

PORT HEDLAND IRON PROJECT

SUPPLEMENTARY REPORT

PORT HEDLAND IRON PTY LTD

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ACKNOWLEDGEMENT OF COUNTRY

Preston Consulting acknowledges the Traditional Owners of the lands on which it works, in particular the Kariyarra people, the Traditional Custodians of the land on which the activity is proposed. Preston Consulting pays its respects to Elders past and present, to emerging community leaders and to all Aboriginal and Torres Strait Islander peoples.

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EXECUTIVE SUMMARY

THE PROPOSED ACTION

The Port Hedland Iron Project (Proposed Action) is a staged development of a large-scale downstream iron ore processing facility 10 km south-west of Port Hedland in the Pilbara region of Western Australia (WA) (Figure 2-2). The Proposed Action is being developed by Port Hedland Iron Pty Ltd (PHI) on behalf of joint venture partners POSCO, Marubeni and China Steel Company (see Section 1.2).

The development envelopes, disturbance footprint and indicative infrastructure footprint for the Proposed Action is provided in Figure 2-3. A summary of the Proposed Action is provided in Table ES1 and the key Proposed Action elements (e.g., development, action, activities or processes) which are likely to cause an impact on the environment are summarised in Table ES2.

Table ES1: Key characteristics of the Proposed Action

Proposed Action Title	Port Hedland Iron Project – Stage 1
Proponent Name	Port Hedland Iron Pty Ltd
Short Description	Port Hedland Iron Pty Ltd (PHI) is progressing the development of a large-scale downstream iron ore processing facility known as the Port Hedland Iron Project (the Proposed Action). The Proposed Action is located in the Boodarie Strategic Industrial Area (SIA) approximately 10 km southwest of Port Hedland in the Pilbara region. The Proposed Action's regional location is shown in Figure 2-2 and the indicative footprint and development envelopes are shown in Figure 2-3. The Proposed Action will consist of a pellet plant and a HBI Plant, consuming approximately 3-3.5 Mtpa of iron ore. The first processing step is to produce iron ore pellets (3-3.5 Mtpa). Most of the pellets will be fed into the HBI plant to produce approximately 2 Mtpa HBI. The remainder of the pellets (~0.7 Mtpa) will be exported from the Port as pellets. The infrastructure to be developed within the Boodarie SIA for the Proposed Action will include: • Iron ore processing facility (IOPF) comprising one pellet and one HBI plant producing approximately 2 Mtpa of HBI and 0.7 Mtpa of iron ore pellets for export; • Hydrogen production and storage facilities for supply to IOPF; • Nitrogen plant; and • Supporting infrastructure such as: o HBI and pellet handling and storage facilities; o Flux storage; o Administration and other non-process buildings; o Workshops; o Water storage and management areas; o Magnetite concentrate/ore handling facilities; o Power production, management and transmission; o Carbon capture, storage and transport infrastructure; o Drainage and sediment control; and o Access roads. The HBI and iron ore pellets will be shipped out of the Port of Port Hedland (PoPH). The scope of the Proposed Action does not include any construction works at the PoPH or the export of pellets and HBI. Water, power and natural gas will be supplied by third parties and subject to separate approvals to be acquired by the relevant third-party and therefore not part of this referral. However, the referral includes an EIDE to allow connection within the Boodarie SIA to third-

	party suppliers, if needed, as well as development of access roads and drainage for the Proposed Action. The EIDE covers the infrastructure corridors identified in the Boodarie SIA Structure Plan. These infrastructure corridors are managed by the Department of Jobs, Tourism, Science and Innovation (JTSI). The layout of the infrastructure within the EIDE will be determined once commercial arrangements with third-party suppliers have been finalised as well as consultation undertaken with JTSI. The Proposed Action also excludes early works for communications infrastructure, laydown areas and access roads.

Table ES2: Location and proposed extent of physical and operational elements

Element	Location / Description	Maximum extent, capacity or range
Physical Elements		
Plant Development Envelope: • Clearing of native vegetation; • Construction; • Earthworks; • Ore processing; and • Transport.	Figure 2-3	Disturbance of up to 300 ha within a 518 ha Development Envelope.
EIDE: • Clearing of native vegetation; • Construction; and • Transport.	Figure 2-3	Disturbance of up to 90 ha within a 466 ha Development Envelope.
Construction Elements		
N/A	N/A	N/A
Operational Elements		
Ore processing	N/A	Production of 3.5 Mtpa of iron ore pellets and 2.0 Mtpa of HBI.
Rehabilitation and closure		
Areas temporarily cleared during the construction phase that are not required for operations will be rehabilitated following construction. Final rehabilitation to commence within 12 months of cessation of decommissioning. Topsoil will be spread across the site, with seeding of native species likely to be required.		
Commissioning		
Commissioning of the processing facility to be undertaken subject to operational limits.		
Decommissioning		
All above-surface infrastructure will be removed from site. Buried concrete and other buried infrastructure may be remain in-situ if they do not pose a contamination risk.		
Other elements which affect extent of effects on the environment		
Proposed Action Time	Maximum Proposed Action life	101 years
	Construction phase	2.5 years
	Operations phase	99 years
	Decommissioning phase	Approximately 10 years

MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The Proposed Action was referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) on 22 December 2023 (EPBC 2023/09764). DCCEEW determined that the Proposed Action was a 'controlled action' and required assessment and approval under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act), due to potential impacts on the following relevant controlling provisions:

- Listed threatened species and communities (Sections 18 & 18A).

The Proposed Action is being assessed on Preliminary Documentation. This Supplementary Document addresses the request for additional information that is required to be included in the Preliminary Documentation.

Table ES3 summarises relevant information on the potential impacts, mitigation, residual impacts, outcomes and offsets for each of the relevant Matters of National Environmental Significance (MNES). The appendices provided include supporting studies and investigations undertaken to inform this supplementary document, the key elements of which are included in this document.

Table ES3: Summary of potential impacts on MNES, proposed mitigation, residual impacts and outcomes

Threatened Species and Communities	
Policy and Guidance	• Generic guidelines for the content of a draft EPBC Act PER/EIS (including the objects and principles of the EPBC Act, 1999) (DotEE, 2016a); • EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) – including the Offset Assessment guide; • Environmental Management Plan Guidelines (DotE, 2014); • EPBC Act Condition Setting Policy (DAWE, 2020); and • EPBC Act Outcomes-based conditions policy (DotE, 2016a).
Potential Impacts	<u>General fauna and habitat (including locally significant fauna)</u> • Up to 390 ha of native fauna habitat disturbance; • Death or injury of fauna due to vehicle strike or earthmoving equipment; • Increased predation or competition from introduced fauna; • Alterations to fauna behaviour (including feeding or breeding characteristics) as a result of elevated dust, light or noise emissions; • Alteration of habitat characteristics as a result of changes to the surface water regime; and • Reduction in habitat health as a result of: o Increased sedimentation during construction; o Leaks or spillages of hydrocarbons or chemicals; and o Introduction or spread of weed species. <u>Bilby</u> • Up to 378.1 ha (26.8% of Survey Area) of disturbance to critical habitat; • Increased predation or competition from introduced fauna; and • Alterations to behaviour (including feeding or breeding characteristics) as a result of elevated light or noise emissions. <u>Grey Falcon</u> • Up to 386.1 ha (26.1% of Survey Area) of disturbance to potential foraging habitat; • Increased predation or competition from introduced fauna; and • Alterations to behaviour (including feeding or breeding characteristics) as a result of elevated light or noise emissions. <u>Northern Quoll</u> • Up to 1.6 ha (18% of Survey Area) of disturbance to potential foraging/dispersal habitat; • Increased predation or competition from introduced fauna; and • Alterations to behaviour (including feeding or breeding characteristics) as a result of elevated light or noise emissions.

Mitigation	**Avoid:** The key avoidance mechanism implemented by PHI was the design of the development envelopes to avoid key habitat features associated with terrestrial fauna. The Proposed Action has been reduced to the minimum possible footprint to avoid disturbance where possible. As for flora and vegetation, the Proposed Action is located within an area set aside as a Strategic Industrial Area where there is existing industrial development and is not located in undeveloped pristine parts of the Pilbara remote from any supporting infrastructure. It therefore avoids impacts to fauna and fragmentation of fauna habitat in these pristine undeveloped areas. **Minimise:** • Implement industry best practice management measures for terrestrial fauna; • Obtain and comply with the following approvals; and • Implement the measures to minimise the risk and impact of hydrocarbon spills and other contamination. **Rehabilitate:** The key rehabilitation measures that relate to terrestrial fauna are summarised below: 1. All infrastructure will be removed; and 2. The development envelopes will be revegetated with local native species. The Proposed Action is required to sign a Lease with the State Government under the LAA. PHI expects that the terms and conditions of the lease will require decommissioning and rehabilitation of the Proposed Action at the end of its operational life, which will ensure rehabilitation measures are implemented. **Offset:** After the implementation of the mitigation measures described above, it is predicted that the Proposed Action will have an unavoidable significant residual impact on: • Critical Bilby habitat; and • Foraging habitat for the Grey Falcon. Proposed offsets for these significant residual impacts are discussed in detail in Section 7 and the IRP in Appendix 2.
Outcomes	PHI has incorporated avoidance, minimisation and rehabilitation measures into the Proposed Action design and operational processes, however some direct impacts to terrestrial fauna are unavoidable. The Proposed Action will result in disturbance to 386.1 ha of native vegetated fauna habitat, in a relatively uncleared landscape. All of this vegetation is considered to be in Good to Excellent condition, no poor or degraded vegetation was recorded in the survey. Evidence of the Bilby was recorded in the survey and is listed as Vulnerable under the EPBC Act. It is primarily threatened by predation of foxes and feral cats and loss and fragmentation of breeding and foraging habitat as a result of vegetation clearing. Sandplain habitat has been identified as critical habitat for the Bilby. This habitat is present throughout the development envelopes. However, Sandplain habitat is widespread across the Pilbara and critical habitat is defined as any area where the Bilby is known or likely to occur, as shown in Figure 5-4. This constitutes up to 216,636,018 ha of habitat. Therefore, disturbance of up to 378.1 ha of habitat (0.0001% of regional extent) within a SIA is unlikely to result in a significant impact on the species. Nevertheless, after the implementation of avoidance, minimisation and rehabilitation mitigation measures, disturbance of 378.1 ha of critical habitat is deemed to be significant and is proposed to be counterbalanced by offsets, outlined in Section 7 and the IRP in Appendix 2. The Grey Falcon was recorded in the survey and is listed as Vulnerable under the EPBC Act. Sandplain, Open Woodlands and Drainage habitat was considered potential foraging habitat for the Grey Falcon. The Grey Falcon is wide ranging with a distribution across the arid and semi-arid zone of Australia and prey on smaller bird species. The Proposed Action will require up to 386.1 ha of disturbance to potential foraging habitat which is deemed to be significant and is proposed to be counterbalanced by offsets, outlined in Section 7 and the IRP in Appendix 2. The Northern Quoll was considered possible to occur within the Survey Area and is listed as Endangered under the EPBC. The Drainage Area may provide potential foraging and dispersal habitat for the species, particularly considering the relatively recent record (2018) approximately 4.5 km from the development envelopes. The Proposed Action will require up to 1.6 ha of Drainage Area habitat which is deemed to be significant and is proposed to be counterbalanced by offsets, outlined in Section 7 and the IRP in Appendix 2.

Social and Economic Matters	
Policy and Guidance	• Generic guidelines for the content of a draft EPBC Act PER/EIS (including the objects and principles of the EPBC Act) (DotEE, 2016a); • EPBC Act Condition Setting Policy (DAWE, 2020); • EPBC Act Outcomes-based conditions policy (DotE, 2016a); and • Engage Early – Guidance for proponents on best practice Indigenous engagement for environmental assessments under the EPBC Act (DotE, 2016b).
Potential Impacts	<u>Local residents and community</u> • Access to the land will only be granted with appropriate safety measures; and • Amenity impacts from visual, noise and dust emissions, traffic during construction or operation of the Proposed Action. <u>Traditional uses of the land</u> • Access to the land will only be granted with appropriate safety measures; and • Amenity impacts from visual, noise and dust emissions, traffic during construction or operation of the Proposed Action. <u>Aboriginal heritage sites</u> • No sites are predicted to be directly impacted by the Proposed Action; and • No registered Aboriginal Heritage Sites are predicted to be affected by dust emissions from construction or operation of the Proposed Action.
Mitigation	The Proposed Action has incorporated avoidance, minimisation and rehabilitation measures into the Proposed Action design and operational processes to ensure that social surroundings impacts are minimised. The Proposed Action is expected to result in minor impacts to Traditional Uses of the Land and Local Residents and Community given the small footprint, lack of direct uses of the land and the location of the Proposed Action in an SIA. The community of Port Hedland is critical to the Project. PHI will be active in earning consistent community support to sustain the workforce, amenities and activities associated with the Proposed Action

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this Supplementary Document is to provide a detailed description of the Port Hedland Iron Project (the Proposed Action), and to enable assessment of the potential environmental impacts that may result should the Proposed Action be implemented. This Supplementary Document outlines the key elements (characteristics) required for the construction and operation of the Proposed Action.

The Proposed Action was declared a controlled action due to the potential impacts on Listed threatened species and communities (Section 18 and 18A of the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act)). This Supplementary Document therefore focuses on EPBC Act Listed threatened species and communities. Potential impacts to Listed threatened species and communities are described in detail and are assessed using relevant studies specific to the Proposed Action. This Supplementary Document therefore describes the most relevant characteristics and impacts of the Proposed Action for EIA and provides all relevant biological and technical reports and survey results as Appendices (Appendix 1-9).

The Proposed Action is to construct and operate a pellet and hot briquette iron (HBI) plant, collectively consuming approximately 3-3.5 million tonnes per annum (Mtpa) of iron ore. Most iron ore pellets produced will be fed into the HBI plant to produce approximately 2 Mtpa of HBI. The remaining pellets (~0.7 Mtpa) will be exported from the PoPH as pellets.

The Proposed Action triggers a requirement for environmental assessment and approval under Part IV of the EP Act. The Proposed Action was referred to the EPA to set the level of assessment, which has since been identified as "Referral Information with additional information (required under s. 40(2)(a) of the EP Act) and public review". It has a public review period for additional assessment information of 4 weeks.

1.2 PROPONENT

The Proponent for the Proposed Action is Port Hedland Iron Pty Ltd (PHI) (ABN: 667 564 589).

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PHI has been established as a special purpose vehicle to develop the Proposed Action. It represents the interests of the Joint Venture partners of POSCO, Marubeni and China Steel Company as shown in Figure 1-1.

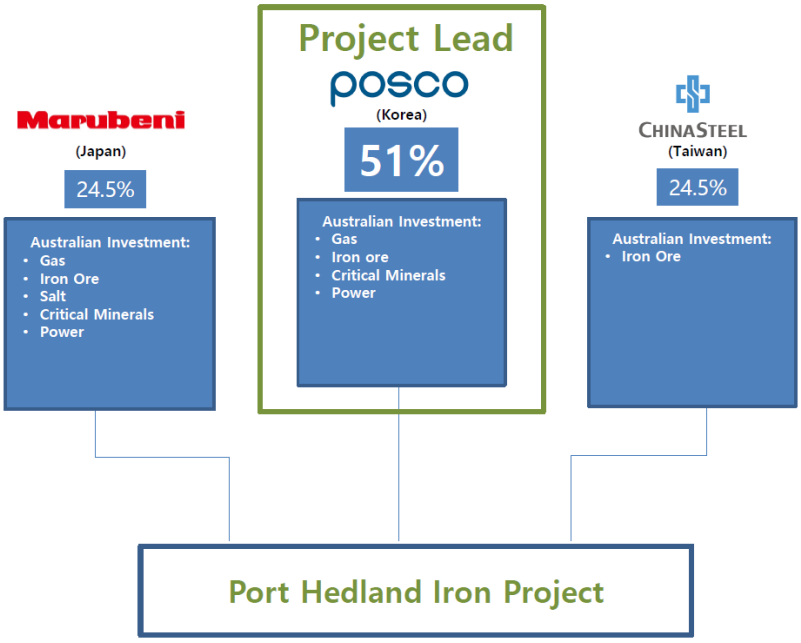


Figure 1-1: Ownership structure

1.3 LEGISLATIVE CONTEXT

1.3.1 SECTION 87 OF THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The Proposed Action was referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) on 22 December 2023 (EPBC 2023/09764). DCCEEW determined that the Proposed Action was a 'controlled action' and required assessment and approval under the EPBC Act, due to potential impacts on the following relevant controlling provisions:

- Listed threatened species and communities (Sections 18 & 18A).

The Proposed Action will be assessed on preliminary documentation by DCCEEW. The Proposed Action is not being assessed as an accredited assessment by the EPA.

1.3.2 PART IV OF THE *ENVIRONMENTAL PROTECTION ACT 1986*

Part IV of the EP Act makes provisions for the EPA to undertake EIA of significant Proposed Actions, strategic Proposed Actions and land use planning schemes. The Proposed Action is considered to be a significant Proposed Action and therefore requires assessment under Part IV of the EP Act.

The EPA uses environmental principles, factors and associated objectives as the basis for assessing whether a Proposed Action or land use planning scheme's impact on the environment is acceptable. The environmental principles, factors and objectives, therefore, underpin the EIA process.

The Proposed Action was referred under Section 38 of the EP Act on 14 September 2023. The EPA released its decision to assess the Proposed Action as an Assessment on Referral Information, with additional information required under s. 40(2) (a), on 13 December 2023. The Proposed Action is not being assessed as an accredited assessment under the EP Act.

1.3.3 Other Approvals and Regulation

Land Tenure

The Boodarie Strategic Industrial Area, located approximately 10 km south-west of Port Hedland, is zoned for strategic and downstream processing industries and has been planned by the WA Government to accommodate a range of mineral, gas processing and other strategic industries. The Proposed Action is located on land zoned as a Strategic Industrial Area (SIA) (within the Boodarie SIA) under the Town of Port Hedland (ToPH) Local Planning Scheme No. 7. SIAs are planned for downstream processing and other heavy and strategic industries, these areas are surrounded by an industry protection zone to ensure heavy industry can continue to operate without land use conflict (https://siawa.com.au/#planned). Re-zoning of the area is not required.

The Proposed Action is located within the Kariyarra Native Title Determination and requires compliance under the *Native Title Act 1993* (Cth). Negotiations with Kariyarra Aboriginal Corporation (KAC) and Kariyarra Traditional Owners in respect of an Indigenous Land Use Agreement have commenced and are currently ongoing.

Should the Proposed Action commence, the Proposed Action will be implemented on a Lease issued by the Government of WA under the *Land Administration Act 1997* (WA) (LAA). On 30 December 2022, the State Government allocated approximately 960 ha of land at the Boodarie SIA to PHI for the purpose of constructing and operating the Proposed Action. Following the land allocation, PHI needs to negotiate an Option to Lease and a Lease with DevelopmentWA. This negotiation has commenced.

In advance of the Option to Lease, an application for a Section 91 (s91) Licence under the LAA was submitted to Department of Planning, Lands and Heritage (DPLH). The s91 Licence was granted and enabled early land access for investigations on the land required for the Proposed Action. The Proposed Action is covered by File Notation Areas (16658 and 16673) for the purposes of the Pilbara SIA (Boodarie Core Strategic Industry Zone).

Planning approvals in the SIA are managed under the Boodarie SIA Structure Plan (Structure Plan). The Structure Plan provides for the long-term strategic industrial development of the area and is intended to coordinate the detailed land use and development of the BSIA. A development application will need to be submitted to the ToPH under the *Planning and Development Act 2005* (WA) that meets the requirements laid out in the Structure Plan. Whilst the development Application is submitted to the ToPH, it will be assessed by the relevant Development Assessment Panels as the mandatory value threshold for requiring Development Assessment Panel review of $10 million will be exceeded.

Proposed Action dependencies such as provision of water, gas, hydrogen and accommodation are outside of the scope of this referral but will also require applicable planning approvals.

Other Decision-Making Authorities, Approvals and Regulation

Implementation of the Proposed Action is subject to other approvals in addition to Part IV of the EP Act and the EPBC Act. Table 1-1 identifies other approvals and associated legislation that will apply to the Proposed Action. The relevant decision-making authorities have also been identified for each approval or legislation.

Table 1-1: Other approvals and regulation

DMA and department (if relevant)	Legislation or agreement regulating the activity	Approval required and relevant Proposed Action element	Relevant Impact
Chief Executive Officer, Department of Water and Environmental Regulation (DWER)	*Environmental Protection Act 1986*	**Works Approval** Required for the construction and commissioning of the Processing Plant **Licence** Required for the operation of the Processing Plant	Air emissions, dust emissions and noise emissions
Chief Dangerous Goods (DG) Officer (Department of Energy, Mines, Industry Regulation and Safety (DEMIRS))	*Dangerous Goods Safety Act 2004* (WA)	**DG Licence** May be required for the bulk storage of fuel if above specified limits (unlikely)	Contamination of soils, groundwater and surface water (hydrocarbon spills) Fire (combustion of stored fuel)
Chief Executive Officer (ToPH)	*Planning and Development Act 2005* (WA)	**Development Approval Application** Permission for specified use or development to occur	Noise emissions Dust emissions
Minister for Water	*Rights in Water and Irrigation Act 1914* (RIWI Act)	**Bed and Banks Permit** Required if taking, storing or diverting water	Alteration of surface water flows
Minister for Aboriginal Affairs	*Aboriginal Heritage Act 1972* (AH Act)	**Consent under Section 18 of the *AH Act.*** Required to impact any Aboriginal site	Damage or disturbance of any Aboriginal site

2 THE PROPOSED ACTION

2.1 BACKGROUND

2.1.1 REASON FOR THE PROPOSED ACTION

PHI is progressing a feasibility assessment of a large-scale iron ore processing facility known as the Port Hedland Iron Project (Proposed Action). The ownership structure of the Proposed Action is currently a Joint Venture (JV) between POSCO (51%), Marubeni Corporation (24.5%) and China Steel Corporation (24.5%). Should the Proposed Action proceed past a Final Investment Decision, construction of Stage 1 of the Proposed Action is proposed to commence in Q1 2027.

The home countries of the JV partners (South Korea, Japan and Taiwan) are all committed to net zero emissions by 2050, as is Australia. Hence, they all have a strong environmental driver to move towards low emissions steel making. The emissions intensity of the current steelmaking technology (using blast furnaces with coal as the reductant) is 2.2 tCO_2 per t of liquid steel (tCO_2/t-LS) (Figure 2-1). The Proposed Action can reduce greenhouse gas (GHG) emissions intensity from start up by around 55% to 1.1 tCO_2/t-LS. Further reductions can be achieved as hydrogen becomes available at competitive costs and input is incrementally increased.

Port Hedland is seen as a logical location for a low emissions iron operation due to its proximity to ore sources, a population centre, a port and potential for long term, cheap renewable energy.

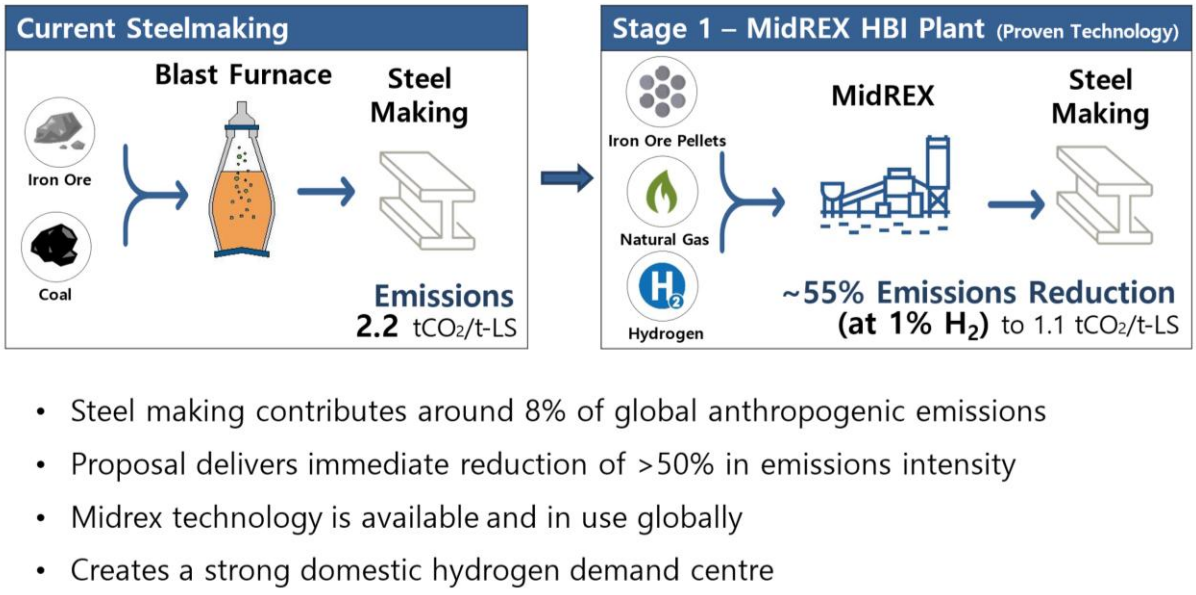


Figure 2-1: Emissions reduction basis for Proposed Action

2.2 PROPOSED ACTION DESCRIPTION

2.2.1 LOCATION

The Proposed Action is located within the Boodarie SIA in the ToPH, within the Kariyarra Native Title Determination. The Boodarie SIA comprises 3,743 ha of "Strategic Industry" zoned land. The Boodarie SIA is situated 4 km west of South Hedland townsite and approximately 12 km south of Port Hedland townsite in WA (Figure 2-2).

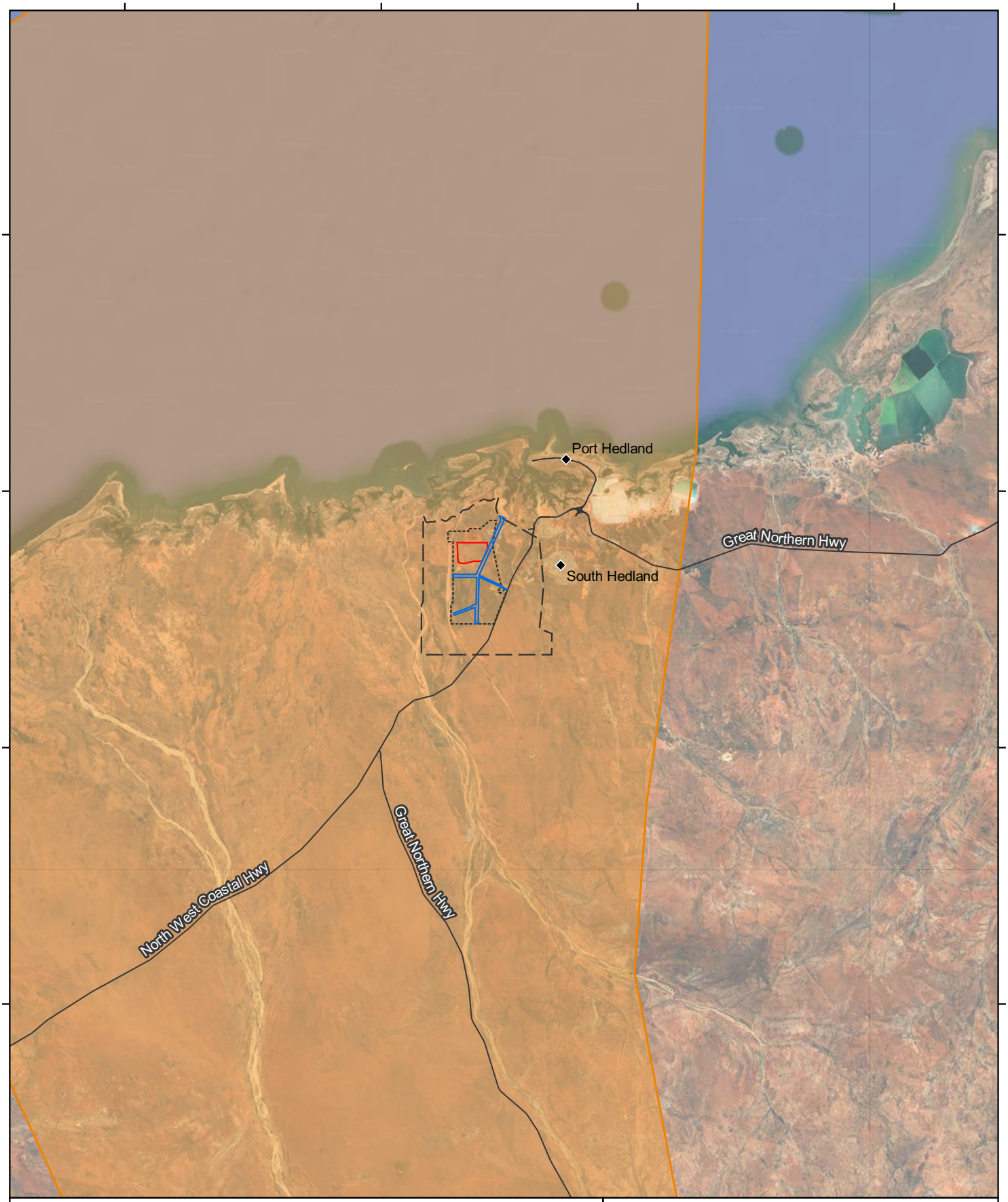
Existing development with the Boodarie SIA includes sand mining, power stations, temporary iron ore stockpiling and laydown areas. The Boodarie SIA has been identified as the most viable location in the Pilbara for the Proposed Action with good access to labour, ore, gas, power and port and good potential for renewable energy, green hydrogen and water supply. Within the Boodarie SIA, 915 hectares (ha) of land has been identified for the purpose of constructing and operating iron making facilities and allocated to Port Hedland Iron for this purpose.

2.2.2 DEVELOPMENT ENVELOPES AND DISTURBANCE FOOTPRINTS

The Proposed Action includes a 518 ha Plant Development Envelope (PDE) and a 466 ha External Infrastructure Development Envelope (EIDE), within which up to 300 ha and 90 ha will be disturbed, respectively (Figure 2-3). The PDE sits within the 925 ha land allocation to Port Hedland Iron.

2.2.3 TIMEFRAME

The maximum Proposed Action life is expected to be approximately 101 years, with the start date for construction scheduled for Q1 2027 and operations in 2031. The construction phase is expected to last 2.5 years and operations to commence thereafter, over a 99-year period. Decommissioning will occur approximately 10 years after cessation of operations and final rehabilitation will commence within 12 months of cessation of decommissioning.



Legend

- Plant Development Envelope
- External Infrastructure Development Envelope
- Kariyarra Native Title Determination Area (LGATE-066)
- Boodarie Strategic Industrial Area
- Industry Protection Zone
- Major Roads (LGATE-195)
- Towns

Imagery: Google Satellite

PHGS_0406_027

Figure 2-2: Proposed Action location

Preston Consulting

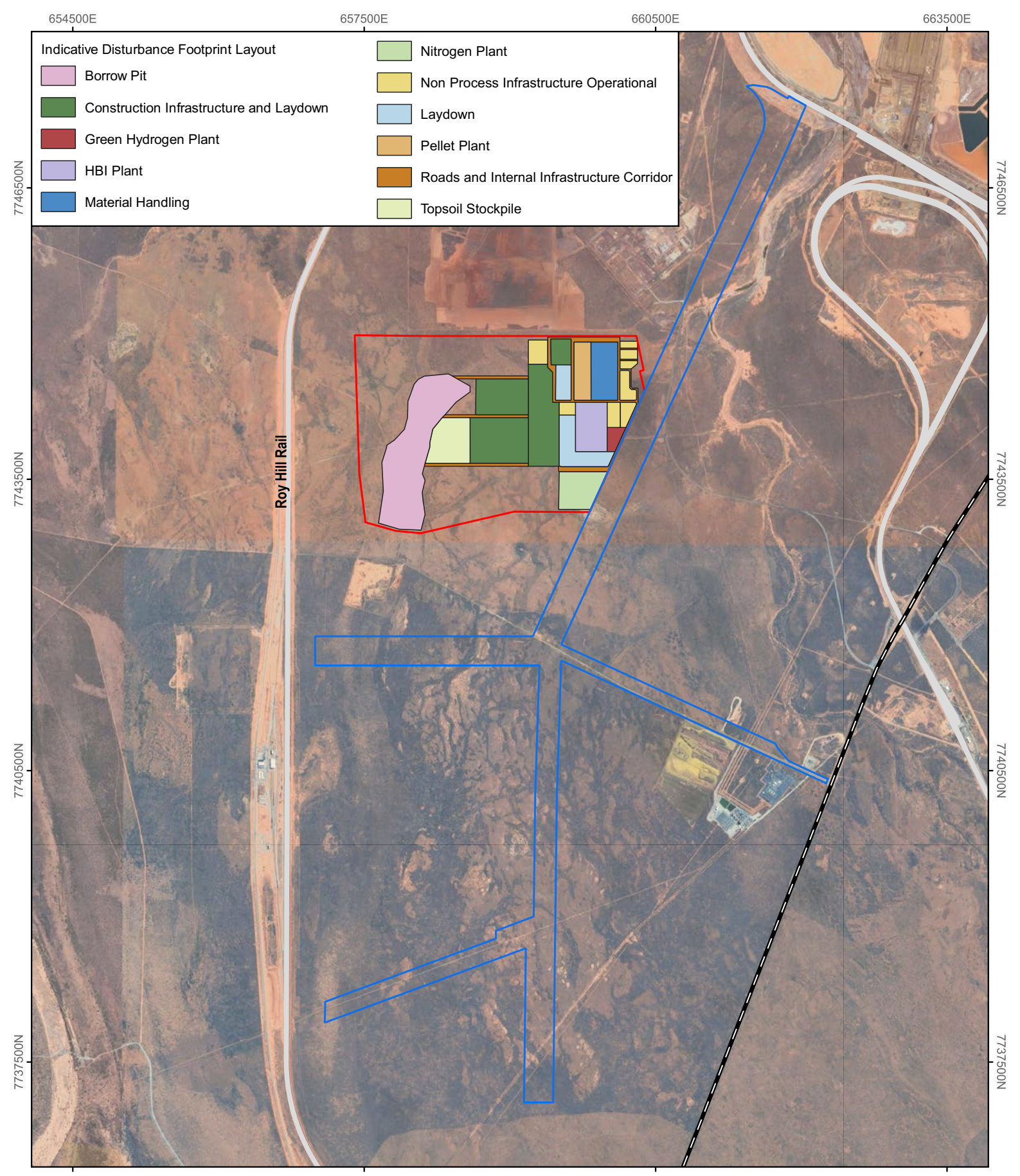
0 10 20 km

GDA 2020 (MGA Zone 50)

1:500,000 (A4)

AS 13/12/2024

EPBC 2023/09764



Legend

External Infrastructure Development Envelope

Plant Development Envelope

Freeways & Highways (LGATE-195)

Railway (DPLH-058)

Imagery: Google Satellite

EPBC 2023/09764

GDA 2020 / MGA Zone 50

0 1 2 km

1:50,000 (A4)

Preston Consulting

Figure 2-3: Development envelopes and indicative disturbance footprint

AS

September 2023

2.2.4 Proposed Action Content Elements

A summary of the Proposed Action is provided in Table 2-1 and the elements of the Proposed Action (e.g., physical, construction and operational) which are likely to cause an impact on the environment are summarised in Table 2-2.

Table 2-1: General Proposed Action content description

Proposed Action Title	Port Hedland Iron Project – Stage 1
Proponent Name	Port Hedland Iron Pty Ltd
Short Description	Port Hedland Iron Pty Ltd (PHI) is progressing the development of a large-scale downstream iron ore processing facility known as the Port Hedland Iron Project (the Proposed Action). The Proposed Action is located in the Boodarie Strategic Industrial Area approximately 10 km southwest of Port Hedland in the Pilbara region. The Proposed Action's regional location is shown in Figure 2-2 and the indicative footprint and development envelopes are shown in Figure 2-3. The Proposed Action will consist of a pellet plant and a HBI Plant, consuming approximately 3-3.5 Mtpa of iron ore. The first processing step is to produce iron ore pellets (3-3.5 Mtpa). Most of the pellets will be fed into the HBI plant to produce approximately 2 Mtpa HBI. The remainder of the pellets (~0.7 Mtpa) will be exported from the Port as pellets. The infrastructure to be developed within the Boodarie SIA for the Proposed Action will include: • IOPF comprising one pellet and one HBI plant producing approximately 2 Mtpa of HBI and 0.7 Mtpa of iron ore pellets; • Hydrogen production and storage facilities for supply to IOPF; • Nitrogen plant; and • Supporting infrastructure such as: o HBI and pellet handling and storage facilities; o Flux storage; o Administration and other non-process buildings; o Workshops; o Water storage and management areas; o Magnetite concentrate/ore handling facilities; o Power production, management and transmission; o Carbon capture, storage and transport infrastructure; o Drainage and sediment control; and o Access roads. The HBI and iron ore pellets will be shipped out of the PoPH. The scope of the Proposed Action does not include any construction works at the PoPH or the export of pellets and HBI. Water, power and natural gas will be supplied by third parties and subject to separate approvals to be acquired by the relevant third-party and therefore not part of this referral. However, the referral includes an EIDE to allow connection within the Boodarie SIA to third party suppliers, if needed, as well as development of access roads and drainage for the Proposed Action. The EIDE covers the infrastructure corridors identified in the Boodarie SIA Structure Plan. These infrastructure corridors are managed by the Department of Jobs, Tourism, Science and Innovation (JTSI). The layout of the infrastructure within the EIDE will be determined once commercial arrangements with third-party suppliers have been finalised as well as consultation undertaken with JTSI. The Proposed Action also excludes early works for communications infrastructure, laydown areas and access roads.

Table 2-2: Location and proposed extent of physical and operational elements

Element	Location / Description	Maximum extent, capacity or range
Physical Elements		
Plant Development Envelope: • Clearing of native vegetation; • Construction; • Earthworks; • Ore processing; and • Transport.	Figure 2-3	Disturbance of up to 300 ha within a 518 ha Development Envelope.
EIDE: • Clearing of native vegetation; • Construction; and • Transport.	Figure 2-3	Disturbance of up to 90 ha within a 466 ha Development Envelope.
Construction Elements		
N/A	N/A	N/A
Operational Elements		
Ore processing	N/A	Production of 3.5 Mtpa of iron ore pellets and 2.0 Mtpa of HBI.
Rehabilitation and closure		
Areas temporarily cleared during the construction phase that are not required for operations will be rehabilitated following construction. Final rehabilitation to commence within 12 months of cessation of decommissioning. Topsoil will be spread across the site, with seeding of native species likely to be required.		
Commissioning		
Commissioning of the processing facility to be undertaken subject to operational limits.		
Decommissioning		
All above-surface infrastructure will be removed from site. Buried concrete and other buried infrastructure may remain in-situ if they do not pose a contamination risk.		
Other elements which affect extent of effects on the environment		
Proposed Action Time	Maximum Proposed Action life	101 years
	Construction phase	2.5 years
	Operations phase	99 years
	Decommissioning phase	Approximately 10 years

2.2.5 Detailed Description

The Proposed Action requires the parallel development of many support services and facilities. PHI is actively completing the planning, engineering, land access, commercial negotiations and approvals for the iron-making components of the Proposed Action (essentially pellet plant and HBI plant). These items are identified as within battery limits with details as shown in Table 2-3. The current descriptions of the items inside and outside of the battery limits are outlined in Table 2-3 and Table 2-4. Values provided within the Table are approximate. An indicative layout is provided in Figure 2-3.

All items which are outside the battery limits will be subject to their own approvals processes, with third party suppliers required to obtain their own approvals, if existing approvals do no exist.

Table 2-3: Inside battery limits

Proposed Action Area	Area Description
Magnetite concentrate/ore and flux unloading facility	Raw magnetite concentrate / iron ore will be unloaded by using seven sets of side tip truck unloading systems designed for 300 t/h. A 1,200 t/h stacker will be used to form feed stockpiles with a total storage of 70,000 tonnes. A 1,200 t/h rail mounted bridge scraper reclaimer will be provided to transfer iron ore / concentrate to the iron ore storage bins.
Flux additive stockyard and materials handling system	Additives for the pellet plant (limestone and bentonite) imported into the plant site by road haulage and will be unloaded via tip truck unloading system which is designed for 100 t/h. Stacker designed for 500 t/h of additive will form stockpiles will be used to load either product.
3.5 Mtpa pellet plant	Two horizontal high intensity mixers in parallel operation. Seven pelletising discs, double deck roller feeder with epsilon chute for size-segregated feeding of green pellets to indurating machine, pelletising system, induration machine, rotary kiln and cooler.
Pellet stockyard and materials handling system	Pellet storage, pellet screen for fines which will be reprocessed. Rail mounted stacker will load pellets onto stockpile. Bridge drum reclaimer will transfer pellets from stockpile to HBI plant.
MIDREX HBI Plant	MIDREX HBI process. Top charging feed hopper above shaft furnace, shaft furnace for pellet direct reduction, hot briquetting system – seven briquetting machines to form the hot briquettes. Four hot fines recycling systems. Two HBI cooling conveyors will cool the generated HBI to allow transfer to the product handling system. Gas cleaning system, reformer and heat recovery system.
HBI stockyard and materials handling system	HBI product will be transported to HBI storage yard via a series of conveyors. HBI will be stacked by level luffing and slewing type stacker which will travel on a rail. HBI will be reclaimed via mobile equipment which will feed trucks to transport to port facilities for export.
Hydrogen electrolyser	A pilot hydrogen plant (electrolyser) will be constructed at the Boodarie SIA to supply the initial 1% hydrogen requirements for the Proposed Action, being 2,000 tpa. However, if an immediate and cost-effective source of hydrogen becomes available PHI may utilise third party supplied hydrogen instead of the electrolyser.
Associated non-process infrastructure and maintenance facilities	• Internal roads to the process plant boundary limits and tie-in to existing roads, access road alongside conveyor corridor; • Main Gatehouse and Weighbridge – entry and exit; • Workshop/stores; • Administration Building; • Operations/Central Control Room; • Mess building; • Emergency Services Building; • Laboratory;

Proposed Action Area	Area Description
	• Power Receiving Substation; • Fire/Water/Nitrogen Protection; • Roads and other miscellaneous works; • Diesel Tanks; • Sewerage System; • External Fence; and • Dust Suppression Systems.
Water treatment – Raw	Brackish water reverse osmosis (BWRO) and includes the following main systems/equipment: • Dissolved Air Flotation, consisting of Sump, Mixing Tank, Pumps, Treated Water Basin; • Ultrafiltration (UF System), consisting of Pumps, Filter, UF unit, Reject Water Basin, UF Treated Water Basin; and • BWRO System, consisting of Pumps, BWRO membranes, Industrial and Potable Water Basin.
Water treatment – Waste	Waste Water Treatment Plant: HBI Plant, Industrial wastewater includes overflow/drain water from water ponds, clarifiers. All this water will be collected in the industrial wastewater collecting pond located at the water treatment area.

Table 2-4: Outside battery limits

Activity	Description
Export/import infrastructure facilities at the Port of Port Hedland	Town Berth PH1, Utah Point and possibly Lumsden Point.
Balance of hydrogen supply	PHI is in discussion with third parties for supply of hydrogen in excess of the 1% (2,000 tpa) requirement to come from the onsite electrolyser. Potential location will depend on detailed engineering and agreement on firming and storage requirements.
Power	Third-party supplied 120 MW hybrid power station of a mixed split of thermal and renewable either islanded or grid connected.
Water Supply	Groundwater abstraction borefield and associated infrastructure including storage tanks, pumps, and pipelines will transfer the water resource approximately 110 km to the Boodarie SIA. Contingency water supply (likely to be temporary desalination plant).
Gas supply	Gas supply pipeline will be owned and operated by third party. Options are existing pipelines owned by APA Group or new pipeline connected to Australian Gas Infrastructure Group's Dampier to Bunbury Natural Gas Pipeline.
Carbon Capture and Storage	Location of transport and storage infrastructure outside of Boodarie SIA depending on commercial arrangements with potential service providers. Equipment necessary to capture carbon emissions will form part of the pellet and HBI plant, which is within the battery limit of the Proposed Action.
Workforce Facilities	• Temporary Accommodation – bespoke facility (approximately 2,000 person) will facilitate mobilisation in Q1 2027 for early works at the Boodarie SIA (land within the Kingsford Smith Business Park (within the airport precinct) or at Lots 331 and 506 in South Hedland); and • Permanent Accommodation – will accommodate both construction and operational workforce in the long term (Lots 331 and 506 South Hedland).

Transport and Port

The HBI and iron ore pellets will be shipped out of the PoPH. The scope of the Proposed Action does not include any construction works at the PoPH or the export of pellets and HBI.

Water, Power and Natural Gas Supply

Water, power and natural gas will be supplied by third parties and subject to separate approvals by the relevant third party and are therefore not part of this referral. However, the referral includes an EIDE to allow connection within the Boodarie SIA to third-party suppliers if needed, as well as development of access roads and drainage for the Proposed Action. The EIDE covers the infrastructure corridors identified in the BSIA Structure Plan. The planning for these infrastructure corridors will be managed by JTSI. The layout of the infrastructure within the EIDE will be determined once commercial arrangements with third-party suppliers have been finalised as well as consultation undertaken with JTSI.

The Proposed Action also excludes early works for communications infrastructure, laydown areas and access roads.

Surface Water Diversions and Barriers

Pentium Water (2023) found that the Proposed Action is located in a low-lying area within the South West Creek floodplain, with several tributaries that impact the area. As a result, the Proposed Action site is prone to sporadic flooding. The site is flat, but with minor undulations/ unevenness, and after rainfall, standing water and pooling would occur where the site is not otherwise modified. Due to the flatness of the site, the 100-year flood velocities are low, typically <1m/s.

Implementing the Proposed Action is unlikely to impact flood levels and does not represent a risk to the environment from a surface water perspective, provided normal mitigating controls are implemented during all phases of the Proposed Action.

The Turner River is located 7 km west of the Proposed Action however it is west of the Roy Hill railway and does not interact with the Proposed Action.

2.3 PROPOSED ACTION ALTERNATIVES

Table 2-5 provides an analysis of the alternatives considered in the development of the Proposed Action.

Table 2-5: Proposed Action alternatives

Alternative	Discussion
Location	Alternative locations could be in other States or locations within WA. More likely alternative locations would be overseas where land access is easily obtained and costs are likely to be lower. The development of the Proposed Action overseas would result in the avoidance of local impacts. Many countries are actively seeking to attract such projects. Attracting a project such as this Proposed Action to the Pilbara would be consistent with many Australian government policies and objectives – particularly those supporting downstream processing and the development of manufacturing capability in Australia. It represents an opportunity for Australia to be part of the global emissions reduction pathway for green steel.
Technology	Proposed Action is utilising existing best practice available technology for HBI production. It incorporates the production of pellets at the front end to promote safer operating conditions. HBI technologies considered both Midrex and Energiron. Both are established technologies and can produce HBI and hot DRI (HDRI). Midrex have demonstrated and proven HBI production, including the use of hydrogen as a reductant. HBI production based on 100% hydrogen technology from start-up is not being considered as the required hydrogen production technology and capability is yet to be developed on a cost-effective basis. Hydrogen will be incorporated into the Proposed Action as it is developed, proven safe, economic and practicable (expected to be 5-10 years away). Two different pelletising technologies were considered: Straight Grate (SG) and Grate Kiln (GK). GK was selected due to better pellet quality.
Timeline	This is not being considered. Delays would see increased likelihood of alternative locations being utilised.
No Development	This is not being considered. No development would require the continuing use coal-fired blast furnaces for steel production and does not align with the Joint Venture parties.

2.4 Local and Regional Context

2.4.1 Biogeographic Regions

The Proposed Action is located within the Roebourne Interim Biogeographical Regionalisation for Australia (IBRA) subregion (PIL4) of the Pilbara bioregion, 15 km southwest of Port Hedland. 98% of the development envelopes are situated within the Uaroo land system, while the remaining 2% is within the Littoral system.

2.4.2 Soil and Landform

In 2013 LandCorp undertook geotechnical investigations on the Boodarie SIA. Investigations determined that soil conditions were reasonably uniform across the site and comprised of a surficial topsoil layer (sand with variable organic content) overlying mixed floodplain deposits (and upper silty sand overlying dense, locally variably cemented clayey sand). The 2013 report determined that the site is situated within low-lying land that is prone to flooding and that the surface is lightly to densely vegetated with low lying shrubs and grass. Vegetation associations within the development envelopes include 589: “Short bunch-grass savanna/ grass steppe” and 647: “Grass steppe”.

2.4.3 Surface Water

Based on modelling from Pentium Water (2023), it was determined that the Proposed Action was not subject to tide or sea surge flooding despite Port Hedland's general vulnerability to cyclonic rainfall intensities, flooding creeks and run-off from land upstream. The soils on site (silty clay) typically have a low infiltration rate, and stormwater is therefore predicted to run-off. The area is flat and flood velocities are very low, thereby minimising the potential for undue erosion/ sedimentation. The Proposed Action will be subject to Development Approval which will consider surface water management in detail.

2.4.4 Groundwater

Historical groundwater modelling indicates that groundwater in the region is generally shallow but also saline, reflecting the location close to the coast. Monitoring results from groundwater bores within the decommissioned BHP HBI Plant indicate that the elevation of groundwater varies from 3 to 5 m Australian Height Datum (AHD) at the BHP HBI Plant site and from 2 to 3 m AHD closer to the ocean. In response to rainfall recharge of the shallow unconfined groundwater aquifer, groundwater elevations in the Boodarie area vary seasonally by up to 2 m. Groundwater elevations usually peak in April (which appears to be due to high rainfall at the beginning of the year) and generally decline for the remainder of the year. Salinity has ranged from 13,000 and 52,000 mg/L TD (EPA, 1995; BHP Billiton Pty Ltd, 2011).

No groundwater abstraction is proposed as part of the Proposed Action. Water supply will be sourced from third parties who will be required to obtain their own environmental approvals.

2.4.5 Land Use

The dominant land use of the PIL4 subregion comprises grazing (native pastures), Aboriginal lands and reserves, conservation, mining leases and urban development (Kendrick & Stanley 2001). Land use summaries extracted from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES 2018) within the PIL4 subregion are summarised as 'production from relatively natural environments' and 'conservation and natural environments'. Land use across the development envelopes is subject to similar usages (and proportional area) to the PIL4 subregion.

The Proposed Action is located on land zoned as a SIA (within the Boodarie SIA) under the ToPH Local Planning Scheme No. 7. SIAs are planned for downstream processing and other heavy and strategic industries, these areas are surrounded by an industry protection zone to ensure heavy industry can continue to operate without land use conflict (https://siawa.com.au/#planned). Individual projects within the SIA are to be managed under the Boodarie SIA Structure Plan (Structure Plan). The Structure Plan provides for the long-term strategic industrial development of the area and is intended to coordinate the detailed land use and development of the Boodarie SIA.

The Port Hedland and South Hedland power stations and a pipe stockyard are situated adjacent to the Proposed Action to the east.

2.4.6 Environmental Assets

Environmental assets include Environmentally Sensitive Areas (ESA) which are areas requiring special protection due to their landscape, wildlife and/or historical value. ESAs are declared in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005, which was gazetted on 8 April 2005. The following areas are declared to be ESAs:

- Declared World Heritage property as defined in section 13 of the EPBC Act;
- An area that is included on the Register of the National Estate, because of its natural heritage value, under the Australian Heritage Council Act 2003 of the Commonwealth;
- A defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands;
- Area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located;
- Area covered by a threatened ecological community (TEC);
- A Bush Forever site listed in "Bush Forever" Volumes 1 and 2 (2000), published by the WA Planning Commission, except to the extent to which the site is approved to be developed by the WA Planning Commission;
- Areas covered by the Environmental Protection (Gnangara Mound Crown Land) Policy 1992;
- Areas covered by the Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002;
- Areas covered by the lakes to which the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 applies; and
- Protected wetlands as defined in the Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998.

No ESAs or conservation reserves intersect the development envelopes (Figure 2-4). The nearest conservation reserves are Mungaroona Range Nature Reserve and Eighty Mile Beach Marine Park, located approximately 101 km south-southwest and 110 km north-west from the Proposed Action boundary, respectively.

There is a recommended EPA Redbook Marine Conservation Reserve where the Proposed Action is located, spanning from Mary Anne Islands to Cape Keraudren (Figure 2-4). This includes the PoPH in its entirety.



Legend

- Plant Development Envelope
- External Infrastructure Development Envelope
- Port Authorities Boundary (LGATE-243)
- EPA Redbook Recommended Conservation Reserves (DBCA-029)
- Major Roads (LGATE-195)

Imagery: Google Satellite

PHGS_0406_012

Figure 2-4: Conservation reserves and management zones

Preston Consulting

0 3 6 km

N

GDA 2020 (MGA Zone 50)

1:150,000 (A4)

AS

15/11/2024

3 STAKEHOLDER ENGAGEMENT

3.1 KEY STAKEHOLDERS

The Commonwealth, State and Local Government and community groups, Traditional Owners and landowners/farmers are considered key stakeholders for the Proposed Action.

3.1.1 GOVERNMENT STAKEHOLDERS

Commonwealth, State and Local Government authorities have been briefed on the Proposed Action to ensure any issues, concerns or suggestions are identified and, where appropriate, addressed or responded to by PHI. The consultations have resulted in some changes to the Proposed Action design; however, in most cases the purpose was to provide the Government stakeholders with relevant information.

The following Government stakeholders have been consulted:

Commonwealth:

- Net Zero Authority (NZEA);
- Australian Renewable Energy Agency (ARENA);
- DCCEEW;
- Department of Industry Science and Resources;
- Export Finance Australia;
- National Reconstruction Fund;
- Northern Australia Infrastructure Fund (NAIF);
- Clean Energy Finance Corporation;
- International Climate Change and Energy; and
- Major Projects Facilitation Agency.

State:

- JTSI;
- DEMIRS;
- DPLH;
- DWER;
- Development WA;
- EPA;
- Pilbara Ports Authority (PPA);
- Main Roads WA;
- Water Corporation; and
- Pilbara Development Commission (PDC).

Local:

- ToPH.

3.1.2 Traditional Owners

The Kariyarra People are the Traditional Owners of the land where the Proposed Action will be constructed and operated. The relationship between PHI and the Kariyarra will be formalised via an Indigenous Land Use Agreement (ILUA) which is currently under negotiation with the Kariyarra People (represented by KAC). The ILUA will also form the basis for the issue of leases of land within the BSIA. The Government of WA is understood to also be in negotiations with the Kariyarra people regarding the BSIA.

PHI has been working with the KAC over two years to define characteristics of the Proposed Action, the heritage values associated with the Proposed Action area, how impacts to those values will be minimised and how the Group will benefit from the development and operation of the Proposed Action. KAC have provided monitors for all flora and fauna survey work and geotechnical investigations completed to date.

3.1.3 Corporate and Community Stakeholders

PHI recognises that individuals, companies and communities may also be interested in the impacts of the Proposed Action. The following corporate and community stakeholders were deemed to be relevant to this Proposed Action:

- Port Hedland Industries Council (PHIC);
- Port Hedland Chamber of Commerce;
- Clean Energy Finance (CEF);
- Climate Change Australia (CCA);
- World Wildlife Fund (WWF);
- The Superpower Institute.

3.1.4 Potential Suppliers and Adjacent Landholders

- BP/Australia Renewable Energy Hub);
- BHP;
- Fortescue Mining Group (FMG);
- Vysarn Water;
- Legacie (Ngarluma Water Project);
- APA Group;
- Horizon Power;
- Woodside Energy Pty Ltd;
- Santos Limited; and
- Hancock Prospecting.

3.2 Stakeholder Engagement Process

PHI has a consultation strategy which identifies key external parties and stakeholders and is proactively engaging with these parties and stakeholders in respect of the potential implementation and resulting impacts of the Proposed Action. The aim of such extensive consultation is to develop productive relationships that ensure the Proposed Action is underwritten by sustainable agreements and necessary statutory approvals. The consultation strategy has also been developed to secure the approvals necessary for the construction and operation of the Proposed Action, which requires consultation with the above stakeholders.

PHI has held pre-referral meetings with the EPA, DWER, JTSI, PPA, Development WA and DCCEEW regarding the Proposed Action, and feedback has been incorporated into this Supplementary Document where applicable.

PHI participates in events where regional development issues are discussed. PHI is a member of PHIC and plans to establish more of a local presence as Proposed Action development plans are progressed and the Proposed Action proceeds toward a Final Investment Decision.

3.3 STAKEHOLDER CONSULTATION

PHI has a Stakeholder Consultation Register which maintains records of all consultations with stakeholders. The Register summarises key issues raised by stakeholders during the consultation process and describes how PHI has responded to those issues. A summarised version of the Stakeholder Consultation Register is provided in Table 3-1 to provide details of the stakeholder consultation undertaken to-date for the Proposed Action. A stakeholder consultation plan is also provided in Table 3-2 to demonstrate PHI's commitment to early and ongoing stakeholder consultation.

Table 3-1: Stakeholder consultation register

Stakeholder	Date/s	Relevant issues / topics raised	Proponent response / outcome relevant to MNES
Australian Renewable Energy Agency (ARENA)	Meetings – Aug 2023; Jul, Nov 2024.	• Proposed Action introduction; • Support; • Hydrogen Headstart; and • Hydrogen Transition Plan.	• Timing of increased hydrogen use and transition to net zero.
DCCEEW	Meetings – April - Dec 2023; Jun 2024.	• Proposed Action update; • DCCEEW areas of responsibility; • EPBC referral; and • Safeguard Mechanism.	• DCCEEW requested regular engagement with PHI on Safeguard Mechanism.
DPLH	Meeting - Mar 2023.	• Traditional Owner Engagement • Proposed investigation program timeframes; and • Port facilities.	• N/A.
DWER	Meeting – Apr 2023.	• Proposed Action introduction; • Pre-referral meeting; and • Stage 1 of the Proposed Action.	• Scope of referral for Stage 1 is acceptable.
DevelopmentWA	Meetings – Jan - Nov 2023; Mar - Aug 2024.	• Proposed Action introduction; • Development approach; • Option to Lease; • Traditional Owner Engagement; and • Land allocation.	• DevelopmentWA to issue key terms for option to lease.
EPA	Meetings - Apr 2023, December 2024.	• Proposed Action introduction; • Pre-referral meeting; and • Assessment process.	• Scope of referral for Stage 1 is acceptable.
JTSI	Meetings – Jun - Dec 2022; Jan - Nov 2023; Feb - Nov 2024.	• Proposed Action introduction; • Land allocation; • Option to lease; • Lead Agency Frameworks; • Traditional owner engagement update; • Safeguard Mechanism and GHG's;	• JTSI to organise intergovernmental meetings.

Stakeholder	Date/s	Relevant issues / topics raised	Proponent response / outcome relevant to MNES
		• Hydrogen; and • Water.	
KAC	Meetings - Feb, May, Jun, Dec 2023; Feb, Aug, Oct 2024; Jan, May 2025.	• Heritage sites with PDE; • Attempts to coordinate Social Surroundings consultation; • Kariyarra priorities; • Upskilling; • Early childhood / education centres in Port Hedland; and • Agreement negotiations.	• No sites identified within the PDE.
Major Project Facilitation Agency	Meetings – Mar 2023, Aug 2023.	• Proposed Action introduction; and • Progress update.	• Plan for Hydrogen and Carbon Capture Use, and Storage (CCUS) implementation.
Minerals Research Institute of WA	Meetings – Dec 2023; Mar 2024.	• Proposed Action update; • Industry commitment and guidance; • Hematite; and • Test or and processes to develop solutions.	• N/A.
Pilbara Development Commission	Meetings – Apr, Sep 2023; Dec 2024.	• Proposed Action introduction; • Addressing Project questions; • Native Title negotiations; • Name change; and • Workforce accommodation.	• N/A.
PPA	Meetings – Feb - 2023; Nov 2024.	• Proposed Action introduction; • Proposed Action update; • Clarification on port facilities; • Project planning; • Site visit; and • Water.	• Work with PPA on Proposed Action.
ToPH	Meetings – Jan - Dec 2023; Feb 2024.	• Proposed Action introduction and overview;	• ToPH supportive of the Proposed Action; and

Stakeholder	Date/s	Relevant issues / topics raised	Proponent response / outcome relevant to MNES
		• Proposed Action update; • Ore sources and their means of delivery; • Import materials and transport requirements; • Planning requirements; • Incoming and Outgoing services; and • Workforce accommodation.	• Design to be in line with the ToPH's design guidelines.
Water Corporation	Meetings – Aug, Oct 2024, February 2025.	• Proposed Action update; • Water Corp update; • Water supply BSIA; and • Information required by Water Corp to develop water supply for BSIA	• Collaboration on the Proposed Action on water supply options.

Table 3-2: Stakeholder consultation plan

Timing	Stakeholder	Type	Purpose of Planned Engagement	Issues to be Raised
2026 - ongoing	EPA Services - DWER	Telephone, letters, email and meetings	Correspondence during assessment under Part IV of the EP Act. EPA Board meeting.	• Presentation of EIA; • Review of draft referral information; • Draft conditions; • EPA Board meeting; • Compliance; and • Offsets.
2026 - ongoing	DCCEEW	Telephone, letters, email and meetings	Correspondence during assessment under EPBC Act.	• Presentation of EIA; • Review of referral information; • Draft conditions; • Management Plans; • Compliance; and • Offsets.
2026 - ongoing	Industry Regulation - DWER	Telephone, letters, email and meetings	Correspondence to obtain works approvals under Part V of the EP Act.	• Future Works Approvals and Licence requirements; • Proposed Action timing (i.e., construction); • Potential environmental impacts; and • Compliance.
2026 - ongoing	Federal Government Agencies and Authorities	Telephone, letters, email and meetings	Funding and financing opportunities.	• Details for funding applications and arranging Project finance; and • Dependent projects.
2026 - ongoing	Local Government Authorities	Telephone, letters, email and meetings	Correspondence summarising the Proposed Action status (i.e., approvals to date and path forward).	• Approvals required; • Future applications; • Path forward for the Proposed Action; • Local workforce availability; • Export through the port; and • Offsets.

Timing	Stakeholder	Type	Purpose of Planned Engagement	Issues to be Raised
2026 - ongoing	Kariyarra People	Telephone, email, letter and copies of approval documents Meetings	Feedback on Proposed Action design.	• Approvals to date; • Future applications; • Studies undertaken and key findings; • Path forward for the Proposed Action; • Potential for indigenous contracting and employment opportunities; • Heritage protection; • Provision of land management information; and • Offsets.
2026 - ongoing	Non-government organisations and community groups	Telephone, letters, email and meetings	Input and provision of information.	• Provision of ecological information; • Invitation for comment; • Priority Flora; and • Offsets.

4 FLORA AND VEGETATION

4.1 POLICY AND GUIDANCE

Relevant Commonwealth Government guidance documents for flora and vegetation are summarised in Table 4-1.

Table 4-1: Policy and guidance relevant to EPBC Act listed Flora and Vegetation

Policy and Guidance	How guidance has been considered
Key Documents	
Generic guidelines for the content of a draft EPBC Act Public Environment Report (PER)/Environmental Impact Statement (EIS; including the objects and principles of the EPBC Act, 1999; DotEE, 2016a)	This document was considered in the preparation of this Supplementary Report and while undertaking EIA.
EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) – including the Offset Assessment guide	This document was considered when determining whether offsets were expected to be required for this factor.
Environmental Management Plan Guidelines (DotE, 2014)	This document was considered but not deemed to be relevant as no management plans were prepared for this factor.
EPBC Act Condition Setting Policy (DAWE, 2020)	This document was used as guidance for the referral process and EIA of the Proposed Action.
EPBC Act Outcomes-based conditions policy (DotE, 2016a)	This document was used to assist in developing the outcomes for Flora and Vegetation.
Relevant Technical Guidance	
Relevant EPBC Act listed species-specific survey guidelines and protocols.	This document was used as guidance when undertaking surveys of EPBC listed species and potential survey limitations.
Relevant EPBC Act listed species-specific Recovery plans, Threat Abatement Plans, ACAs and other documents.	This document was used as guidance to assess and manage EPBC listed species that may be impacted by the Proposed Action.

4.2 RECEIVING ENVIRONMENT

The information in this section has been sourced from the Flora and Vegetation Assessment Phoenix Environmental Sciences Pty Ltd (Phoenix) (2024a; Appendix 1) undertaken for the Proposed Action.

4.2.1 BIOREGIONAL CONTEXT

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia's landscapes into large 'bioregions' and 'subregions' based on climate, geology, landform, native vegetation and species information (DotEE, 2016b). The Proposed Action is located in the Roebourne subregion (PIL4) of the Pilbara bioregion (Figure 4-1) which is characterised as:

"Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses and dwarf shrubsteppe of *Acacia stellaticeps* or *A. pyrifolia* and *A. inaequilatera*. Uplands are dominated by *Triodia* hummock grasslands. Ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Samphire, Sporobolus and mangal occur in the marine alluvial flats and river deltas (Kendrick & Stanley 2001)."

4.2.2 Survey Effort

Phoenix was commissioned by PHI to undertake a detailed flora and vegetation survey for the Proposed Action. The purpose of the survey was to delineate key flora values for the Proposed Action to inform the environmental assessment and approvals process, as well as provide context for the preparation of EIA documentation. Surveys were completed in April and September of 2023 and included a desktop study, field survey and reporting. The 'Survey Area' is approximately 1,476.3 ha and includes four corridors with the western-most corridor located adjacent to the Port Hedland power station (Figure 4-2).

Several biological database searches were undertaken to identify and prepare lists of significant flora and vegetation communities that may occur within the Survey Area. A literature search was conducted for accessible reports for biological surveys conducted within a 40 km radius of the Survey Area to build on the lists developed from the database searches.

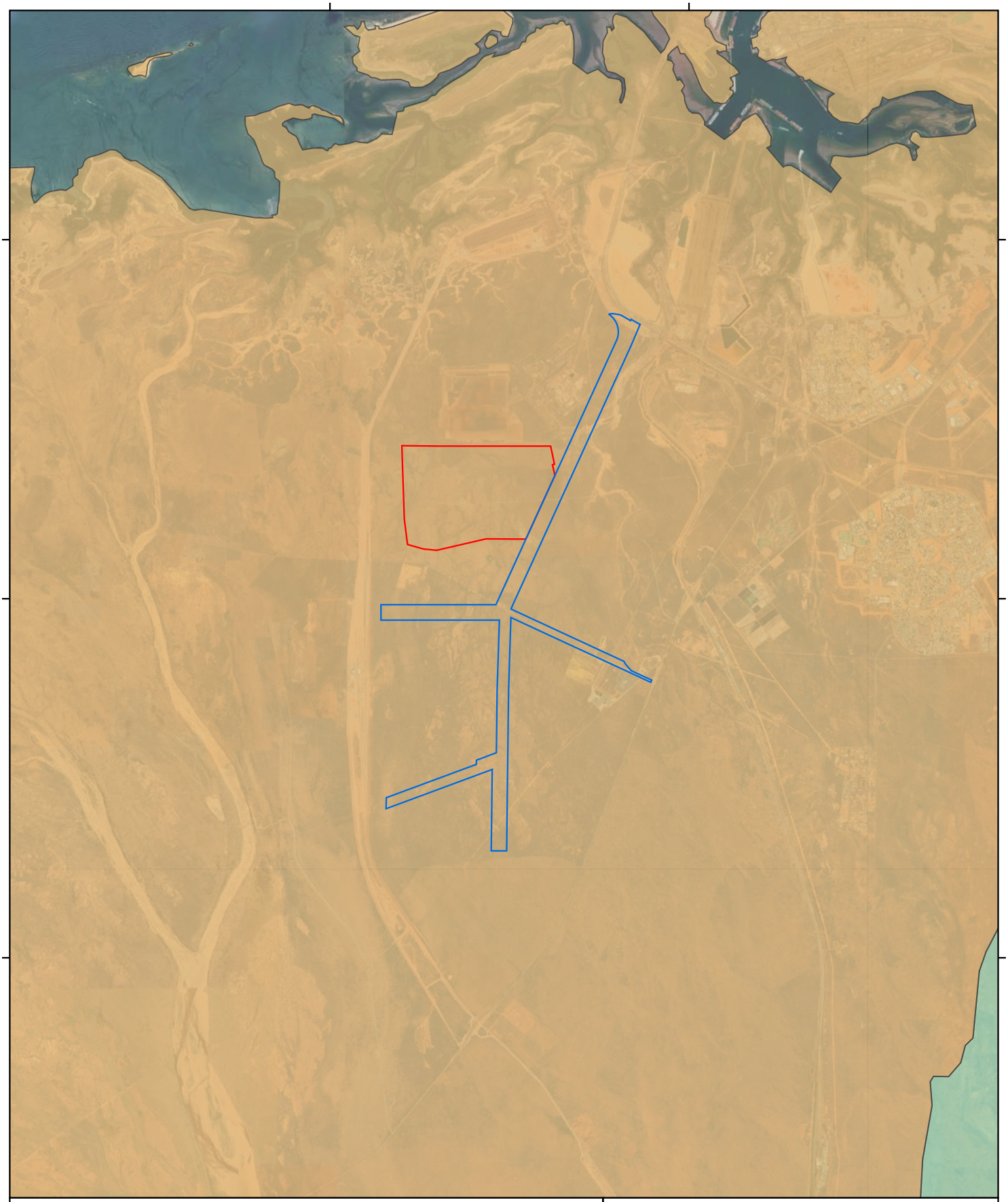
Quadrat locations were selected to ensure than an accurate representation of the major vegetation types within the Survey Area were sampled adequately, with a minimum of at least three quadrats per vegetation type. Phoenix sampled a total of 41 quadrats across the Survey Area (Figure 4-3). Quadrat sampling dimensions were 50 m x 50 m in accordance with EPA guidance for the Eremaean Botanical Province (EPA, 2016b). The following information was collected from each quadrat:

- Location: The geographic coordinates of all four corners of the quadrat in WGS84 projection;
- Description of vegetation: A broad description utilising the structural formation and height classes based on National Vegetation Information System ESCAVI (2003) and in accordance with the EPA (2016b);
- Habitat: A brief description of landform and habitat;
- Geology: A broad description of surface soil type and rock type;
- Disturbance History: A description of any observed disturbance including an estimate of time since last fire, weed invasions, soil disturbance, human activity and fauna activity;
- Vegetation Condition: Using the condition scale in EPA (2016b) for the Eremaean Botanical Province;
- Height and Percentage Foliage Cover: A visual estimate of cover of total vegetation cover, cover of shrubs and trees >2 m tall, cover of shrubs <2 m, total grass cover and total herb cover;
- Photograph: A colour photograph of the vegetation within each quadrat in a south-easterly direction from the north-west corner of the quadrat; and
- Flora Species List: Comprehensive list of all flora species recorded within the quadrat.

Additional targeted searches were undertaken for significant flora (Threatened and Priority), Declared Pests and Weeds of National Significance (WoNS). Vegetation was traversed by foot utilising transects with searched focused on habitats considered likely to support significant flora. If a flora species was suspected to be significant, the following information was recorded:

- GPS coordinated, including population boundaries where applicable;
- Description of the habitat and floristic community in which the potential significant species was located;
- Population size estimate (i.e. estimated number of individual plants) where applicable;

- Specimen collection for taxonomic identification and lodgement to the WA Herbarium; and
- Photograph of live plant in situ and description of important details, such as flower colour, height of individual or average height of population.



Legend

- Plant Development Envelope
- External Infrastructure Development Envelope

IBRA7 Subregions

- Chichester (PIL01)
- Roebourne (PIL04)

Imagery: Google Satellite

PHGS_0406_013

Figure 4-1: IBRA subregions

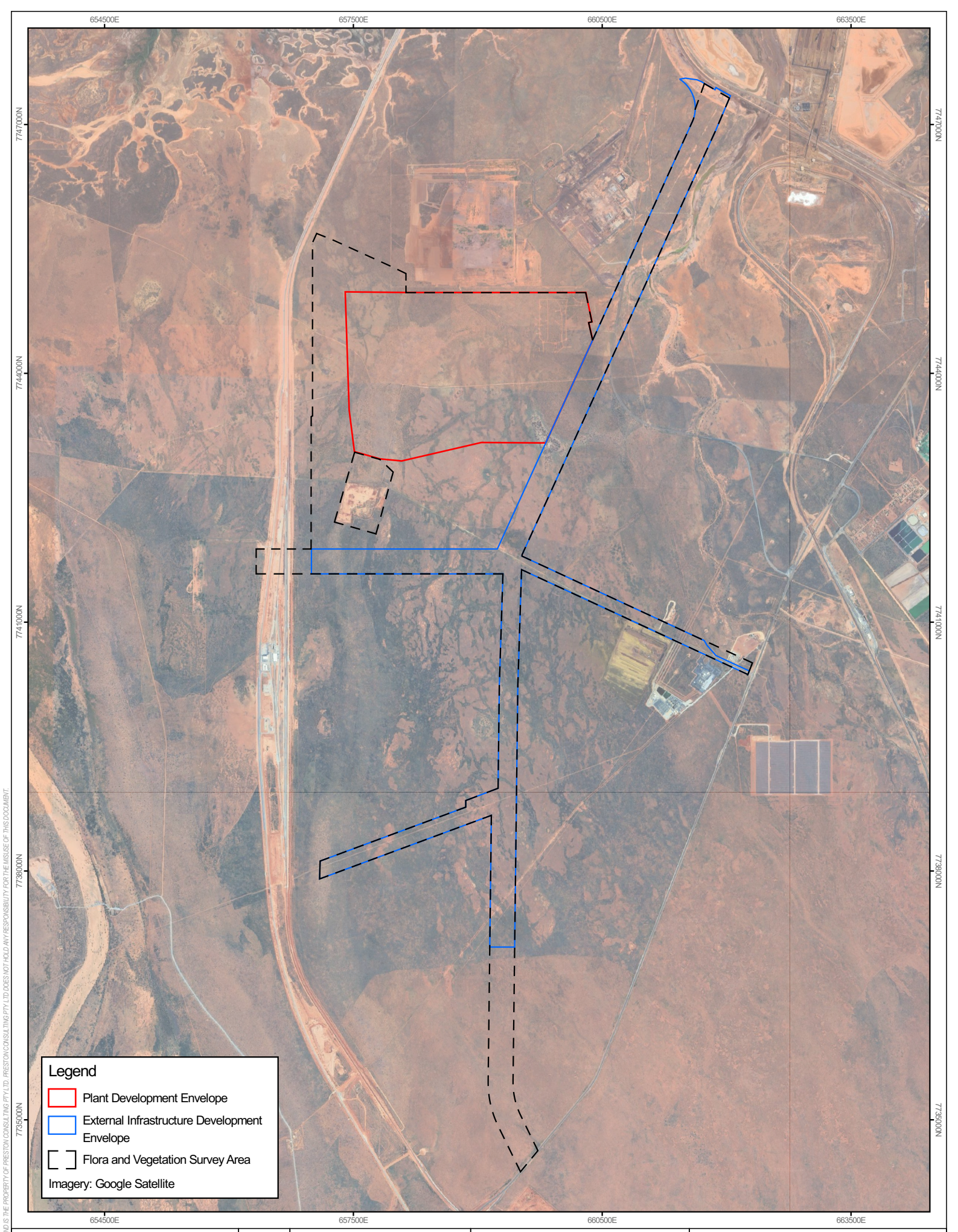
Preston Consulting

0 2 4 km

GDA 2020 (MGA Zone 50)

1:100,000 (A4)

AS 15/11/2024



0 0.9 1.8 km

GDA2020 / MGA zone 50

1:55,000

EPBC 2023/09764

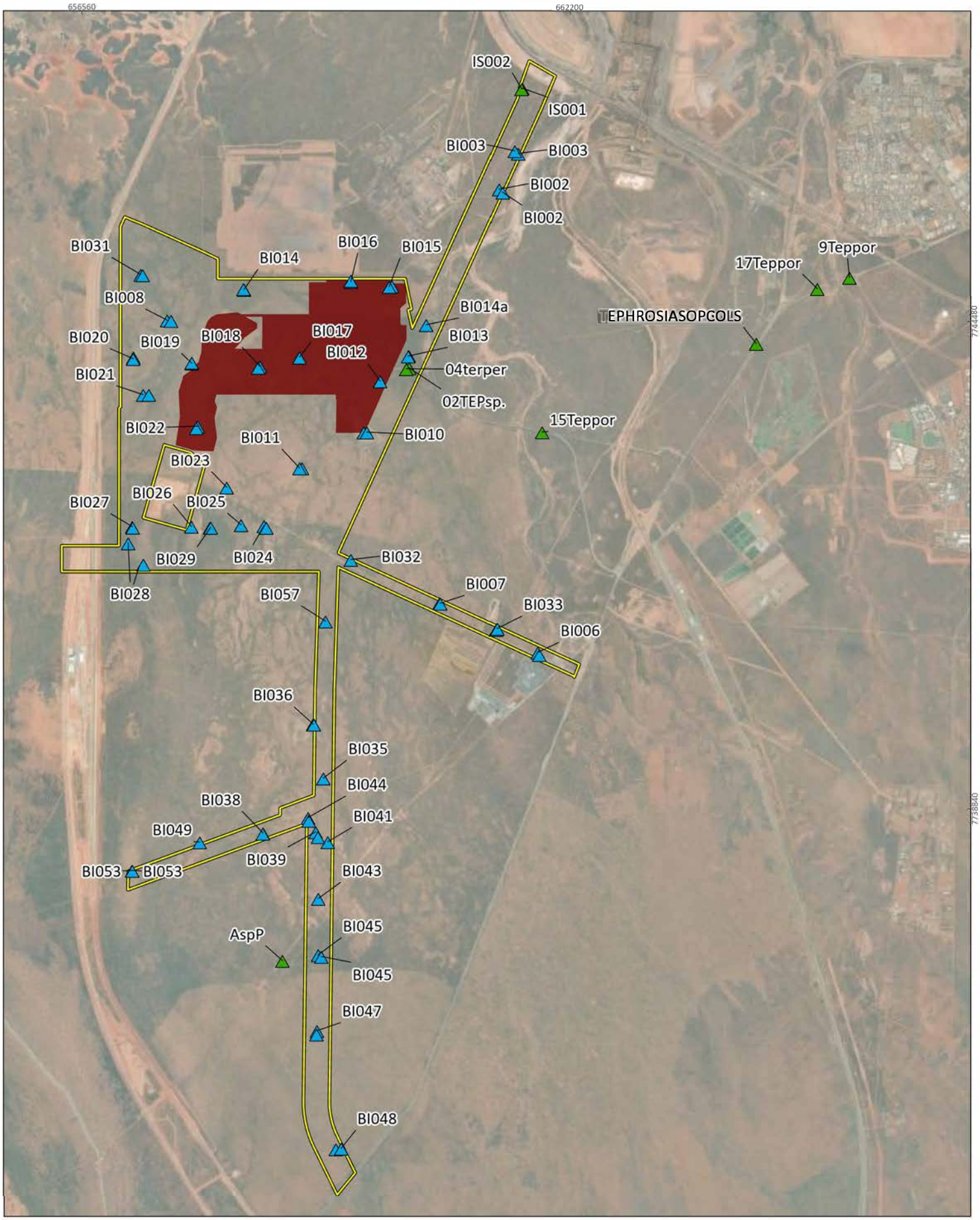
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Project: PHI_0406_014
Date: 20/02/2026
Size: A4
Author: ASmithers (Preston Consulting Pty Ltd)

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Figure 4-2: Flora and vegetation survey area

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Figure 4-3: Flora survey sample sites

EPBC 2023/09764

PHOENIX ENVIRONMENTAL SCIENCES

4.2.3 Alignment with Technical Guidance

Phoenix designed and implemented field assessments based on the relevant State and Commonwealth legislation and guidelines, as well as EPA technical guidance. All botanists held valid collection licences to collect flora for scientific purposes, issued under the BC Act. Further detail on survey limitations is provided in Table 4-2.

Table 4-2: Potential limitations of the flora and vegetation surveys

Potential Survey Limitation	Impact on Survey
Sources of information and availability of contextual information (i.e., pre-existing background versus new material).	**Not a limitation.** Regional information was found in the ENV (2011a) report. Additionally, previous surveys have been conducted in the vicinity of the Survey Area.
Scope (i.e., what life forms, etc., were sampled).	**Not a limitation.** All items in the scope were achieved.
Proportion of flora collected and identified (based on sampling, timing and intensity).	**Not a limitation.** Sufficient sites were surveyed to capture the flora of the Proposed Action during the time of survey. The three of the total 140 taxa that were not identified due to insufficient taxonomic characters, had affinity to common species and thus there was no concern of confusion with significant flora.
Completeness and further work which might be needed (i.e., was the Survey Area fully surveyed).	**Not a limitation.** All items in the scope were achieved.
Survey timing, weather, season, cycle.	**Not a limitation.** Surveys were conducted during the primary and supplementary survey periods appropriate for the botanical province (EPA, 2016b).
Disturbances (fire, flood, accidental human intervention, etc.).	**Limitation.** There is evidence of fire across the Survey Area. In particular the northernmost and southernmost areas appear to be more fire affected than the central region. The vegetation types will change with the pass of time as the vegetation matures depending on the occurrence and frequency of fires.
Access problems (i.e., ability to access the Survey Area).	**Limitation.** Over 12 ha (<1% of the Survey Area) in the northeast corridor were not surveyed as a result of restricted access due to cultural significance in the area. No similar textures occur in the Survey Area and therefore vegetation type was not assigned to this area.
Experience levels (e.g., degree of expertise in plant identification to taxon level).	**Not a limitation.** Dr Grant Wells who led the field surveys for this Proposed Action, has more than 18 years of experience conducting surveys in the Pilbara region.

4.2.4 Flora

The Phoenix (2024a) desktop review identified records of 544 flora taxa within the 40 km desktop search extent, comprising of 485 native species and 60 introduced species. The taxa represents 228 genera and 72 families. The most prominent families were the Fabaceae, Poaceae, Malvaceae, and Amaranthaceae.

Significant Flora

Desktop Assessment

Phoenix's (2024a) desktop review found records of 13 significant flora species within the search extent. No Threatened flora listed under the EPBC Act were identified within the Survey Area,

Field Survey

Phoenix's (2024a) field survey did not record any flora species listed under the EPBC Act.

Range Extensions Flora

Significant range extensions were recorded for three species: *Eragrostis setifolia, Maireana georgei* and *Santalum spicatum.* None of these species are listed under the EPBC Act.

Unidentified flora

Three specimens collected during the survey could not be identified to species level (Table 4-3), mainly as a result of insufficient taxonomic characters, as plants were sterile (lacking reproductive structures) and damaged.

None of the unidentified species in the survey were considered likely to be MNES flora. Both the *Eucalyptus* and the *Corymbia* species resemble many of the commonly occurring species in the area, they were simply unidentifiable due to the absence of fertile material in combination with fire damage. Furthermore, WA Herbarium (2024) shows that there are no species of Threatened flora from the aforementioned genera in the Roebourne subregion.

The indetermined Poaceae species resembles the genus *Eriachne*. While there was no specimen collected for this entity, the field team correctly identified the *Eriachne* genus when making collections. The WA Herbarium (2024) shows only four Priority species of the Poaceae family occurring in the Roebourne subregion: *Eragrostis crateriformis*, *Eragrostis surreyana*, *Themeda* sp. Hamersley Station (M.E. Trudgen 11431), and *Triodia degreyensis*. Since none of the Threatened species belong in the genus *Eriachne*, the Poaceae sp. record is unlikely to be a Threatened MNES species.

Table 4-3: Unidentified taxa recorded during the field survey

Taxon	Comments
Corymbia sp.	Sterile and available material damaged by fire.
Eucalyptus sp.	Sterile and available material damaged by fire.
Poaceae sp.	Sterile.

Introduced (Exotic Species)

Phoenix's (2024a) desktop review identified 60 records of introduced species within the desktop search extent. Of these 60 introduced species, six are Declared Pests and three are WoNS. Species recorded as Declared Pests or WoNS are listed below:

- *Calotropis procera:* Declared Pest;
- *Coccinia grandis:* Declared Pest;
- *Indigofera hochstetteri:* Declared Pests;
- *Opuntia stricta:* Declared Pests and WoNS;
- *Parkinsonia aculeata:* Declared Pests and WoNS; and
- *Tamarix aphylla:* Declared Pests and WoNS.

Four introduced flora species were recorded during Phoenix's (2024a) field survey, none of these were listed as Declared Pests or as WoNS. All of the introduced flora recorded during the field survey have previously been recorded in the Pilbara bioregion with all of them having an extensive range in WA (WA Herbarium 1998). These species include:

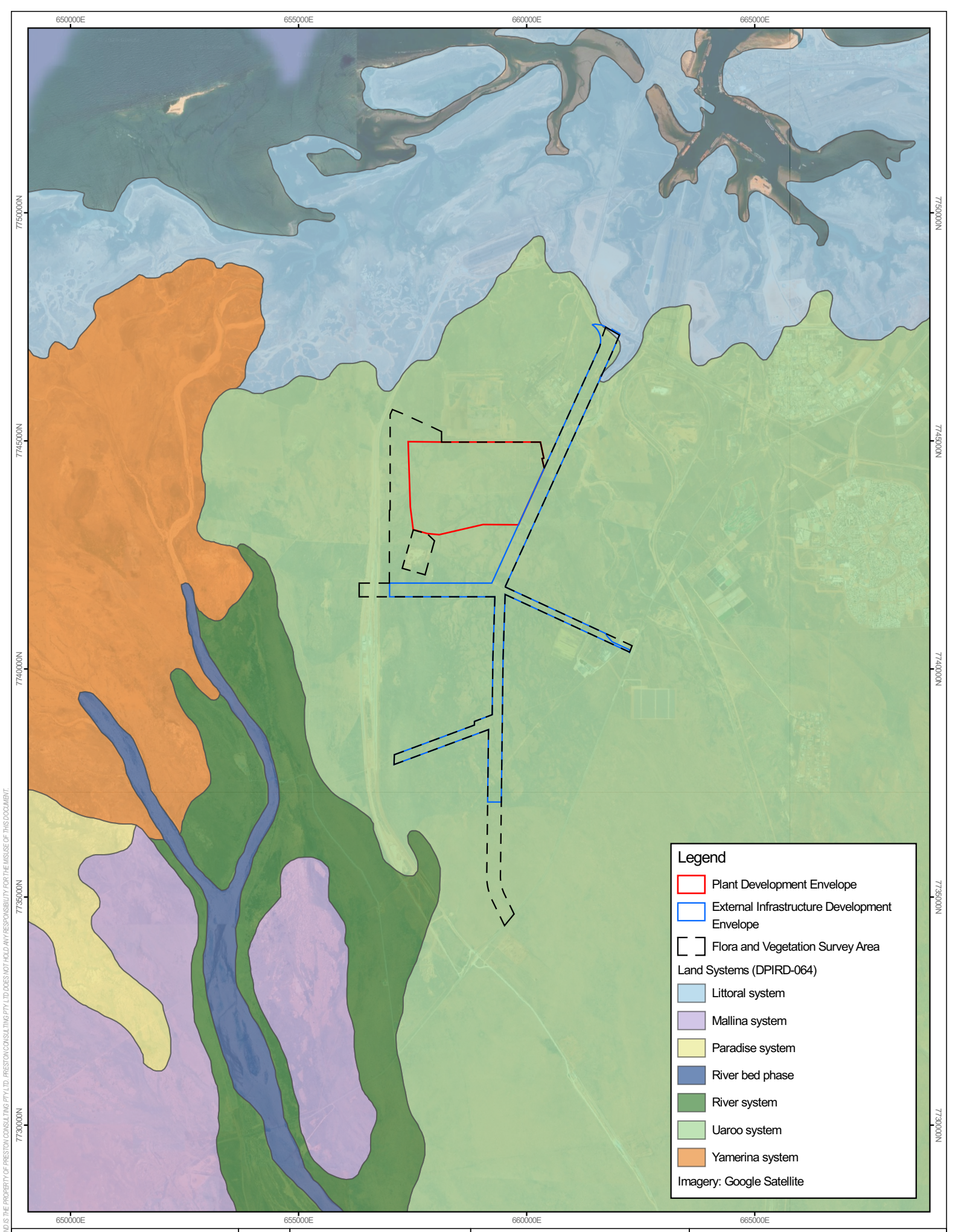
- *Aerva javanica*;
- *Stylosanthes hamata*;
- *Cenchrus ciliaris*; and
- *Cenchrus setiger*.

4.2.5 VEGETATION

Land Systems

Department of Primary Industries and Regional Development (WA) (DPIRD) undertakes land systems mapping for WA using a nesting soil-landscape mapping hierarchy (Schoknecht & Payne 2011). Under this hierarchy, land systems are defined as areas with recurring patterns of landforms, soils, vegetation and drainage (Payne & Leighton 2004). The Survey Area intersects two land systems (Figure 4-4) and include the following:

- *The Uaroo System* (98% of the development envelopes): which is characterised by broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered Acacia shrubs; and
- *The Littoral System* (2% of the development envelopes): which is characterised by bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse acacia shrublands and mangrove forests.



0 1 2 km

GDA2020 / MGA zone 50

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EPBC 2023/09764

N

Project: PHI_0406_026
Date: 20/02/2026
Size: A4
Author: ASmithers (Preston Consulting Pty Ltd)

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Figure 4-4: Land Systems

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Regional Native Vegetation Extent

Native vegetation within 10, 15 and 20 km of the development envelopes was mapped using DPIRD's Native Vegetation Extent dataset (DPIRD, 2017) (Figure 4-5). The extent of native vegetation surrounding the development envelopes is summarised in Table 4-4.

Table 4-4: Native vegetation surrounding the Proposed Action

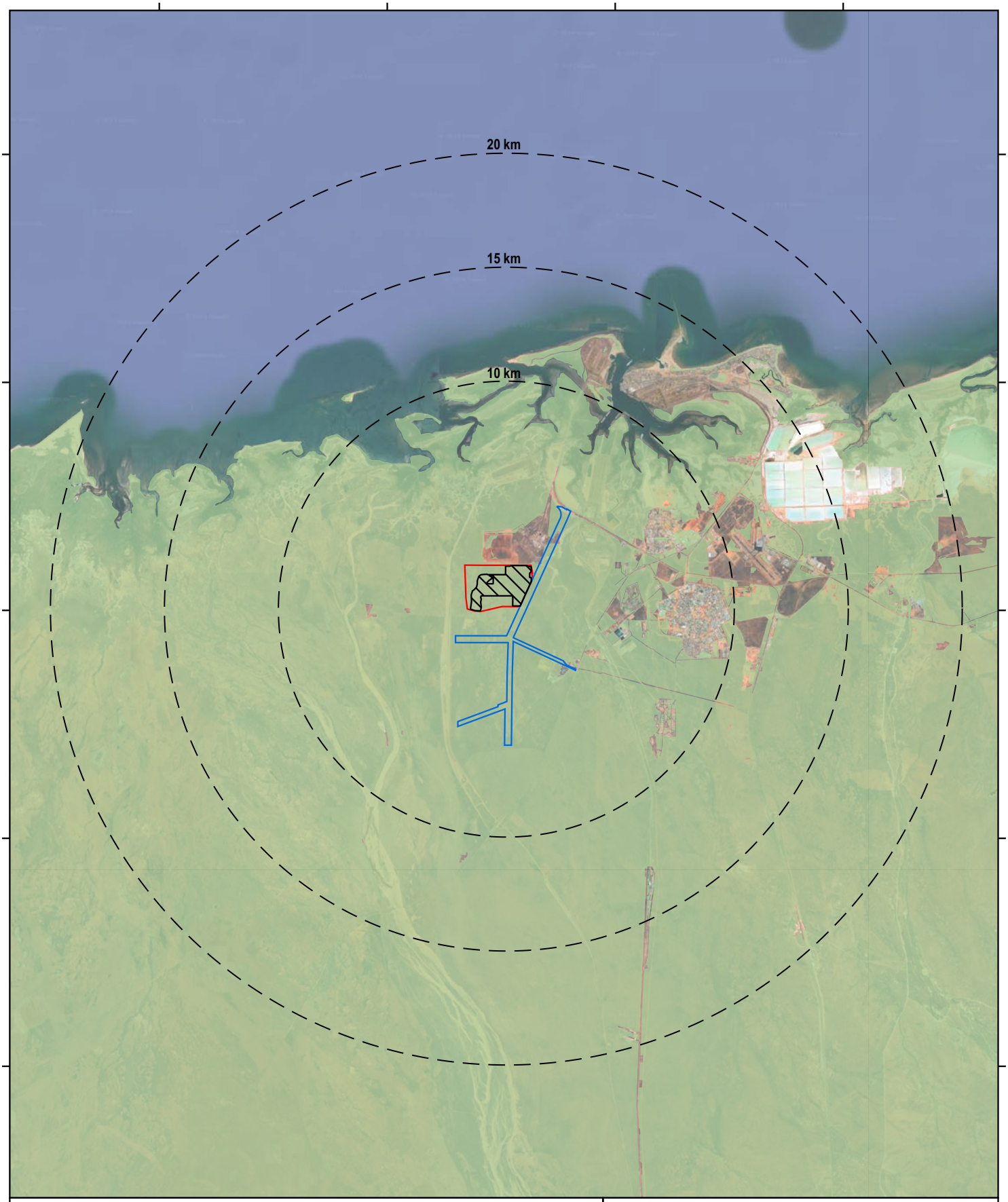
Radius (km)	Area of native vegetation remaining (ha)	% of native vegetation remaining
Development envelopes	983.2	98.0
10	48,078.9	87.0
15	80,617.0	89.3
20	122,722.9	92.1

Vegetation Associations

Regional scale pre-European vegetation mapping for WA (Beard *et al.* 2013; DPIRD 2018) identifies two vegetation associations mapped in the Survey Area (Figure 4-6). The remaining extent for both vegetation associations at the Statewide scale exceeds 99.0% they are therefore considered of Least Concern (Table 4-5). However, none of vegetation association 645 is currently represented in DBCA lands.

Table 4-5: Statewide extent of pre-European vegetation associations present in the Survey Area

Vegetation association	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in DBCA lands (%)	% of Survey Area
589, Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	807,698.6	802,713.4	99.4	1.9	82.9
647, Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	195,860.9	191,711.4	97.9	N/A	17



Legend

- Plant Development Envelope
- External Infrastructure Development Envelope
- Native Vegetation (DPIRD-005)
- Buffers

Imagery: Google Satellite

PHGS_0406_015

Figure 4-5: Extent of native vegetation surrounding the Proposed Action

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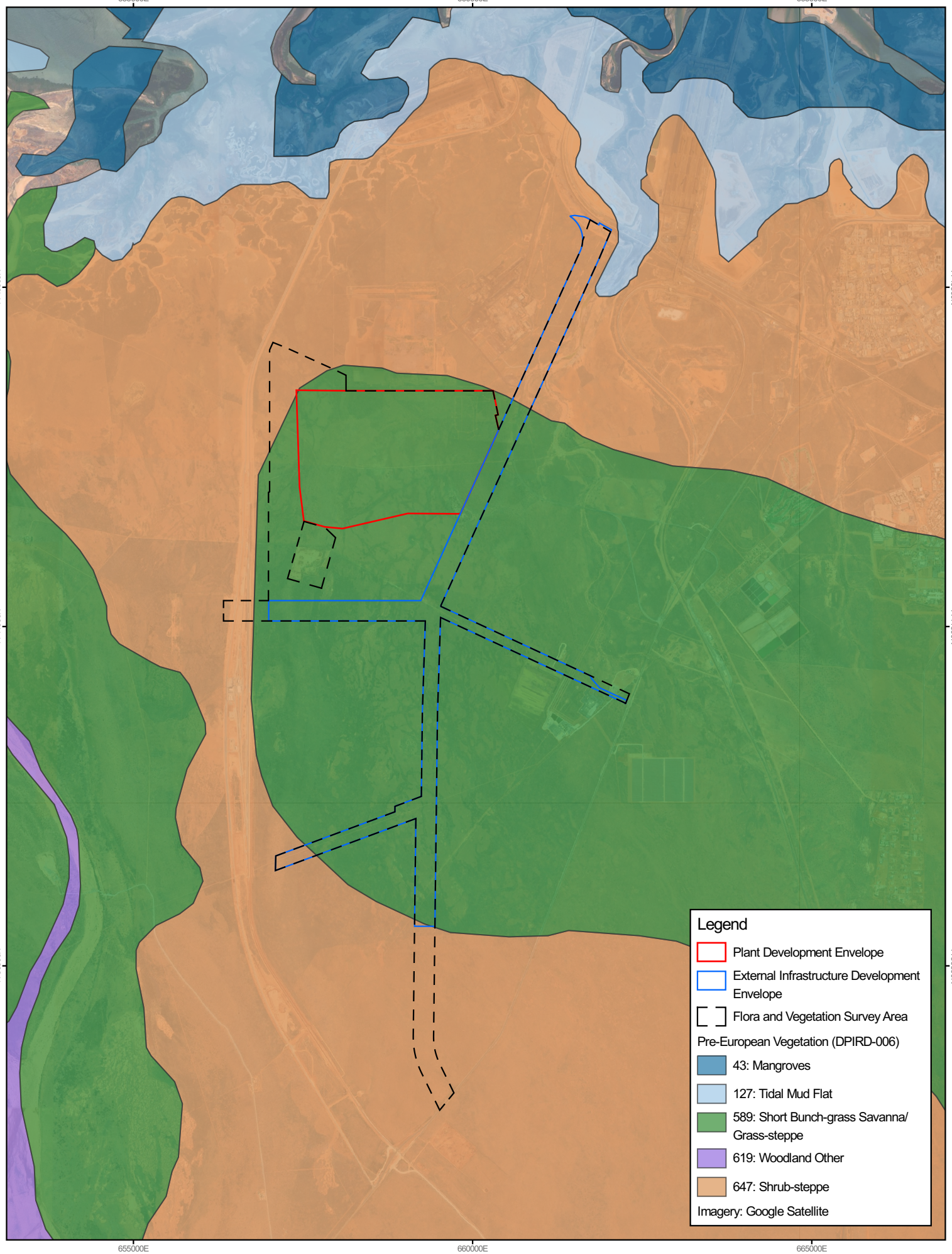
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GDA 2020 (MGA Zone 50)

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AS 15/11/2024



0 1 2 km

GDA2020 / MGA zone 50

1:70,000

EPBC 2023/09764

N

Project: PHI_0406_022
Date: 20/02/2026
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Figure 4-6: Pre-European vegetation

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Vegetation Communities

Six vegetation types were defined and mapped across the Survey Area (Figure 4-7). The most dominant vegetation type accounting for 28.0% of the mapped vegetation was AsPtTe which is defined as 'Low sparse shrubland of *Acacia stellaticeps, Pluchea tetranthera*, and *Afrohybanthus aurantiacus*, over a low open to hummock grassland of *Triodia epactia* and/or *T. secunda*, with *Eriachne mucronata*'. The four vegetation types consisting of *Acacia* shrublands over *Triodia* hummock grasslands (AccCiiTe, AccAsTe, AsTsch and AsPtTe) dominated the Survey Area, comprising nearly 85% followed by the hummock grasslands of *Triodia epactia* and *T. secunda* (TeTsec), comprising 11% of the Survey Area. Of the remaining area, 2% was cleared and <1% consisted of a 'not assessed' area and a *Eucalyptus victrix* woodland EvGlEa, respectively. The area that was not assessed was due to a registered heritage site. The EvGlEa appeared to be a unique vegetation type in the Survey Area and should is regarded as locally significant.

Vegetation Condition

The condition of vegetation within the Survey Area ranged from Good to Excellent (excluding cleared). The condition rating for vegetation within the Survey Area was based on the appropriate condition scale for the Eremaean Botanical Province (EPA, 2016b). There is evidence of fire across the Survey Area, in particular the northernmost and southernmost areas. The vegetation types will change with the pass of time as the vegetation matures depending on the occurrence and frequency of fires. The vegetation condition ratings relate to vegetation structure, the level of disturbance and weed cover at each structural layer and the ability of the vegetation unit to regenerate. The areas mapped are shown in Figure 4-8 and outlined in Table 4-6.

Table 4-6: Vegetation Condition

Vegetation Condition	Area mapped within the Survey Area (ha)	Proportion of mapped vegetation (%)
Excellent	1,349.5	91.4
Very Good	77.2	5.2
Good	1.9	0.1
Cleared	35.5	2.4

Threatened Ecological Communities

The generation of a EPBC Act Protected Matters Report (27 February 2025) identified no presence of Threatened and Priority Ecological Communities (TECs) within a 0 – 50 km radius of the Proposed Action.

No TECs or PECs were recorded within the Survey Area during the survey.

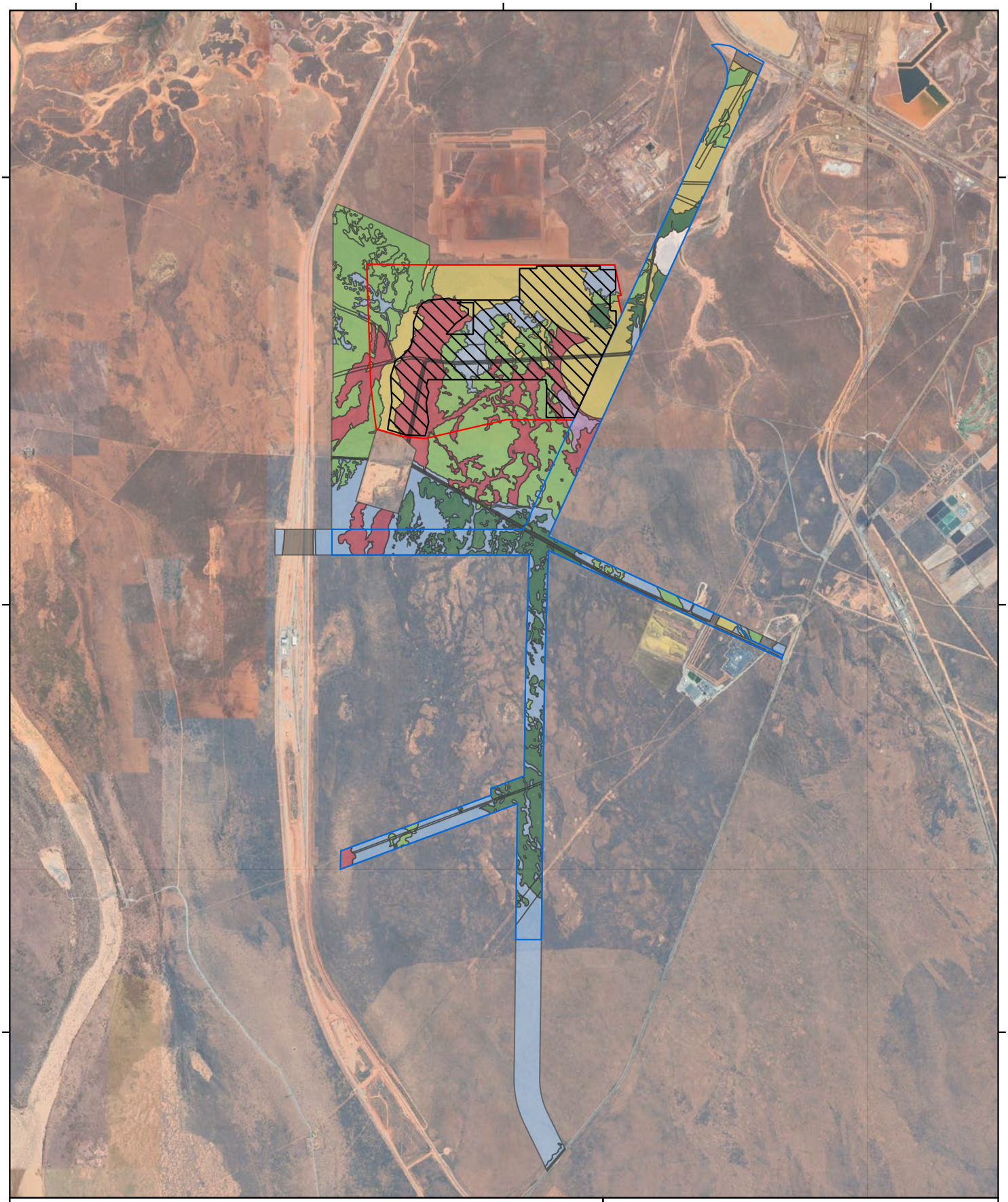


Figure 4-7: Vegetation communities

EPBC 2023/09764



Figure 4-8: Vegetation Condition

EPBC 2023/09764

4.2.6 Environmental Values

Based on the information provided throughout Section 4.2, the Proposed Action will not impact on any EPBC Act listed flora species or ecological communities. Potential impacts on flora and vegetation and the habitat it provides for EPBC Act listed terrestrial fauna species is considered in Section 5.

4.3 Mitigation

PHI has mitigated the potential impacts to this factor according to the mitigation hierarchy; avoid, minimise, rehabilitate, offset.

4.3.1 Avoid

PHI has conducted extensive flora and vegetation surveys of the areas within and surrounding the development envelopes and have utilised this information to undertake planning and design revisions.

A total of 1,440.7 ha of native vegetation was recorded within the Survey Areas. During the preparation of the Proposed Action's site layout, a key consideration was the avoidance of vegetation wherever practicable, and the footprint minimised to smallest extent possible to avoid clearing of native vegetation.

The Proposed Action is located within an area set aside as a Strategic Industrial Area where there is existing industrial development and is not located in undeveloped, pristine parts of the Pilbara. It therefore avoids impacts to flora and vegetation in these pristine, undeveloped areas.

4.3.2 Minimise

The following mitigation measures are proposed to ensure that direct and indirect impacts to flora and vegetation are minimised:

1. **Implement industry best practice management measures for flora and vegetation:**
    a. Implement industry best practice management measures for flora and vegetation;
    b. Preparation and implementation of a Bushfire Management Plan (BMP) which includes best management practices to reduce the risk of bushfires as a result of the Proposed Action;
    c. Implementation of industry-standard controls for hydrocarbon storage and handling;
    d. Clearing is to be conducted on an as-needed basis, followed by progressive rehabilitation of cleared area s as soon as is practicable;
    e. Minimise clearing by utilising existing access tracks and disturbance where practicable;
    f. Implement industry-standard controls for waste management, sedimentation and spillages;
    g. The introduction and spread of weeds will be minimised through strict operational hygiene practices; and
    h. Offset payments to the PEOF may be required for the loss of Good to Excellent quality vegetation.

2. **Obtain and comply with Works Approval(s) and Licences issued under Part V of the EP Act:**
    a. Part V approvals are expected to include limits on dust emissions that, whilst focussed on air quality, will have secondary benefit of managing dust emissions from the Proposed Action to minimise impacts on flora and vegetation;

4.3.3 REHABILITATE

The key rehabilitation measures that relate to flora and vegetation are summarised below:

1. All infrastructure will be removed; and
2. The disturbance footprints will be revegetated with local native species.

A lease with the State Government under the LAA is expected to contain terms and conditions of requiring decommissioning and rehabilitation of the Proposed Action at the end of its operational life, which will ensure rehabilitation measures are implemented.

4.3.4 OFFSETS

As there are no impacts on any flora species or ecological communities considered to be MNES, there are no significant residual impacts that require offsetting for flora and vegetation. Noting that under the EP Act approval, it is expected that the significant residual impacts of clearing 387.1 ha of Good to Excellent quality native vegetation will require offsetting under the Ministerial Statement (once issued).

5 TERRESTRIAL FAUNA

5.1 POLICY AND GUIDANCE

Relevant Commonwealth Government guidance documents for terrestrial fauna are summarised in Table 5-1.

Table 5-1: Policy and guidance relevant to the Terrestrial Fauna Key Environmental Factor

Policy and Guidance	How guidance has been considered
Key Documents	
Generic guidelines for the content of a draft EPBC Act PER/EIS (including the objects and principles of the EPBC Act, 1999) (DotEE, 2016a)	This document was considered in the preparation of this supplementary document and while undertaking EIA.
EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) – including the Offset Assessment guide	This document was considered when determining whether offsets were expected to be required for this factor.
Environmental Management Plan Guidelines (DotE, 2014)	This document was considered during the preparation of the Fauna Management Plan (Appendix 3)
EPBC Act Condition Setting Policy (DAWE, 2020)	This document was used as guidance for the referral process and EIA of the Proposed Action.
EPBC Act Outcomes-based conditions policy (DotE, 2016a)	This document was used to assist in developing suitable outcomes for Terrestrial Fauna.
Relevant Technical Guidance	
Relevant EPBC Act listed species-specific survey guidelines and protocols.	This document was used as guidance when undertaking surveys of EPBC listed species and potential survey limitations.
Relevant EPBC Act listed species-specific Recovery plans, Threat Abatement Plans, ACA's and other documents.	These documents were used as guidance to assess and manage EPBC listed species that may be impacted by the Proposed Action.
Recovery Plans and Threat Abatement Plas	
Recovery Plan for the Greater Bilby (*Macrotis lagotis*) (DCCEEW, 2023a)	This document was considered during the preparation of the Fauna Management Plan (Appendix 3)
Threat abatement plan for predation by feral cats (DotE, 2013)	This document was considered during the preparation of the Fauna Management Plan (Appendix 3)
Threat abatement plan for competition and land degradation by rabbits (DotEE, 2016)	This document was considered during the preparation of the Fauna Management Plan (Appendix 3)
Threat abatement plan for predation by the European red fox (DEWHA, 2008)	This document was considered during the preparation of the Fauna Management Plan (Appendix 3)
Conservation Advice	
Conservation Advice *Macrotis lagotis* Greater Bilby (TSSC, 2016)	This document was considered during the preparation of the Fauna Management Plan (Appendix 3)
Conservation Advice *Falco hypoleucos* Grey Falcon (TSSC, 2020)	This document was considered during the preparation of the Fauna Management Plan (Appendix 3)
Conservation Advice *Pezoporus occidentalis* Night Parrot(DCCEEW, 2025)	This document was considered during the preparation of the Fauna Management Plan (Appendix 3)

5.2 RECEIVING ENVIRONMENT

Information in this section has been sourced from the Port Hedland Green Steel Project: Detailed Terrestrial Fauna Survey 2023 (Phoenix, 2024b, Appendix 4).

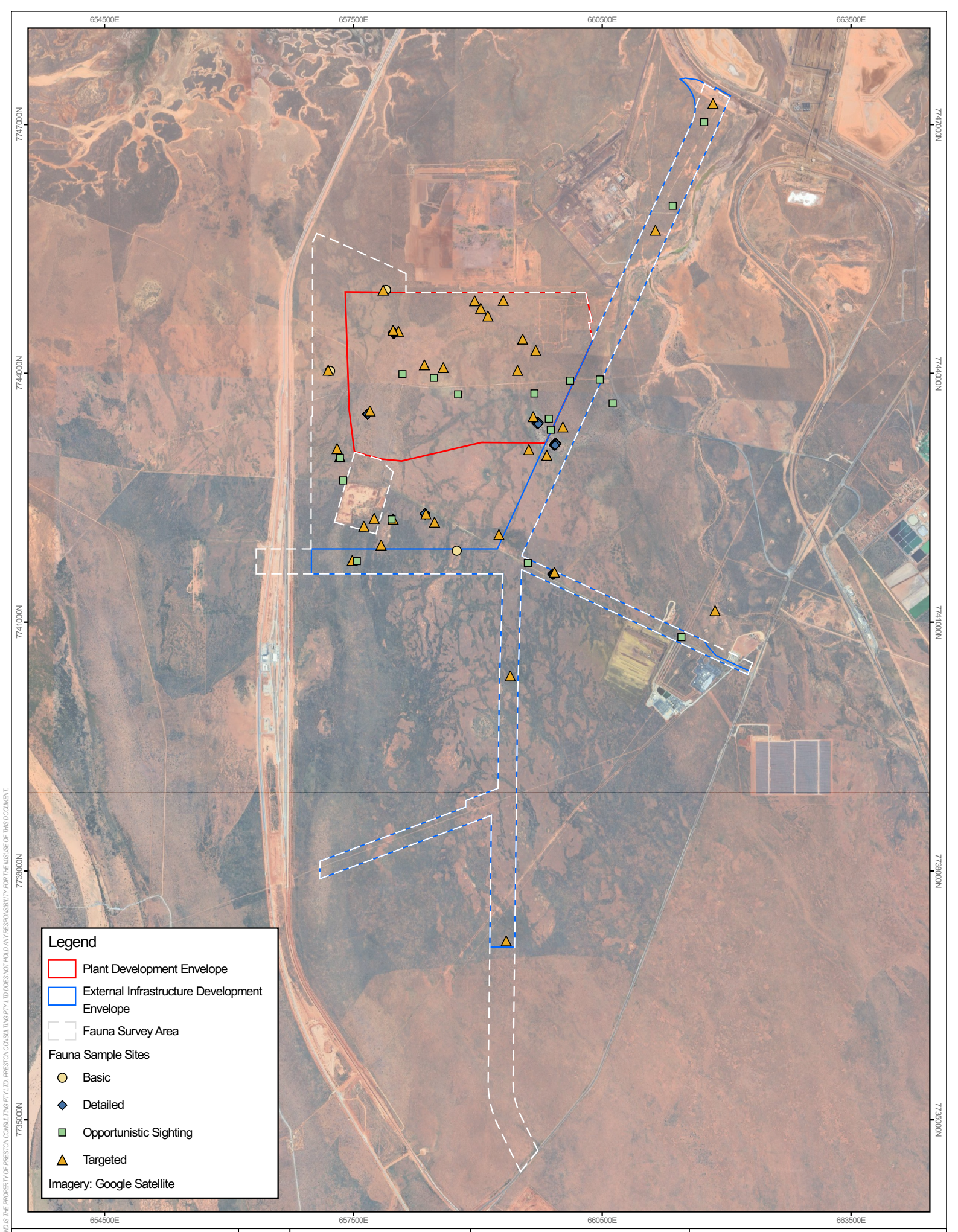
5.2.1 SURVEY EFFORT

Phoenix was commissioned by PHI to undertake a detailed fauna survey for the Proposed Action. The purpose of the survey was to define the fauna vales of the Survey Area to inform Proposed Action planning and the EIA process. The survey was conducted in February 2023 and included a desktop assessment, detailed and targeted survey. The terrestrial fauna Survey Area aligns with the flora and vegetation Survey Area and is approximately 1,476.3 (Figure 5-1).

Several biological database searches were undertaken to identify and prepare lists of significant fauna that may occur within the Survey Area. A literature search was conducted for accessible reports for biological surveys conducted within a 40 km radius of the Survey Area to build on the lists developed from the database searches.

A total of 58 survey sites were sampled during the field survey (Figure 5-1). These include six systematic survey sites, 25 Greater Bilby (*Macrotis lagotis*) (Bilby) plots, seven Bilby transects and 20 additional opportunistic /reference /targeted survey sites. The key field methods that were undertaken during the detailed surveys were:

- Habitat assessment and mapping;
- System trapping;
- Active diurnal and nocturnal searches;
- Avifauna surveys;
- Bat echolocation recordings;
- Camera trapping;
- Targeted surveys for Bilby; and
- Short range endemic (SRE) invertebrate sampling.



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GDA2020 / MGA zone 50

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EPBC 2023/09764

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Project: PHI_0406_018
Date: 20/02/2026
Size: A4
Author: ASmithers (Preston Consulting Pty Ltd)

Preston Consulting

Figure 5-1: Fauna sample sites

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Habitat Assessment and Mapping

Initial habitat characterisation was undertaken using various remote geographical tools, including aerial photography (Google Earth®), land system maps and topographic maps. Habitats with the potential to support significant terrestrial fauna species were identified based on known habitats within the Pilbara bioregion. Tentative sites were selected for the survey to represent all habitat types. Final survey site selection was conducted after ground-truthing of site characteristics. At the broadest scale, site selection considered aspect, topography and land systems. At the finer scale, consideration was given to proximity to water bodies (drainage lines and creek), vegetation complexes and condition and soil type. Sites were primarily chosen to represent the best example of distinct habitats within the broader habitat associations of the Survey Area with a focus on species of significance identified in the desktop review. Two replicates per habitat type were selected for detailed systematic sampling. Habitat descriptions and characteristics were recorded at all systematic survey sites.

To more accurately define and delineate the fauna habitats in the Survey Area, photographs were taken while traversing the Survey Area with a focus on transitions between fauna habitats (ecotones) apparent from aerial imagery. All photographs were geolocated and spatially mapped to reference. Photographs were used in conjunction with survey site descriptions and regional land system descriptions to map the fauna habitats of the Survey Area.

Systematic trapping

Six systematic trapping sites were established to capture terrestrial mammals, reptiles and amphibians (Figure 5-1). Each site comprised five 'sub-sites' which consisted of two dry pitfall traps, four funnel traps and two aluminium box traps. The pipes and buckets were installed flush with the substrate, with an aluminium drift fence bisecting each pit. Funnel traps were positioned at the start and finish of each drift fence, and one on either side of the drift fence in the centre between pitfall traps. Aluminium box traps were place in vegetation adjacent to the trap line. Sub-sites were positioned approximately 20 m apart along a 100 m transect. The aluminium box traps were baited with a universal bait mixture consisting of oats, peanut butter and sardines to attract small mammals. Aluminium box and funnel traps were shrouded with reflective closed cell insulation to provide shade and protection for any captured animals. All traps were given as much shade as possible under/around vegetation. Reflective closed cell insulation and leaf litter were used to provide protection from the elements in the bottom of all buckets. Traps were open for seven consecutive nights and checked within three hours of sunrise. Baits were removed and replaced every second day. The total vertebrate trapping effort for the 6 systematic trapping sites during the surveys was 1,608 trap-nights, where a trap-night is defined as one trap remaining open for one night.

Active diurnal and nocturnal searches

Active searches were undertaken at each systematic site and two additional sites throughout the Survey Area. Active searches primarily targeted diurnal herpetofauna and mammals from direct sightings and secondary evidence. Searches focused on significant species identified in the desktop review as potentially occurring within the Survey Area, including the Bilby.

Searches were undertaken in any observable microhabitats considered likely to support mammals, reptiles and amphibians. Techniques included: raking leaf and bark litter, overturning logs, searching beneath the bark of trees, investigating dead trees and logs, investigating burrows and identifying any secondary evidence including tracks, diggings, scats, fur or sloughs (shed skins), predation or feeding sites, and fauna constructed structures such as nests. Between 0.7 to 6.3 person hours was spent active searching at each site for a total of 11.3 hours over the duration of the field survey. Nocturnal searches were undertaken at each systematic site to detect the presence of any nocturnal fauna species. Nocturnal searches were undertaken between sunset and 9 pm when activity levels were highest for most nocturnal species. Searches consisted of using head torches to detect animal movement, eye shine, or other evidence of fauna presence. These searches particularly targeted reptiles and mammals, but also nocturnal birds. Approximately 21 person hours of nocturnal searches were undertaken during the field surveys.

Avifauna Surveys

Twenty-minute avifauna surveys were undertaken at each of systematic site and two additional sites. Avifauna surveys were confined to the habitat type (up to 2 ha) represented by each site to collect assemblage data for each habitat. Avifauna surveys were undertaken throughout the day with a focus on periods of higher activity around sunrise and sunset. Surveys consisted of bird recordings from visual sightings and call recognition. Between 0.7 to 3.0 person hours was spent of avifauna census at each site for total of 9.3 hours over the during the field survey.

Additional avifauna observations were also recorded opportunistically while other field work was being completed, including observations made during travel and active searches. SongMeter SM4 recording devices were deployed at 3 sites for 3 - 8 nights to target Night Parrot (*Pezoporus occidentalis* –Critically Endangered) in accordance with survey guidelines (Department of Parks and Wildlife (DPaW) 2017). The Song Meters were deployed at systematic sites in locations considered potential roost habitat for Night Parrot and set to record continuously over the deployment period. The migratory and non-migratory avifauna assemblage identified in the desktop review as potentially occurring was taken into consideration when undertaking systematic avifauna surveys and traversing the Survey Area.

Bat Echolocation Recordings

Song Meter SM4 recording devices were used to record bat echolocation calls at five sites during the field survey (Figure 5-1). Recording devices were deployed at each site for a minimum of 4 nights of recording for 8 - 12 continuous hours per night. The Song Meters were positioned in areas of habitat likely to have increased insect activity and to attract bats (i.e. likely foraging areas or movement corridors) and/or potential roosting sites where possible.

Camera Trapping

Four motion-sensitive camera traps baited with universal bait were deployed for five nights to gather broad fauna assemblage data outside of disturbance periods. Cameras were deployed for a total of 20 camera trap-nights.

Targeted Bilby Surveys

The objective of the targeted Bilby survey was to determine their presence/absence from the Survey Area and identify areas of recent activity by adopting survey methods detailed in DBCA (2018). Bilby populations are known to have moving home ranges (Dziminski *et al.* 2020). Detection of secondary evidence including scats, tracks, burrows and diggings is the most reliable technique to determine whether bilbies are currently or were formerly present in an area. The occurrence of fresh scats, definitive tracks and/or multiple concentrated diggings can be indicative of current presence; unclear tracks, burrows and diggings in the open can indicate potential activity but cannot alone be used to verify current presence. A combination of linear transects and 2 ha sign plots were undertaken to provide extensive and representative coverage in all suitable habitat types across a large Survey Area that varies considerably in shape. It is recommended for 2 - 4 plots to be searched per 100 ha, with plot spacing increasing with the size of the Survey Area (DBCA 2018). By combining these methods, there is an increase in confidence in detecting the presence of Bilby in a given area (DBCA 2018). Linear transects were searched with approximately 20 m spacing in the Survey Area corridors where suitable habitat was located. A total of 18 transects were traversed on foot to detect Bilby presence.

The standardised 2 ha sign plot method was used for the centre portion of the Survey Area where suitable habitat was identified. The methods involved searching multiple 2 ha plots for Bilby sign, for 25 minutes. Sign plots were distributed to include all areas of suitable Bilby habitat across the Survey Area. A total of 25 (2 ha) plots were searched. All locations of secondary evidence were recorded on GPS enabled devices.

Short-Range Endemic Invertebrates

Phoenix was engaged by PHI to determine the presence of SRE invertebrate fauna occurring in the Survey Area. The assessment was based on the habitat types present within the Survey Area, as well as previous records of terrestrial invertebrates within a search area around the Proposed Action.

The specific aims of the surveys were to:

- Characterise SRE invertebrates in the SRE Survey Area;
- Provide further information on the potential SRE habitats of the SRE Survey Area and its surrounds; and
- Assess the SRE status of species and the likelihood of their confinement to disturbance areas at the Proposed Action.

The survey approach and methods used were based on *Technical Guidance: Sampling of Short-Range Endemic Invertebrate Fauna* (EPA, 2016d). The survey was designed to target species from invertebrate groups known to contain a high proportion of range-restricted species: spiders (Mygalomorphae), centipedes (Chilopoda), millipedes (Diplopoda), two-pronged bristletails (Diplura), flatworms (Tricladia), land snails (Eupulmonata), pseudoscorpions (Pseudoscorpiones), scorpions (Scorpiones), and slaters (Isopoda).

Sampling Effort

Sampling for SRE invertebrates was conducted at all six systematic sites including areas identified as suitable habitats for SREs. Sampling comprised the following methods:

- Dry pit trapping;
- Active foraging;

- Litter/ soil sieving; and
- Blowing for mygalomorph spiders.

Active foraging comprised inspection of logs, the underside of bark of larger trees and the underside of rocks. Methodical searches were conducted amongst the leaf litter of shade-bearing tall shrubs and trees, including raking of litter.

A standardised approach was undertaken whereby each site, considered suitable SRE habitat, was sampled for 20 minutes, with a total search effort of approximately 1.8 hours. Trapdoor spider burrows identified during the searches were excavated if they were considered inhabited. Spider burrows were located by visual inspection and blowing, whereby a leaf blower is used to open the lid and expose the burrow. Excavation involved removing soil from around the burrow to carefully expose the burrow chamber and remove the spider. Combined litter/soil sifts were undertaken at two sites, with up to three sifts conducted at each site dependent on abundance of leaf litter. Leaf litter samples were sieved through three stages of decreasing mesh size over a round tray and invertebrates were picked from the sieves and tray with forceps. These samples particularly targeted small spiders (Araneomorphae), pseudoscorpions, buthid scorpions, millipedes, centipedes (in particular Geophilomorpha and Cryptopidae), smaller species of molluscs (e.g. Pupillidae) and slaters.

Phoenix's (2024b) desktop review identified seven confirmed SREs and 78 potential SRE taxa within the desktop search (100 km buffer). Most of these species were recorded within habitat types that are not present within the Survey Area with the exception of one record of a mygalomorph. A further 50 taxa of uncertain SRE status and 70 non-SRE taxa from SRE groups were identified. The desktop records indicate one SRE-group species of uncertain status (*Rhagada* 'sp. indet', one record) was recorded within the Survey Area (Figure 5-2). This record was located approximately 165 m from the southeastern boundary of the Survey Area. A further 23 taxa were within 5 km of the Survey Area, comprising five mygalomorph spiders (family Anamidae), five pseudoscorpions (Chthoniidae, Olpiidae), five scorpions (Buthidae, Urodacidae), two isopods (Armadillidae) and six land snails (Pupillidae), of which 13 are widespread, seven are uncertain and three are potential SRE taxa. None of the SRE species that have been recorded are listed as MNES.

Overall, the Survey Area is comprised of generally low value SRE habitat. No confirmed SRE species were recorded within the Survey Area, and it is unlikely any of the recorded potential SRE species are restricted to the Survey Area only, with no known MNES SRE species in previous records in the Survey Area.

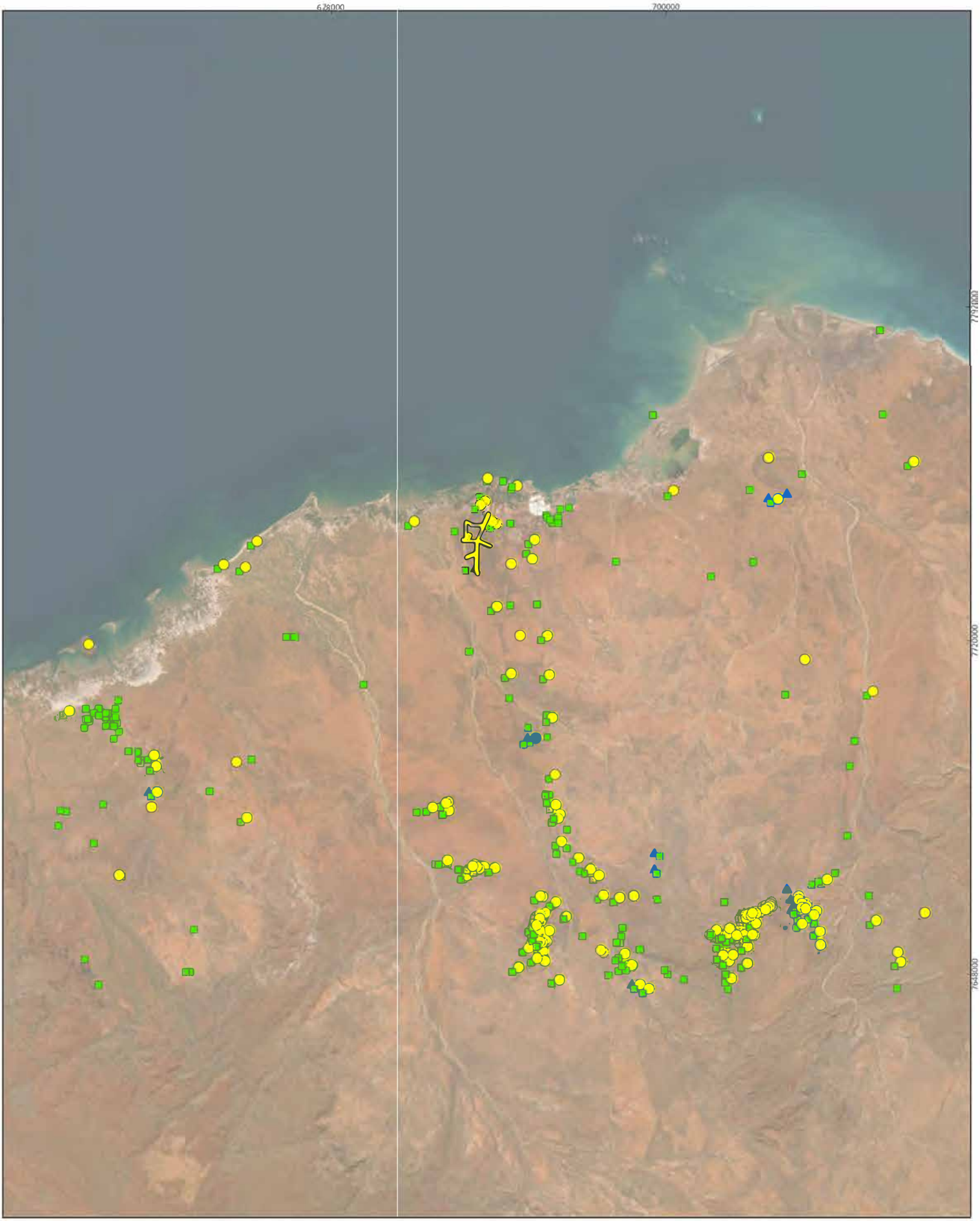


Figure 5-2: Desktop records of SRE fauna

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PHOENIX ENVIRONMENTAL SCIENCES

5.2.2 Alignment with Technical Guidance

EPA Guidance Statement 56 (EPA, 2020a) and technical guidance (EPA, 2020a) outlines a number of limitations that may arise during surveying. Further detail on survey limitations is provided in Table 5-2.

Table 5-2: Potential limitations of the Terrestrial Fauna Survey

EPA Limitation	Comments
Availability of contextual information at a regional and local scale	**Not a Limitation:** Database searches and previous surveys within the vicinity of the Proposed Action provided a comprehensive species list for the region.
Competency/experience of the team carrying out the survey	**Not a Limitation:** The survey team have more than 20 years of combined experience conducting fauna surveys in the Pilbara region of WA.
Scope and completeness	**Not a Limitation:** The scope was sufficient for the size of the Survey Area and the fauna habitats present and is considered complete.
Proportion of fauna recorded and/or collected, any identification issues	**Not a Limitation:** Based on species accumulation curves, a sufficient proportion of fauna was recorded for the Survey Area.
Access within the Survey Area	**Not a Limitation:** All parts of the Survey Area were accessible.
Timing, rainfall, season	**Not a Limitation:** Timing of the survey (Autumn season) was optimal for the Survey Area and consistent with EPA (2020b) guidance for the Eremaean Climatic Province.
Disturbance that may have affected the results of the survey	**Not a Limitation:** No disturbances affected the results of the survey.

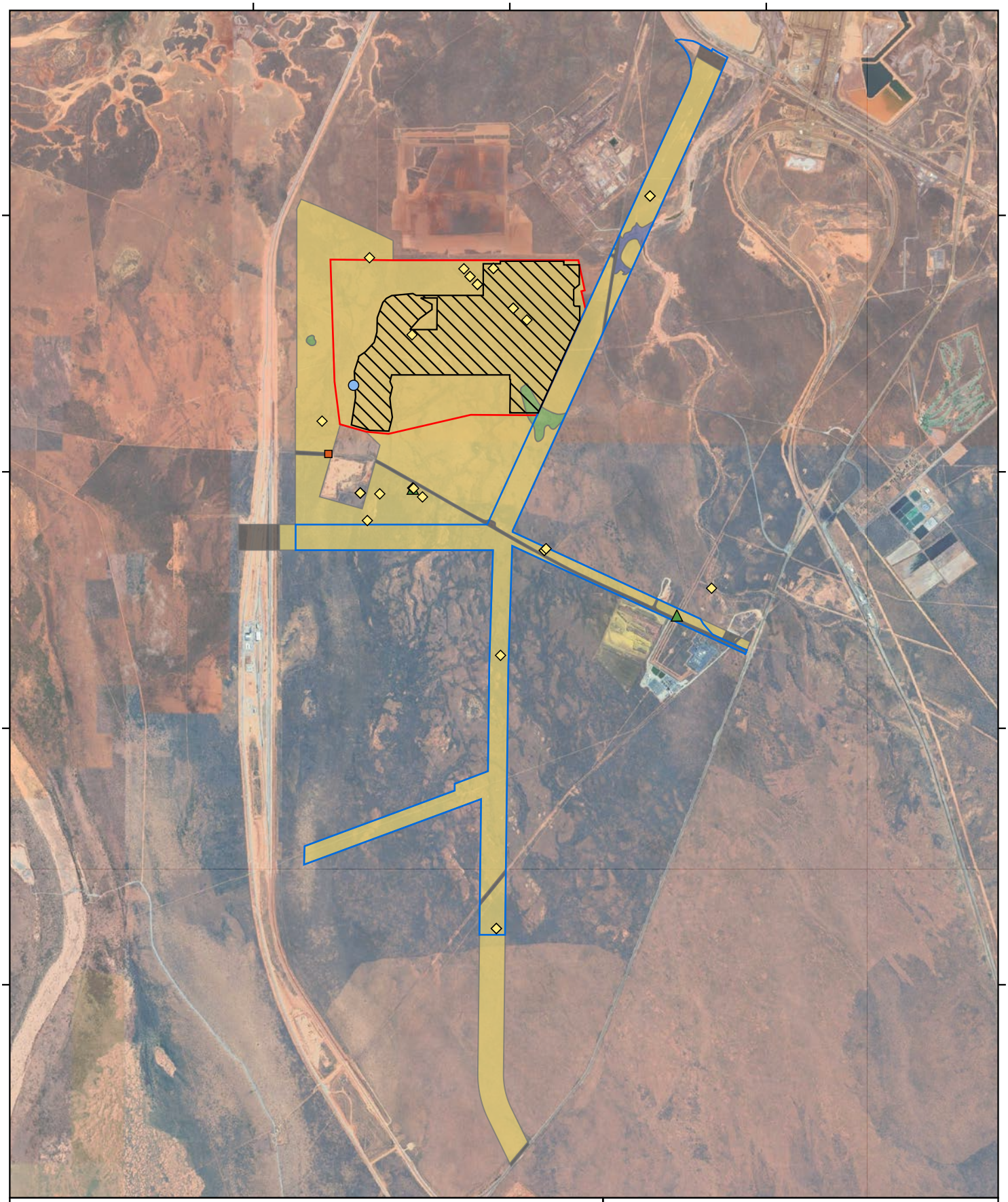
5.2.3 Fauna Habitat

Three fauna habitats were identified within the Survey Area (Table 5-3; Figure 5-3). These fauna habitats were identified as Sandplains, Open Woodlands and Drainage Line. All habitat types identified in the Survey Area are typical of the Roebourne subregion and Uaroo land system. Habitats within the Survey Area are considered abundant and widespread throughout the Pilbara. The majority of the Survey Area (95.6%) is comprised of Sandplain habitat and is characterised by red-orange sandy soils on a gently undulating plain. The dominant vegetation complexes comprise of spinifex hummock grasslands and low *Acacia stellaticeps* shrublands. Open Woodlands comprise of only 15.4 ha (0.9%) of the Survey Area, occurring at two discrete locations. The linear infrastructure corridor in the north-east intersects a small section of Drainage Line habitat. The Drainage Line habitat is a Heritage protected area due to the presence of shell middens. As a result, no fauna sampling was conducted in this area. A total of 42.1 ha (2.8%) of the Survey Area has been cleared/disturbed and is largely devoid of native vegetation.

All three fauna habitats represent low value SRE habitat. Most of the SRE invertebrate species, identified in the desktop assessment, were recorded in habitat types that are not present within the Survey Area, except for one species of mygalomorph.

Table 5-3: Fauna Habitat

Fauna Habitat	Key Habitat Elements	Area within Survey Area (ha)
Sandplains	• Mosaic of spinifex hummock grasslands and Low *Acacia stellaticeps* shrublands on an undulating plain.	1,409.6
Open Woodlands	• Open low to mid *Eucalyptus* woodland over evenly scattered, open tussock grasses with spinifex hummocks present. • Predominantly sandy soil with a shallow sandy-clay crust.	15.4
Drainage Line	• Small section of the Foreshore flats with intertidal water slow, predominantly dry. • Heritage protected area.	8.9
Cleared/Disturbed	• Cleared areas with infrastructure and roads.	45.1



Legend

Plant Development Envelope

External Infrastructure Development Envelope

Significant Fauna

- Bilby (Macrotis lagotis) (Vulnerable)
- Fork-tailed Swift (Apus pacificus) (Migratory)
- Osprey (Pandion cristatus) (Migratory)
- Grey falcon (Falco hypoleucos) (Vulnerable)

Fauna Habitat

- Cleared/disturbed
- Drainage line
- Open woodland
- Sandplain

Imagery: Google Satellite

PHGS_0406_035

Figure 5-3: Fauna habitats and significant fauna records

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5.2.4 General Vertebrate Fauna Assemblages

A total of 82 vertebrate species were recorded in the detailed survey, comprising of six amphibians, 36 reptiles, 25 birds and 15 mammals (including two introduced species). This represents less than half of the species that were identified as potentially occurring in the desktop review

Amphibians

There are 11 amphibian species that potentially occur within the Survey Area of which two were observed during the field survey. The observed species were the Little Red Tree Frog (*Litoria rubella*) and the Desert Spadefoot (*Notaden nichollsi*). The recorded amphibian assemblage within the Survey Area is 1.9% of the total vertebrate species assemblage.

The Little Red Tree Frog (*Litoria rubella*) is a common species often found around most sources of water in arid regions such as waterholes, gorges, rocky areas and are frequently found around human structures. *Litoria rubella* eggs are laid in small clusters that are attached to vegetation in and around water bodies.

The Desert Spadefoot (*Notaden nichollsi*) is generally identified in open country with sparse vegetation cover. This species is known to burrow over 1 m deep when inactive and is often found near termite mounds. *Notaden nichollsi* breeds in temporarily flooded area of clay or sandy soils. The spawn is a large, shapeless clump of over 1,000 eggs.

Reptiles

There are 93 reptile species that potentially occur within the Survey Area of which 38 were observed during the field survey. These comprise of five snakes, four legless lizards, six geckos, 16 skinks, four goannas and three dragons.

Habitats that retain leaf litter, woody debris and logs are likely to be important for providing shelter to reptiles, as are granite outcrops with crevices and exfoliating rock. The reptile assemblage of each habitat is likely to be influenced by the substrate (e.g., rocky, clayey or sandy), but there is also likely to be considerable overlap with many of the remaining species being widely distributed and occurring across several habitats.

Birds

There are 48 bird species that potentially occur within the Survey Area of which 23 were observed during the field surveys. Of the 23 species, 16 families were represented passerines (perching birds). The remaining 25 species from 12 families represent non-passerines. Raptors (Pandionidae, Accipitridae, Falconidae) recorded the highest diversity among birds, representing over 20% of the recorded assemblage.

Mammals

There are 46 mammal species that potentially occur within the Survey Area of which 13 native mammal species were recorded within the Survey Area. These comprise of three species if carnivorous marsupials (Dasyuridae), one species of macropod (Macropodidae), one species of omnivorous marsupial (Thylacomyidae), five microchiropteran bats from two families (Molossidae, Vespertilionidae), two species of native rodent (Muridae) and one monotreme (Tachyglossidae).

Two feral predators, the Cat (*Felis catus*) and Fox (*Vulpes vulpes*) were recorded. These species are likely to be common in the Survey Area.

5.2.5 EPBC Act Listed Fauna

Two Threatened, and two Migratory listed fauna species listed under the EPBC Act were recorded within the Survey Area. These species are:

- Greater Bilby (*Macrotis lagotis*) – Vulnerable;
- Grey Falcon (*Falco hypoleucos*) – Vulnerable;
- Fork-tailed Swift (*Apus pacificus*) – Migratory; and
- Osprey (*Pandion cristatus*) – Migratory.

The EPBC Act fauna species that were recorded during the field surveys are shown in Figure 5-3 and outlined in Table 5-4. There were no species identified in the desktop assessment that were considered likely to occur. There was one species that was considered possible to occur, the Northern Quoll (*Dasyurus hallucatus*; Endangered).

Table 5-4: Significant fauna potentially occurring within the Survey Areas

Species	Status	Likelihood of Occurrence	Notes
BIRDS			
Apus pacificus **Fork-tailed Swift**	Mi	Recorded	One record of this species was directly sighted (BIE04) at the survey site. This species occurs in a wide range of dry or open habitats, including riparian woodlands, tea-tree swamps, low scrub, heathland, saltmarsh, grassland and spinifex sandplains, open farmland and inland and coastal sand dunes which is supported by the Survey Area (DSEWPaC 2011).
Pandion cristatus **Osprey**	Mi	Recorded	One record of this species was directly sighted (Opp11) at the survey site. This species is present across most of coastal Australia but is absent from Tasmania and Victoria.
Falco hypoleucos **Grey Falcon**	Vu	Recorded	Two records (one pair and one fledged juvenile) were directly slighted (BIE001, Opp15). This species uses a large variety of habitats such as timbered plains, creek lines, shrublands and open grasslands. The habitat requirements of this species are supported by the Survey Area.
Pezoporus occidentalis **Night Parrot**	Cr	Unlikely	While suitable habitat exists within the study area, the lack of records reduces the probability of occupying the study area. Considering the threats to dispersal for Night Parrot, it is likely the study area occurs outside their typical range and would not support this species.

Species	Status	Likelihood of Occurrence	Notes
MAMMALS			
Macrotis lagotis **Greater Bilby**	Vu	Recorded	Survey records sourced 128 records of this species with 112 of those found in the Survey Area. 32 old diggings and 53 old scats were recorded inside of the Survey Area. 12 records of recent diggings and 15 records of recent scats were found within the Survey Area. This species prefers hummock grasslands in plains and alluvial areas, open tussock grasslands on uplands and hills, and mulga woodland/shrubland on ridges and rises. The habitat requirements of this species are supported by the Survey Area.
Dasyurus hallucatus **Northern Quoll**	En	Possible	This species is found in a variety of habitats, however, rocky areas provide an important denning habitat, while they forage in nearby grasslands and creek lines. Within the Survey Area there is an absence of suitable denning habitat, but a suitable dispersal habitat is present in minor drainage habitat. It is therefore possible for this species to occur within the Survey Area.

EPBC Act listed species: Vu = Vulnerable, En = Endangered, Cr = Critically Endangered, Mi = Migratory, Ma = Marine

Threatened Fauna

There are two Threatened fauna species (Bilby and Grey Falcon) that were recorded in the survey and one Threatened fauna species (Northern Quoll) that was considered possible to occur. Threatened species are those that are considered in danger of extinction as their populations have declined and/or are still declining, and their total population size is small and/or fragmented or geographically restricted. Sites that support these species may be important for their long-term conservation, particularly if the site supports a resident or breeding population.

Greater Bilby – Macrotis lagotis

The Bilby is listed as Vulnerable under the EPBC Act. The Bilby is a burrowing marsupial and is characterised by its long, silky blue-grey fur and its long pinkish ears. Their body is compact in size and they feature a pointed snout with a long tongue and a tail that is black and white in colour (Burrell, 2024). This species is found in a range of habitats from arid rocky soils with little ground cover to semi-arid shrublands and woodlands (Burrell, 2024). They are also known to inhabit spinifex and tussock grassland regions (Burrell, 2024). Once common throughout Australia, the Bilby is found within semi-arid regions of the Australian mainland; the Tanami Desert of the Northern Territory, the Great Sandy and Gibson Deserts, parts of the Pilbara and Kimberley regions of WA and the clayey and stony soils of the Mitchell grasslands of southwest Queensland (Burrell, 2024). Threats to the Bilby include predation by foxes and feral cats, an increased frequency of intense, high severity fires that reduce habitat and food availability and grazing by rabbits and other introduced herbivores that reduce food resources and impacts vegetation structure (DCCEEW, 2023a).

Habitat critical to survival of the Bilby, as defined by DCCEEW (2023a), includes:

- Any area where the species is known or likely to occur, as shown on the distribution map in Figure 5-4;
- Any location outside the known or likely distribution where bilbies are found to occur;
- Any area, between the areas noted above, that may be periodically occupied by bilbies; and

- Any area which bilbies may naturally colonise or may feasibly be reintroduced.

Based on this, Sandplain habitat recorded within the Survey Area is considered to be critical habitat for the Bilby under DCCEEW's definition. Minor Drainage Line habitat and Open Woodland habitat recorded in the Survey Area may also be utilised by the Bilby as dispersal and/or foraging habitat.

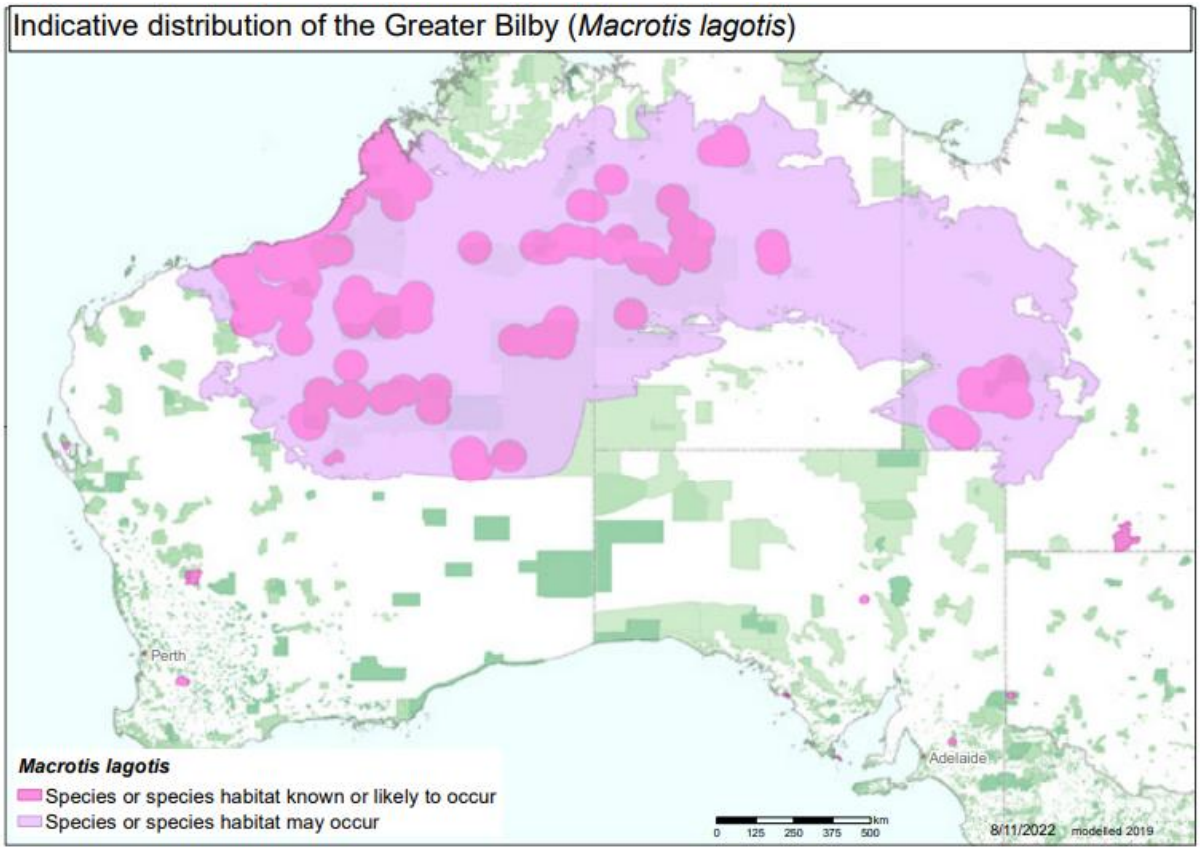


Figure 5-4: Modelled current distribution of the Bilby (*Macrotis lagotis*) (DCCEEW, 2023a)

Having been previously recorded within the Survey Area by Phoenix (2022), it is unsurprising that secondary evidence of the species was recorded throughout the Survey Area during the survey for the Proposed Action. While most secondary evidence identified was old (> 2 weeks), some recent evidence of Bilby activity was identified from odorous scats and loose sandy spoil associated with diggings that are indicative of Bilby foraging activity. All recent scats and diggings were located near the northern boundary of the Survey Area. Despite both intensive and extensive targeted survey effort (25 Bilby search plots and seven transects searches), no Bilby burrows (old, recently active, or active burrows) were located.

Bilby are known to utilise relatively large, mobile home ranges in response to the scarcity of food resources in the semi-arid and arid parts of their range. While the Survey Area clearly forms part of a local population's home range, the absence of track sequences and wider spread of recent activity (indicative of current or very recent Bilby presence) within the Survey Area, particularly the area near the northern boundary, may suggest that they have dispersed elsewhere, outside of the Survey Area. Nevertheless, whether the local Bilby population is currently occupying the Survey Area or not, it is likely to return given that it has been recorded nearby on multiple occasions.

Grey Falcon – Falco hypoleucos

The Grey Falcon is listed as Vulnerable under the EPBC Act. The Grey Falcon occurs in the arid and semi-arid zones of Australia and has an overall Australian listing of Vulnerable (Sutton, 2010). The distribution of this species is restricted largely to areas of the highest annual temperatures where average annual rainfall is below 500 mm (Birdlife International, 2024). Grey Falcons typically nest and roost along heavily wooded drainage lines. With large foraging home ranges, they predominantly prey on other bird species in flight from above. Speculative threats to the Grey Falcon include land/ range degradation caused by overgrazing in arid zone rangelands and the clearance of open woodlands, nesting-site availability, competition between other bird species, predation by feral species and threats from potential international falconry (Birdlife International, 2024).

Major Drainage Line habitat is considered critical habitat and represents the most suitable breeding and foraging habitat for Grey Falcons. Major Drainage Line habitat provides large trees for nesting and waterbodies which act as attractants for prey. No Major Drainage Line habitat is present within the Survey Area. Grey Falcon forage over a variety of habitat and may utilise the Survey Area for foraging. Major Drainage Line habitat is approximately 6 km west associated with the Turner River, which has a catchment of 4,802 km^2 and is approximately 236 km in length (FMG, 2022).

A breeding pair and single fledged juvenile were recorded perched on a transmission tower at the western end of the Survey Area adjacent to the APA Boodarie Power Station. Grey Falcons and numerous other birds of prey species frequently nest high up on transmission towers which provide nest security from predators and a vantage point from which to observe prey. The Survey Area would only comprise a fraction of the resident Grey Falcons' foraging home range and given the means with which they hunt their prey (on the wing) clearing of native vegetation for the Proposed Action, and subsequent Proposed Action activities are unlikely to negatively impact the pair.

Northern Quoll – Dasyurus hallucatus

The Northern Quoll is listed as Endangered by the EPBC Act. The Northern Quoll is a nocturnal predator, consuming invertebrates, small mammals, reptiles, birds, carrion and fruit (DCCEEW, 2017). This species is commonly found in rocky areas, with rugged rocky habitats such as gorges, gullies, escarpments, boulder fields and small caves critical for denning and shelter (DCCEEW, 2017). Drainage lines connecting rocky areas represents dispersal and foraging habitat for the species. The Northern Quoll formerly occurred across northern Australia from WA to south-east Queensland (DCCEEW, 2017). Its current distribution has severely declined from its historical distribution especially in the more arid parts of its range. Extant populations occur in the Pilbara and Kimberley regions, parts of the Northern territory and near-coastal Queensland. The species remnant populations are associated with rocky areas. Threats to Northern Quoll population include predation by feral cats, being poisoned via cane toads and a loss of habitat due to agriculture and urban developments.

No rocky habitats, critical to support Northern Quoll, are present within the Survey Area and therefore the Survey Area is unlikely to support a resident population. However, the species has been recorded approximately 4 km east-northeast of the Survey Area and given its wide foraging range (>5 km) and the proximity and connectivity of the Survey Area to the large drainage line to the east, it is possible, Northern Quoll may, albeit infrequently, forage in the eastern extent of the Survey Area.

Night Parrot - Pezoporus occidentalis

The Night Parrot is listed as Critically Endangered under the EPBC Act. Night Parrots are medium-sized, nocturnal, ground dwelling birds that are found in mature spinifex habitat in arid and semi-arid regions. Adults are mostly bright-green with extensive black and yellow markings, including streaks, spots and bars and a yellow belly (Higgins, 1999). It is very difficult to prove the presence of night parrots at the landscape scale, and even more difficult to establish absence because of the rarity and highly cryptic nature of the species. Figure 5-5 provides an indicative distribution map of the present distribution of the species based on best available knowledge.

The Night Parrot inhabits remote arid and semi-arid areas of Australia appearing to favour dense vegetation comprising old-growth (often > 50 years unburnt) spinifex (*Triodia* spp.) especially hummocks that are ring-forming for roosting and nesting. Such areas may also be associated with dense chenopod shrubs. It is thought that spinifex hummocks that are <40- 50 cm in height are not likely to provide adequate shelter for roosting and nesting (DPaW, 2017).

Night parrot Population declines and range contractions historically occurred due to a combination of interacting threats (DCCEEW, 2025). The spread of feral predators (particularly feral cats and establishment of fox populations), combined with habitat destruction and alteration caused by introduced herbivores, is likely to have reduced population size and potentially resulted in local extinction. These threats likely led to the elimination of the night parrot across much of its former distribution.

Threats vary between feeding and roosting habitats, and because night parrots rely on a variety of habitats, threat variability across these habitats makes the species subject to a wide range of threats (DCCEEW, 2025). Indeed, persistence in the landscape likely requires a sustained longterm history of safety from all major threats, an increasingly rare attribute for habitat in arid Australia that is likely to be met in few places throughout the species' former range. Threats to Night Parrot include:

- Predation by the foxes and cats;
- Habitat damage & competition caused by introduced herbivores; and
- Buffel grass (*Cenchrus ciliaris*) invasion;
- Disturbance caused by human visitation to key sites;
- Alteration of habitat and water availability associated with pastoral activities;
- Impacts associated with minerals and renewable energy development activities;
- Groundwater extraction;
- Fire regimes that cause declines in biodiversity;
- Increased temperatures and changes in rainfall; and
- Collision with fences and vehicles.

The Proposed Action is located within the Boodarie SIA, which is located close to the industrial facilities of the Port of Port Hedland as well as being adjacent to existing railway networks and also the Great Northern Highway, which is a major transport route. While suitable habitat exists within the study area, the lack of records and surrounding land uses reduces the probability of Night Parrot occupying the study area. Considering the threats to dispersal for Night Parrot, it is likely the study area occurs outside their typical range and would not support this species (Phoenix, 2024b).

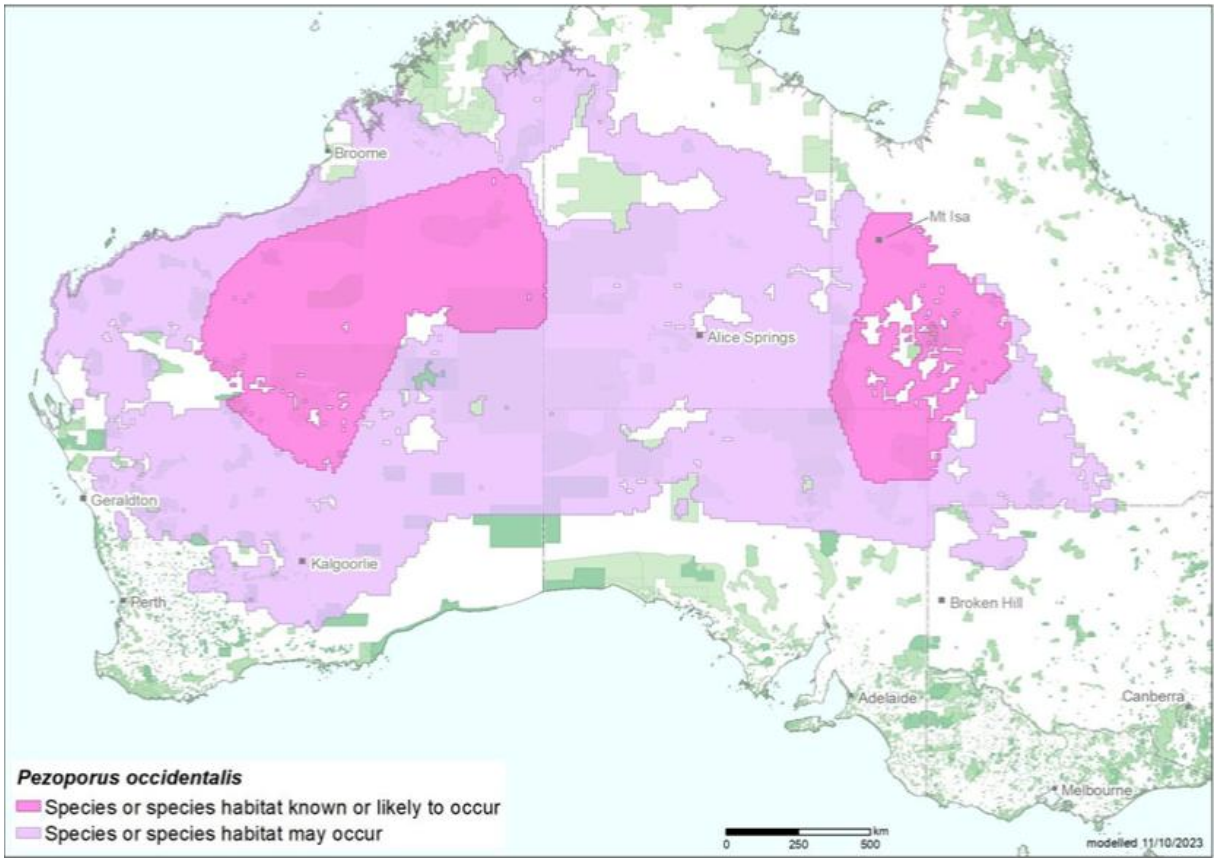


Figure 5-5: Night Parrot Indicative Distribution Map

Migratory Fauna

Two Migratory species were recorded within the Survey Area, no other migratory species were considered likely or possible to occur (Table 5-4; Figure 5-3).

Although migratory species are not always present at a site, a particular site may have significance as a seasonal or ephemeral foraging, breeding or shelter area. Impacts to these sites may then impact the population both within the site and further afield. For migratory shorebirds, a site is deemed internationally important if it regularly supports more than 1% of the flyway population of a species, or a total abundance of at least 20,000 shorebirds, and nationally important if it regularly supports more than 0.1% of the flyway population of a species, at least 2,000 shorebirds or at least 15 shorebird species (Hansen et al., 2016; DCCEEW, 2024a). None of these criteria were met for any species within the Survey Area.

Osprey – Pandion cristatus

The Osprey is listed as Migratory under the EPBC Act. The Osprey is a medium-sized raptor that generally appears singly but have been known to also occur in pairs or family groups. This species is most abundant in the northern portion of Australia, where high population densities occur in remote areas, this species is rare to uncommon within the southern parts of WA. The breeding range for the Osprey extends around the northern coast of Australia from Albany in WA to Lake Macquarie in NSW, with a second isolated breeding population on the coast of South Australia. The area of occupancy of the Osprey in Australia is estimated to be 117,400 km^2.

The Osprey occurs within littoral and coastal habitats and terrestrial wetlands of tropical Australia and offshore islands. For the most part, this species is found in coastal regions but will occasionally frequent inland areas along major rivers, particularly in northern Australia. The main threat to Osprey populations throughout Australia is the loss, degradation or alteration of habitat for urban development purposes. Another lesser threat to the population is the ingestion of prey items containing pollutants such as pesticides, heavy metal for fishing tackle. The competition for food, reduced water quality disturbance or persecution by humans and accidental mortality arising from collisions with powerlines are further examples of threats to the Osprey population numbers. Various management strategies across the eastern portion of the country have been implemented to stabilise population numbers.

Ospreys are a predominantly coastal species but also forage in mangroves and other large water bodies where they almost exclusively prey on large fish. The habitats present within the Survey Area are unlikely to provide any utility to the species and therefore will not be impacted by the Proposed Action.

Fork-tailed Swift – Apus pacificus

The Fork-tailed Swift is listed as Migratory under the EPBC Act. The Fork-tailed Swift is a non-breeding visitor to Australia between September and April (Boehm, 1962). While it can be common further north, in southwest Australia this species is generally scarce (Johnstone & Storr, 1998). The bird is primarily observed foraging for insects in proximity to cyclonic weather (Boehm, 1962). Although a migratory species, the Fork-tailed Swift has a large range and a large population that appears to be stable (BirdLife International, 2021b).

Fork-tailed swifts are an almost exclusively aerial species and are therefore not limited by the availability of specific terrestrial habitats. As such, the species will not be affected by the clearing of native vegetation or Proposed Action related activities within the Survey Area.

5.3 ENVIRONMENTAL VALUES

The information provided in Section 5.2 was utilised to determine the environmental values that require assessment for this factor. Environmental values were included for assessment based on the following parameters:

- Fauna species listed under the EPBC Act that were recorded, known to occur or are considered to have a high or moderate likelihood of occurring within the Survey Areas;
- Species with restricted distribution;
- Species with a degree of historical impact from threatening processes;
- Species that provide an important function required to maintain the ecological integrity of a significant ecosystem; and
- Habitat types that are important to the life history of a significant species, i.e., breeding, feeding and roosting or aggregation areas, or where they are unique or isolate habitats in the landscape or region.

The two Migratory species recorded, the Osprey and the Fork-tailed Swift are not considered to be affected by the Proposed Action due to the lack of suitable habitat within the Survey Area. Ospreys are a predominantly coastal species, and the Fork-tailed Swift is an almost exclusively aerial species. Therefore, these species have not been considered further in this assessment.

The Northern Quoll was considered possible to occur due to a relatively recent (2018) record 4.5 km from the development envelopes. There is no critical denning or highly productive foraging habitat (complex rocky habitats) present in the Survey Area. The Drainage Line habitat may be considered as suitable dispersal habitat and therefore the Northern Quoll has been considered as a key environmental value requiring assessment.

Section 5.2.5 identified five significant fauna species that were recorded or considered possible to occur within the Survey Area. These species have the potential to be impacted by the Proposed Action and therefore have been considered as key environmental values requiring assessment.

Section 5.2.5 identified that no confirmed SREs were identified within the Survey Area however two potential SRE species were recorded. No habitats were identified as being restricted to the development envelopes and all habitats were deemed to be low value SRE habitat. Therefore, SRE's have not been considered further in this assessment.

Two fauna habitats were identified as being restricted and/or isolated, Open Woodlands and Drainage Line habitat. Sandplain habitat was identified as critical habitat for Bilby. These habitats are considered significant and therefore require assessment.

The following Environmental Values were therefore determined to require assessment for impacts on MNES:

- General fauna species and habitat (provides a general assessment of fauna assemblages and habitat for MNES species); and
- Listed significant fauna species.

5.4 POTENTIAL IMPACTS

Table 5-5 defines the potential impacts (direct, indirect and cumulative) on the environmental values for this factor in a local and regional context. Assessment of the potential impacts is provided in the following sections.

Table 5-5: Potential Impacts on Terrestrial Fauna

Environmental value and current extent	Potential direct impact	Potential indirect impact	Impacts associated with other Proposed Actions	Total cumulative impact
General fauna and habitat Current habitats are relatively undisturbed, all vegetation associations have more than 90% of their pre-European extent remaining (Least Concern)	Up to 390 ha of native fauna habitat disturbance. Death or injury of fauna due to vehicle strike or earthmoving equipment.	Increased predation or competition from introduced fauna. Alterations to fauna behaviour (including feeding or breeding characteristics) as a result of elevated dust, light or noise emissions. Alteration of habitat characteristics as a result of changes to the surface water regime. Reduction in habitat health as a result of: • Increased sedimentation during construction; • Leaks or spillages of hydrocarbons or chemicals; and • Introduction or spread of weed species.	The Proposed Action occurs within the Boodarie SIA. It is anticipated that up to 80% of the SIA will be cleared to allow the development of additional projects in the SIA. Therefore, it is anticipated that there will be additional clearing of up to 3,166 ha.	Up to 3,556 ha of disturbance to native fauna habitat. Potential indirect habitat health impacts.
Bilby Up to 1,409.6 ha of sandplain habitat (critical habitat) was recorded within the Survey Area. Up 24.3 ha of potential foraging/dispersal habitat was recorded within the Survey Area including; • 15.4 ha of Open Woodlands; and • 8.9 ha of Drainage Area.	Up to 386.1 ha (26.9 % of Survey Area) of disturbance to habitat, 378.1 ha of which is considered to be critical habitat (sandplain).	Increased predation or competition from introduced fauna. Alterations to behaviour (including feeding or breeding characteristics) as a result of elevated light or noise emissions.	As above	Up to 3,556 ha of disturbance to native fauna habitat which includes 378.1 ha of critical habitat and 8 ha of potential foraging/dispersal habitat Potential indirect habitat health impacts.
Grey Falcon and Night Parrot Up to 1,433.9 ha of potential foraging habitat was recorded within the Survey Area including; • 15.4 ha of Open Woodlands; • 1,409.6 ha of Sandplain; and • 8.9 ha of Drainage Area.	Up to 386.1 ha (26.1% of Survey Area) of disturbance to potential foraging habitat.	Increased predation or competition from introduced fauna. Alterations to behaviour (including feeding or breeding characteristics) as a result of elevated light or noise emissions.	As above	Up to 3,556 ha of disturbance to native fauna habitat which includes 386.1 ha of potential foraging habitat. Potential indirect habitat health impacts.

Environmental value and current extent	Potential direct impact	Potential indirect impact	Impacts associated with other Proposed Actions	Total cumulative impact
Northern Quoll Up to 8.9 ha of potential foraging/dispersal habitat (Drainage Area) was recorded within the Survey Area.	Up to 1.6 ha (18% of Survey Area) of disturbance to potential foraging/dispersal habitat.	Increased predation or competition from introduced fauna. Alterations to behaviour (including feeding or breeding characteristics) as a result of elevated light or noise emissions.	As above	Up to 3,556 ha of disturbance to native fauna habitat which includes 1.6 ha of potential foraging/dispersal habitat. Potential indirect habitat health impacts.

5.5 ASSESSMENT OF IMPACTS

The following sections assess the potential impacts on each environmental value identified in Section 5.3.

5.5.1 GENERAL FAUNA SPECIES AND HABITAT

Direct Disturbance

The Proposed Action will result in the direct disturbance of up to 386.1 ha of vegetated terrestrial fauna habitat (excludes already cleared areas of 3.9 ha) (Figure 5-6). There are several items of note during this assessment:

- All the vegetation to be disturbed is considered to be in Good to Excellent condition; and
- The Proposed Action is located in the Boodarie SIA which has been zoned for the purposes of industrial development.

When assessing the disturbance associated with the Proposed Action at a regional scale, the majority of the disturbance will occur within two vegetation associations; '589: Short bunch-grass savanna/ Grass Steppe', and '647: Shrub-steppe' For a detailed description of these vegetation associations, refer to Section 4.

Table 5-6 lists out the potential direct impacts to fauna habitats mapped during the surveys.

Table 5-6: Potential direct impacts to fauna habitats

Fauna habitat types	Extent within Survey Areas	Extent within development envelopes	Current extent in Indicative Disturbance Footprint (ha) and %
Open Woodland	15.4	12.8	6.4 (41.6% of surveyed extent)
Sandplain	1,406.9	936.0	378.1 (26.9% of surveyed extent)
Drainage Line	8.9	8.3	1.6 (18.0% of surveyed extent)
Cleared/ disturbed	45.1	19.8	3.9 (8.6% of surveyed extent)

An assessment of the impacts of the direct disturbance of fauna habitat has been provided below and is shown in Figure 5-6. Where more detail is warranted, it has been provided in subsequent sections:

- **Open Woodland** – Up to 6.4 ha of this habitat is proposed to be disturbed. This equates to 41.6% of the extent within the Survey Area. This habitat is not restricted to the development envelope but has been identified as habitat for the Grey Falcon and Bilby. As such this habitat type has been discussed in further detail in Section 5.5.3 and Section 5.5.2;
- **Sandplain –** Up to 378.1 ha of this habitat is proposed to be disturbed. This equates to 26.8% of the extent within the Survey Area. This habitat is not restricted to the development envelope but has been identified as habitat for Bilby and Grey Falcon. As such this habitat type has been discussed in further detail in Section 5.5.2 and 5.5.3; and

- **Drainage Line –** Up to 1.6 ha of this habitat is proposed to be disturbed. This equates to 18.0% of the local extent within the Survey Areas. This habitat is not restricted to the development envelopes and has been identified as an important habitat for Grey Falcon, Bilby and Northern Quoll. As such this habitat type has been discussed in further detail in Section 5.5.3, Section 5.5.2 and 5.5.4.

Offsets proposed in Section 7 for the loss of native vegetation are proposed to also counterbalance the loss of native fauna habitat.

Fauna Vehicle Strike

There is a risk of fauna death or injury during clearing, operations or transport. The majority of birds and larger fauna would be expected to flee the areas to be cleared as the equipment approaches. It is likely however that there will be some fauna injuries or deaths during these activities. PHI will implement management measures to minimise this likelihood (refer to Section 5.6).

Vehicle strike may lead to fauna injuries or fatalities as light vehicles and trucks will regularly use the access road. Vehicle speed limits within the EIDE will be the responsibility of Main Roads WA. Internal roads under PHI control (i.e. in the PDE) will be speed restricted to reduce the likelihood of vehicle strike.

Based on the above, any fauna strike impacts are likely to be rare and not significant on a local or regional scale.

Increased Predation

Phoenix (2024b) recorded two introduced species during fauna surveys including Cats (*Felis catus*) and foxes (*Vulpes vulpes*). The Proposed Action has the potential to introduce additional species or increase the population of existing introduced species, through the following vectors:

- Food wastes at work areas; or
- Presence of additional cleared corridors that may be utilised by introduced fauna for access or predation.

The appropriate management and disposal of food wastes (refer to Section 5.6) will ensure that food wastes do not attract fauna to the area. No pets will be brought to site.

With the implementation of controls (refer to Section 5.6) potential introduced fauna impacts described above are expected to be able to be appropriately mitigated such that impacts to fauna are not significant on a local or regional scale.

Altered Fauna Behaviour

The Proposed Action will produce low levels of artificial light, vibration and noise emissions. The main source of emissions will be the process and pellet plant. Equipment moving within the development envelope will produce noise emissions however this will be limited to the indicative disturbance footprint. Nevertheless, it is expected that some fauna will keep their distance from the development envelopes while operating.

With the implementation of controls (refer to Section 5.6) potential increased risks to fauna from light, vibration or noise emissions are expected to be able to be appropriately mitigated such that impacts are not significant on a local or regional scale.

Hydrocarbon Spills

Hydrocarbon spills associated with hydraulics failures on machinery and refuelling spills may occur on occasion in operational areas. Spills generally result in no impact due to refuelling and other hydrocarbon transfers occurring within bunded areas. Where a spill does occur on unbunded ground, they result in a defined area of hydrocarbon-contaminated soil that can be remediated via passive means such as bioremediation.

Proposed control measures are identified in Section 5.6 and are designed to further reduce the risk of fauna habitat impacts from hydrocarbon spillage.

Changes to the Surface Water Regime

Impacts associated with the surface water regime are expected to be minor and unlikely to significantly affect fauna habitat. As part of the Boodarie SIA planning process, a District Water Management Strategy has been approved by DWER. There is a level of uncertainty regarding other projects which may be developed within the Boodarie SIA and how they will impact surface water regimes. However, under the District Water Management Strategy a coordinated approach to surface water management across the Boodarie SIA will be implemented to ensure ecological protection (GHD, 2013). As part of development approvals, PHI will need approval for a Local Water Management Strategy that aligns with District Water Management Strategy and demonstrate that changes in surface water regimes do not cause significant ecological damage. The minor changes to the surface water regime are unlikely to cause significant impacts to terrestrial fauna habitat.

Dust Deposition

There is the potential for deposited dust to affect the health of susceptible vegetation, and therefore fauna habitat, by adversely affecting photosynthesis and transpiration rates. The Proposed Action is located within the Boodarie SIA with an existing elevated level of dust deposition. PHI will implement a standard dust mitigation measures to ensure dust levels, associated with the Proposed Action, are reduced to a negligible level.

Altered Fire Regimes

Fire is a known disturbance mechanism in the Pilbara region of WA, with evidence of fire identified during flora/vegetation surveys for the Proposed Action (Phoenix, 2024a). In particular the northernmost and southernmost surveyed areas appear to be more fire affected than the central region (Phoenix, 2024a).

Processing facilities have the potential to ignite bushfires through hot work and other activities, however with appropriate firefighting and prevention management measures, the development of the Proposed Action will improve the ability to immediately fight fire outbreaks and prevent them from spreading. Through the planning approvals process, a coordinated approach to fire management across the Boodarie SIA is also required (Urbis, 2017). The potential for increased fire risk is therefore expected to not be significant.

Weeds

Weeds have the potential to reduce habitat quality by outcompeting and displacing native vegetation if introduced or conditions are altered to favour their growth. Weeds may be spread and/or introduced by vehicles and equipment, resulting in soil and weed vegetative material being transported around site and being present on equipment entering and exiting site.

No Declared Pests or WoNS were recorded during flora/vegetation surveys for the Proposed Action, however four introduced species were identified. Standard weed hygiene will be implemented to ensure no introduction of new species or spread of existing species and any increased competition with native species.

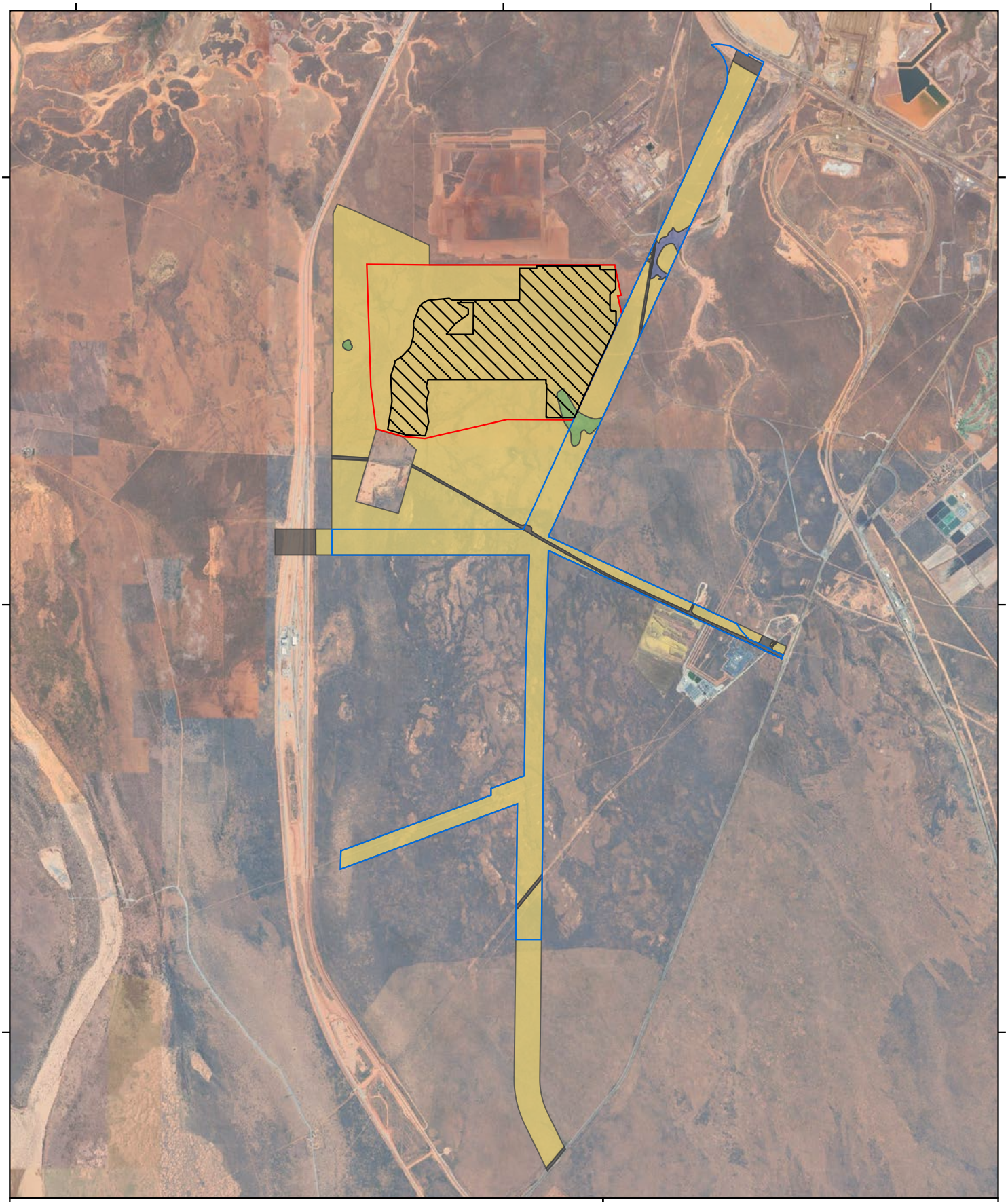


Figure 5-6: Indicative direct disturbance to fauna habitat

5.5.2 BILBY

The Bilby is listed as Vulnerable under the EPBC and BC Acts. Prior to European settlement the Bilby frequently occurred across the-quarters of the Australian continent in semi-arid and arid zones. Since European settlement, largely due to the introduction of feral species and alterations to habitat, the Bilby currently occupies 20% of its original range. The species recorded within the development envelopes with sources of previous and current evidence of Bilby activity uncovered during Phoenix's (2024b) survey. All recent odorous scats and loose sandy spoil associated with diggings were located near the northern boundary of the Survey Area. Phoenix (2024b) identified Bilby habitat across the PDE and EIDE. Based on this, it is likely that most of the Boodarie SIA would be considered Bilby habitat due to the extent within the surveyed area.

Sandplain habitat is considered critical habitat for the Bilby and is widespread across the Pilbara. Critical habitat is defined as any area where the Bilby is known or likely to occur, as shown in Figure 5-4 (DCCEEW, 2023a). Based on this, any disturbance within the 216,636,018-ha area, identified within the Recovery Plan, is considered to be disturbance to critical Bilby habitat. This also means that there is also no possible alternative design that would avoid habitat considered critical for Bilby.

Up to 1,409.6 ha of potential critical habitat was recorded within the Survey Area. Up to 378.1 ha (26.8% of Survey Area or 0.0001% of regional extent) may be disturbed as a result of the Proposed Action. Additionally, up to 8 ha of disturbance to potential foraging/dispersal (Minor Drainage and Open Woodland) habitat is required. No indirect impacts are expected to result in further disturbance to Bilby habitat. Given the Proposed Action's location relatively near residential areas and existing industrial facilities, close proximity to the Great Northern Highway which is a major transport route and introduced fauna observations inclusive of foxes and cats which are a known threat to the Bilby.

Given the Proposed Action's impact on Bilby habitat, an additional cumulative impact assessment on the critical habitat was conducted for this species. Projects with publicly available information on disturbance to Bilby habitat within 100 km of the Project were included. The Port Hedland Solar Project, Hemi Gold Project and Telfer - Havieron Gold Mining Project will all result in additional impacts to Bilby habitat.

Table 5-7: Cumulative disturbance to critical Bilby Habitat (ha)

Habitat	Proposed Action	Port Hedland Solar Project	Hemi Gold Project	Telfer – Havieron Gold Mining Project	TOTAL
Sandplain habitat	378.1	200.0	5,900.0	493.6	6,971.7

Cumulative loss of Bilby habitat is considered a threat to the species (Commonwealth of Australia, 2023). PHI has assessed the loss of habitat as being a significant residual impact and offsets are proposed to counterbalance those impacts.

Based on the above assessment, the Proposed Action is predicted to result in impacts to 378.1 ha of critical habitat. While these habitats are wide-ranging in the area, these impacts to the Bilby are nevertheless considered significant, and therefore offsets are proposed under the PEOF to counterbalance the impacts to these species in Section 7.

5.5.3 GREY FALCON

The Grey Falcon is listed as Vulnerable under the EPBC Act. A breeding pair and single fledged juvenile were recorded perched on a transmission tower at the western end of the Survey Area adjacent to the Alinta Power Station. The species occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and WA. The species is mainly found where annual rainfall is less than 500 mm, except when wet years are followed by drought, when the species might become marginally more widespread, although it is essentially confined to the arid and semi-arid zones at all times (TSSC, 2020).

The Grey Falcon is only restricted by habitat in relation to roosting sites (inland drainage lines, grasslands, sparse wooded lowlands, often using old nests and communication towers etc.) and its foraging range is widespread due to its prey mainly being other birds. The tussock grassland habitat is used widely for hunting by the Grey Falcon (Garnett and Crowley, 2000). In the Pilbara, the Grey Falcon is mostly recorded from the coastal plain between the De Grey and Ashburton Rivers. The preferred habitat of this species comprises lightly wooded coastal and riverine plains.

Given the wide-ranging nature of this species, all habitat types within the development envelopes are considered potential foraging habitats:

- Sandplain;
- Drainage Area; and
- Open Woodlands.

Up to 1,433.9 ha of potential Grey Falcon broad foraging habitat was recorded within the Survey Area. Up to 386.1 ha (26.1%) may be disturbed as a result of the Proposed Action. It is likely that the Proposed Action would only comprise a fraction of the resident Grey Falcons foraging home range. Given the means with which they hunt their prey (on the wing), the clearing of native vegetation for the Proposed Action, which does not include any areas of heavily wooded drainage lines, and subsequent activities are unlikely to negatively impact the recorded pair of Grey Falcons.

No indirect impacts, including from weeds, altered fire regimes, surface water and wind erosion and dust, noise, lighting and vibration are expected to result in further disturbance to Grey Falcon and their habitat given the management measures proposed to manage these potential impacts through the Fauna Management Plan as well as additional State environmental and planning approval requirements.

As the Grey Falcon is known to perch on transmission towers, the installation of any powerlines and similar structure are unlikely to indirectly impact on the Grey Falcon.

Given the Proposed Action is located within an area set aside as a strategic industrial area where there is existing industrial development, proximity to the Great Northern Highway and observations of feral fauna, Grey Falcon habitat within the development envelopes is considered poor quality. This further reduces the potential for indirect impacts from the Proposed Action.

The location within the Boodarie SIA also means that impacts to more pristine parts of the Pilbara, where there are currently no direct or indirect impacts on Grey Falcon and their habitat are avoided. Based on the above assessment, the Proposed Action is predicted to result in direct impacts to 386.1 ha of broad foraging habitat.

Given the scale of disturbance, the impacts to the Grey Falcon are considered significant, and therefore offsets are proposed under the PEOF to counterbalance the impacts to these species in Section 7.

5.5.4 Northern Quoll

The Northern Quoll is listed as Endangered under the EPBC Act. The Northern Quoll considered as possibly occurring in the Survey Area. There is a relatively recent record identified 32 km and 43 km from the Survey Area and a nearby record 4 km east-northeast of the Survey Area which was identified in 2012. Given its wide foraging range (>5 km) and the proximity and connectivity of the Survey Area to the drainage line to the east, it is possible that Northern Quoll may infrequently forage in the Drainage Area habitat. Up to 8.9 ha of Drainage Area habitat was recorded within the Survey Area. Up to 1.6 ha (18.0%) may be disturbed as a result of the Proposed Action.

There is no suitable denning habitat within or in the vicinity of the Proposed Action and no Northern Quoll were recorded during the survey of the development envelopes (Phoenix, 2024b). In addition, there are no structurally diverse woodlands or forest areas containing large diameter trees that would be considered habitat critical for survival of the species.

The species may disperse through the development envelopes based on the recent records (Phoenix, 2024b) in the surrounding area. However, given the Proposed Action will be located relatively near residential areas and existing industrial facilities it is not considered dispersal habitat connecting populations important for the long-term survival of the Northern Quoll.

No indirect impacts are expected to result in further disturbance to Northern Quoll habitat.

Based on the above assessment, the Proposed Action is predicted to result in impacts to 1.6 ha of potential foraging/dispersal habitat. Dispersal within this area will not be restricted and impact to this area will be minimised wherever possible. The Northern Quoll is wide-ranging, and this small scale impact is not considered significant and therefore no offsets are proposed.

5.5.5 Night Parrot

The Night Parrot is listed as Critically Endangered under the EPBC Act. The Night Parrot is considered unlikely to occur in the Survey Area. The distribution and numbers of Night Parrots declined severely after European settlement. The species was presumed extinct for a century, until a population was rediscovered in 2013. Night Parrots are very difficult to monitor and remain one of Australia's most cryptic species, being nocturnal, primarily ground-feeding parrots, that inhabit remote arid and semi-arid areas of Australia. Previously found throughout most of arid and semi-arid WA, since 2017 all night parrot records from WA have occurred in central and northern areas of WA's interior (DBCA, 2024). No Night Parrot were recorded during the survey of the development envelopes (Phoenix, 2024b).

Research from Queensland (QLD), coupled with recent observations from WA, provide insight into Night Parrot ecology and habitat requirements. At the landscape scale, Night Parrots require two distinct habitats:

- Patches of low, dense vegetation in which they roost during the day; and

- Nearby floodplains or other low-lying areas supporting diverse assemblages of native grasses and herbs in which to feed at night.

Both roosting and foraging habitat is typically on flat or gently sloping ground, and is very open, with few trees or shrubs. Night parrots have been known to fly up to 10 km from their roosting sites during foraging expeditions, and possibly further (Murphy et al. 2017), so foraging habitat is not necessarily within or immediately adjacent to roosting areas (DBCA, 2024).

Roost sites may be occupied for extended periods of several months, up to several years, and are also used by the birds for breeding. This can occur at any time of year if there have been significant rainfall events (Murphy et al. 2017a). These roosting and breeding sites are 'long-term stable roost sites'. All contemporary roosting/breeding observations have been from *Triodia* dominated habitats, but historically Night Parrots have also been reported roosting at sites dominated by chenopods, such as samphire and *Sclerolaena*, and in some cases lignum. Structurally and topographically, these chenopod-dominated sites are similar to known *Triodia* dominated roost sites.

At the local (site) level, long-term stable roost sites are found in areas that support long unburnt *Triodia* hummocks, especially *Triodia* species that are ring-forming, such as *Triodia longiceps*. The *Triodia* is typically structurally complex, with a mix of hummock sizes. A roosting site is typically a few hectares in area and occupied by a pair or small groups of 3-4 birds (probably adults and dependent young).

Phoenix did not record any Night Parrot despite a targeted survey effort in accordance with EPA Guidance. There are a number of factors which would greatly reduce the risk of Night Parrot occurring within the development envelopes. Primarily, the Proposed Action is located within a SIA with existing industrial facilities immediately adjacent to the development envelopes. This includes a railway line to the west, Great Northern Highway to the south and a Power Station to the southeast. Additionally, the area is prone to fires and feral predators which make the habitat unsuitable for the Night Parrot. For these reasons, it is unlikely that any of the vegetation within the development envelopes would support the Night Parrot and therefore clearing of 386.1 ha of vegetation is not expected to impact the species.

5.6 MITIGATION

PHI has mitigated the potential impacts to this factor according to the mitigation hierarchy; avoid, minimise, rehabilitate and offset.

5.6.1 AVOID

The key avoidance mechanism implemented by PHI was the design of the development envelopes to avoid key habitat features associated with terrestrial fauna. The Proposed Action has been reduced to the minimum possible footprint to avoid disturbance where possible.

The Proposed Action avoids disturbance of any Major Drainage Line habitat. There is no disturbance of any large trees associated with watercourses that would be considered critical breeding habitat for the Grey Falcon.

As for flora and vegetation, the Proposed Action is located within an area set aside as a Strategic Industrial Area where there is existing industrial development and is not located in undeveloped pristine parts of the Pilbara remote from any supporting infrastructure. It therefore avoids impacts to fauna and fragmentation of fauna habitat in these pristine undeveloped areas.

5.6.2 Minimise

The following mitigation measures are proposed to ensure that direct and indirect impacts to terrestrial fauna are minimised:

1. **Implement industry best practice management measures for terrestrial fauna:**
    a. Fauna Management Plan (Appendix 3) which includes commitments to minimise impacts to Bilby and Bilby habitat. In particular PHI intends to implement an exclusion zone around any active Bilby burrows. In the absence of published information on buffer zones, the size of the exclusion zones are based on those implemented for other projects in the region and provide for the protection of the burrow until the Bilby have relocated ;
    b. Clearing is to be conducted on an as-needed basis, to avoid and/or minimise disturbance of any significant fauna habitat;
    c. Minimise clearing by utilising existing access tracks and disturbance where practicable; and
    d. Offset payments to the PEOF may be required for the loss of Good to Excellent quality vegetation/ fauna habitat.
2. **Obtain and comply with the following approvals:**
    a. Ministerial Statement to be issued under Part IV of the EP Act;
    b. EPBC Act approval;
    c. Works Approval(s) and Licence to be issued under Part V of the EP Act; and
    d. DG Licence issued under the DG Act if required; and
3. **Implement the measures to minimise the risk and impact of hydrocarbon spills and other contamination**.

5.6.3 Rehabilitate

The key rehabilitation measures that relate to terrestrial fauna are summarised below:

1. All infrastructure will be removed; and
2. The development envelopes will be revegetated with local native species.

The Proposed Action is required to sign a Lease with the State Government under the LAA. PHI expects that the terms and conditions of the lease will require decommissioning and rehabilitation of the Proposed Action at the end of its operational life, which will ensure rehabilitation measures are implemented.

5.6.4 Offsets

After the implementation of the mitigation measures described above, it is predicted that the Proposed Action will have an unavoidable significant residual impact on:

- Critical Bilby habitat; and
- Foraging habitat for the Grey Falcon.

Proposed offsets for these significant residual impacts are discussed in detail in Section 7 and the IRP in Appendix 2.

5.7 PREDICTED OUTCOME

PHI has incorporated avoidance, minimisation and rehabilitation measures into the Proposed Action design and operational processes, however some direct impacts to terrestrial fauna are unavoidable. The Proposed Action will result in disturbance to 386.1 ha of native vegetated fauna habitat, in a relatively uncleared landscape. All of this vegetation is considered to be in Good to Excellent condition, no poor or degraded vegetation was recorded in the survey.

Evidence of the Bilby was recorded in the survey and is listed as Vulnerable under the EPBC Act. It is primarily threatened predation by foxes and feral cats and loss and fragmentation of breeding and foraging habitat as a result of vegetation clearing. Sandplain habitat has been identified as critical habitat for the Bilby. This habitat is present throughout the development envelopes. However, Sandplain habitat is widespread across the Pilbara and critical habitat is defined as any area where the Bilby is known or likely to occur, as shown in Figure 5-4. This constitutes up to 216,636,018 ha of habitat. Therefore, disturbance of up to 378.1 ha of habitat (0.0001% of regional extent) within a SIA is unlikely to result in a significant impact on the species. Nevertheless, after the implementation of avoidance, minimisation and rehabilitation mitigation measures, disturbance of 378.1 ha of critical habitat is deemed to be significant and is proposed to be counterbalanced by offsets, outlined in Section 7 and the IRP in Appendix 2.

The Grey Falcon was recorded in the survey and is listed as Vulnerable under the EPBC. Sandplain, Open Woodlands and Drainage habitat was considered potential foraging habitat for Grey Falcon. The Grey Flacon is wide ranging with a distribution across the arid and semi -arid zone of Australia and prey on smaller bird species. The Proposed Action will require up to 386.1 ha of disturbance to potential foraging habitat which is deemed to be significant and is proposed to be counterbalanced by offsets, outlined in Section 7 and the IRP in Appendix 2.

The Northern Quoll was considered possible to occur within the Survey Area and is listed as Endangered under the EPBC. The Drainage Area may provide potential foraging/dispersal habitat for the species, particularly considering the relatively recent record (2018) approximately 4.5 km from the development envelopes. The Proposed Action will require up to 1.6 ha of disturbance to potential foraging/dispersal habitat. Dispersal within this area will not be restricted and impact to this area will be minimised wherever possible. The Northern Quoll is wide-ranging, and this small scale impact is not considered significant and therefore no offsets are proposed.

The predicted outcomes for Terrestrial Fauna are therefore:

- Disturb no more than the following environmental values:
    - 386.1 ha of fauna habitat of in Good to Excellent quality condition;
    - 378.1 ha of critical habitat for the Bilby;
    - 1.6 ha of foraging/dispersal habitat for Northern Quoll; and
    - 386.1 ha of foraging habitat for Grey Falcon.

If the Proposed Action is approved, the Ministerial Statement is likely to contain a condition requiring the finalisation and implementation of the IRP provided in Appendix 2. The offset

measures will be reviewed and refined in the IRP and will be informed by discussions with DEMIRS, DBCA, DCCEEW to ensure they adequately counterbalance the residual impacts.

6 SOCIAL AND ECONOMIC MATTERS

6.1 POLICY AND GUIDANCE

Relevant Commonwealth Government guidance documents for social and economic matters are summarised in Table 6-1.

Table 6-1: Policy and guidance relevant to social and economic matters

Policy and Guidance	How guidance has been considered
Key Documents	
Generic guidelines for the content of a draft EPBC Act PER/EIS (including the objects and principles of the EPBC Act) (DotEE, 2016a)	Other Minister of the Environment (Cth) approval decision making considerations
EPBC Act Condition Setting Policy (DAWE, 2020)	This document was used as guidance for the EIA and the development of mitigation measures and likely regulation of the Proposed Action.
EPBC Act Outcomes-based conditions policy (DotE, 2016a)	This document was used as guidance for the EIA and the development of mitigation measures and likely regulation of the Proposed Action.
Relevant Technical Guidance	
Engage Early – Guidance for proponents on best practice Indigenous engagement for environmental assessments under the EPBC Act (DotE, 2016b)	This document was used as guidance for assessment and management of physical and social impacts on Aboriginal Heritage.

6.2 RECEIVING ENVIRONMENT

6.2.1 ABORIGINAL HERITAGE AND CULTURAL VALUES

Native Title / Traditional Owners

The Proposed Action is located within the Kariyarra Native Title Determination Area (Figure 6-1). KAC and Kariyarra Traditional Owners are the determined native title party for this area, including Aboriginal heritage, Aboriginal sites and Kariyarra social and cultural heritage values. The Kariyarra People's native title claim (WAD 6169 of 1998) was lodged in 1998. The Determination Area covers about 17,354 km^2 of Kariyarra traditional country and encompasses the ToPH, the Aboriginal community of Yandeyarra, several pastoral leases and mining operations (YMAC, 2024).

All Kariyarra Country and waters are important to the Kariyarra People. Some identified areas of particular cultural, historical and environmental significance within the Determination Area include Yandeyarra Reserves, the Abydos homestead and Reserve (containing many ancient rock engravings), Mumbillina Bluff, Friendly Creek, Wamaranya, Marrapikurinya, Mt Dove, Kangan, Boodarie Station, Portree Pool, Mt Francisco and Munda Station. The Kariyarra claim area has many rivers, the largest being the Yule (Kakurrka Muri) and Turner (Kapankalanha) Rivers, which are major topographic features of the Determination Area and importantly, are home to the mythological water serpent – the Warlu (YMAC, 2024).

Consultation with KAC and Kariyarra Traditional Owners will be ongoing regarding the Proposed Action, including options to minimise impacts to Kariyarra Social Surroundings. Consultation to date has considered DCCEEW's interim guidance *Engaging with First Nations People and Communities on Assessments and Approvals under the* Environment Protection and Biodiversity Conservation Act 1999 (DCCEEW, 2023c), and this guidance will be considered in ongoing consultation.

Aboriginal Heritage

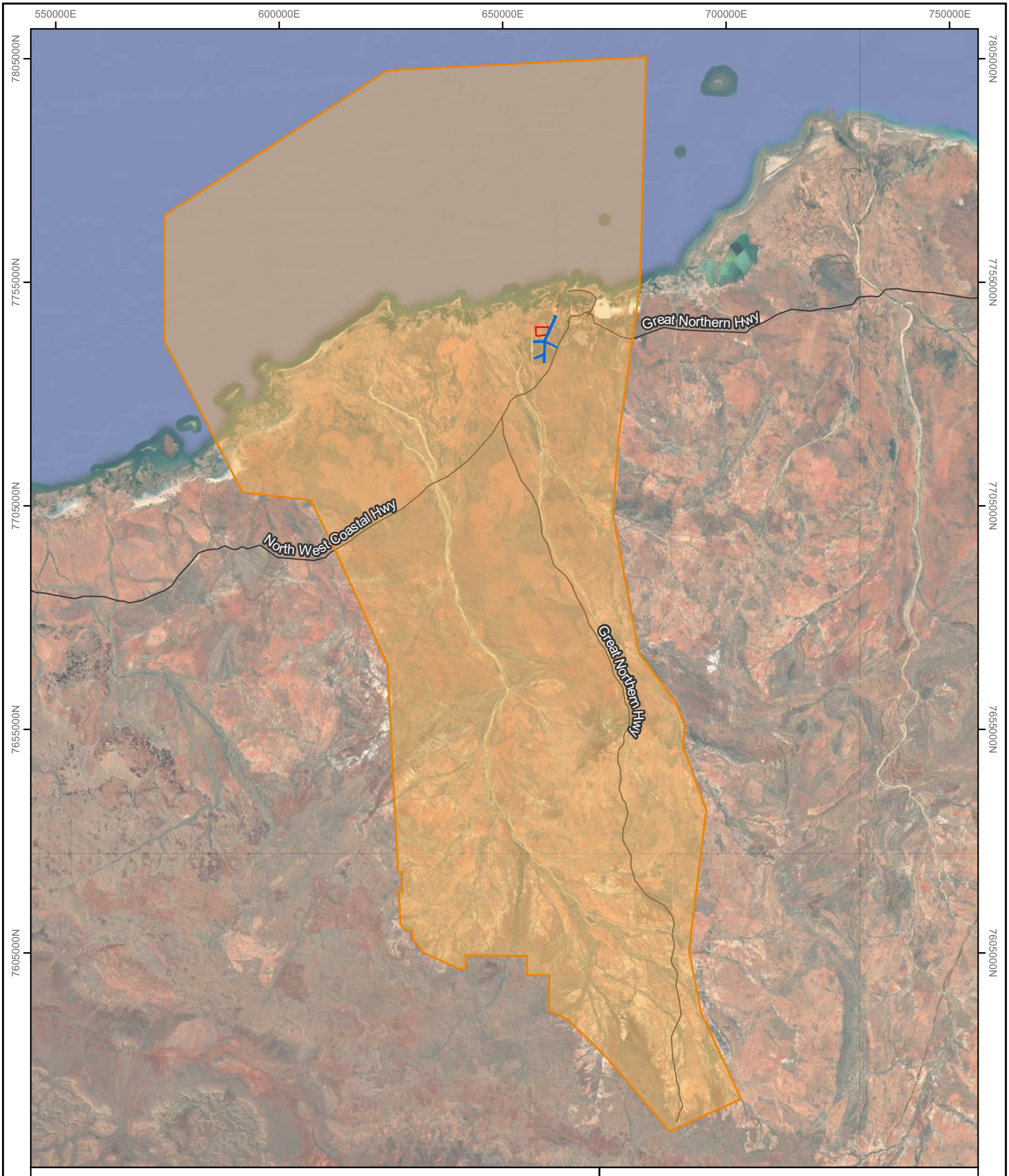
A search of the Aboriginal Cultural Heritage Inquiry System (ACHIS) was undertaken in November 2024 and did not identify any Registered Aboriginal sites within the PDE, but did identify four Registered Aboriginal sites within the EIDE (Figure 6-2), being:

- Midden (ID: 164);
- Artefacts / Scatter, Camp, Midden, Other (ID: 764);
- Artefacts / Scatter, Midden, Shell, Water Source (ID:17023); and
- Midden, Shell (ID: 25647).

An Aboriginal Site identification assessment was undertaken by RPS in 2012 across the Boodarie SIA. The survey identified three Aboriginal sites, all of which were artefact scatters. Two of these intersect the EIDE and were identified in the ACHIS search discussed above.

An archaeological heritage survey was completed within the PDE and did not identify any Aboriginal sites. Surveys within the EIDE have been undertaken by Sticks and Stones Cultural Resources Management Pty Ltd (Sticks and Stones, 2024).

PHI plans to undertake dedicated Social Surroundings consultation with KAC and Kariyarra Traditional Owners in 2025. An increased focus on Social Surroundings has developed under the EP Act in WA in recent times that considers social and cultural values around traditional uses of the land and includes Aboriginal places, objects and social/cultural landscapes. Dedicated consultation is planned to be undertaken with KAC and Kariyarra Traditional Owners to understand potential impacts to Kariyarra Social Surroundings and Aboriginal cultural and social heritage values arising from the Action.



Legend

- Plant Development Envelope
- External Infrastructure Development Envelope
- Kariyarra Native Title Determination Area (LGATE-066)

Imagery: Google Satellite

PHGS_0406_027

Figure 6-1: Kariyarra Native Title Determination Area

Preston Consulting

0 20 40 km

GDA 2020 (MGA Zone 50)

1:1,100,000 (A4)

AS

25/11/2024

EPBC 2023/09764

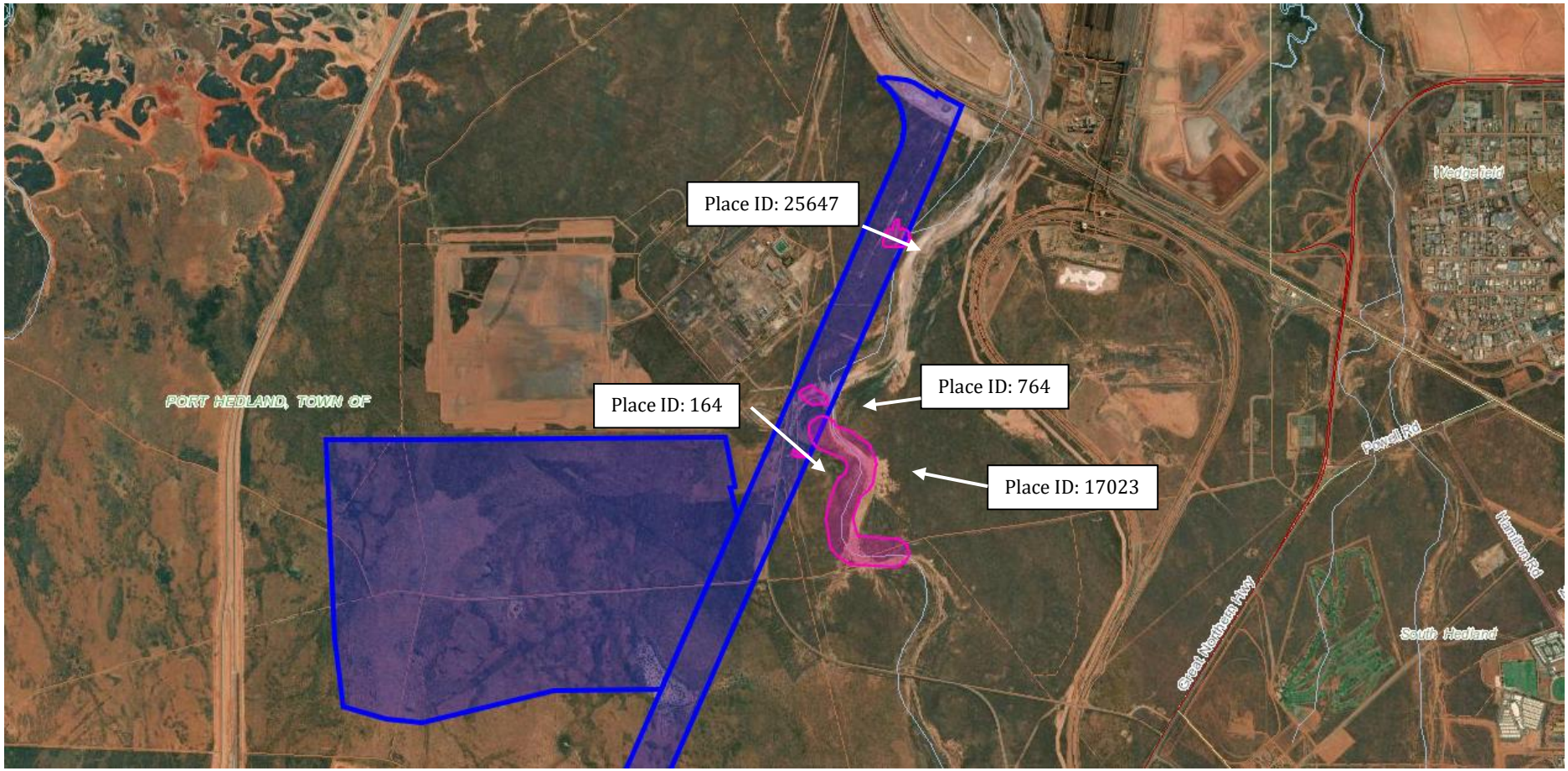
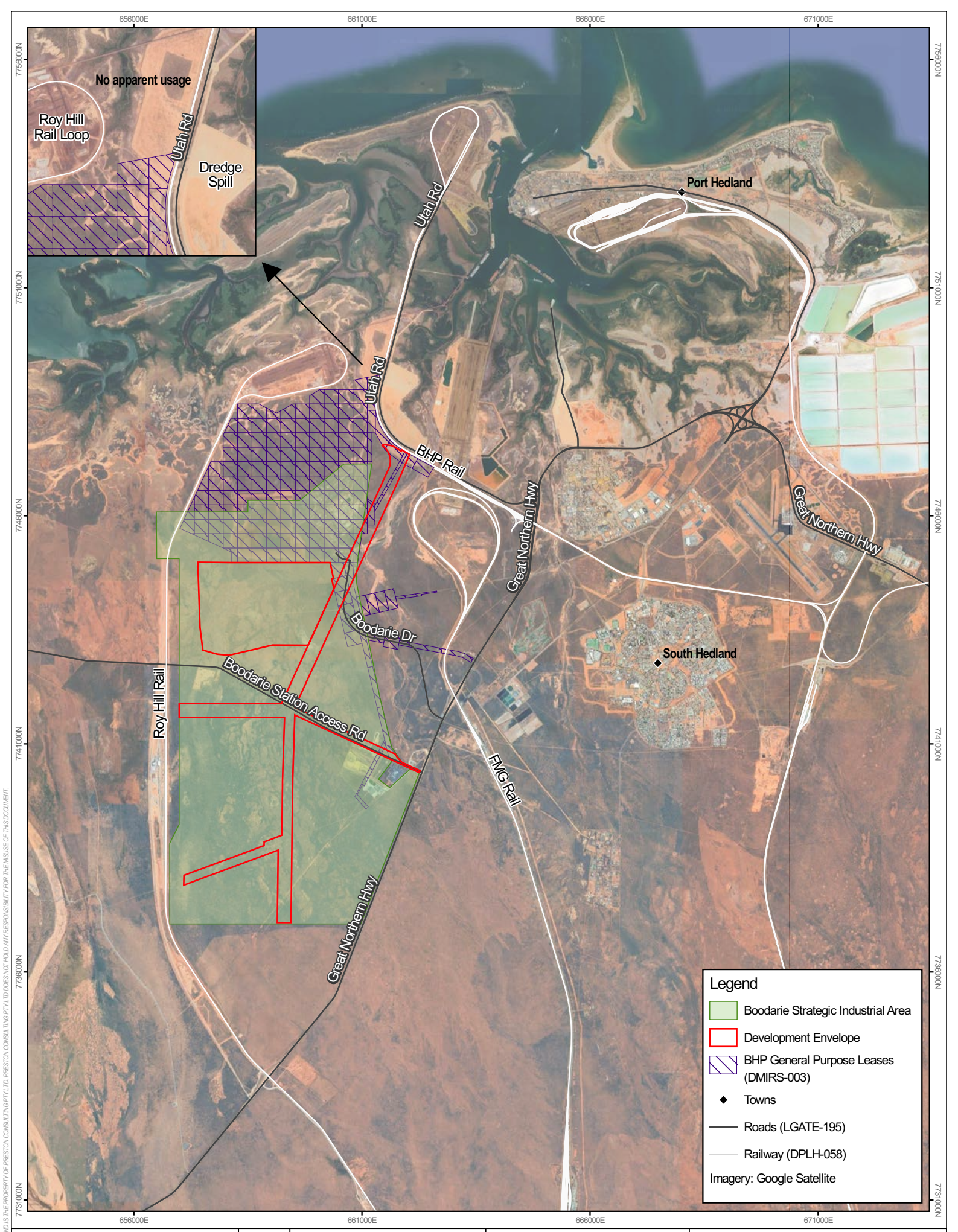


Figure 6-2: Aboriginal heritage sites recorded on the DPLH database within the development envelopes

6.2.2 CURRENT LAND USE

The Proposed Action is located within the Boodarie SIA in the ToPH. The Boodarie SIA comprises 4,000 ha of "Strategic Industry" zoned land. The Boodarie SIA is situated 4 km west of South Hedland townsite and approximately 12 km south of Port Hedland townsite in WA (Figure 2-2).

The Roebourne subregion of WA's Pilbara bioregion has a variety of land uses, including grazing, mining, conservation, and urban development. The Boodarie SIA was formerly part of the Boodarie pastoral lease. The Boodarie SIA is now surrounding by mining, transport and industrial land uses – the Great Northern Highway forms the southern boundary, the Roy Hill rail line forms the western boundary and the FMG and BHP rail lines form the eastern and northern boundaries (Figure 6-3).



THIS FIGURE IS SUBJECT TO COPYRIGHT AND IS THE PROPERTY OF PRESTON CONSULTING PTY LTD. PRESTON CONSULTING PTY LTD DOES NOT HOLD ANY RESPONSIBILITY FOR THE MISUSE OF THIS DOCUMENT.

0 1 2 km

GDA2020 / MGA zone 50

1:100,000

N

Project: PHGS_0406_036
Date: 21/05/2025
Size: A4
Author: ASmithers (Preston Consulting Pty Ltd)

Preston Consulting

Figure 6-3: Current land use

EPBC 2023/09764

6.2.3 Local Residents and Community

The Proposed Action is located entirely within a SIA with no current identified recreational or community uses. Recreational activities are limited within this area due to the zoning and use of firearms would not be safe due to the proximity of people. Boodarie SIA has a buffer zone which is recognised as a Special Control Area. The Special Control Area prevents the establishment of any new sensitive receptors within this area and provides a buffer to ensure land use conflicts are avoided and amenity impacts are avoided or minimised.

One area is noted to have been used for illegal "bush parties".

6.3 Potential Impacts

The Proposed Action will have an unavoidable direct impact on 390 ha of land within the 4,000 ha area that has been identified by the WA Government for industrial use. The development envelopes will become largely inaccessible to the public for safety reasons.

The Proposed Action may have indirect impacts associated with social aspects including access, traffic, visual impact, and dust emissions. The Proposed Action is not expected to emit any odours that would impact on local residents and the community.

Table 6-2 defines the potential impacts (direct, indirect and cumulative) on the social values for this factor in a local and regional context. Assessment of the potential impacts is provided in the following sections, informed by the results of studies undertaken on Aboriginal heritage, dust, noise and visual impacts.

Table 6-2: Potential impacts on social values

Social value and current extent	Potential direct impact	Potential indirect impact	Impacts associated with other Proposed Actions	Total cumulative impact
Local Residents and Community	Access to the land will only be granted with appropriate safety measures.	Amenity impacts from visual, noise and dust emissions, traffic during construction or operation of the Proposed Action.	The Proposed Action occurs within the Boodarie SIA with land allocated to multiple proponents within the area. Impacts associated with other project are unknown at this stage however it is assumed that up to 80% of the SIA will eventually be developed/cleared.	• Restricted access to larger areas of BSIA. • Amenity impacts from noise and dust emissions, traffic during construction or operation of the Proposed Action. • Visual impacts from infrastructure and lighting at night.
Traditional Uses of the Land	Access to the land will only be granted with appropriate safety measures.	Amenity impacts from visual, noise and dust emissions, traffic during construction or operation of the Proposed Action.	The Proposed Action occurs within the Boodarie SIA with land allocated to multiple proponents within the area. Impacts associated with other Boodarie SIA projects (should they be developed) are unknown at this stage however it is assumed that up to 80% of the SIA will eventually be developed/cleared.	• No impact to through access of Boodarie SIA (this is not currently possible). • Restricted access to larger areas of BSIA. • Amenity impacts from noise and dust emissions, traffic during construction or operation of the Proposed Action added

Social value and current extent	Potential direct impact	Potential indirect impact	Impacts associated with other Proposed Actions	Total cumulative impact
			Existing Actions include roads, rail, port and power stations.	to those from roads, rail, port and power stations. • Visual impacts from infrastructure and lighting at night added to those from road, rail, port (distant) and power stations.
Aboriginal Heritage Sites Four identified Aboriginal Heritage Sites are located within the EIDE.	No sites are predicted to be directly impacted by the Proposed Action.	No registered Aboriginal Heritage Sites are predicted to be affected by dust emissions from construction or operation of the Proposed Action.	As above.	No direct or indirect impacts to previously recorded Aboriginal Heritage Sites.

6.4 ASSESSMENT OF IMPACTS

6.4.1 ABORIGINAL HERITAGE

PHI plans to avoid all identified heritage places through the considered placement of development with the PDE. However, if additional surveys identify Heritage sites or Social Surroundings consultation identifies Aboriginal cultural heritage values that are unavoidable in the Plant DE, PHI will consult with the Kariyarra People. Monitoring of construction activity will ensure that any inadvertent exposure of heritage materials is managed according to the requirements of the AH Act.

Within the EIDE there are existing Aboriginal heritage sites. PHI will attempt to locate all infrastructure in the EIDE outside of Aboriginal heritage sites. However, final location of any infrastructure in the EIDE is subject to agreement with JTSI, who have ultimate say on where infrastructure is located within the EIDE. Therefore, it may not be possible to avoid disturbance of Aboriginal heritage sites. Currently there is no plan to use the northern corridor of the BSIA (where the heritage sites are located).

6.4.2 TRADITIONAL USES OF THE LAND

The Kariyarra People are represented by the Kariyarra Aboriginal Corporation – the prescribed Body Corporate for the Kariyarra People. Traditional uses of the land are understood to potentially include hunting and gathering in the terrestrial and marine environments around the Proposed Action DEs.

The deep connection to the land, sea, skies, and all living things includes a spiritual, scared, and cultural connection which has been passed down through many generations and continues to be a source of identity, shaping beliefs, customs, and practices. The Proposed Action will potentially impact upon this connection.

Access to these environments close to the Port of Port Hedland and within the Boodarie SIA has already been impacted by the activities associated with the port, including rail, roads, stockpiles, wharves, conveyors and other infrastructure. The Proposed Action will result in restricted access to around 300 ha of land within the designated land allocation in the Boodarie SIA – an area with no current through-access. New access roads to the site will provide all weather access to the plant site but will not result in any through-traffic to other terrestrial or marine environments to the east or west as access will continue to be constrained by existing rail lines.

6.4.3 Local Residents and Community

As previously noted, the Proposed Action location is within a Special Control Area for the Boodarie SIA. The Boodarie SIA has an industrial buffer zone which is recognised as a Special Control Area under the Town of Port Hedland's Local Planning Scheme. The Special Control Area is intended to avoid land use conflicts and amenity impacts by preventing the establishment of incompatible land uses and sensitive receptors within proximity to the SIA.

Modelling undertaken for noise, dust and visual impacts have also shown that there will be no significant amenity impacts at sensitive receptors. State environmental and development approvals will also ensure that the Proposed Action is operated in a manner that ensures ongoing management of amenity to avoid impacts on local residents and community.

6.5 Social and Economic Benefits

The Proposed Action is also a long-term project, which will have significant long term positive benefits for the town of Port Hedland. This will be achieved through developing strategies to source as much local employment as possible, in addition to the provision of quality permanent accommodation, designed to attract and maintain the operational workforce.

The negotiation of an ILUA with the Kariyarra people will ensure the provision of compensation for the temporary loss of native title over the land within the DE (native title will not be extinguished). Further economic and social benefits will flow to the Kariyarra People through the negotiation of other mechanisms in the ILUA. PHI will continue to work with KAC and other relevant organisations to ensure employment opportunities are provided to Traditional Owners.

The Proposed Action will generate up to $37.7 billion in gross domestic profit for Western Australia, and an estimated 1,600 jobs in construction and 400 jobs during operations.

The Proposed Action will also generate broader opportunities for the WA economy. This includes downstream processing of iron ore, enabling hydrogen and energy projects, plus stimulating supporting services across a range of sectors.

Business relationships with potential service providers for green hydrogen, green power, gas, water, ore supply and accommodation are being developed.

6.6 Federal Government Funding

The Proposed Action has not received any funding from Federal Government departments or agencies so far. Although PHI is in ongoing discussions with the Federal Government on potential funding related to the Proposed Action.

6.7 SUMMARY

The Proposed Action has incorporated avoidance, minimisation and rehabilitation measures into the Proposed Action design and operational processes to ensure that social surroundings impacts are minimised.

The Proposed Action is expected to result in minor impacts to Traditional Uses of a very small portion (0.02%) of the Kariyarra Land and Local Residents and Community given the small footprint, lack of direct uses of the land and the location of the Proposed Action in an SIA.

The community of Port Hedland is critical to the Project. PHI will be active in earning consistent community support to sustain the workforce, amenities and activities associated with the Project and its social licence to operate.

7 OFFSETS

DCCEEW may apply environmental offsets where it determines that the residual impacts of a Proposed Action are significant, after avoidance, minimisation and rehabilitation have been pursued. Offsets are the last of the four steps in the mitigation hierarchy (Avoid, Minimise, Rehabilitate and Offset). They are only applied to counterbalance significant residual impacts when the other steps have already been applied to a Proposed Action. Where appropriate, offsets are considered during the assessment phase of an EIA under the EPBC Act.

The EPBC Act Environmental Offsets Policy (Department of Sustainability, Environment, Water, Population and Communities (now DCCEEW); 2012) states:

> *"The term 'environmental offsets' refers to measures that compensate for the residual adverse impacts of an action on the environment. Offsets provide environmental benefits to counterbalance the impacts that remain after avoidance and mitigation measures. These remaining, unavoidable impacts are termed 'residual impacts.' For assessments under the EPBC Act, offsets are only required if residual impacts are significant.*
>
> *Offsets can help to achieve long-term environmental outcomes for matters protected under the EPBC Act, while providing flexibility for proponents seeking to undertake an action that will have residual impacts on those protected matters."*

PHI has commissioned numerous environmental surveys and studies for the Proposed Action. The surveys determined that there were key environmental values that required protection including terrestrial fauna habitat, flora and vegetation.

7.1 SUMMARY OF SIGNIFICANT RESIDUAL IMPACTS

This Impact Reconciliation Report (IRP) has been prepared to detail the significant residual impacts of the Proposed Action to MNES habitat and provide information about how the impacts will be offset under the PEOF.

It is considered that unavoidable significant residual impacts to fauna habitat. These impacts are summarised in Table 7-1. For all other MNES, residual impacts resulting from the Proposed Action are not considered significant and offsets are not required.

Table 7-1: Summary of significant residual impacts

MNES	Residual Impacts	Offset Measure
Listed threatened species & communities (Sections 18 & 18A)		
Bilby (*Macrotis lagotis*)	Clearing of up to 378.1 ha of critical sandplain habitat.	PEOF Contribution
Grey Falcon (*Falco hypoleucos*)	Clearing of up to 386.1 ha of supporting habitat.	

7.2 DETAILS OF PROPOSED OFFSET

Table 7-2 describes the measures proposed to offset the additional residual impacts associated with the Proposal. These measures are subject to refinement as the Proposal assessment progresses, and pending discussions with influencing parties such as DBCA. PEOF funding will be maintained through indexation to the Perth CPI.

Table 7-2: Proposed offsets

Offset	Type	Details	Relevant values/MNES
Contribution to the PEOF ($3,306/ha) for direct and indirect impacts to critical habitat for Bilby (foraging habitat)	PEOF: Direct-- preservation of existing habitat and management	The aim of the PEOF is to deliver environmental offsets in the Pilbara through a strategic landscape-scale approach, building on regional programs including ranger groups, so that environmental offset outcomes are greater than the sum of individual offset contributions. The PEOF combines money from individual offset payments required under Part IV of the EP Act, and contributions required under Part 9 or 10 of the EPBC Act. The establishment of the PEOF enables the government to combine offset money and partner with regional land management organisations, to deliver projects that achieve better and more connected biodiversity conservation outcomes	Bilby
Contribution to the PEOF ($1,653/ha) for direct and indirect impacts to supporting habitat for Grey Falcon	PEOF: Direct-- preservation of existing habitat and management	As above	Grey Falcon

7.3 Assessment of Proposed Offsets

7.3.1 Assessment Against Environmental Offsets Principles

Table 7-3 provides the overarching principles that are applied in determining the suitability of offsets. In assessing the suitability of an offset, government decision-making will be informed by scientifically robust information and incorporate the precautionary principle in the absence of scientific certainty and conducted in a consistent and transparent manner.

Table 7-3: Assessment of the proposed offset against the EPBC Act offset principles

No.	Principle	Assessment outcome
1	Offsets must deliver an overall conservation outcome that improves or maintains the viability of the environmental aspect that is protected by national environment law and affected by the Proposed Action	The PEOF will target both state and Commonwealth environmental matters within areas that have legal access to support longevity for offset outcomes.
2	Offsets must be built around direct offsets but may include other compensatory measures	The PEOF will deliver environmental offsets in the Pilbara through a strategic landscape-scale approach, building on regional programs including ranger groups, so that environmental offset outcomes are greater than the sum of individual offset contributions.
3	Offsets must be in proportion to the level of statutory protection that applies to the protected matter	PEOF offset rates are based on the level of biodiversity protection in the region, and cumulative impacts to environmental values, including high quality vegetation and the conservation of significant-species habitat.

No.	Principle	Assessment outcome
4	Offsets must be of a size and scale proportionate to the residual impacts on the protected matter	The PEOF Implementation Plan (Department of Water and Environmental Regulation; DWER, 2019a) states that: "*Projects delivered through the fund must improve one or more environmental matters specified for offset contributions. Environmental matters are those for which a significant residual impact has been identified through the environmental impact assessment process*". This includes both State Government matters and Commonwealth MNES.
5	Offsets must effectively account for and manage the risks of the offset not succeeding	The PEOF have developed a Governance Framework to facilitate the coordinated delivery of environmental offset projects (DWER, 2019b). The PEOF will deliver environmental offsets in the Pilbara through a strategic landscape-scale approach, building on regional programs including ranger groups, so that environmental offset outcomes are greater than the sum of individual offset contributions.
6	Offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs	The PEOF Implementation Plan (DWER, 2019a) states that: "*Projects delivered through the fund must improve one or more environmental matters specified for offset contributions. Environmental matters are those for which a significant residual impact has been identified through the environmental impact assessment process*". This includes both State Government matters and the Commonwealth MNES.
7	Offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable	DWER will provide a report annually to contributing individuals and organisations regarding expenditure, project evaluation reports and plans for the following 12 months.
8	Offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced	The PEOF have developed a Governance Framework to facilitate the coordinated delivery of environmental offset project (DWER, 2019b). The PEOF Project Recommendation Group and Implementation Advisory Group would be responsible for the implementation of appropriate offset programs.

7.3.2 MONITORING

Routine monitoring is necessary to ensure the proposed offsets are effective in counterbalancing the significant residual impacts on the environmental values.

Contributions to PEOF will be monitored by payments made based on evidence of actual clearing starting from the date of commencement of the action and then for each subsequent 24-month period. PHI will submit to DWER evidence of each payment made within 10 business days of the date of payment.

The PEOF has an Implementation Plan which describes how the fund will be delivered over the next five years (DWER, 2019a). Monitoring, evaluation and reporting of project outputs and outcomes will be included in the delivery of all projects related to the PEOF.

7.3.3 FUNDING ARRANGEMENTS

Funding arrangements for the PEOF are expected to be established in the approval conditions in the Approval Decision.

7.3.4 MANAGEMENT, ROLES AND RESPONSIBILITIES

The overall accountability for implementing the offset IRP, and reporting on the implementation of the offsets IRP, rests with PHI. PHI will be responsible for the provision of offset funding to PEOF and the preparation of annual reports and compliance reports.

The PEOF will be adaptively managed to plan, implement, monitor, evaluate and adjust delivery over time. DWER and the DBCA, with advice from the Implementation Advisory Group, will define the desired outcomes for each environmental matter for the longer term and each funding round.

The PEOF Project Recommendation Group and Implementation Advisory Group would be responsible for the implementation of appropriate offset programs.

8 GLOSSARY

Term	Meaning
ACHIS	Aboriginal Cultural Heritage Inquiry System
AH Act	*Aboriginal Heritage Act 1972*
AHD	Australian Height Datum
APA	APA Group
AREH	Australian Renewable Energy Hub
ARENA	Australian Renewable Energy Agency
BC Act	*Biodiversity Conservation Act* 2016
BMP	Bushfire Management Plan
BWRO	Brackish Water Reverse Osmosis
CCA	Climate Change Australia
CCUS	Carbon Capture, Use and Storage
CEF	Clean Energy Finance
$CO_{2\text{-}e}$	Carbon dioxide equivalent
CPI	Consumer Price Index
Cth	Commonwealth
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DG	Dangerous Goods
DISR	Department of Industry, Science and Resources
DotE	Department of the Environment
DotEE	Department of the Environment and Energy
DPaW	Department of Parks and Wildlife (WA)
DPIRD	Department of Primary Industries and Regional Development (WA)
DPLH	Department of Planning, Lands and Heritage (WA)
DRI	Direct Reduced Iron
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EIDE	External Infrastructure Development Envelope
EIS	Environmental Impact Statement
EP Act	*Environmental Protection Act 1986* (WA)
EPA	Environmental Protection Authority (WA)

Term	Meaning
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ESA	Environmentally Sensitive Areas
GHG	Greenhouse Gas
GK	Grate Kiln
ha	Hectares
Hancock	Hancock Prospecting
HBI	Hot Briquette Iron
HDRI	Hot DRI
Horizon	Horizon Power
IBRA	Interim Biogeographic Regionalisation for Australia
ILUA	Indigenous Land Use Agreement
IOPF	Iron Processing Facility
IRP	Impact Reconciliation Procedure
JTSI	Department of Jobs, Tourism, Science and Innovation (WA)
JV	Joint Venture
KAC	Kariyarra Aboriginal Corporation
km	Kilometres
LAA	*Land Administration Act 1997* (WA)
m	Metre
m^3	Cubic metre
mm	Millimetre
MNES	Matters of National Environmental Significance
Mt	Million Tonnes
Mtpa	Million Tonnes per Annum
MW	Megawatt
NEPC	National Environment Protection Council
NVCP	Native Vegetation Clearing Permit
NZEA	Net Zero Authority
PDE	Plant Development Envelope
PEOF	Pilbara Environmental Offsets Fund
PER	Public Environment Report
PHI	Port Hedland Iron Pty Ltd
PHIC	Port Hedland Industries Council
Phoenix	Phoenix Environmental Sciences Pty Ltd
PIL4	Pilbara 4
PoPH	Port of Port Hedland
PPA	Pilbara Ports Authority

Term	Meaning
Proposed Action	Port Hedland Iron Project
PV	Production Variable
QLD	Queensland
Ramboll	Ramboll Australia Pty Ltd
RIWI Act	*Rights in Water and Irrigation Act* 1914
s91	Section 91
Santos	Santos Limited
SG	Straight Grate
SIA	Strategic Industrial Area
SRE	Short range endemic
tCO2-e	Tonnes of carbon dioxide equivalent
TEC	Threatened Ecological Communities – plant communities listed as being threatened and legally protected under the *Biodiversity Conservation Act 2016* and / or the *Environment Protection and Biodiversity Conservation Act 1999*
ToPH	Town of Port Hedland
UF	Ultrafiltration
USEPA	United States Environmental Protection Authority
Vysarn Water	Vysarn
WA	Western Australia
WoNS	Weeds of National Significance
Wood	Wood Australia Pty Ltd
Woodside	Woodside Energy Pty Ltd

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PORT HEDLAND IRON PROJECT - STAGE 1

APPENDICES

PORT HEDLAND IRON PTY LTD

PREPARED FOR PORT HEDLAND IRON PTY LTD
BY PRESTON CONSULTING PTY LTD

APPENDIX 1

PHOENIX
ENVIRONMENTAL SCIENCES

Detailed flora and vegetation survey for the Port Hedland Green Steel Project

Prepared for Port Hedland Green Steel Pty Ltd

December 2024

Final Report



Detailed flora and vegetation for the Port Hedland Green Steel Project

Prepared for Port Hedland Green Steel Pty Ltd

Version history

Author/s	Reviewer/s	Version	Version number	Date submitted	Submitted to
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EXECUTIVE SUMMARY

Port Hedland Green Steel Pty Ltd (PHGS) is progressing the development of large-scale downstream iron ore processing capability known as the Port Hedland Green Steel Project (the Project). The Project is located approximately 15 km southwest of Port Hedland, Western Australia (WA) in the Boodarie Strategic Industrial Area. PHGS intend to seek approval under Part IV of the *Environmental Protection Act 1986* (EP Act) to enable development of the Project which will consist of a pellet plant and a hot briquette iron (HBI) plant, consuming approximately 3-3.5 million tonnes per annum (Mtpa) of iron ore. Phoenix Environmental Sciences Pty Ltd (Phoenix) were engaged in February 2023 to conduct a detailed flora vegetation survey for areas that overlap sections of the Project. The survey covered an area of 1,476.3 ha.

A desktop assessment was prepared prior to the field work. The results of the desktop assessment identified the potential for 12 significant flora, and 60 introduced species, of which 6 are a Declared Pest species with 3 of those declared pests also listed as a Weed of National Significance (WoNs). No Threatened or Priority Ecological communities were recorded for the study area.

Survey design, methodology and report writing adhere to relevant principles and guidelines. The first phase of the field work was conducted from 15 to 19 April 2023. A total of 41 quadrats (50 m x 50 m) were conducted in the study area. This was then followed by the second season field work from 13 to 15 September 2023 which revisited the 41 quadrats. Targeted searches were conducted during both seasons to maximise the likelihood of finding significant flora.

Four significant flora were identified in the study area. The Priority 1 *Tephrosia rosea* var. Port Hedland and three species considered significant due to habitat range extensions. The species listed as range extensions are *Eragrostis setifolia*, *Maireana georgei*, and *Santalum spicatum*.

Two vegetation types were considered locally significant. EvGlEa, was considered locally significant with one quadrat placed in the area where this unique vegetation type is occurring. Additionally, a small patch to the west of the study area, has a strong resemblance to the locally significant area and is thus also considered locally significant. The vegetation type AsTsch, was considered significant as one population of the Priority 1 flora *Tephrosia rosea* var. Port Hedland occurred within that vegetation type.

The results of the desktop and field surveys by Phoenix provides adequate baseline data to minimise environmental impacts when developing the study area; specifically identifying relatively discrete areas that support the conservation of significant species.

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ACRONYMS AND ABBREVIATIONS

BoM	Bureau of Meteorology
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPIRD	Department of Primary Industries and Regional Development
IBRA	Interim Biogeographic Regionalisation of Australia
NES	National Environmental Significance
NVIS	National Vegetation Information System
PEC	Priority Ecological Communities
WA	Western Australia
WoNS	Weed of National Significance
EPBC	Environmental Protection and Biodiversity Conservation
UPGMA	Unweighted pair group method with arithmetic mean

1 INTRODUCTION

Port Hedland Green Steel Pty Ltd (PHGS) is progressing the development of large-scale downstream iron ore processing capability known as the Port Hedland Green Steel Project (the Project). The Project is located approximately 15 km southwest of Port Hedland, Western Australia (WA) in the Boodarie Strategic Industrial Area (Figure 1-1). PHGS intend to seek approval under Part IV of the *Environmental Protection Act 1986* (EP Act) to enable development of the Project which will consist of a pellet plant and a hot briquette iron (HBI) Plant, consuming approximately 3-3.5 million tonnes per annum (Mtpa) of iron ore.

In February 2023, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by PHGS to undertake a Detailed flora and vegetation survey for the Project.

The purpose of the survey was to delineate key flora values for the proposal to inform the environmental assessment and approvals process, as well as provide context for the preparation of Environmental Impact Assessment documentation.

1.1 SCOPE OF WORK

The scope of work for the Detailed flora and vegetation survey. was as follows:

- Desktop study:
    - identify any conservation significant species or ecological communities located either in the study area or near the study area.
- Field survey:
    - collect comprehensive site and species data within quadrats.
    - targeted searches for Threatened and Priority flora identified in the desktop assessment.
    - vegetation type and condition mapping
- Reporting:
    - provide the survey outcomes in a detailed report suitable for use in regard to the environmental approvals and assessment process

1.2 STUDY AREA

The study area is located in the Town of Port Hedland and the Eremaean Climatic Province as defined by EPA (2016b). It is approximately 1,476.3 ha and includes 4 corridors with the western-most corridor located adjacent to the Port Hedland power station (Figure 1-1).





Port Hedland Green Steel Pty Ltd
Port Hedland Green Steel Project

Project No	1558
Date	7/03/2024
Drawn by	JL
Map author	LB

0 25 50
Kilometers

1:1,220,800 (at A4) GDA 1994 MGA Zone 50

All information within this map is current as of 7/03/2024. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.

- Study area
- Boodarie Strategic Industrial Area
- Indicative disturbance footprint
- Environmentally sensitive areas
- Lakes
- DBCA managed land
- Road

Figure 1-1
Project location and study area

PHOENIX ENVIRONMENTAL SCIENCES

2 LEGISLATIVE CONTEXT

The protection of flora in WA is principally governed by three acts:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- State *Biodiversity Conservation Act 2016* (BC Act)
- State EP Act.

The BC Act came into full effect on 1 January 2019 and replaced the functions of the *Wildlife Conservation Act 1950* (WC Act).

2.1 COMMONWEALTH

The EPBC Act is administered by the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW). The EPBC Act provides for the listing of Threatened flora (and fauna) and Threatened Ecological Communities (TECs) as matters of National Environmental Significance (NES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of NES, require approval from the Australian Government Minister for the Environment through a formal referral process. Key threats and habitat critical to the survival of EPBC Act Threatened species are usually defined in the conservation advice and/or recovery plan for the species.

Conservation categories applicable to Threatened flora species under the EPBC Act are as follows:

- Extinct (EX)[1] – there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – taxa facing a high risk of extinction in the wild in the medium-term
- Conservation Dependent (CD)[1] – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable, Endangered or Critically Endangered.

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English & Blyth 1997). There are three categories under which ecological communities can be listed as TECs under the EPBC Act: Critically Endangered, Endangered and Vulnerable.

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the State BC Act provides for the listing of Threatened flora species (Government of Western Australia 2018) in the following categories:

- Critically Endangered (CR) – species facing an extremely high risk of extinction in the wild in the immediate future[2]
- Endangered (EN) – species facing a very high risk of extinction in the wild in the near future[2]

[1] Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.

[2] As determined in accordance with criteria set out in the ministerial guidelines.

- Vulnerable (VU) – species facing a high risk of extinction in the wild in the medium term future[2].

The Department of Biodiversity, Conservation and Attractions (DBCA) administers the BC Act and also maintains a non-statutory list of Priority flora. Priority species are still considered to be of conservation significance – that is they may be Threatened – but cannot be considered for listing under the BC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority flora list are assigned to one of four Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.2 Critical habitat

Under the State BC Act, habitat is eligible for listing as critical habitat if it is critical to the survival of a Threatened species or a TEC and its listing is otherwise in accordance with the ministerial guidelines.

2.2.3 Threatened and Priority Ecological Communities

The BC Act provides for the listing of TECs in the following categories:

- Critically Endangered – facing an extremely high risk of becoming eligible for listing as a collapsed ecological community in the immediate future[2]
- Endangered – facing a very high risk of becoming eligible for listing as a collapsed ecological community in the near future[2]
- Vulnerable – facing a high risk of becoming eligible for listing as a collapsed ecological community in the medium term future[2].

An ecological community may be listed as a collapsed ecological community under the BC Act if there is no reasonable doubt that the last occurrence of the ecological community has collapsed or the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure.

The DBCA also maintains a non-statutory list of Priority Ecological Communities (PECs), which may become TECs in the future; however, do not currently meet survey criteria or that are not adequately defined. PECs are assigned to one of five categories depending on their priority for survey or definition, with Priority 1 of highest concern and Priority 5 of lowest concern.

2.2.4 Other significant flora and vegetation

Under the EPA's environmental factor guidelines, flora and vegetation may be considered significant for a range of reasons other than listing as a Threatened or Priority species or ecological community.

In addition to listing as Threatened or Priority, EPA (2016a) identifies the following:

- flora may be significant for
    - local endemism or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
    - new species or anomalous features that indicate a potential new species
    - representing the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
    - being unusual species, including restricted subspecies, varieties or naturally occurring hybrids
    - having relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape
- vegetation may be significant for:

- having restricted distribution
- subject to a degree of historical impact from threatening processes
- having a role as a refuge
- providing an important function required to maintain ecological integrity of a significant ecosystem.

Provided in the guide for assessment of applications to clear native vegetation DER (2014) is a scale for assessing the bioregional conservation status of ecological vegetation classes (Table 2-1).

Table 2-1 Bioregional conservation status of ecological vegetation classes

Conservation status	Description
Presumed extinct	Probably no longer present in the bioregion
Endangered*	Less than 10% of pre-European extent remains
Vulnerable*	10-30% of pre-European extent exists
Depleted*	More than 30% and up to 50% pre-European extent exists
Least concern	More than 50% of pre-European extent exists and subject to little or no degradation over a majority of this area

*or a combination of depletion, loss of quality, current threats and rarity gives a comparable status.

2.2.5 Environmentally Sensitive Areas

Under section 51B of the EP Act the Minister for Environment may declare by notice either a specified area of the State or a class of areas of the State to be Environmentally Sensitive Areas (ESAs). ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8th April 2005 (Government of Western Australia 2005).

ESAs are areas where the vegetation has high conservation value. Several types of areas are declared ESAs including:

- the area covered by vegetation within 50 metres (m) of Threatened flora, to the extent to which the vegetation is continuous with the vegetation in which the Threatened flora is located
- the area covered by a TEC
- a defined wetland (Ramsar wetlands, conservation category wetlands and nationally important wetlands) and the area within 50 m of the wetland
- Bush Forever sites.

2.2.6 Introduced flora

Introduced flora (weeds) pose threats to biodiversity and natural values by successfully out-competing native species for available nutrients, water, space and sunlight; reducing the natural structural and biological diversity by smothering native plants or preventing them from growing back after clearing, fire or other disturbance; replacing the native plants that animals use for shelter, food and nesting; and altering fire regimes, often making fires hotter and more destructive (Australian Weeds Committee 2007).

Management of some weed species is required under Commonwealth or State frameworks. Key classifications for significant introduced flora that are relevant to this report are:

- Declared Pest – the *Biosecurity and Agriculture Management Act 2007*, Section 22 makes provision for a plant taxon to be listed as a Declared Pest organism in parts of, or the entire State. Under the Biosecurity and Agriculture Management Regulations 2013 Declared Pests

are assigned to one of three control categories that dictate the level of management required (DPIRD 2019).

- Weed of National Significance (WoNS) – high impact, established introduced flora causing major economic, environmental, social and/or cultural impacts in a number of states/territories, and which have strong potential for further spread (Australian Weeds Committee 2012). Management is required in accordance with Department of Primary Industries and Regional Development (DPIRD) guidelines for particular WoNS.

Throughout this report, introduced flora species are indicated with an asterisk (*).

3 EXISTING ENVIRONMENT

3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia's landscapes into large 'bioregions' and 'subregions' based on climate, geology, landform, native vegetation and species information (DoEE 2016). The study area is located in the Roebourne subregion (PIL4) of the Pilbara bioregion (Figure 3-1) which is characterised as (Kendrick & Stanley 2001)

"Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses and dwarf shrubsteppe of *Acacia stellaticeps* or *A. pyrifolia* and *A. inaequilatera*. Uplands are dominated by *Triodia* hummock grasslands. Ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Samphire, Sporobolus and mangal occur in the marine alluvial flats and river deltas."

3.2 LAND SYSTEMS AND SURFACE GEOLOGY

DPIRD undertakes land system mapping for WA using a nesting soil-landscape mapping hierarchy (Schoknecht & Payne 2011). While the primary purpose of the mapping is to inform pastoral and agricultural land capability, it is also useful for informing biological assessments. Under this hierarchy, land systems are defined as areas with recurring patterns of landforms, soils, vegetation and drainage (Payne & Leighton 2004).

The study area intersects two land systems and is almost entirely dominated by the Uaroo System (Payne & Leighton 2004) (Table 3-1; Figure 3-2).

Table 3-1 Land systems and extent in study area

Land system	Description	Area (ha)	% of study area
Uaroo System	Broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered *Acacia* shrubs.	1,474.0	99.8
Littoral System	Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse acacia shrublands and mangrove forests.	2.3	0.2
	Total	**1,476.3**	**100.0**

According to the Surface Geology of Australia 1:1,000,000 scale, WA database Stewart *et al.* (2008) the study area intersects one geological formation (Table 3-2; Figure 3-3).

Table 3-2 Surface geology of the study area, extent by deposit type

Surface geology	Abbreviation	Description	Area (ha)	% of study area
Alluvium 38485	Qa	Channel and flood plain alluvium; gravel, sand silt, clay, locally calcreted.	1476.3	100.0
		Total	**1476.3**	**100.0**





Port Hedland Green Steel Pty Ltd
Port Hedland Green Steel Project

Project No	1558
Date	7/03/2024
Drawn by	FK
Map author	LB

0 20 40
Kilometers

1:1,155,400(at A4) GDA 1994 MGA Zone 50

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Study area

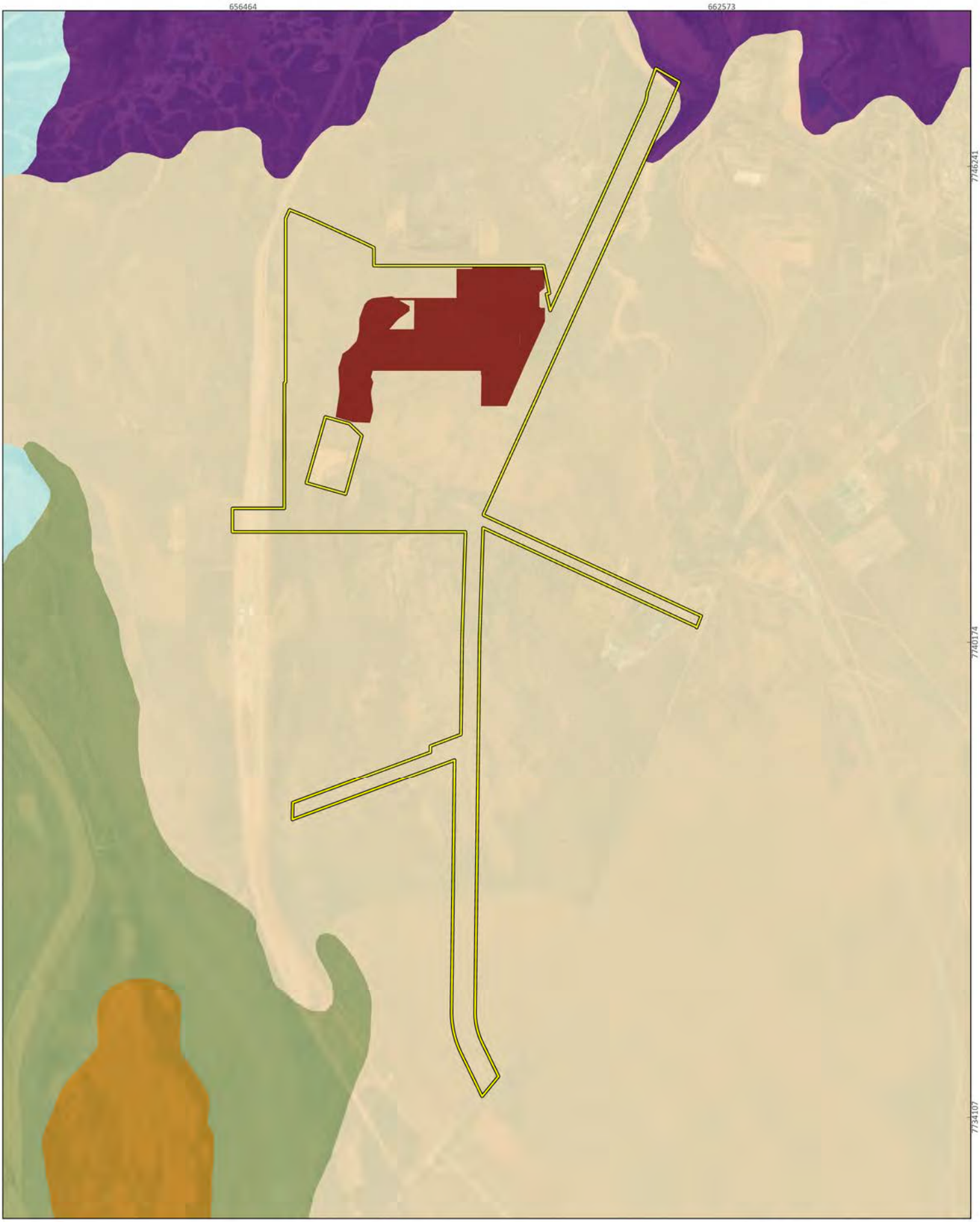
Region, subregion

- Dampierland, Pindanland
- Great Sandy Desert, McLarty
- Pilbara, Chichester
- Pilbara, Fortescue
- Pilbara, Roebourne

Figure 3-1

Study area in relation to IBRA bioregions and subregions

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- Study area
- Indicative disturbance footprint

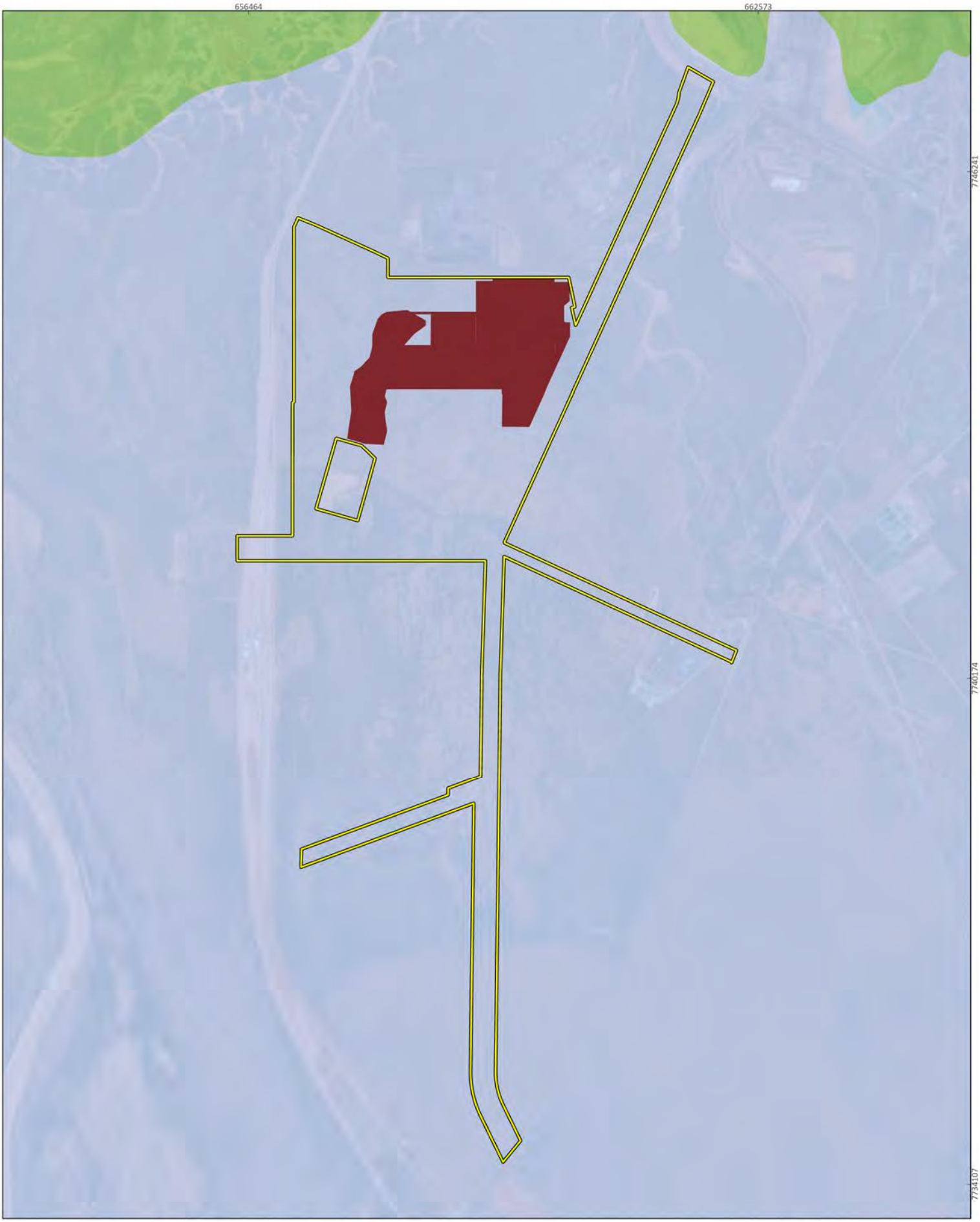
Land systems

- Littoral System
- Mallina System
- River System
- Uaroo System
- Yamerina System

Figure 3-2

Land systems in the study area

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Port Hedland Green Steel Project

Project No	1558
Date	7/03/2024
Drawn by	FK
Map author	LB

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Kilometers

1:58,600(at A4) GDA 1994 MGA Zone 50

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Study area

Indicative disturbance footprint

Surface geology

Qa

Qe

Figure 3-3

Surface geology in the study area

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3.3 CLIMATE AND WEATHER

The climate of the Roebourne subregion is described as arid (semi-desert) tropical with highly variable rainfall, falling mainly in summer (Kendrick & Stanley 2001). The nearest Bureau of Meteorology (BoM) weather station with comprehensive data collection and recent historic climate data is Port Hedland Airport (no. 004032), Latitude: 20.37°S Longitude 118.63°E), located 12km north-east of the study area.

Port Hedland Airport records the highest mean maximum monthly temperature (37.7°C) in December 2022 (lowest in July 2022, 27.8°C) and the lowest minimum mean monthly temperature (11.6°C) in July 2022 (highest in February 2023, 27.2°C) (BoM 2024)(Figure 3-4). The total rainfall the year preceding the survey was 306 mm compared to the historical annual mean of 318.5 mm, which is marginally lower than the mean. May 2022 recorded the highest total rainfall with 123.8 mm (Figure 3-4).

Daily mean temperatures at Port Hedland Airport in the 3 months preceding the surveys were on average consistent with the long-term averages for the region (Figure 3-4). The average mean maximum and minimum temperatures were between 0.3°C and 1.3°C warmer than the long-term averages, respectively. Daily maximum temperatures during the survey ranged from 31.7°C to 34.9°C, and daily minimum temperatures from 15.6°C to 25.4°C. However, notably in the final 7 months preceding the survey, the mean maximum temperature was inconsistent with the historical data trendline.

Records from Port Hedland Airport show that total rainfall between February-April 2023 (74.4 mm) was less than half of the historical data during the same months (165.4 mm) (Figure 3-4).

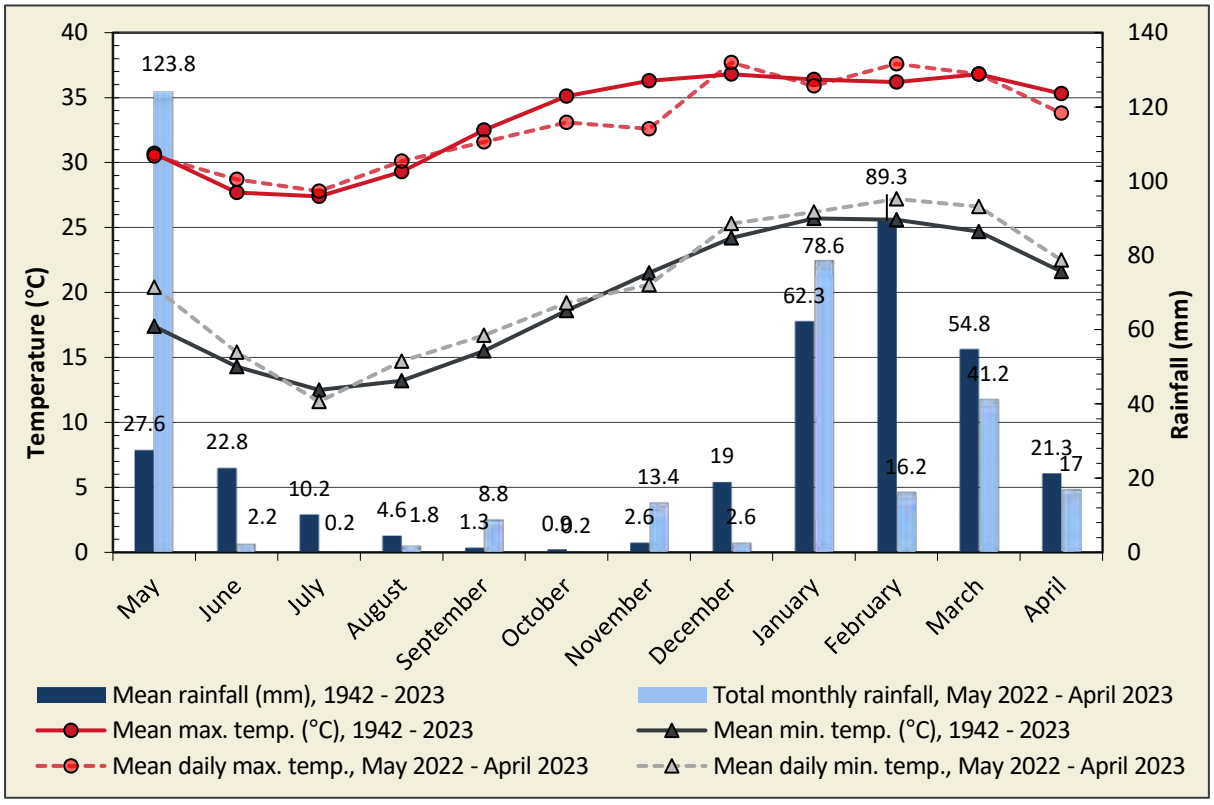


Figure 3-4 **Annual climate and weather data for Port Hedland Airport (no. 004032) and mean monthly data for the 12 months preceding the Autumn survey (BoM 2024)**

Port Hedland Airport recorded the highest mean maximum monthly temperature (37.7°C) in December 2022 (lowest in June 2023, 27.4°C) and the lowest minimum mean monthly temperature (12.8°C) in July 2023 (highest in February 2023, 27.2°C) (BoM 2024)(Figure 3-5) The total rainfall the year preceding the survey was 186.4 mm compared to the historical annual mean of 318.5 mm, which is substantially lower than the mean. January 2023 recorded the highest total rainfall with 78.6 mm (Figure 3-5).

Daily mean temperatures at Port Hedland Airport in the 3 months preceding the surveys were on average hotter than the long-term averages for the region (Figure 3-5). Both minimum and maximum temperatures in July were consistent with the historical data. September and August temperatures rose, mean maximum temperatures in the final two months were higher by 3°C when compared to historical data, the mean minimum temperatures in the final two months were approximately 2.5°C higher than the historical data.

Records from Port Hedland Airport show total rainfall between July-September 2023 (0.2 mm) was less than historical data during the same months (16.1 mm). Total annual rainfall for 2022-2023 (186.4 mm) averaged just over half of the historical mean (318.5) (Figure 3-5). Rainfall in the Pilbara is variable (Sudmeyer 2016). In the Port Hedland Airport Station, the highest and lowest mean rainfall records from 1942 -2023 are 713.2 mm and 44.5 mm respectively. Thus, the low annual rainfall registered in the period from 2022 – 2023 is not considered unusual.

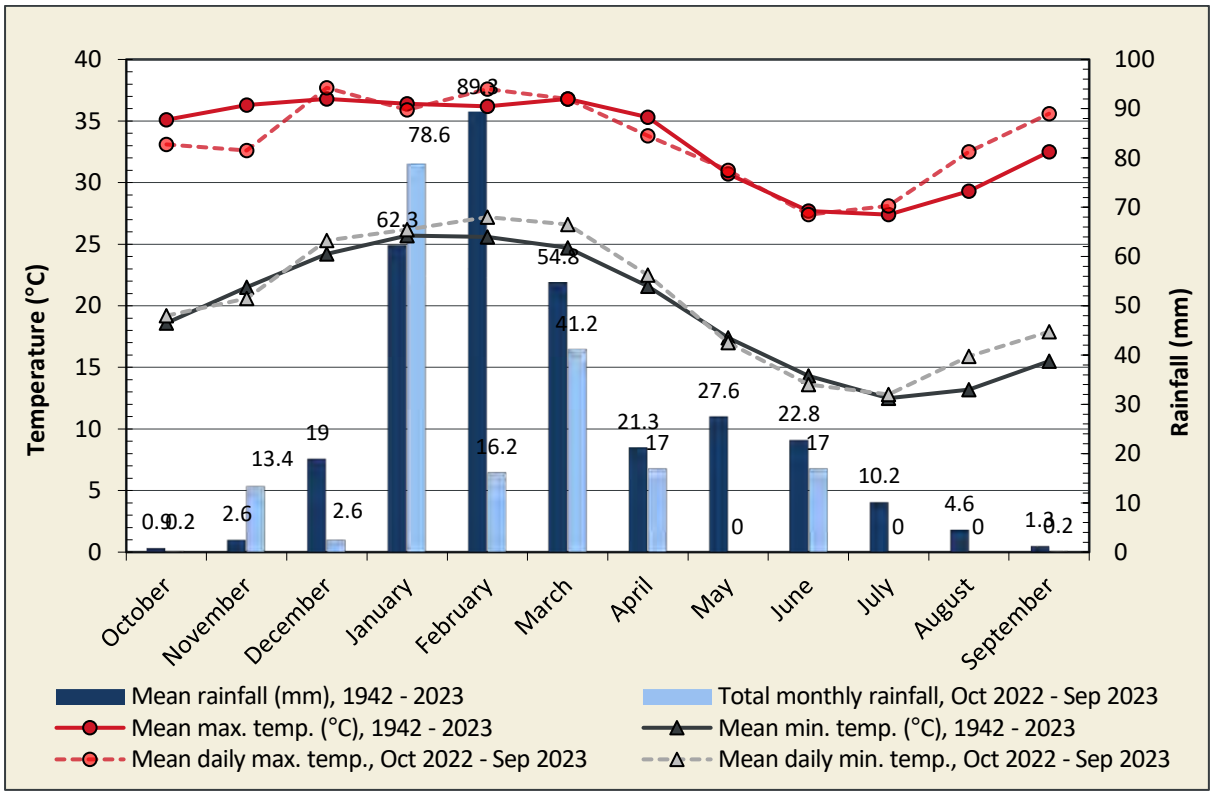


Figure 3-5 **Annual climate and weather data for Port Hedland Airport (no. 004032) and mean monthly data for the 12 months preceding the Spring survey (BoM 2024)**

3.4 LAND USE

The dominant land use of the PIL4 subregion comprises grazing (native pastures), Aboriginal lands and reserves, conservation, mining leases and urban development (Kendrick & Stanley 2001). As per land use summaries extracted from the Australian Bureau of Agricultural and Resource Economics and Sciences ABARES (2018) and summarised in Table 3-3, 'production from relatively natural environments' and 'conservation and natural environments' are the dominant land use components

comprising the PIL4 subregion. The majority of the study area is covered by the area allocated as the 'Boodarie Strategic Industrial Area. Land use across the study area is subject to similar usages (and proportional area) to the PIL4 subregion; the dominant secondary components represent 'grazing native vegetation' (1,008.5 ha, 68.3%) and 'other minimal uses' (461.1 ha, 31.2%), which does not have any formal environmental protection. The Port Hedland and South Hedland power stations and a pipe stockyard are situated adjacent to the study area to the east.

Table 3-3 Land use of the study area, according to ABARES (2018)

Land use	PIL4 subregion		Study area	
	Area (ha)	% of PIL4	Area (ha)	% of study area
Conservation and natural environments	492,279.8	26.5	461.1	31.2
Intensive uses	8,481.1	0.5	4.2	0.3
Production from dryland agriculture and plantations	367.7	<0.01	-	-
Production from irrigated agriculture and plantations	0.4	<0.01	-	-
Production from relatively natural environments	1,302,639.7	70.1	1,008.7	68.3
Water	54,528.3	2.9	2.3	0.2
Total	**1,858,297.0**	**100.0**	**1,476.3**	**100.0**

3.5 CONSERVATION RESERVES AND ESAS

No conservation reserves intersect the study area or occur within the 40 km desktop search extent. The nearest conservation reserves are Mungaroona Range Nature Reserve and Eighty Mile Beach Marine Park, located approximately 101 km south-southwest and 110 km north-west from the study area boundary, respectively (Figure 1-1). No DBCA lands of interest proposed for conservation occur near the study area.

A total of 8 ESAs occur within the 40 km desktop search extent (Figure 1-1). All of the 8 ESA's can be characterised as coastal. This indicates that these ESAs are not relevant to the study area, as it is not considered to be coastal (Figure 1-1).

4 METHODS

The detailed flora survey was conducted in accordance with relevant survey guidelines and guidance, including:

- *EPA Environmental Factor Guideline: Flora and vegetation* (EPA 2016a)
- *EPA Technical Guidance: Flora and vegetation surveys for Environmental Impact Assessment* (EPA 2016b)

4.1 DESKTOP REVIEW

Searches of several biological databases were undertaken to identify and prepare lists of significant flora and vegetation that may occur within the study area (Table 4-1). A literature search was conducted for accessible reports for biological surveys conducted within 40 km of the study area to build on the lists developed from the database searches (Table 4-2).

Table 4-1 Database searches conducted for the desktop review

Database	Target group/s	Search coordinates and extent
Protected Matters Search Tool (DCCEEW 2023)	EPBC Act Threatened flora and ecological communities	Study area plus 40 km buffer
DBCA Threatened and Priority Flora Database (DBCA 2023c)	Threatened and Priority flora	Study area plus a 40 km buffer
DBCA Threatened and Priority Ecological Communities Database (DBCA 2023b)	TECs and PECs	Study area plus a 40 km buffer
DBCA NatureMap Database (DBCA 2023a)	Flora records	Study area plus a 40 km buffer

Table 4-2 Survey reports included in the desktop review

Report author	Survey description	Project
Phoenix Environmental Sciences (2022)	Baseline flora and vegetation survey	Port Hedland Solar Farm Project
ENV (2011)	Detailed flora and vegetation assessment	Port Hedland region
Emerge Associates (2019)	Reconnaissance Flora and vegetation assessment	Port Hedland International Airport
GHD (2016)	Reconnaissance Flora and vegetation assessment	Roy Hill Port Facility
GHD (2020)	Level 1 fauna and reconnaissance flora survey	Windfence
Biota (2008)	Targeted survey and vegetation mapping	Utah Point Berth Development
Biota (2004)	Detailed flora and vegetation assessment	FMG Stage A Rail Corridor

4.2 FIELD SURVEY

4.2.1 Survey timing

Field survey dates are provided in Table 4-3.

Table 4-3 Survey dates

Survey type	Season	Dates
Flora and vegetation detailed survey, phase 1	Autumn	15 – 19 April 2023
Targeted searches for significant flora	Autumn	19 April 2023
Flora and vegetation detailed survey, phase 2	Spring	13 – 15 September 2023
Targeted searches for significant flora	Spring	15 September 2023

4.2.2 Flora and vegetation

Field methods for the flora and vegetation survey of the survey area included:

- surveying of quadrats (see 4.2.2.1)
- targeted searches for significant flora (4.2.2.2)
- vegetation type and condition mapping (4.2.2.3, 4.2.2.4)
- TEC/PEC assessment (4.2.2.5).

Prior to the commencement of the field survey, data including satellite imagery, survey boundary, and pre-selected vegetation quadrats were loaded onto electronic field devices. The field survey involved assessing and mapping vegetation boundaries, conducting quadrat sampling and collecting opportunistic flora specimens. GPS locations of vegetation and condition boundaries, survey sites and flora specimen data were recorded digitally.

4.2.2.1 Quadrats

Quadrat locations were selected to ensure that an accurate representation of the major vegetation types within the study area were sampled adequately, with a minimum of at least three quadrats per vegetation type. Two methods were used for the selection of quadrat placement within the study area. Preliminary quadrat locations were pre-selected using aerial photography, with selection based on apparent changes in the vegetation visible in the aerial imagery. Final quadrat placement was determined in the field while ground-truthing the study area on foot.

In total, 41 quadrats were surveyed across the study area (Figure 4-1; Appendix 1).

Quadrat sampling dimensions were 50 m x 50 m in accordance with EPA guidance for the Eremaean Botanical Province. The following information was recorded for each quadrat (Appendix 2)

- location – the geographic coordinates of all four corners of the quadrat in WGS84 projection
- description of vegetation – a broad description utilising the structural formation and height classes based on National Vegetation Information System ESCAVI (2003) and in accordance with EPA (2016b) (Appendix 3)
- habitat – a brief description of landform and habitat

- geology – a broad description of surface soil type and rock type
- disturbance history – a description of any observed disturbance including an estimate of time since last fire, weed invasions, soil disturbance, human activity and fauna activity
- vegetation condition – using the condition scale in EPA (2016b) for the Eremaean Botanical Province
- height and percentage foliage cover (PFC) – a visual estimate of cover of total vegetation cover, cover of shrubs and trees >2 m tall, cover of shrubs <2 m, total grass cover and total herb cover
- photograph – a colour photograph of the vegetation within each quadrat in a south-easterly direction from the north-west corner of the quadrat
- flora species list – comprehensive list of all flora species recorded within the quadrat.

To ensure accurate taxonomic identification of flora species present within the study area, collections were made of each specimen at least once and each collection was pressed and documented for identification using the WA Herbarium resources.

For each species identified, records on FloraBase and the Australasian Virtual Herbarium were consulted to provide information on known ranges to determine whether the survey area represented a range extension for the species.

4.2.2.2 Targeted flora searches

Targeted searches were undertaken for significant flora (Threatened and Priority), Declared Pests and WoNS. Remnant vegetation was traversed by foot in meandering transects with the searches focused on habitats considered likely to support significant flora.

If a flora species was considered to potentially be a significant species (i.e. similar floristic characteristics and occurring within suitable habitat) the following information was collected:

- GPS coordinates, including population boundary where applicable
- description of the habitat and floristic community in which the potential significant species was located
- population size estimate (i.e. estimated number of individual plants) where applicable
- specimen collection for taxonomic identification and lodgement to the WA Herbarium
- photograph of live plant in situ and description of important details, such as flower colour, height of individual or average height of population.

Following the field survey, the likelihood of occurrence for each significant flora species identified in the desktop review was assessed and assigned to one of three ratings:

- recorded – species recorded within the study area by previous or current survey
- possible – study area within known range of species; potential habitat within the study area, records within 5 km of study area and may not have been detectible during survey (e.g. survey conducted outside flowering period, annual plant survey conducted outside likely period of occurrence, small herbaceous plant in dense vegetation), or entire area of habitat not thoroughly searched
- unlikely – study area outside known range of species and/or no suitable habitat present in study area and/or suitable/potential habitat present but study area considered adequately searched for the species.

4.2.2.3 Vegetation type mapping

Vegetation mapping was undertaken at a scale of 1:10,000 using the National Vegetation Information System (NVIS) sub-association level (L5) for structural descriptions (ESCAVI 2003). The vegetation descriptions from quadrats from the survey were grouped according to similarity of community structure (i.e. canopy levels), species composition and combination of species and the prevalent community structure (i.e. woodland, shrubland, etc.). The vegetation boundaries were mapped utilising QGIS ESRI imagery and from vegetation boundaries recorded on GPS during the field survey.

To support delineation of vegetation types, a cluster analysis was conducted based on species presence in each quadrat. The fusion strategy for the site classification was flexible UPGMA with a beta value of -0.1 and Bray Curtis association measure in the software package PATN (Belbin 2003). A dendrogram was produced to illustrate the similarities between the vegetation units identified. Statistically distinct vegetation units (the floristic group) classified the vegetation at a local scale. Local scale vegetation units were described at NVIS Level V – Association (ESCAVI 2003). The term 'vegetation type' was used for local scale vegetation units in accordance with EPA technical guidance (EPA 2016b).

Quadrat BI020 was excluded from the vegetation analysis. The target vegetation to sample was too small and mixed with the adjacent vegetation types for PATN to include coherently the site into a branch.

4.2.2.4 Vegetation condition mapping

The condition of vegetation was mapped across the study area based on the appropriate condition scale for the Eremaean Botanical Province (EPA 2016b; Trudgen 1988) (Table 4-4). The vegetation condition ratings relate to vegetation structure, the level of disturbance and weed cover at each structural layer and the ability of the vegetation unit to regenerate. Vegetation condition ranges from Excellent being the highest rating to Completely Degraded as the lowest.

Completely cleared areas (e.g. roads, tracks, paddocks) were excluded from condition ratings and mapped as 'not assessed'.

Table 4-4 Vegetation condition rating scale (EPA 2016b)

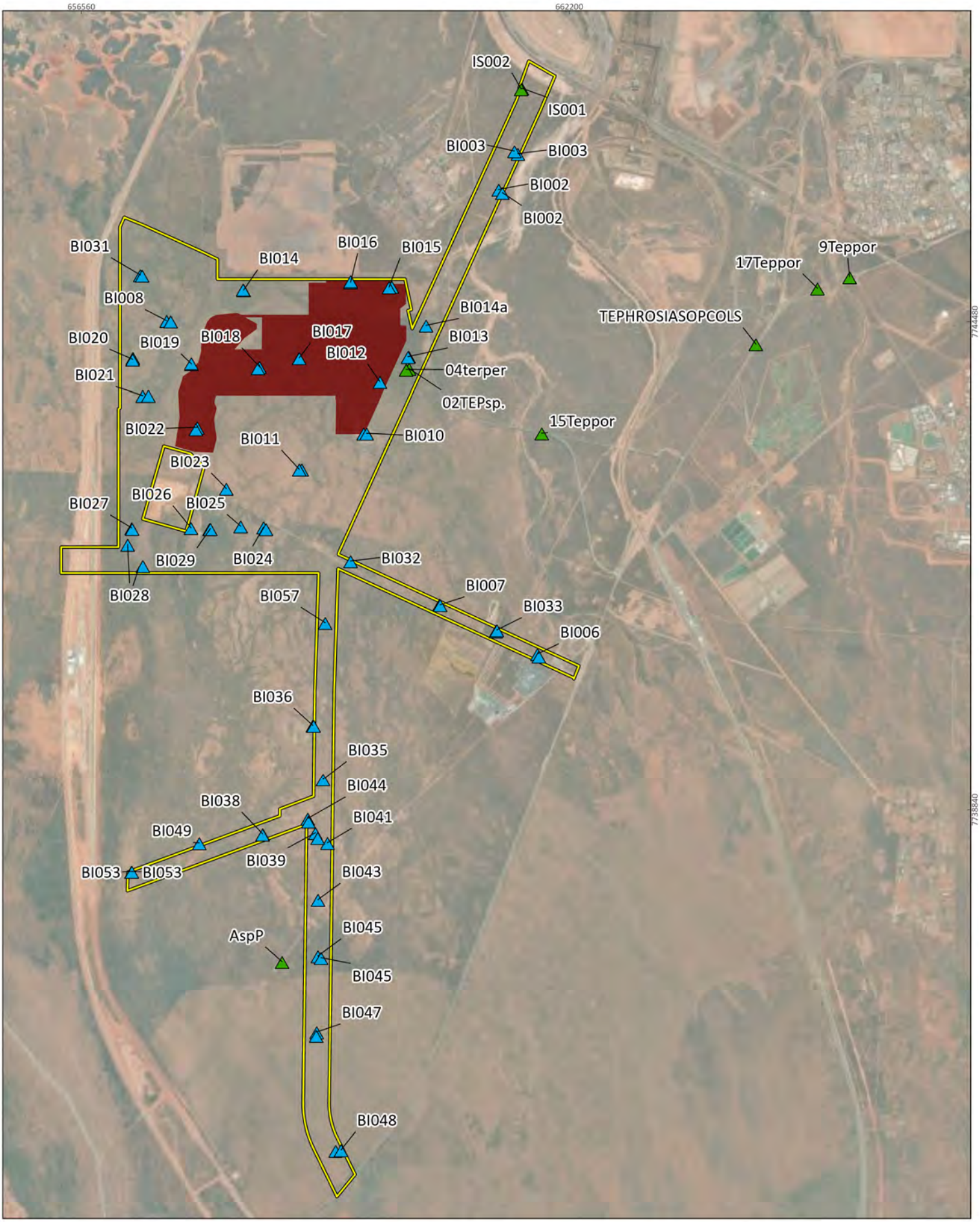
Condition rating	Description
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

4.2.2.5 TEC/PEC assessment

The presence/absence of TECs and PECs was assessed by comparing the DBCA database with the observations made in the field, as well as with statistical analysis interpretation of significant vegetation types.

4.2.2.6 Analysis of survey completeness

A species accumulation curve based on accumulated species versus number of sites surveyed was used to evaluate the level of adequacy of the survey effort. The species accumulation curve was generated by inputting the site-species matrix into Phoenix's proprietary spreadsheet.



Western Australia

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Project No	1558
Date	11/12/2024
Drawn by	JL
Map author	LB

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Study area

Indicative disturbance footprint

Site type

Individual specimen

Quadrat

Figure 4-1

Flora and vegetation survey sites

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4.2.3 Assessment personnel

The personnel involved in the assessment and field surveys are listed in Table 4-5. All survey work was carried out under relevant licences issued by DBCA under the BC Act.

Table 4-5 Survey personnel

Name	Permit	Qualifications	Role/s
Dr Grant Wells	FB62000538; TFL2324-0016	PhD (Botany)	Quality assurance, reporting, and field survey
Natasha Rogers	FB62000518; TFL 2223-0135	Bachelor of Science	Field survey, reporting, and logistics
Luis Buchan Rivas	FB62000514; TFL 2324-0018	Grad Dip in Science (Biodiversity Science)	Field survey, reporting, data analysis, and mapping
Calvin Williams	FB62000525; TFL 2324-0015	Bachelor of Environmental Science	Field survey
Sarah Woodiss-Field	FB62000479	BSc (Zool. And Cons. Biol)	Field survey
Gemma Maling	FB62000528	BSc Environmental Restoration	Field survey
Dr Andrew Perkins	N/A	PhD (Botany)	Taxonomy
Frank Obbens	N/A	BSc. Hons (Biology)	Taxonomy
Brigitte Kovar	N/A	Msc (Geo. Int.)	Map production
Jade Larkman	N/A	Bachelor of Science (Environmental Science)	Map production

5 RESULTS

5.1 DESKTOP REVIEW

5.1.1 Flora and vegetation

5.1.1.1 Flora assemblage

The desktop review identified records of 544 flora taxa within the 40 km desktop search extent, comprising of 485 native species and 60 introduced species. The taxa representing 228 genera and 72 families. The most prominent families were the Fabaceae (103 spp.; 18.9%), Poaceae (94 spp.; 17.3%), Malvaceae (41 spp.; 7.5%), and Amaranthaceae (32 spp.; 5.9%).

A detailed survey of the proposed Port Hedland Solar Farm by Phoenix Environmental Sciences (2022) conducted 19 quadrats and 11 relevé surveys within an area of 670.37 ha. A total of 146 taxa were recorded representing 38 families and 88 genera with 140 native species and 6 introduced flora. The most prominent families were Poaceae, Fabaceae, Malvaceae and Convolvulaceae. No Declared Pests or WoNS were recorded during the survey but three declared pests, **Calotropis procera, *Opuntia stricta* (WoNs) and **Tamarix aphylla* (WoNs) were identified in the desktop assessment.

A regional survey of the Port Hedland area ENV (2011) conducted 158 quadrats and 3 relevé surveys within an area of 80,874 ha. A total of 388 taxa were recorded from 55 families and 152 genera with 326 native species and 12 introduced flora. The most prominent families were Fabaceae (71), Poaceae (51), Malvaceae (29), Amaranthaceae (18) and Cyperaceae (15). No Declared Pests or WoNS were recorded during the survey.

A reconnaissance survey of an area of the Port Hedland airport Emerge Associates (2019) conducted 5 10 x 10 m^2 quadrats for detailed vegetation sampling and opportunistic collections within an area of 37.99 ha. A total of 43 species were recorded representing 16 Families and 31 genera with 38 native species and 5 introduced flora. The most prominent families were Poaceae (9), Fabaceae (6) Amaranthaceae (5) and Asteraceae (4). One Declared Pest **Calotropis procera* was recorded.

A reconnaissance survey of a port facility GHD (2016) conducted transects and opportunistic collecting sampling within an area of 27.13 ha. A total of 28 species were recorded from 15 families and 23 genera with 25 native species and 3 introduced flora. The most prominent families were Poaceae (6), Fabaceae (5) and Chenopodiaceae (4). No Declared Pests or WoNS were recorded.

A reconnaissance survey of Port Wind Fence Survey Area on Finucane Island GHD (2020) conducted 5 relevés and transect sampling within an area of 3.77 ha. A total of 47 taxa were recorded representing 30 families and 39 genera with 42 native species and 5 introduced flora. The most prominent families were Fabaceae, Poaceae and Chenopodiaceae. One declared pest **Coccinia grandis* was recorded.

A targeted survey at Port Hedland port at Utah Point on Finucane Island Biota (2008) conducted systematic searches for rare flora within an area of 349.7 ha. A total of 115 taxa were recorded representing 35 families and 77 genera with 110 native species and 5 introduced flora. The most prominent families were Fabaceae (21), Poaceae (16), Convolvulaceae (7) and Malvaceae (7). No Declared Pests or WoNS were recorded.

A detailed survey of a proposed new port in Port Hedland and railway leading to Weeli Wolli Creek Biota (2004) conducted 97 quadrats and over 30 relevés. A total of 762 taxa were recorded representing 69 families and 233 genera with 751 native species and 11 introduced flora. The most prominent families were Fabaceae (140), Poaceae (125), Malvaceae (66) and Chenopodiaceae (37). No Declared Pests or WoNS were recorded. Due to the nature of this survey because it's a long corridor that extended for approximately 345 km SE, much of the results from this survey are not applicable to this desktop review.

5.1.1.2 Significant flora

Records of 13 significant flora species were identified within the desktop search extent (Table 5-1; Figure 5-1). No Threatened flora listed under the EPBC Act and/or BC Act were identified, 12 Priority flora listed by the DBCA were identified. The remaining significant species recorded was a locally significant species *Phyllanthus* sp. B Kimberley Flora.

There were no records of significant flora within the study area, however 7 records were within 5 km of the study area (Figure 5-1). Taking into consideration the proximity of known records and preferred habitat of each significant species it was considered that 8 species may occur in the project.

Emerge Associates (2019); (GHD 2016, 2020) didn't record any conservation significant species.

Phoenix Environmental Sciences (2022) recorded no Threatened or Priority species but did collect one locally significant species *Phyllanthus* sp. B Kimberley Flora. In the Phoenix Environmental Sciences (2022) report, it is referred as *Phyllanthus* sp. 'Port Hedland Solar Farm'. This species is deemed locally significant in this desktop review as there are only 6 records of this species on Florabase and the Port Hedland specimen is a significant range extension and the southernmost record.

ENV (2011) recorded 4 Priority flora species, *Tephrosia* rosea var. Port Hedland (P1), *Gomphrena pusilla* (P2), *Abutilon* sp. Pritzelianum (P3) and *Euploca mutica* (P3).

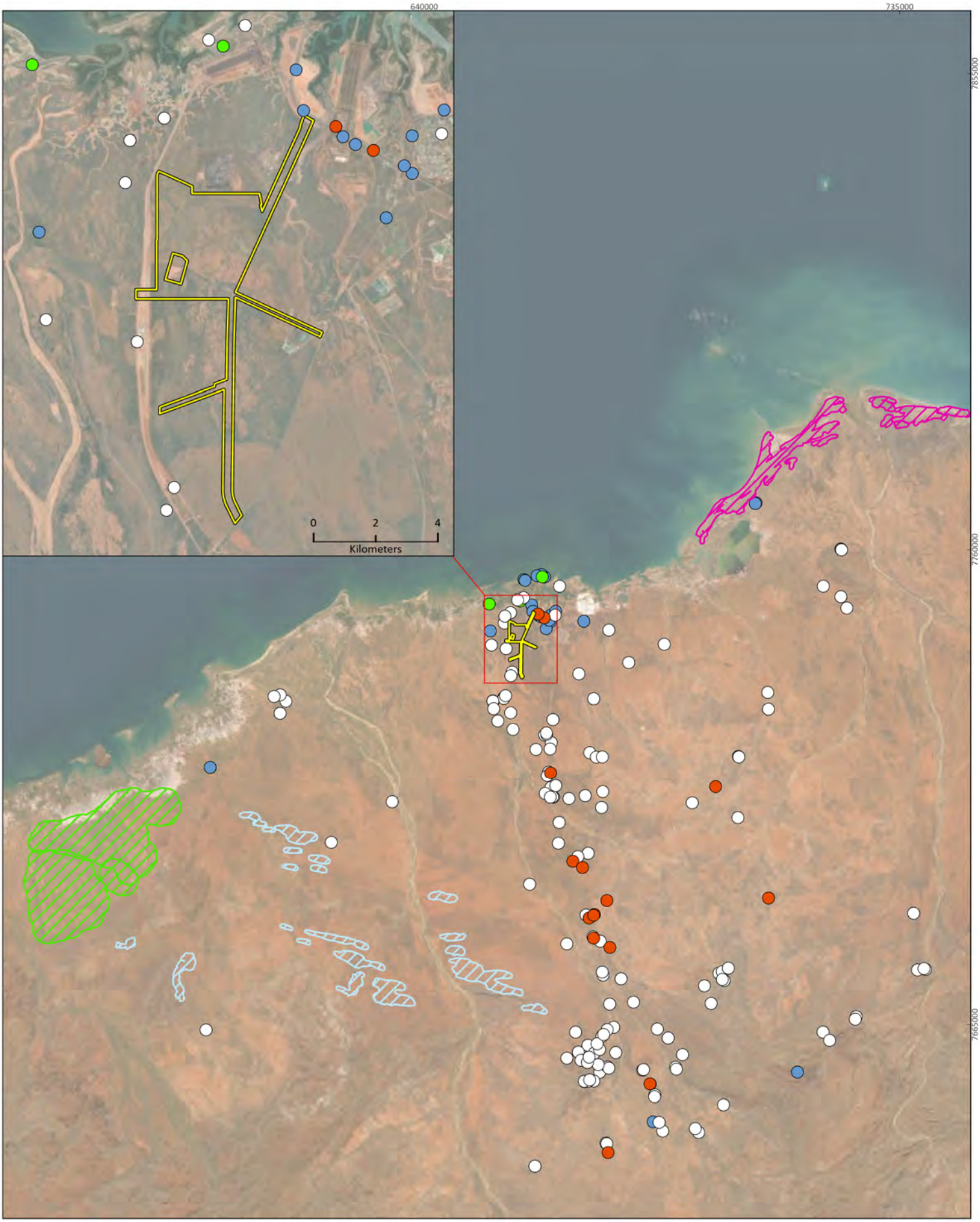
Biota (2008) recorded one priority species, *Bulbostylis burbidgeae* (P4) which they collected twice in a new habitat type that previously it wasn't known to occur in.

Biota (2004) recorded 7 species that maintain a priority listing, *Paspalidium retiglume* (P2), *Eremophila spongiocarpa* (P3), *Goodenia* sp. East Pilbara (P3), *Stylidium weeliwolli* (P3), *Gymnanthera cunninghamii* (P3), *Themeda* sp. Hamersley Station (P3) and *Bulbostylis burbidgeae* (P4). However, due to the nature of the study area, many of these species aren't applicable to the current survey and therefore 6 of the 7 species listed were not included in the desktop review.

Table 5-1 Significant flora identified in the desktop review

Species	Status	Proximity to study area (number of records within 40 km)	Habitat	Flowering times	Likelihood of occurrence in study area
Tephrosia rosea var. Port Hedland (A.S. George 1114)	P1 (DBCA)	2.4 km NE (24 records)	Predominantly recorded on coastal dunes but also in red sand plain in *Acacia* shrublands over *Triodia* hummock grasslands.	March, July, August, September, October	Possible, especially in northwest.
Gomphrena pusilla	P2 (DBCA)	5.8 km NW (5 records)	Grows in open Shrubland of *Acacia bivenosa* over open *Triodia epactia* hummock grassland of over an open tussock of *Cenchrus ciliaris* along limestone ridge tops on brown loam, exposed calcrete rock and calcareous coastal dunes.	March – April, June	Unlikely, as generally closer to the coast.
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	P3 (DBCA)	0.7 km S (33 records)	Grows in shrublands of *Acacia* sp. over *Triodia* hummock grasslands on sandy plains and floodplains in red-brown sandy clay loam soil.	April, July	Possible, suitable habitat is present.
Eragrostis crateriformis	P3 (DBCA)	0.42 km W (10 records)	Grows in low open woodlands over sparse *Acacia* shrublands over *Triodia* grasslands on red sandy clay loam soil associated with drainage lines, floodplains and clay pans.	January – May or July	Possible, suitable habitat is present.
Euphorbia clementii	P3 (DBCA)	37.5 km SSE of study area (27 records)	Grows in *Corymbia hamersleyana* woodland over *Acacia* spp. shrubland on undulating rocky plains, edges of minor drainage lines and in red-brown clay-loam with ironstone.	May - July	Unlikely, habitat may not be present.
Euploca mutica	P3 (DBCA)	8.7 km E (34 records)	Grows in *Acacia* shrubland over hummock grassland in sandy loam plains and floodplains.	May - November	Possible, suitable habitat is present.
Gomphrena leptophylla	P3 (DBCA)	1.8 km NW (1 record)	Grows in hummock grassland, *with Triodia epactia* and *T. secunda* along drainage lines and floodplains in red sandy loam soils.	March - September	Possible, suitable habitat may be present.

Species	Status	Proximity to study area (number of records within 40 km)	Habitat	Flowering times	Likelihood of occurrence in study area
Gymnanthera cunninghamii	P3 (DBCA)	4.8 km N (6 records)	Grows in *Eucalyptus*, *Melaleuca* and *Acacia* woodlands over mixed grasslands associated with riverbanks, creeks, drainage lines and floodplains.	January - December	Possible, suitable habitat may be present.
Rothia indica subsp. *australis*	P3 (DBCA)	15 km SE and E (5 records)	Grows in shrublands over *Triodia* hummock grasslands in red sandy to loamy soils.	April - August	Possible, suitable habitat is present.
Triodia chichesterensis	P3 (DBCA)	28 km SSE (3 records)	Grows in clay-loam soils frequently associated with quartzite on undulating plains and low rises in woodlands and shrublands over *Triodia* hummock grasslands.	April - June	Unlikely, habitat may not be present.
Bulbostylis burbidgeae	P4 (DBCA)	2.5 km NE (2 records)	Grows in *Triodia* hummock grasslands typically associated with granite boulders, hill tops and outcrops.	March or June - August	Unlikely, habitat may not be present.
Ptilotus mollis	P4 (DBCA)	22 km SSE (1 record)	Grows on iron outcropping, hill slopes in skeletal red/brown clay loam soils.	May or September	Unlikely, habitat may not be present.
Phyllanthus sp. B Kimberley Flora (T.E.H. Aplin et al. 809)	sp. nov.	1.5 km E (1 record)	Riparian vegetation with *Eucalyptus victrix*.	March	Possible, suitable habitat is present.





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Study area

Status

- P1 (DBCA list)
- P2 (DBCA list)
- P3 (DBCA list)
- P4 (DBCA list)

TEC/PEC name, category

- Eighty Mile Land System, Priority 3
- Gregory Land System, Priority 3
- Horseflat Land System of the Roebourne Plains, Priority 3

Figure 5-1

Desktop records of significant flora and vegetation

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5.1.1.3 Introduced flora

The desktop review identified records of 60 introduced species within the desktop search extent (Appendix 4). Of those 60 introduced species, 6 are Declared Pests, and 3 are WoNs (Table 5-2; Appendix 4).

Table 5-2 Desktop records of significant weeds

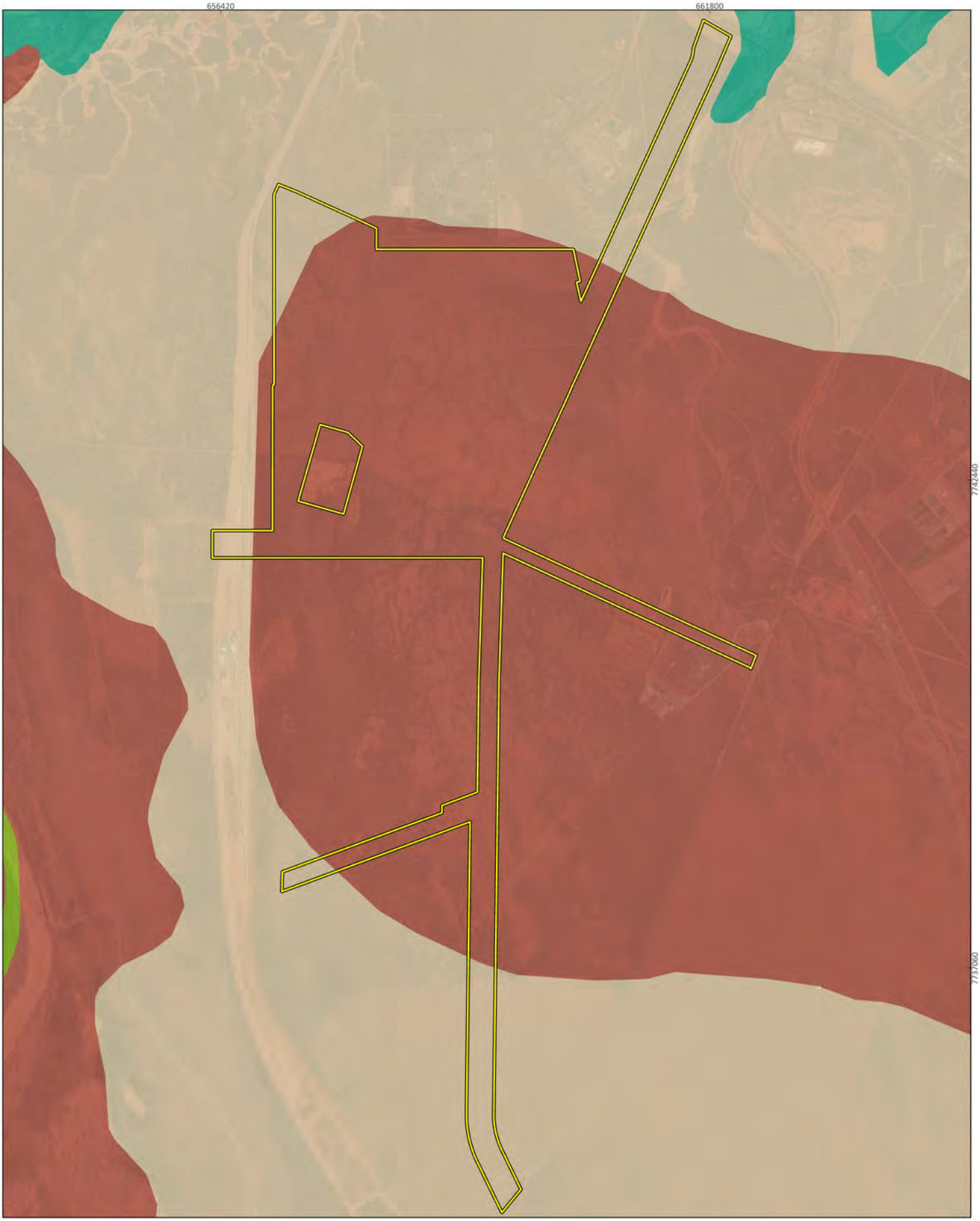
Species	Declared Pest	WoNS
**Calotropis procera*	X	
**Coccinia grandis*	X	
**Indigofera hochstetteri*	X	
**Opuntia stricta*	X	X
**Parkinsonia aculeata*	X	X
**Tamarix aphylla*	X	X

5.1.1.4 Vegetation associations

Regional scale pre-European vegetation mapping for Western Australia (Beard *et al.* 2013; DPIRD 2018) identifies two vegetation associations mapped in the study area (Table 5-3, Figure 5-2). The remaining extent of both vegetation associations at the Statewide scale exceeds 99.5% and they are therefore considered of Least Concern (Table 5-3). None of vegetation association 647 is currently represented in DBCA lands (Government of Western Australia 2019).

Table 5-3 Statewide extent of Pre-European vegetation associations present in the study area (Government of Western Australia 2019)

Vegetation association	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in DBCA lands (%)	% of study area
589, Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	807,698.6	802,713.4	99.4	1.9	82.9
647, Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	195,860.9	191,711.4	97.9	N/A	17





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Study area

Vegetation association

- Short bunch-grass savanna / Grass-steppe
- Shrub-steppe
- Tidal mud flat
- Woodland other

Figure 5-2
Vegetation associations of the study area

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5.1.1.5 Significant vegetation

The DBCA Threatened and Priority Ecological Communities database search identified the presence of one PEC within the desktop search extent (Figure 5-1; Table 5-4). This community does not intersect with the study area.

Table 5-4 TECs and PECs identified in the desktop review

Community name	Status	Proximity to study area	Description
Eighty Mile Land System	P3 (DBCA)	~36 km NE of study area	Beach foredunes, longitudinal coastal dunes and sandy plains with tussock grasslands and spinifex grasslands. Threats: extensive threatening processes acting at landscape scales, namely altered fire regimes, over grazing, erosion, and weed invasion (buffel grass).

5.2 FIELD SURVEY

5.2.1 Flora and vegetation

5.2.1.1 Flora assemblage

A total of 140 flora taxa representing 36 families and 84 genera identified to species level were recorded in the study area during the field surveys (Appendix 5). Species richness ranged from 0 - 28 species between quadrats (Appendix 2, Appendix 5). The assemblage included 136 native species and 4 introduced species, including 118 perennial species, and 22 annual or short-lived species. The most prominent families recorded were Poaceae (28 spp.), Fabaceae (24 spp.), Convolvulaceae (11 spp.), and Malvaceae (11 spp.).

The species accumulation curve constructed to demonstrate survey completeness indicates that sufficient sites were surveyed to capture the flora present during the time of surveying the study area. The curve begins at 14, accounting for the 14 taxa recorded outside the quadrats, i.e. targeted searches, and opportunistic collections (Figure 5-3).

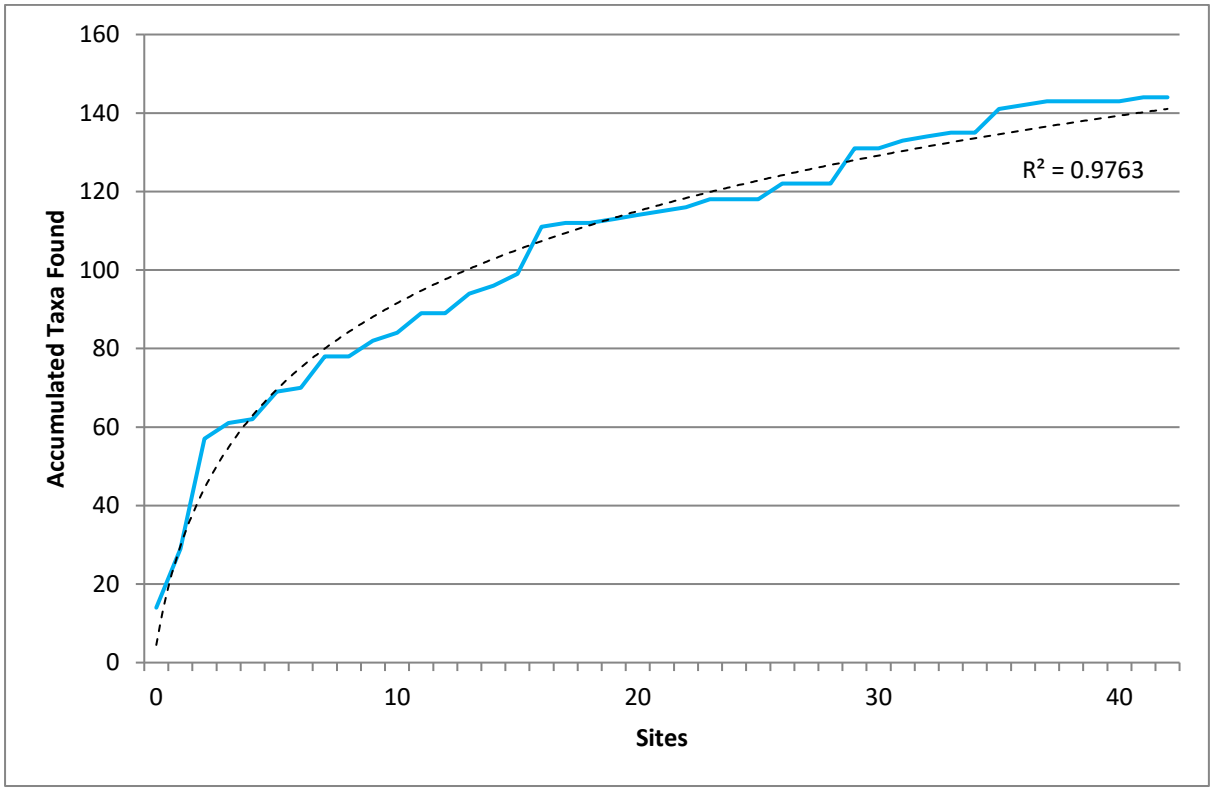


Figure 5-3 **Species accumulation curve for Phoenix survey sites. The accumulation curve is shown in blue in a solid line and the best-fit trendline is displayed as a dotted line**

5.2.1.2 Significant flora

One Priority flora was recorded during the field survey: *Tephrosia rosea* var. Port Hedland (A.S. George 1114), P1 (DBCA) (Table 5-5; Figure 5-4).

Significant range extensions were recorded for 3 species: *Eragrostis setifolia*, *Maireana georgei*, and *Santalum spicatum* (Table 5-5). Therefore, these records are also considered significant flora (refer to section 2.2.4).

The likelihood of occurrence assessment (section 4.2.2.2) for the remaining significant species identified in the desktop review (section 5.1.1.2) determined that 6 species may possibly occur and 7 species are unlikely to occur in the project (Table 5-6).

Table 5-5 Details of significant flora recorded during the field survey

Species	Status	WA Herbarium accession no.	Distribution and ecology	Survey records	Photograph
Tephrosia rosea var. Port Hedland (A.S. George 1114)	P1 (DBCA)	NA	Occurs in the northern Pilbara. Distributed across the following IBRA regions: Great Sandy Desert and Pilbara. (WA Herbarium 2024) Its suitable habitats include sand dunes, sandy plains, and road verges. Its suitable habitat consistently shows the presence of sand in the soil texture with listings of reddish-brown sand, coastal dunes sands, yellow deep sands, red sand, and red-brown loamy sand soil. This species is described in the Florabase records as abundant when present, with individuals' frequencies often describing more than 50 and up to 300 individuals at a site of collection.	49 plants recorded at 6 locations, with only one population occurring within the study area. This species was recorded on road verges on plains with red-brown loamy sand.	 (Phoenix 2024)

Species	Status	WA Herbarium accession no.	Distribution and ecology	Survey records	Photograph
Eragrostis setifolia	RE 150 km NE of the nearest record	NA	Occurring in most of the state, *E. setifolia* is distributed across the following IBRA Regions: Carnarvon, Central Ranges, Coolgardie, Dampierland, Gascoyne, Geraldton Sandplains, Gibson Desert, Great Sandy Desert, Great Victoria Desert, Little Sandy Desert, Murchison, Nullarbor, Ord Victoria Plain, Pilbara, Tanami and Yalgoo (WA Herbarium 2024). Its habitat ranges from claypans and slopes to creek banks, and depressions. It occurs in seasonally flooded habitats. This plant grows along a wide variety of soils including clay, loam, alluvium, grey sand, and sometimes saline soils.	Sparse tussocks of *E. setifolia* were found covering near 1 percent of quadrat BI010 in a locally significant vegetation type in the study area. The population of *E. setifolia* was found in a *Eucalyptus victrix* woodland over a sparse grassland of mixed Poaceae species. The soil was described as a light-brown, grey, and red-brown sandy loam.	 (Phoenix 2024)

Species	Status	WA Herbarium accession no.	Distribution and ecology	Survey records	Photograph
Maireana georgei	RE 160 km E of nearest record	NA	Occurring in most of the state, *M. gerogei* is distributed across the following 17 IBRA Regions: Avon Wheatbelt, Carnarvon, Central Kimberley, Central Ranges, Coolgardie, Gascoyne, Gibson Desert, Great Sandy Desert, Great Victoria Desert, Little Sandy Desert, Mallee, Murchison, Nullarbor, Ord Victoria Plain, Pilbara, Tanami, Yalgoo (WA Herbarium 2024). Occurs in a wide variety of habitats including plains, claypans, slopes, and ironstone. The soil textures where it grows are variable too, including quartz pebbles, sandy clay soils, gravelly ground, and red loam.	An opportunistic collection of one plant was recorded 160 Km E of the nearest record. This species currently represents the closest record to Port Hedland.	 (Phoenix 2024)
Santalum spicatum	RE 225 km NE of nearest record	NA	*S. spicatum* is widely distributed across the state in the following 16 IBRA Regions: Avon Wheatbelt, Carnarvon, Coolgardie, Esperance Plains, Gascoyne, Geraldton Sandplains, Gibson Desert, Great Victoria Desert, Jarrah Forest, Little Sandy Desert, Mallee, Murchison, Nullarbor, Pilbara, Swan Coastal Plain, Yalgoo. Reported to grow in rocky basalt areas with red to brown clay loam soils.	This species was opportunistically collected just outside of the study area. There was a small population of *S. spicatum* in the playa of a dry saline flood line. This collection represents the northernmost record in the state.	 (ALA 2024)





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Study area

Species, status

Tephrosia rosea var. Port Hedland (A.S. George 1114), P1 (DBCA list)

Figure 5-4

Significant flora records from the field survey

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Table 5-6 Likelihood of occurrence for significant flora identified in the desktop review

Species	Status	Likelihood of occurrence
Tephrosia rosea var. Port Hedland (A.S. George 1114)	P1 (DBCA)	**Recorded** It is occurring in the eastern part of the study area where the habitat is suitable, i.e. on loam sand on a road verge. However, anywhere outside of the area where it was recorded, the combination of habitat and disturbance where this species occur does not appear as likely anymore.
Gomphrena pusilla	P2 (DBCA)	**Unlikely** There are no records of *Acacia bivenosa* in the study area, a species normally associated with *G. pusilla*. Furthermore, its suitable habitat, limestone ridgetops and calcareous coastal dunes, is not present in the study area.
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	P3 (DBCA)	**Possible** Suitable habitat for this species was found within the study area. This species has also been recorded 1 km away from the study area.
Eragrostis crateriformis	P3 (DBCA)	**Possible** This species is associated with soils with clay in the soil, and in drainage lines. While its occurrence is possible in the study area, only two quadrats (BI003 and BI025) have descriptions of clay in its soil texture and therefore potential habitat is limited.
Euphorbia clementii	P3 (DBCA)	**Unlikely** There is no suitable habitat for this species in the study area.
Euploca mutica	P3 (DBCA)	**Possible** Suitable habitat across most vegetation types in the study area with collection records nearby.
Gomphrena leptophylla	P3 (DBCA)	**Possible** Habitat especially suitable in the floodplains in the grasslands.
Gymnanthera cunninghamii	P3 (DBCA)	**Unlikely** This species is associated with *Eucalyptus* and *Melaleuca* woodlands on creeks. While site BI010 has a *Eucalyptus* woodland on what appears to be a floodplain, this habitat doesn't exactly match the habitat descriptions shown in FloraBase for this species (Herbarium 2024).
Rothia indica subsp. *Australis*	P3 (DBCA)	**Possible** Suitable habitat, and collections near the study area.
Triodia chichesterensis	P3 (DBCA)	**Unlikely** No suitable habitat. The study area is not represented by quartzite on undulating plains on woodlands which is the known habitat for this species.
Bulbostylis burbidgeae	P4 (DBCA)	**Unlikely** While this species grows in hummock grasslands, the study area does not contain granite boulders, hill tops, or outcrops, the habitat requirement of *B. burbidgeae*.
Ptilotus mollis	P4 (DBCA)	**Unlikely** No suitable habitat found in the study area, i.e. no outcrops or hill slopes.

Species	Status	Likelihood of occurrence
Phyllanthus sp. B Kimberley Flora (T.E.H. Aplin et al. 809)	Indeterminate	**Unlikely** This species is associated with riparian habitats, there is only one likely habitat for this species within the study area. The riparian habitat is located in the northeastern corridor. However, due to heritage restrictions the creek line was not surveyed.

5.2.1.3 Introduced flora

Four introduced flora species were recorded during the survey, none of them are listed neither as declared pests nor as WoNS (Table 5-7).

Table 5-7 Introduced flora recorded in the field survey

Family	Species	Declared Pest	WoNS
Amaranthaceae	**Aerva javanica*	No	No
Fabaceae	**Stylosanthes hamata*	No	No
Poaceae	**Cenchrus ciliaris*	No	No
Poaceae	**Cenchrus setiger*	No	No

5.2.1.4 Unidentified flora

Three specimens collected during the survey could not be identified to species level (Table 5-8), mainly as a result of insufficient taxonomic characters, as plants were sterile (lacking reproductive structures) and damaged.

Table 5-8 Unidentified taxa recorded during the field survey

Taxon	Comments
Corymbia sp.	Sterile and available material damaged by fire.
Eucalyptus sp.	Sterile and available material damaged by fire.
Poaceae sp.	Sterile.

5.2.1.5 Vegetation types

Six vegetation types were defined for the study area based on the cluster analysis (Figure 5-5). Four of these vegetation types are sparse to open shrublands of mixed *Acacia* species over open hummock *Triodia* species grasslands. One vegetation type consists of a hummock grassland of *Triodia;* and one vegetation type was a *Eucalyptus victrix* woodland over a forbland of *Goodenia lamprosperma*, and mixed species of tussock grasses (Table 5-9; Figure 5-6). The four vegetation types consisting of *Acacia* shrublands over *Triodia* hummock grasslands dominated the project, comprising nearly 85% of the study area; followed by the hummock grasslands of *Triodia epactia* and *T. secunda* (TeTsec), comprising 11% of the study area. Of the remaining 4% of the study area, 2% was cleared, and less that 1% consisted of a 'not assessed' area, and a *Eucalyptus victrix* woodland respectively (Table 5-9). The <1% that was not assessed, wasn't surveyed do to restricted access. On the other hand, the <1% of *Eucalyptus victrix* woodland over mixed species of tussock grasses, appeared to be a unique vegetation type in the study area and should be regarded as locally significant.

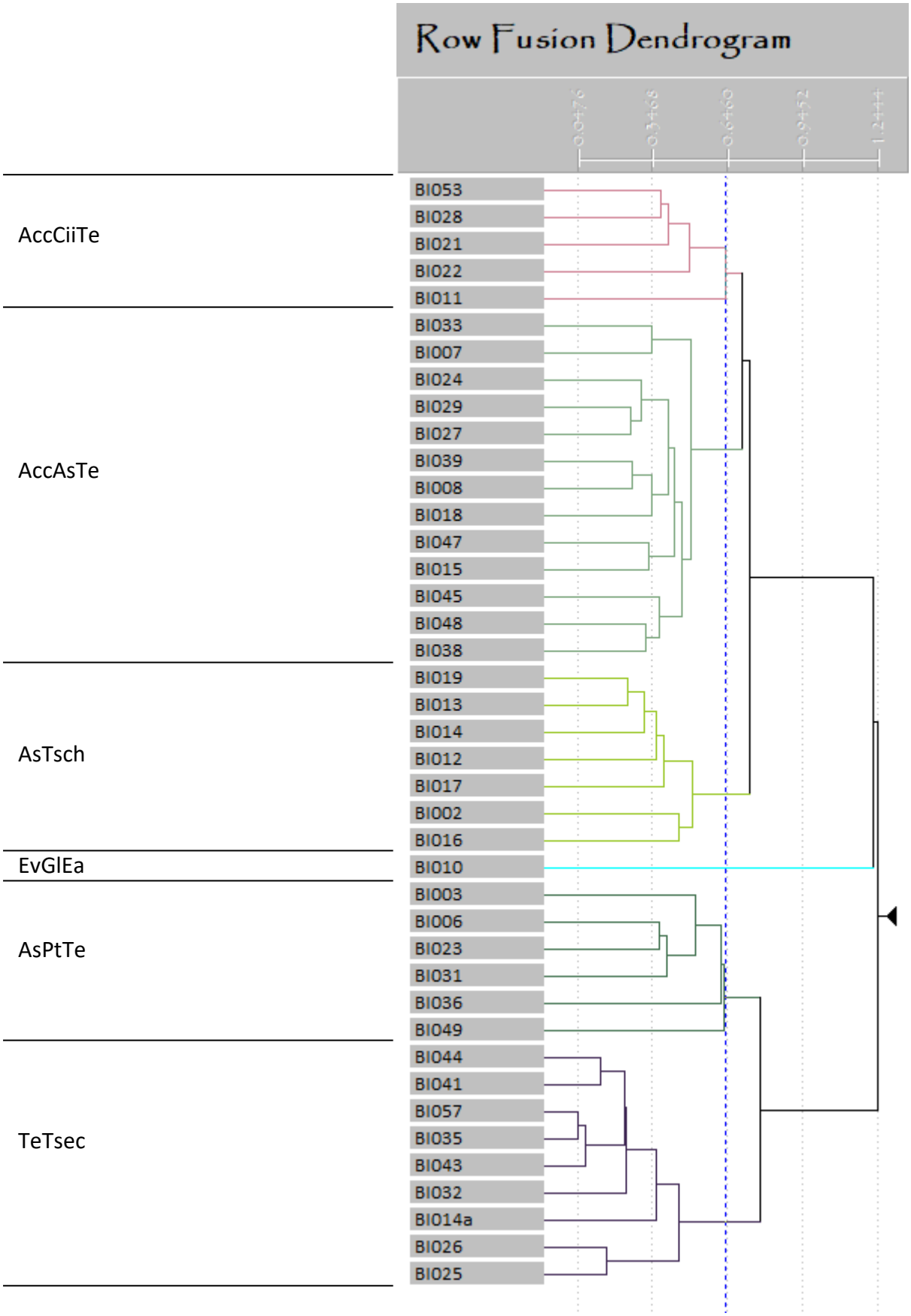
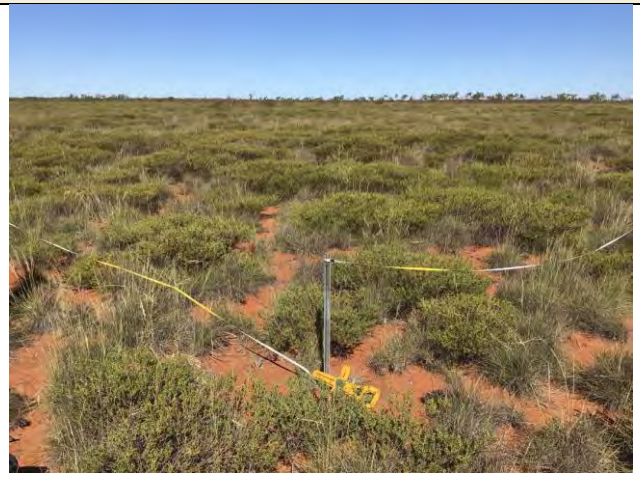


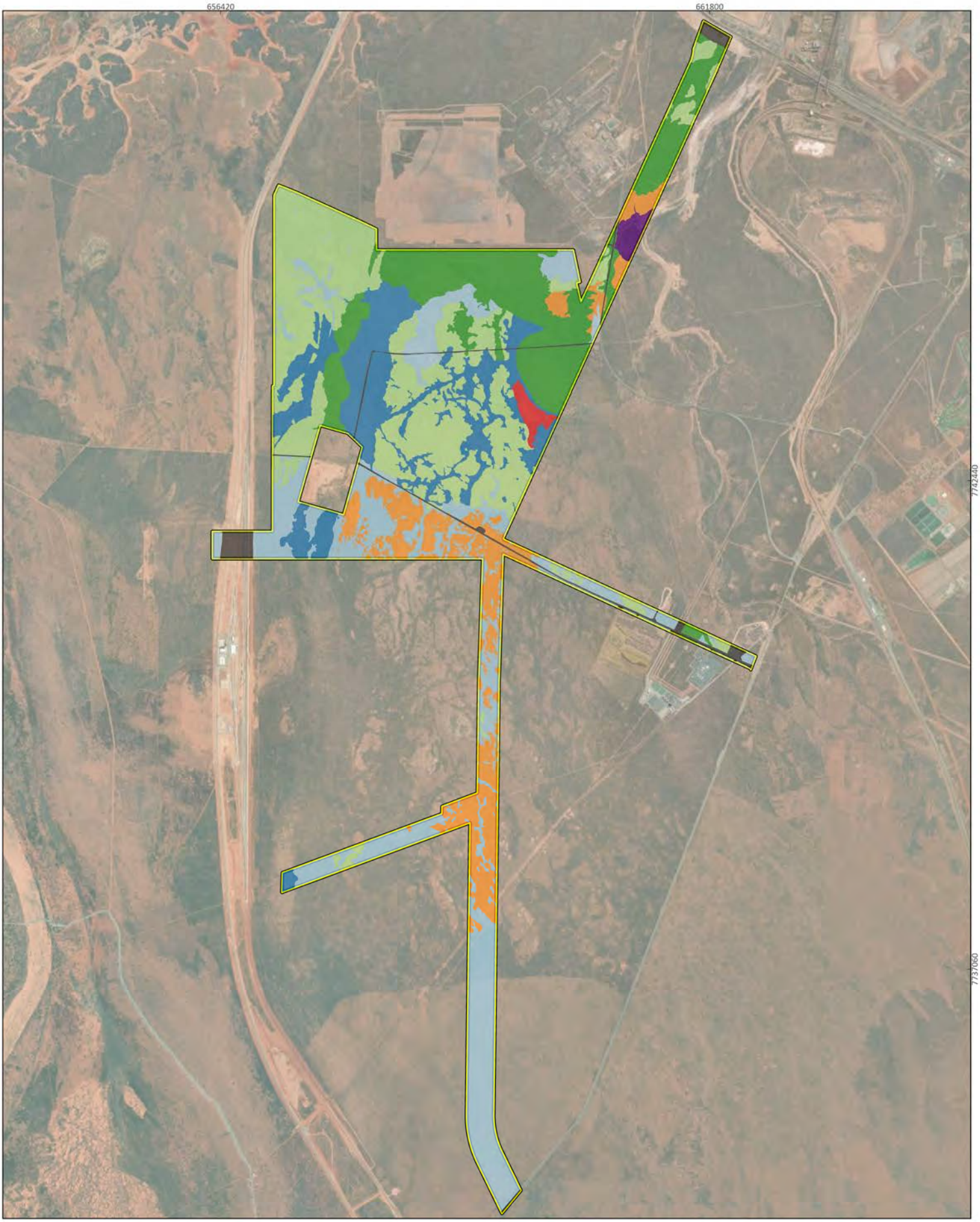
Figure 5-5 Hierarchical clustering (UPGMA) of the flora quadrats of the study area

Table 5-9 Vegetation types, description and extent in the study area

Vegetation type	Site/s	Vegetation description	Extent in study area (ha) and % of study area	Representative photograph
AccCiiTe	5	Tall sparse shrubland of *Acacia colei* var. *colei, A. tumida* var. *tumida,* and *Acacia sericophylla,* over low isolated shrubs of *Corchorus incanus* subsp. *incanus, Solanum lasiophyllum,* and *Acacia stellaticeps,* over a low open hummock grassland of *Triodia epactia,* with *Eragrostis eriopoda,* and *Chrysopogon fallax.*	224.8 ha (15.2%)	
AccAsTe	13	Variably present low isolated trees of *Corymbia candida* or *Eucalyptus victrix,* over a tall sparse shrubland of *Acacia colei* var. *colei,* occasionally with *Acacia tumida* var. *tumida,* and *Acacia sericophylla,* over a low open shrubland of *Acacia stellaticeps, Corchorus incanus* subsp. *incanus,* and *Sida* sp. Pilbara (A.A. Mitchell PRP 1543), over a low hummock grassland of *Triodia epactia,* with *Chrysopogon fallax,* and *Eragrostis eriopoda.*	344.2 ha (23.3%)	

Vegetation type	Site/s	Vegetation description	Extent in study area (ha) and % of study area	Representative photograph
AsTsch	7	Low open shrubland of *Acacia stellaticeps, Corchorus incanus* subsp. *incanus,* and *Ptilotus astrolasius,* over a low open hummock grassland of *Triodia schinzii*, and *Triodia epactia,* with variably present *Eragrostis eriopoda.*	266.8 (18.1%)	
EvGlEa	1	Low woodland of *Eucalyptus victrix,* over a sparse forbland of *Goodenia lamprosperma, Alternanthera angustifolia,* and *Nellica maderaspatensis,* over a low sparse tussock grassland of *Eulalia aurea, Chrysopogon fallax,* and *Eragrostis setifolia.*	11.9 (0.8%)	

Vegetation type	Site/s	Vegetation description	Extent in study area (ha) and % of study area	Representative photograph
AsPtTe	6	Low sparse shrubland of *Acacia stellaticeps, Pluchea tetranthera*, and *Afrohybanthus aurantiacus,* over a low open to hummock grassland *of Triodia epactia* and/or *T. secunda,* with *Eriachne mucronata.*	413.6 ha (28%)	
TeTsec	9	Low hummock grassland of *Triodia epactia,* and *Triodia secunda,* occasionally with *Triodia longiceps.*	167.2 ha (11.3%)	





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Study area

Vegetation type

- AccAsTe
- AccCiiTe
- AsPtTe
- AsTsch
- Cleared
- EvGlEa
- Not assessed
- TeTsec

Figure 5-6
Vegetation types recorded in the field survey

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5.2.1.6 Vegetation condition

Remnant vegetation in the study area was recorded to be in Good to Excellent condition (Figure 5-7) with 91.4% of the vegetation in Excellent condition (Table 5-10).

Table 5-10 Vegetation condition – extent of each condition rating in study area

Condition rating	Area (ha)	% of study area
Excellent	1349.5	91.4
Very Good	77.2	5.2
Good	1.9	0.1
Poor	0	0
Degraded	0	0
Completely Degraded	0	0
Not assessed	47.7	3.2





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Study area

Vegetation condition

Excellent

Good

Not assessed

Very good

Figure 5-7

Vegetation condition in the study area

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5.2.1.7 Significant vegetation

The DBCA Threatened and Priority Ecological Communities database search identified the presence of one PEC within the desktop search extent (Figure 5-1). This PEC, the Eighty Mile Land System, P3 (DBCA), does not intersect and does not occur in the study area, since the PEC refers to coastal ecological communities, and the Project is not located in the coast. Furthermore, this PEC is also located ~38 km away from the study area.

In total, two vegetation types were considered to have local significance in the study area (Table 5-11).

Table 5-11 Significant vegetation types in the study area

Vegetation type	Significance	Level of significance
EvGlEa	There are 11.9 ha of this unique vegetation type represented in one sole region of the study area.	Locally significant
AsTsch	This vegetation is suitable habitat for the P1 *Tephrosia rosea* var. Port Hedland, although apparently only when there is disturbance through the vegetation, i.e. a road. While the extent of this vegetation type consists of 266.8 ha in the study area, there was only one collection of the priority flora in the study area. *T. rosea* var. Port Hedland was collected along a road that extends for 800m within the AsTsch vegetation type. All other recordings of the priority flora were also collected along road verges but outside of the study area.	Locally significant

5.3 SURVEY LIMITATIONS

The limitations of the flora and vegetation survey have been considered in accordance with the EPA Technical guidance (2016b) (Table 5-12).

Table 5-12 Consideration of potential survey limitations

Limitations	Comments
Availability of contextual information at a regional and local scale	Not a limitation Regional information was found in the ENV (2011) report. Additionally, previous surveys have been conducted in the vicinity of the study area.
Competency/experience of the team carrying out the survey	Not a limitation Dr Grant Wells who led the field surveys for this project, has more than 18 years of experience conducting surveys in the Pilbara region.
Scope and completeness	Not a limitation All items in the scope were achieved.
Proportion of flora recorded and/or collected, any identification issues	Not a limitation Sufficient sites were surveyed to capture the flora of the project during the time of survey (refer to section 5.2) The 3 of the total 140 taxa that were not identified due to insufficient taxonomic characters, had affinity to common species and thus there was no concern of confusion with significant flora.
Access within the study area	Limitation Over 12 ha (<1% of the study area) in the NE corridor were not surveyed as a result of restricted access due to cultural significance in the area. No similar textures occur in the study area and therefore vegetation type was not assigned to this area.
Timing, rainfall, season	Not a limitation Surveys were conducted during the primary and supplementary survey periods appropriate for the botanical province (EPA 2016b).
Disturbance that may have affected the results of the survey	Limitation There is evidence of fire across the study area. In particular the northernmost and southernmost areas appear to be more fire affected than the central region. The vegetation types will change with the pass of time as the vegetation matures depending on the occurrence and frequency of fires.

6 DISCUSSION

6.1 FLORA AND VEGETATION

More than a quarter of the taxa listed in the desktop were recorded in the current survey, half the families were recorded in the survey, and over a third of the genera were recorded. The dominant families showed similar numbers for both the desktop and the survey with Poaceae, Fabaceae, and Malvaceae being the most families surveys in both cases. Convolvulaceae was equally dominant to Malvaceae with 8% occurrence during the field survey. However, this was not the case for the desktop assessment, where Amaranthaceae was the fourth dominant family, albeit with 5.9% occurrence.

6.1.1 Significant flora

The P1, *Tephrosia rosea* var. Port Hedland was recorded inside and outside the study area. One population was identified within the study area consisting of 6 individuals. A further three populations were recorded outside the study area, containing 26, 2, and 15 individuals respectively. All the populations of *T. rosea* var. Port Hedland were recorded in disturbed areas in road verges.

From the habitats in which *T. rosea* var. Port Hedland has been recorded in this and a previous survey (Phoenix Environmental Sciences 2022), *T. rosea* var. Port Hedland appears to occur opportunistically along areas of disturbance. This species was recorded in the vegetation type AsTsc, which comprises over 18% of the study area. It is possible that disturbance within this vegetation type may result in the establishment of further individuals/populations of this species.

Other significant flora besides *T. rosea* var. Port Hedland were deemed as possibly occurring in the study area; however, none of these species were recorded during the survey. The field team made collections while searching for *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095), however, the collections were determined in the WA Herbarium as *Abutilon lepidum,*, which is not a significant flora species.

Eragrostis crateriformis, a species that could possibly occur in the study area, was not recorded. The likelihood of recording this species was low since it is an annual species which flowers from May to July and the area was not surveyed in those months.

The habitat of *Euploca mutica* is described as *Acacia* shrubland over hummock grassland on plains and floodplains. However, while much of the study area consists of *Acacia* shrublands over hummock grasslands, this species was not recorded during the survey.

Gomphrena leptophylla, an annual herb shows records of flowering from March through September. While its occurrence is possible, no species of the genus *Gomphrena* were recorded in the study area.

Rothia indica subsp. *australis,* an annual herb, was not recorded during the survey. A collection with the fieldname *Rothia* was made in an effort to find the Priority *Rothia* species*,* however, taxonomical work determined the collection as *Grona filiformis.*

While the *Phyllanthus* sp. B Kimberley Flora may occur in the study area, with its habitat requirements associated with riparian vegetation (Phoenix Environmental Sciences 2022); targeted searches for this species were not conducted in the study area. There was no access to the riparian vegetation of the study area due to heritage value restrictions.

Range extensions were recorded for three species, with their extended distribution ranging from 150 to 225 km from their nearest known records. *Eragrostis setifolia* was recorded 150 km NE of the nearest record in a locally significant vegetation in the study area, EvGlEa. *Maireana georgei* was recorded 160 km east the nearest record. It is a species that occurs in a wide variety of habitats, and it is reasonable for it to occur in the study area, it was found in the vegetation type AsPtTe. *Santalum spicatum* was collected 225 km NE of the nearest record, in a saline playa where a salt tolerant species,

namely, *Tecticornia indica* was collected too. *S. spicatum* was collected near the boundary of a pre-European vegetation association that does not occur in the study area: vegetation 127 - Tidal mudflat.

None of the unidentified species in the survey were considered likely to be Priority flora. Both the *Eucalyptus* and the *Corymbia* species resemble many of the commonly occurring species in the area; they were simply unidentifiable due to the absence of fertile material in combination with fire damage. Furthermore, WA Herbarium (2024) shows that there are no Priority flora of the aforementioned genera in the Roebourne subregion.

The indetermined Poaceae species resembles the genus *Eriachne*. While there was no specimen collected for this entity, the field team correctly identified the *Eriachne* genus when making collections. WA Herbarium (2024) shows only four Priority species of the Poaceae family occurring in the Roebourne subregion: *Eragrostis crateriformis*, *Eragrostis surreyana*, *Themeda* sp. Hamersley Station (M.E. Trudgen 11431), and *Triodia degreyensis*. Since none of the Priority species belong in the genus *Eriachne*, the Poaceae sp. record is unlikely to be a Priority species.

6.1.2 Introduced flora

None of the weed species recorded are a Declared Pest or WoNs. All of the introduced flora recorded during the field survey have previously been recorded in the Pilbara bioregion with all of them having an extensive range in WA (WA Herbarium 1998).

6.1.3 Vegetation

The pre-European vegetation association 647 (Beard *et al.* 2013), Hummock grasslands, dwarf shrub steppe; *Acacia translucens* over soft spinifex was relevant to the study area. The vegetation types, AccAsTe, AccCiiTe, AsPtTe recorded in the vegetation association 647 in the current survey represent *Triodia* grasslands with or without a low shrub layer of *Acacia stellaticeps*. A review of the distribution of *Acacia translucens* (WA Herbarium 1998) has determined that the species is predominantly recorded in the Kimberley bioregion and the closest record of the species to the study area is approximately 125 km to the east of Port Hedland/the study area. *Acacia translucens* is closely related to *A. stellaticeps* which are both part of the *A. stigmatophylla* group (Kodela et al. 2001). *A. stellaticeps* is conspecific with *Acacia translucens* var. *humilis* but was determined to represent a separate species in 2001 (Kodela et al. 2001). Subsequently the vegetation recorded in the study area in the current survey is considered representative of vegetation association 647 (Government of Western Australia 2019), a vegetation classed as Least Concern. Furthermore, the vegetation defined for the Study Area does not represent any listed TEC or PEC.

The vegetation type EvGlEa from the current survey was considered locally significant due to its restricted distribution in the study area. This vegetation type, while locally significant due to its uniqueness in the study area, does not contain any Priority or Threatened flora. This area can probably be preserved during upcoming developments as it represents less than 1% of the study area. A very small patch of a similar vegetation type occurs in the west of the study area, where quadrat BI020 was surveyed. This quadrat was excluded from the analysis because the software found it as an outlier in the dendrogram. After investigating the species collected in this quadrat, and the aerial view of the area, it was determined that while this area is somewhat analogous to the locally significant EvGlEa, it is too small to place a quadrat in it. With a shared soil texture of sandy loam, an overstory of *Eucalyptus victrix,* and with the occurrence of the range extension flora *Eragrostis setifolia,* this quadrat appears to be a very similar vegetation type to EvGlEa. However, several differences between the flora species recorded at each location confirm these two quadrats are not strictly replicates of each other. The major differences are: BI020 does not contain *Goodenia lamprosperma* (a species of high cover in BI010), and it contains three species which are not present in BI010; namely, *Eriachne*



APPENDIX 2



PORT HEDLAND IRON PROJECT

IMPACT RECONCILIATION PROCEDURE

2 October 2025

Document Number: PHI-HBI-IRP-01

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ACKNOWLEDGEMENT OF COUNTRY

In the spirit of reconciliation, Preston Consulting acknowledges the traditional lands of the Kariyarra People on which the Proposed Action is proposed. We recognise their rich culture and their continuing connection to land and waters, and pay our respects to their Elders past, present and emerging.

DOCUMENT CONTROL

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1 THE PROPOSED ACTION

Port Hedland Iron Pty Ltd (PHI) is progressing the development of large-scale downstream iron ore processing capability known as the Port Hedland Iron Project (the Proposed Action). The Proposed Action is located in the Boodarie Strategic Industrial Area approximately 10 km south west of Port Hedland in the Pilbara region. The Proposed Action's regional location is shown in Figure 1 and the indicative footprint and development envelopes are shown in Figure 2.

The Proposed Action will consist of a pellet plant and a hot briquette iron (HBI) Plant, consuming approximately 3-3.5 million tonnes per annum (Mtpa) of iron ore. The first processing step is to produce iron ore pellets (3-3.5 Mtpa). Most of the pellets will be fed into the HBI plant to produce approximately 2 Mtpa HBI. The remainder of the pellets (~0.7 Mtpa) will be exported from the Port as pellets.

The initial infrastructure to be developed within the Boodarie Strategic Industrial Area (SIA) for the Proposed Action will include:

- Iron ore processing facility (IOPF) comprising one pellet and one HBI plant producing approximately 2 Mtpa of HBI and 0.7 Mtpa of iron ore pellets;
- Hydrogen production and storage facilities for supply to IOPF;
- Nitrogen plant; and
- Supporting infrastructure such as:
    - HBI and pellet handling and storage facilities;
    - Flux storage;
    - Administration and other non-process buildings;
    - Workshops;
    - Water storage and management areas;
    - Magnetite concentrate/ore handling facilities;
    - Power production, management and transmission;
    - Carbon capture, storage and transport infrastructure;
    - Drainage and sediment control; and
    - Access roads.

The HBI and iron ore pellets will be shipped out of the Port of Port Hedland (PoPH). The scope of the Proposed Action does not include any construction works at the PoPH or the export of pellets and HBI.

Water, power and natural gas will be supplied by third parties and subject to separate approvals by the relevant third party and are therefore not a part of this referral. However, the referral includes an External Infrastructure Development Envelope (EIDE) to allow connection within the Boodarie SIA to third party suppliers, if needed, as well as development of access roads and drainage for the Proposed Action. The EIDE covers the infrastructure corridors identified in the Boodarie SIA Structure Plan. These infrastructure corridors are managed by the Department of Jobs, Tourism, Science and Innovation (JTSI). The layout of the infrastructure within the EIDE will be determined once commercial arrangements with third-party suppliers have been finalised as well as consultation undertaken with JTSI. The Proposed Action also excludes early works for communications infrastructure, laydown areas and access roads.

The Proposed Action is located within the Boodarie SIA in the Town of Port Hedland, within the Kariyarra Native Title Determination. The Boodarie SIA comprises 4,000 ha of "Strategic Industry" zoned land. The Boodarie SIA is situated 4 km west of South Hedland townsite and approximately 12 km south of Port Hedland townsite in Western Australia (Figure 1).

The Proposed Action includes a 518 ha Plant Development Envelope (PDE) and a 466 ha EIDE, within which up to 300 ha and 90 ha will be disturbed, respectively (Figure 2).

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) released its decision that the referral was a controlled action under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) by preliminary documentation on 3 May 2024. As this is a controlled action, further assessment is needed before a decision can be made on whether or not approval can be granted under the EPBC Act.

A delegate of the Minister for the Environment and Water accepted the referral under Section 74A of the EPBC Act.

1.1 APPROACH

Information relevant to the Proposed Action has been considered in preparing and assessing potential significant residual impacts.

This IRP has been prepared to:

- Align with likely conditions under the EPBC 2023/09764 (pending); and
- Present offsets under the EPBC Act for potential significant residual impacts to MNES relating to the Proposed Activity only.

This IRP has been developed with consideration to *Instructions: Impact Reconciliation Procedures and Impact Reconciliation Reports*.

Note: This IRP will be updated as required, following the provision of the conditions under EPBC 2023/09764.



Legend

- External Infrastructure Development Envelope
- Plant Development Envelope
- Freeways & Highways (LGATE-195)
- WA Towns

Imagery: Google Satellite

GDA 2020 / MGA Zone 50

0 7.5 15 km

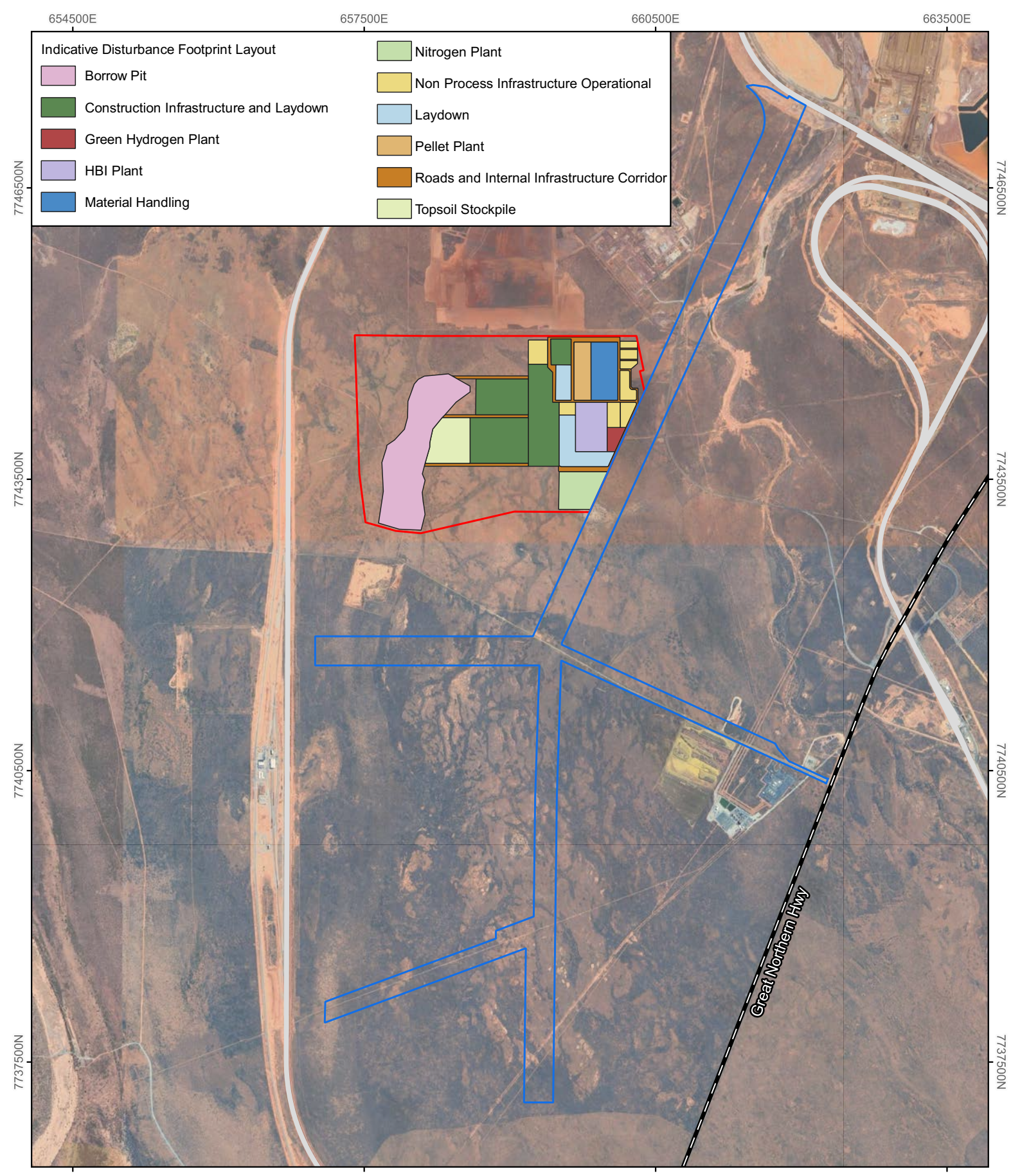
1:500,000 (A4)

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Figure 1: Proposed Action location

AS

September 2023



Legend

External Infrastructure Development Envelope

Plant Development Envelope

Freeways & Highways (LGATE-195)

Railway (DPLH-058)

Imagery: Google Satellite

GDA 2020 / MGA Zone 50

0 1 2 km

1:50,000 (A4)

Preston Consulting

Figure 2: Development envelopes and indicative disturbance footprint

AS

September 2023

2 CONDITION REQUIREMENTS

2.1 PART IV OF THE EP ACT

The Proposed Action is considered to be significant and as such requires assessment under Part IV of the EP Act. The Proposed Action was referred under Section 38 of the *Environmental Protection Act 1986* (EP Act; WA) on 14 September 2023. The Environmental Protection Authority (EPA) released its decision to assess the Proposed Action as an Assessment on Referral Information, with additional information required under s. 40(2) (a), on 18 October 2023. Conditional requirements will be added from the Ministerial Statement once issued.

2.2 EPBC ACT APPROVAL

Figure 2 presents the Proposed Action development envelopes currently being assessed by DCCEEW under EPBC 2023/09764. As assessment is underway, conditions are yet to be determined.

PHI has determined that the Proposed Action may result in significant residual impacts to the following Matters of National Significance (MNES):

- Critical habitat for the Greater Bilby (*Macrotis lagotis*, EPBC listed - Vulnerable); and
- Potential foraging habitat for the Grey Falcon (*Falco hypolecus*, EPBC listed – Vulnerable).

PHI considers that the potential significant residual impacts can be counterbalanced by a contribution to the Pilbara Environmental Offset Fund (PEOF), in accordance with the Western Australia (WA) Environmental Offsets Guidelines and the EPBC Act Environmental Offsets Policy.

3 PROCEDURE

3.1 IDENTIFICATION OF THE BIODIVERSITY VALUES REQUIRING OFFSETS UNDER THE PEOF

After the implementation of mitigation measures described in the documentation supporting the Proposed Action and the requirements of approvals issued under the *Environmental Protection Act 1986* (EP Act) and EPBC 2023/09764 (pending), the Proposed Action is predicted to have a significant residual impact on the MNES detailed in Section 3.1.1.

3.1.1 SIGNIFICANT RESIDUAL IMPACTS

This Impact Reconciliation Report (IRP) has been prepared to detail the significant residual impacts of the Proposed Action to MNES habitat and provide information about how the impacts will be offset under the PEOF.

It is considered that unavoidable significant residual impacts to fauna habitat may occur to the Greater Bilby and the Grey Falcon as summarised in Table 1. For all other MNES, residual impacts resulting from the Proposed Action are not considered significant and offsets are not required.

Table 1: Summary of Significant Impacts – EPBC 2023/09764

MNES	Residual Impacts	Offset Measure
Listed threatened species & communities (Sections 18 & 18A)		
Greater Bilby	Clearing of up to 378.1 ha critical sandplain habitat. Increased weed burdens during construction due to clearing and native vegetation clearing. Habitat erosion due to wind and surface water over time.	PEOF Contribution
Grey Falcon	Clearing of up to 386.1 ha broad foraging habitat. Increased weed burdens during construction due to clearing and native vegetation clearing. Habitat erosion due to wind and surface water over time.	PEOF Contribution

3.1.2 BILBY

After the implementation of mitigation measures, the Proposed Action is predicted to have significant residual impacts on the *Macrotis lagotis* (Greater Bilby) as a result of clearing up to 378.1 ha of critical sandplain habitat. The distribution of sandplain habitat within the Proposed Action Area and surrounds is shown in Figure 4.

Habitat critical to survival of the Greater Bilby, as defined by DCCEEW (2023a), includes:

- Any area where the species is known or likely to occur, as shown on the distribution map in Figure 4;
- Any location outside the known or likely distribution where bilbies are found to occur;
- Any area, between the areas noted above, that may be periodically occupied by bilbies; and
- Any area which bilbies may naturally colonise or may feasibly be reintroduced.

Based on this, Sandplain habitat recorded within the development envelopes is considered to be critical habitat for the Greater Bilby under DCCEEW's definition.

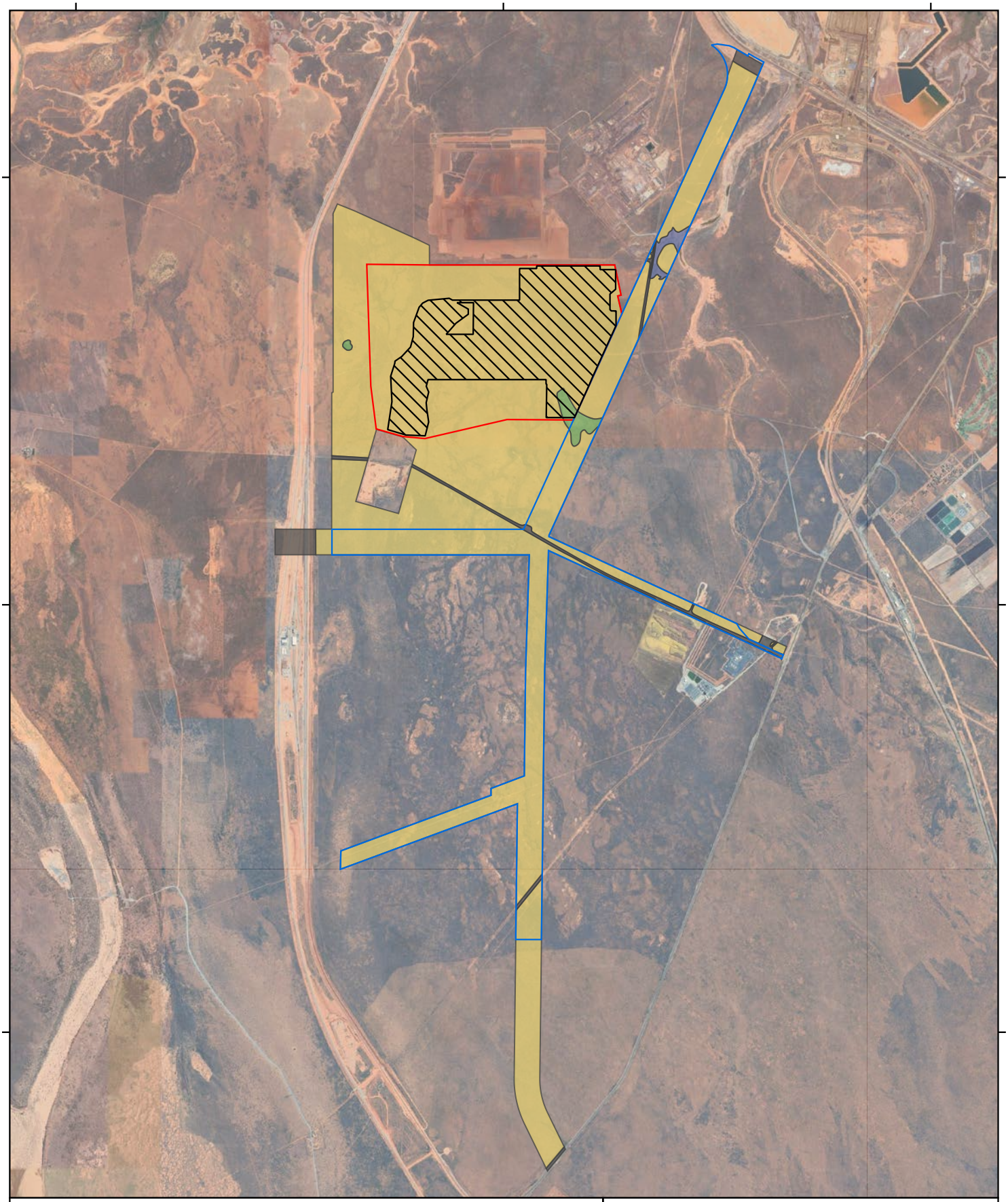


Figure 3: Fauna habitat

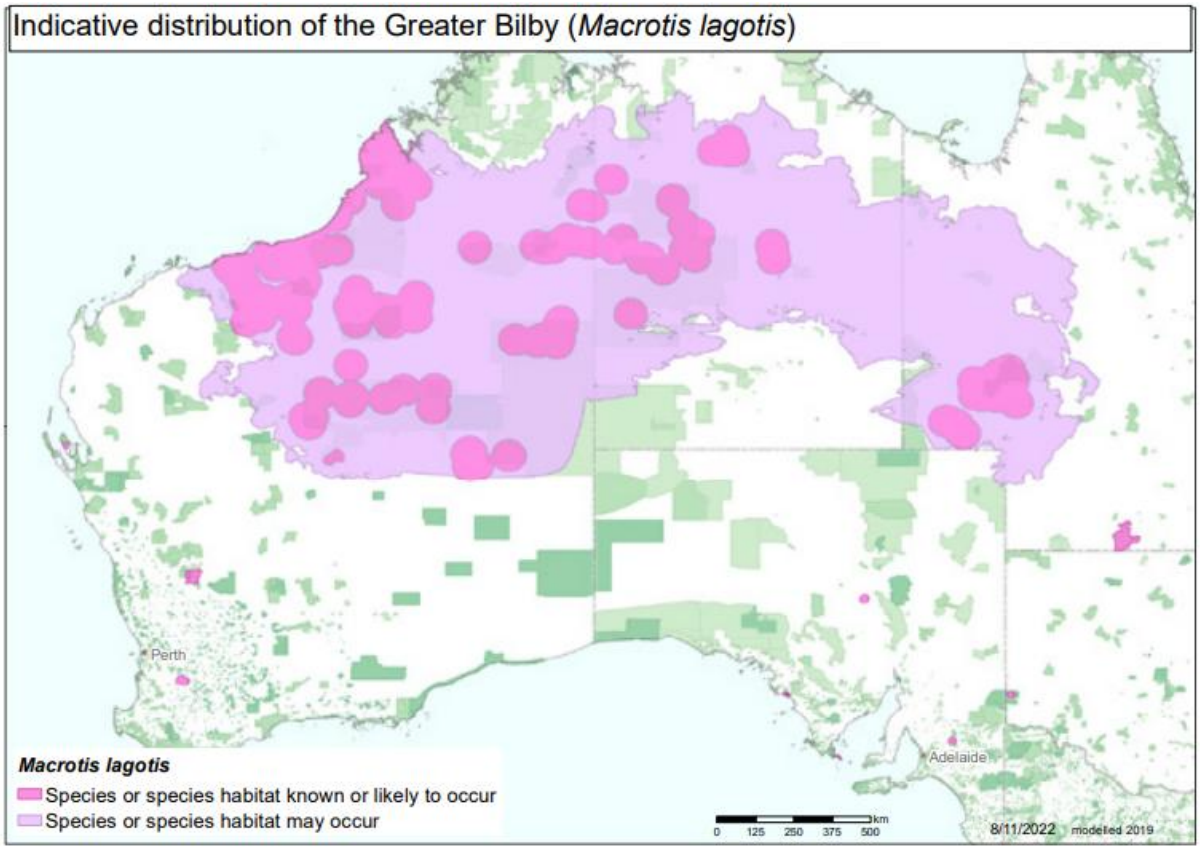


Figure 4: Modelled current distribution of the Greater Bilby (*Macrotis lagotis*) (DCCEEW, 2023)

3.1.3 GREY FALCON

The Grey Falcon is only restricted by habitat in relation to roosting sites (inland drainage lines, grasslands, sparse wooded lowlands, often using old nests and communication towers etc.) and its foraging range is widespread due to its prey mainly being other birds. The tussock grassland habitat is used widely for hunting by the Grey Falcon (Garnett and Crowley, 2000). In the Pilbara, the Grey Falcon is mostly recorded from the coastal plain between the De Grey and Ashburton Rivers. The preferred habitat of this species comprises lightly wooded coastal and riverine plains.

Given the wide-ranging nature of this species, all habitat types within the development envelopes are considered potential foraging habitats:

- Sandplain;
- Drainage Area; and
- Open Woodlands.

Major Drainage Line habitat is considered critical habitat and represents the most suitable breeding and foraging habitat for Grey Falcons. Major Drainage Line habitat provides large trees for nesting and waterbodies which act as attractants for prey. No Major Drainage Line habitat is present within the Proposed Action Area. Grey Falcons forage over a variety of habitat and may utilise the Proposed Action Area for foraging. Major Drainage Line habitat is approximately 6 km west associated with the Turner River, which has a catchment of 4,802 km2 and is approximately 236 km in length (FMG, 2022).

After the implementation of mitigation measures, and given the absence of critical habitat, the Proposed Action is predicted to have significant residual impacts on the *Falco hypolecus* (Grey

Falcon) as a result of clearing up to 386.1 ha of broad foraging habitat. The distribution of suitable foraging habitat within the development envelopes and surrounds is shown in Figure 3.

3.2 Details of Proposed Offsets

To counterbalance the residual impacts to MNES, PHI proposes to make contributions to the PEOF in compliance with the EPBC Environmental Offsets Policy. In the past, it has been difficult for companies to access land and implement their on-ground offsets because of complexities of working on Crown land with overlapping leases (DWER, 2019a). The PEOF aims to invest in strategic conservation projects in the Pilbara bioregion to offset vegetation and species habitat impacted by development (Prober, 2020). It will be supported by a monitoring and evaluation program involving a Program Stream that will aim to measure the general improvement of ecological conditions across the Pilbara resulting from the Fund, and a Strategy Stream, that will more specifically address the effectiveness of ecological management interventions. The PEOF allows multiple offset payments to be combined for larger conservation projects or to expand successful regional initiative, enabling landscape-scale projects with widespread environmental benefits (DWER, n.d.).

The financial contribution is based on the maximum anticipated hectares to be directly impacted (cleared), however the final contribution will be based on actual clearing once clearing has been conducted. The biodiversity values are categorised as 'critical' where habitat is utilised by significant species as shelter / denning / roosting habitat and 'supporting' where habitat is utilised by significant species for foraging and / or dispersal. The categorisation of habitat as critical is based on definitions in the Greater Bilby Recovery Plan (Commonwealth of Australia, 2023).

The Greater Bilby was identified from multiple scats and diggings across the development envelopes. No active or inactive burrows were identified. The sandplain habitat within the development envelopes is most likely utilised for foraging and dispersal activities.

Survey work by Phoenix (2024) identified the areas within the development envelopes as containing suitable Greater Bilby sandplain habitat. Up to 378.1 ha of sandplain habitat has the potential to be cleared for the development of the Proposed Action (26% of mapped extent) which is not expected to represent a significant proportion of locally available habitat.

Up to 1,433.9 ha of potential Grey Falcon broad foraging habitat was recorded within Phoenix's (2024) Survey Area, with 386.1 ha (26.1%) likely to be disturbed as a result of the Proposal. It is likely that the Proposal would only comprise a fraction of the resident Grey Falcons foraging home range.

The funding required shall be based on a rate of $3,306 (excluding GST and adjusted for Consumer Price Index (CPI) each year) per hectare of 'Critical habitat for the Greater Bilby cleared for the Proposed Action and $1,972 per hectare of 'Supporting habitat for the Grey Falcon' cleared for the proposal. The maximum offset contribution will be $2,011,387.80 (Table 2).

Table 2: Summary of Contributions

EPBC Act protected matter to be offset	Protected matter value rating category	Habitat Definition	Amount of area to be offset (ha)	Justification	IBRA subregion	Documented PEOF rate($/ha)	Total to be Offset
Greater Bilby	Critical Habitat	Any area where the species is known or likely to occur or any area outside the known or likely distribution where the Greater Bilby is found. Any area between the previous noted areas, that may be periodically occupied by the Greater Bilby and/or anywhere that the Greater Bilby may naturally colonise or may be feasibly reintroduced.	378.1	Disturbance will occur within an area where the Greater Bilby is likely or known to occur.	Roebourne	$3,306	$1,249,998.60
Grey Falcon	Supporting Habitat	In the Pilbara, the Grey Falcon is mostly recorded from the coastal plain between the De Grey and Ashburton Rivers. The preferred habitat of this species comprises lightly wooded coastal and riverine plains. Within the development envelopes foraging habitats are: • Sandplain; • Drainage Area; and • Open Woodlands.	386.1	Disturbance will occur within an area where the Grey Falcon is likely or known to occur.	Roebourne	$1,972	$761,389.2
						Total Amount to be Offset	**$2,011,387.8**

*Total amount is subject to change, the rates will be adjusted in accordance with the percentage change in the Perth CPI from the date of the approval decision until the applicable financial year in which the payment is made.

3.2.1 Offset Principles

Table 3 provides the overarching principles that are applied in determining the suitability of offsets. In assessing the suitability of an offset, government decision-making will be informed by scientifically robust information and incorporate the precautionary principle in the absence of scientific certainty and conducted in a consistent and transparent manner.

Table 3: EPBC Act overarching principles applied in determining the suitability of offsets

No.	Principle	Offset Suitability
1	Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action.	The PEOF will target both state and Commonwealth environmental matters within areas that have legal access to support longevity for offset outcomes.
2	Suitable offsets must be built around direct offsets but may include other compensatory measures.	The PEOF will deliver environmental offsets in the Pilbara through a strategic landscape-scale approach, building on regional programs including ranger groups, so that environmental offset outcomes are greater than the sum of individual offset contributions.
3	Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter.	PEOF offset rates are based on the level of biodiversity protection in the region, and cumulative impacts to environmental values, including high quality vegetation and the conservation of significant-species habitat.
4	Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter.	The PEOF Implementation Plan (Department of Water and Environmental Regulation; DWER, 2019a) states that: "*Projects delivered through the fund must improve one or more environmental matters specified for offset contributions. Environmental matters are those for which a significant residual impact has been identified through the environmental impact assessment process*". This includes both State Government matters and Commonwealth MNES.
5	Suitable offsets must effectively account for and manage the risks of the offset not succeeding.	The PEOF have developed a Governance Framework to facilitate the coordinated delivery of environmental offset projects (DWER, 2019b). The PEOF will deliver environmental offsets in the Pilbara through a strategic landscape-scale approach, building on regional programs including ranger groups, so that environmental offset outcomes are greater than the sum of individual offset contributions.
6	Suitable offsets must be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action).	The PEOF Implementation Plan (DWER, 2019a) states that: "*Projects delivered through the fund must improve one or more environmental matters specified for offset contributions. Environmental matters are those for which a significant residual impact has been identified through the environmental impact assessment process*". This includes both State Government matters and the Commonwealth MNES.
7	Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable.	DWER will provide a report annually to contributing individuals and organisations regarding expenditure, project evaluation reports and plans for the following 12 months.

No.	Principle	Offset Suitability
8	Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	The PEOF have developed a Governance Framework to facilitate the coordinated delivery of environmental offset project (DWER, 2019b). The PEOF Project Recommendation Group and Implementation Advisory Group would be responsible for the implementation of appropriate offset programs.
9	In assessing the suitability of an offset, government decision-making will be informed by scientifically robust information and incorporate the precautionary principle in the absence of scientific certainty.	The PEOF Commonwealth Offset Policy Principles (DWER, 2019a) states that a suitable offset must be efficient, effective, timely, transparent, scientifically robust and reasonable. The PEOF will be informed by scientifically robust information and incorporate the precautionary principle in the absence of scientific certainty.
10	In assessing the suitability of an offset, government decision-making will be conducted in a consistent and transparent manner.	The PEOF Implementation Plan (DWER, 2019a) states that: *"In assessing the suitability of an offset, Western Australian Government decision-making will be:* • *Informed by scientifically robust information and incorporate the precautionary principle in the absence of scientific certainty; and* • *Conducted in a consistent and transparent manner."*

3.2.2 Offset Objectives

The offset objectives for the Greater Bilby are aligned with the recovery objectives as outlined in the Greater Bilby Recovery Plan (Commonwealth of Australia, 2023). The Recovery Plan includes on-ground conservation and management actions, which are planned to occur within a monitoring framework that measures the impact of management. The Recovery Plan includes supporting actions to promote the role of Traditional Owners and land managers in Bilby conservation, provide governance and coordination, establish and maintain monitoring and surveys, and undertake research to inform management.

The Recovery Plan has four key objectives with associated performance criteria, as detailed below:

- **Objective 1:** The size of the Greater Bilby population has grown.
- **Objective 2:** The area occupied by the Greater Bilby has been maintained or increased.
- **Objective 3:** The genetic diversity of the Greater Bilby has been maintained and retains the potential for evolutionary change through adaption and selection.
- **Objective 4:** Indigenous organisations, communities, and individuals have a greater role in Greater Bilby conservation.

The Threatened Species Scientific Committee advises that a recovery plan is not recommended for the Grey Falcon. The Conservation Advice provides sufficient guidance on the recovery of the Grey Falcon and a decision to have a recovery plan is unlikely to lead to substantial additional conservation benefits at this time. Key points from the Grey Falcon conservation advice are as follows:

Primary conservation actions:

- Support initiatives to improve habitat management; and
- Cat and camel control in arid and semi-arid Australia.

Conservation and management priorities:

- Habitat loss, disturbance and modifications;
    - Support improved fire and grazing management in areas where Grey Falcons are known to occur;
    - Protect known nesting trees and include adequate exclusion buffers with regard to proposed developments and land clearing activities;
    - Support the establishment and survival of replacement nest trees in areas where Grey Falcon in known to breed; and
    - Retain artificial structures with known or potential Grey Falcon nests.
- Invasive species;
    - Control invasive cats and camels in areas where Grey Falcons are known to occur, especially in known roosting and nesting areas.

Stakeholder Engagement:

- Engage Indigenous Land Councils, communities, pastoral industry, land managers and non-government organisations to support the conservation of Grey Falcons;
- Discourage the disclosure of locations of active nests to the public;
- Promote the conservation, and raise the profile, of Grey Falcons through strategic programs and educational products with land holders and community groups; and
- Promote the exchange of conservation priorities between governments, non-government organisations and communities through use of networks, publications and websites.

Survey and Monitoring priorities:

- This species is rare, with a very large distribution. Monitoring population trends is particularly challenging, and will probably require collaboration between many stakeholders to implement, once a suitable approach has been designed;
- Annual surveys of breeding events across the arid and semi-arid zone are recommended including at least the Western Simpson Desert, Tanami Desert and Barkly Tablelands;
- Locating active Grey Falcon nests is aided by:
    - Visiting nests used in previous years;
    - Actively searching for new nests in suitable habitat; and
    - Following up records from the general public, including from Indigenous communities, land managers and bird watchers.

Information and research priorities:

- Develop methods for assessing population trends in a rare, widely-distributed species. This requires consideration of logistical, sampling and analytical constraints;
- Continues to collect ecological and demographic information; and
- Improve knowledge about potential threatening processes including feral cats, climate change and habitat modification.

3.3 METHODOLOGY TO DETERMINE CLEARING

In order to accurately reconcile the clearing completed the Proposed Action, baseline information will be used to determine the appropriate value ($/ha) for the offset.

Approved clearing is progressively tracked using the Proposed Action's Ground Disturbing Permit system and Clearing Database. This will track actual clearing that has been undertaken using GPS tracking methods. Once an area has been cleared, the survey department will generate coordinates for the cleared area and then revise the Site Plan and Clearing Database to provide a spatial representation of clearing to-date. The clearing database is to be updated regularly.

In addition, ground truthing using a licenced surveyor will be undertaken annually (in July) to verify the clearing within the Clearing Register. Results of the survey will be provided to the DCCEEW to verify areas of impacts (when licensing permits).

The verification involves a visual comparison of clearing area coordinates mapped on the Proposed Action's Site Plan with the ground truthing survey data. Any inaccuracies in the extent of clearing in the Site Plan will be rectified based on the ground truthing survey data to produce final clearing polygons. This data will be supplied as part of the Impact Reconciliation Report (IRR) for submission to DCCEEW.

The Clearing Database includes the following information:

- Method of clearing;
- Reason / justification;
- Amount required;
- Timing; and
- Baseline ecological value.

4 REPORTING

4.1 FREQUENCY AND TIMING

The reporting schedule is provided in Table 4. The clearing calculation for the first biennial reporting period will commence from ground disturbing activities and end on the second 30 June following the commencement of ground disturbing activities. Each subsequent clearing calculation will be from 1 July to 30 June, two years later, with the first three periods shown in Table 4.

Each Impact Reconciliation Report (IRR) will be provided to DCCEEW within three months of the end of each reporting period. Evidence of payments will be provided to DCCEEW within 10 business days of the date of payment.

Table 4: Reporting Period and Frequency of the IRP

Period	Action	Timing
	Approval Decision issued	TBD
	Commencement of Proposed Action	TBD
Period 1	First biennial reporting period	From the commencement of the Proposed Action to 30 June 20XX
	Ground truthing	July following commencement of Proposed Action
	IRR submitted to DCCEEW	30 September 20XX
	Evidence of payment submitted to DCCEEW	Within 10 business days of the date of the payment
Period 2	Second biennial reporting period	1 July 20XX to 30 June 20XX
	Ground truthing	July of the following biennial period
	IRR submitted to DCCEEW	30 September 20XX
	Evidence of payment submitted to DCCEEW	Within 10 business days of the date of the payment
Period 3	Second biennial reporting period	1 July 20XX to 30 June 20XX
	Ground truthing	July of the following biennial period
	IRR submitted to DCCEEW	30 September 20XX
	Evidence of payment submitted to DCCEEW	Within 10 business days of the date of the payment
On completion of clearing	IRR submitted to DCCEEW	Within 40 business days of completion of clearing required for the Proposed Action
	Final Reconciliation Report to DCCEEW	Within 40 business days of completion of clearing required for the Proposed Action

The contribution to the PEOF will be paid biennially, with the amount to be contributed calculated based on the clearing undertaken in both years of the biennial reporting period, and the contribution calculated on the basis of the real value of the payment per hectare cleared being the same as the amounts specified in the Ministerial Statement at the date the approval decision was made.

The IRR will confirm the area and the relevant values of the vegetation cleared in order to determine the value of the biennial offset payment. Dollar/hectare rates will be as specified in Section 3.2. The real value of contributions will be adjusted in accordance with the percentage change in the CPI applicable to the financial year in which the payment is made.

4.2 CLEARING AND RECONCILIATION

Each IRR shall be structured in the manner prescribed in the EPA's "*Instructions for preparing Impact Reconciliation Procedures and Impact Reconciliation Reports* ', using the template provided in the link below:

https://www.epa.wa.gov.au/forms-templates/instructions-preparing-impact-reconciliation-procedures-and-impact-reconciliation

Each IRR shall include the following information:

- Proposed Action background;
- Summary of ministerial statement reporting condition requirements;
- Summary of the environmental values covered by the IRP;
- Purpose for clearing undertaken within the reporting period;
- A table showing the current extent of clearing (ha), the rate/ha for each clearing matter and an estimate of the total amount due - DWER to calculate the final amount payable for the reporting period; and
- A figure showing the current extent of clearing.

GLOSSARY

Term	Meaning
CPI	Consumer Price Index
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DWER	Department of Water and Environmental Regulation
EIDE	External Infrastructure Development Envelope
EP Act	Environmental Protection Act 1986
EPA	Environmental Protection Authority
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
ha	Hectare
HBI	Hot Briquette Iron
IOPF	Iron Ore Processing Facility
IRP	Impact Reconciliation Procedure
IRR	Impact Reconciliation Report
JTSI	Department of Jobs, Tourism, Science and Innovation
km	Kilometre
Mtpa	Million Tonnes per Annum
PDE	Plant Development Envelope
PEOF	Pilbara Environmental Offsets Fund
PHI	Port Hedland Iron Project
Phoenix	Phoenix Environmental Sciences Pty Ltd
PoPH	Port of Port Hedland
Proposed Action	Port Hedland Iron Project
Proposed Action Area	Plant Development Envelope and External Infrastructure Development Envelope
SIA	Strategic Industrial Area
WA	Western Australia

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APPENDIX 3



PORT HEDLAND IRON PROJECT

FAUNA MANAGEMENT PLAN

26 SEPTEMBER 2025

DOCUMENT ID: POS_AUS_EMP_REV_B

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ACKNOWLEDGEMENT OF COUNTRY

In the spirit of reconciliation, Preston Consulting acknowledges the traditional lands of the Kariyarra People on which the Project is proposed. We recognise their rich culture and their continuing connection to land and waters, and pay our respects to their Elders past, present and emerging.

DOCUMENT CONTROL

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EXECUTIVE SUMMARY

Port Hedland Iron Pty Ltd (PHI) is progressing the development of downstream iron ore processing capability known as the Port Hedland Iron Project (Project). The Project is located in the Boodarie Strategic Industrial Area (SIA) approximately 10 kilometres (km) south west of Port Hedland in the Pilbara region of Western Australia (WA). The Project will consist of a pellet plant and a hot briquette iron (HBI) Plant, consuming approximately 3-3.5 million tonnes per annum (Mtpa) iron ore to produce approximately 2 Mtpa HBI and 0.7 Mtpa of Pellets for export.

A detailed terrestrial fauna survey and pre-clearance survey for the Greater Bilby (Bilby; *Macrotis lagotis*) were undertaken by Phoenix Environmental Sciences Pty Ltd (Phoenix) in April 2023 for PHI (Phoenix, 2024). The detailed survey was undertaken in a 1,476 ha survey area 7 km east of the South Hedland (Survey Area). The Survey Area included the 518 ha Plant Development Envelope (PDE) and the 466 ha External Infrastructure Development Envelope (EIDE). The pre-clearance survey was undertaken in support of geotechnical investigations over a 6 ha area within the PDE.

This Fauna Management Plan (FMP) has been developed in order the ensure that construction and operational activities of the Project are carried out in a manner that minimises impacts to Night Parrot, Bilby and Grey Falcon individuals as well as their and habitat.

Table 1: Summary

Project Name	Port Hedland Iron Project
Proponent Name	Port Hedland Iron Pty Ltd
Ministerial Statement number	NA
Purpose of this Management Plan	To ensure construction and operational activities of the Project are carried out in a manner that minimises impacts to the Night Parrot (*Pezporus occidentalis*) Bilby (*Macrotis lagotis*) and Grey Falcon (*Falco hypoleucos*).
Key environmental factor	Terrestrial Fauna.
EPA's environmental objective	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
Condition clauses	NA
Key components	The key components of this FMP include avoiding, minimising and reducing the impacts of the Project by: • Restricting disturbance and vegetation clearing to designated areas, vehicle movement to designated tracks, and all other infrastructure to approved cleared areas; • Monitor Night Parrot. Bilby and Grey Falcon activity to determine presence or absence within and around the development envelopes; • Monitor feral predator activity and implement feral predator control procedures; • Implementing a weed management procedure for vehicles and machinery entering and leaving the development envelopes, to ensure they are free from soil and vegetative material and are restricted to designated tracks or approved areas only; • Implementing dust, noise and vibration suppression procedures and controls; • Implementing fire prevention measures and procedures to prevent or minimise the occurrence of fire within the development envelopes; and • Implementing hydrocarbon or pollutant management engineering and design controls, to reduce the likelihood of spills occurring.

Proposed Construction Period	2028-2030
EMP required pre-construction?	Yes

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1 CONTEXT, SCOPE AND RATIONALE

1.1 PROJECT DESCRIPTION

PHI is progressing the development of large-scale downstream iron ore processing capability known as the Port Hedland Iron Project (Project). The Project is located in the Boodarie SIA approximately 10 km south west of Port Hedland in the Pilbara region of WA.

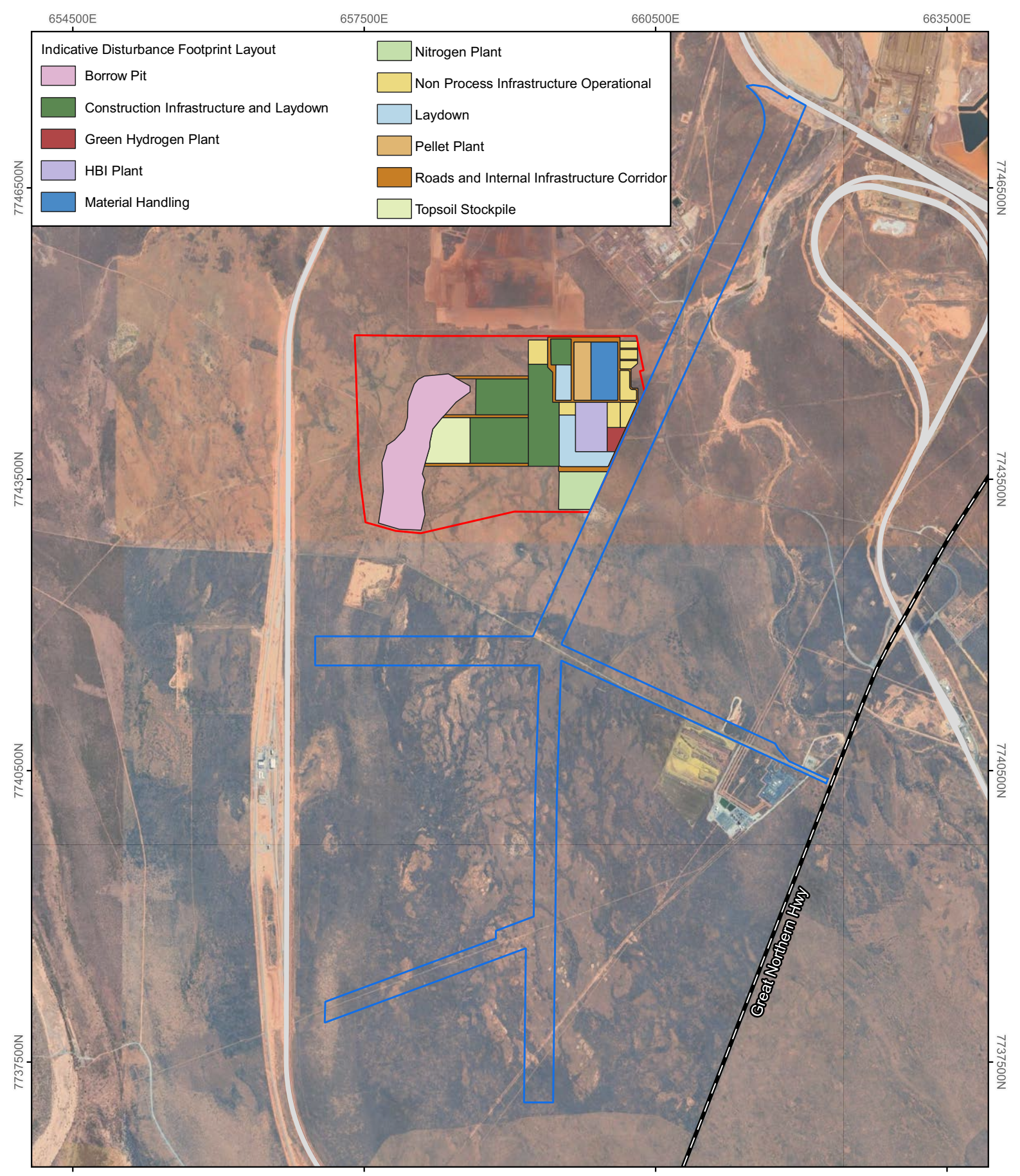
The Project will consist of a pellet plant and a HBI Plant, consuming approximately 3-3.5 Mtpa magnetite ore to produce approximately 2 Mtpa of HBI.

The initial infrastructure to be developed within the SIA for the Project will include:

- Iron ore processing facility (IOPF) comprising one pellet and one HBI plant producing approximately 2 Mtpa of HBI and 0.7 Mtpa of iron ore pellets;
- Carbon capture and storage infrastructure;
- Hydrogen production and storage facilities for supply to IOPF; and
- Supporting infrastructure such as:
    - HBI and pellet handling and storage facilities;
    - Flux storage;
    - Administration and other non-process buildings;
    - Workshops;
    - Water storage areas;
    - Magnetite concentrate handling facilities; and
    - Access roads.

The development envelopes will total an area of 984 ha. The development envelopes are comprised of a 518 ha PDE and a 466 ha EIDE (Figure 1). Both development envelopes are within the SIA.

Development of the Project will require, subject to the finalised design, the clearing of up to 386.1 ha of land variably and sparsely covered in native vegetation within the development envelopes. This has the potential to impact on known habitat for a local population of Greater Bilby (*Macrotis lagotis;* hereafter Bilby) and broad foraging habitat for the Grey Falcon (*Falco hypoleucos*; hereafter Grey Falcon). In addition to the Bilby and the Grey Falcon, the development envelopes provide potential habitat for the Night Parrot (*Pezoporus occidentalis*) and lie within the Priority Survey Bioregion for the species (DBCA, 2024). No Night Parrot were recorded during surveys, however due to the presence of potential habitat, this species has been included in the FMP. The Project location and development envelopes are shown in Figure 1. A summary of the Project details and the FMP are provided in Table 1.



Legend

- External Infrastructure Development Envelope
- Plant Development Envelope
- Freeways & Highways (LGATE-195)
- Railway (DPLH-058)

Imagery: Google Satellite

GDA 2020 / MGA Zone 50

0 1 2 km

1:50,000 (A4)

Preston Consulting

Figure 1: Development Envelopes

AS

September 2023

1.2 Purpose of this Management Plan

The purpose of this FMP is to ensure that impacts to the Night Parrot, Bilby and Grey Falcon during construction of the Project are avoided and minimised as far as possible through the implementation of good practice management measures. This FMP will provide management actions and monitoring measures that will deliver conservation outcomes for the Night Parrot, Bilby and Grey Falcon, and account for the residual impacts associated with habitat loss from the construction of the Project.

This FMP includes:

- Spatially accurate, rectified and geographically referenced maps showing the location of Night Parrot, Bilby and Grey Falcon records in relation to the development envelopes;
- Management actions that will be undertaken to prevent direct and indirect impacts to Night Parrot, Bilby and Grey Falcon individuals and their habitat from weeds, feral predators, fire, hydrocarbon or other environmental contamination;
- Management actions to be implemented that aim to ensure the management targets are achieved; and
- Monitoring methodology including the frequency and assessment methodology.

This FMP also includes sections on both adaptive management and review, and stakeholder engagement to ensure it aligns with the Environmental Protection Authority's (EPA) and the Department of Climate Change, Energy, the Environment and Water (DCCEEW) current guidance (EPA, 2024; DotE, 2014).

The management measures and monitoring identified are expected to ensure that the impacts to Bilby and Grey Falcon populations are not significant.

1.3 Approvals

The Project is being assessed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act, Cth) as an 'Assessment on Preliminary Documentation'.

1.4 Night Parrot

1.4.1 Status

The Night Parrot is listed as Critically Endangered under the EPBC Act and WA *Biodiversity Conservation Act 2016* (BC Act). In addition to legislative protection, this species is culturally important to Traditional Owners as a part of tjukurrpa (The Dreaming) (Indigenous Desert Alliance, n.d.).

1.4.2 Ecology and Distribution

Historic and contemporary records provide evidence of the past and present distribution of the Night Parrot. Previously found throughout most of arid and semi-arid WA, since 2017 all Night Parrot records from WA have occurred in central and northern areas of WA's interior (DBCA, 2024).

Figure 2 shows Night Parrot survey bioregions. High Priority Survey Bioregions are those in which all contemporary, and the most high veracity historical records of Night Parrot have occurred, or where a bioregion is in close proximity to contemporary records. The Priority Survey Bioregions include those with historical reports (some of high veracity) but no reported contemporary records and are likely to contain suitable habitat that could support Night Parrot populations (DBCA, 2024).

At the landscape scale, night parrots require two distinct habitats:

1. Patches of low, dense vegetation in which they roost during the day; and
2. Nearby floodplains or other low-lying areas supporting diverse assemblages of native grasses and herbs in which to feed at night.

Both roosting and foraging habitat is typically on flat or gently sloping ground, and is very open, with few trees or shrubs. Night Parrots have been known to fly up to 10 km from their roosting sites during foraging expeditions, and possibly further, so foraging habitat is not necessarily within or immediately adjacent to roosting areas.

All contemporary records from QLD and WA have been associated with paleodrainages or eroded rocky areas; landscapes that support both roosting and foraging habitat. Paleodrainages, including salt lake edges and nearby interdunal claypans often support suitable foraging habitat. The margins of these drainages can be topographically complex and support isolated patches of *Triodia* that are protected from fire. In these systems, chenopod-dominated areas are also considered potential roosting or foraging habitat. Eroded rocky areas, including stony pavements and the edges of breakaways, can also be topographically complex. That complexity, plus extensive areas of bare stony ground, provide protection from fire for areas of Triodia. At these sites, runon areas and shallow depressions, or other areas of slight relief can support patches of suitable foraging habitat (DBCA, 2024).

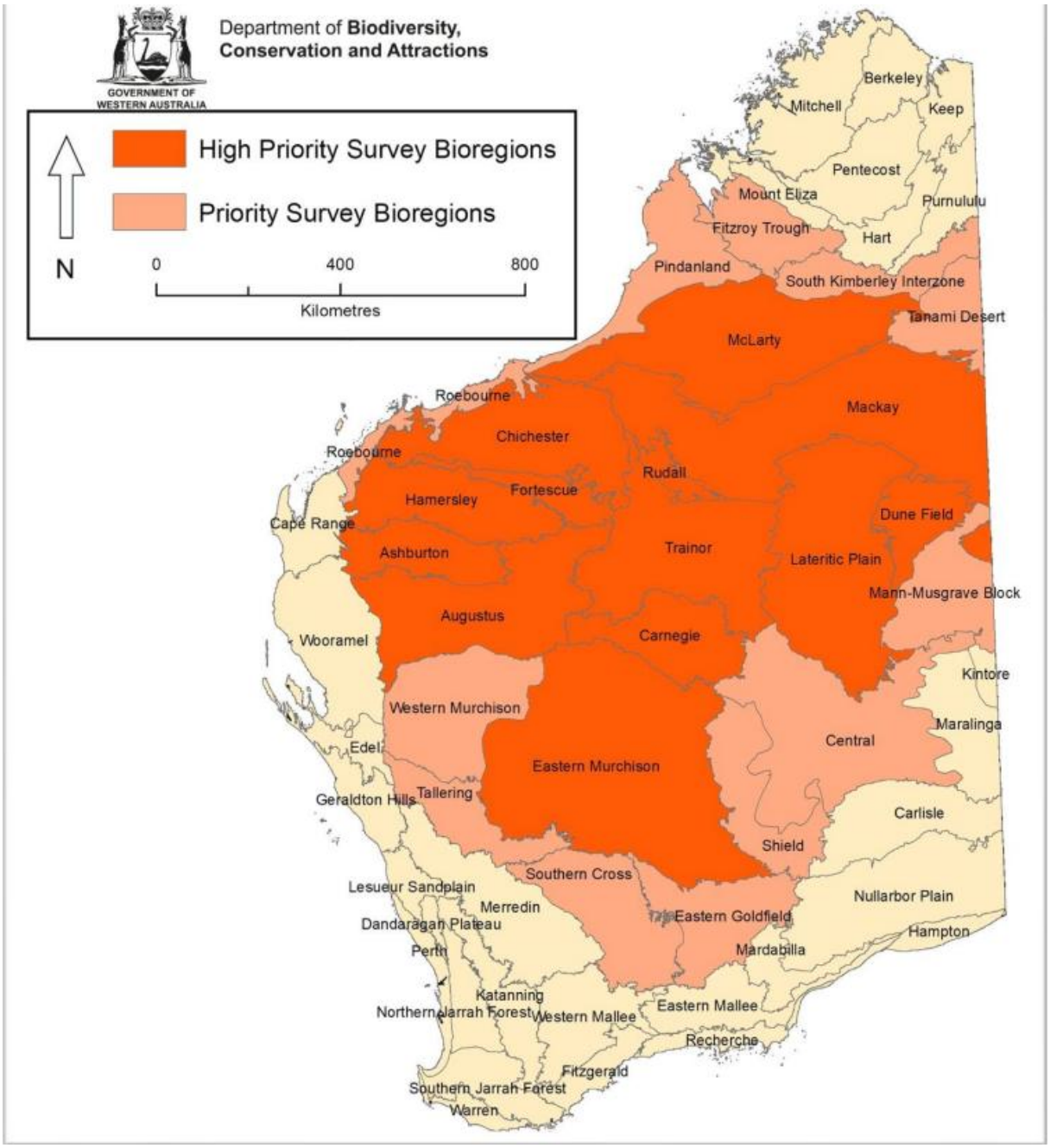


Figure 2: Night Parrot survey regions

1.4.1 KEY THREATS

Key threats to the Night Parrot include:

- Inappropriate fire regimes – increase in fire frequency and intensity of fires impacting sites for nesting and roosting;
- Predation by feral cats and foxes; and
- Habitat degradation by introduced herbivores, particularly those with hooves. Over-grazing by cattle can reduce the availability and quality of ground cover.

1.5 BILBY

1.5.1 STATUS

The Bilby is listed as Vulnerable under the EPBC Act and the WA BC Act. In addition to legislative protection, this species is culturally important to Traditional Owners (Paltridge, 2016; Walsh & Custodians of the Bilby, 2016).

1.5.2 ECOLOGY AND DISTRIBUTION

The Bilby occurs in two main separate geographic areas: one extending from the western desert of the Northern Territory to the Pilbara and Kimberley regions in WA; and one in south-western Queensland.

The species is solitary and shelters in burrows during daylight and intermittently during the night. It occupies three main habitat types across its' distribution (Threatened Species Scientific Committee (TSSC), 2016):

- Open tussock grassland on uplands and hills;
- *Acacia aneura* (mulga) woodland/shrubland growing on ridges and rises; and
- Hummock grassland in plains and alluvial areas.

Bilby habitat varies across the landscape, influenced by climatic zones, soil, vegetation types, and landforms. Throughout WA, three landforms have been identified as habitat; residual landforms, fluvial landforms and plains and dune fields (Cramer et al., 2016).

Bilbies are highly mobile and have large foraging ranges, with adult females moving up to 1.5 km between burrows on consecutive days, and adult males moving up to 5 km between burrows on consecutive days (Commonwealth of Australia, 2023). Studies have indicated an average home range of 0.18 km^2 for females and 3.16 km^2 for males, with numerous active and inactive (unused) burrows present within this range (Commonwealth of Australia, 2023).

The Bilby is an omnivore that digs for food, with a diet consisting of invertebrates such as insect larvae, termites, ants, grasshoppers, spiders and beetles, and other items such as seeds, bulbs and fungi (TSSC, 2016). Some of the key food sources are dependent on fire history (Commonwealth of Australia, 2023).

1.5.3 KEY THREATS

The key threats to the Bilby include (Commonwealth of Australia, 2023):

- Predation by feral predators including cats (*Felis catus*) and foxes (*Vulpes vulpes*);
- Habitat loss and fragmentation;
- Domestic and other introduced species;
- Unmanaged fire and inappropriate fire regimes;
- Loss of Traditional Owner knowledge and land management; and
- Reduction in population resilience and genetic fitness in wild and intensively managed populations.

1.6 GREY FALCON

1.6.1 STATUS

The Grey Falcon is listed as Vulnerable under the EPBC Act and BC Act.

1.6.2 ECOLOGY AND DISTRIBUTION

The Grey Falcon is only restricted by habitat in relation to roosting sites (inland drainage lines, grasslands, sparse wooded lowlands, often using old nests and communication towers etc.) and its foraging range is widespread due to its prey mainly being other birds. The tussock grassland habitat is used widely for hunting by the Grey Falcon (Garnett and Crowley, 2000). In the Pilbara, the Grey Falcon is mostly recorded from the coastal plain between the De Grey and Ashburton Rivers. The preferred habitat of this species comprises lightly wooded coastal and riverine plains.

1.6.3 KEY THREATS

In the absence of focused studies on Grey Falcons, all potential threats to the species that have been published are based on general considerations and extrapolations from better studied species and are, therefore, speculative (Garnett and Crowley 2000, Garnett et al. 2011). Key threats to the Grey Falcon include:

- Predation by cats;
- Increased temperatures in arid and semi-arid Australia;
- Small population size;
- Grazing by exotic herbivores;
- Nest Shortage;
- Birdwatchers and photographers;
- Collision with traffic;
- Collisions with fences and powerlines;
- Egg collecting; and
- Falconry.

1.7 RATIONALE AND APPROACH

PHI's approach to management used in this FMP is to emphasise managing impacts through planning, organisation and controlling aspects of the Project prior to commencement. The following hierarchical approach to manage potential impacts has been used:

- Avoidance: measures used to avoid or prevent impacts from the Project;
- Minimisation: measures taken to reduce the duration, intensity and/or extent of impact; and
- Rehabilitate: measures taken to remediate and rehabilitate areas temporarily disturbed during construction.

Results from surveys and study findings inform PHI's management approach for meeting the EPA's environmental objective.

All surveys have been conducted with escort and participation by Kariyarra Aboriginal Corporation (KAC) monitors.

1.7.1 Survey Findings

A detailed terrestrial fauna survey was undertaken by Phoenix in April 2023 (Phoenix, 2024), within a 1,476 ha Survey Area which included the PDE and the EIDE (Figure 3). No Night Parrot were recorded during surveys, however sandplain habitat was considered potential habitat for the species.

Secondary evidence (tracks and scats) of the Bilby were recorded from 112 locations within the Survey Area during the detailed fauna survey, however, no active or inactive burrows were recorded (Figure 4). The majority of the secondary evidence (78%) was recorded within the PDE. The remaining locations were all located within the EIDE. All evidence was identified within sandplain habitat.

A small area of the PDE was subject to a Bilby pre-clearance survey in accordance with the conditions of a Native Vegetation Clearing Permit (CPS10103-1) (Figure 3). The survey did not record any active or inactive/old Bilby burrows. In the eastern area Bilby scats were recorded at three locations and foraging digs were identified at nine locations. The recency of the scats could not be determined due to weathering associated with heavy rainfall and large temperature ranges.

A detailed terrestrial fauna survey and targeted Bilby survey was also undertaken for APA's Port Hedland Solar Project, immediately southeast of the Project (Phoenix, 2022). No burrows were identified however evidence of Bilby was recorded throughout the study area and particularly along South West Creek. The study area for the targeted Bilby survey intersected with the Project area with 29 records at 10 locations within the EIDE (Phoenix, 2022;Figure 3). The majority of these records were associated with sandplain habitat, all associated with scats and diggings.

A breeding pair and single fledged juvenile were recorded perched on a transmission tower during surveys for the Project (Figure 5). Grey Falcons typically nest and roost along heavily wooded drainage lines (critical habitat). There are no heavily wooded drainage lines within the developments envelope that would be considered critical habitat for they Grey Falcon however given the wide-ranging nature of this species, all habitat types within the development envelopes are considered potential foraging habitats:

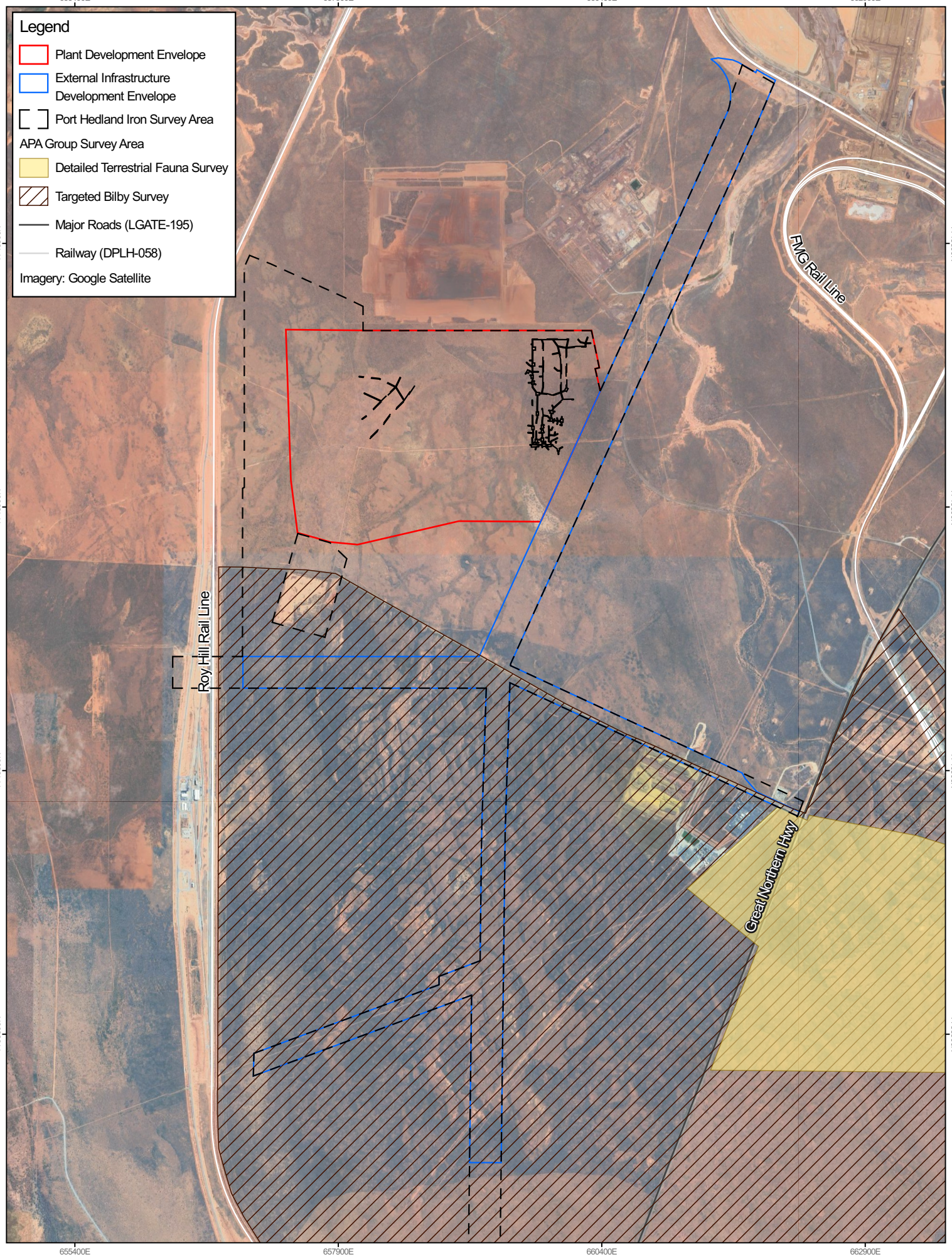
- Sandplain;
- Drainage Area; and
- Open Woodlands

No evidence of Northern Quoll was recorded during the surveys completed for the Project, however there were historical records identified though the desktop assessment, 4 km northeast of the Project (Figure 6).

A description of the surveys is outlined in Table 2. The key findings of these assessments are detailed in the following sections.

Table 2: Environmental report and survey programs undertaken.

Survey Description	Area of Coverage	Field Dates	Report Title
Prior to Development			
Detailed Terrestrial Fauna Survey • Desktop assessment, with emphasis on Threatened & Priority fauna; • Detailed fauna assessment of the Survey Area; and • Definition and mapping of fauna habitat, Threatened and Priority fauna, and related management issues.	PDE, EIDE and surrounds.	April 2023	Detailed terrestrial fauna survey for the Port Hedland Green Steel Project (Phoenix, 2024).
Pre-clearance Bilby Survey: • Targeted Bilby survey within the PDE.	Within the PDE.	September 2023	Pre-clearance field note (S. Pynt pers. comms.)
Detailed Terrestrial Fauna and Targeted Bilby Survey • Survey undertaken for APA's Port Hedland Solar Project and included: o A desktop assessment; o Detailed fauna assessment; and o Targeted Bilby Survey.	Sections of the EIDE.	January 2021 and August 2021.	Detailed terrestrial fauna and targeted Bilby survey for The Port Hedland Solar Farm Project.



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0 0.7 1.4 km

GDA2020 / MGA zone 50

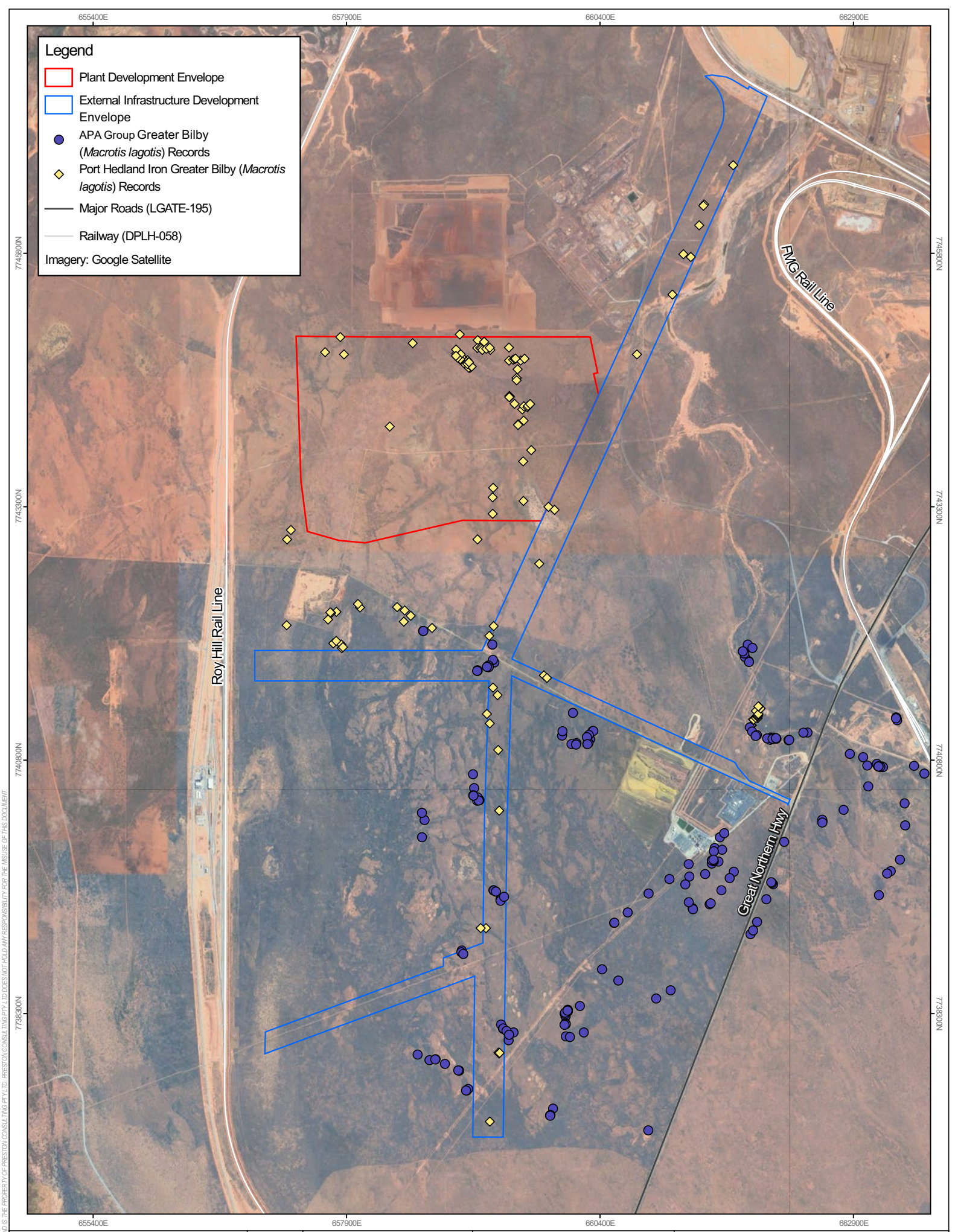
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Project: PHGS_0406_039
Date: 18/09/2025
Size: A4
Author: ASmithers

Preston Consulting

Figure 3: PHI Survey Area in relation to Port Hedland Solar Project Survey Area



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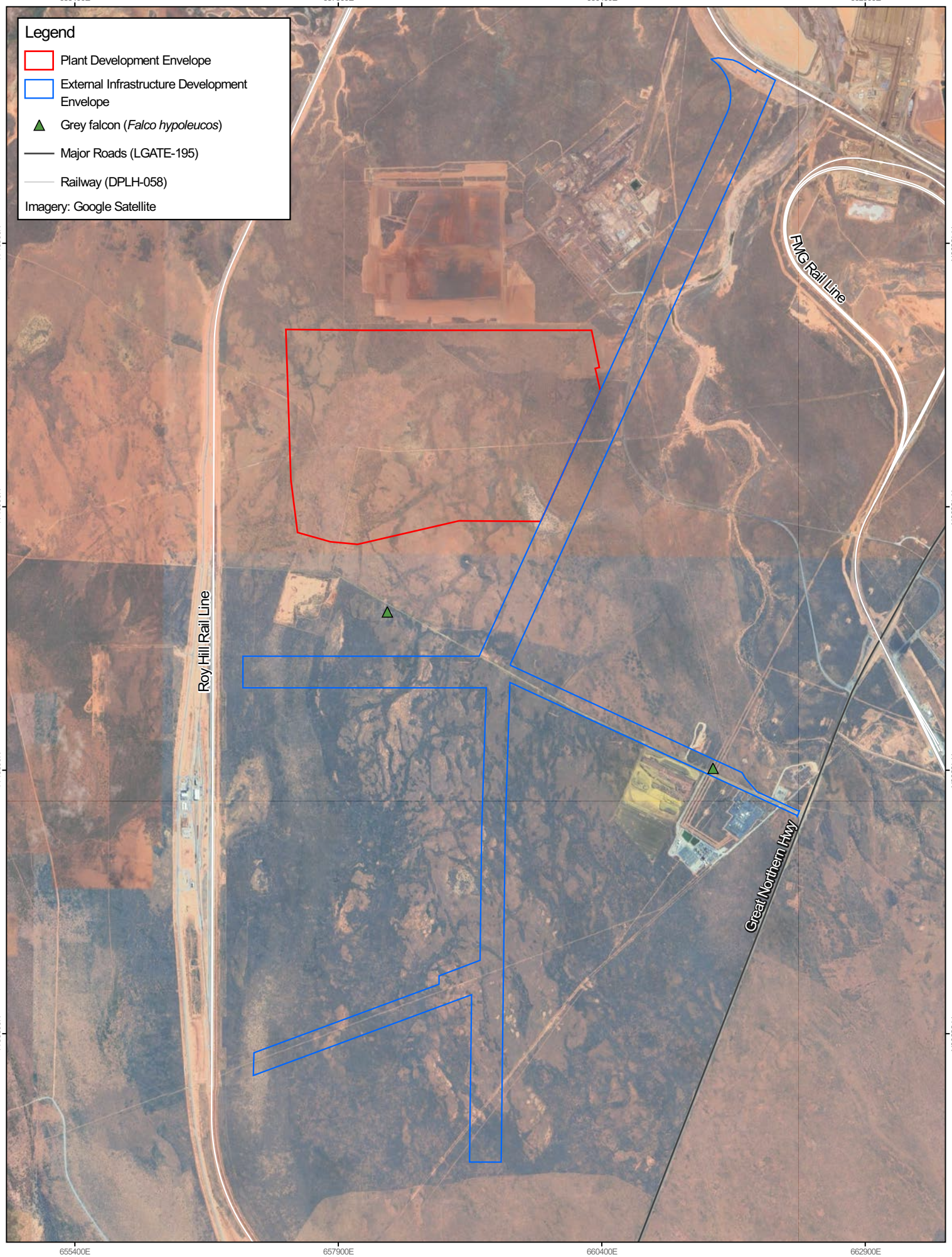
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Project: PHGS_0406_038
Date: 09/09/2025
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Figure 4: Location of Secondary Bilby Evidence



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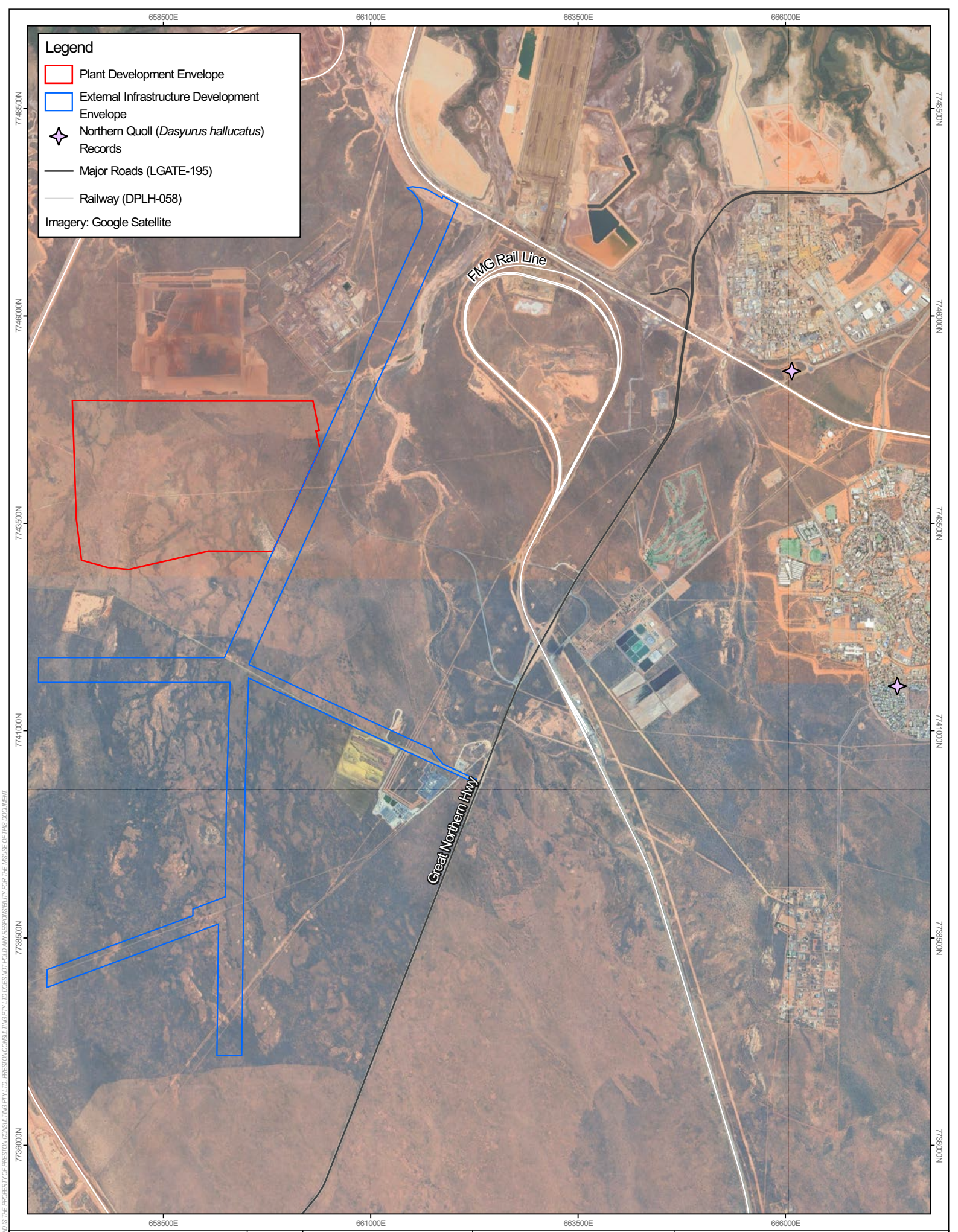
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Project: PHGS_0406_040
Date: 09/09/2025
Size: A4
Author: ASmithers

Preston Consulting

Figure 5: Grey Falcon record identified during Phoenix (2024) surveys



0 0.9 1.8 km

GDA2020 / MGA zone 50

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Project: PHGS_0406_041
Date: 11/09/2025
Size: A4
Author: ASmithers

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Figure 6: Desktop Records of Northern Quoll

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1.7.2 Key Assumptions and Uncertainties

Key assumptions of this FMP include:

- Fauna surveys have accurately recorded the nature of the presence of Night Parrot, Bilby and Grey Falcon and identified habitat values;
- Fauna surveys accurately reported on the distribution of the Night Parrot, Bilby and Grey Falcon;
- Conditions experienced during survey programs were ideal for recording Night Parrot, Bilby and Grey Falcon unless specified otherwise; and
- Night Parrot, Bilby and Grey Falcon evidence of occupancy has been correctly identified during the survey.

1.7.3 Management Approach

The management approach developed in this FMP is based on the mitigation hierarchy to ensure potential impacts to the fauna have been avoided and minimised where possible. The strategy focuses on avoidance primarily, followed by minimisation and rehabilitation where applicable.

The potential impacts of the Project on fauna have resulted in this management plan (this document) to prescribe a particular manner of implementation to avoid and minimise direct and indirect impacts. Implementation of the Project in this manner is expected to minimise significant impacts to fauna.

1.7.4 Rationale for Choice of Provisions

This FMP has been prepared in accordance with the "*Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*" (EPA, 2024) and the "*Environmental Management Plan Guidelines*" (DotE, 2014) published by the EPA and the Commonwealth, respectively.

The rationale for the choice of provisions is based on implementing the management approach described above to avoid, minimise and rehabilitate the potential impacts caused by construction of the Project on Night Parrot, Bilby and Grey Falcon. A critical element to this management approach is identifying and quantifying the potential direct and indirect impacts to Night Parrot, Bilby and Grey Falcon caused by the Project. A summary of the potential impacts of the Project is included in the following sections.

Direct Impacts

Loss of habitat

Survey work by Phoenix (2024) identified the areas within the development envelopes as containing suitable Night Parrot, Bilby and Grey Falcon habitat. Up to 378.1 ha of sandplain habitat and 386.1 ha of broad foraging habitat for the Grey Falcon, has the potential to be cleared for the development of the Project. This will result in a 26% reduction of the local extent of habitat for both species which is not expected to represent a significant proportion of locally available habitat. No Bilby burrows were identified during the surveys however it is possible that bilbies could dig burrows within the development envelope in the time between the survey and construction of the Project.

Night Parrot have also not been recorded during surveys and whilst unlikely to be recorded in the development envelopes due to the low quality of habitat and surrounding land uses, this FMP addresses management of the loss of habitat given the Critically Endangered status of the Night Parrot.

Vehicle strike

During construction of the Project there will be increased vehicle movement throughout the development envelopes, consequently increasing the likelihood of vehicle strikes on Night Parrot, Bilby and Grey Falcon.

Indirect Impacts

Weed invasion

Weeds have the potential to disperse during construction due to clearing of native vegetation and increased vehicle movements. Increased weed burdens in fauna habitat can prevent seedling recruitment of native plant species potentially reducing the amount of habitat and food resources available. Increased weed densities can also alter fire regimes. The land has historically been used for pastoralism.

Increased predation from introduced fauna

The initial clearing of habitat could increase the likelihood of predation by introduced predators by reducing the amount of shelter and protection from native vegetation. Domestic waste within the development envelopes also has the potential to attract feral predators and increase predation, particularly by cats. The site is close to the town of South Hedland, the Wedgefield Industrial Area and port of Port Hedland.

Erosion of habitat

Clearing of native vegetation has the potential to increase the risk of erosion from wind and surface water run-off and cause degradation of habitat.

Fire

The relationship between fauna and fire is complex, and the absence of active fire management or the prevailing fire regime of an area can determine its suitability as habitat. Fire can influence on the type and availability of food resources, vegetation density by making it more, or less, suitable for fauna, and may influence predator behaviour and predation.

Other

Disruption to normal behavioural patterns from increased levels of activity (i.e. noise, dust, light and vibration) in the area could impact on dispersal, foraging and breeding.

1.7.5 Risk Assessment

The management actions in this FMP have been developed to mitigate potential impacts to fauna and their habitat arising from the Project. These have been prioritised based on the risk that each potential impact will result in, to EPBC Listed fauna and their habitat. The key threats and impacts to fauna from Project activities are outlined in Table 3. The threats have been assessed against the risk assessment criteria provided in Appendix 1. Appendix 2 provides a risk assessment for each of the four Threatened species.

Table 3: Summarised Risk Assessment

Potential Threat / Project related activities	Potential Impacts	Species Risk Rating			Assessment and Justification
		Grey Falcon	Bilby	Night Parrot	
Direct Impacts					
Clearing activities.	Loss of habitat.	Low	Medium	Low	• Sandplain habitat has been identified as critical habitat for the Bilby; • No Bilby burrows were identified within the development envelopes; • Major drainage habitat is considered critical habitat for the Grey Falcon and represents the most suitable breeding and foraging habitat. No major drainage habitat is present within the development envelopes. Drainage line habitat was recorded within the EIDE and may provide foraging (supporting) habitat for the Grey Falcon; • Grey Falcon are highly nomadic species and may be frequent in the area; and • Suitable sandplain habitat for the Night Parrot was identified in the development envelope. However, the lack of records and surrounding land uses reduces the probability of Night Parrot occupying the development envelopes.
Ground disturbance machinery or vehicle movements / interactions.	Direct loss and injury to fauna individuals as a result of fauna vehicle collisions	Low	Low	Low	• Key clearing activities to occur during daylight hours; • No Bilby burrows were identified within the development envelopes; • The Grey Falcon commonly nests in timbered areas, particularly tall trees along watercourses, and forages in open or more sparsely vegetated habitats; • A breeding pair and a single fledged juvenile Grey Falcon were recorded during the survey. The breeding pair were recorded within the EIDE perched on a transmission tower in the EIDE adjacent to APA's power station; and • Suitable sandplain habitat for the Night Parrot was identified in the development envelope. However, the lack of records and surrounding land uses reduces the probability of Night Parrot occupying the development envelopes.
General construction and operational activities.	Direct loss and injury to fauna individuals as a result of vehicle collisions.	Low	Low	Low	
Indirect Impacts					
Ground disturbance machinery or vehicle movements / interactions.	Change in fauna behaviour due to noise, vibration and dust emissions.	Low	Low	Low	• Key clearing activities to occur during daylight hours; • The Project is located in an area which is already exposed to high levels of noise vibration and dust as it is located in an industrial area adjacent to a highway which is a major transport route; and • No known breeding populations of Bilby or Night Parrot have been recorded within the development envelopes. A breeding Grey Falcon pair were recorded in the EIDE however there is no suitable breeding habitat within the development envelopes.
	Habitat degradation as a result of contamination, weeds,	Low	Low	Low	• No known permanent waterbodies within the development envelopes; and • Project design to maintain surface waterflows.

Potential Threat / Project related activities	Potential Impacts	Species Risk Rating			Assessment and Justification
		Grey Falcon	Bilby	Night Parrot	
	altered fire regimes and alteration, contamination of surface water and altered surface water flows.				• Suitable sandplain habitat for the Night Parrot was identified in the development envelope. However, the lack of records and surrounding land uses reduces the probability of Night Parrot occupying the development envelopes.
Clearing activities.	Decline in habitat condition though weeds, alteration to fire regimes and dust generation and deposition.	Low	Low	Low	• The majority of vegetation within the development envelopes is in good to excellent condition. • Suitable habitat for the Bilby, Grey Falcon and Night Parrot was recorded in the development envelopes. The Project is not likely to support the Night Parrot due to the existing threats to dispersal; and • No Weeds of National Significance recorded.
	Increased predation	Low	Low	Low	• Feral animals known to occur at the Project and extensively across the region due to the proximity to residential areas. Implementation of the Project is unlikely to result in an increase of feral animals; and • Implementation of management actions detailed in Section 2.3.
Increased domestic waste.	Attraction of feral predators and increase predation on significant fauna.	Low	Low	Low	• Feral animals are known to occur in the area; • Implementation of management actions detailed in Section 2.3; and • Suitable habitat is present within the development envelopes, although extensive surveys have identified minimal presence of Grey Falcon and no Night Parrot.
General construction and operational activities.	Increased light spill, noise, dust and / or vibration resulting in behavioural changes including breeding, attraction to areas of	Low	Low	Low	• No known breeding populations of Bilby or Night Parrot have been recorded within the development envelopes. A breeding Grey Falcon pair were recorded in the EIDE however there is no suitable breeding habitat within the development envelopes; and

Potential Threat / Project related activities	Potential Impacts	Species Risk Rating			Assessment and Justification
		Grey Falcon	Bilby	Night Parrot	
	high activity, displacement to less suitable refugia / habitat.				• The Project is located in an area which is already exposed to high levels of noise vibration and dust as it is located in an industrial area adjacent to a highway which is a major transport route.
	Habitat degradation as a result of contamination, weeds, altered fire regimes and alteration, contamination of surface water and altered surface water flows.	Low	Low	Low	• Project design to ensure water flows are maintained; • Suitable habitat is present within the development envelopes, although extensive surveys have identified minimal presence of Grey Falcon and no Night Parrot; and • The lack of Night Parrot records and surrounding land uses reduces the probability of Night Parrot occupying the development envelopes.
	Increased predation or competition due to introduction or spread of introduced fauna species (i.e., cane toad and fox) or diseases.	Low	Low	Low	• Feral animals are known to occur in the area; and • Suitable habitat is present within the development envelopes, although extensive surveys have identified minimal presence of Grey Falcon and no Night Parrot.
	Anthropogenic activity in proximity or within critical habitat resulting in disturbance of fauna species (human visitation).	Low	Low	Low	• No known breeding populations of Bilby or Night Parrot have been recorded within the development envelopes. A breeding Grey Falcon pair were recorded in the EIDE however there is no suitable breeding habitat within the development envelopes.
Physical presence of infrastructure.	Behavioural changes as a result of barriers to movement. Barrier to dispersal. Potential to isolate local populations.	Low	Low	Low	• All habitat types extend outside of the development envelopes; and • Habitat connectivity is to be maintained through Project design.

2 COMPONENTS

2.1 OVERARCHING OBJECTIVES

2.1.1 RECOVERY PLAN OBJECTIVES

Night Parrot

There is no current recovery plan for the Night Parrot. The Conservation Advice provides sufficient guidance on the recovery of the Night Parrot (DCCEEW, 2025). Key points from the Night Parrot Conservation Advice are as follows:

Priority Conservation Objective

Maintain the persistence of Night Parrots in areas where it has been detected since 2013 and increase abundance and area of occupancy of the species by protection and appropriate management of threats at known or potentially occupied sites.

Conservation and Management Priorities

- Invasive species impacts (including from grazing, trampling, predation):
  - Monitor and control for fox and cat activity in localities where Night Parrots are known or likely to occur;
  - Avoid the introduction or intensification of grazing by domestic stock in habitats likely to be used by Night Parrots;
  - Avoid the establishment and of stock or other water sources within stock grazing range, or cat and fox dispersal range of habitats likely to be used by Night Parrots;
  - Avoid the intensity of grazing by domestic stock in habitats likely to be used by Night Parrots;
  - Monitor and control for feral herbivore activity in localities where Night Parrots are known or likely to occur; and
  - Conduct localised buffel grass control using an adaptive management approach in known or likely Night Parrot habitat;
- Habitat loss, disturbance and modification impacts:
  - Avoid changes to land management in areas known to be used by Night Parrots;
  - Support land managers to covenant or otherwise increase the security of conservation management of areas known to be used by Night Parrots;
  - Avoid the extent of fencing in areas likely to be used by Night Parrots;
  - Protect existing natural water sources within Night Parrot habitat from disturbance or modification;
  - Avoid human visitation to known Night Parrot roosts;
  - Avoid establishing roads through areas likely to be used by Night Parrots;
  - Ensure any mining or infrastructure development sufficiently survey for the species to avoid areas that are known or likely to be used by Night Parrots;
- Climate change and severe weather impacts:
  - When droughts occur in known Night Parrot habitat, gather information about impacts on food and water availability and population dynamics to better understand how weather and resource changes impact the species;

- Fire:
    - Implement fire regimes that maximise the amount of long-unburnt structurally complex *Triodia* within the landscape over time; and
    - Fragment large areas of spinifex through burning or fuel removal to create linear breaks or series of connected small patches to prevent entire patches being burned during single wildfire events.

Bilby

The Commonwealth issued a revised National Recovery Plan for the Greater Bilby in 2023 (Commonwealth of Australia, 2023). The Recovery Plan aims to halt the decline and support recovery of the Bilby and provides the research and management actions necessary to maximise the Bilby's chances of long-term survival in nature (Commonwealth of Australia, 2023).

The Recovery Plan includes on-ground conservation and management actions, which are planned to occur within a monitoring framework that measures the impact of management. The Recovery Plan includes supporting actions to promote the role of Traditional Owners and land managers in Bilby conservation, provide governance and coordination, establish and maintain monitoring and surveys, and undertake research to inform management.

The Recovery Plan has four key objectives with associated performance criteria, as detailed below:

- **Objective 1**: The size of the Greater Bilby population has grown.
- **Objective 2**: The area occupied by the Greater Bilby has been maintained or increased.
- **Objective 3**: The genetic diversity of the Greater Bilby has been maintained and retains the potential for evolutionary change through adaption and selection.
- **Objective 4**: Indigenous organisations, communities, and individuals have a greater role in Bilby conservation.

Grey Falcon

The Threatened Species Scientific Committee advises that a recovery plan is not recommended for the Grey Falcon. The Conservation Advice provides sufficient guidance on the recovery of the Grey Falcon and a decision to have a recovery plan is unlikely to lead to substantial additional conservation benefits at this time. Key points from the Grey Falcon Conservation Advice are as follows:

Primary conservation actions:

- Support initiatives to improve habitat management; and
- Cat and camel control in arid and semi-arid Australia.

Conservation and management priorities:

- Habitat loss, disturbance and modifications;
    - Support improved fire and grazing management in areas where Grey Falcons are known to occur;
    - Protect known nesting trees and include adequate exclusion buffers with regard to proposed developments and land clearing activities;
    - Support the establishment and survival of replacement nest trees in areas where Grey Falcon in known to breed; and
    - Retain artificial structures with known or potential Grey Falcon nests.

- Invasive species;
    - Control invasive cats and camels in areas where Grey Falcons are known to occur, especially in known roosting and nesting areas.

Stakeholder Engagement:

- Engage Indigenous Land Councils, communities, pastoral industry, land managers and non-government organisations to support the conservation of Grey Falcons;
- Discourage the disclosure of locations of active nests to the public;
- Promote the conservation, and raise the profile, of Grey Falcons through strategic programs and educational products with land holders and community groups; and
- Promote the exchange of conservation priorities between governments, non-government organisations and communities through use of networks, publications and websites.

Survey and Monitoring priorities:

- This species is rare, with a very large distribution. Monitoring population trends is particularly challenging, and will probably require collaboration between many stakeholders to implement, once a suitable approach has been designed;
- Annual surveys of breeding events across the arid and semi-arid zone are recommended including at least the Western Simpson Desert, Tanami Desert and Barkly Tablelands;
- Locating active Grey Falcon nests is aided by:
    - Visiting nests used in previous years;
    - Actively searching for new nests in suitable habitat; and
    - Following up records from the general public, including from Indigenous communities, land managers and bird watchers.

Information and research priorities:

- Develop methods for assessing population trends in a rare, widely-distributed species. This requires consideration of logistical, sampling and analytical constraints;
- Continues to collect ecological and demographic information; and
- Improve knowledge about potential threatening processes including feral cats, climate change and habitat modification.

2.1.2 Environmental Protection Authority Objective

The EPA's environmental objective for Terrestrial Fauna is set out within the EPA's *Statement of environmental principles, factors, objectives and aims of EIA* (EPA, 2023). The EPA's objective for the Terrestrial Fauna Environmental Factor is "*to protect terrestrial fauna so that biological diversity and ecological integrity are maintained*".

2.2 Environmental Objectives for this Plan

The key management objectives specific to construction of the Project are:

- Minimise clearing and impacts to sandplain habitat in the development envelopes;
- Reduce impacts to Night Parrot, Bilby and Grey Falcon populations and habitat outside of the development envelopes;
- Prevent introduction and/or spread of weeds into sandplain habitat or adjacent areas;
- Prevent introduction and dispersal of feral predators into sandplain habitat;
- Prevent introduction of fire and/or spread of fire into adjacent areas; and

- No Night Parrot, Bilby or Grey Falcon mortality as a result of vehicle strike.

2.3 MANAGEMENT ACTIONS, TARGETS AND MONITORING

To achieve these objectives, management targets and actions have been developed to address the key potential impacts associated with the Project. The management targets and actions which will be implemented in accordance with this plan are summarised in Table 4.

Table 4 presents the environmental management objectives and actions that the Project has implemented or will implement prior to ground disturbing activities, and during construction, in order to achieve the objectives. These actions are focused on avoiding adverse impacts the Bilby resulting from Project activity and are also applicable to the Grey Falcon and Night Parrot. These actions will be implemented prior to and during ground disturbance and construction activities of the Project.

Table 4: Management Objectives and Actions

Management Objective	Key Management Action	Management Target	Monitoring	Reporting
Objective 1: Avoid and minimise clearing impacts to sandplain habitat.	• A suitably qualified person will survey for the presence of Night Parrot and Bilby before clearing works in sandplain habitat; • Undertake relocation of Bilby individuals where required; • If Night Parrot is recorded, halt clearing works until it has been confirmed, via additional surveys, that the Night Parrot is no longer occupying the area proposed for clearing; • Clearing is only to occur within approved areas; • Boundaries of areas to be cleared or disturbed will be identified by a Global Positioning System (GPS) coordinates and maps of boundaries will be provided to dozer operators; • Exclusion zones of five metres will be established around any active Bilby burrows (should they be identified during pre-clearance surveys or at other times during construction works); • Exclusion zones will be demarcated with flagging prior to the commencement of clearing and the exclusion zones are to remain adequately marked for the duration of clearing activities or until it is confirmed that bilbies have relocated and the burrow is no longer active; • All clearing will require a permit via completion of internal ground disturbance procedures, that will include: o Prompts to minimise clearing; o Demarcation of disturbance areas; o Designated oversight responsibilities and timing of actions; o General actions that ensure clearing is undertaken in accordance with environmental approvals; • Clearing boundaries will be clearly marked on construction documents and within the field; • Surface water management measures (i.e. bunding) will be implemented to ensure clearing of native vegetation will not increase erosion of habitat; • Erosion and sedimentation control measures will be implemented during all construction activities to prevent erosion and control sediment on the site; • Vehicles and machinery to remain on approved and/or existing tracks to reduce soil compaction; and • Undertake remediation and rehabilitation of areas that are temporarily disturbed during construction.	Total clearing not to exceed the authorised extent in the ministerial statement/EPBC Act approval decision. No clearing outside the development envelopes. No direct loss of, or serious injury to Bilby, Night Parrot or Grey Falcon individuals as a result of the Project. No evidence of soil compaction or soil erosion in areas of retained habitat as a result of the Project.	Monitoring of vegetation clearing will be ongoing until clearing is complete. Monitoring for Bilby, Night Parrot and Grey Falcon will be undertaken at least every two years. Monitoring of erosion controls during construction.	To DCCEEW and Department of Water and Environmental Regulation after any potential non-compliance within seven days of potential non-compliance being known. Reporting to Department of Biodiversity, Conservation and Attractions (DBCA) in accordance with the BC Act. Annual clearing data reported in annual Compliance Assessment Report (CAR).

Management Objective	Key Management Action	Management Target	Monitoring	Reporting
Objective 2: Prevent introduction and/or spread of weeds into habitat or adjacent areas.	• Baseline weed survey to determine weed locations and densities; • Weed hygiene procedures will be implemented to minimise the risk of introducing new species to the site and surrounding areas. Weed hygiene procedures include: o Equipment inspections undertaken to check hygiene of earthmoving equipment and vehicles arriving on site; o Vehicles and machinery to remain on approved and/or existing tracks to limit the risk of weed invasion within undisturbed areas; o Movement of machines and other vehicles will be restricted within the development envelopes, to designated tracks or approved areas only; o Plant and soil materials will be restricted from being brought to site unless approved for a specific purpose; and o Hygiene breaches to be reported internally as an environmental incident. • Post-construction weed survey to determine whether new species have been introduced or existing infestations have expanded or intensified; • If inspections show new weed species or populations are established, weed mapping will be conducted to determine the extent of the impact and measure the effectiveness of control measures; • Develop and implement weed control programs where new species are detected and/or the area of occupancy of weed species has increased; and • Follow up monitoring on any areas where weeds have required control within one year. • Internal reporting as follows: o Incident reports of occurrences weed infestations, during general and targeted searches for *Cenchrus ciliaris*, *Aerva javanica*, *Malvastrum americanum*, *Portulaca oleraceoleracea*. and *Vachellia farnesiana* o Invasive species control reports; and o Records of equipment (including vehicle) washdown, hygiene certificates and auditing.	No new Declared Weeds or Weeds of National Significance within surrounding vegetation, attributable to the Project. No significant increase in weed cover attributable to the Project.	Assess the extent of weed infestation annually. Monitoring will include targeted searches of the weed species within the development envelopes.	• Summary of weed management actions undertaken reported in CAR. • Detection of any Declared Weeds or Weeds of National Significance will be reported to the Department of Primary Industries and Regional Development.

Management Objective	Key Management Action	Management Target	Monitoring	Reporting
Objective 3: Prevent introduction and dispersal of feral/domestic predators into habitat.	• Undertake baseline feral fauna survey prior to commencing construction; • Undertake feral fauna monitoring and control measures (if required) within and on the perimeter development envelopes; • Monitoring to be undertaken at appropriate locations by PHI in partnership with Indigenous Rangers where feasible; • Feral animal control programme in line with the Town of Port Hedland and DBCA guidance. Should feral predator control be required, trapping will be the preference; • Trapping will be undertaken at appropriate locations by PHI in partnership with Aboriginal land managers, Traditional Owners and Indigenous Rangers where feasible; • Trapped animals will be managed through an agreement with the Town of Port Hedland; • Incident reports of occurrences feral/domestic predators, during general and targeted searches; • Opportunistic feral fauna sightings will be recorded, and assessed on an annual basis; • No pets will be permitted on site; and • Avoid attraction of introduced species to the development envelopes by implementing waste management procedures (e.g. rapid removal of putrescible waste, secure lids on bins).	No increase in feral/domestic predator activity within the development envelopes.	Monitoring will be undertaken at least annually. If monitoring indicates an increase of feral predator activity (above baseline results) within the development envelopes, feral predator controls will be implemented.	Summary of feral animal sightings reported in CAR. Summary of feral animal control actions undertaken reported in CAR.
Objective 4 Prevent introduction of fire and/or spread of fire into adjacent areas.	• Maintenance of existing fire breaks; • An Emergency Response Plan; • On-site firefighting capability will be established, and firefighting equipment located on site and in vehicles; • Fire awareness training; • Specific measures to prevent accidental fires; • Procedures for fire identification and reporting; • Response procedures and fire drills; and • Implementation of a Bushfire Management Plan.	No incidents of fire originating within, and spreading outside of, the development envelopes attributable to the Project.	• Regular inspections of firefighting equipment and machinery; and • Regular inspections of fire breaks and environmental fuel loads in proximity to the development envelopes.	As per the Bushfire Management Plan.

Management Objective	Key Management Action	Management Target	Monitoring	Reporting
Objective 5: No mortality as a result of vehicle collisions.	• All construction personnel to undergo induction training on Night Parrot, Bilby, Northern Quoll and Grey Falcon presence and behaviour and the required vehicle speed limits; • Personnel to report any opportunistic sightings of Night Parrot, Bilby and/or Grey Falcon; and • Restricted night-time vehicle movements to minimise the potential for vehicle strikes.	No direct loss or serious injury to Bilby, Night Parrot and Grey Falcon individuals as a result of vehicle strikes.	Not applicable.	Report any incidents of mortality, or opportunistic sightings, to DBCA and DCCEEW within seven days of incident. All vertebrate fauna deaths and injuries will be entered as an incident and tracked through PHI's incident management system and reported in AER. Monitoring reports will be submitted to Government as per requirements under the Biodiversity Conservation Regulations 2018 and *Animal Welfare Act 2002*.

2.4 IMPLEMENTATION

Incident reporting and investigations will be undertaken in accordance with a Project-specific incident reporting and investigation procedure, and root causes will be determined. Corrective actions will be identified and implemented to address the root causes.

Incidents and non-compliances with this FMP and other management documents will be reported and investigated in accordance with a Project-specific incident reporting and investigation procedures, and appropriate measures implemented to prevent recurrence. Where applicable, environmental incidents will be reported to the relevant government agency.

The following procedure will be implemented when a non-compliance occurs:

- Report the incident (within seven days), investigate the cause and identify contingency actions;
- Implement contingency actions which may include:
    - Review management measure practicality or relevance;
    - Improve training and education for all personnel; and
    - Improve and implement increased protective measures as necessary;
- Monitor outcomes.

2.4.1 WEED MANAGEMENT

Introducing or spreading weeds by earthmoving equipment and ground disturbance can impact the availability and quality Bilby and Grey Falcon habitat. PHI will engage in ongoing active weed management to ensure weeds are controlled.

Objectives

The objective of weed management is to ensure that Project activities do not result in the introduction of new weed species or increase in the extent of existing weed species.

Methodology

A weed monitoring and management programme will be developed to ensure that any existing and new weed infestations within area of Project-related disturbance (including areas of rehabilitation) are identified and controlled or eradicated. Monitoring will be undertaken at specific locations within and around the development envelopes.

Should monitoring indicate the introduction or spread of weeds within the development envelopes, weed control programs will be developed and implemented.

2.4.2 FERAL PREDATOR CONTROL

Predation from feral cats, dingo/wild dogs and foxes have had a serious detrimental effect on the conservation of the Bilby, and feral cats are known to predate on the Grey Falcon. Accordingly, feral predator control in areas of Bilby and Grey Falcon habitat is considered important to maintain populations of both species.

Objectives

The objective of feral predator control is to reduce the threat to Bilby and Grey Falcon from feral predators.

Methodology

A key component of the feral predator monitoring and control program will be to provide opportunities to exchange knowledge and experience on techniques with Traditional Owners.

Should monitoring indicate an increase in feral predator activity within the development envelopes, feral predator control will be implemented. Trapping will be the preferential control method as the proximity to South Hedland means that shooting and baiting are not appropriate. Trapped animals will be managed under an agreement with the Town of Port Hedland.

3 ROLES AND RESPONSIBILITIES

PHI is responsible for complying with all the commitments made in environmental management plans. This section defines the roles and responsibilities of personnel in charge of the environmental management of the Project. The roles and responsibilities of each relevant position is documented, including the responsibilities of subcontractors.

Table 5: FMP management roles and responsibilities

Role	Responsibility
All Personnel	• Comply with all legal requirements and the requirements of this Plan. • Report fauna incidents and sightings of MNES to their Supervisor or Site Environment Team. • Attend environmental inductions.
General Manager	• Ultimate responsibility for compliance with the requirements of the FMP. • Provision of resources and personnel required to implement this FMP.
Manager Environment and Approvals	• Maintain this FMP and review the effectiveness and implementation of this FMP. • Provide advice, including procedures and requirements, to all key parties to ensure compliance with legal requirements, achievement of environmental objectives and improving environmental performance. • Provide support to all personnel as required ensuring the FMP is implemented. • Implement monitoring programmes.
Zoological Specialists	• When instructed by the Manager Environment and Approvals, provide advice, including procedures and requirements to key parties to ensure achievement of environmental objectives and improving environmental performance.
Environmental Officer	• Report on the implementation of the FMP. • Provide advice, including procedures and requirements, to all key parties to ensure compliance with legal requirements, achievement of environmental objectives and improving environmental performance. • Provide training and inductions on fauna management as outlined in this FMP. • Environmental inspections.

4 ENVIRONMENTAL TRAINING

All personnel involved with construction, operation and closure of the Project are to receive relevant environmental training to ensure they understand their responsibilities in implementing the FMP. Personnel to be trained include those at the site/s of construction, operation and closure of the Project.

The training is to be tailored to the role of the individual within the Project team. Training is to be implemented as per the requirements of Table 6.

Table 6: FMP environmental training requirements

Training Type	Personnel to be trained	Information to be provided
Site induction	All personnel	• General environmental management on site. • Incident reporting requirements. • General requirements of the FMP. • Information about which activities will be managed by the FMP. • Potential non-compliance consequences.
GDP	Personnel associated with vegetation clearing	• GDP procedure implementation. • Requirements of this FMP in the GDP process. • General description of significant fauna species and habitat that may occur within the Project area.

All training is to be recorded in the Project Training Register. The Register is to include:

- The person receiving the training;
- The date the training was received;
- The name of the person conducting the training; and
- A summary of the training received.

All pre-clearance field surveys investigations have been undertaken by personnel that are suitably qualified:

- Qualified zoologist with a minimum of five years' experience in the WA arid zone; and
- Experienced in the detection of bat and bird listening surveys.

5 EMERGENCY CONTACT AND PROCEDURES

If an EPBC Act-listed fauna species was injured during Project activities, or found orphaned, it would constitute an emergency situation applicable under this FMP. In this case the following procedure would be followed:

1. The Project or Environmental Manager to call Pilbara Wildlife Carers Association (https://www.pwca.org.au) in the first instance to discuss the immediate situation and develop a plan of action to get treatment for the individual; and
2. The Project or Environmental Manager to contact DBCA to inform them on the situation and possible need for additional support.

PHI will report the incident to DBCA and DCCEEW as soon as practicable and investigate all incidents.

In the event of a death of an EPBC Act-listed fauna species individual, the death will be reported to DBCA and DCCEEW, and in consultation with DBCA, the body may (pending its condition) be collected, vouchered, appropriately stored, and submitted to WA Museum or DBCA.

6 ADAPTIVE MANAGEMENT AND REVIEW

This FMP has been developed to mitigate the potential impacts of the Project identified in Section 1.7.4 by implementing the management actions outlined in Section 2.3. The adaptive management and review strategy includes ongoing evaluation of monitoring data to determine if the environmental outcomes are being met. In the event that the FMP is failing to achieve the outcomes defined in Section 2.1, PHI will initiate a review of the FMP.

In order to facilitate an adaptive management approach, the FMP will be revised annually from the first year of construction. Each revision will draw on information learned in the preceding years and will typically include a review of following:

- Key assumptions and uncertainties (Section1.7.2);
- The performance of the FMP against the outcomes (Section 2.1);
- Re-evaluation of the rationale for the choice of provisions (Section 1.7.4); and
- The consideration of any external changes during the life of the Project.

7 STAKEHOLDER CONSULTATION

This FMP has been structured to ensure the document aligns with the EPA's *How to prepare* Environmental Protection Act 1986 *Part IV environmental management plans* (EPA, 2024). Representatives from PHI and Preston Consulting Pty Ltd have met and liaised with EPA and DCCEEW to discuss the Project and presence of Night Parrot, Bilby and Grey Falcon in the development envelopes.

KAC monitors have assisted in survey work and provided Traditional Owner perspectives into the survey work.

8 GLOSSARY

Term	Definition
BC Act	*Biodiversity Conservation Act 2016* (WA)
Bilby	Greater Bilby (*Macrotis lagotis*)
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EIDE	External Infrastructure Development Envelope
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FMP	Fauna Management Plan
GPS	Global Positioning System
Grey Falcon	Grey Falcon (*Falco hypoleucos*)
ha	Hectare
HBI	Hot Briquetted Iron
IOPF	Iron Ore Processing Facility
KAC	Kariyarra Aboriginal Corporation
km	Kilometre
m	Metres
Mtpa	Million tonnes per annum
PDE	Plant Development Envelope
PHI	Port Hedland Iron Pty Ltd
Phoenix	Phoenix Environmental Sciences Pty Ltd
Project	Port Hedland Iron Project
Recovery Plan	Recovery Plan for the Greater Bilby
SIA	Strategic Industrial Area
TSSC	Threatened Species Scientific Committee
UCL	Unallocated Crown Land
WA	Western Australia

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APPENDIX 1: RISK ASSESSMENT CRITERIA AND MATRIX

Consequence of Hazard Definitions

Consequence of Impact	Environmental Factor
	Biodiversity
Insignificant	Alteration or disturbance to an isolated area with no effect on habitat or ecosystem. No loss of any individual Threatened plants or animals.
Minor	Alteration or disturbance to <10% of a habitat or ecosystem resulting in a recoverable impact within 2 years. Loss of individual Threatened plants or animals.
Moderate	Alteration of disturbance to 10- 40% of a habitat or ecosystem resulting in a recoverable impact within 2-5 years. Loss of multiple Threatened plants or animals.
Major	Alteration or disturbance to 40- 70% of a habitat or ecosystem resulting in a recoverable impact within 5-15 years. Loss of >50% known local population of plant / animal species with possible loss of entire population.
Severe	Alteration or disturbance to >70% of a habitat or ecosystem resulting in a recoverable impact >15 years. Local loss of conservation significant or listed species. Extinction of a species.

Likelihood Descriptors

Descriptor	Probability
Almost Certain	Event will occur during the Project.
	High number of known incidents.
Likely	Event likely to occur during the Project.
	Regular incidents known.
Possible	Event may occur in some instances during the Project.
	Occasional incidents known.
Unlikely	Event is not likely to occur during the Project.
	Some occurrences known.
Rare	Event will occur in exceptional circumstances during the Project.
	Very few or no known occurrences.

Consequence and Likelihood Matrix

Risk Matrix		Impact				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood	Almost Certain	Medium	High	High	Extreme	Extreme
	Likely	Medium	Medium	High	High	Extreme
	Possible	Low	Medium	Medium	High	High
	Unlikely	Low	Low	Medium	Medium	High
	Rare	Low	Low	Low	Medium	Medium

Risk Assessment Criteria Table

Level of Risk	Suggested Risk Criteria
Low	Acceptable with adequate controls (subject to alignment with tolerance and appetite).
Moderate	Acceptable with adequate controls (subject to alignment with tolerance and appetite).
High	Requires strict controls.
Extreme	Requires strict controls. May not be able to mitigate the risk in some cases.

APPENDIX 2: THREATENED SPECIES RISK ASSESSMENT

BILBY

Table 7: Bilby Risk Assessment

Impact	Relevant Information	Consequence	Likelihood	Risk Rating	Assessment and Justification
Direct Impacts					
Clearing activities.	Loss of habitat.	Moderate	Possible	Medium	- Sandplain habitat has been identified as critical habitat for the Bilby; and - No Bilby burrows were identified within the development envelopes.
Ground disturbance machinery or vehicle movements / interactions.	Direct loss and injury to fauna individuals as a result of fauna vehicle collisions or misidentification (predominantly Pilbara Olive Python).	Minor	Unlikely	Low	- Key clearing activities to occur during daylight hours; and - No Bilby burrows were identified within the development envelopes.
General construction and operational activities.	Direct loss and injury to fauna individuals as a result of vehicle collisions.	Minor	Unlikely	Low	
Indirect Impacts					
Ground disturbance machinery or vehicle movements / interactions.	Change in fauna behaviour due to noise, vibration and dust emissions.	Minor	Unlikely	Low	- Key clearing activities to occur during daylight hours; - The Project is located in an area which is already exposed to high levels of noise vibration and dust as it is located in an industrial area adjacent to a highway; and - No known breeding populations of Bilby have been recorded within the development envelopes.
Ground disturbance machinery or vehicle movements / interactions.	Habitat degradation as a result of contamination, weeds, altered fire regimes and alteration, contamination of surface water and altered surface water flows.	Minor	Unlikely	Low	- No known permanent waterbodies within the development envelopes; and - Project design to maintain surface waterflows.
Clearing activities.	Decline in habitat condition though weeds, alteration to fire regimes and dust generation and deposition.	Minor	Unlikely	Low	- The majority of vegetation within the development envelopes was in good to excellent condition; - Suitable sandplain habitat for the Bilby was recorded in the development envelopes; and - No Weeds of National Significance were recorded.
Clearing activities.	Increased predation	Minor	Unlikely	Low	- Feral animals known to occur at the Project and extensively across the region due to the proximity to residential areas. Implementation of the Project is unlikely to result in an increase of feral animals; and - Implementation of management detailed in Section 2.3.
Increased domestic waste	Attraction of feral predators and increase predation on significant fauna.	Minor	Unlikely	Low	- Feral animals known to occur at the Project; and - Implementation of management actions detailed in Section 2.3.
General construction and operational activities.	Increased light spill, noise, dust and / or vibration resulting in behavioural changes including breeding, attraction to areas of high activity, displacement to less suitable refugia / habitat.	Moderate	Rare	Low	- No known breeding populations of Bilby have been recorded within the development envelopes; and - The Project is located in an area which is already exposed to high levels of noise vibration and dust as it is located in an industrial area adjacent to a highway;
General construction and operational activities.	Habitat degradation as a result of contamination, weeds, altered fire regimes and alteration, contamination of surface water and altered surface water flows.	Minor	Unlikely	Low	- Project design to ensure water flows are maintained; and - Implementation of management actions detailed in Section 2.3.
General construction and operational activities.	Increased predation or competition due to introduction or spread of introduced fauna species (i.e., cane toad and fox) or diseases.	Minor	Unlikely	Low	- Feral animals are known to occur in the area; and - Implementation of management actions detailed in Section 2.3.
General construction and operational activities.	Anthropogenic activity in proximity or within critical habitat resulting in disturbance of fauna species (human visitation).	Minor	Unlikely	Low	- No known breeding populations of Bilby have been recorded within the development envelopes.
Physical presence of infrastructure.	Behavioural changes as a result of barriers to movement. Barrier to	Minor	Rare	Low	- All habitat types extend outside of the development envelopes; and - Habitat connectivity is to be maintained through Project design.

Impact	Relevant Information	Consequence	Likelihood	Risk Rating	Assessment and Justification
	dispersal. Potential to isolate local populations.				

GREY FALCON

Table 8: Grey Falcon Risk Assessment

Impact	Relevant Information	Consequence	Likelihood	Risk Rating	Assessment and Justification
Direct Impacts					
Clearing activities.	Loss of habitat.	Minor	Unlikely	Low	- Major drainage habitat is considered critical habitat for the Grey Falcon and represents the most suitable breeding and foraging habitat. No major drainage habitat is present within the development envelopes. Drainage line habitat was recorded within the EIDE and may provide foraging (supporting) habitat for the Grey Falcon; and - Grey Falcon are highly nomadic species and may be frequent in the area.
Ground disturbance machinery or vehicle movements / interactions.	Direct loss and injury to fauna individuals as a result of fauna vehicle collisions.	Moderate	Rare	Low	- Key clearing activities to occur during daylight hours; - The Grey Falcon commonly nests in timbered areas, particularly tall trees along watercourses, and forages in open or more sparsely vegetated habitats; and - A breeding pair and a single fledged juvenile Grey Falcon were recorded during the survey. The breeding pair were recorded within the EIDE perched on a transmission tower in the EIDE adjacent to APA's power station.
General construction and operational activities.	Direct loss and injury to fauna individuals as a result of vehicle collisions.	Moderate	Rare	Low	
Indirect Impacts					
Ground disturbance machinery or vehicle movements / interactions.	Change in fauna behaviour due to noise, vibration and dust emissions.	Minor	Unlikely	Low	- Key clearing activities to occur during daylight hours; - The Project is located in an area which is already exposed to high levels of noise vibration and dust as it is located in an industrial area adjacent to a highway; and - A breeding Grey Falcon pair were recorded in the EIDE however there is no suitable breeding habitat within the development envelopes.
Ground disturbance machinery or vehicle movements / interactions.	Habitat degradation as a result of contamination, weeds, altered fire regimes and alteration, contamination of surface water and altered surface water flows.	Minor	Unlikely	Low	- No known permanent waterbodies within the development envelopes; and - Project design to maintain surface waterflows.
Clearing activities.	Decline in habitat condition though weeds, alteration to fire regimes and dust generation and deposition.	Moderate	Rare	Low	- The majority of vegetation within the development envelopes was in good to excellent condition; - Suitable habitat for the Grey Falcon was recorded in the development envelopes; and - No Weeds of National Significance were recorded.
Clearing activities.	Increased predation	Minor	Unlikely	Low	- Feral animals known to occur at the Project and extensively across the region due to the proximity to residential areas. Implementation of the Project is unlikely to result in an increase of feral animals; and - Implementation of management actions detailed in Section 2.3.
Increased domestic waste	Attraction of feral predators and increase predation on significant fauna.	Minor	Rare	Low	- Feral animals are known to occur in the area; - Implementation of management actions detailed in Section 2.3; and - Suitable habitat is present within the development envelopes, although extensive surveys have identified minimal presence of Grey Falcon.
General construction and operational activities.	Increased light spill, noise, dust and / or vibration resulting in behavioural changes including breeding, attraction to areas of high activity, displacement to less suitable refugia / habitat.	Minor	Unlikely	Low	- A breeding Grey Falcon pair were recorded in the EIDE however there is no suitable breeding habitat within the development envelopes; and - The Project is located in an area which is already exposed to high levels of noise vibration and dust as it is located in an industrial area adjacent to a highway.
General construction and operational activities.	Habitat degradation as a result of contamination, weeds, altered fire regimes and alteration, contamination of surface water and altered surface water flows.	Insignificant	Unlikely	Low	- Project design to ensure water flows are maintained; and - Suitable habitat is present within the development envelopes, although extensive surveys have identified minimal presence of the Grey Falcon.
General construction and operational activities.	Increased predation or competition due to introduction or spread of introduced fauna species (i.e., cane toad and fox) or diseases.	Minor	Unlikely	Low	- Feral animals are known to occur in the area; and - Suitable habitat is present within the development envelopes, although extensive surveys have identified minimal presence of Grey Falcon.
General construction and operational activities.	Anthropogenic activity in proximity or within critical habitat resulting in disturbance of fauna species (human visitation).	Minor	Rare	Low	- A breeding Grey Falcon pair were recorded in the EIDE however there is no suitable reeding habitat within the development envelopes.
Physical presence of infrastructure.	Behavioural changes as a result of barriers to movement. Barrier to	Insignificant	Rare	Low	- All habitat types extend outside of the development envelopes.

Impact	Relevant Information	Consequence	Likelihood	Risk Rating	Assessment and Justification
	dispersal. Potential to isolate local populations.				- Habitat connectivity is to be maintained through Project design.

NIGHT PARROT

Table 9: Night Parrot Risk Assessment

Impact	Relevant Information	Consequence	Likelihood	Risk Rating	Assessment and Justification
Direct Impacts					
Clearing activities.	Loss of habitat.	Minor	Unlikely	Low	- No Night Parrot were recorded during surveys; - Night Parrot are unlikely to occur at the Project; and - Suitable sandplain habitat for the Night Parrot was identified in the development envelope. However, the lack of records and surrounding land uses reduces the probability of Night Parrot occupying the development envelopes.
Ground disturbance machinery or vehicle movements / interactions.	Direct loss and injury to fauna individuals as a result of fauna vehicle collisions or misidentification (predominantly Pilbara Olive Python).	Minor	Unlikely	Low	- Key clearing activities to occur during daylight hours; - Night Parrot are unlikely to occur at the Project; and - Suitable sandplain habitat for the Night Parrot was identified in the development envelope. However, the lack of records and surrounding land uses reduces the probability of Night Parrot occupying the development envelopes.
General construction and operational activities.	Direct loss and injury to fauna individuals as a result of vehicle collisions.	Minor	Rare	Low	
Indirect Impacts					
Ground disturbance machinery or vehicle movements / interactions.	Change in fauna behaviour due to noise, vibration and dust emissions.	Minor	Rare	Low	- Night Parrot are unlikely to occur at the Project; - No Night Parrot recorded during surveys; - Key clearing activities to occur during daylight hours; and - The Project is located in an area which is already exposed to high levels of noise vibration and dust as it is located in an industrial area adjacent to a highway.
Ground disturbance machinery or vehicle movements / interactions.	Habitat degradation as a result of contamination, weeds, altered fire regimes and alteration, contamination of surface water and altered surface water flows.	Minor	Unlikely	Low	- No known permanent waterbodies within the development envelopes; - Project design to maintain surface waterflows; and - Suitable habitat for the Night Parrot was identified in the development envelope. However, the lack of records and surrounding land uses reduces the probability of Night Parrot occupying the development envelopes.
Clearing activities.	Decline in habitat condition though weeds, alteration to fire regimes and dust generation and deposition.	Minor	Unlikely	Low	- The majority of vegetation within the development envelopes was in good to excellent condition; - Suitable habitat for the Night Parrot was recorded in the development envelopes. The Project is not likely to support the Night Parrot due to the existing threats to dispersal; and - No Weeds of National Significance were recorded.
Clearing activities.	Increased predation	Minor	Unlikely	Low	- Night Parrot are unlikely to occur at the Project; - Feral animals known to occur at the Project and extensively across the region due to the proximity to residential areas. Implementation of the Project is unlikely to result in an increase of feral animals; and - Implementation of management actions detailed in Section 2.3.
Increased domestic waste	Attraction of feral predators and increase predation on significant fauna.	Minor	Unlikely	Low	- Feral animals are known to occur in the area; - No Night Parrot recorded during surveys; - Night Parrot unlikely to occur at the Project; - Suitable habitat is present within the development envelopes, although extensive surveys have not identified any evidence of the Night Parrot; and - Implementation of management actions detailed in Section 2.3.
General construction and operational activities.	Increased light spill, noise, dust and / or vibration resulting in behavioural changes including breeding, attraction to areas of high activity, displacement to less suitable refugia / habitat.	Minor	Unlikely	Low	- No Night Parrot were recorded during surveys; - Night Parrot are unlikely to occur at the Project; and - The Project is located in an area which is already exposed to high levels of noise vibration and dust as it is located in an industrial area adjacent to a highway.
General construction and operational activities.	Habitat degradation as a result of contamination, weeds, altered fire regimes and alteration, contamination of surface water and altered surface water flows.	Moderate	Possible	Low	- Project design to ensure water flows are maintained; - Suitable habitat is present within the development envelopes, although extensive surveys have not identified any evidence of the Night Parrot; and - The lack of records and surrounding land uses reduces the probability of Night Parrot occupying development envelopes.
General construction and operational activities.	Increased predation or competition due to introduction or spread of introduced fauna species (i.e., cane toad and fox) or diseases.	Minor	Unlikely	Low	- Feral animals are known to occur in the area; - Suitable habitat is present within the development envelopes, although extensive surveys have not identified any evidence of the Night Parrot; and - Night Parrot unlikely to occur at the Project.
General construction and operational activities.	Anthropogenic activity in proximity or within critical habitat resulting in	Minor	Unlikely	Low	- No known Night Parrot have been recorded within development envelopes; and - Night Parrot unlikely to occur at the Project.

Impact	Relevant Information	Consequence	Likelihood	Risk Rating	Assessment and Justification
	disturbance of fauna species (human visitation).				
Physical presence of infrastructure.	Behavioural changes as a result of barriers to movement. Barrier to dispersal. Potential to isolate local populations.	Minor	Rare	Low	- All habitat types occur outside of the development envelopes; and - Habitat connectivity is to be maintained through Project design.

NORTHERN QUOLL

Table 10: Northern Quoll Risk Assessment

Impact	Relevant Information	Consequence	Likelihood	Risk Rating	Assessment and Justification
Direct Impacts					
Ground disturbance machinery or vehicle movements / interactions.	Direct loss and injury to fauna individuals as a result of fauna vehicle collisions or misidentification (predominantly Pilbara Olive Python).	Minor	Unlikely	Low	- No Northern Quoll have been recorded during surveys. The nearest record is 4 km northeast of the Project and was recorded in 2018.
Clearing activities.	Loss of habitat.	Minor	Unlikely	Low	- No rocky habitat critical to support the Northern Quoll are present within the development envelopes; and - The development envelopes do not contain any known permanent waterbodies, although drainage lines may provide suitable foraging habitat for Northern Quoll.
General construction and operational activities.	Direct loss and injury to fauna individuals as a result of vehicle collisions.	Minor	Rare	Low	- No Northern Quoll have been recorded during surveys. The nearest record is 4 km northeast of the Project and was recorded in 2018; and - The development envelopes do not contain any known permanent waterbodies, although drainage lines may provide suitable foraging habitat for Northern Quoll.
Indirect Impacts					
Ground disturbance machinery or vehicle movements / interactions.	Change in fauna behaviour due to noise, vibration and dust emissions.	Minor	Rare	Low	- No known denning populations of Northern Quoll have been recorded within development envelopes.
Ground disturbance machinery or vehicle movements / interactions.	Habitat degradation as a result of contamination, weeds, altered fire regimes and alteration, contamination of surface water and altered surface water flows.	Minor	Unlikely	Low	- Vegetation recorded to be largely good to excellent condition; - No Northern Quoll have been recorded during surveys. The nearest record is 4 km northeast of the Project and was recorded in 2018; - The development envelopes do not contain any known permanent waterbodies, although drainage lines may provide suitable foraging habitat for Northern Quoll; and - No Weeds of National Significance were recorded.
Clearing activities.	Decline in habitat condition though weeds, alteration to fire regimes and dust generation and deposition.	Minor	Unlikely	Low	- Vegetation recorded to be largely good to excellent condition; - No Northern Quoll have been recorded during surveys. The nearest record is 4 km northeast of the Project and was recorded in 2018; - The development envelopes do not contain any known permanent waterbodies, although drainage lines may provide suitable foraging habitat for Northern Quoll; - No Weeds of National Significance were recorded; and - Project design to ensure water flows are maintained.
Clearing activities.	Increased predation	Minor	Unlikely	Low	- Feral animals known to occur at the Project and extensively across the region due to the proximity to residential areas. Implementation of the Project is unlikely to result in an increase of feral animals; - Implementation of management actions detailed in Section 2.3; and - No Northern Quoll have been recorded during surveys. The nearest record is 4 km northeast of the Project and was recorded in 2018.
Increased domestic waste	Attraction of feral predators and increase predation on significant fauna.	Minor	Unlikely	Low	- No Northern Quoll have been recorded during surveys. The nearest record is 4 km northeast of the Project and was recorded in 2018; - The development envelopes do not contain any known permanent waterbodies, although drainage lines may provide suitable foraging habitat for Northern Quoll; - Feral animals are known to occur in the area; and - Implementation of management actions detailed in Section 2.3.
General construction and operational activities.	Increased light spill, noise, dust and / or vibration resulting in behavioural changes including breeding, attraction to areas of high activity, displacement to less suitable refugia / habitat.	Minor	Unlikely	Low	- No known denning populations of Northern Quoll have been recorded within the development envelopes.
General construction and operational activities.	Habitat degradation as a result of contamination, weeds, altered fire	Minor	Unlikely	Low	- Vegetation recorded to be largely good to excellent condition.

Impact	Relevant Information	Consequence	Likelihood	Risk Rating	Assessment and Justification
	regimes and alteration, contamination of surface water and altered surface water flows.				- No Northern Quoll have been recorded during surveys. The nearest record is 4 km northeast of the Project and was recorded in 2018; - The development envelopes do not contain any known permanent waterbodies, although drainage lines may provide suitable foraging habitat for Northern Quoll; - No Weeds of National Significance were recorded; and - Project design to ensure water flows are maintained.
General construction and operational activities.	Increased predation or competition due to introduction or spread of introduced fauna species (i.e., cane toad and fox) or diseases.	Minor	Unlikely	Low	- Feral animals are known to occur in the area; and - Implementation of management actions detailed in Section 2.3.
General construction and operational activities.	Anthropogenic activity in proximity or within critical habitat resulting in disturbance of fauna species (human visitation).	Minor	Unlikely	Low	- No known denning populations of Northern Quoll have been recorded within the development envelopes.
Physical presence of infrastructure.	Behavioural changes as a result of barriers to movement. Barrier to dispersal. Potential to isolate local populations.	Minor	Rare	Low	- All habitat types occur outside of the development envelopes; and - Habitat connectivity is to be maintained through Project design.

APPENDIX 4

PHOENIX
ENVIRONMENTAL SCIENCES

Detailed terrestrial fauna survey for the Port Hedland Green Steel Project

Prepared for Port Hedland Green Steel Pty Ltd

February 2024

Final



Detailed terrestrial fauna survey for the Port Hedland Green Steel Project
Prepared for Port Hedland Green Steel Pty Ltd

Version history

Author/s	Reviewer/s	Version	Version number	Date submitted	Submitted to
W. Purser, S. Pynt, J. Larkman, P. Williams	S. Pynt	Draft for client comments	0.1	08-Sep-23	P. Ranford
S. Pynt	J.Clark	Final, client comments addressed	1.0	15-Nov-23	P. Ranford
J. Scanlon	S. Pynt	Final	2.0	13-Feb-24	P. Ranford

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Project code: 1557-BIE-PRE-FAU

EXECUTIVE SUMMARY

Port Hedland Green Steel Pty Ltd (PHGS) is progressing the development of large-scale downstream iron ore processing capability known as the Port Hedland Green Steel Project (the Project), located approximately 15 km southwest of Port Hedland, Western Australia (WA; Figure 1-1). PHGS intend to seek approval under Part IV of the Environmental Protection Act 1986 (EP Act) to enable development of the Project which will consist of a pellet plant and a hot briquette iron (HBI) plant, consuming approximately 3-3.5 million tonnes per annum (Mtpa) of iron ore. In February 2023, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by Preston Consulting to undertake a Detailed terrestrial fauna survey for the Project.

The survey was undertaken in Autumn from 17-30 April 2023. The purpose of the survey was to define the fauna values of the study area to inform Project planning and environmental impact assessment processes.

A total of 58 survey sites were sampled including 6 systematic survey sites, 25 Bilby plots, 7 Bilby transects (BT) and 20 additional opportunistic/reference/targeted survey sites. A total of 103 terrestrial vertebrate species representing 44 families and 79 genera were recorded in the study area during the field surveys. The assemblage included 101 native species and 2 introduced species.

Three broad fauna habitat types were identified in the study area, comprising sandplains, open woodlands and drainage lines. Sandplains comprise the majority of the study area, accounting for over 95%. Open woodlands and drainage lines comprised less than 1% (0.9% and 0.6%, respectively) of the study area), the remainder being cleared.

Five significant vertebrate species comprising 2 Threatened, one Priority and 2 Migratory listed species were recorded in the study area. These included: Greater Bilby (Vulnerable; EPBC and BC Acts), Grey Falcon (Vulnerable; EPBC and BC Acts), Brush-tailed Mulgara (Priority 4; Department of Biodiversity, Conservation and Attractions (DBCA Priority list), Fork-tailed Swift (Migratory; EPBC and BC Acts) and Osprey (Migratory; EPBC and BC Acts). Black Falcon was also recorded (not conservation listed, but rare and considered locally significant).

The most significant result of the survey was the 128 records of Bilby sign, comprising 32 old diggings, 69 old scats, 12 recent diggings and 15 recent scats. However, despite both intensive and extensive targeted survey effort, no Bilby burrows (old, recently active, or active burrows) were detected. Together, the evidence therefore suggests that the study area forms part of a local population's home range, but it is not core breeding habitat. Instead, it is considered foraging habitat that is temporarily used as season conditions within the broader landscape dictate.

The Brush-tailed Mulgara was also recorded in the study area from 2 active or recently active burrows.

A breeding pair and recently fledged juvenile Grey Falcon were recorded perched next to a nest on a transmission tower adjacent to the Alinta Energy Power Station at the western extent of the study area are unlikely to be impacted by Project related disturbances, given the species large foraging home range of which the study area represents only a fraction.

The 2 Migratory listed bird species, Fork-tailed Swift and Osprey, while recorded in the study area, are not relevant to the habitats present. Fork-tailed swifts are an almost exclusively aerial species and are therefore not limited by the availability of specific terrestrial habitats. Ospreys are a predominantly coastal species but also forage in mangroves and other large water bodies where they prey on large fish. Therefore, development of the Project, including clearing of native vegetation within the study area poses no threats to these species.

With respect to Short-range endemic (SRE) invertebrates, while the open woodland habitat seems locally isolated, it extends to the east, outside the study area via diffuse drainages to more extensive open woodland habitat associated with the large drainage line known as South-west Creek.

The SRE fauna of the region is well understood with several confirmed SRE species known in the area and a high number of records from several different SRE groups. The desktop review identified 7

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The SRE fauna of the region is well understood with several confirmed SRE species known in the area and a high number of records from several different SRE groups. The desktop review identified 7

confirmed SRE taxa and 78 potential SRE taxa from within the SRE desktop search area. Of these most were recorded in habitat types that are not present in the study area, except for one record of a mygalomorph. This record was located approximately 165 m from the southeastern boundary of the study area. During the field survey 2 mygalomorph specimens were collected that could not be identified as the sequencing failed. These records are cautiously determined as potential SRE species.

Overall, the study area comprises low value SRE habitat. No confirmed SRE species were recorded within the study area, and it is unlikely any of the recorded potential SRE's are restricted to the study area.

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1 INTRODUCTION

Port Hedland Green Steel Pty Ltd (PHGS) is progressing the development of large-scale downstream iron ore processing capability known as the Port Hedland Green Steel Project (the Project), located approximately 15 km southwest of Port Hedland, Western Australia (WA; Figure 1-1). PHGS intend to seek approval under Part IV of the Environmental Protection Act 1986 (EP Act) to enable development of the Project which will consist of a pellet plant and a hot briquette iron (HBI) Plant, consuming approximately 3-3.5 million tonnes per annum (Mtpa) of iron ore.

In February 2023, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by PHGS to undertake a Detailed terrestrial fauna survey for the Project.

The purpose of the survey was to define the fauna values of the study area to inform Project planning and environmental impact assessment processes.

1.1 SCOPE OF WORK

The scope of work for the Detailed terrestrial fauna survey was as follows:

- Desktop study:
  - gather contextual information on the potential terrestrial fauna and fauna habitats of the study area.
  - identify significant fauna that potentially occur in the study area.
- Detailed survey:
  - collect comprehensive, quantitative data on species, assemblages and habitats in the study area.
- Targeted survey:
  - determine the presence/absence of one or more significant species identified in the desktop review as likely to occur in the study area, including (but not limited to) Mulgara and Greater Bilby.
  - determine distribution and abundance (where possible) of specific significant species.
  - describe and map habitats or features that are important to significant fauna or faunal assemblages, such as for breeding, foraging or dispersal.
- Stand-alone technical report suitable for inclusion in environmental approval documentation.

1.2 STUDY AREA

The study area is located in the Town of Port Hedland and the Eremaean Climatic Province as defined by EPA (2020). It is approximately 1,476.3 ha and includes 4 corridors with the western-most corridor located adjacent to the Port Hedland power station (Figure 1-1).





Port Hedland Green Steel Pty Ltd
Port Hedland Green Steel Project

Project No	1557
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- Study area
- Indicative disturbance footprint
- Boodarie Strategic Industrial Area
- Phoenix (2022) targeted Bilby survey
- Phoenix (2021) detailed fauna survey
- Environmentally sensitive areas
- Lakes
- DBCA managed land
- Whim Creek Road

Figure 1-1
Project location and study area

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2 LEGISLATIVE CONTEXT

The protection of fauna in WA is principally governed by 3 acts:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- State *Biodiversity Conservation Act 2016* (BC Act)
- State *Environmental Protection Act 1986* (EP Act).

The BC Act came into full effect on 1 January 2019 and replaced the functions of the *Wildlife Conservation Act 1950* (WC Act).

2.1 COMMONWEALTH

The EPBC Act is administered by the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW). The EPBC Act provides for the listing of Threatened fauna as matters of National Environmental Significance (NES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of NES, require approval from the Australian Government Minister for the Environment through a formal referral process. Key threats and habitat critical to the survival of EPBC Act Threatened species are usually defined in the conservation advice and/or recovery plan for the species.

Conservation categories applicable to fauna species under the EPBC Act are as follows:

- Extinct (EX)[1] – there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – taxa facing a high risk of extinction in the wild in the medium-term
- Conservation Dependent (CD)[1] – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable, Endangered or Critically Endangered.

The EPBC Act is also the enabling legislation for protection of Migratory species as matters of NES under several international agreements:

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

[1] Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the BC Act provides for the listing of Threatened fauna species (Government of Western Australia 2018a, b)[2] in the following categories:

- Critically Endangered (CR) – species facing an extremely high risk of extinction in the wild in the immediate future[3]
- Endangered (EN) – species facing a very high risk of extinction in the wild in the near future[3]
- Vulnerable (VU) – species facing a high risk of extinction in the wild in the medium-term future[3].

Species may also be listed as Specially Protected (SP) under the BC Act in one or more of the following categories:

- species of special conservation interest (conservation dependent fauna, CD) – species with a naturally low population, restricted natural range, of special interest to science, or subject to or recovering from a significant population decline or reduction in natural range
- Migratory species (Mig.), including birds subject to international agreement
- species otherwise in need of special protection (OS).

The Department of Biodiversity, Conservation and Attractions (DBCA) administers the BC Act and also maintains a non-statutory list of Priority fauna. Priority species are still considered to be of conservation significance – that is they may be Threatened – but cannot be considered for listing under the BC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority fauna lists are assigned to one of 4 Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.2 Critical habitat

Under the BC Act, habitat is eligible for listing as critical habitat if it is critical to the survival of a Threatened species or a Threatened Ecological Community (TEC) and its listing is otherwise in accordance with the ministerial guidelines.

2.2.3 Other significant fauna

Under the EPA's environmental factor guidelines, fauna may be considered significant for a range of reasons other than listing as a Threatened or Priority species.

In addition to listing as Threatened or Priority, EPA (2016a) identifies the following attributes that constitute significant fauna:

- species with restricted distribution (see also section 2.2.4)
- species subject to a degree of historical impact from threatening processes
- providing an important function required to maintain the ecological integrity of a significant ecosystem.

[2] The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the BC Act.

[3] As determined in accordance with criteria set out in the ministerial guidelines.

2.2.4 Short-range endemic invertebrates

Short-range endemic (SRE) fauna are defined as animals that display restricted geographic distributions, nominally less than 10,000 km^2, that may also be disjunct and highly localised (Harvey 2002). EPA (2016a) identifies species with restricted distributions as being significant fauna in the context of environmental impact assessments (EIA). SRE fauna need to be considered in EIA as localised, small populations of species that are generally at greater risk of changes in conservation status due to environmental change than other, more widely distributed taxa.

Short-range endemism in terrestrial invertebrates is believed to have evolved through 2 primary processes (Harvey 2002):

- Relictual – where the drying climate reduced the area of suitable habitat available to a species, forcing a range contraction. Such habitats typically maintain historic mesic conditions (e.g. south facing rock faces or slopes of mountains or gullies).
- Habitat speciality – where species settled in particular isolated habitat types (e.g. rocky outcrops) by means of dispersal and evolved in isolation into distinct species.

SRE invertebrates have however also been reported in more widespread habitats such as spinifex plains or woodlands, mainly in groups with low dispersal capabilities, for example mygalomorph spiders and millipedes (see for example Car & Harvey 2014; Rix *et al.* 2018).

There can be uncertainty in categorising a specimen as an SRE due to several factors including poor regional survey density, lack of taxonomic research and problems of identification, i.e. specimens that may represent SREs cannot be identified to species level based on the life stage. For example, in contrast to mature males, juvenile and female millipedes, mygalomorph spiders and scorpions cannot be identified to species level. Molecular techniques such as 'barcoding' (Hebert *et al.* 2003a; Hebert *et al.* 2003b) are routinely employed to overcome taxonomic or identification problems.

2.2.5 Environmentally Sensitive Areas

Under section 51B of the EP Act the Minister for Environment may declare by notice either a specified area of the State or a class of areas of the State to be Environmentally Sensitive Areas (ESAs). ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8 April 2005 (Government of Western Australia 2005).

ESAs are areas where the vegetation has high conservation value. Several types of areas are declared ESAs including:

- the area covered by vegetation within 50 meters (m) of Threatened flora, to the extent to which the vegetation is continuous with the vegetation in which the Threatened flora is located
- the area covered by a Threatened Ecological Community (TEC)
- a defined wetland (Ramsar wetlands, conservation category wetlands and nationally important wetlands) and the area within 50 m of the wetland
- Bush Forever sites.

3 EXISTING ENVIRONMENT

3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia's landscapes into large 'bioregions' and 'subregions' based on climate, geology, landform, native vegetation and species information (DoEE 2016). The study area is located in the Roebourne subregion (PIL4) of the Pilbara bioregion (Figure 3-1) which is characterised as (Kendrick & Stanley 2001):

> "Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia stellaticeps* or *A. pyrifolia* and *A. inaequilatera*. Uplands are dominated by *Triodia* hummock grasslands. Ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Samphire, *Sporobolus* and mangal occur on marine alluvial flats and river deltas."

3.2 LAND SYSTEMS AND SURFACE GEOLOGY

The Department of Primary Industries and Regional Development (DPIRD) undertakes land system mapping for WA using a nesting soil-landscape mapping hierarchy (Schoknecht & Payne 2011). While the primary purpose of the mapping is to inform pastoral and agricultural land capability, it is also useful for informing biological assessments. Under this hierarchy, land systems are defined as areas with recurring patterns of landforms, soils, vegetation and drainage (Payne & Leighton 2004).

The study area intersects 2 land systems (Table 3-1; Figure 3-2). Most of the study area comprises the Uaroo system with a hiatus in the northeast corridor representing the Littoral system.

Table 3-1 Land systems and extent in study area

Land system	Description	Area (ha)	% of study area
Uaroo System	Broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered acacia shrubs.	1,474.0	99.8
Littoral System	Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse acacia shrublands and mangrove forests.	2.3	0.2
	Total	**1,476.3**	**100.0**

According to the Surface Geology of Australia 1:1,000,000 scale, WA database (Stewart *et al.* 2008), the study area intersects one geological formation representing alluvium 38485 (Table 3-2; Figure 3-2).

Table 3-2 Surface geology of the study area, extent by deposit type

Surface geology	Abbreviation	Description	Area (ha)	% of study area
alluvium 38485	Qa	Channel and flood plain alluvium; gravel, sand, silt, clay, locally calcreted	1,476.3	100.0
		Total	**1,476.3**	**100.0**





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Study area

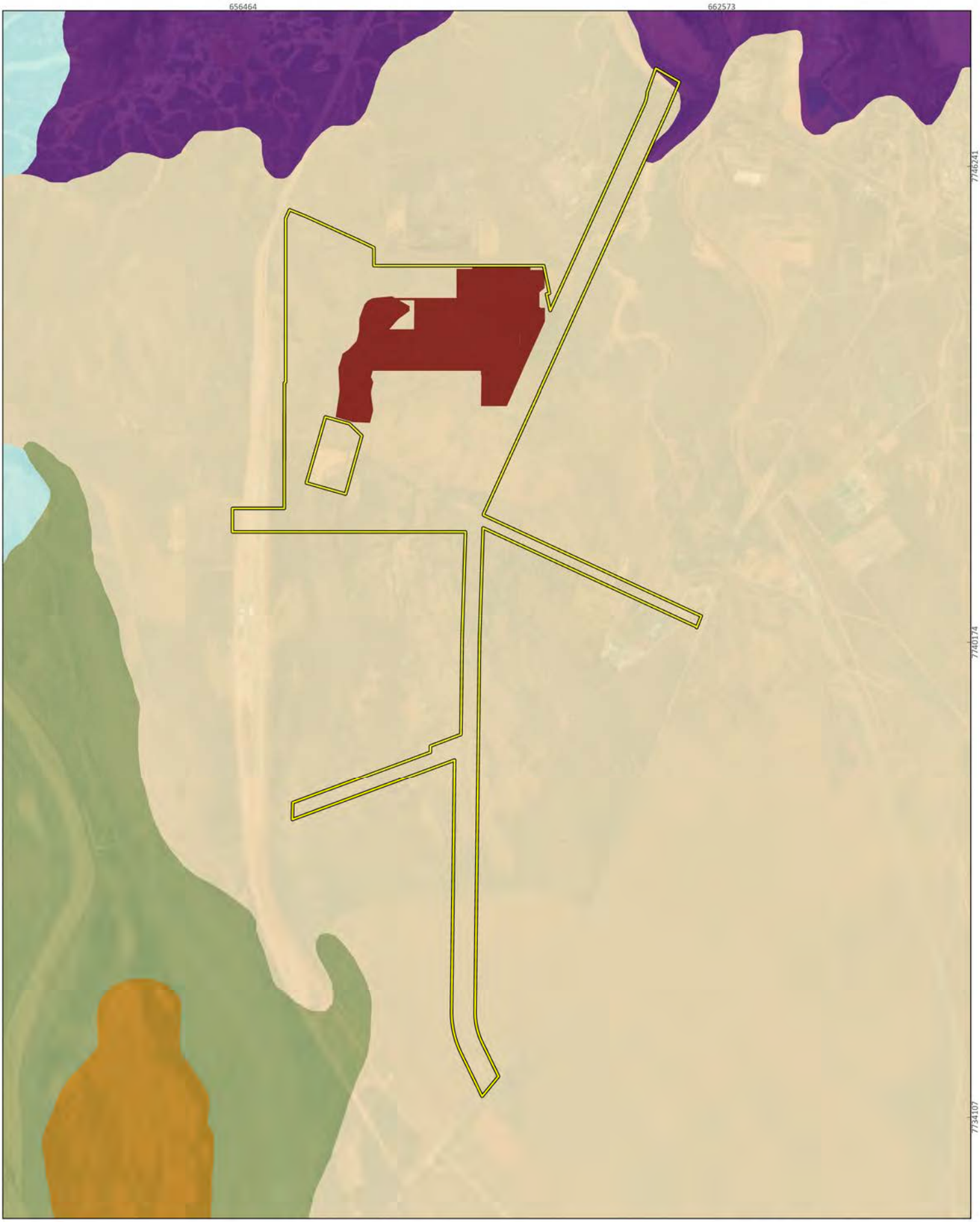
Region, subregion

- Dampierland, Pindanland
- Great Sandy Desert, McLarty
- Pilbara, Chichester
- Pilbara, Fortescue
- Pilbara, Roebourne

Figure 3-1

Study area in relation to IBRA bioregions and subregions

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- Study area
- Indicative disturbance footprint

Land systems

- Littoral System
- Mallina System
- River System
- Uaroo System
- Yamerina System

Figure 3-2

Land systems and surface geology in the study area

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3.3 CLIMATE AND WEATHER

The climate of the Roebourne subregion is described as arid (semi-desert) tropical with highly variable rainfall, falling mainly in summer (Kendrick & Stanley 2001). The nearest Bureau of Meteorology (BoM) weather station with comprehensive data collection and recent historic climate data is Port Hedland Airport (no. 004032), Latitude: 20.37°S Longitude 118.63°E, located approximately 11 km north-east of the study area.

Port Hedland Airport records the highest mean maximum monthly temperature (36.8°C) in December and March (lowest in July, 27.4°C) and the lowest minimum mean monthly temperature (12.5°C) in July (highest in January, 25.7°C) (BoM 2023) (Figure 3-3). Median annual rainfall is 310.6 mm with January and February recording the highest monthly median (25.6 and 71.2 mm respectively; Figure 3-3). Cyclonic activity is significant with several systems affecting the coast and hinterland annually (Kendrick & Stanley 2001). Prior to commencement of the survey, Cyclone Ilsa (Category 5) threatened the town of Port Hedland; however, local precipitation and damage was negligible.

Daily mean temperatures at Port Hedland Airport in the 3 months preceding the surveys were on average consistent with the long-term averages for the region (Figure 3-3). The average mean maximum and minimum temperatures were 0.3°C and 1.3°C warmer than the long-term averages, respectively. Daily maximum temperatures during the survey ranged from 31.7°C to 34.9°C, and daily minimum temperatures from 15.6°C to 25.4°C (Appendix 8).

Records from Port Hedland Airport show a total of 22.5 mm (19.8 %) more local precipitation was recorded in the 3 months leading up to the survey compared to the long-term averages for the region; local precipitation was almost identical to the long-term median, with 3.8 mm more (314.4 mm) recorded in the 12 months preceding the survey. No rainfall was recorded during the survey (Appendix 6).

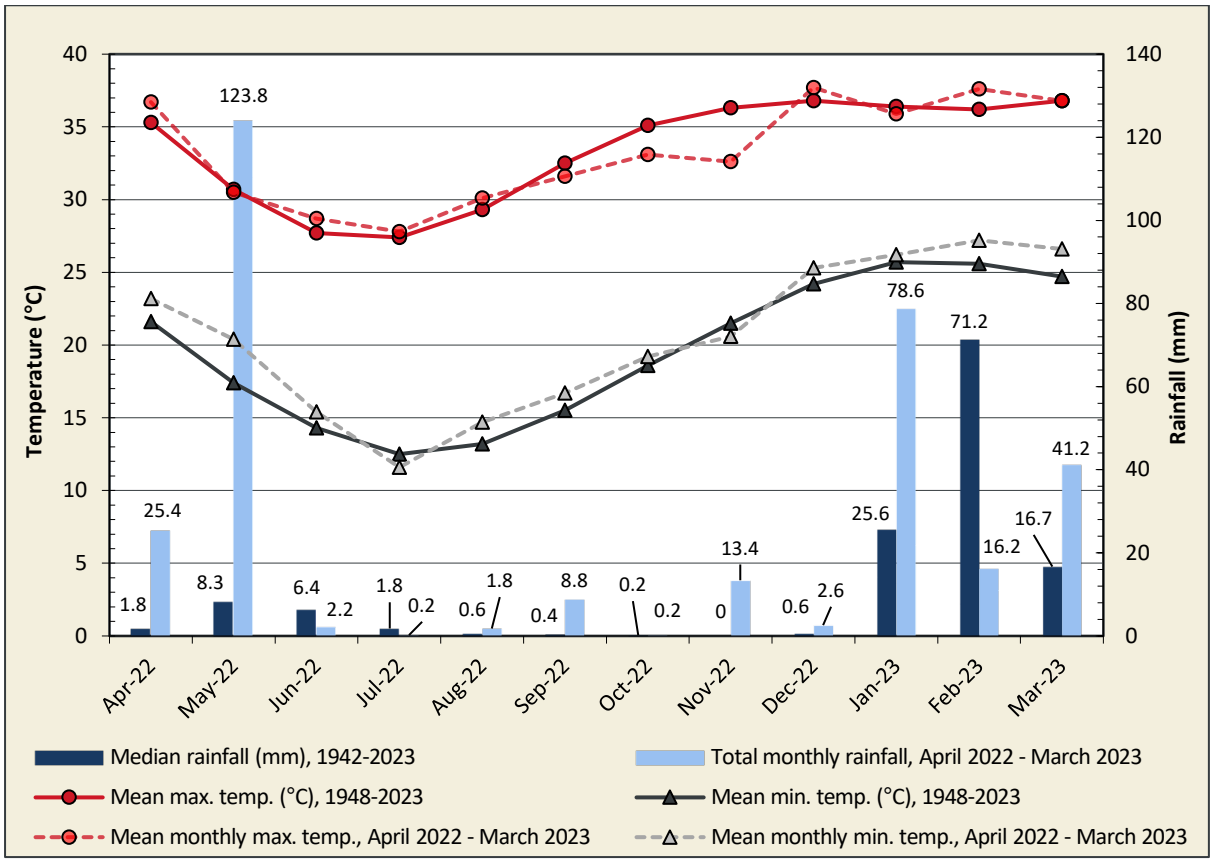


Figure 3-3 **Annual climate and weather data for Port Hedland Airport (no. 004032) and mean monthly data for the 12 months preceding the survey (BoM 2023)**

3.4 LAND USE

The dominant land use of the PIL4 subregion comprises grazing (native pastures), Aboriginal lands and reserves, conservation, mining leases and urban development (Kendrick & Stanley 2001). As per land use summaries extracted from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES 2018) and summarised in Table 3-3, 'production from relatively natural environments' and 'conservation and natural environments' are the dominant land use components comprising the PIL4 subregion. The majority of the study area is covered by the area allocated as the 'Boodarie Strategic Industrial Area' (Figure 1-1). Land use across the study area is subject to similar usages (and proportional area) to the PIL4 subregion; the dominant secondary components represent 'grazing native vegetation' (1,008.5 ha, 68.3%) and 'other minimal uses' (461.1 ha, 31.2%), which does not have any formal environmental protection. The Port Hedland and South Hedland power stations and a pipe stockyard are situated adjacent to the study area to the east.

Table 3-3 Land use of the study area, according to ABARES (2018)

Land use	PIL4 subregion		Study area	
	Area (ha)	% of PIL4	Area (ha)	% of study area
Conservation and natural environments	492,279.8	26.5	461.1	31.2
Intensive uses	8,481.1	0.5	4.2	0.3
Production from dryland agriculture and plantations	367.7	<0.01	-	-
Production from irrigated agriculture and plantations	0.4	<0.01	-	-
Production from relatively natural environments	1,302,639.7	70.1	1,008.7	68.3
Water	54,528.3	2.9	2.3	0.2
Total	**1,858,297.0**	**100.0**	**1,476.3**	**100.0**

3.5 CONSERVATION RESERVES AND ESAS

No conservation reserves intersect the study area or occur within the 40 km desktop search extent. The nearest conservation reserves are Mungaroona Range Nature Reserve and Eighty Mile Beach Marine Park, located approximately 101 km south-southwest and 110 km north-east from the study area boundary, respectively (Figure 1-1). No DBCA lands of interest proposed for conservation occur near the study area. A total of 7 ESAs occur within the desktop search extent (Figure 1-1; Table 3-4); 2 small ESAs (IDs 15126 and 15128) occur nearby, located approximately 8 and 10.7 km north-northwest and north-northeast of the study area, respectively. A larger ESA is located approximately 18.7 km north-east of the study area, encompassing salt evaporator ponds and the surrounding tidal mudflats. This ESA comprises a system of evaporation ponds and adjacent mudflats, classified by Birdlife International (2022) as an Important Bird Area (IBA) due to its global importance for Migratory bird populations, particularly Red-necked Stints and Sharp-tailed Sandpipers (Figure 1-1).

Table 3-4 ESAs in the desktop search extent

Identity	Area (ha)	Distance to study area
12070	36.4	34.2 km NE
12071	32.3	39.4 km NE
12074	206.0	36.8 km NE
12075	19,732.6	18.7 km NE
15126	7.8	8.0 km NNW
15127	36.1	8.0 km N
15128	1.5	10.7 km NNE

4 METHODS

The Detailed terrestrial fauna survey was conducted in accordance with relevant survey guidelines and guidance, including:

- *EPA Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020)
- *EPA Technical Guidance: Sampling of short-range endemic invertebrate fauna* (EPA 2016c)
- *Guideline for survey and relocation of Bilby in WA* (DBCA 2018)
- *Interim guideline for preliminary surveys of Night Parrot (Pezoporus occidentalis) in WA* (DPaW 2017).

4.1 DESKTOP REVIEW

Searches of several biological databases were undertaken to identify and prepare lists of significant fauna that may occur within the study area (Table 4-1). A literature search was conducted for accessible reports for biological surveys conducted within 40 km of the study area to build on the lists developed from the database searches (Table 4-2).

Table 4-1 Database searches conducted for the desktop review

Database	Target group/s	Search coordinates and extent
Protected Matters Search Tool (DCCEEW 2022)	EPBC Act Threatened fauna	Study area plus a 40 km buffer
DBCA Threatened and Priority Fauna Database (DBCA 2022b)	Threatened and Priority fauna	Study area plus a 40 km buffer
DBCA NatureMap Database (DBCA 2022a)	Fauna records	Study area plus a 40 km buffer
WA Museum Arachnid and Myriapod Database, Mollusca Database (WAM 2022)	Arachnid, myriapod and mollusc SREs	100 x 100 km search area encompassing the study area between 19.5269°S, 117.5647°E (NW corner) and 21.3154°S, 119.4991°E (SE corner)

Table 4-2 Survey reports included in the desktop review

Report author	Survey description	Project	Relative location
Bennelongia (2011)	Migratory shorebird survey	Outer Harbour Development	Adjacent (N)
ENV (2009)	Terrestrial fauna surveys	Outer Harbour Development	Overlapping
ENV and Phoenix (2009)	Level 2 SRE invertebrate survey	Outer Harbour Development and Goldsworthy Rail Duplication	Overlapping
ENV (2011)	Basic and targeted terrestrial fauna surveys	Port Hedland Regional Assessment	Overlapping
Phoenix (2022a)	Basic vertebrate fauna survey	Port Hedland Source Planning	6.5 km N
Phoenix (2022b)	Detailed terrestrial fauna (2021) and targeted Bilby survey	Port Hedland Solar Farm	Adjacent (E)

Report author	Survey description	Project	Relative location
Phoenix (2013)	SRE invertebrate survey	East Pilbara Independent Rail Project	Overlapping (all sites to S)

Vertebrate taxonomy follows the current WAM checklist (Western Australian Museum Department of Terrestrial Zoology 2023) except where known to be superseded by recently published revisions (e.g. Nankivell *et al.* 2023; Prates *et al.* 2023; Umbrello *et al.* 2023). Recent changes in nomenclature are noted under 'Status/comments' for the relevant species in Appendix 3. Exclusively marine reptile and mammal species are included in Appendix 5 but not considered further in this report.

4.2 FIELD SURVEY

4.2.1 Survey timing

The survey was undertaken in Autumn from the 17-30 April 2023.

4.2.2 Terrestrial fauna

Field methods undertaken within the study area included:

- habitat assessment and mapping (see 4.2.2.1)
- systematic trapping (4.2.2.2)
- active diurnal and nocturnal searches (4.2.2.3)
- avifauna surveys (4.2.2.4)
- bat echolocation recordings (4.2.2.5)
- camera trapping (4.2.2.6)
- targeted surveys for Greater Bilby (4.2.2.7; *Macrotis lagotis*, VU)
- SRE invertebrate sampling (4.2.2.9).

A total of 58 survey sites were sampled during the survey (Figure 4-1; Appendix 1). These include 6 systematic survey sites, 25 Bilby plots (BP), 7 Bilby transects (BT) and 20 additional opportunistic/reference/targeted survey sites.

4.2.2.1 Habitat assessment and mapping

Initial habitat characterisation was undertaken using various remote geographical tools, including aerial photography (Google Earth®), land system maps and topographic maps. Habitats with the potential to support significant terrestrial fauna species were identified based on known habitats of such species within the Pilbara bioregion. Tentative sites were selected for the terrestrial fauna survey to represent all habitat types. Final survey site selection was conducted after ground-truthing of site characteristics.

At the broadest scale, site selection considered aspect, topography and land systems. At the finer scale, consideration was given to proximity to water bodies (drainage lines and creek), vegetation complexes and condition and soil type. Sites were primarily chosen to represent the best example of distinct habitats within the broader habitat associations of the study area with a focus on species of conservation significance identified in the desktop review. Two replicates per habitat type were selected for Detailed systematic sampling. Habitat descriptions and characteristics were recorded at all Level 2 systematic survey sites (Figure 4-1; Table 4-3; Appendix 2).

To more accurate define and delineate the fauna habitats in the study area, photographs were taken while traversing the study area (Figure 4-1) with a focus on transitions between fauna habitats (ecotones) apparent from aerial imagery. All photographs were geolocated and spatially mapped to reference. Photographs were used in conjunction with survey site descriptions and regional land system descriptions (Schoknecht & Payne 2011) to map the fauna habitats of the study area.

Table 4-3 Terrestrial fauna survey effort

Site	Site type	Habitat assessment (#)	Diurnal active searches (hours)	Nocturnal active searches (hours)	Birding (hours)	Ultrasonic recording (nights)	Acoustic recorder (nights)	Camera trap (trap-nights)	Bucket (trap-nights)	Aluminium box (trap-nights)	Funnel (trap-nights)	Pipe (trap-nights)	Bilby 2 ha plot (#)	Bilby transect (#)	Opp sighting (#)	SRE foraging (hours)	Litter sieve (#)
BIE001	FS	1	0.7	4	1.3	4	6		35	70	140	35			4	0.3	
BIE002	FS	1	0.3	4	1.0	6	8		35	70	140	35				0.3	
BIE003	FS	1	1.0	3	1.0				35	70	140	35			4	0.3	
BIE004	FS	1	1.0	4	1.0	(3)	3		35	70	140	35			1	0.3	
BIE005	FS	1	0.7	3	0.7	4			35	70	140	35			4	0.3	3
BIE006	FS	1	6.3	3	3.0	4		20	35	70	140	35			3	0.3	3
BIE007	FS		0.7		0.7												
BIE008	FS		0.7		0.7												
BIE009	TFS									1							
BIE010	TFS									20							
BP001-025	TFS												25				
BT001-007	TFS													18			
Opp001-016	FS														22		
Total		**6**	**11.3**	**21.0**	**9.3**	**21**	**17**	**20**	**210**	**441**	**840**	**210**	**25**	**18**	**38**	**1.8**	**6**

Rows highlighted in grey are systematic sites. Values in parentheses indicate intended survey effort in the absence of device malfunction. TFS = Targeted fauna site; FS = Fauna site; SP = Site photo; BT = Bilby transect; BP = Bilby plot.

4.2.2.2 Systematic trapping

Six systematic trapping sites were established to capture terrestrial mammals, reptiles and amphibians (Figure 4-1). Each site comprised 5 'sub-sites' which consisted of 2 dry pitfall traps including one PVC pipe (15 cm diameter x 60 cm depth) and one 20 L bucket, 4 funnel traps (75 cm x 18 cm x 18 cm) and 2 aluminium box traps (9 cm x 10 cm x 33 cm). The pipes and buckets were installed flush with the substrate, with a 10 m long, 30 cm high aluminium drift fence bisecting each pit. Funnel traps were positioned at the start and finish of each drift fence, and one on either side of the drift fence in the centre between pitfall traps. Aluminium box traps were place in vegetation adjacent to the trap line. Sub-sites were positioned approximately 20 m apart along a 100 m transect.

The aluminium box traps were baited with a universal bait mixture consisting of oats, peanut butter and sardines to attract small mammals. Aluminium box and funnel traps were shrouded with reflective closed cell insulation (R2.5 rated) to provide shade and protection for any captured animals. All traps were given as much shade as possible under/around vegetation. Reflective closed cell insulation (R2.5 rated) and leaf litter were used to provide protection from the elements in the bottom of all buckets.

Traps were open for 7 consecutive nights and checked within 3 hours of sunrise. Baits were removed and replaced every second day.

The total vertebrate trapping effort for the 6 systematic trapping sites during the surveys was 1,608 trap-nights (Table 4-3), where a trap-night is defined as one trap remaining open for one night.

4.2.2.3 Active diurnal and nocturnal searches

Active searches were undertaken at each systematic site and 2 additional sites throughout the study area (Figure 4-1). Active searches primarily targeted diurnal herpetofauna and mammals from direct sightings and secondary evidence. Searches focused primarily on significant species identified in the desktop review as potentially occurring within the study area, including Brush-tailed Mulgara (*Dasycercus blythi*, P4) and Greater Bilby (*Macrotis lagotis*, VU).

Searches were undertaken in any observable microhabitats considered likely to support mammals, reptiles and amphibians. Techniques included: raking leaf and bark litter, overturning logs, searching beneath the bark of trees, investigating dead trees and logs, investigating burrows and identifying any secondary evidence including tracks, diggings, scats, fur or sloughs (shed skins), predation or feeding sites, and fauna constructed structures such as nests. Between 0.7 to 6.3 person hours was spent active searching at each site for a total of 11.3 hours over the duration of the field survey (Table 4-3).

Nocturnal searches were undertaken at each systematic site to detect the presence of any nocturnal fauna species. Nocturnal searches were undertaken between sunset and 9 pm when activity levels were highest for most nocturnal species. Searches consisted of using head torches to detect animal movement, eye shine, or other evidence of fauna presence. These searches particularly targeted reptiles and mammals, but also nocturnal birds. Approximately 21 person hours of nocturnal searches were undertaken during the field surveys (Table 4-3).

4.2.2.4 Avifauna surveys

Twenty-minute avifauna surveys were undertaken at each of systematic site and 2 additional sites (Figure 4-1; Table 4-3). Avifauna surveys were confined to the habitat type (up to 2 ha) represented by each site to collect assemblage data for each habitat. Avifauna surveys were undertaken throughout the day with a focus on periods of higher activity around sunrise and sunset. Surveys consisted of bird recordings from visual sightings and call recognition. Between 0.7 to 3.0 person hours was spent of avifauna census at each site for total of 9.3 hours over the during the field survey (Table 4-3).

Additional avifauna observations were also recorded opportunistically while other field work was being completed, including observations made during travel and active searches.

SongMeter SM4 recording devices were deployed at 3 sites for between 3 to 8 nights to target Night Parrot (*Pezoporus occidentalis*, CR; Table 4-3) in accordance with survey guidelines (DPaW 2017). The Song Meters were deployed at systematic sites in locations considered potential roost habitat for Night Parrot and set to record continuously over the deployment period.

The migratory and non-migratory avifauna assemblage identified in the desktop review as potentially occurring was taken into consideration when undertaking systematic avifauna surveys and traversing the study area.

4.2.2.5 Bat echolocation recordings

Song Meter SM4 recording devices were used to record bat echolocation calls at 5 sites during the field survey (Table 4-3, Figure 4-1)Recording devices were deployed at each site for a minimum of 4 nights of recording for between 8 and 12 continuous hours per night (Table 4-3). Devices were aimed at a 45° angle to the ground. The Song Meters were positioned in areas of habitat likely to have increased insect activity and to attract bats (i.e. likely foraging areas or movement corridors) and/or potential roosting sites where possible.

4.2.2.6 Camera trapping

Four motion-sensitive camera traps baited with universal bait were deployed for 5 nights at BIE006 to gather broad fauna assemblage data outside of disturbance periods (Table 4-3). Cameras were deployed for a total of 20 camera trap-nights. Cameras were set to take 3 rapid-fire images with one second intervals and a 5-second video with a 15-second trigger interval. Camera sensitivity was set to high.

4.2.2.7 Targeted surveys for Bilby (*Macrotis lagotis*, VU)

The objective of the targeted Bilby survey was to determine their presence/absence from the study area and identify areas of recent activity by adopting survey methods detailed in DBCA (2018). Bilby populations are known to have moving home ranges (Dziminski *et al.* 2020). Detection of secondary evidence including scats, tracks, burrows and diggings is the most reliable technique to determine whether bilbies are currently or were formerly present in an area. The occurrence of fresh scats, definitive tracks and/or multiple concentrated diggings can be indicative of current presence; unclear tracks, burrows and diggings in the open can indicate potential activity but cannot alone be used to verify current presence.

A combination of linear transects and 2 ha sign plots were undertaken to provide extensive and representative coverage in all suitable habitat types across a large study area that varies considerably in shape. It is recommended for 2-4 plots be searches per 100 ha, with plot spacing increasing with the size of the study area (DBCA 2018). By combining these methods, there is an increase in confidence in detecting the presence of Bilby in a given area (DBCA 2018).

Linear transects were searched with ~20 m spacing in the study area corridors where suitable habitat was located (Figure 4-2). A total of 18 transects were traversed on foot to detect Bilby presence (Appendix 7).

The standardised 2 ha sign plot method was used for the centre portion of the study area where suitable habitat was identified. The methods involved searching multiple 2 ha plots for Bilby sign, for 25 minutes. Sign plots were distributed to include all areas of suitable Bilby habitat across the study area. A total of 25 2 ha plots were searched.

All locations of secondary evidence were recorded on GPS enabled devices (Figure 5-3)

4.2.2.8 Analysis of survey completeness

Species accumulation curves were produced on a samples and abundance basis using PRIMER V6 (Clarke & Gorley 2006) to obtain an estimate of survey completeness (i.e. whether the collection adequately represents the vertebrate fauna assemblage of the study area) for systematic methods completed within the study area (overall). All sample types were aggregated per site and no data transformation was undertaken. The maximum permutations were set at 999.

4.2.2.9 SRE invertebrate sampling

Sampling for SRE invertebrates was conducted at all 6 systematic sites (Figure 4-1), including areas identified as suitable habitat for SREs. Sampling comprised the following methods:

- dry pit trapping
- active foraging
- litter/soil sieving
- blowing for mygalomorph spiders.

SRE were collected from dry pitfall traps and other systematic traps during the Detailed survey of the study area.

Active foraging for SRE invertebrate groups (concurrently with active vertebrate fauna searches) comprised inspection of logs, the underside of bark of larger trees and the underside of rocks. Methodical searches were conducted amongst the leaf litter of shade-bearing tall shrubs and trees, including raking of litter.

A standardised approach was undertaken whereby each site (considered suitable SRE habitat) was sampled for 20 minutes, with a total search effort of approximately 1.8 hours (Table 4-3). Trapdoor spider burrows identified during the searches were excavated if they were considered inhabited. Spider burrows were located by visual inspection and blowing, whereby a leaf blower is used to open the lid and expose the burrow. Excavation involved removing soil from around the burrow to carefully expose the burrow chamber and remove the spider.

Combined litter/soil sifts were undertaken at 2 sites, with up to 3 sifts conducted at each site dependent on abundance of leaf litter. In total, 6 sifts were undertaken (Table 4-3). The collection of leaf litter samples was standardised volumetrically by the diameter and height (310 mm x 50 mm = 1.55 L) of the sieves which were completely filled with compressed litter and the upper layers of underlying soil. Samples were sieved through 3 stages of decreasing mesh size over a round tray and invertebrates were picked from the sieves and tray with forceps. These samples particularly targeted small spiders (Araneomorphae), pseudoscorpions, buthid scorpions, millipedes, centipedes (in particular Geophilomorpha and Cryptopidae), smaller species of molluscs (e.g. Pupillidae) and slaters.

SRE potential habitat rating

Fauna habitat mapping was assessed for its potential to support endemic SRE species and communities. Potential SRE habitat was rated as follows:

- High – defined/known areas of habitat that contain elements that often give rise to specialisation or dependency in invertebrate fauna, such as aspect (e.g. south facing slopes, geological features, granite), soil types that retain water (e.g. clay, loam). These habitats may also include habitat isolates which have the capacity to restrict dispersal.
- Low – areas of largely intact native vegetation that occur broadly across the landscape, are less incised and typically link more restricted habitats. This may include land that was cleared but has since been rehabilitated or is in the process of being rehabilitated.

- None – land that has been previously cleared for other uses that no longer contains native vegetation.

SRE status rating

Currently, there is no accepted system to determine the likelihood that a species is an SRE. The WA Museum applies 3 categories: Confirmed, Potential, and Widespread. Confirmed SREs are taxa for which the distribution is known to be less than 10,000 km^2, the taxonomy is well known, and the group is well represented in collections and/or via comprehensive sampling (WAM 2013). Potential SREs include those taxa for which there is incomplete knowledge of taxonomy or geographic distribution, and the group is not well represented in collections. Phoenix applies 4 categories based on the WA Museum criteria (Table 4-4).

Table 4-4 SRE categories

SRE category	Criteria
Confirmed	Distribution <10,000 km^2. Taxonomy of the group is well known (but not necessarily published); group is well represented in collections, in particular from the region in question; high levels of endemism exist in documented species; inference is often possible from immature specimens.
Likely	Distribution < 10,000 km^2. Taxonomically poorly resolved group but group is generally well represented in collections; unusual morphology for the group (e.g. some form of troglomorphism); often recorded as singletons in survey and few, if any, regional records.
Potential	Distribution <10,000 km^2. Taxonomically poorly resolved group; patchy distribution, often common in certain microhabitats, but no other regional records; congeners (= species in the same genus) both widespread and restricted in distribution.
Widespread	Distribution >10,000 km^2.

SRE taxonomy

Initial higher-level (class, order, family) identifications of specimens are undertaken by Phoenix staff in Phoenix' invertebrate laboratory. Final specials designations are allocated using specialist morphological and/or molecular sequencing (Table 4-5).

Where possible identifications are on compared with reference material from the WA Museum and/or taxonomist reference collections.

Table 4-5 Specialist taxonomists

Person	Title	Taxa
Dr Erich S. Volschenk	Taxonomic consultant, Alacran	Scorpiones, Pseudoscorpiones
Dr Simon Judd	Taxonomic consultant	Isopoda
Dr Cathy Carr	Taxonomist	*Antichiropus* millipedes
Jane McRae	Taxonomist; Bennelongia	Stygofaunal amphipods, copepods, ostracods, oligochaetes, coleoptera, bathynellaceae
Anna Jacks	Invertebrate zoologist, Phoenix	Selenopidae spiders, Chilopoda, Gastropoda, Isopoda, Diplopoda

Sequences were edited and analysed using Genious 2022.2. Sequences for comparison were sourced from GenBank (Benson *et al.* 2012) and Phoenix's DNA database using the megablast search function in Geneious. For each sequence, the most similar 10 matches were retrieved. In cases where the retrieved sequences represented a species more than twice, then the 2 longest sequences were

retained and the shorter conspecific sequences discarded. Where megablast results yielded families differing from the morphological assessment, then additional sequences were obtained from GenBank, representing the morphological taxonomic assessment. If all of the resulting blast sequences represented organisms from a different taxonomic class, sequences were discarded as likely contamination.

SRE specimens collected during the survey have been lodged with the WA Museum.

4.2.3 Likelihood of occurrence assessment

Following the field survey, the likelihood of occurrence for each significant fauna species identified in the desktop review was assessed and assigned to one of 4 ratings:

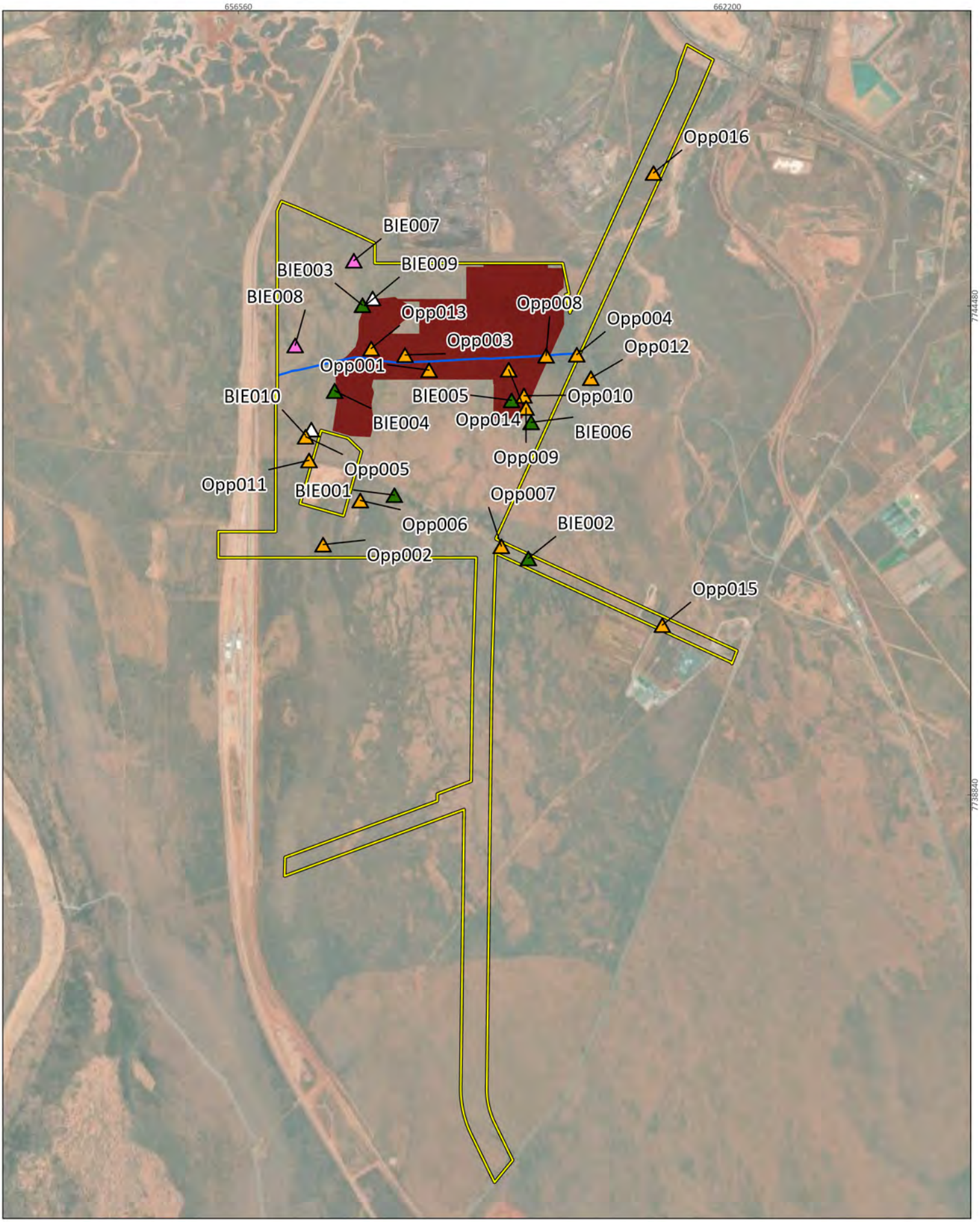
- recorded – species recorded within the study area by previous or current survey
- likely – study area within current known range of species, suitable habitat within the study area and home range of species intersects study area based on known records
- possible – study area within current known range of species, suitable habitat within the study area and home range of species does not intersect study area based on known records
- unlikely – study area outside current known range of species or no suitable habitat present in study area.

4.2.4 Survey personnel

The personnel involved in the surveys are listed in Table 4-6. All survey work was carried out under relevant licences issued by DBCA under the BC Act (Table 4-6).

Table 4-6 Survey personnel

Name	Permit	Qualifications	Role/s
Simon Pynt	Fauna taking (biological assessment) licence no. BA27000780, TFA2223-0183	BSc Zoology	Project management and logistics, field survey, reporting
Jade Larkman		BSc Environmental Sciences	Field survey, desktop review
Will Purser		MSc Biological Sciences (Zoology)	Field survey, reporting
Patrick Williams		MSc Environmental Sciences	Field survey
Kerryn Fox		MSc Veterinary Science (Wildlife Health and Conservation)	Reporting
John Scanlon		BSc Hons (Zoology), PhD (Zoology)	Reporting
Brigitte Kovar		MSc Geographical Information Systems (GIS)	GIS





Port Hedland Green Steel Pty Ltd
Port Hedland Green Steel Project

Project No	1557
Date	5/02/2024
Drawn by	JL
Map author	SP

0 1 2
Kilometers

1:56,400 (at A4) GDA 1994 MGA Zone 50

All information within this map is current as of 5/02/2024. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.

- Study area
- Indicative disturbance footprint
- Whim Creek Road

Fauna site type

- Basic
- Detailed
- Opportunistic sighting
- Targeted

Figure 4-1

Terrestrial fauna survey sites

PHOENIX ENVIRONMENTAL SCIENCES





Port Hedland Green Steel Pty Ltd
Port Hedland Green Steel Project

Project No	1557
Date	5/02/2024
Drawn by	JL
Map author	SP

0 1 2
Kilometers

1:54,300 (at A4) GDA 1994 MGA Zone 50

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- Study area
- Indicative disturbance footprint
- Whim Creek Road
- 2 ha search plots
- Transect search tracks
- Plot search tracks

Figure 4-2

Bilby plot and transect search locations

PHOENIX ENVIRONMENTAL SCIENCES

5 RESULTS

5.1 DESKTOP REVIEW

5.1.1 Vertebrate fauna

The desktop review identified records of 372 vertebrate taxa within the desktop search extent. The list comprised 11 frogs, 93 reptiles (including 2 introduced species), 222 birds (including 2 naturalised species) and 46 mammals (including 11 introduced species) (Table 5-1; Appendix 3).

Phoenix previously carried out a Detailed terrestrial fauna and targeted Bilby survey in the Boodarie area (Phoenix 2022b); the Detailed study area lies adjacent to the Project's eastern corridor, and the targeted Bilby survey area intersects the southern half of the study area (Figure 1-1). A total of 82 species were recorded during the Detailed fauna survey, comprising 6 amphibians, 36 reptiles, 25 birds and 15 mammals (including 4 introduced species).

Table 5-1 Summary of terrestrial fauna desktop results

Class	Introduced	Native	Total
Amphibians	0	11	**11**
Reptiles	2	91	**93**
Birds	2	220	**222**
Mammals	11	35	**46**
Total	**15**	**357**	**372**

EPBC Protected Matters Search (DCCEEW 2023a) does not return species locations and includes instances where suitable habitat may occur but the species has not necessarily been observed (indicated with an asterisk in Table 5-2).

Seventy-one significant vertebrate species were identified in the desktop review, comprising 18 species listed as Threatened, Conservation Dependent or SP under the EPBC Act and/or BC Act, 55 avifauna species listed as Migratory under the EPBC Act and BC Act (7 of these also Threatened), and a further 6 species are listed as Priority by DBCA (including one locally extinct species, and one also Migratory) (Table 5-2).

Two significant vertebrate species have previously been recorded within the study area (Figure 5-1):

- Bilby, *Macrotis lagotis* (VU), recorded by DBCA (2022b); one record in the west of the study area from 1899. Over 100 records of secondary evidence were recorded by Phoenix (2022b) within and nearby the study area.
- Brush-tailed Mulgara, *Dasycercus blythi* (P4), recorded by DBCA (2022b); 3 records in the study area between 2008 and 2012. An additional 269 records occur in the wider desktop review area from 1982 to 2019.

An additional 31 significant species have been recorded within 5 km of the study area, comprising one reptile, 28 birds and 2 mammals (highlighted in grey in Table 5-2).

Table 5-2 Significant vertebrate fauna identified in the desktop review

Species	Status	Proximity to study area	Habitat
Reptiles (3)			
Ctenotus angusticeps Airlie Island Ctenotus	P3 (DBCA list)	2.7 km NNE	Associated with samphire shrublands and saltmarshes (Maryan *et al.* 2013). Has been reported using crab holes for avoiding humans and for shelter at night.
Liasis olivaceus barroni Pilbara Olive Python	VU (EPBC & BC Acts)	26.4 km SSE	Commonly found in rocky areas in association with watercourses and pools and often associated with areas of permanent pooling water near rocky habitats, such as gullies, gorges and rocky ranges or boulder sites. It has also been recorded in riparian vegetation along major rivers (Barker & Barker 1994; Pearson 2003).
Liopholis kintorei Great Desert Skink	VU (EPBC Act; BC Act)	*	The Great Desert Skink is a large social lizard restricted to central desert regions, occupying complex burrow systems. Habitats range from hard spinifex gravelly plains and sandplains to semi-saline soft spinifex sandplains, and even non-spinifex mulga woodland (Indigenous Desert Alliance 2022).
Non-migratory birds (5)			
Falco hypoleucos Grey Falcon	VU (EPBC & BC Act)	6.7 km SSW	The Grey Falcon is a widespread but rare species inhabiting much of the hot, semi-arid and arid interior of Australia. Occurs in a wide variety of arid habitats including open woodlands and open *Acacia* shrubland, hummock and tussock grasslands and low shrublands, particularly where crossed by tree-lined water courses (Schoenjahn *et al.* 2019; Threatened Species Scientific Committee 2020).
Falco peregrinus Peregrine Falcon	OS (BC Act)	1.4 km SW	Preferred habitat includes cliffs and wooded watercourses. Nesting occurs mainly on cliff ledges, granite outcrops, quarries and in trees with old raven or Wedge-tailed Eagle nests (Johnstone & Storr 1998).
Pezoporus occidentalis Night Parrot	EN/CR (EPBC Act; BC Act)	*	Rare and cryptic species appearing to favour areas of dense vegetation comprising old-growth (often > 50 years unburnt) spinifex (*Triodia* spp.) especially hummocks that are ring-forming for roosting and nesting. Such areas may also be associated with dense chenopod shrubs. It is thought that spinifex hummocks that are <40-50 cm in height are not likely to provide adequate shelter for roosting and nesting (DPaW 2017).
Rostratula australis Australian Painted Snipe	EN (EPBC & BC Acts)	*	Generally, inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (DCCEEW 2023b).
Sternula nereis nereis Fairy Tern	VU (EPBC & BC Acts)	6.7 km NNE	In WA, the species is present along the entire coastline, with rare records from the far north (Kimberley) and off the Nullarbor Plain. It nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation (DCCEEW 2023b).

Species	Status	Proximity to study area	Habitat
Migratory birds (55)			
Actitis hypoleucos Common Sandpiper	Mig. (EPBC & BC Acts)	2.2 km E	Found across a wide range of wetlands: small ponds, large inlets and mudflats where they forage on the shore usually close to the vegetation (DCCEEW 2023b). Prefers rocky creeks, channels, dams, and mangrove-lined inlets (Geering *et al.* 2007).
Anous stolidus Common Noddy	Mig. (EPBC & BC Acts)	*	In Australia the species, occurs mainly in ocean off the Queensland coast, but the species also occurs off the north-west and central WA coast. During the breeding season, the Common Noddy usually occurs on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand (DCCEEW 2023b).
Apus pacificus Fork-tailed Swift	Mig. (EPBC & BC Acts)	9.1 km NE	Widespread Migratory species that does not breed in Australia, typically present from October to April. It occurs in a wide range of dry or open habitats across most of WA and is uncommon to moderately common in the north-west (DCCEEW 2023b). Forages and roosts in flight so not limited by terrestrial habitat; flocks most often seen ahead of cyclones or during thunderstorms (Johnstone *et al.* 2013).
Ardenna pacifica Wedge-tailed Shearwater	Mig. (EPBC & BC Acts)	*	The Wedge-tailed Shearwater is a pelagic, marine bird known from tropical and subtropical waters. It breeds on offshore islands of the east and west coasts of Australia in summer (del Hoyo *et al.* 1996). Common breeding visitor to Pilbara waters and islands (Johnstone *et al.* 2013).
Arenaria interpres Ruddy Turnstone	Mig. (EPBC & BC Acts)	2.3 km E	Non-breeding migrant, common on Pilbara coast mainly from late August – April, but may be present year-round as juvenile birds overwinter here (Johnstone *et al.* 2013). Usually found on ocean coasts with exposed rock, stones, or shell beaches (Morcombe 2004).
Calidris acuminata Sharp-tailed Sandpiper	Mig. (EPBC & BC Acts)	2.2 km E	The Sharp-tailed Sandpiper is one of the most common Australian shorebirds. It occurs on saline wetlands such as coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (DCCEEW 2023b).
Calidris alba Sanderling	Mig. (EPBC & BC Acts)	3.4 km SSW	Found mostly on open sandy beaches exposed to open sea swell, and also on exposed sandbars and spits, shingle banks and beaches that may contain wave-washed rocky outcrops (DCCEEW 2023b).
Calidris canutus Red Knot	EN/Mig. (EPBC Act; BC Act)	3.4 km SSW	Widespread across coastal Australia often found in intertidal mudflats, sandbars, estuaries, harbours, lagoons, beaches, and reefs (IUCN 2019).
Calidris ferruginea Curlew Sandpiper	CR/Mig. (EPBC Act; BC Act)	2.3 km E	In Australia the species is strictly migratory and occurs in large numbers. Mainly occur on intertidal mudflats in sheltered coastal areas, also around non-tidal swamps, lakes, and lagoons near the coast. Less often inland around ephemeral and permanent lakes and waterholes, usually with bare edges of mud or sand (DCCEEW 2023b).

Species	Status	Proximity to study area	Habitat
Calidris melanotos Pectoral Sandpiper	Mig. (EPBC & BC Acts)	8.9 km ENE	The Pectoral Sandpiper is an uncommon solitary shorebird found in wetlands, inland as well as on the coast. Occurs on shallow fresh to saline wetlands, usually coastal or near-coastal but occasionally further inland. Prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation (DCCEEW 2023b).
Calidris ruficollis Red-necked Stint	Mig. (EPBC & BC Acts)	2.1 km NNW	Mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores (DCCEEW 2023b).
Calidris subminuta Long-toed Stint	Mig. (EPBC & BC Acts)	2.3 km E	Occurs in a variety of terrestrial wetlands, preferring shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds (DCCEEW 2023b).
Calidris tenuirostris Great Knot	CR/Mig. (EPBC Act; BC Act)	3.4 km SSW	Rarely found inland and are mainly found in coastal areas, intertidal mudflats, estuaries, inlets, harbours, lagoons, saltworks and mangrove swamps (DCCEEW 2023b).
Calonectris leucomelas Streaked Shearwater	Mig. (EPBC & BC Acts)	*	A marine species, occurs frequently in northern Australia, with records from central WA, around the north coast, and south to central New South Wales (Marchant & Higgins 1990).
Charadrius leschenaultii Greater Sand Plover	VU/Mig. (EPBC Act; BC Act)	3.4 km SSW	Almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly, or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons, inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs (DCCEEW 2023b).
Charadrius mongolus Lesser Sand Plover	EN/Mig. (EPBC & BC Acts)	3.4 km SSW	Found in coastal littoral and estuarine environments, it inhabits intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops (DCCEEW 2023b).
Charadrius veredus Oriental Plover	Mig. (EPBC & BC Acts)	6.7 km NNE	Inhabits coastal habitats such as estuarine mudflats and sandbanks, sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland where they inhabit flat, open, semi-arid or arid grasslands (DCCEEW 2023b).
Chlidonias leucopterus White-winged Black Tern	Mig. (EPBC & BC Acts)	2.2 km E	In Australia, the species mostly inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. They also inhabit tidal wetlands, such as harbours, bays, estuaries and lagoons, and their associated tidal sandflats and mudflats (DCCEEW 2023b).
Cuculus optatus Oriental Cuckoo	Mig. (EPBC & BC Acts)	*	This species has an extremely large range that includes parts of Europe, Asia and northern Australia (IUCN 2019). Typically occurs on margins of tropical forest habitats. Occurs as a rare non-breeding visitor to mangrove habitat on the Pilbara coast (Johnstone *et al.* 2013).
Fregata ariel Lesser Frigatebird	Mig. (EPBC & BC Acts)	6.4 km NNE	A pelagic bird, this species is usually found far from land over water (Marchant & Higgins 1990).

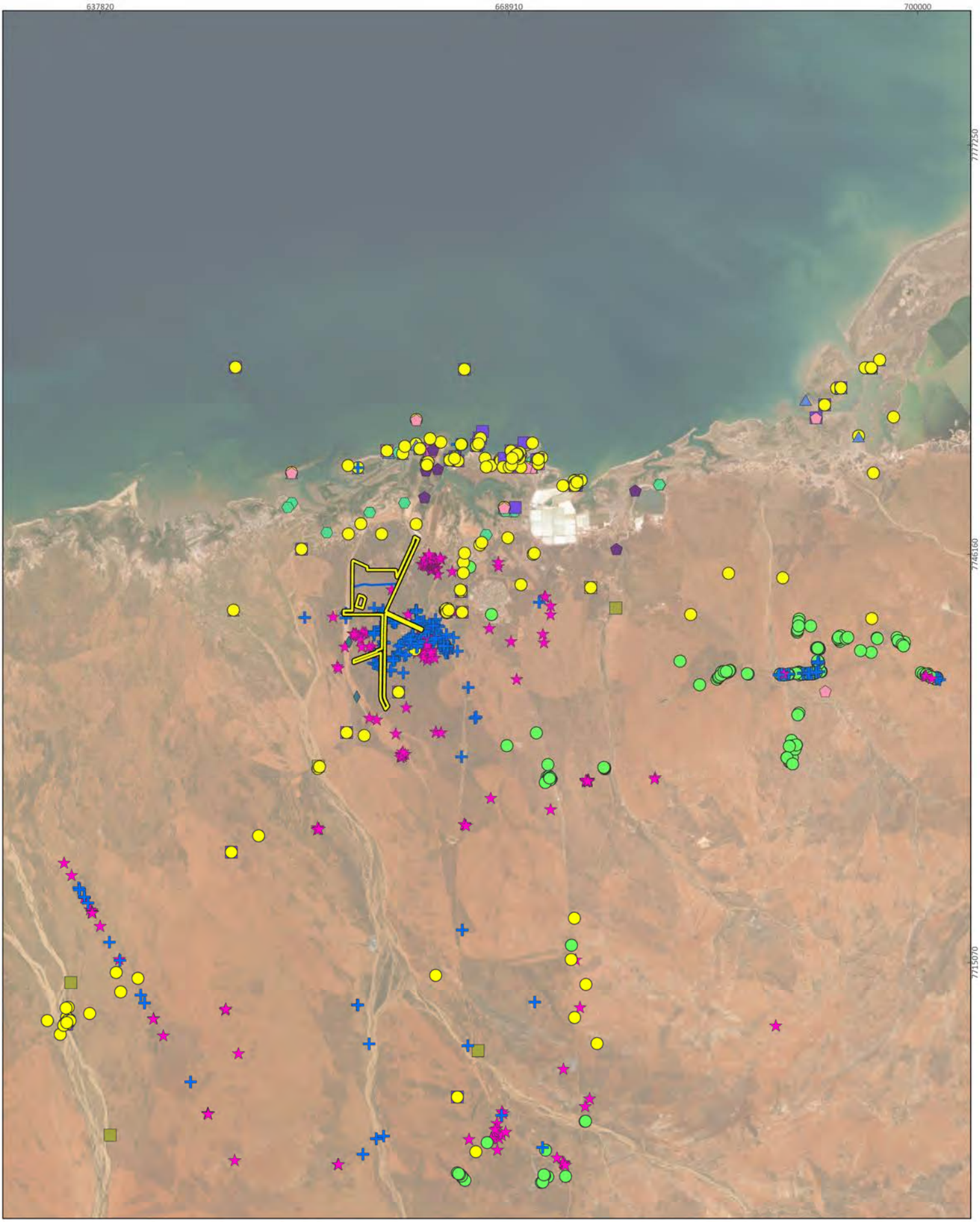
Species	Status	Proximity to study area	Habitat
Fregata minor Great Frigatebird	Mig. (EPBC & BC Acts)	*	Occurs in tropical and subtropical seas, coasts and islands, and is a regular visitor to the west Australian coast (Pizzey & Knight 2012).
Gallinago stenura Pin-tailed Snipe	Mig. (EPBC & BC Acts)	4.7 km ENE	Occurs at edges of freshwaters swamp and ponds, and is also found on more open wetlands such as claypans (DCCEEW 2023b).
Gelochelidon nilotica Gull-billed Tern	Mig. (BC Act)	1.1 km SSE	Occur in freshwater swamps, salt lakes, beaches, mudflats and sewage farms, and are rarely found over the ocean (DCCEEW 2023b).
Glareola maldivarum Oriental Pratincole	Mig. (EPBC & BC Acts)	19 m ESE	In Australia, it inhabits open plains, floodplains and grasslands, often with extensive bare areas (DCCEEW 2023b).
Hirundo rustica Barn Swallow	Mig. (EPBC & BC Acts)	2.2 km E	Occurs in open country in coastal lowlands, an uncommon visitor to Australia (DCCEEW 2023b).
Hydroprogne caspia Caspian Tern	Mig. (EPBC & BC Acts)	2.3 km E	Found in sheltered coastal habitats and near-coastal terrestrial wetlands (DCCEEW 2023b).
Limicola falcinellus Broad-billed Sandpiper	Mig. (BC Act)	9.8 km NE	Occurs in sheltered coastal habitats such as saltmarshes, lagoons, sewage farms and mudflats (DCCEEW 2023b).
Limnodromus semipalmatus Asian Dowitcher	Mig. (EPBC & BC Acts)	7.5 km NE	Occurs in sheltered coastal environments, such as lagoons and estuaries, and exposed mudflats. The Port Hedland Saltworks IBA provides crucial habitat for this species (DCCEEW 2023b).
Limosa lapponica Bar-tailed Godwit	Mig. (EPBC & BC Acts)	3.3 km E	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays (DCCEEW 2023b).
Limosa limosa Black-tailed Godwit	Mig. (BC Act)	12.8 km ENE	Occurs in coastal habitats, such as sheltered bays, estuaries, lagoons, mudflats and sandflats, and is also found in near-coastal wetlands (DCCEEW 2023b).
Macronectes giganteus Southern Giant Petrel	EN/Mig. (EPBC Act; BC Act)	*	The Southern Giant Petrel occurs in Antarctic to subtropical waters and breeds on 6 subantarctic and Antarctic islands in Australian territory; Macquarie Island, Heard Island and McDonald Island in the Southern Ocean, and Giganteus Island, Hawker Island, and Frazier Island in the Australian Antarctic Territories (DCCEEW 2023b).
Motacilla cinerea Grey Wagtail	Mig. (EPBC & BC Acts)	*	Vagrant visitor to Australia that inhabits fast-flowing streams and rivers (IUCN 2019).
Motacilla flava Yellow Wagtail	Mig. (EPBC & BC Acts)	7.9 km NNE	Uncommon but regular visitor to Pilbara in small numbers; inhabits a range of damp or wet habitats with low vegetation including damp meadows, marshes, waterside pastures, and sewage farms (IUCN 2019; Johnstone *et al.* 2013).

Species	Status	Proximity to study area	Habitat
Numenius madagascariensis Eastern Curlew	CR/Mig. (EPBC Act; BC Act)	3.3 km E	Occurs mainly on intertidal mudflats, on exposed seagrass beds or mudflats (Geering *et al.* 2007). Also utilises sand spits of estuaries, mangroves, lake shores and ocean beaches.
Numenius minutus Little Curlew	Mig. (EPBC & BC Acts)	2.3 km E	Found on short, dry grasslands and dry grass edges of freshwater inlands (Geering *et al.* 2007).
Numenius phaeopus Whimbrel	Mig. (EPBC & BC Acts)	3.3 km E	Forages on intertidal mudflats, estuaries and lagoons, occasionally foraging on beaches and on rock platforms (DCCEEW 2023b).
Oceanites oceanicus Wilson's Storm Petrel	Mig. (EPBC & BC Acts)	7.9 km NNE	Only occurs at sea, mainly found in tropical and subtropical waters (DCCEEW 2023b).
Onychoprion anaethetus Bridled Tern	Mig. (EPBC & BC Acts)	6.8 km N	Occurs in tropical and subtropical seas, rarely found in inshore continental waters (DCCEEW 2023b).
Pandion cristatus Osprey	Mig. (EPBC & BC Acts)	1.0 km NNE	Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Occur in a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes (DCCEEW 2023b).
Phaethon lepturus White-tailed Tropicbird	Mig. (EPBC & BC Acts)	*	Found across pelagic waters and the coasts of tropical and subtropical seas (IUCN 2019). Occurs only as a rare visitor to Pilbara coastal waters (Johnstone *et al.* 2013).
Phalaropus lobatus Red-necked Phalarope	Mig. (EPBC & BC Acts)	34.2 km E	In Australia, this species occurs at lakes and swamps, both inland and coastal (DCCEEW 2023b).
Philomachus pugnax Ruff	Mig. (EPBC & BC Acts)	3.4 km SSW	In Australia the Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges (DCCEEW 2023b).
Plegadis falcinellus Glossy Ibis	Mig. (EPBC & BC Acts)	28.5 km NE	Predominantly inhabits terrestrial wetlands, foraging in shallow water over soft substrate or on grassy or muddy verges of wetlands providing a variety of water depths. Inland, freshwater wetlands are preferred, especially permanent or ephemeral waterbodies on floodplains and shallow swamps with abundant aquatic flora (Johnstone *et al.* 2013; Marchant & Higgins 1990).
Pluvialis fulva Pacific Golden Plover	Mig. (EPBC & BC Acts)	8.4 km W	In Australia this species usually inhabits coastal habitats, on beaches, mudflats and sandflats (DCCEEW 2023b).
Pluvialis squatarola Grey Plover	Mig. (EPBC & BC Acts)	3.3 km E	Occurs on intertidal mudflats, saltmarshes, sandflats and beaches of oceanic coastlines, bays and estuaries. During migration it may also be found inland on lakes, pools or grasslands (del Hoyo *et al.* 2014; IUCN 2019).

Species	Status	Proximity to study area	Habitat
Sterna dougallii Roseate Tern	Mig. (EPBC & BC Acts)	9 km NE	This medium size tern breeds on several Australian Islands, including in WA. Unlike many species of tern, they don't occur inland, seen over coastal and offshore blue water, coral reefs, lagoons and islands. Pilbara records include passage migrants, breeding visitors and some breeding residents (Johnstone *et al.* 2013; Johnstone & Storr 1998).
Sterna hirundo Common Tern	Mig. (EPBC & BC Acts)	6.4 km NNE	In Australia, they occur in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores (DCCEEW 2023b).
Sternula albifrons Little Tern	Mig. (EPBC & BC Acts)	6.4 km N	In Australia, they inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets (DCCEEW 2023b).
Sula leucogaster Brown Booby	Mig. (EPBC & BC Acts)	13.3 km NNE	Occurs in tropical waters, including coastal waters, harbour and estuaries, but is rarely seen flying over land (DCCEEW 2023b).
Thalasseus bergii Crested Tern	Mig. (BC Act)	3.3 km E	Inhabits tropical and subtropical coastlines. Found along the entire Australian coast (IUCN 2019).
Tringa brevipes Grey-tailed Tattler	Mig. (EPBC & BC Acts), P4 (DBCA list)	3.3 km E	Occurs on sheltered coasts with reefs and rock platforms or mudflats, and can also be found on reefs or platforms that are exposed at low tide (DCCEEW 2023b).
Tringa glareola Wood Sandpiper	Mig. (EPBC & BC Acts)	2.2 km E	Prefers the shallows of wooded lakes or swamps with trees. It also inhabits freshwater swamps, lakes, flooded pastures and occasionally, mangroves (Morcombe 2004).
Tringa nebularia Common Greenshank	Mig. (EPBC & BC Acts)	2.3 km E	Mostly on the coast but sometimes inland; uses permanent and ephemeral terrestrial wetlands, including rivers and creeks (DCCEEW 2023b).
Tringa stagnatilis Marsh Sandpiper	Mig. (EPBC & BC Acts)	6.4 km NNE	Inhabits coastal and inland wetlands, estuarine and mangrove mudflats, beaches, swamps, lakes and several other types of wetlands (Morcombe 2004).
Xenus cinereus Terek Sandpiper	Mig. (EPBC & BC Acts)	3.4 km SSW	Inhabits coastal mudflats, sheltered estuaries and lagoons. In Australia, it has a primarily coastal distribution, with occasional records inland (Morcombe 2004).
Mammals (8)			
Dasycercus blythi Brush-tailed Mulgara	P4 (DBCA list)	Inside	Occurs in spinifex grasslands throughout much of the arid zone, digging their burrows in the flats between low sand dunes (Van Dyck & Strahan 2008).

Species	Status	Proximity to study area	Habitat
Dasyurus hallucatus Northern Quoll	EN (EPBC & BC Acts)	4.0 km ENE	Most commonly found in rocky areas, with rugged rocky habitats such as gorges, gullies, escarpments, boulder fields and small caves critical for denning and shelter (DCCEEW 2023b). Drainage lines connecting rocky areas represents dispersal and foraging habitat for the species.
Lagostrophus fasciatus fasciatus Banded Hare-wallaby (mainland)	P4 (DBCA list)	<~50 km	Extinct on the mainland – last confirmed sighting was in 1906. Natural (wild) populations are restricted to Bernier and Dorre Islands in Shark Bay, WA (Morris & Burbidge 2008).
Macroderma gigas Ghost Bat	VU (EPBC & BC Acts)	25.0 km SSE	Roost sites include caves, rock crevices and disused mine adits. Foraging habitat in areas surrounding roost sites, mostly woodlands and watercourses (Bullen 2021).
Macrotis lagotis Greater Bilby	VU (EPBC & BC Acts)	Inside	Bilby prefers hummock grassland in plains and alluvial areas, open tussock grassland on uplands and hills, mulga woodland/shrubland on ridges and rises (DCCEEW 2023b), loamy or sandy soils associated with palaeodrainage lines and perched drainage lines, dune fields and sandplains; recently burnt habitat (1-3 years) is used frequently (DBCA 2018).
Mormopterus cobourgianus North-western Free-tailed Bat	P1 (DBCA list)	3.1 km NNE	Occurs in mangrove habitats in WA, where they roost in tree hollows (Reardon 2014).
Pseudomys chapmani Western Pebble-mound Mouse	P4 (DBCA list)	27.7 km E	Restricted to non-coastal, central and eastern parts of the Pilbara where preferred habitat comprises gentle, sparsely vegetated slopes of rocky ranges with surface fragments of abundant gravel and pebbles (Morris & Burbidge 2008).
Rhinonicteris aurantia (Pilbara) Pilbara Leaf-nosed Bat	VU (EPBC & BC Acts)	27.4 km E	Normally restricted to caves and mine adits (horizontal shafts) with stable, warm and humid microclimates (Van Dyck & Strahan 2008), but temporary roosts such as crevices and tree hollows may be used in warm and humid conditions, allowing greater dispersal during the wet season.

* EPBC Protected Matters Search does not return species location and includes instances where suitable habitat may occur but the species has not necessarily been observed. Rows highlighted in grey represent significant vertebrate species recorded within 5 km of the study area.





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Port Hedland Green Steel Project

Project No	1557
Date	29/09/2023
Drawn by	FK
Map author	SP

0 7.5 15
Kilometers

1:371,900 (at A4) GDA 1994 MGA Zone 50

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- Study area
- Whim Creek Road

Status

- CR/Mig./CR (EPBC Act; BC Act)
- EN (EPBC & BC Acts)
- EN/CR (EPBC Act; BC Act)
- EN/Mig. (EPBC & BC Acts)
- EN/Mig./EN (EPBC Act; BC Act)
- EN/Mig./Mig. (EPBC Act; BC Act)
- Mar/Mig. (EPBC Act; BC Act)
- Mig. (BC Act)
- Mig. (EPBC & BC Acts)
- Mig. EPBC and BC Acts; P4 DBCA list
- OS (BC Act)
- P1 (DBCA list)
- P3 (DBCA list)
- P4 (DBCA list)
- VU (BC Act)
- VU (EPBC & BC Acts)
- VU/Mig./VU (EPBC Act; BC Act)

Figure 5-1

Desktop records of significant vertebrate fauna

PHOENIX ENVIRONMENTAL SCIENCES

5.1.2 SRE invertebrate fauna

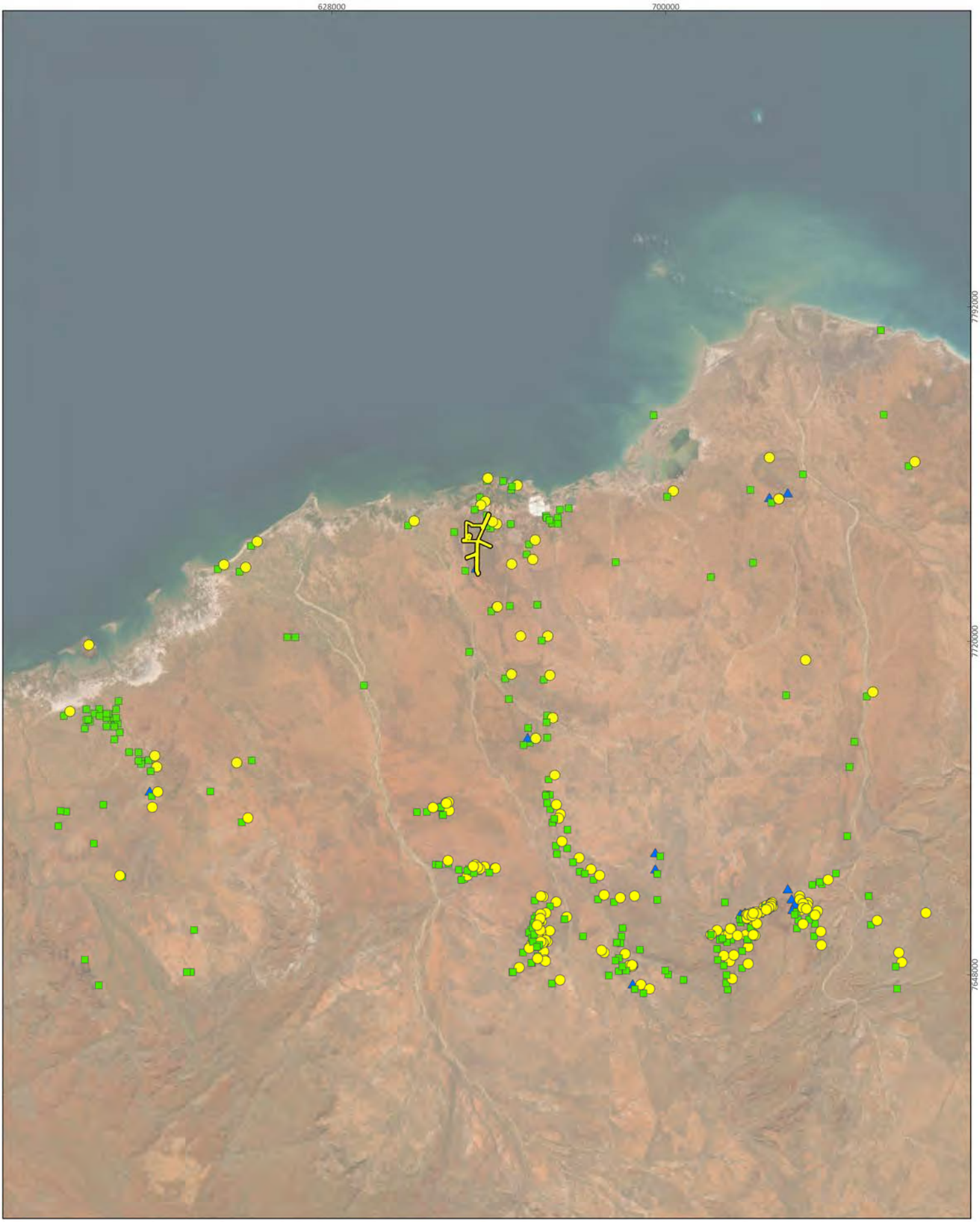
The desktop review identified records of 7 confirmed SRE taxa and 78 potential SRE taxa from within the SRE desktop search area (Table 5-3; Figure 5-2; Appendix 4). A further 50 taxa of uncertain SRE status and 70 non-SRE (i.e., Widespread) taxa from SRE groups were identified. The desktop records indicate one SRE-group species of uncertain status (*Rhagada* 'sp. indet', one record) has been recorded within the study area (Figure 5-2). A further 23 taxa have been recorded within 5 km of the study area, comprising 5 mygalomorph spiders (family Anamidae), 5 pseudoscorpions (Chthoniidae, Olpiidae), 5 scorpions (Buthidae, Urodacidae), 2 isopods (Armadillidae) and 6 land snails (Pupillidae), of which 13 are Widespread, 7 are uncertain and 3 are potential SRE taxa.

Scorpions were the most commonly recorded SRE group within the 100 km buffered desktop search area (20.5% of the total number of taxa), followed by land snails (19.5%) and pseudoscorpions (19.0%). Centipedes and harvestmen spiders were poorly represented with only 4 and 2 taxa identified respectively, none of which were confirmed or potential SREs.

Of the 85 taxa confirmed or potential SRE taxa, 13 are named species. These comprise 5 millipedes, 3 land snails, 2 mygalomorph spiders, 1 isopod, 1 pseudoscorpion and 1 selenopid spider. The remaining 72 comprise taxa named only to morphospecies codes as applied by the WA Museum or are not identified to confirmed species level (i.e. "sp." or "cf."). The majority of taxa records of uncertain SRE status are unidentifiable ("sp. indet.", i.e. female or juvenile specimens) or could not be identified to species or morphospecies and may represent new species or other species listed in the same genus where records exist (Table 5-3).

Table 5-3 Summary of SRE taxa identified in the desktop review

Group	SRE Status				Total
	Confirmed	Potential	Uncertain	Not SRE	
Centipedes	0	0	3	1	4
Harvestmen spiders	0	0	2	0	2
Isopods	0	7	5	6	18
Land snails	0	11	5	24	40
Millipedes	3	7	5	3	18
Mygalomorph spiders	2	18	10	8	38
Pseudoscorpions	1	16	16	6	39
Scorpions	0	18	3	21	42
Selenopid spiders	1	1	1	1	4
Total	**7**	**78**	**50**	**70**	**205**





Port Hedland Green Steel Pty Ltd
Port Hedland Green Steel Project

Project No	1557
Date	29/09/2023
Drawn by	FK
Map author	SP

0 20 40
Kilometers

1:1,054,000 (at A4) GDA 1994 MGA Zone 50

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Study area

SRE status

- Potential
- Confirmed
- Uncertain

Figure 5-2

Desktop records of SRE invertebrates

PHOENIX ENVIRONMENTAL SCIENCES

5.2 FIELD SURVEY

5.2.1 Vertebrate fauna

5.2.1.1 Habitats

Three broad fauna habitat types were identified in the study area during the survey. These comprise (in order of extent): sandplains, open woodlands and drainage lines (Table 5-4; Figure 5-3). The study area also contains areas that are mapped as cleared/disturbed; these areas are largely devoid of native vegetation and predominantly comprise roads and unsealed access tracks).

Sandplains cover most of the study area (1,411.5 ha; 95.6%) and are characterised by red-orange sandy soils on a gently undulating plain. The dominant vegetation complexes comprise spinifex hummock grasslands and low *Acacia stellaticeps* shrublands. At the low points of the undulating plain, there are shallower sandy soils and small isolated clay pans (<10 m^2) occur that support shallow temporary water pools, immediately after rain. The surrounding vegetation surring the low points are typically dominated by small (stunted) spinifex hummock grasslands, often without a supporting shrub layer. In contrast to this, at local high points of the undulating plain, sandy soils are deeper and support taller shrublands usually dominated by *Acacia tumida pilbarensis* over dense-low *Acacia stellaticeps*, isolated to scattered *Acacia inaequilatera* and *Grevillea wickhamii* over spinifex hummock grass. Isolated *Owenia reticulata* trees (pundul/pundle, native walnut) also occur in this habitat.

Open woodlands comprise only 14.4 ha (1.0%) of the study area, occurring at 2 discrete locations within the study area. The majority of open woodlands habitat (13.4 ha) is situated in the east, intersecting the eastern boundary of the study area (approximately 500 m south of the old Whim Creek Road; Figure 5-3). The remaining 0.9 ha of open woodlands is situated near the western boundary, approximately 250 m north of the old Whim Creek Road (Figure 5-3). Open woodlands are characterised by the presence of low to moderately dense, evenly distributed *Eucalyptus leucophloia* trees. These are set over a sparse to scattered layer of stage 2 and 3 spinifex hummocks, native tussock, and invasive buffel grasses. The soil is a red-orange sandy-clay, featuring an almost flat surface layer of shallow clay, indicative of seasonal or sporadic inundation. At the eastern extent of the study area the open woodland habitat continues eastward, beyond the study area boundary, narrowing into diffuse drainages heading east and northeast.

The linear infrastructure corridor in the north-east intersects a small section of drainage line habitat (8.3 ha; 0.6%). This area comprises open to scattered low *Acacia stellaticeps* shrubland over small stage 3 and 4 spinifex hummock grasses. The small area comprising drainage line habitat within the study area is a Heritage protected area due to the presence of shell middens. As a result of its existing Heritage status and small extent, no fauna sampling was conducted in this area and it is only considered in brief.

A total of 42.1 ha (2.8%) of the study area has been cleared/disturbed and is largely devoid of native vegetation.

Table 5-4 Extent and description of each fauna habitat in the study area

Habitat type	Site/s	Description	Extent and % of study area	Representative photos
Sandplains	BP025, BT004, BT006, BP021, BP023, BP024, BP022, BT007, BIE001, BIE003, BIE004, Opp013, BIE002, Opp001, Opp008, Opp002, BT003, Opp005, BP004, BIE007, Opp014, Opp006, BP005, Opp003, Opp010, Opp009, BP006, BP003, BIE010, BIE009, BT002, BP002, BP001, BP015, Opp004, Opp007, BP016, Opp015, BT001, Opp016, BP018, BP007, BP008, BP009, BP011, BP013, BP020	Mosaic of spinifex hummock grasslands and low *Acacia stellaticeps* shrublands on an undulating plain. Isolated *Owenia reticulata* trees over mixed *Acacia stellaticeps* dominant shrublands (*A. tumida* and *A. inaequilatera* scattered to widely scattered) over stage 2 to 5 spinifex hummock grasslands on red-orange sandy soils.	1,406.9 ha (95.6)	

Habitat type	Site/s	Description	Extent and % of study area	Representative photos
Open woodlands	BIE006, BIE005, BIE008, BP017, BP019, BP014	Shallow flat depression relative to surrounding sandplain. Open low to mid *Eucalyptus* woodland over evenly scattered, open tussock grasses (native and buffel) with spinifex hummocks variably present. Predominantly sandy soil with a shallow sandy-clay crust. Surrounded by low sandy rise with dense mature spinifex hummocks and mixed *Acacia* dominant shrubs including *A. stellaticeps, A. tumida pilbarensis* and isolated *A. inaequilatera.* Higher percentage cover of leaf litter than the surrounding areas, forming transported clumps.	15.4 ha (0.9)	

Habitat type	Site/s	Description	Extent and % of study area	Representative photos
Drainage line	BIE011	Small section of the Foreshore flats with intertidal water flow, predominantly dry. Heritage protected area due to incidence of shell middens. Low *Acacia stellaticeps* shrubland with widely scatted *Acacia tumida pilbarensis* over stage 3 and 4 spinifex hummock grasses on red-orange to orange sandplain.	8.9 ha (0.6)	
Cleared/disturbed	Opp011	Cleared areas with infrastructure and roads.	45.1 ha (2.9)	



Western Australia

PERTH

Port Hedland Green Steel Pty Ltd
Port Hedland Green Steel Project

Project No	1557
Date	5/02/2024
Drawn by	JL
Map author	SP

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Kilometers

1:56,400 (at A4) GDA 1994 MGA Zone 50

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- Study area
- Indicative disturbance footprint
- Whim Creek Road

Habitat

- Cleared/disturbed
- Disturbed Infrastructure
- Drainage line
- Open woodland
- Sandplain

Species, status

- Brush-tailed Mulgara, P4 (DBCA list)
- Fork-tailed Swift, Mig. (EPBC & BC Acts)
- Grey Falcon, VU (BC Act)
- Osprey,Mig. (EPBC & BC Acts)
- Bilby, VU (EPBC & BC Acts), old digging
- Bilby, VU (EPBC & BC Acts), old scat
- Bilby, VU (EPBC & BC Acts), recent digging
- Bilby, VU (EPBC & BC Acts), recent scat

Figure 5-3

Fauna habitats and significant fauna records from the field survey

PHOENIX ENVIRONMENTAL SCIENCES

5.2.1.2 Assemblage

A total of 103 terrestrial vertebrate species representing 44 families and 79 genera were recorded in the study area (Appendix 3; Appendix 6). The assemblage included 101 native species and 2 introduced species.

The recorded assemblage represents 27.7% of the species identified in the desktop review (Table 5-5).

Table 5-5 Number of species recorded in survey compared to desktop results, by group

Group	No. species identified in desktop review	No. species recorded in survey	Recorded assemblage (%)
Amphibians	11	2	18.2 (1.9)
Reptiles	93 (inc. 2 introduced)	38	40.9 (36.9)
Birds	222 (including 2 naturalised)	48	21.6 (46.6)
Mammals	46 (inc. 11 introduced)	15 (inc. 2 introduced)	32.6 (14.6)
Total	**372**	**103**	**27.7** (100.0)

Values in parentheses indicate the overall percentage of records per class recorded during the survey

Two species of amphibian were recorded within the study area including, one species of tree frog (family Pelodryadidae) and one burrowing frog (Limnodynastidae).

Thirty-eight species of reptile were recorded. These comprise 5 snakes (Elapidae, Typhlopidae), 4 legless lizards (Pygopodidae), 6 geckoes (Diplodactylidae, Gekkonidae), 16 skinks (Scincidae), 4 goannas (Varanidae) and 3 dragons (Agamidae).

Of the 48 species of bird recorded, 23 species from 16 families represent passerines (perching birds). The remaining 25 species from 12 families represent non-passerines. Raptors (Pandionidae, Accipitridae, Falconidae) recorded the highest diversity among birds, representing over 20% of the recorded assemblage.

Thirteen native mammal species were recorded. These comprise 3 species of carnivorous marsupials (Dasyuridae), one species of macropod (Macropodidae), one species of omnivorous marsupial (Thylacomyidae), 5 microchiropteran bats from 2 families (Molossidae, Vespertilionidae), 2 species of native rodent (Muridae) and one monotreme (Tachyglossidae).

One species was recorded during the survey that was not identified by the desktop results, the Black Falcon (*Falco subniger*). This bird is a rare visitor in the Pilbara (Johnstone *et al.* 2013) and considered locally significant (Figure 5-3). While the Black Falcon is not listed as significant in WA, it is protected by State lists in other parts of its range. In New South Wales it is listed as VU under the BC Act (April 2023 list); in South Australia as Rare under the *National Parks and Wildlife Act 1972 (January 2020 list)*, and in Victoria as CR under the *Flora and Fauna Guarantee Act 1988 (June 2023 list)* (DCCEEW 2023b).

Figure 5-4 plots the species accumulation of systematic data captured during the survey. The 4 indices (Sobs, Chao2, Jacknife2 and Bootstrap) all indicate that the systematic survey effort was adequate for the study area, in that few additional species were recorded towards the end of the sample period. It is expected that few remain undetected within the study area.

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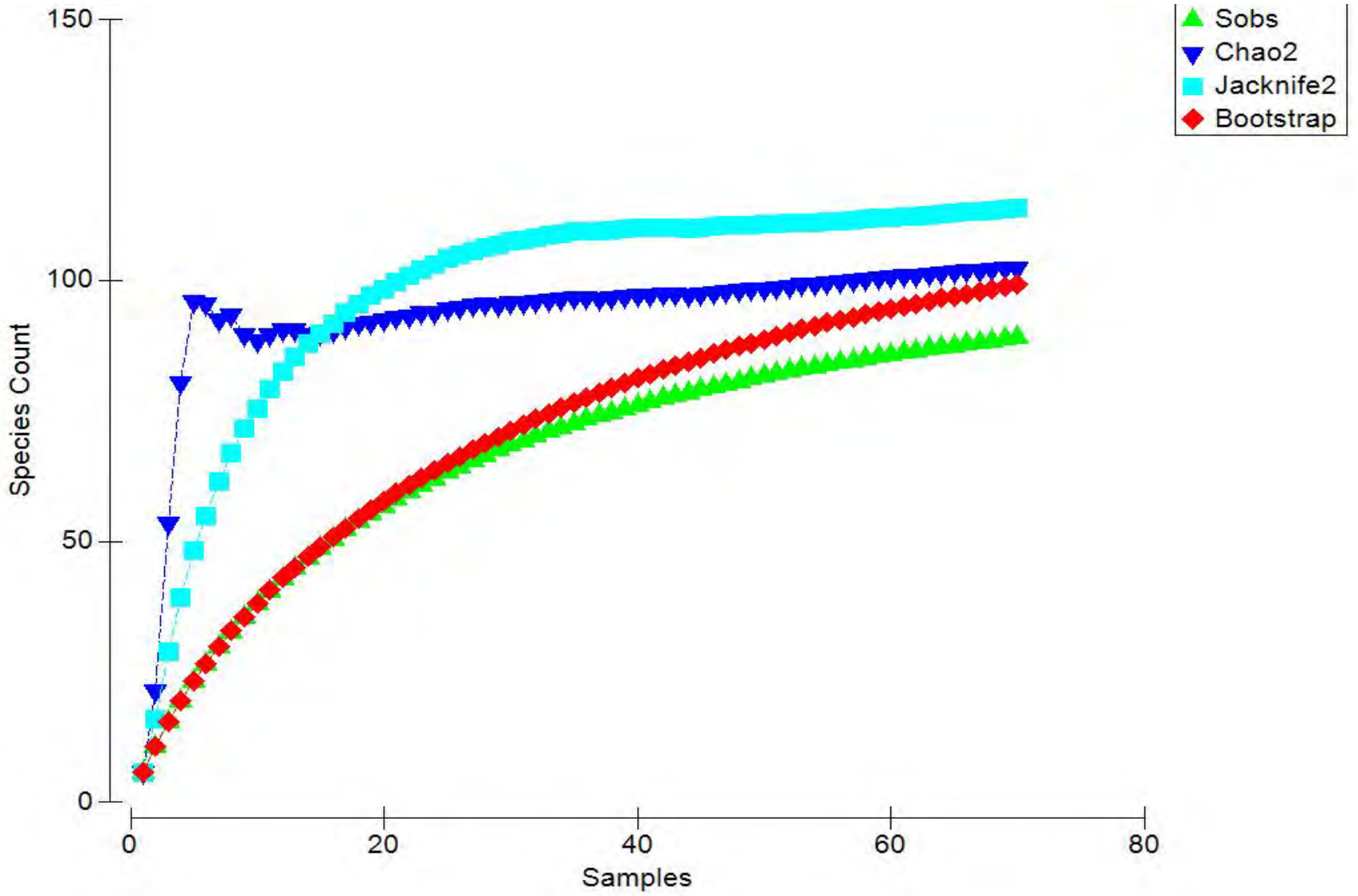


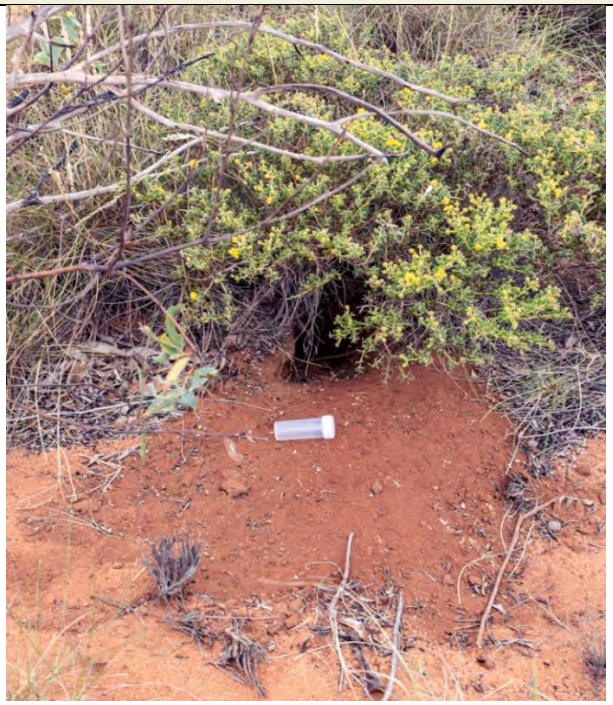
Figure 5-4 Species accumulation curve for vertebrate fauna

5.2.2 Significant vertebrate fauna

Two Threatened, one Priority and 2 Migratory listed species were recorded in the survey, including: Greater Bilby (*Macrotis lagotis*, VU), Grey Falcon (*Falco hypoleucos*, VU), Brush-tailed Mulgara (*Dasycercus blythi*, P4), Fork-tailed Swift (*Apus pacificus*, Mig.) and Osprey (*Pandion cristatus*, Mig.) (Table 5-6; Figure 5-3). No other significant fauna were identified in the survey in accordance with EPA (2020) (see section 2.2.3), but Black Falcon (*Falco subniger*) is also considered locally significant. Threatened and Priority fauna records were reported to DBCA via the licencing return system.

Table 5-6 Details of significant vertebrate fauna recorded during the field survey

Species	Status	Survey records	Representative photograph
Macrotis lagotis Greater Bilby	VU (EPBC & BC Acts)	128 records (112 in study area): 32 old diggings (top photo) 53 old scats in study area, 16 nearby (bottom right photo); 12 records of recent diggings (middle photo) and 15 records of recent scats (bottom left photo).	   

Species	Status	Survey records	Representative photograph
Dasycercus blythi Brush-tailed Mulgara	P4 (DBCA list)	2 records of active or recently active burrows (BIE010, BIE009).	
Apus pacificus Fork-tailed Swift	Mig. (EPBC & BC Acts)	1 record, directly sighted (BIE04).	No photo.
Pandion cristatus Osprey	Mig. (EPBC & BC Acts)	One record, directly sighted (Opp11).	
Falco hypoleucos Grey Falcon	VU (EPBC & BC Acts)	2 records (one pair and fledged juv.), directly sighted (BIE001, Opp15).	

Species	Status	Survey records	Representative photograph
Falco subniger Black Falcon	Not conservation listed but locally significant	1 record, directly sighted (BIE003)	No photo.

The likelihood of occurrence assessment (section 4.2.3) for the significant species identified in the desktop review (Table 5-2) but not recorded in the survey determined that none were likely to occur, one may possibly occur and 65 are unlikely to occur in the study area (Table 5-7). A more exhaustive analysis is provided in Appendix 5.

Table 5-7 Likelihood of occurrence of relevant significant vertebrate fauna identified in the desktop review, and recorded in the field survey, categorised as Recorded (5), likely (0), possible (1) and unlikely (65)

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
Reptiles (3)					
Ctenotus angusticeps Airlie Island Ctenotus	P3 (DBCA list)	2.7 km NNW	The Airlie Island Ctenotus is known from approximately 12 locations in northwest WA (DoEE 2018b). On the mainland it generally inhabits the landward fringe of salt marsh communities in samphire shrubland or marine couch grassland (Maryan *et al.* 2013) in the intertidal zone along mangrove (Grey Mangrove (*Avicennia marina*) with occasional Red Mangrove (*Rhizophora stylosa*)) margins, however, subtle differences in vegetation/topography exist among sites where the species has been recorded (Biologic 2012).	**Unlikely**	The Project is unlikely to significantly impact populations nearby and this species may only be detected in low abundance (if detected at all).
Liasis olivaceus barroni Pilbara Olive Python	VU (EPBC & BC Acts)	26.4 km SSE	It is commonly found in rocky areas in association with watercourses and pools and often associated with areas of permanent pooling water near rocky habitats, such as gullies, gorges and rocky ranges or boulder sites.	**Unlikely**	Given the lack of recent records and the wide available habitats outside the study area, it is unlikely that the study area supports a significant number of this species or provides important resources for significant life history stages.
Liopholis kintorei Great Desert Skink	VU (EPBC Act; BC Act)	Projected distribution	Restricted to central desert regions, occupying complex burrow systems. Habitats range from hard spinifex gravelly plains and sandplains to semi-saline soft spinifex sandplains, and even non-spinifex mulga woodland (Indigenous Desert Alliance 2022).	**Unlikely**	Not recorded from the Pilbara, despite structurally similar habitat occurring.
Non-migratory Birds (5)					
Falco hypoleucos Grey Falcon	VU (EPBC & BC Acts)	463 m SSW	It uses a large variety of habitats such as timbered plains, creeklines, shrublands and open grasslands.	**Recorded**	
Falco peregrinus Peregrine Falcon	OS (BC Act)	238 m NNW	The Peregrine Falcon's preferred habitat includes cliffs and wooded watercourses. Nesting occurs mainly on cliff ledges,	**Unlikely**	Despite wide foraging home ranges, no roosting habitat is present within the study area or adjacent or nearby to suggest the species is likely

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
			granite outcrops, quarries and in trees with old raven or Wedge-tailed Eagle nests.		to frequently visit the study area for foraging. Study area does not provide specific value critical to the species.
Pezoporus occidentalis Night Parrot	EN/CR (EPBC Act; BC Act)	Projected distribution	Appears to favour areas of dense vegetation comprising old-growth (often > 50 years unburnt) spinifex (*Triodia* spp.) especially hummocks that are ring-forming for roosting and nesting. Such areas may also be associated with dense chenopod shrubs.	**Unlikely**	While suitable habitat exists within the study area, the lack of records reduces the probability of occupying the study area. Considering the threats to dispersal for Night Parrot, it is likely the study area occurs outside their typical range and would not support this species.
Rostratula australis Australian Painted Snipe	EN (EPBC & BC Acts)	Projected distribution	Inhabits shallow terrestrial fresh-brackish wetlands, including temporary and permanent lakes, swamps and claypans, waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains.	**Unlikely**	Negligible suitable habitat is within the study area, it is unlikely to be the preferred habitat when other, better-quality habitat is available.
Sternula nereis nereis Fairy Tern	VU (BC Act)	N/A	Sheltered beaches, banks and spits above the tide and usually below vegetation. They have been found to utilise a variety of other habitats including estuaries, lake islands, wetlands and the mainland coastline (DCCEEW 2023b).	**Unlikely**	While possible for this species to occur, the lack of spatial data and limited available habitat means that it is unlikely for this species to occupy the available habitat in significant numbers or during important life history stages (e.g., courtship or breeding).
Migratory Birds (55)					
Apus pacificus Fork-tailed Swift	Mig. (EPBC & BC Acts)	8.8 km NE	Occurs in a wide range of dry or open habitats, including riparian woodlands, tea-tree swamps, low scrub, heathland, Saltmarsh, grassland and spinifex sandplains, open farmland and inland and coastal sand dunes (DSEWPaC 2011).	**Recorded**	
Pandion cristatus Osprey	Mig. (EPBC & BC Acts)	975 m N	P. *cristatus* is present across most of coastal Australia but is absent from Tasmania and Victoria. In south coastal WA, the species extends as far east as Esperance (Johnstone & Storr 1998; Poole *et al.* 2002).	**Recorded**	
Actitis hypoleucos Common Sandpiper	Mig. (EPBC & BC Acts)	1.9 km ENE	Small ponds, large inlets, and mudflats where they forage on the shore usually close to the vegetation.	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
					number of individuals and therefore the outcome is unlikely.
Anous stolidus Common Noddy	Mig. (EPBC & BC Acts)	Projected distribution	Found primarily in coastal areas and inland wetlands of the Pilbara and Kimberley regions (DCCEEW 2023b).	**Unlikely**	Given the lack of recent records and the wide available habitats outside the study area, it is unlikely that the study area supports a significant number of this species or provides important resources for significant life history stages.
Ardenna pacifica Wedge-tailed Shearwater	Mig. (EPBC & BC Acts)	*	Pelagic marine bird known from tropical and subtropical waters, breeds on offshore islands of the east and west coasts of Australia in summer (del Hoyo *et al.* 1996). Common breeding visitor to Pilbara waters and islands (Johnstone *et al.* 2013).	**Unlikely**	Suitable marine or island habitat not present in the study area; mainland terrestrial habitats are not used.
Arenaria interpres Ruddy Turnstone	Mig. (EPBC & BC Acts)	2.3 km ENE	Typically found in the northern parts of Australia in aquatic environments (ALA 2023).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Calidris acuminata Sharp-tailed Sandpiper	Mig. (EPBC & BC Acts)	1.9 km ENE	Usually found in coastal regions containing exposed rocks. They are also found in tidal pools and beaches. They are also known to be found on sandy beaches, clay ridges and occasionally in estuaries, harbours and lagoons. They have been recorded on sewage ponds and mudflats (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Calidris alba Sanderling	Mig. (EPBC & BC Acts)	3.4 km WSW	Found utilising coastal environments open to sea swell as well as sandbars and spits and shingle banks. They also occur on wave-washed rock outcrops. They are also less frequently found in estuaries and inlet harbours and near-coastal inland wetlands (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Calidris canutus Red Knot	EN/Mig./EN (EPBC Act; BC Act)	1.9 km ENE	Muddy edges of shallow fresh or brackish vegetated wetlands, including lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland (DoEE 2018b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
Calidris ferruginea Curlew Sandpiper	CR/Mig./CR (EPBC Act; BC Act)	2.3 km ENE	Typically occupying intertidal mudflats, sandflats and sheltered coasts. They are also known to occupy beaches, lagoons, harbours and sandy beaches. They have also been recorded occupying saline terrestrial wetlands and sewage ponds and are rarely found in freshwater swamps (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Calidris melanotos Pectoral Sandpiper	Mig. (EPBC & BC Acts)	8.9 km E	Occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand.	**Unlikely**	Negligible suitable habitat is within the study area, it is unlikely to be the preferred habitat when other, better-quality habitat is available.
Calidris ruficollis Red-necked Stint	Mig. (EPBC & BC Acts)	1.9 km ENE	Shallow fresh to saline wetlands such as coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Calidris subminuta Long-toed Stint	Mig. (EPBC & BC Acts)	1.9 km ENE	They are found across a wide range of open mudflat-like habitats in salt as well as freshwater systems.	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Calidris tenuirostris Great Knot	CR/Mig./CR (EPBC Act; BC Act)	3.4 km WSW	They occupy a variety of wetlands. They appear to favour shallow, freshwater and brackish wetlands including river floodplains, sewage ponds, swamps and lagoons. They are also known to occupy muddy shorelines, weeds and sedges and occasionally stunted samphire. They are known to occupy permanent wetlands and artificial lakes (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Calonectris leucomelas Streaked Shearwater	Mig. (EPBC & BC Acts)	Projected distribution	They usually occupy sheltered coastal habitats as well as mudflats and sandflats such as inlets, bays, harbours, estuaries and lagoons. They have been known to occupy reefs and rock platforms as well as shorelines and mangroves. There are also records in swamps near the coast, salt lakes and non-tidal lagoons (DCCEEW 2023b).	**Unlikely**	Coastal environments are marginally available within the study area but prone to disturbance. While technically possible due to dispersal potential, habitat preferences and lack of evidence mean it is unlikely for this species to

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
					occupy the study area in significant numbers or for significant life history stages.
Charadrius leschenaultii Greater Sand Plover	VU/Mig./VU (EPBC Act; BC Act)	3.4 km WSW	It occurs frequently in northern Australia, with records from central WA, around the north coast, and south to central New South Wales (Marchant & Higgins 1990).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Charadrius mongolus Lesser Sand Plover	EN/Mig. (EPBC & BC Acts)	3.4 km WSW	Utilises coastal and estuarine environments. They typically occupy sheltered sandy or muddy beaches as well as intertidal sandbanks and mudflats, reefs and rock platforms. They have occasional records occupying saltworks, salt lakes and marginal saltmarshes and brackish swamps (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Charadrius veredus Oriental Plover	Mig. (EPBC & BC Acts)	1.1 km E	Typically found in coastal and estuarine environments. They are known to utilise intertidal mudflats and sandflats, as well as sheltered harbours. They are known to occasionally occupy sandy beaches and rock platforms. There are records of this species utilising saltmarshes, mangrove saltworks, brackish swamps and silt islands (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Chlidonias leucopterus White-winged Black Tern	Mig. (EPBC & BC Acts)	2.2 km NE	Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland, where they are found in sparsely vegetated plains or recently burnt open areas.	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Cuculus optatus Oriental Cuckoo	Mig. (EPBC & BC Acts)	*	Wide-ranging species of tropical forest margins including coastal mangrove habitat (IUCN 2019), occurs as a rare non-breeding visitor to the Pilbara coast (Johnstone *et al.* 2013).	**Unlikely**	No suitable forest or mangrove habitat present in the study area.
Fregata ariel Lesser Frigatebird	Mig. (EPBC & BC Acts)	6.4 km NNE	Typically occurs in wetland environments such as brackish, saline and coastal areas. They are also known to occupy sheltered areas such as estuaries. harbours and lagoons particularly those with sandflats and mudflats (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
Fregata minor Greater Frigatebird	Mig. (EPBC & BC Acts)	Projected distribution	This species has a wide distribution, moving between countries along the equator during non-breeding season, including the northern parts of Australia (BirdLife International 2023)	**Unlikely**	Coastal environments are marginally available within the study area but prone to disturbance. While technically possible due to dispersal potential, habitat preferences and lack of evidence mean it is unlikely for this species to occupy the study area in significant numbers or for significant life history stages.
Gallinago stenura Pin-tailed Snipe	Mig. (EPBC & BC Acts)	4.7 km E	It is usually seen in tropical or warmer waters off northern WA, Northern Territory, Queensland and northern New South Wales.	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Gelochelidon nilotica Gull-billed Tern	Mig. (BC Act)	1.1 km E	They occur in marine, coastal and pelagic environments and are usually observed in coastal waters in beaches, platforms and sheltered areas including harbours and estuaries (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Glareola maldivarum Oriental Pratincole	Mig. (EPBC & BC Acts)	1.1 km E	Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands. They are only rarely found over the ocean.	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Hirundo rustica Barn Swallow	Mig. (EPBC & BC Acts)	2.2 km ENE	Inhabits open plains, floodplains or short grassland, wetlands, saltworks and sewage farms. May also occur along the coast, inhabiting beaches, mudflats and islands, or around coastal lagoons.	**Unlikely**	It is unlikely to occur within the study area as a resident or foraging visitor. It may fly near or over the study area given the proximity to coastal, tidal mudflat, saltworks and mangroves.
Hydroprogne caspia Caspian Tern	Mig. (EPBC & BC Acts)	2.3 km ENE	Found in a variety of aquatic habitats including coastal areas, salt exploitation sites, wastewater treatment areas, cliffs and rocky islands, estuaries and intertidal areas with sand, rocks, mud or a combination of these substrates.	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Limicola falcinellus Broad-billed Sandpiper	Mig. (BC Act)	7.3 km NE	Found in sheltered coastal environments, mudflats and favours estuarine habitats. Occasionally they have been found occupying saltmarshes, freshwater lagoons, saltworks and sewage farms. They have also been known to occupy creeks, swamps and lakes	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
			near the coast, favouring those with mudflats and exposed sands with receding tides (DCCEEW 2023b).		
Limnodromus semipalmatus Asian Dowitcher	Mig. (EPBC & BC Acts)	2.3 km ENE of study area	Found in sheltered coastal habitats and near-coastal terrestrial wetlands (DAWE 2022).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Limosa lapponica Bar-tailed Godwit	Mig. (EPBC & BC Acts)	3.3 km ENE	Inhabits sheltered coastal habitats including tidal creeks, coastal lagoons and estuaries. There are many records utilising mudflats and sandflats. They are also known to occupy ponds, saltworks and sewage farms (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Limosa limosa Black-tailed Godwit	Mig. (BC Act)	3.3 km ENE	Occurs predominantly in coastal habitats including sandflats, banks, mudflats harbours, estuaries and lagoons and bays. There are some records of sightings in sewage farms, salt lakes and brackish wetlands near the coast, as well as sandy beaches and rock platforms (Department of the Environment 2015).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Macronectes giganteus Southern Giant Petrel	EN/Mig./Mig. (EPBC Act; BC Act)	Projected distribution	Typically found in coastal environments with sheltered bays, estuaries and lagoons. Habitat use is dictated by the tides. They are also found in shallow and sparsely vegetated near-coastal wetlands (DCCEEW 2023b).	**Unlikely**	It is very unlikely this species will occupy the study area and if found inside or nearby, will likely be passing through and not reliant on the habitat available within the study area in significant proportions or during important life history stages.
Motacilla cinerea Grey Wagtail	Mig. (EPBC & BC Acts)	Projected distribution	A small wagtail that is a vagrant visitor to Australia, inhabits fast flowing streams, rivers and wetland margins (IUCN 2019).	**Unlikely**	Given the lack of local records and absence of suitable stream habitat in the study area, it is unlikely to occur.
Motacilla flava Yellow Wagtail	Mig. (EPBC & BC Acts)	7.3 km NE	Uncommon but regular visitor to Pilbara; inhabits a range of damp or wet habitats with low vegetation including damp meadows, marshes, waterside pastures, and sewage farms (IUCN 2019; Johnstone *et al.* 2013).	**Unlikely**	Given the lack of recent records and the wide available habitats outside the study area, it is unlikely that the study area supports a significant number of this species or provides important resources for significant life history stages.

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
Numenius madagascariensis Eastern Curlew	CR/Mig./CR (EPBC Act; BC Act)	3.3 km ENE	Uses a large variety of habitats.	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Numenius minutus Little Curlew	Mig. (EPBC & BC Acts)	1.9 km ENE of study area	Australia's largest and elusive shorebird. Little information is available on this species given this species' shyness and records taking flight at the first sign of disturbance (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Numenius phaeopus Whimbrel	Mig. (EPBC & BC Acts)	606 m ESE	They spend the non-breeding season in northern Australia from Port Hedland to the Queensland coast (DoEE 2018b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Oceanites oceanicus Wilson's Storm Petrel	Mig. (EPBC & BC Acts)	606 m ESE	Usually found on intertidal mudflats and sheltered coastal areas. They have also been found in other waterbodies including harbours, lagoons, estuaries, rivers and mangroves. Occasionally they are found in sandy and rocky beaches or intertidal areas (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Onychoprion anaethetus Bridled Tern	Mig. (EPBC & BC Acts)	6.8 km NW	Usually found on intertidal mudflats and sheltered coastal areas. They have also been found in other waterbodies including harbours, lagoons, estuaries, rivers and mangroves. Occasionally they are found in sandy and rocky beaches or intertidal areas (DCCEEW 2023b).	**Unlikely**	Given the age of this record as well as the species' habitat preferences, it is unlikely that this species will be occupying habitats within the study area and even less likely to be found within the study area in significant abundance.
Phaethon lepturus White-tailed Tropicbird	Mig. (EPBC & BC Acts)	Projected distribution	Found across pelagic waters and the coasts of tropical and subtropical seas (IUCN 2019). Occurs only as a rare visitor to Pilbara coastal waters (Johnstone *et al.* 2013).	**Unlikely**	No suitable marine habitat occurs in the study area.
Phalaropus lobatus Red-necked Phalarope	Mar/Mig. (EPBC Act; BC Act)	34.2 km E	Records indicate their preference for occurring at sea during non-breeding periods. They have been recorded in inland coastal areas, highly saline water bodies including lakes, swamps and wetlands in Australia (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
Philomachus pugnax Ruff	Mig. (EPBC & BC Acts)	3.4 km WSW of study area	Typically occupies saline and brackish wetlands with mudflats. They have been found in a range of wetlands including lakes, swamps, tidal rivers, and flood lands. There are some records of them occupying sheltered coastal areas such as harbours and estuaries and wetlands surrounded by dense vegetation (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Plegadis falcinellus Glossy Ibis	Mig. (EPBC & BC Acts)	1.9 km ENE of study area	Marine habitats and tropical waters. They typically occur in Pisonia-coconut vegetation and on sandy substrates. Other habitat preferences are not well understood (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Pluvialis fulva Pacific Golden Plover	Mig. (EPBC & BC Acts)	7.3 km NE	Inland, freshwater wetlands are preferred, permanent or ephemeral waterbodies on floodplains and shallow swamps with abundant aquatic flora.	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Pluvialis squatarola Grey Plover	Mig. (EPBC & BC Acts)	3.3 km ENE	Typically inhabits coastal environments and occasionally can be found in wetlands, mudflats and sandflats in sheltered areas. They have been found on islands, sand and coral cays. They have been recorded in terrestrial environments, usually near waterbodies and paddocks areas (DCCEEW 2023b).	**Unlikely**	It is unlikely the Project would provide suitable habitat in sufficient magnitude for a significant number of individuals and therefore, the outcome is unlikely.
Sterna dougallii Roseate Tern	Mig. (EPBC & BC Acts)	9 km NE	This medium size tern is seen over coastal and offshore blue water, coral reefs, lagoons and islands (breeding on several Australian Islands, including in WA) but does not occur inland. Pilbara records include passage migrants, breeding visitors and some breeding residents (Johnstone *et al.* 2013; Johnstone & Storr 1998)	**Unlikely**	Suitable marine habitat is not present in the study area.
Sterna hirundo Common Tern	Mig. (EPBC & BC Acts)	6.4 km NNE	Occupies mostly sheltered coastal areas such as harbours, lagoons, estuaries and river deltas, particularly those with margins of sand or mud. They have been recorded utilising inland wetlands of both fresh and saline conditions, including lakes, rivers, creeks and artificial wetlands (sewage pools and saltworks included) (DCCEEW 2023b).	**Unlikely**	Suitable habitat is not available within the study area. Individuals can move through the study area in search of other suitable habitats. This species is unlikely to occur in significant numbers or undertake important life history stages.

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
Sternula albifrons Little Tern	Mig. (EPBC & BC Acts)	6.4 km N	Occupies a range of natural and artificial aquatic environments including irrigation land, water storage areas, lagoons, estuaries, coastal dunes, freshwater lakes as well as seasonal and intermittent freshwater lakes.	**Unlikely**	Suitable habitat is not available within the study area. Individuals can move through the study area in search of other suitable habitats. This species is unlikely to occur in significant numbers or undertake important life history stages.
Sula leucogaster Brown Booby	Mig. (EPBC & BC Acts)	13.3 km NNE	In WA, the Brown Booby is found from Bedout Island and near Onslow, and north to Bunker Group of islands in Queensland Off north-west WA, Brown Boobies are most abundant 18–36 km from land, but also occur inside and outside these limits (DoEE 2018b). It uses both marine and terrestrial habitats but tends to stay close to breeding sites, such as tropical islands, continental islands, sand cays and atolls for breeding. It is known to approach mainland coastlines more than other boobies and has been recorded in coastal waters, harbours and estuaries and near offshore islands but seldom flying over land (DoEE 2018b).	**Unlikely**	Suitable habitat is not available within the study area. Individuals can move through the study area in search of other suitable habitats. This species is unlikely to occur in significant numbers or undertake important life history stages.
Thalasseus bergii Crested Tern	Mig. (EPBC & BC Acts)	3.3 km ENE	Inhabit a variety of aquatic environments including estuaries, lagoons, sheltered coastal areas, lakes, bays and harbours. Particularly those with sand banks or splits and exposed ocean beaches. This species is widespread but not favouring offshore continental islands or coral cays (DCCEEW 2023b).	**Unlikely**	Suitable habitat is not available within the study area. Individuals can move through the study area in search of other suitable habitats. This species is unlikely to occur in significant numbers or undertake important life history stages.
Tringa brevipes Grey-tailed Tattler	Mig. (EPBC and BC Acts; P4 DBCA list)	606 m ESE	Inhabits coastal areas, typically those sheltered such as embayments and estuaries, although they are also known to occupy rocky coasts and platforms. Occasionally they are found in inland waterbodies (DCCEEW 2023b).	**Unlikely**	Suitable habitat is not available within the study area. Individuals can move through the study area in search of other suitable habitats. This species is unlikely to occur in significant numbers or undertake important life history stages.
Tringa glareola Wood Sandpiper	Mig. (EPBC & BC Acts)	1.9 km ENE	Habitat preferences vary with activities. Feeding habitat preferences include shallow water and intertidal areas on rocky substrates, coral rubble, mudflats, mangroves and potentially seagrass. Breeding habitat includes the branches of mangroves or	**Unlikely**	Suitable habitat is not available within the study area. Individuals can move through the study area in search of other suitable habitats. This species is unlikely to occur in significant numbers or undertake important life history stages.

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
			shrubs and driftwood. Otherwise, they favour habitats in sheltered coastal environments and mudflat aquatic areas (DCCEEW 2023b).		
Tringa nebularia Common Greenshank	Mig. (EPBC & BC Acts)	1.9 km ENE	The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes (DoEE 2018a).	**Unlikely**	Suitable habitat is not available within the study area. Individuals can move through the study area in search of other suitable habitats. This species is unlikely to occur in significant numbers or undertake important life history stages.
Tringa stagnatilis Marsh Sandpiper	Mig. (EPBC & BC Acts)	6.4 km NNE	They prefer coastal open mudflats.	**Unlikely**	Suitable habitat is not available within the study area. Individuals can move through the study area in search of other suitable habitats. This species is unlikely to occur in significant numbers or undertake important life history stages.
Xenus cinereus Terek Sandpiper	Mig. (EPBC & BC Acts)	3.4 km WSW	The Marsh Sandpiper occurs along the WA NW coast and throughout parts of eastern Australia. It inhabits coastal and inland wetlands, estuarine and mangrove mudflats, beaches, swamps, lakes and several other types of wetlands (Morcombe 2004).	**Unlikely**	Suitable habitat is not available within the study area. Individuals can move through the study area in search of other suitable habitats. This species is unlikely to occur in significant numbers or undertake important life history stages.
Mammals (8)					
Dasycercus blythi Brush-tailed Mulgara	P4 (DBCA list)	Within study area	Occurs in spinifex grasslands throughout much of the arid zone, digging their burrows in the flats between low sand dunes.	**Recorded**	
Macrotis lagotis Greater Bilby	VU (EPBC & BC Acts)	Within study area	Prefers hummock grassland in plains and alluvial areas, open tussock grassland on uplands and hills, and mulga woodland/shrubland on ridges and rises.	**Recorded**	
Dasyurus hallucatus Northern Quoll	EN (EPBC & BC Acts)	4.0 km WNW	Found in a variety of habitats; however, rocky areas provide important denning habitat, while they forage in nearby grasslands and creeklines.	**Possible**	Absence of suitable denning habitat (rocky ranges, outcrops, and boulder piles), suitable dispersal habitat present in minor drainage habitat.
Pseudomys chapmani Western Pebble-mound Mouse	P4 (DBCA list)	27.7 km E	The mounds are located on the gentle slopes of rocky ranges covered in rocky mulch, hard spinifex and sparse trees and shrubs (*Eucalyptus*, *Senna*, *Acacia* and *Ptilotus*). They are also often found near Acacia-dominated drainage lines.	**Unlikely**	No suitable habitat within the study area despite the proximity and date of the desktop record, the study area.

Species	Status	Proximity to study area	Habitat Preferences	Likelihood	Comment
Rhinonicteris aurantia (Pilbara) Pilbara Leaf-nosed Bat	VU (EPBC & BC Acts)	27.4 km E	Obligate cave roosting species, forage for insects almost exclusively over freestanding water. Disperses between roost and foraging habitat via humid gorges and gullies to avoid desiccation and shelter from predation.	**Unlikely**	No suitable roost caves of any category within the study area. No suitable dispersal habitat (drainage lines) nor permanent water pools critical for foraging.
Macroderma gigas Ghost Bat	VU (EPBC & BC Acts)	25.0 km SSE	Prefers to roost in caves beneath bluffs of low, rounded hills composed of Marra Mamba geology, granite rock piles in the Pilbara and sandstone elsewhere, as well as addits (abandoned mines).	**Unlikely**	No suitable roost caves of any category within the study area. No dispersal habitat (drainage lines). Study area does not contain important habitat features likely to attract the species on a regular or repeated basis. More productive foraging and dispersal habitat nearby, outside the study area.
Lagostrophus fasciatus fasciatus Banded Hare-wallaby (mainland)	P4 (DBCA list)	Within study area	Extinct on the mainland – last confirmed sighting on the mainland was in 1906. Natural (wild) populations are restricted to Bernier and Dorre Islands in Shark Bay, WA (Morris & Burbidge 2008).	**Unlikely**	Species extinct on the mainland.
Mormopterus cobourgianus North-western Free-tailed Bat	P1 (DBCA list)	3.1 km NNE	Restricted range appearing to favour mangroves and adjoining areas in small spouts, crevices and dead branches of mangroves. This species is relatively data deficient (Australian Museum 2020).	**Unlikely**	Unlikely for this species to occupy the study area for important life history stages. Possible for them to infrequently fly over or nearby given the proximity to mangrove habitats to the North, outside the study area.

5.2.2.1 SRE invertebrate fauna

5.2.2.1.1 Habitats

Three habitats were identified within the study area that are suitable habitat for SRE invertebrates (Table 5-8; Figure 5-5). All SRE habitats represent low value SRE habitat. While the open woodland habitat seems locally isolated, it extends eastward outside the study area and connects to larger open woodlands along drainage lines.

Table 5-8 Extent and description of each SRE habitat in the study area

Habitat type	Site/s	Description	SRE habitat rating	Extent in study area and % of study area
Sandplains	BP(001, 002, 004, 005, 006, 015, 025, 008, 009, 011, 013 016, 017, 020, 021, 022 023, 024) BT007, BIE001, BIE003, BIE004, BIE002, Opp001, Opp008, Opp002, BT003, Opp005, BIE007, Opp014, Opp006, Opp003, Opp010, Opp009, B003, BIE010, BIE009, BT002, Opp004, Opp007,Opp015, BT001,	Mosaic of spinifex hummock grasslands and low *Acacia stellaticeps* shrublands on an undulating plain. Isolated *Owenia reticulata* trees over mixed *Acacia stellaticeps* dominant shrublands (A. *tumida* and A. *inequalatera* scattered to widely scattered) over stage 2 to 5 spinifex hummock grasslands on red-orange sandy soils.	Low	1,406.9 ha (95.6)
Open woodlands	BIE006, BIE005, BIE008, BP017, BP019, BP014	Shallow flat depression relative to surrounding sandplain. Open low to mid Eucalyptus woodland over evenly scattered, open tussock grasses (native and Buffel) with isolated spinifex hummocks also present. Substrate predominantly sandy with some clay. Hardened crust present. Surrounded by low sandy rise with dense mature spinifex hummocks and mixed *Acacia* dominant shrubs including *A. stellaticeps, A. tumida pilbarensis* and isolated *A. inequalatera.* Higher percentage cover of leaf litter than the surrounding areas, forming transported clumps.	Low	15.41 ha (0.9)

Habitat type	Site/s	Description	SRE habitat rating	Extent in study area and % of study area
Drainage lines	BT001	Small section of area known as Foreshore flats. Tidal influenced though predominantly dry. Heritage protected area due to incidence of shell middens. Low *Acacia stellaticeps* shrubland with widely scatted *Acacia tumida pilbarensis* over small stage 3 and 4 spinifex hummock grasses on red-orange to orange sandplain.	Low	8.9 ha (0.6)
Cleared/disturbed	Opp011	Cleared areas with infrastructure and roads.	Low	45.0.ha (2.9)

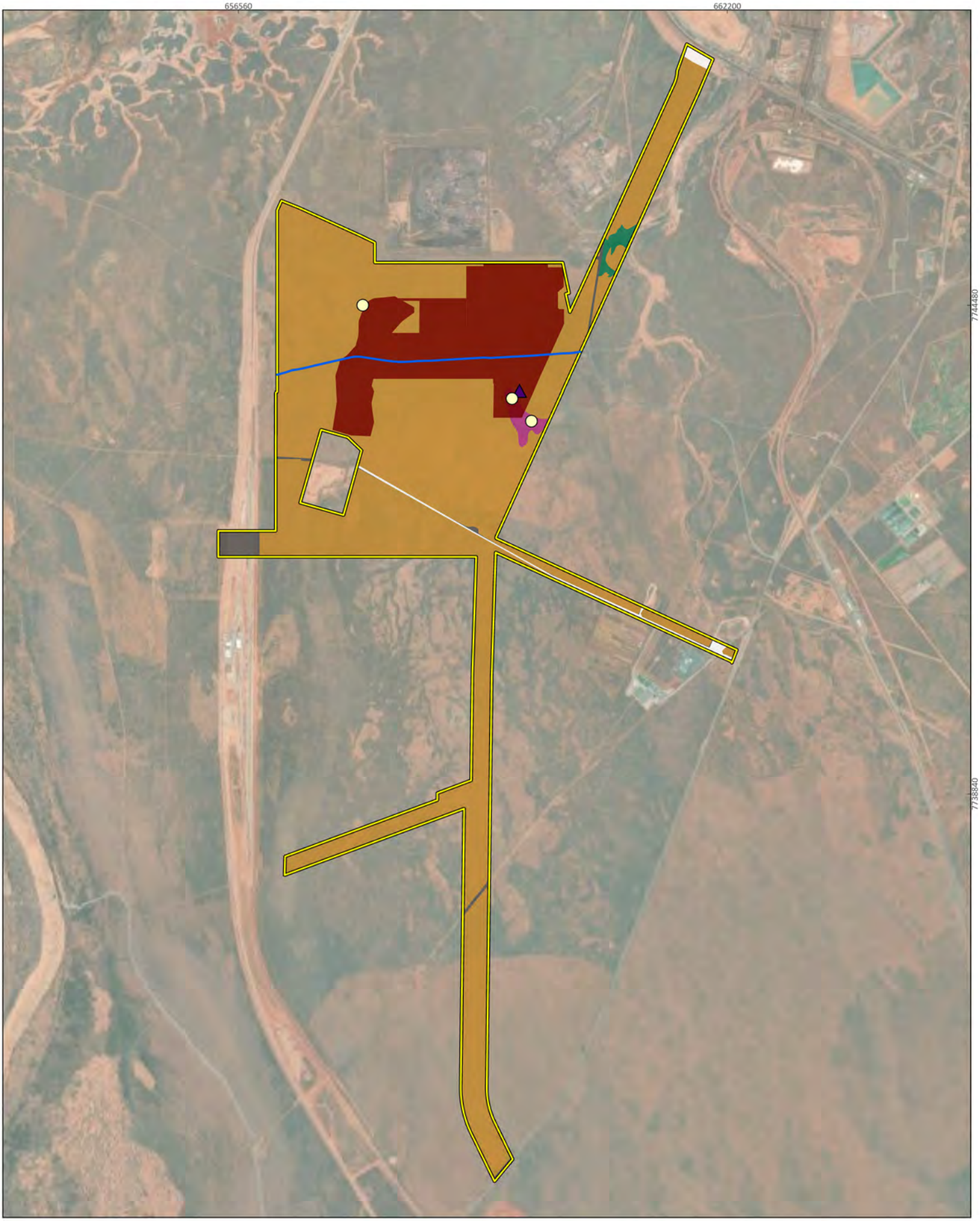
5.2.2.1.2 SRE records

A total of 14 specimens from SRE groups were collected within the study area (Figure 5-5; Table 5-9). The assemblage comprises of 5 mygalomorph spiders (*Aname*), 5 Isopods (*Armadillidae*), and 4 Pseudoscorpions (*Chernetidae*). Of these, 4 specimens could not be identified to species or morphospecies code as applied from the WA Museum. The assemblage includes one taxa resolved to species and 3 taxa to morphospecies code. All species represent potential SRE's except for the mygalomorph spider, *Aname sinuate*, which is Widespread. Specimens were collected from sandplains and open woodlands within the study area; both are considered low value SRE habitat.

Table 5-9 Specimens from SRE groups recorded in the field survey

Higher order/ Family	Taxa	Site/s	Spec. num	Habitat	SRE status	Comments on status
Class Arachnida, order Araneae						
Anamidae	Aname 'Phoenix0068'	BIE003	1	Sandplain	Potential	Species only known to morphospecies code from the Port Hedland Solar Farm project. Specimens were collected in a widespread habitat type that is not restricted to the study area.
Anamidae	Aname sinuata	BIE005	2	Open Woodland	Widespread	Widespread species known across the Pilbara region.
Mygalomorphae	Mygalomorphae sp. indet.	BIE006	2	Open Woodland	Potential	Specimens sequencing failed so could not be identified properly. Specimens recorded in a widespread habitat type; however, it is not continuous in the local area. Specimens recorded in this habitat type alone are likely restricted to the study area.
Class Arachnida, order Pseudoscorpion						
Chernetidae	Chernetidae 'Phoenix0146'	BIE006	4	Open Woodland	Potential	Specimens recorded in a widespread habitat type; however, it is not continuous in the local area. Specimens recorded in this habitat type alone are likely restricted to the study area.

Higher order/ Family	Taxa	Site/s	Spec. num	Habitat	SRE status	Comments on status
Class Malacostraca, order Isopoda						
Armadillidae	Buddelundia 'Phoenix0145'	BIE006	3	Open Woodland	Potential	Specimens recorded in a widespread habitat type; however, it is not continuous in the local area. Specimens recorded in this habitat type alone are likely restricted to the study area.
Armadillidae	Buddelundia sp. indet.	BIE005, BIE006	2	Open Woodland	Potential	Specimens sequencing failed so could not be identified properly. Specimens recorded in a widespread habitat type; however, it is not continuous in the local area. Specimens recorded in this habitat type alone are likely restricted to the study area.



Western Australia

PERTH

Port Hedland Green Steel Pty Ltd
Port Hedland Green Steel Project

Project No	1557
Date	5/02/2024
Drawn by	JL
Map author	SP

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Kilometers

1:56,400 (at A4)

GDA 1994 MGA Zone 50

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- Study area
- Indicative disturbance footprint
- Whim Creek Road
- Drainage line
- Open woodland
- Sandplain

Habitat

- Cleared/disturbed
- Disturbed Infrastructure

SRE status

- Potential
- Wisedpread

Figure 5-5

SRE habitats and recorded SRE taxa

PHOENIX ENVIRONMENTAL SCIENCES

5.3 SURVEY LIMITATIONS

The limitations of the terrestrial fauna survey have been considered in accordance with EPA (2016b, d) and are presented in Table 5-10.

Table 5-10 Consideration of potential survey limitations

Limitations	Comments
Availability of contextual information at a regional and local scale	Database searches and previous surveys within the vicinity of the Project provided a comprehensive species list for the region.
Competency/experience of the team carrying out the survey	The survey team have more than 20 years of combined experience conducting fauna surveys in the Pilbara region of WA.
Scope and completeness	The scope was sufficient for the size of the study area and the fauna habitats present and is considered complete.
Proportion of fauna recorded and/or collected, any identification issues	Based on species accumulation curves, a sufficient proportion of fauna was recorded for the study area.
Access within the study area	All parts of the study area were accessible.
Timing, rainfall, season	Timing of the survey (Autumn season) was optimal for the study area and consistent with EPA (2020) guidance for the Eremaean Climatic Province.
Disturbance that may have affected the results of the survey	No disturbances affected the results of the survey.

6 DISCUSSION

6.1 VERTEBRATE FAUNA

6.1.1 Fauna habitats

All habitat types identified in the study area are typical of the Roebourne subregion and Uaroo land system (Table 3-1; Figure 3-2). Characterised by "broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered *Acacia* shrubs (Payne & Leighton 2004)," the Uaroo system represents more than 5% (7.02%) of the of the Pilbara Bioregion. Less than 1% of this (0.31%) is currently cleared for 'intensive use', 16% is in the conservation estate and 83.5% is used for pastoral activities (in the Pilbara Bioregion – Uaroo extends outside this region also). As such, the fauna habitats present within the study area are considered abundant and widespread throughout the Pilbara. While open woodlands show some local isolation within the study area, the most prominent example of this habitat type within the study area (in the east) is functionally connected, via diffuse drainages to open woodlands along the large drainage approximately 2 km east of the study area.

6.1.2 Fauna assemblage

The recorded fauna assemblage represents only 27.9% of the desktop assemblage; however, this is accounted for by the small size of the study area (1,476 ha) and low diversity of fauna habitats present, compared to the those within the desktop search extent, which include: pelagic, littoral/coastal, estuarine, mangrove, salt flats, drainage, wetland, granite outcrop, banded ironstone ranges, major rivers and offshore islands. These habitats combined, support a comparatively higher diversity of vertebrate fauna than those (habitats) present in the study area. This is exemplified by the 218 bird species identified by the desktop review, of which only 48 species (22%) were recorded in the survey (Table 5-5). Of the 218 species of bird identified by the desktop review at least 108 are largely restricted to coastal/littoral, pelagic, mangrove, wetland, mudflat and rock platform habitats.

The record of the Black Falcon (*Falco subniger*) is considered locally significant. While the species is not conservation listed in WA, it is listed in other parts of its range. In New South Wales Black Falcon is listed as VU under the BC Act (April 2023 list); in South Australia it is listed as Rare under the National Parks and Wildlife Act 1972 (January 2020 list), and in Victoria it is listed as CR under the Flora and Fauna Guarantee Act 1988 (June 2023 list) (DCCEEW 2023b).

6.1.3 Bilby

Prior to European settlement, the Bilby occurred continuously across three-quarters of the continent in the semi-arid and arid zones. Since European settlement, largely due to introduction of foxes and cats, habitat changes caused by livestock and other introduced herbivores; Bilby occupy approximately 20% of its former range.

Having been previously recorded within the study area by Phoenix (2022b), it is no surprise that secondary evidence of the species was recorded throughout the study area during the current survey. While most of the secondary evidence identified was old (> 2 week), some recent evidence of Bilby activity was identified from odorous scats and loose sandy spoil associated with diggings that are indicative of Bilby foraging activity. All recent scats and diggings were located near the northern boundary of the study area. Despite both intensive and extensive targeted survey effort (25 Bilby search plots and 7 transects searches), no Bilby burrows (old, recently active, or active burrows) were located within the study area.

Bilby are known to utilise relatively large, mobile home ranges in response to the scarcity of food resources in the semi-arid and arid parts of their range. While the study area clearly forms part of a local population's home range, the absence of track sequences and wider spread of recent activity (indicative of current or very recent Bilby presence) within the study area, particularly the area near the northern boundary, may suggest that they have dispersed elsewhere, outside of the study area. Nevertheless, whether the local Bilby population is currently occupying the study area or not, it is likely to return given that it has been recorded nearby on multiple occasions (albeit via secondary evidence; DBCA 2022b).

6.1.4 Mulgara

Mulgara were previously recorded in the study area and nearby (DBCA 2022b). While no direct sightings of the species were recorded during the current survey, 2 recently active, or active burrows were recorded and subsequently targeted with Elliot traps but evaded capture. Given the dominance of suitable sandplain habitat within the study area it is recommended that pre-clearance surveys for the species be conducted prior to clearing of native vegetation within the study area, concurrently with pre-clearance surveys for Bilby.

6.1.5 Grey Falcon

Grey falcons typically nest and roost along heavily wooded drainage lines. With large foraging home ranges, they predominantly prey on other bird species in flight from above. The breeding pair and single fledged juvenile were recorded perched on a transmission tower at the western end of the study area adjacent to the Alinta Power Station. Grey Falcons and numerous other birds of prey species frequently nest high up on transmission towers which provide nest security from predators and a vantage point from which to observe prey. The study area would only comprise a fraction of the resident Grey Falcons' foraging home range and given the means with which they hunt their prey (on the wing) clearing of native vegetation for the Project, and subsequent Project activities are unlikely to negatively impact the pair.

6.1.6 Fork-tailed Swift

Fork-tailed swifts are an almost exclusively aerial species and are therefore not limited by the availability of specific terrestrial habitats. As such, the species will not be affected by the clearing of native vegetation or Project related activities within the study area.

6.1.7 Osprey

The Osprey observed perching on a sign in the study area is not considered relevant to the proposed development of the Project. Ospreys are a predominantly coastal species but also forage in mangroves and other large water bodies where they almost exclusively prey on large fish. The habitats present within the study area are unlikely to provide any utility to the species and therefore will not be impacted by the Project.

6.1.8 Northern Quoll

No rocky habitats, critical to support Northern Quoll are present within the study area. As such the study area is unlikely to support a resident population. However, the species has been recorded approximately 4 km east-northeast of the study area and given its wide foraging range (>5 km) and the proximity and connectivity of the study area to the large drainage line to the east, it is possible, Northern Quoll may, albeit infrequently, forage in the eastern extent of the study area.

6.2 SRE INVERTEBRATE FAUNA

Three SRE habitats were identified within the study area, primarily comprising sandplains (95.6%). The sandplains are considered low prospectivity SRE habitat as they are very dry environments, with limited shade, which are not conducive to the formation of the SRE fauna.

While the open woodland habitat seems locally isolated, it does extend eastward outside the study area and connects to larger open woodlands along drainage lines. This habitat type is well represented in the local area and within the Roebourne subregion.

The SRE fauna of the region is well understood with several confirmed SRE species known in the area and a high number of records from several different SRE groups. The desktop review identified 7 Confirmed SRE taxa and 78 Potential SRE taxa from within the SRE desktop search area. Of these most were recorded in habitat types that are not present in the study area, except for one record of mygalomorph. This record was located approximately 165m from the southeastern boundary of the study area. During the field survey 2 mygalomorph specimens were collected that could not be identified as the sequencing failed. These specimens are cautiously classified as Potential SRE species.

Overall, the study area comprises extensive and mostly continuous low prospectivity SRE habitat. No Confirmed SRE species were recorded within the study area, and it is unlikely any of the recorded Potential SRE's are restricted to the study area.

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