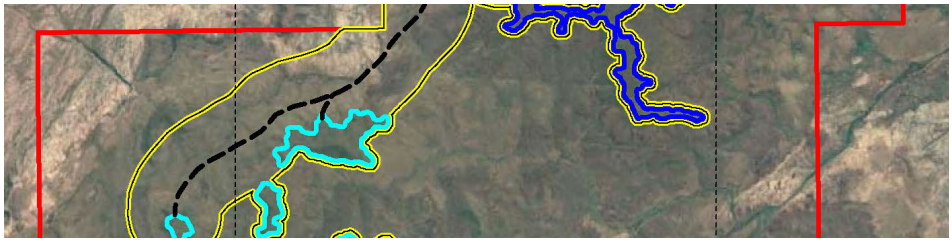
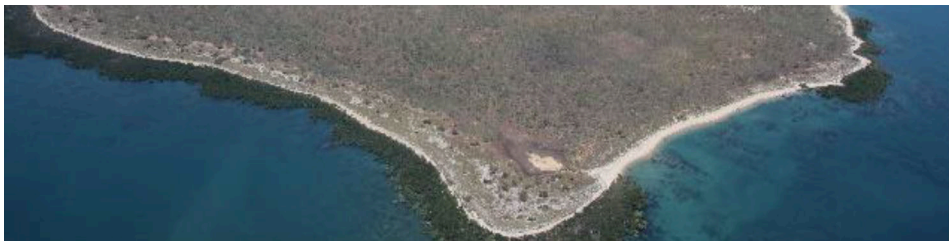
Wuudagu Bauxite Project





Section 38 Referral Supporting Information

December 2019

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Wuudagu Bauxite Project Section 38 Referral

Contents

Figures

1.0 Introduction

1.1 Proposal

Valperlon Bulk Commodities Pty Ltd ('the proponent') is seeking to develop the Wuudagu Bauxite Project ('the proposal'). The proposal is to construct and operate a bauxite mining and export operation, including product load-out via barging and deep water transhipping, at a site approximately 15 km west of Kalumburu, in the northeast of Western Australia (Figure 1.1).

The proposal would be implemented within a development envelope approximately 8,435 ha in size (Figure 1.1).

1.2 Purpose of this Document

This document has been prepared to support referral of the proposal under section 38 of the *Environmental Protection Act 1986* (EP Act). It provides information on the proposal characteristics, existing environment, potential environmental impacts and proposed environmental management commitments.

This document has been prepared in accordance with Part IV Division 1 of the EP Act and the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016*.

1.3 Proponent Details

The proposal is being developed by Valperlon Bulk Commodities Pty Ltd, a privately-owned Australian bauxite exploration and development company.

The contact person for the proponent is:

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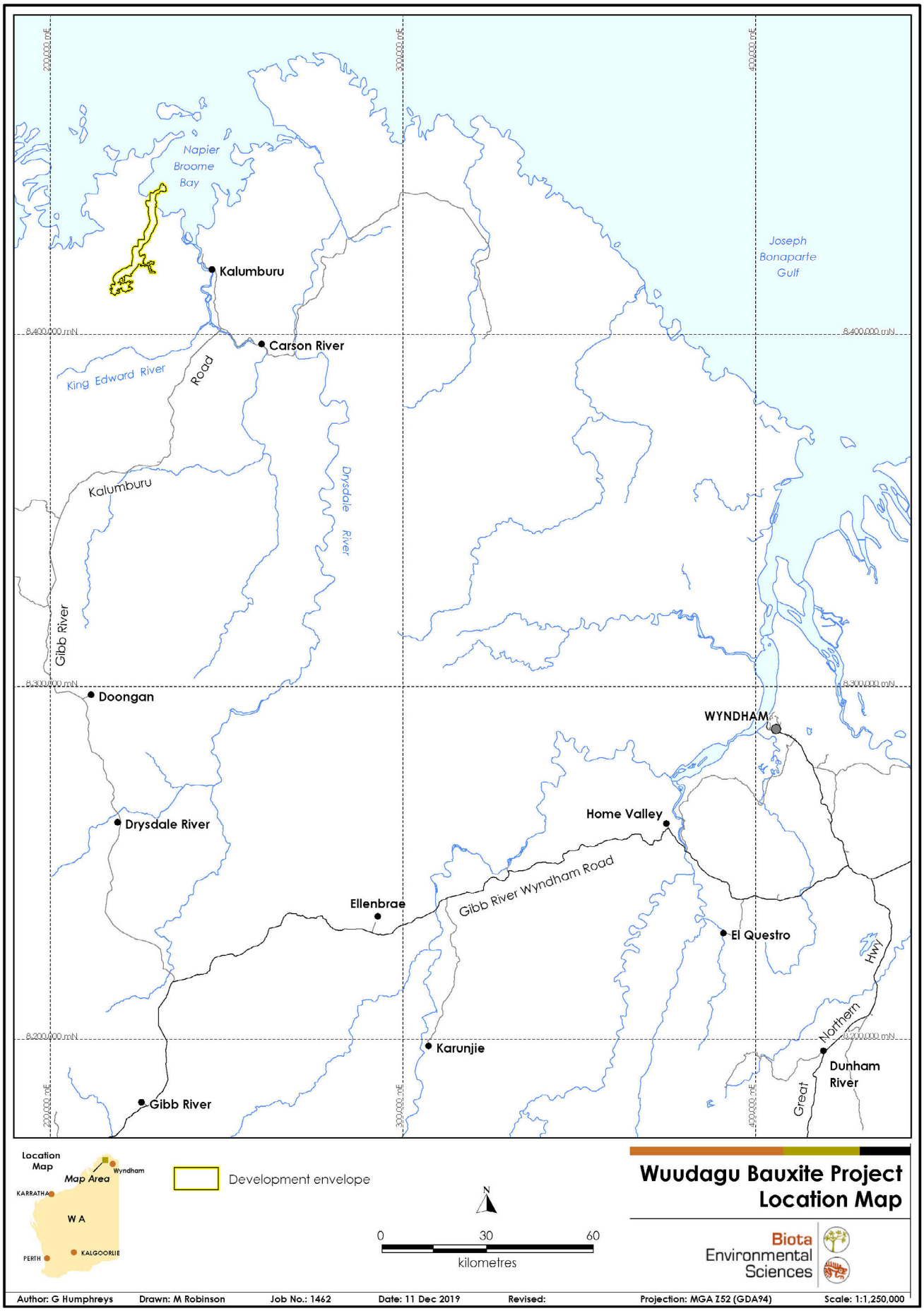

Figure 1.1: Location map for the proposal.

2.0 Land Use and Tenure

2.1 Land Use

The proposal is located in the Shire of Wyndham-East Kimberley (Figure 2.1). The southern portion of the development envelope that will accommodate the proposal is located on Unallocated Crown Land, while the northern portion, principally the haul route and support infrastructure, is sited within Reserve 24705; a Section 91 File Notation Area for Wunambal Gaambera Uunguu Traditional Owner fire management (Figure 2.1).

The offshore section of the development envelope passes through State Waters vested as the North Kimberley Marine Park (Figure 2.1), which is managed by the Department of Biodiversity Conservation and Attractions (DBCA) (Section 4.1). None of the terrestrial conservation estate occurs in proximity to the development envelope.

2.2 Tenure

The proponent holds two Exploration Licences under the *Mining Act 1978* within which the proposal will be implemented, E 80/4898-I and E 80/5265 (Figure 2.1). These will fully accommodate the development envelope and be converted to Mining Leases under the terms of the *Mining Act 1978* prior to project commencement.

2.3 Native Title

The proposal lies within the Uunguu Part A Native Title Determined Area (WC1999/035). The proponent engaged with the traditional owners early in the process of developing the proposal and is in ongoing consultation regarding land access, heritage and social impact surveys and environmental management.

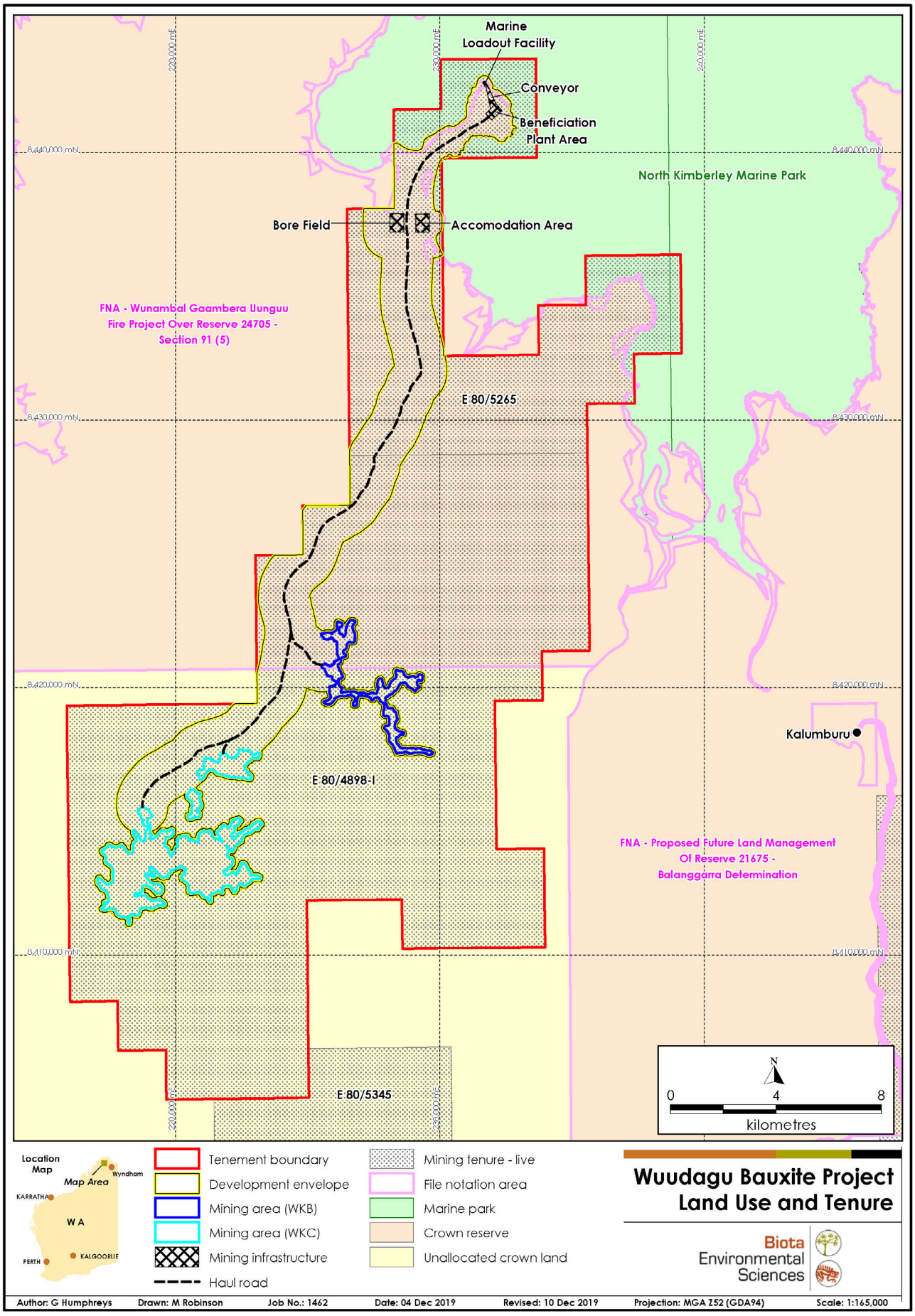

Figure 2.1: Land use and tenure.

3.0 Proposal Description

3.1 Overview

The proposal is to construct and operate a bauxite mining and export operation approximately 15 km to the west of Kalumburu. Two primary mining areas have been identified and proved up through exploration drilling; WB and WC (including two satellite areas denoted WCN and WCNN). Bauxite will be mined by surface mining methods in relatively shallow pits that will not intersect the water table.

The proposal includes the construction of approximately 35 km of haul roads from the mining areas, which will be used to truck bauxite to the beneficiation plant inland of Guy Point. Mined material will be crushed and clay impurities will be removed using water. An upgraded bauxite product will be loaded via conveyor onto barges off Guy Point. The barges will then transport the product offshore where it will be transhipped to larger vessels for shipping to export markets. The anticipated life of the proposed project is expected to be approximately 10 years.

A summary of the proposal is provided in Table 3.1.

Table 3.1: Summary of the proposal.

Proposal Title	Wuudagu Bauxite Project
Proponent	Valperlon Bulk Commodities Pty Ltd
Short Description	Construct and operate a bauxite mining and export operation approximately 15 km to the west of Kalumburu in the Shire of Wyndham-East Kimberley. Bauxite will be trucked from two primary mining areas totalling approximately 1,465 ha, along a haulage route of approximately 30 km to a beneficiation plant inland of Guy Point. An upgraded bauxite product will be loaded onto barges via conveyor, for transhipping to larger vessels offshore.

The development envelope for the proposal, and the current conceptual project design are shown in Figure 3.1, with a preliminary summary of proposal key characteristics provided in Table 3.2. The extent of the physical elements of the proposal totals 1,946 ha (Table 3.2).

Table 3.2: Preliminary key characteristics of the proposal.

Element	Location	Proposed Extent
Physical Elements		
Mining areas	Figure 3.1	Clearing of no more than 1,465 ha
Haul road	Figure 3.1	Clearing of no more than 400 ha
Beneficiation plant	Figure 3.1	Clearing of no more than 17 ha
Conveyor	Figure 3.1	Clearing of no more than 7 ha
Onshore load-out facility	Figure 3.1	Clearing of no more than 2 ha
Marine load-out facility	Figure 3.1	Disturbance of no more than 3 ha of sea bed
Bore field and power generation facility	To be confirmed (nominal on Figure 3.1)	Clearing of no more than 35 ha
Accommodation camp	Figure 3.1	Clearing of no more than 20 ha
Operational Elements		
Water supply	To be confirmed (nominal on Figure 3.1)	Abstraction of no more than 1,095 m^3/day of groundwater from a yet to be defined bore field within the development envelope

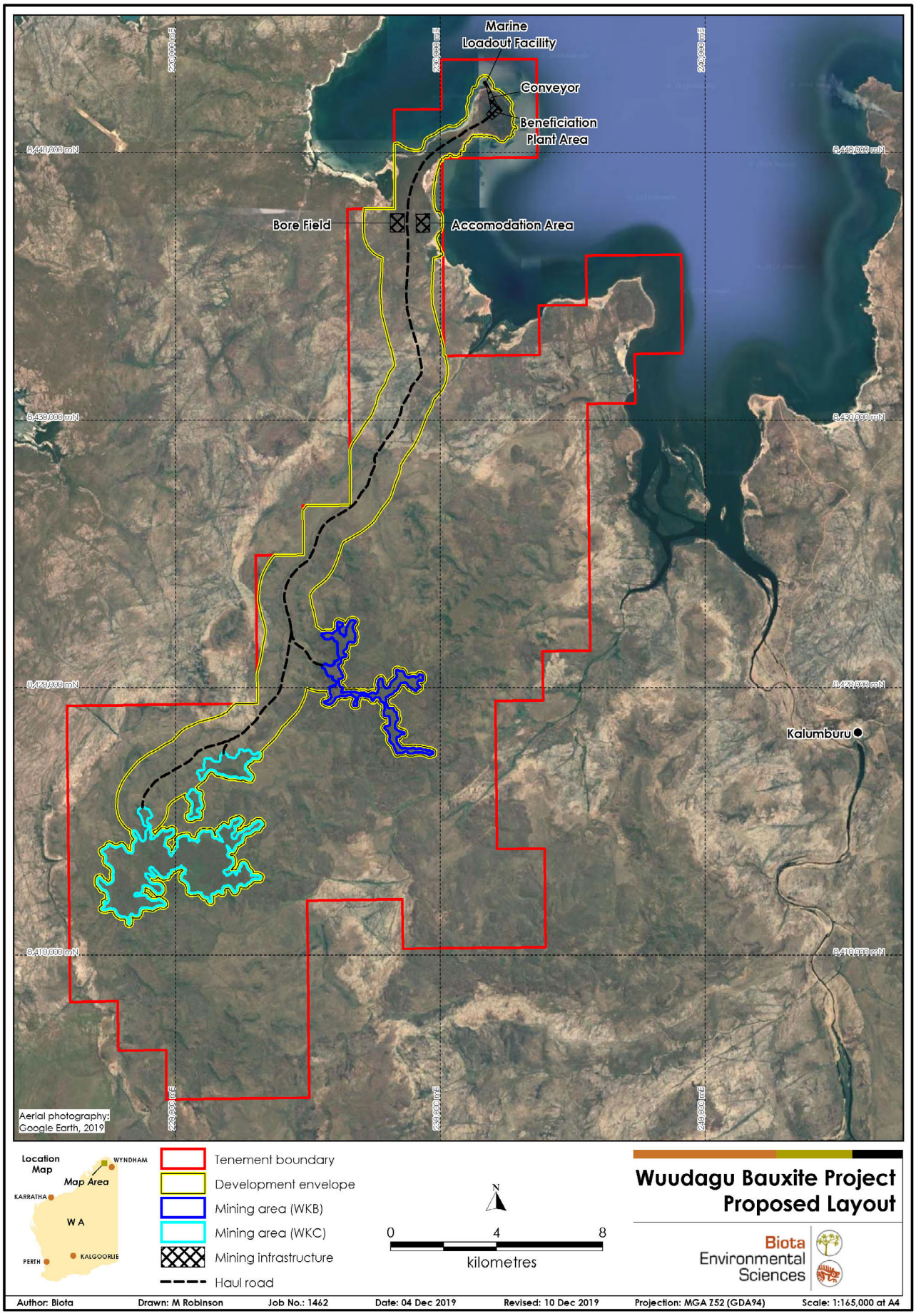

Figure 3.1: Project development envelope, indicative footprint and conceptual design.

3.2 Proposal Description

3.2.1 Mining Areas

The mining areas for the proposal will comprise two zones: WB and WC (including satellite areas WCN and WCNN) (see Figure 3.1). The proponent has undertaken exploration drilling to delineate these areas, resulting in confidence there is an economically extractable resource. A mining rate of up to 6 million tonnes per annum is envisaged and the anticipated life of the proposed project is expected to be approximately 10 years.

Mining will occur by surface mining methods under minimal overburden with loading onto trucks for haulage to the beneficiation plant (Section 3.2.2). Current mining depths are expected to average 4 m below ground level and will not intersect the water table.

Once the initial mining is underway and pits are established, clay material that is removed during product beneficiation will be directly returned into mined areas, removing the need for dedicated waste storage facilities to be constructed.

Stockpiled overburden and soil material will be returned to the mined areas for progressive rehabilitation with existing flora species. Rehabilitation and closure planning will form an early component of all operational planning for the mining areas.

3.2.2 Haul Road

The proposal will require the construction of up to 35 km of haul roads with a width of 100 m, running from the mining areas to a beneficiation plant inland of Guy Point.

The road is expected to be constructed through a combination of cut and fill methods and the utilisation of borrow pits from along the route.

The finished surface material and drainage mechanisms implemented will be determined to enable year round use. The haul road is anticipated to require ongoing maintenance.

3.2.3 Beneficiation Plant

Mined bauxite will be hauled by truck to the beneficiation plant, where the material will be crushed and clay impurities will be removed using water. Reject water from the plant will be filtered and recycled in the beneficiation process, with the solid clay material trucked back to mined out areas.

Maintenance, office and fuel storage facilities will be constructed adjacent to the beneficiation plant.

Power and water to operate the plant will be provided onsite by the project (see Section 3.2.6).

3.2.4 Conveyor and Marine Loadout Facility

The upgraded bauxite product will be stockpiled adjacent to the beneficiation plant prior to being transported by conveyor to a marine load out facility extending from the northern limit of Guy Point.

The conveyor will be situated within a corridor approximately 50 m wide and 1 km in length before it reaches a jetty at the coast. The jetty will be a pile and truss structure, extending approximately 100 m from the shore, that will support the conveyor and terminate with a radial stacker loading the product directly onto barges in a berthing area.

A materials offloading facility, including fuel bunkering, will be constructed adjacent to the marine loading facility.

3.2.5 Transhipping

Once barges are loaded, they will transport the product to larger vessels offshore. The product will then be transhipped from the barges to larger vessels for shipping to export markets.

No permanent mooring point will be required at the transhipment location where vessels will anchor in a designated area.

3.2.6 Other Infrastructure

The proposal will also include the construction and operation of other support infrastructure, comprising:

- an accommodation camp for up to 250 people;
- waste management facilities comprising recycling, combustion, landfill and septic;
- a bore field (envisaged as up to 1,095 m^3/day capacity) to provide water for the beneficiation plant, site dust suppression and the project workforce;
- a power generation facility (envisaged as up to 6 MVA capacity); and
- a power distribution network from the power generation facility to the accommodation camp, bore field, beneficiation plant, conveyor and marine loadout facility.

The waste management and power generation facilities will preferably be located in the vicinity of the beneficiation plant and accommodation camp.

The power distribution network will be located along the haul road.

3.2.7 Workforce

The project will require a workforce of up to 100 people during construction and up to 250 people during operations, all of whom will be accommodated onsite.

3.2.8 Anticipated Timing

Subject to statutory approvals, construction for the proposal is anticipated to commence April 2021, with first product loaded in October 2021, signifying the start of operations.

4.0 Environmental Environment

4.1 Benthic Communities and Habitats

Napier Broome Bay appears to support a rich diversity of benthic communities and habitats (BCH) types (Figure 4.1), including corals, macroalgae, mangroves (Walker 1996, DEC 2008) and likely seagrasses (Walker 1996, Bayliss and Wilcox 2015). According to DEC (2008) sandstone reefs are the most common BCH in nearshore areas (<10 m) of Napier Broome Bay and can be generally classified as algal dominated (*Sargassum* spp.) reefs with sparse/isolated coral colonies present in low densities, but with coral richness increasing towards the tip of the Anjo Peninsula (Figure 4.1). Also common in nearshore areas are bare sand and sandy sediments that support patchy / sparse to medium density communities of filter feeders (DEC 2008). The dominant habitat type of deeper areas of Napier Broome Bay (>10 m) are classified as fine, bioturbated sediment with occasional sparse density filter feeding communities (DEC 2008) (Figure 4.1).

It is presumed that seagrasses occur in Napier Broome Bay, but supporting evidence is scare. For example, despite previous reports of Napier Broome Bay supporting seagrass (Walker 1996), no seagrass was observed by DEC in 2008. Notwithstanding this, given dugong are known to occur in southern portions of Napier Broome Bay (Bayliss and Wilcox 2015), it is likely that seagrass would occur in, and near to Woppinbie Creek in the south of Napier Broome Bay (Figure 4.1). Further, according to Dr K McMahon (2019, pers. comms. 11 December), seagrass samples (*Halophila ovalis*) collected by Uunguu Rangers adjacent to Guy Point have been archived for genetic analysis, but results are yet to be published.

DEC (2008) provided several possible reasons why seagrasses were not observed during their survey, including lack of spatial coverage and seasonal timing of the survey, noting that temporal variation in the abundance of seagrass has been observed previously at locations in the southern Kimberley (Fry et al. 2008).

4.2 Coastal Processes

Napier Broome Bay is part of the northern Kimberley Region in which drowned geological features are affected by a meso-tidal regime and extreme weather conditions (Eliot and Eliot 2008). The location is similar to other promontories and landforms in the region with respect to its sandstone geology, key processes and landform diversity (Eliot and Eliot 2008).

Anjo Peninsula, the predominant coastal geomorphological feature in the locality of the proposal, is mainly comprised of King Leopold Sandstone overlain by sandy soil and colluvium, and forms a base 6 to 8 km wide and approximately 11 km long. Along the eastern shores of Anjo Peninsula, rock platforms are well developed and there are distinct sequences of sandy beach ridges in embayment's north of the barge landing in West Bay (Eliot and Eliot 2008).

The key processes driving coastal geomorphology in the region include sea level variation (especially high spring tides), extreme meteorological events (tropical cyclones and prolonged monsoonal activity) and heavy rainfall and run-off (Eliot and Eliot 2008).

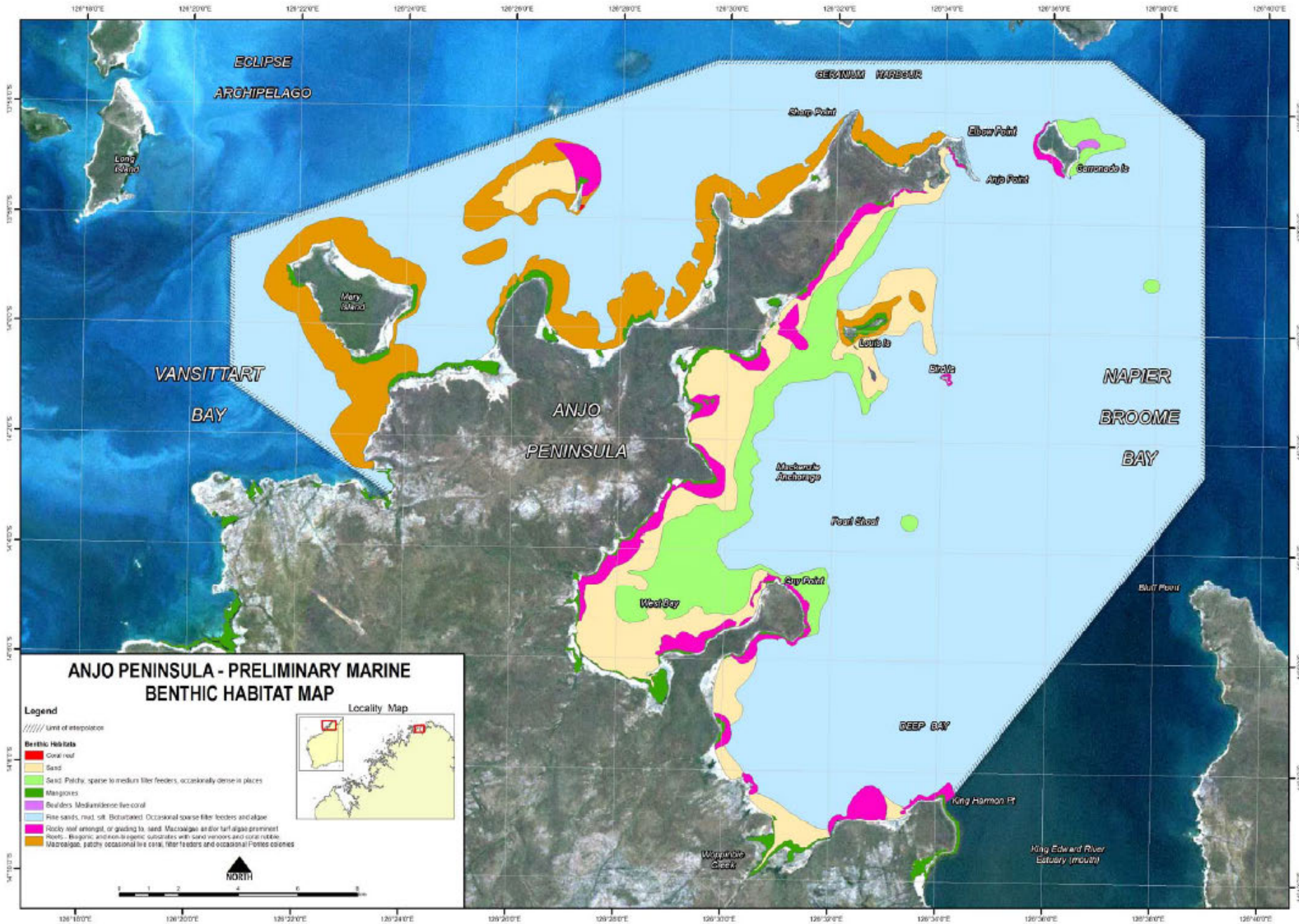

Figure 4.1: Preliminary marine benthic habitat map of Napier Broome Bay (DEC 2008).

Secondary processes are thought to be significant at a local scale due to variation in lithology along the coast (Eliot and Eliot 2008) and include:

- local sea level
- local currents
- local winds
- coastal flooding
- sediment transport, and
- estuarine hydraulics.

The EPA environmental factor guideline for coastal processes identifies seven significant coastal values (EPA 2016a); from these, three are relevant to development envelope:

- coastline potentially supports conservation significant marine fauna such as turtles, seabirds and crocodiles
- significant cultural and aesthetic values
- active or passive recreation.

The EPA recognises that there are inherent links between the factor coastal processes and other environmental factors (EPA 2016a). While impacts to these values may be addressed under other relevant environmental factors, key values that are be associated with coastal areas in the development envelope are identified here for completeness.

The tidal flats of Napier Broome Bay are likely to support populations of migratory shorebirds which are protected by a number of international conservation agreements and are treated as matters of national significance under the EPBC Act. Marine reptiles, including turtles and crocodiles are also common to the area (Halford and Barrow 2017, Whiting et al. 2018), however, recent investigations suggest that turtles are not nesting - at least in significant numbers - in the development envelope (Whiting et al. 2018). Marine fauna are discussed in greater detail in Section 4.4.

Aboriginal people have had a continuous association with the north Kimberley saltwater country for many millennia (DPaW 2016). Collectively known as the saltwater people, several aboriginal groups (including people from the Wunambal and Kwini language groups) maintain a deep spiritual connection to coastal areas in the region, which is recognised through both native title rights (the coastal areas of the proposal fall into the Uunguu Part A native title area) and traditional law.

Passive recreation, via tourism, is a significant industry for the Kimberley, generating economic, social and employment benefits for the regions communities. By way of example, a recent study estimated the Kimberley cruise tourism expenditure at approximately $63 million, and more than 1,000 visitors to the coast near Kalumburu (DPaW 2016).

4.3 Marine Environmental Quality

In the absence of any available data, it is assumed that marine environmental quality in the development envelope is pristine and remains largely influenced by interacting natural processes associated with geomorphology, tides, climate and riverine inputs.

Napier Broome Bay is a large embayment between Anjo Point in the west and Cape Talbot in the east (Figure 4.2).

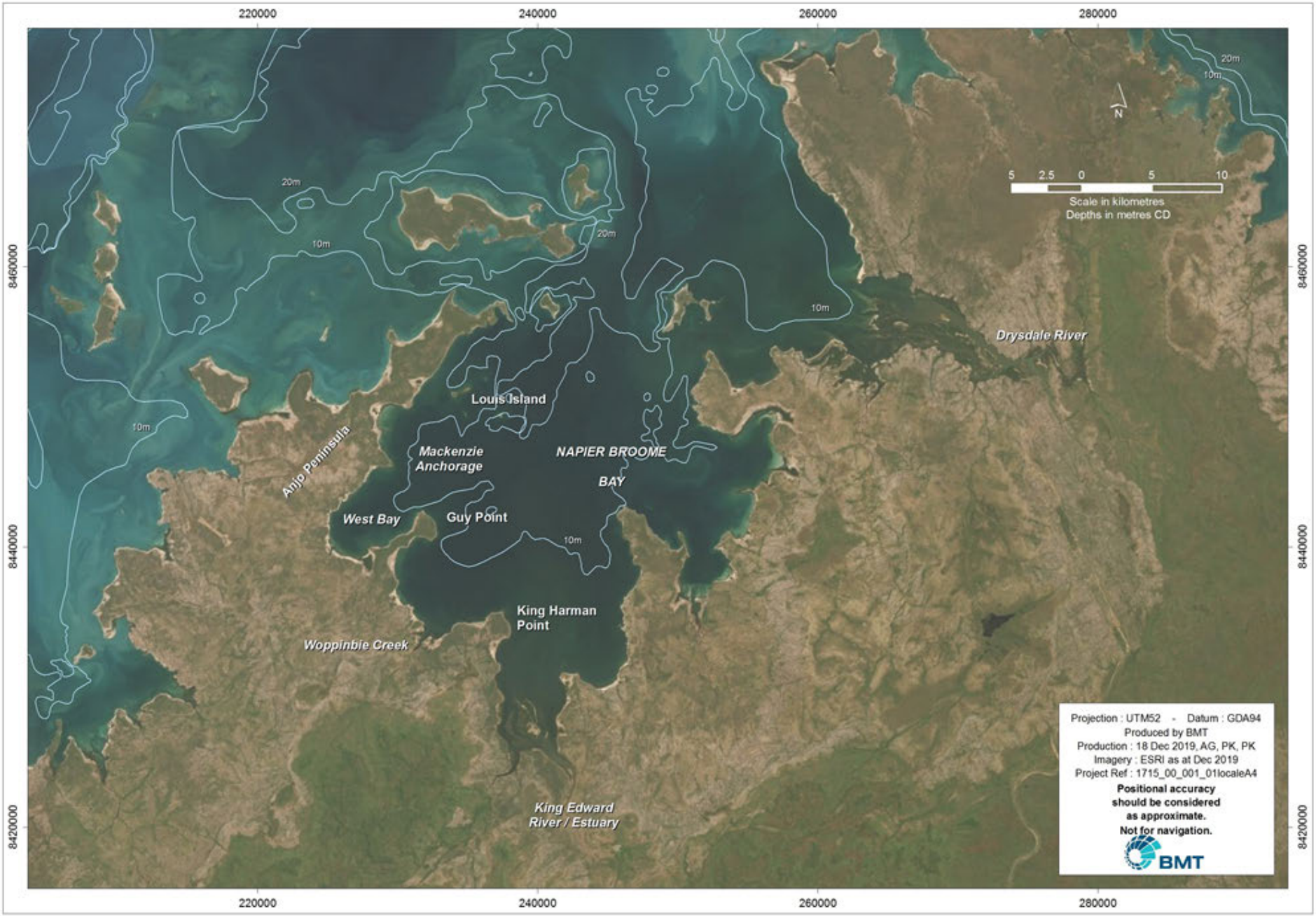

Figure 4.2: Location of marine geological features Napier Broome Bay

Within Napier Broome Bay there are smaller embayments; West Bay and Deep Bay are in the southern portions of Napier Broome Bay and abut the development envelope. Mackenzie Anchorage, to the north of West Bay is between 10 m and 14 m in depth (Figure 4.2). A natural deep-water channel roughly defined by the 20 m bathymetric contour runs seaward in an approximate north-easterly direction from Mackenzie Anchorage. In other areas of Napier Broome Bay, water depths range from <3 m to 30 m depth (Figure 4.2).

Like other parts of the Kimberley region, Napier Broome Bay has a macrotidal regime that creates very strong horizontal currents in the shallow coastal waters (Waples et al. 2019). In moving over the hydraulically rough seabed, these tidal flows can generate turbulent mixing that can be further influenced by prevailing winds and episodic events like tropical cyclones in the austral summer months (Waples et al. 2019). These flows interact with the complex coastline of headlands and bays, offshore island and reef systems, to define the physical oceanography of the region. Unlike southern areas in the Kimberley, however, the maximum astronomical tidal range in Napier Broome Bay is less than 3 m, which represents one of the smallest tidal ranges in the Kimberley region[1] and as such, its influence on marine mixing is likely to be less tempered.

The Kimberly region has a monsoonal climate with distinct wet and dry seasons. The annual average rainfall at Kalumburu is ~1,220 mm (Bureau of Meteorology 2019) noting official climatic monitoring in Kalumburu ceased in March 2005. The majority of rain (~90%) falls between November and March each year. Rainfall during the remainder of the year is generally light and sporadic. Heavy rainfall is often associated with monsoonal depressions and tropical cyclones (DEC 2008). During the wet-season, terrestrial runoff generates high turbidity, deposits sediments, and subsidises marine carbon and nutrient pools. In turn, these events drive productivity in the inshore environment (Waples et al. 2019).

Napier Broome Bay has two major contributory catchments - The King Edward and Drysdale rivers drain catchments - which cover ~8,400 km^2 and ~15,670 km^2, respectively. Several smaller freshwater creek systems (e.g. Woppinbie, Dominic and Placid creeks) also drain directly into Napier Broome Bay.

4.4 Marine Fauna

The Kimberley region of Western Australia is globally recognised for its rich diversity of marine fauna, numerous of which have conservation significance. The EPBC Act Protected Matters Report listed 57 Listed Marine Species, 14 Threatened and 21 Migratory species which may occur in Napier Broome Bay. While many of the listed species are expected to possibly pass through the development envelope on occasion, for example during migration, the area encompasses waters that are known habitat for several species, including dugongs (*Dugong dugong*), sawfish (*Pristis clavata, Pristis pristis, Pristis zijsron*), turtles (*Caretta caretta, Chelonia mydas, Dermochelys coriacea, Eretmochelys imbricata, Lepidochelys olivacea, Natator depressus*), dolphins (*Orcaella heinsohni, Sousa chinensis*) and salt-water crocodiles (*Crocodylus porosus*).

The proposal locality is perhaps most well recognised for dugongs, which also have cultural significance to the Wunambal Gaambera people and other Traditional Owners in the area (DPaW 2016). The estimated number of dugongs in the Kimberley region is about 12,600, with an average density of one dugong for every 4 km^2 (Waples et al. 2019). One of the highest densities of dugongs in the Kimberley were suggested by Waples et al. (2019) to occur near to the development envelope (Figure 4.3).

[1] By comparison, tidal range at Yampi Sound in the Buccaneer Archipelago can exceed 10 m.

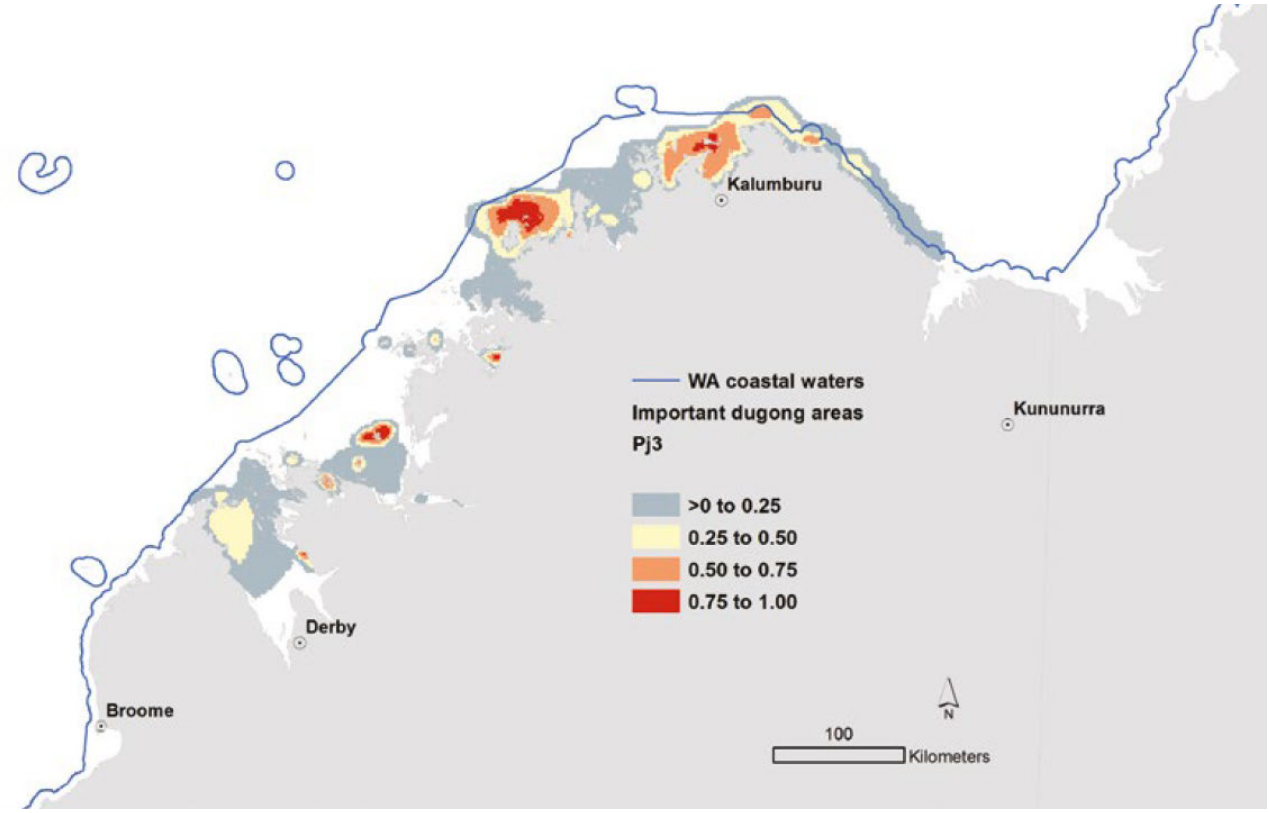

Figure 4.3: Important dugong areas in the Kimberley, Western Australia (Waples et al. 2019).

Marine turtles are also of significant ecological and cultural value to a wide cross section of stakeholders throughout the community and have a high intrinsic value similar to those of other wildlife and megafauna. The Kimberley coast and inshore marine waters in general support foraging habitat and nesting beaches for five species (listed above) of marine turtles (Waples et al. 2019). While marine turtles undoubtedly use the waters alongside the development envelope, this is most likely for foraging, as according to Whiting et al. (2018), there is no evidence to suggest that Napier Broome Bay supports any significant turtle rookeries.

While little is known about the distribution and abundance of sawfish species in Western Australia in general, the north-Kimberley region is considered important as it contains nationally and globally significant populations (DSEWPaC 2012). Of significance to the proposal, it is understood that the Drysdale River Sanctuary Zone, which drains into the southern portion of Napier Broome Bay, provides important habitat for sawfish (DPaW 2016).

In terms of other conservation significant megafauna, the proposal location is thought to sit beyond (further north of) what is typically considered humpback whale calving habitat (Thums et al. 2018), although the Australian snubfin, Indo-Pacific humpback and Indo-Pacific bottlenose dolphins are known to rely on the waters in and adjacent to the North-west Marine Region for breeding and foraging (Brown et al. 2016).

4.5 Flora and Vegetation

4.5.1 Vegetation

Detailed seasonal surveys for flora and vegetation are yet to be undertaken of the development envelope and are planned for 2020 (Section 5.5.2). A preliminary reconnaissance was conducted during 2018 (APM 2018) and targeted sampling was also conducted in September 2019 to identify preliminary biological constraints (Biota In

prep.). The current documentation of the vegetation of the development envelope is therefore based on available mapping and characterisation from desktop review sources.

Beard (1979), mapped four vegetation types for the development envelope:

1. Grasslands, high grass savanna woodland; grey box (*Eucalyptus tectifica*) and cabbage gum (*Eucalyptus grandifolia*) over white grass (*Sehima nervosum*) and *Sorghum* spp;
2. Grasslands, high grass savanna woodland; stringybark (*Eucalyptus tetrodonta*) and woolybutt (*Eucalyptus miniata*) over upland tall grass and curly spinifex (*Plectrachne pungens*);
3. Medium woodland-tropical; stringybark (*Eucalyptus tetrodonta*) and woolybutt (*Eucalyptus miniata*) with understorey of palms (*Livistona eastonii*); and
4. Grasslands, high grass savanna woodland; stringybark (*Eucalyptus tetrodonta*) and woolybutt (*Eucalyptus miniata*) over upland tall grass of curly spinifex (*Plectrachne pungens*) and *Sorghum* spp.

Observations onsite during the 2019 targeted survey indicate that these vegetation descriptions broadly characterise the vegetation types present.

Threatened Ecological Communities (TECs) listed for the Kimberley region comprise the intertidal mudflats of Roebuck Bay, coastal monsoon (vine) thickets of the Dampier Peninsula and several types of rainforest swamp and mound spring assemblages. Database searches indicate that none of these TECs are known from the development envelope.

Vine thicket vegetation does occur within the development envelope, associated with the slopes of the plateau landforms on which the mining areas will be situated, but these do not appear to correspond to either the vine thicket TECs or State Priority Ecological Communities (PECs), given their substrates and geographic location.

4.5.2 Flora

Database searches (including NatureMap[2] and FloraBase[3]), as well as previous surveys in the vicinity of the development envelope, suggest 35 conservation significant flora species could potentially occur, comprising a single Threatened flora species and 34 Priority species, however at present none of these have been documented from the development envelope either during reconnaissance surveys (APM 2018) or a targeted survey undertaken by Biota (In prep.) in 2019.

The only Threatened species with potential to occur, *Eucalyptus ceracea,* is known only from the Seppelt Range, approximately 100 km to the east of the development envelope. It is not currently known from the project area, but will be targeted during the Detailed flora and vegetation surveys to be undertaken in 2020.

4.6 Subterranean Fauna

The subterranean habitats of the proposal locality have been poorly sampled for both troglofauna (air-breathing subterranean fauna occurring between the ground surface and

[2] https://naturemap.dpaw.wa.gov.au
[3] https://florabase.dpaw.wa.gov.au

the water table) and stygofauna (aquatic fauna occurring in the groundwater). Both ecological groups do however occur in wide range of geological formations in the Kimberley region (Humphreys 1993), and it is possible that either troglofauna or stygofauna could occur.

Elements of the proposal that could potentially affect subterranean fauna comprise the mining areas themselves (in regard to removal of troglofauna habitat) and the proposal bore field (with potential impacts on local aquifer systems). Initial appraisals of the geology of the development envelope indicate that the habitats do not appear overly prospective and the impacts are likely to be relatively localised. On this basis, then a desktop study and verification survey will be undertaken during 2020 to further inform the assessment (see Section 5.6.2).

4.7 Terrestrial Fauna

A targeted terrestrial fauna survey of the mining areas was undertaken in September 2019 (Biota In prep.). The primary purpose of the survey was to identify potential key biological constraints ahead of the Level 2 seasonal fauna survey of the development envelope to be undertaken in 2020 (Section 5.7.2). To this end the survey targeted listed species conservation significance and also potential invertebrate Short Range Endemics (SREs) (particularly land snails but also mygalomorph spiders and millipedes). Identification of some species of SRE are problematic due to limits on available contextual data and uncertain taxonomic affinities. Early identification of SREs permits both contextual sampling in subsequent surveys and sufficient time to complete robust taxonomic comparisons.

Targeted survey work involved deployment of remote cameras, medium and large Elliott traps, funnel traps and installation of pit fall traps. A total of six sites were established sampling the key habitats on each of the mining areas such that plateau tops and edges were sampled. Hand foraging for SREs was undertaken at each of the trapping sites as well as at other locations on the plateau. Sample sites for potential SREs was stratified by different vine thickets, between plateau top and vine thicket within plateaus. This permitted initial assessment of whether endemism was occurring at the level of individual vine thickets within a landform, between habitats within landforms, between different landforms or not at all.

4.7.1 Vertebrate Fauna

Elliott trapping during the targeted survey yielded just a single capture event of the rodent the Grassland Melomys (*Melomys burtoni*) (Biota In prep.). The species is commonly encountered throughout its range and is not of conservation significance. The Little Red Flying Fox (*Pteropus scapulatus*) was the only other native mammal sighted during the survey. Over the 2016/17 wet season the Wunambal Gaambera rangers deployed five remote cameras at each of four sites on the plateaus, including those on which the development envelope is sited for a period of six weeks and recorded Northern Quoll (*Dasyurus hallucatus*) and Northern Brown Bandicoot (*Isoodon macrourus*), but neither species were evident during the targeted survey. Cattle had penetrated into all parts of the vine thickets on all margins of the plateau.

The funnel and pit traps yielded 17 reptiles and a single frog during the targeted survey (Biota In prep.). None of the recorded species has an elevated conservation status.

Based on available data, the only species listed as Threatened at both Commonwealth and State levels that is confirmed to occur in the locality of the development envelope is the Northern Quoll (*Dasyurus hallucatus*) – Endangered (Commonwealth); Endangered (State) – Recorded from camera monitoring by traditional owner rangers (T. Vigilante, pers. comm.).

Database searches (including NatureMap and Atlas of Living Australia) suggest that a further 16 conservation significant species may potentially occur. These include the Black-footed Tree-rat (*Mesembriomys gouldii*) and Nabarlek (*Petrogale concinna*), both of which are listed as Threatened under State and Commonwealth legislation, but there is currently no evidence of these species utilising the development envelope.

4.7.2 SRE Fauna

The targeted survey recorded four camaenid land snails of which three were represented by live specimens and therefore suitable for genetic analyses. Camaenid land snails have undergone significant diversification in the Kimberley region and many species qualify as SREs based on current collections. The three taxa represented by live collections are a *Setobaudinia*, *Xanthomelon* and an *Amplirhagada*. Taxonomic studies are ongoing but it appears that at least the *Amplirhagada* is likely to represent a new species and only known from the current sampling locations within and outside of the development envelope. Based on these results, this *Amplirhagada* species would qualify as an SRE. Shells of a fourth camaenid species tentatively assigned to the Genus *Xanthomelon* were recorded from the sandstone adjacent to the mesas. Genetic studies on the remaining specimens including at least three mygalomorph spider species, a millipede and a species of slater has largely been completed with comparisons with regional collections currently in progress.

Land snails were sent to Frank Koehler at the Australian Museum who has undertaken a taxonomic revision of Western Australian camaenid land snails including appraisals of Kimberley species. The remaining potential SRE invertebrates have been lodged with the WA Museum. Tissue from all potential SRE invertebrates have been sent to Helix Molecular Solutions for the purpose of undertaking genetic bar-coding studies to place specimens in local (within the study area boundary) and regional context (where such context exists).

4.8 Social Surroundings

4.8.1 Stakeholder Identification

Stakeholder analysis was carried out early in the development process, and a list of key stakeholders has been drawn up so that consultation can take place and key stakeholder interests considered.

The stakeholders listed in Table 4.1 have been identified prior to the preparation of this document, some have already been engaged by the proponent, and further consultation will take place during the environmental impact assessment process and ongoing development of the proposal.

Table 4.1: Key stakeholders identified to date for the proposal.

Stakeholder	Interest / Context
Wunambal Gaambera Aboriginal Corporation (WGAC)	Representing the traditional owners of the land.
Environmental Protection Authority (EPA)	Responsible for assessing and advising on all environmental aspects of the proposal, including relevant environmental factors and survey and assessment requirements.
Shire of Wyndham-East Kimberley	The proposal is located in the Shire of Wyndham-East Kimberley.
Department of Mines and Petroleum	Responsible for the granting of *Mining Act 1978* tenure that accommodates the development envelope.
Department of Biodiversity Conservation and Attractions (DBCA)	Manager of the North Kimberley Marine Park, in addition to specialist expertise in threatened species.

4.8.2 Traditional Owner Consultation

The proponent has engaged extensively with the Wunambal Gaambera Aboriginal Corporation and Wunambal Gaambera Traditional Owners regarding the implementation of the proposal.

The project has the potential to provide significant economic, education, training, employment and contracting opportunities for Traditional Owners and the broader local community. The proponent is actively working with Wunambal Gaambera to maximise these opportunities and is also committed to working with Traditional Owners regarding the staged rehabilitation of disturbed areas, regional environmental management and an agreed project closure plan.

5.0 Assessment of Preliminary Key Environmental Factors

The framework of environmental factors and objectives adopted by the EPA are detailed in the EPA's Statement of Environmental Principles, Factors and Objectives (EPA 2018). The proponent has identified the following preliminary key environmental factors that are relevant to the proposal:

- Benthic Communities and Habitat;
- Coastal Processes;
- Marine Environmental Quality;
- Marine Fauna;
- Flora and Vegetation;
- Subterranean Fauna;
- Terrestrial Fauna;
- Greenhouse Gas Emissions; and
- Social Surroundings.

The above factors are discussed in Sections 5.5 to 5.9. The proponent considers that the remaining environmental factors identified in EPA (2018) are either not relevant to the proposal or the proposal will not result in a significant impact and are unlikely to be key environmental factors (see Section 6.0).

5.1 Benthic Communities and Habitat

5.1.1 EPA Objective

The EPA objective for the Benthic Communities and Habitat factor is to protect benthic communities and habitat so that biological diversity and ecological integrity are maintained.

5.1.2 Potential Environmental Impacts

The proponent's preliminary assessment of the potential environmental impacts on benthic communities and habitat arising from the proposal is summarised in Table 5.1.

Table 5.1**: Potential environmental impacts of the proposal on benthic communities and habitat (after Part B of EPA 2016b).**

EPA factor	Benthic Communities and Habitat
EPA policy and guidance – *What have you considered and how have you applied them in relation to this factor?*	Benthic Communities and Habitat has been identified as a preliminary key factor following EPA (2016c). Desktop assessment and survey requirements have been determined in the context of guidance provided in *Technical Guide – Benthic Communities and Habitat* (EPA 2016d). Surveys will be completed in 2020 in accordance with the requirements of EPA (2016d).
Consultation – *Outline the outcomes of consultation in relation to the potential environmental impacts*	A pre-referral consultation meeting was held with EPA Services, where the scope of the referral, likely key environmental factors and survey work required were discussed.

Receiving environment – *Describe the current condition of the receiving environment in relation to this factor*	The benthic communities and habitat (BCH) that occur in the development envelope area predominantly comprise bioturbated sediments with sparse filter feeders, corals and macroalgae. It is probable that seagrasses also occur in the development envelope, but this is yet to be verified.
Proposal activities – *Describe the proposal activities that have the potential to impact the environment*	Based on available mapping, it is appears that a very small area of BCH (no more than 3 ha) - likely characterised by rocky reef with sparse corals, macroalgae and possibly other BCH types - that may be directly impacted during construction of marine loadout facilities. A minor area of loss may also possibly occur due to anchoring at the transhipment point. It is conceivable that indirect impacts to BCH could also occur as a result of turbidity associated with vessel movements, surface water drainage or during rock-armour laydown if required; if indirect impacts were to occur, such impacts would likely be minor/temporary in nature.
Mitigation – *Describe the measures proposed to manage and mitigate the potential environmental impacts*	Mitigation measures that will be implemented to minimise impacts on BCH have followed the Western Australian mitigation hierarchy (Avoid, Minimise, Rehabilitate, Offset (Government of Western Australia 2011)) and will comprise: • Engineering design of the loadout facility (including pile jetty) and other infrastructure during the project planning stage will ensure the environmental footprint for all marine infrastructure is minimised.
Impacts – *Assess the impacts of the proposal and review the residual impacts against the EPA objective*	The potential impacts arising from the proposal include: • Construction activities will result in permanent loss in a small area of BCH. However, while the value of this BCH is yet to be ascertained, previous investigations suggest the BCH is very sparse and the small extent of loss means it is unlikely to be ecologically significant. • Disturbance of sediments during construction activities, or as a result of shipping, may potentially lead to a temporary increase in local water column turbidity and localised sediment deposition arising from suspended and resuspended sediments being transported by water movements. The prevailing high-energy tidal regime of the region causes naturally turbid coastal waters and precludes the growth of benthic primary producers. With effective planning and environmental management measures in place, the proponent considers that the proposal is likely to meet the EPA objective for the BCH factor.
Assumptions – *Describe any assumptions critical to your assessment e.g. particular mitigation measures or regulatory conditions*	This preliminary assessment of impacts on BCH assumes the findings of the BCH field survey will validate the current assessment of the type of the marine habitat within the development envelope.

5.2 Coastal Processes

5.2.1 EPA Objective

The EPA objective for the Coastal Processes factor is to maintain the quality of water, sediment and biota so that environmental values are protected.

5.2.2 Potential Environmental Impacts

The proponent's preliminary assessment of the potential environmental impacts on marine environmental quality arising from the proposal is summarised in Table **5.2**.

Table 5.2: **Potential environmental impacts of the proposal on coastal processes (after Part B of EPA 2016b).**

EPA factor	Coastal Processes
EPA policy and guidance – *What have you considered and how have you applied them in relation to this factor?*	Coastal Processes has been identified as a preliminary factor following EPA (EPA 2016a).
Consultation – *Outline the outcomes of consultation in relation to the potential environmental impacts*	A pre-referral consultation meeting was held with EPA Services, where the scope of the referral, likely key environmental factors and survey work required were discussed.
Receiving environment – *Describe the current condition of the receiving environment in relation to this factor*	Napier Broome Bay is part of the northern Kimberley Region in which drowned geological features are affected by a meso-tidal regime and extreme weather conditions. The coastal geomorphology has been identified as stable and having only a very low level coastal hazard development risk.
Proposal activities – *Describe the proposal activities that have the potential to impact the environment*	Aspects of the proposal that may affect coastal processes include permanent placement of marine load out facility infrastructure that may alter wave energy and current patterns.
Mitigation – *Describe the measures proposed to manage and mitigate the potential environmental impacts*	Mitigation measures that will be implemented to minimise impacts on coastal processes have followed the Western Australian mitigation hierarchy (Avoid, Minimise, Rehabilitate, Offset (Government of Western Australia 2011)) and will comprise: • Selection of a geomorphologically stable marine load out location. • Engineering design of the load out facility (including pile jetty) and other infrastructure during the project planning stage will ensure environmental objectives for coastal processes and beach morphology are considered and can be met. • A Marine Environmental Management Plan (EMP) will be prepared and implemented to provide guidance during construction and operations activities.
Impacts – *Assess the impacts of the proposal and review the residual impacts against the EPA objective*	The potential impacts associated with the proposal are anticipated to be minor but may induce changes in local erosion/deposition patterns. With effective planning and environmental management measures in place, the proponent considers that the proposal is likely to meet the EPA objective for the Coastal Processes factor.
Assumptions – *Describe any assumptions critical to your assessment e.g. particular mitigation measures or regulatory conditions*	This preliminary assessment of impacts on coastal processes assumes the findings of planned field surveys will validate the current assessment of the nature of the marine habitat within the development envelope.

5.3 Marine Environmental Quality

5.3.1 EPA Objective

The EPA objective for the Marine Environmental Quality factor is to maintain the quality of water, sediment and biota so that environmental values are protected.

5.3.2 Potential Environmental Impacts

The proponent's preliminary assessment of the potential environmental impacts on marine environmental quality arising from the proposal is summarised in Table **5.3**.

Table 5.3**: Potential environmental impacts of the proposal on marine environmental quality (after Part B of EPA 2016b).**

EPA factor	Marine Environmental Quality
EPA policy and guidance – *What have you considered and how have you applied them in relation to this factor?*	Marine quality has been identified as a preliminary factor following EPA (EPA 2016e). Desktop assessment and survey requirements have been determined in the context of the guidance provided in Environmental Factor Guideline - Marine Environmental Quality (EPA 2016e). Surveys are currently planned for 2020 and will be completed in accordance with the requirements of EPA (2016e).
Consultation – *Outline the outcomes of consultation in relation to the potential environmental impacts*	A pre-referral consultation meeting was held with EPA Services, where the scope of the referral, likely key environmental factors and survey work required were discussed.
Receiving environment – *Describe the current condition of the receiving environment in relation to this factor*	The site should be considered greenfield as there is no history of marine development on Guy Point, and minimal nearby onshore development, that could affect marine quality. As such, marine quality in the area remains largely the result of interacting natural processes associated with geomorphology, tides, climate and riverine inputs.
Proposal activities – *Describe the proposal activities that have the potential to impact the environment*	Construction activities that may affect marine quality include piling, any rock-armour laydown and on-site surface water management. Operational activities that may impact marine quality are largely associated with vessels.
Mitigation – *Describe the measures proposed to manage and mitigate the potential environmental impacts*	Mitigation measures that will be implemented to minimise impacts on marine environmental quality have followed the Western Australian mitigation hierarchy (Avoid, Minimise, Rehabilitate, Offset (Government of Western Australia 2011)) and will comprise: • Design of marine infrastructure to avoid or minimise reduction in marine environmental quality. • Design of surface water management structures to avoid or minimise any release of run-off from the proposal to the marine environment. • Design of any hydrocarbon storage and handling facilities to Australian Standards to minimise the risk of release to the marine environment. • Implementation of a Marine EMP to reduce turbidity during construction and release of toxicants during operations.
Impacts – *Assess the impacts of the proposal and review the residual impacts against the EPA objective*	Potential effects on marine quality associated with the proposal include: • Temporary periods of elevated suspended sediments (turbidity) and light reduction during construction. • Increased risk of marine contamination from toxic antifouls on ship hulls and hydrocarbon spills. With effective planning and environmental management measures in place, the proponent considers that the proposal is likely to meet the EPA objective for the Marine Environmental Quality factor.
Assumptions – *Describe any assumptions critical to your assessment e.g. particular mitigation measures or regulatory conditions*	This preliminary assessment of impacts on marine environmental quality assumes the findings of planned field surveys will validate the current assessment of the nature of the marine habitat within the development envelope.

5.4 Marine Fauna

5.4.1 EPA Objective

The EPA objective for the Marine Fauna factor is to protect marine fauna so that biological diversity and ecological integrity are maintained.

5.4.2 Potential Environmental Impacts

The proponent's preliminary assessment of the potential environmental impacts on marine fauna arising from the proposal is summarised in Table **5.4**.

Table 5.4**: Potential environmental impacts of the proposal on marine fauna (after Part B of EPA 2016b).**

EPA factor	Marine Fauna
EPA policy and guidance – *What have you considered and how have you applied them in relation to this factor?*	Marine Fauna has been identified as a preliminary factor following EPA (EPA 2016f). Desktop assessment and survey requirements have been determined in the context of the guidance provided in Environmental Factor Guideline - Marine Fauna (EPA 2016f). Surveys are currently planned for 2020 and will be completed in accordance with the requirements of EPA (2016f).
Consultation – *Outline the outcomes of consultation in relation to the potential environmental impacts*	A pre-referral consultation meeting was held with EPA Services, where the scope of the referral, likely key environmental factors and survey work required were discussed.
Receiving environment – *Describe the current condition of the receiving environment in relation to this factor*	There is a diverse array of marine fauna, including those of conservation significance, that are likely to either permanently or temporarily occur in the development envelope including cetaceans, turtles, dugongs and sawfish.
Proposal activities – *Describe the proposal activities that have the potential to impact the environment*	Aspects of the proposal that may affect marine fauna include piling, vessels and vessel movements. The area of direct habitat loss is considered negligible and unlikely to affect local populations of marine fauna.
Mitigation – *Describe the measures proposed to manage and mitigate the potential environmental impacts*	The proponent will ensure requirements for management of impacts of underwater noise (and all other potential interactions) required under EPBC Regulations 2000 – Part 8 Division 8.1: Interacting with cetaceans, are met throughout the all phases of the project. This will include the following measures during construction • Use of Marine Fauna Observers; • Soft-starts during piling; • Definition of exclusion zones; and • Timing of construction activities to avoid any key events (e.g. breeding). Implementation of a Marine EMP with specific consideration for managing marine fauna impacts, including • Introduced Marine Species (IMS) risk assessment and management; • Maintenance of machinery to reduce noise; and • Notifications to mariners.
Impacts – *Assess the impacts of the proposal and review the residual impacts against the EPA objective*	The potential impacts on marine fauna arising from the proposal include: • auditory damage or changes in behaviour due to underwater noise; • changes in behaviour due to increased presence of vessel and vessel movements;

	• loss of biodiversity due to introduction of IMS; and • loss of individuals (faunal deaths) due to vessel strikes. With effective planning and environmental management measures in place, the proponent considers that the proposal is likely to meet the EPA objective for the Marine Fauna factor.
Assumptions – *Describe any assumptions critical to your assessment e.g. particular mitigation measures or regulatory conditions*	This preliminary assessment of impacts on marine fauna assumes the findings of the marine fauna field survey will validate the current assessment of the nature of the marine habitat within the development envelope.

5.5 Flora and Vegetation

5.5.1 EPA Objective

The EPA objective for the Flora and Vegetation factor is to protect flora and vegetation so that biological diversity and ecological integrity are maintained.

5.5.2 Potential Environmental Impacts

The proponent's preliminary assessment of the potential environmental impacts on flora and vegetation arising from the proposal is summarised in Table 5.5.

Table 5.5**: Potential environmental impacts of the proposal on flora and vegetation (after Part B of EPA 2016b).**

EPA factor	Flora and Vegetation
EPA policy and guidance – *What have you considered and how have you applied them in relation to this factor?*	Flora and Vegetation has been identified as a preliminary key factor following EPA (2016g). Survey type has been assessed in the context of the guidance provided in *Technical Guide - Terrestrial Flora and Vegetation Surveys* (EPA 2016h), with the determination that a Detailed survey is required. Surveys will be completed during 2020 in accordance with the requirements of EPA (2016h).
Consultation – *Outline outcomes of consultation in relation to the potential environmental impacts*	A pre-referral consultation meeting was held with EPA Services, where the scope of the referral, likely key environmental factors and survey work required were discussed. Traditional owners were also consulted in respect of the flora and vegetation values of the development envelope and members of the Traditional Owner Ranger Program will be invited to participate in the surveys.
Receiving environment – *Describe the current condition of the receiving environment in relation to this factor*	Four broad vegetation types are mapped for the area, mostly comprising savanna woodland units. Vine thicket patches are present in association with the margins of the plateau on which the mining areas will be sited, but do not appear to correspond to TECs or PECs. One Threatened flora species has a low potential to occur, and up to 33 other Priority flora species may be present.
Proposal activities – *Describe the proposal activities that have the potential to impact the environment*	The aspects of the proposal that may impact on flora and vegetation include: • Clearing of flora and vegetation to accommodate the proposal infrastructure and mining areas (Section 3.1). • Deployment of plant and equipment into the development envelope from other locations where weeds or soil pathogens may be present.
Mitigation – *Describe the measures proposed to manage and mitigate the*	Mitigation measures that will be implemented to minimise impacts on flora and vegetation have followed the Western Australian mitigation hierarchy (Avoid, Minimise, Rehabilitate, Offset (Government of Western Australia 2011)) and will comprise:

potential environmental impacts	• Limiting the extent of mining areas to within a buffer zone from the boundary of the plateau landforms, such that vine thicket and rainforest vegetation types will not be subject to project ground disturbance.
	• Avoidance of Threatened or Priority flora populations during project design wherever possible.
	• Reduction of vegetation clearing footprint during the design stage to the minimum practicable, including utilisation of any existing cleared areas and co-location of infrastructure to the extent feasible.
	• Development and implementation of a Terrestrial EMP addressing:
	  ○ Comprehensive weed hygiene management.
	  ○ Vegetation clearing control measures.
	  ○ General construction and operations site matters such as waste management, fire risk management and environmental inductions.
	• Development and implementation of Mine Closure Plan (MCP), consistent with the requirements of EPA and DWER, addressing:
	  ○ Materials characterisation and management.
	  ○ Identification of closure knowledge gaps.
	  ○ Financial provisioning for closure.
	  ○ Rehabilitation protocols.
	  ○ Rehabilitation and weed monitoring and contingency measures.

Impacts – *Assess the impacts of the proposal and review the residual impacts against the EPA objective*	The potential impacts arising from the proposal include: • Clearing of a total of 1,946 ha of native vegetation within the 8,435 ha development envelope to accommodate the proposal infrastructure and mining areas. • Weed introduction and spread during earthworks and construction activities. The proposal is not expected to alter the conservation status of any Threatened or Priority flora species or result in any significant reduction in the representation of vegetation types at local or regional scales. Existing data indicate that no TECs, PECs or Threatened Flora will be affected by the proposal as none are currently known from the development envelope. The proponent considers that the proposal is likely to meet the EPA objective for the Flora and Vegetation factor.
Assumptions – *Describe any assumptions critical to your assessment e.g. particular mitigation measures or regulatory conditions*	This preliminary assessment of impacts on flora and vegetation assumes: • The vegetation descriptions from regional mapping, and as described during reconnaissance and targeted field work completed to date, are representative of the full range of vegetation types present. • That no currently unidentified species or communities of conservation significance occur within the development envelope (to be further informed through the completion of a Detailed flora and vegetation survey during 2020). • That environmental management measures intended to mitigate or minimise construction and operational impacts on flora and vegetation are effective (high confidence, based on demonstrated successful application of control measures in other similar settings).

5.6 Subterranean Fauna

5.6.1 EPA Objective

The EPA objective for the Subterranean Fauna factor is to protect subterranean fauna so that biological diversity and ecological integrity are maintained.

5.6.2 Potential Environmental Impacts

The proponent's preliminary assessment of the potential environmental impacts on subterranean fauna arising from the proposal is summarised in Table **5.6**.

Table 5.6**: Potential environmental impacts of the proposal on subterranean fauna (after Part B of EPA 2016b).**

EPA factor	Subterranean Fauna
EPA policy and guidance – *What have you considered and how have you applied them in relation to this factor?*	Subterranean Fauna has been identified as a preliminary key factor following EPA (2016i). Survey has been assessed in the context of the guidance in *Technical Guide - Subterranean Fauna Surveys* (EPA 2016j), with the determination that a desktop assessment and verification survey is required.
Consultation – *Outline the outcomes of consultation in relation to the potential environmental impacts*	A pre-referral consultation meeting was held with EPA Services, where the scope of the referral, likely key environmental factors and survey work required were discussed.
Receiving environment – *Describe the current condition of the receiving environment in relation to this factor*	Initial appraisals of the geology of the development envelope indicate that the habitats do not appear overly prospective for subterranean fauna, but survey effort in the locality is lacking.
Proposal activities – *Describe the proposal activities that have the potential to impact the environment*	The aspects of the proposal that may impact on subterranean fauna include: • Removal of potential subterranean fauna habitat within the proposed mining areas (Section 3.1). • Abstraction of groundwater from local aquifers for the project bore field.
Mitigation – *Describe the measures proposed to manage and mitigate the potential environmental impacts*	Mitigation measures to be implemented to minimise impacts on subterranean fauna have followed the Western Australian mitigation hierarchy (Avoid, Minimise, Rehabilitate, Offset (Government of Western Australia 2011)) and will comprise: • Limiting the extent of mining areas to within a buffer zone from the boundary of the plateau landforms, such that remnant above-water table habitat will be retained within the landform. • Limiting the depth of the mining areas to above the water table such that dewatering will not be required within the mining areas. • Management of the project bore field such that groundwater is abstracted at sustainable yield and drawdown of the water table is minimised.
Impacts – *Assess the impacts of the proposal and review the residual impacts against the EPA objective*	The potential impacts arising from the proposal include: • Removal of a total of up to 1,465 ha of potential troglofauna habitat within the development envelope to accommodate the proposal mining areas. • Lowering of the water table in the vicinity of the project bore field and potential loss of stygofauna habitat. Given that neither the mining areas nor the bore field will remove all locally occurring subterranean fauna habitat, the proponent considers that the proposal is likely to meet the EPA objective for the Subterranean Fauna factor.
Assumptions – *Describe any assumptions critical to your assessment e.g. particular mitigation measures or regulatory conditions*	This preliminary assessment of impacts on subterranean fauna assumes that no currently unidentified subterranean fauna species are restricted to within the development envelope (to be further informed through assessment and survey to be completed in 2020).

5.7 Terrestrial Fauna

5.7.1 EPA Objective

The EPA objective for the Terrestrial Fauna factor is to protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

5.7.2 Potential Environmental Impacts

The proponent's preliminary assessment of the potential environmental impacts on terrestrial fauna arising from the proposal is summarised in Table 5.7.

Table 5.7: Potential environmental impacts of the proposal on terrestrial fauna (after Part B of EPA 2016b).

EPA factor	Terrestrial Fauna
EPA policy and guidance – *What have you considered and how have you applied them in relation to this factor?*	Terrestrial Fauna has been identified as a preliminary key factor following EPA (2016k). Survey type has been assessed in the context of the guidance provided in *Technical Guide - Terrestrial Fauna Surveys* (EPA 2016j), with the determination that a Level 2 survey is required. A preliminary targeted survey has been undertaken during 2019, with the Level 2 survey to be commenced in 2020 and completed in accordance with the requirements of EPA (EPA 2016j).
Consultation – *Outline the outcomes of consultation in relation to the potential environmental impacts*	A pre-referral consultation meeting was held with EPA Services, where the scope of the referral, likely key environmental factors and survey work required were discussed. Traditional Owners were also consulted in respect of the terrestrial fauna work they have undertaken within and near to the development envelope, and members of the Traditional Owner Ranger Program will be invited to participate in the survey work.
Receiving environment – *Describe the current condition of the receiving environment in relation to this factor*	Records of terrestrial vertebrate fauna from targeted sampling are common species for the locality. Northern Quoll (Threatened at both Commonwealth and State levels) is likely to occur in the development envelope and a further 16 conservation significant species may potentially occur. Several land snail taxa, and other invertebrate groups, recorded from the development envelope that may represent SRE species.
Proposal activities – *Describe the proposal activities that have the potential to impact the environment*	The aspects of the proposal that may impact on terrestrial fauna include: • Clearing of terrestrial fauna habitat to accommodate the mining areas and proposal infrastructure (Section 3.1). • Deployment of plant and equipment into the development envelope from other locations where weeds or soil pathogens may be present.

Mitigation – *Describe the measures proposed to manage and mitigate the potential environmental impacts*	Mitigation measures to be implemented to minimise impacts on terrestrial fauna have followed the Western Australian mitigation hierarchy (Avoid, Minimise, Rehabilitate, Offset (Government of Western Australia 2011)) and will comprise:
	• Limiting the extent of mining areas to within a buffer zone from the boundary of the plateau landforms, such that vine thicket and rainforest habitats will not be subject to project ground disturbance.
	• Reduction of the habitat clearing footprint during the design stage to the minimum practicable, including utilisation of existing cleared areas and co-location of infrastructure to the extent feasible.
	• Development and implementation of a Terrestrial EMP addressing:
	  o Habitat clearing control measures.
	  o Comprehensive weed hygiene management.

	○ General construction site matters such as waste management, fire risk management and workforce environmental inductions. • Development and implementation of MCP, consistent with the requirements of EPA and DWER, addressing: ○ Materials characterisation and management. ○ Identification of closure knowledge gaps. ○ Financial provisioning for closure. ○ Rehabilitation protocols. ○ Rehabilitation and weed monitoring and contingency measures.
Impacts – *Assess the impacts of the proposal and review the residual impacts against the EPA objective*	The potential impacts arising from the proposal include: • Clearing of a total of 1,946 ha of fauna habitat within the 8,435 ha development envelope to accommodate infrastructure and mining areas. • Potential direct and indirect impacts on Threatened and Priority fauna species (including direct loss or displacement of individuals during clearing or as a result of operational vehicle movements). • Risk of weed introduction and spread during earthworks and construction activities, modifying fauna habitats with potential flow-on effects to fauna community structure. The proposal is not expected to alter the conservation status of any of the Threatened or Priority fauna species known from or potentially occurring in the development envelope, or result in any significant reduction in the representation of habitat types at local or regional scales. Existing data indicate that no TECs or PECs will be affected by the proposal as none are currently known from the development envelope. The proponent considers that the proposal is likely to meet the EPA objective for the Terrestrial Fauna factor.
Assumptions – *Describe any assumptions critical to your assessment e.g. particular mitigation measures or regulatory conditions*	This preliminary assessment of impacts on terrestrial fauna assumes: • The habitats identified during the targeted survey are representative of the range of habitats present in the development envelope. • That no currently unidentified species or communities of conservation significance occur within the development envelope (to be further informed through Level 2 surveys to be completed in 2020). • That environmental management measures intended to mitigate or minimise general construction and operational impacts on terrestrial fauna are effective.

5.8 Greenhouse Gas Emissions

5.8.1 EPA Objective

The EPA objective for the Greenhouse Gas Emissions factor is to reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.

5.8.2 Potential Environmental Impacts

The proponent's preliminary assessment of the potential environmental impacts on greenhouse gas emissions arising from the proposal is summarised in Table **5.8**.

Table 5.8**: Potential environmental impacts of the proposal on greenhouse gas emissions (after Part B of EPA 2016b).**

EPA factor	Greenhouse Gas Emissions
EPA policy and guidance – *What have you considered and*	Greenhouse Gas Emissions has been identified as a preliminary key factor following EPA (2019).

how have you applied them in relation to this factor?	
Consultation – *Outline the outcomes of consultation in relation to the potential environmental impacts*	A consultation meeting and subsequent discussions were held with the EPA, where the scope of the referral, likely key environmental factors and survey work required were discussed.
Receiving environment – *Describe the current condition of the receiving environment in relation to this factor*	The local receiving environment for the proposal is a greenfield site with essentially no greenhouse emissions from any existing development. The broader airshed of the Anjo Peninsula-Napier Broome Bay includes the existing Mungalalu Truscott Airbase, which operates fixed wing and helicopter personnel transport services for the oil and gas industry.
Proposal activities – *Describe the proposal activities that have the potential to impact the environment*	The aspects of the proposal with the potential to contribute greenhouse gas emissions, comprise: • Emissions from plant and equipment needed to extract bauxite from the mining areas; • Haul truck emissions during the transportation of bauxite from the mining area to the beneficiation plant; • Emissions from power generation for the beneficiation plant, conveyor and other project infrastructure; • Emissions from shipping operations, primarily nearshore barging and tug vessels.
Mitigation – *Describe the measures proposed to manage and mitigate the potential environmental impacts*	Mitigation measures that will be implemented to minimise impacts on air quality and contribute to greenhouse gas emissions have followed the Western Australian mitigation hierarchy (Avoid, Minimise, Rehabilitate, Offset (Government of Western Australia 2011)), comprise: • The use of renewable power as part of the proposal's power generation facilities.
Impacts – *Assess the impacts of the proposal and review the residual impacts against the EPA objective*	Given the avoidance and mitigation measures, the proponent considers that the proposal is likely to meet the EPA objective for the Greenhouse Gas Emissions factor.
Assumptions – *Describe any assumptions critical to your assessment e.g. particular mitigation measures or regulatory conditions*	This preliminary assessment of impacts on greenhouse gas emissions assumes that the estimation of emissions is accurate.

5.9 Social Surroundings

5.9.1 EPA Objective

The EPA objective for the Social Surroundings factor is to protect social surroundings from significant harm.

5.9.2 Potential Environmental Impacts

The proponent's preliminary assessment of the potential environmental impacts on social surroundings arising from the proposal is summarised in Table 5.9.

Table 5.9: **Potential environmental impacts of the proposal on social surroundings (after Part B of EPA 2016b).**

EPA factor	Social Surroundings

EPA policy and guidance – *What have you considered and how have you applied them in relation to this factor?*	Social Surroundings has been identified as a preliminary key factor following EPA (2016l). The aspect considered potentially relevant in relation to this factor is Aboriginal heritage.
Consultation – *Outline the outcomes of consultation in relation to the potential environmental impacts*	A consultation meeting and subsequent discussions were held with the EPA, where the scope of the referral, likely key environmental factors and survey work required were discussed. The Wunambal Gaambera Traditional Owners have been regularly consulted in respect of potential areas of heritage value within the development envelope, and representatives from the group have participated in heritage surveys and environmental studies.
Receiving environment – *Describe the current condition of the receiving environment in relation to this factor*	The area of the development envelope is not a tourist destination, nor does it have any other regular land use activities taking place on-site. For visual amenity, there are no potential sensitive receivers in the vicinity of the development envelope.
Proposal activities – *Describe the proposal activities that have the potential to impact the environment*	Clearing during construction could potentially destroy heritage artefacts or sites of cultural significance to the Traditional Owners.
Mitigation – *Describe the measures proposed to manage and mitigate the potential environmental impacts*	Mitigation measures that will be implemented to minimise impacts on social surroundings have followed the Western Australian mitigation hierarchy (Avoid, Minimise, Rehabilitate, Offset (Government of Western Australia 2011)). The proponent will continue working with the Traditional Owners to undertake heritage clearances in areas that are being considered for ground disturbance. This will include pre-construction clearance surveys and the signing of an Indigenous Land Use Agreement.
Impacts – *Assess the impacts of the proposal and review the residual impacts against the EPA objective*	Given the avoidance and mitigation measures for Aboriginal Heritage values, the proponent considers that the proposal is likely to meet the EPA objective for the Social Surroundings factor.
Assumptions – *Describe any assumptions critical to your assessment e.g. particular mitigation measures or regulatory conditions*	This preliminary assessment of impacts on Social Surroundings assumes that all the known potential heritage concerns in the development envelope are identified.

6.0 Other Environmental Factors

The other factors, although not considered preliminary key factors, which may still be relevant to the proposal are:

- Landforms; and
- Inland Waters.

Potential impacts on these factor will still be assessed in the completion of the environmental impact assessment, but it is the proponent's current assessment is that they are not likely to be key factors for the proposal.

The remaining factors identified by EPA (2018) (i.e. Terrestrial Environmental Quality, Air Quality and Human Health) are not considered to be relevant to the proposal.

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