cultural heritage.
Aboriginal Land Act 1991	Department of Natural Resources and Mines (DNRM)	Land that is or has the potential to be transferred, claimed or leased by Aboriginal people under this Act.	Negotiated agreement with trustees of Mapoon DOGIT or Governor in Council approval.	Land on which part of the project is situated is reserve held by the Mapoon DOGIT for the purposes of the Mineral Resources Act 1989.
Environmental Protection Act 1994	Department of Environment Heritage Protection (DEHP)	An environmental authority is required to carry out a mining activity.	Permits.	An environmental authority is required to carry out a mining activity. Off-lease ERAs may also be triggered.
Mineral Resources Act 1989	Department of Natural Resources and Mines (DNRM)	The prospecting, exploration and mining of minerals and associated land use conflicts.	Mining Lease.	Mining operations will require a mining lease.
Nature Conservation Act 1992	Department of Environment Heritage Protection (DEHP)	Clearing or interference with declared and protected areas or wildlife habitats.	Permit required for disturbance or interference with listed species.	A nature refuge exists on the eastern project boundary (Bertiehaugh Station). Flora and fauna surveys will determine if any species under the act are present on the project site.

State legislation	Administering authority	Approval trigger	Approval type	Relevance to project
Queensland Coastal Protection and Management Act 1995	Department of Environment Heritage Protection (DEHP)	The principal objectives of the Act are the protection, conservation, rehabilitation and management of the state's coastal resources and biodiversity by the provision, of a coordinated and integrated management and administrative framework for the ecologically sustainable development of the coastal zone.	Permits.	Development in a coastal area (in conjunction with the Sustainable Planning Act).
Queensland Fisheries Act 1994	Department of Agriculture Forestry and Fisheries	The *Fisheries Act 1994* provides for the declaration protection of marine plants against unlawful removal, destruction or damage.	Permit.	Marine plants and listed species. Permit will be required if works outside the mining lease impact on any mangroves and for works in tidal areas (in conjunction with the Sustainable Planning Act).
Queensland Heritage Act 1992	Department of Environment Heritage Protection (DEHP)	Regulation, in conjunction with other legislation, for development affecting cultural heritage significant place and providing for heritage agreements to encourage appropriate management of Queensland heritage places.	Heritage Agreement.	The EIS will include comprehensive surveys and the development of mitigation measures to avoid impacts on these values.

State legislation	Administering authority	Approval trigger	Approval type	Relevance to project
Sustainable Planning Act 2009	Department of State Development, Infrastructure and Planning	Triggers for development requiring assessment and approval will be reviewed in detail in the EIS.	Development Permit.	Development approvals may be required for development outside of the mining lease, and for building works.
Vegetation Management Act 1999	Department of Natural Resources and Mines	Native vegetation clearing	Development Permit.	Clearing of vegetation protected by the *Vegetation Management Act 1999* may be required (in conjunction with the Sustainable Planning Act). The triggers for the provision of vegetation offsets will be explored as part of the EIS.
Water Act 2000	Department of Energy and Water Supply	Taking or interfering with water in a watercourse, lake or spring, and certain subartesian and artesian water.	Permit and/or licence.	Licences or permits may be required for water supply, and for extraction of quarry material.

5.3 Planning schemes, policy and guidelines

The following planning schemes and policy documents have been identified as potentially applicable to the assessment and approval of the Pisolite Hills project.

- Planning Scheme for Mapoon Aboriginal Shire and Cook Shire.
- Environmental protection policies (EPPs, subordinate to the EP Act), including:

  (a) EPP (Noise) 2008
  (b) EPP (Air) 2008
  (c) EPP (Water) 2009

- state planning policies and their supporting guidelines;
- fish habitat management operational policies;
- Sustainable Resource Communities Policy
- Cape York Regional Vegetation Management Code.

With specific relevance to maritime safety and operations, the following policies, guidelines and standards may also be referenced within the assessment:

- Maritime Safety Queensland Regulation 2002
- *Maritime Transport and Offshore Facilities Security Act 2003*
- *Transport Operations (Marine Pollution) Act 1995*
- *Transport Operations (Marine Safety) Act 1994*
- Transport Operations (Maritime Safety) Regulation 2004
- Australian Maritime Safety Authority marine orders
- Queensland Coastal Contingency Action Plan (QCCAP)
- Standards for Hydrographic Surveys within Queensland Waters
- Transport Operations (Marine Pollution) Regulation 2008.

6. COSTS AND BENEFITS SUMMARY

Detailed studies show that Cape Alumina's Pisolite Hills project will have lasting social and economic benefits for Western Cape York communities, Far North Queensland and the broader Australian public (Synergies Economic Consulting, 2010). Studies undertaken for the Pisolite Hills project show that the project would boost economic activity by $1.2 billion in Net Present Value (NPV) terms, and create or sustain more than 1,700 jobs over the mine's 15-year life.

6.1 Economic indicators

A number of significant economic benefits will arise as a result of the project, these benefits have been summarised as follows:

Construction

The estimated cost of construction is $380 million, with a total impact on turnover in the economy of $771 million. During construction, the total impact on Gross State Product (GSP) has been estimated as $342 million and the impact on Far North Queensland regional GSP will be $201 million. The total employment impact (including direct construction jobs) is anticipated to exceed 1,200 jobs.

Operations

Based upon the maximum production scenario of seven Mtpa, the annual impact on turnover in the economy is anticipated to be $267 million. The total impact on GSP is estimated to be $118 million during operations (with regional GSP at $58million). The total employment impact will exceed 506 jobs.

Local and regional economic benefits

The project activities will result in an improvement in the Western Cape York economy, due to purchase of local equipment, goods and services and increased availability of disposable income. Local purchasing may include:

- Aviation services;
- Earth-moving equipment hire;
- Food and supplies;
- Fuel supply and transport;
- Light engineering;
- Professional and technical services;
- Road transport services;
- Training and personnel management services; and
- Vehicle hire.

State economic benefits

The project will help to realise the value of a significant Queensland mineral resource via bauxite mining, beneficiation and export. Royalties that are due to the State as a function of the project's mining activities, will create a positive impact upon State economics. Such royalties will be calculated as a percentage of the value of the mineral, as determined by the Minister. Project royalties over the life of the project are expected to be approximately $400 million.

6.1.1 Impacts and synergies with other projects

The potential impacts upon other current and or foreseeable mining activities in the area have been identified as follows:

Impacts upon other projects

Mining Leases which lie adjacent to the project are held by both Rio Tinto Aluminium Limited. Cape Alumina are not aware of any intention to mine the resources which underlie these leases in the near future. In addition, Cape Alumina are not aware of any other mines that currently operate in the immediate vicinity of the proposed mine site. Therefore, the project is not anticipated to have an impact upon neighbouring projects.

The bauxite mining that is currently conducted at Weipa will not be impacted by the project. Cape Alumina is seeking to develop independent transport routes and supply chains for the project.

Potential Synergies with Other projects

The potential synergies with future development activities in the area have been identified. Should other lease holders wish to develop the resources north of Weipa, then the proposed barge export facility may provide access for other projects without the need for costly or destructive construction of additional facilities. If required, the proposed development may be expanded to supply access opportunities for others and minimise export infrastructure footprints. An upgraded Mapoon air strip would provide FIFO access for other mining companies who may wish to develop lease areas in the vicinity of Mapoon.

6.2 Benefits

The project will create employment and business enterprise opportunities and provide long-term legacy benefits through the development of economic infrastructure.

- Economic benefits – the project will assist with the economic stability of the local region, provide economic benefits and employment opportunities and generate export trade dollars for Queensland.
- Local trade benefits – during the project's construction phase, equipment, goods and services will be purchased locally from Queensland suppliers. During the mine's operational phase the procurement of local equipment, goods, consumables and services

will also be conducted, thereby further enhancing the economic health of both the local region and Queensland.

- Training opportunities – as a result of the need for skilled staff, various training opportunities will arise for staff working on the project.
- Provision of infrastructure – the construction of a barging facility and development of the project airstrip will enhance the infrastructure available for use in the region.
- Business development benefits – will include the bauxite transhipment operation, village services such as laundry, food supply and cleaning, mining rehabilitation, environmental monitoring, transport and tourism.
- Direct employment – Cape Alumina will employ a construction workforce of approximately 200 persons during the mine development phase and up to 260 persons during the mine's operational phase. Local residents will be employed wherever possible. Other staff will be obtained from regional areas and travel to site on a FIFO basis. The project's mine staffing plan and the implementation of this plan will have a positive benefit for both local and regional employment in terms of the staff required to operate the mine and the goods and services required for mine operations.
- State economic benefits – the project will help to realise the value of a significant Queensland mineral resource via bauxite mining, beneficiation and export.
- Royalties that are due to the State as a function of the project's mining activities, will create a positive impact upon State economics. The Pisolite Hills operations will produce commercial-grade bauxite for overseas export. In accordance with Queensland legislation, the Proponent will pay mineral royalties to the Queensland Government for the right to mine the State's resources. Such royalties will be calculated as a percentage of the value of the mineral, as determined by the Minister. Project royalties over the life of the project are expected to be approximately $400 million.

6.3 Costs

6.3.1 Cost to government

There are no immediate additional infrastructure costs expected to be met by government. For a small community Mapoon has reasonable levels of social and economic infrastructure. The project will enhance existing infrastructure (for example, its proposed airport redevelopment) and develop additional infrastructure to meet its requirements (barge and ferry facility).

Future demands to augment the existing economic and social infrastructure will depend on whether the project provides a significant boost to Mapoon's population. Within the current planning cycle of government there is not expected to be a major requirement for investment in social or economic infrastructure by government. The population growth of Mapoon should be monitored to ascertain whether sufficient social infrastructure services are available.

6.3.2 Implications for future development in the locality

There are no proposed alternative developments for Mapoon or within the region that are significantly affected by this proposal. The proposal is consistent with the prevailing economic development plans for the region.

6.3.3 Potential impact of major hazards

A separate hazard and risk assessment was undertaken as part of this project. No major hazards for the project were identified where management and control measures would not reduce the likelihood or severity of these risks.

6.3.4 Social impacts

Negative social impacts identified in the social impact study include an increased risk of alcohol and drug abuse and associated anti-social behaviour, and detriment to the community's feel including the potential for mining impacts on traditional fishing and hunting.

7. COMMUNITY AND STAKEHOLDER CONSULTATION

Cape Alumina supports and works closely with the communities in which the company operates and will strive to keep all stakeholders informed about the company's activities throughout the EIS process.

Cape Alumina has consistently shown it can maintain a positive, harmonious working relationship with all stakeholders, particularly the Traditional Land Owners and Aboriginal people of Western Cape York. Studies have shown that over 80 per cent of Mapoon residents strongly supported endeavours to develop the Pisolite Hills project and would like one day to work for the company.

7.1 Stakeholders review

The table below identifies major stakeholder groups that may be affected by the Pisolite Hills project and whether the impact of the project is anticipated to be positive or negative.

Table 7-1: Stakeholder impact matrix

Stakeholder	Description of impact	Net Impact	
		Positive	Negative
Shareholders of Cape Alumina	Cape Alumina will benefit from the project by the value of the expected net revenues	✓	
Mapoon community	Mapoon community will benefit from employment opportunities, economic growth, improved infrastructure, enhanced opportunities for existing businesses to supply the project, new businesses for the local community and payment of royalties to the community. Adverse impacts identified by the community concern the impact of the project on traditional lifestyle and environment.	✓	
Cape York Indigenous communities	Indigenous people are willing to travel from their communities to employment opportunities. It is expected that some employment opportunities and benefits from payment of royalties and flow on effects will exist for people in other Indigenous communities.	✓	
Existing land users (graziers)	There are limited grazing activities on the area to be mined as the land is only marginally suitable for grazing.		✓
Other regional industries	Opportunities exist for other industries to supply inputs to the project. For example, fly-in fly-out services will be provided by a regionally based aviation operator, engineering services, mechanical repair, catering, professional services, fuel etc are likely to be sourced locally. Local industries such as tourism may also benefit from improved access to the region provided by the airport upgrade.	✓	
Far North Queensland economy	A reasonably high proportion of the total economic impacts will be retained in the Far North Queensland economy. However, the project is not so large compared to the size of the regional economy to be likely to create supply constraints and therefore significant upward pressure on wages and input prices for other existing industries.	✓	

Stakeholder	Description of impact	Net Impact	
		Positive	Negative
Bertiehaugh Cattle Station	Part of Cape Alumina's exploration tenements overlap 12,360 hectares of the 135,000 hectare Bertiehaugh Cattle Station. This equates to 9.16 per cent of the overall pastoral lease. The actual land on the Bertiehaugh Cattle Station pastoral lease that is proposed to be mined is 2,053 hectares. This equates to 1.5 per cent of the overall pastoral lease. This land will be fully and progressively rehabilitated to its pre-mining condition however the owner is opposed to mining on the cattle station.		✓
Rio Tinto	Transport of personnel, equipment and bauxite across Rio Tinto mining lease between mine site and port operations at Port Musgrave		✓
Queensland Government	The Queensland Government will benefit directly from the revenue generated from the scheme and by the contribution of the scheme to its development objectives for the region.	✓	
Commonwealth Government	The Commonwealth government benefits through increased taxation revenue and greater prosperity for Indigenous communities	✓	

7.2 Stakeholder engagement process

The Pisolite Hills EIS will continue from its existing stakeholder management processes. The strategy will follow guidance outlined by the Queensland Government in undertaking consultation and stakeholder engagement, ensuring an open and transparent approach is taken to engage with government, affected parties and the wider community. In summary, key elements of the stakeholder management plan would include:

- Identification of all possible stakeholders.
- Effective communication and management plan, targeted to groups of stakeholders or individual key stakeholders as required.
- A summary of key events and activities along with a milestone schedule for when they are likely to occur.
- Assignment of responsibility for rollout and maintenance of each part of the plan.
- Assignment of specific personnel who are to become the primary contact for the implementing the plan.
- The project will maintain a dedicated internet presence and a free call telephone contact service will be established. Cape Alumina will provide regular updates as to the progress of the EIS process, and maintain a regular community communication program, where opinions and thoughts of the community are actively sought.

7.3 Indigenous relations

Cape Alumina has a strong relationship with the Traditional Land Owners and Aboriginal people of western Cape York. In recent years, the company has worked closely with the people of Mapoon to advance the Pisolite Hills project, and the company is working in partnership with the Aboriginal communities and Traditional Land Owners.

To advance our projects, we have negotiated seven exploration agreements with Aboriginal parties in western Cape York, including three agreements with the Mapoon Deed of Grant in Trust (DOGIT) Trustees and Council. The agreements we have in place are:

- Wik Exploration Agreement (17 October 2006 and 29 July 2009)
- Napranum Exploration Agreement (5 December 2006)
- Mapoon Exploration Agreement (23 April 2007)
- Mapoon North Exploration Agreement (11 September 2008)
- Exploration Consent Agreement with Apudthama Land Trust (29 April 2011)
- Conduct and Compensation Agreement with Apudthama Land Trust (29 April 2011)
- Consent and Conduct and Compensation Agreement with Mapoon DOGIT (25 July 2011)

Cape Alumina employs local Aboriginal people in all field operations including exploration, cultural heritage surveys, environmental studies, and environmental monitoring.

Before undertaking any mining, Cape Alumina intends to negotiate an Indigenous Land Use Agreement (ILUA) with the Trustees of the DOGIT land and relevant native title parties under the NTA. Cape Alumina has an initial target of 25 percent of the local work force to be drawn from the local indigenous community. The company understands the need to work with the local community to identify and train personnel to meet these targets, and is committed to a long-term partnership with local residents.

8. GLOSSARY

Term	Explanation
ANZECC	Australian and New Zealand Environment and Conservation Council
AQIS	Australian Quarantine and Inspection Service
ASS	Acid Sulfate Soils
BoM	Bureau of Meteorology
CBX	Australian stock exchange code for Cape Alumina Limited
CG	Coordinator-General
CHMP	Cultural Heritage Management Plan
CSC	Cook Shire Council
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEEDI	Queensland Department of Employment, Economic Development and
DEHP	Queensland Department of Environment and Heritage Protection
DME	Queensland Department of Mines and Energy
DOGIT	Deed of Grant in Trust
DSEWPaC	Department of Sustainability Environment Water Population and Communities
DWT	Dead Weight Tonnage
EIS	Environmental Impact Statement
EMP	Environmental Management Plan – part of the EIS process
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPP Water	Environmental Protection (Water) Policy 2009
ERP	Estimated Residential Population
EVs	Environmental Values
FEL	Front End Loader
FHA	Fish Habitat Areas
FIFO	Fly-in Fly-out
GAB	Great Artesian Basin
GSP	Gross State Product (GSP)
Ha	Hectares
HDPE	High Density Polyethylene
IAS	Initial Advice Statement
ILUA	Indigenous Land Use Agreement
IMS	Introduced Marine Species
IUCN	International Union for the Conservation of Nature
kPa	kilo Pascal

Term	Explanation
LAT	Lowest Astronomical Tide
ML	Mine Lease
ML	Mega Litres
MLA	Mine Lease Application
MNES	Matters of National Environmental Significance under the *EPBC Act*
Mt	Million tonnes
Mtpa	Million tonnes per annum
NAGD	National Guidelines for Dredge Assessments
NCA	*Nature Conservation Act 1992* (Qld)
NCWR	*Nature Conservation (Wildlife) Regulation 2006*
NPF	Northern Prawn Fishery
NPV	Net Present Value
SDPWO Act	*State Development and Public Works Organisation Act 1971*
SIA	Social Impact Assessment – part of the EIS process
STPS	Package Sewage Treatment Plant
t	tonne
TDS	Total Dissolved Solids
tph	Tonnes Per hour
USL	Unallocated State Land
VMA	*Vegetation Management Act 1999* (Qld)
WQOs	Water Quality Objectives

9. REFERENCES AND DATA SOURCES

AARC (2010). Soils and land study. Unpublished report for Cape Alumina.

AARC (2010). Transport study. Unpublished report for Cape Alumina.

Abrahams, H., Mulvaney, M., Glasco, D. and Buff, A. 1995. *An Assessment of the Conservation and Natural Heritage Significance of Cape York Peninsula.* CYPLUS – Queensland and Commonwealth Governments.

AGE (2010). Groundwater impact study. Unpublished report for Cape Alumina.

ANZECC/ARMCANZ (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* National Water Quality Strategy. Australian and New Zealand Environment Conservation Council and Agricultural Resource Management Council of Australia and New Zealand.

ASK (2010). Pisolite Hills air quality study. Unpublished report for Cape Alumina Limited.

ASK (2010). Pisolite Hills noise study. Unpublished report for Cape Alumina Limited.

Australian Hydrographic Service (2007). *Seafarer Tides*. Commonwealth of Australia.

Australian Natural Resource Atlas (ANRA) – Economics Wenlock River. 16/11/2007a. http://www.anra.gov.au/topics/economics/costs-returns/qld/basin-wenlock-river.html

Australian Natural Resources Atlas (ANRA) – Economics Ducie River. 16/11/2007b. http://www.anra.gov.au/topics/economics/costs-returns/qld/basin-ducie-river.html

Baker, R. and Shephard, R. (2006). *Fisheries Resources of Albatross Bay, Gulf of Carpentaria*. Department of Primary Industries and Fisheries

Bejder, L., Samuels, A., Whitehead, H. Finn, H., and Allen, S. (2009). Impact assessment research: use and misuse of habituation, sensitisation and tolerance in describing wildlife responses to anthropogenic stimuli. *Marine Ecology progress Series. Vol. 395: 177–185.*

Bell, I. (2004) *Weipa Coast Turtle Foraging, Nesting and Threats Survey 2003.*

Blaber, S.J.M., Brewer, D.T. and Salini, J.P. (1989). Species composition and biomasses of fishes in different habitats of a tropical northern Australian estuary: their occurrence in the adjoining sea and estuarine dependence. *Estuarine Coastal and Shelf Science*, 29: 509-531.

Blaber, S.J.M., Brewer, D.T., Salini, J.P. (1995). Fish communities and the nursery role of the shallow inshore waters of a tropical bay in the Gulf of Carpentaria, Australia. *Estuarine Coastal and Shelf Science*, 40:177-193

Blaber, S.J.M., Brewer, D.T., Salini, J.P. and Kerr, J. (1990). Biomasses, catch rates and abundances of demersal fishes, particularly predators of prawns, in a tropical bay in the Gulf of Carpentaria, Australia. *Marine Biology*, 107: 397-408.

Burford, M.A. and Rothlisberg, P.C. (1999). Factors limiting phytoplankton production in a tropical continental shelf ecosystem. Estuarine, Coastal and Shelf Science, 48: 541-549.

Coles, R. G., McKenzie, L. J., Bibby, J. M., Lee Long, W. J. and Mellors, J. E. Surveys of Seagrass Meadows and Juvenile Prawn Populations in the Eastern Gulf of Carpentaria: Wellesly Islands region (March – September 1984) and Cape York to Tarrant Point (October - November 1986). DPI Information Series. Department of Primary Industries, Queensland. 30 p.

Commonwealth of Australia (2002). *National Ocean Disposal Guidelines for Dredged Material*, Commonwealth of Australia, Canberra, 2002.

Compagno, L.J.V., and Cook, S.F. (1995) *The exploitation and conservation of freshwater elasmobranchs: status of taxa and prospects for the future*. Journal of Aquaculture and Aquatic Sciences 7, 62-89.

Compagno, L.J.V., White, W.T., and Last, P.R. (2008) Glyphis garricki sp. Nov., a new species of river shark (Carcharhiniformes: Carcharhinidae) Northern Australia and Paua New Guinea, with a redescription of Glyphis glyphis (Müller & Henle, 1839) pp 203-225. In: Last P.R., W.T. White and Pogonoski J.J. (Eds.) Descriptions of New Australian Chondrichthyans. CSIRO Marint and Atmospheric Research Paper 022. pp 358.

Corkeron, P.J., Morisette, N.M., Porter, L. and Marsh, H. (1997) Distribution and status of Humpback Dolphins, Sousa chinensis, in Australian waters. Asian Marine Biology 14:49–59.

Danaher, K.F. 1995. Marine Vegetation of Cape York Peninsula. CYPLUS – Queensland and Commonwealth Governments.

Dear SE, Moore NG, Dobos SK, Watling KM and Ahern CR (2002). Soil Management Guidelines. In Queensland Acid Sulfate Soil Technical Manual. Department of Natural Resources and Mines, Indooroopilly, Queensland, Australia.

DEWHA (Department of the Environment, Water, Heritage and the Arts (2008) Draft Issues Paper for: Freshwater Sawfish (Pristis microdon), Green Sawfish (Pristis zijsron) Speartooth Shark (Glyphis glyphis); and Northern River Shark (Glyphis garracki). Department of Environment, Water, Heritage and the Arts, 86pp.

Duke, N. (2006). Australia's Mangroves: the Authoritative Guide to Australia's Mangrove Plants. University of Queensland, Brisbane.

Eberhard, R. (2006) Water Quality Management on Cape York Peninsula. Report for the Cape York Community Engagement Group (Department of Communities) June 2006. Natural Heritage Trust.

EPA (2007). Queensland Water Quality Guidelines 2006: Minor updates March 2007. Environment Protection Agency, Queensland. 121 Pp.

Erftemeijer, P.L.A., and Lewis III, R.R.R. (2006). Environmental impacts of dredging on seagrasses A review. Marine Pollution Bulletin, 52: 1553-1572.

Fenton, D. M., Marshall, N.A. (2001). A Guide to the Fishers of Queensland. Part C: TRC-Analysis and Social Profiles of Queensland's Charter Fishing Industry. CRC Reef Research Centre Technical Report No. 38. Townsville; CRC Reef Research Centre, 107 pp.

Forbes, A.M.G. (1984). The contribution of local processes to seasonal hydrology of the Gulf of Carpentaria. Océanographie Tropicale, 19: 193-201.

Forest & Sea Consulting (2007) Preliminary Environmental Report, Bauxite Mine and Marine Operations. May 2007.

GHD (2007) Scoping Study Report for Wenlock Bauxite Deposit. March 2007.

GHD (2007b) Report for Wenlock Bauxite Project - Beneficiation and Tailings Study. August 2007

Godfrey, M.H. and Barreto, R. (1995) Beach vegetation and seafinding orientation of turtle hatchlings. Biological Conservation, 74: 29-32.

Hale, P., Long, S. and Tapsall, A. (1998) Distribution and conservation of delphinids in Moreton Bay. In: Tibbetts, I.R., Hall, N.J. and Dennison, W.C. (eds) Moreton Bay and Catchment. School of Marine Science, The University of Queensland, Brisbane.

Hale, P.T., Barreto, A.S. and Ross, G.J.B. (2000) Comparative morphology and distribution of the aduncus and truncatus forms of bottlenose dolphin Tursiops in the Indian and Western Pacific Oceans. Aquatic Mammals, 26:101–110.

Hays, G.C., Ashworth J.S., Barnsley, M.J., Broderick, A.C., Emery, D.R., Godley B.J., Henwood, A. and Jones, E.L. (2001). The importance of sand albedo for the thermal conditions on sea turtle nesting beaches. Oikos, 93: 87-94.

Haywood, M.D.E., Vance, D.J., and Loneragan, N.R. (1995). Seagrass and algal beds as nursery habitats for tiger prawns (Penaeus semisulcatus and P. esculentus) in a tropical Australian estuary. Marine Biology, 122: 213–223.

Hodge, W., Limpus, C.J. and Smissen, P. (2006). Queensland Turtle Conservation Projectproject: Hummock Hill Island Nesting Turtle Study, 2006. Environmental Protection Agency, Queensland. 6 pp

Hodgson, A. J. and Marsh, H. (2007). Response of dugongs to boat traffic: the risk of disturbance and displacement. Journal of Experimental Marine Biology and Ecology, 340: 50-61.

Hoedt, F.E., Choat, J.H., Cruz, JJ., Neil, K.M. and Collins, J. (2001). Survey of the Port of Weipa: port marine baseline surveys and surveys for introduced marine pests. Final report prepared for Ports Corporation Queensland by CRC Reef Research Centre and School of Marine Biology and Aquaculture James Cook University, April 2001.

Hoedt, F.E., Choat, J.H., Cruz, JJ., Neil, K.M. and Collins, J. (2001). Survey of the Port of Weipa: port marine baseline surveys and surveys for introduced marine pests. Final report prepared for

Ports Corporation Queensland by CRC Reef Research Centre and School of Marine Biology and Aquaculture James Cook University, April 2001.

Hydrobiology (2003). Port of Weipa Sediment Sampling and Analysis Plan: April/May 2003 Survey of Lorim Point Wharf and Evans Landing Berth. Prepared by Hydrobiology Pty Ltd for Ports Corporation of Queensland, July 2003.

Hydrobiology (2004). Port of Weipa - Sediment Sampling and Analysis Plan: 2004 Survey. Prepared by Hydrobiology Pty Ltd for Ports Corporation of Queensland, July 2004.

Iversen, E.S and Beardsley, G. (1974). Impact of sand dredging on the fauna of a submerged delta south of Key Biscayne, Florida. Report to the Des Rocher Sand Co., Inc., H. McGovern, President.

Jaensch, R. (2005). Wetland management profile - Saltmarsh wetlands. Ecosystem Conservation Branch, EPA, Aug 2005. Queensland Government.

Jefferson, T.A. (2000). Population biology of the Indo-Pacific hump-backed dolphin in Hong Kong waters. Wildlife Monographs, 144, 1–65.

Jones, M.V., West, R.J., 2005. Spatial and temporal variability of seagrass fishes in intermittently closed and open coastal lakes in southeastern Australia. Estuarine, Coastal and Shelf Science 64, 277-288.

Kenyon, R. A., Turnbull, C., and Smit, N. (2004). Prawns. In: A Description of key species groups in the northern planning area: background paper. National Oceans Office Hobart, Tas.: National Oceans Office. p. 227-248.

King, G.M. 1983. Sulfate reduction in Georgia saltmarsh soils: an evaluation of pyrite formation by use of "SUP 35" S and "SUP 55" Fe tracers. Limnology and Oceanography 28, 987-995.

Last, P.R. and Steven, J.D. (2009) Sharks and Rays of Australia. 2nd Edition. CSIRO Publishing, Melbourne. pp656.

Limpus, C.J. and Miller, J.D. (2008). Australian Hawksbill Turtle Population Dynamics Projectproject. Environmental Protection Agency, Queensland. 130 pp.

Limpus, C.J., Fleay, A. and Baker, V. (1984) The flatback turtle, Chelonia depressa, in Queensland: reproductive periodicity, philopatry and recruitment. Australian Journal of Wildlife Research, 11:579-587.

Long, B.G. and Poiner, I.R. (1994). Infaunal benthic community structure and function in the Gulf of Carpentaria, Northern Australia. Australian Journal of Marine and Freshwater Research, 45: 293-316.

Matrix Plus (2010). Mine rehabilitation study. Unpublished report for Cape Alumina.

Miller, J.D. (1996) Reproduction in sea turtles. In: The Biology of Sea Turtles (Eds: P.L. Lutz and J.A. Musick). CRC Press. p. 51-81.

Munksgaard, NC and Parry, DL. (2002). Metals, arsenic and lead isotopes in near-pristine estuarine and marine coastal sediments from northern Australia. Marine and Freshwater Research, 53: 719-729.

Munksgaard, NC and Parry, DL. (2002). Trace metals, arsenic and lead isotopes in dissolved and particulate phases of North Australian coastal and estuarine seawater. Marine Chemistry, 75: 165–184

NSW Department of Natural Resources, 2006. Estuaries in NSW, website: http://www.naturalresources.nsw.gov.au/estuaries/index.shtml

Orpin, A.R., Ridd, P.V., Thomas, Séverine, A., Kenneth R.N., Marshall, P. and Oliver, J. (2004) Natural turbidity variability and weather forecasts in risk management of anthropogenic sediment discharge near sensitive environments. Marine Pollution Bulletin, 49 7-8: 602-612.

Parra, G.J. (2006) Resource partitioning in sympatric delphinids: space use and habitat preferences of Australian snubfin and Indo-Pacific humpback dolphins. Journal of Animal Ecology. 75: 862-874.

Peverell, S.C. (2005). Distribution of sawfishes (Pristidae) in the Queensland Gulf of Carpentaria, Australia, with notes on sawfish ecology. Environmental Biology of Fishes, 73: 391-402.

Peverell, S.C., McPherson, G., Garrett, R.N., and Gribble, N.A. (2006) New records of the River Shark Glyphis (Carcharhinidae) reported from Cape York Peninsula, northern Australia. Zootaxa 1233, 53-68.

Pillans, R.D., J.D. Stevens, P.M. Kyne & J. Salini (2005). Acoustic tracking of Glyphis sp. A in the Adelaide River, Northern Territory, Australia. [Online]. Canberra, Department of the Environment and Heritage. Available from: http://www.environment.gov.au/coasts/publications/pubs/glyphis-nt.pdf.

Pillans, R.D., Stevens, J.D., Peverell, S., and Edgar, S. (2008) Spatial distribution and habitat utilisation of the speatooth shark Glyphis sp. In relation to fishing in northern Australia. A report for the Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/coasts/publications/speartoth-shark-report.html

Pollard, D.A., 1994. A comparison of fish assemblages and fisheries in intermittently open and permanently open coastal lagoons on the south coast of New South Wales, south-eastern Australia. Estuaries 17, 631-646.

Queensland Herbarium. 2009. Regional Ecosystem Description Database (REDD). Version 6.0b Updated November 2009. Department of Environment and Resource Management: Brisbane.

Quinn, R. H. 1992. Fisheries Resources of the Moreton Bay Region. Queensland Fish Management Authority.

Rasheed, M.A., Taylor, H.A. and Sankey, H.A. (2007) Port of Weipa Long Term Monitoring: September 2007. Report prepared by the Department of Primary Industries and Fisheries, Queensland for Ports Corporation of Queensland.

Rasheed, M.A., Taylor, H.A. and Thomas, R. (2006)b. Long-term seagrass monitoring in Port Curtis and Rodds Bay, Gladstone - October 2005. DPI&F Information Series QI06030 (DPI&F, Cairns), 30 pp

Rasheed, M.A., Taylor, H.A., Dew, K. and Thomas, R. (2006)a. Long term seagrass monitoring in Cairns Harbour and Trinity Inlet - December 2005. DPI&F Information Series QI06032 (DPI&F, Cairns), 25 pp.

Raudzens, E. E. (2007). Northern Prawn Fishery Data Summary 2006. Logbook Program, Australian Fisheries Management Authority, Canberra.

Redfield, J.A., Holmes, J.C. and Holmes, R.D. (1978) Sea snakes of the eastern Gulf of Carpentaria. Australian Journal of Marine and Freshwater Research, 29:325-334.

Richardson, W.J., Malme, C.I., and Thomson, D.H. (1998). Marine mammals and noise.

Roelofs, A., Rasheed, M. and Thomas, R. (2003). Port of Weipa Seagrass Monitoring 2000-2002. EcoPorts Monograph Series No. 22. Ports Corporation of Queensland.

Ryan, D., Sherwood, J, and Haynes, P. (2010) Hydrodynamic alterations to coastal waterways. http://www.ozcoasts.org.au/indicators/hydro_alter.jsp.

Saalfeld, K. and Marsh, H. (2004). Dugong. In, National Oceans Office. Key Species – A Description of key Species Groups in the Northern Planning Area. National Oceans Office, Hobart. Pp 97-114.

Salini, J.P., Blaber, S.J.M. and Brewer, D.T. (1992). Diets of sharks from estuaries and adjacent waters of north-eastern Gulf of Carpentaria, Australia. In Sharks: Biology and Fisheries, 43, eds J.G. Pepperell, Australian Journal of Marine and Freshwater Research, 87-96pp.

SKM (2010). Pisolite Hills social impact study. Unpublished report for Cape Alumina.

Smart J. (1977), “Weipa Queensland, 1:250,000 Geological Series Explanatory Notes”, Sheet SD/54-3.

Somers, I. F. and Long, B. G. (1994). Note on the Sediments and Hydrology of the Gulf of Carpentaria, Australia. Australian Journal of Marine and Freshwater Research, 45: 283-91.

Staples, D.J. (1979). Seasonal Migration Patterns of Postlarval and Juvenile Banana Prawns, Penaeus merguiensis de Man, in the Major Rivers of the Gulf of Carpentaria, Australia. Australian Journal of Marine and Freshwater Research 30(2) 143 - 157 (1979)

Stevens, J.D., Pillans, R.D., and Salini, J. (2005) Conservation Assessment of Glyphis sp. A (speartooth shark), Glyphis sp. C (Northern River Shark), Pristis microdon (Freshwater Sawfish) and Pristis zijsron (Green Sawfish). [online]. Hobart, Tasmania: CSIRO Marine Research.

Available from:
http://www.daff.gov.au//au_data/assets/pdf_file/0018/17721/shark_assess_report.pdf

Synergies Economic Consulting (2010). Pisolite Hills Economics study. Unpublished report for Cape Alumina.

AARC (2010). Terrestrial flora and fauna survey of the Pisolite Hills mine area, transport corridor and water supply pipeline. Unpublished report for Cape Alumina.

Vance, D. J., Haywood, M. D. E., Heales, D. S., Kenyon, R. A., and Loneragan, N. R. (1998). Seasonal and annual variation in abundance of postlarval and juvenile banana prawns Penaeus merguiensis and environmental variation in two estuaries in tropical northeastern Australia: a six year study. Marine Ecology Progress Series, 163 (1): 21-36.

Vermaat, J.E., Agawin, N.S.R., Fortes, M.D., Uri, J.S. (1997). The capacity of seagrasses to survive increased turbidity and siltation: the significance of growth form and light use. Ambio, 26(8): 499-504.

Whitcher I.G. and Horsburgh J.R. (1970) Bauxite Reconnaissance Cape York Peninsular Queensland. CRA Exploration Pty Ltd CR3670

Witherington, B.E. and Martin, R.E. (1996) Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches. Florida Department of Environmental Protection FMRI Technical Report TR-2.

WorleyParsons (2010). Coastal processes study. Unpublished report for Cape Alumina.

WorleyParsons (2010). Contaminated land study. Unpublished report for Cape Alumina.

WorleyParsons (2010). Dredging study. Unpublished report for Cape Alumina.

WorleyParsons (2010). Hazard and risk study. Unpublished report for Cape Alumina.

WorleyParsons (2010). Marine ecology study. Unpublished report for Cape Alumina.

WorleyParsons (2010). Port flood study. Unpublished report for Cape Alumina.

WorleyParsons (2010). Port flora and fauna study. Unpublished report for Cape Alumina.

WorleyParsons (2010). Surface water study. Unpublished report for Cape Alumina.

WorleyParsons (2010). Visual amenity. Unpublished report for Cape Alumina.

WorleyParsons (2010). Waste management study. Unpublished report for Cape Alumina.