



Telfer – Havieron Gold Mining Project

Section 38 *Environmental Protection Act 1986*

Referral Supporting Document

Inclusive of Ministerial Statements 605, 606 and 650 Significant Amendment

Date – 1 December 2025

Revision 9

702-8000-EN-PLA-0019

ACKNOWLEDGEMENT

Greatland acknowledges, recognises and respects Martu as Traditional Owners and custodians of the landscape on which the company operates. Martu society, spiritual beliefs, cultural identity and traditions are intimately interconnected with their ngurra (lands). The Tjukurrpa (creation and law times) operates simultaneously in the past, present and future.

Greatland recognises it is operating within a cultural landscape and that Martu hold the protection, nurturing and management of this landscape of paramount importance. It is through this understanding that Greatland also places the health of the cultural landscape as a priority in everything it does, as both a partner and a guest on Martu ngurra.

DOCUMENT CONTROL

Document Control		
Title	Telfer – Havieron Gold Mining Project Referral Supporting Document (RSD)	
Description	Document supporting the referral of the Havieron Mine Proposal as a significant amendment to the Telfer Gold Mine.	
Purpose	To provide sufficient information for the EPA assessment of the proposed Havieron Project under the EP Act Part IV, and to allow for meaningful public comment as part of that process.	
Revision No.	Modifications (including referral history)	Date Issued
1	Original referral of the Significant Amendment to EPAS.	21/04/2023
2	RSD amended to remove proposed evaporation ponds 4 – 6 as part of a s.38C application to progress early works, and to address other minor EPA requests for information.	31/07/2023
3	Revised to address EPAS requested amendments to the s.38C application and RSD.	24/11/2023
4	Further revisions to address EPA requested amendments to the s.38C application and RSD.	31/01/2024
5	s.38C application withdrawn upon advice from the EPA. RSD revised to include Havieron early works and re-instate evaporation ponds 4 – 6 as part of the referral (the subject of the withdrawn s.38C application).	14/04/2024
6	Revised in accordance with EPA request. This revision was issued by the EPA for public review.	13/09/2024
Public advertising period 13/11/2024 to 4/12/2024		
7	Revised to address public submissions and EPAS requests for further information.	11/04/2025
8	Revised to address final technical comments from EPAS.	11/07/2025
9	Final revision to reflect updated Night Parrot assessment and approved s.43A amendment to development envelope.	1/12/2025
Authorisation of current revision: Shaun Day Chief Executive Officer		

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The following Appendices are provided as standalone documents in support of this RSD:

- Appendix A – Stakeholder Consultation Register
- Appendix B – Letter of support to EPA
- Appendix C - Detailed Flora and Vegetation Survey - Havieron Mine Area, Stratagen, 2020
- Appendix D - Reconnaissance Flora and Vegetation Survey - Stratagen, 2020
- Appendix E - Detailed Flora and Vegetation Survey - Infrastructure Corridor, Stratagen, 2021
- Appendix F - Flora Desktop Assessment, 2022
- Appendix G - Weed Assessment 2022
- Appendix H - Goodenia hartiana targeted survey August 2024
- Appendix I - Goodenia hartiana targeted surveys map series
- Appendix J - Significant Species Management Plan v2
- Appendix K - Historical ecological surveys for Telfer (Approved Proposal)
- Appendix L - Detailed Vertebrate and SRE Survey, Biologic 2020
- Appendix M - Detailed Vertebrate and SRE Invertebrate Fauna Survey, Infrastructure Corridor, Biologic 2021
- Appendix N - Telfer Conservation Significant Species Assessment, Spectrum 2021
- Appendix O - Telfer Night Parrot Monitoring, Spectrum, 2022
- Appendix P - Havieron Project Bilby monitoring, Biologic, 2021
- Appendix Q - Havieron Project Greater Bilby Monitoring, Biologic, 2022
- Appendix R - Telfer Significant Fauna Monitoring Report, Spectrum, 2023
- Appendix S - Scope 1 Greenhouse Gas Emissions Assessment
- Appendix T - Scope 3 Greenhouse Gas Assessment
- Appendix U - Social Studies
- Appendix V - Biologic Subterranean Fauna Survey 2020
- Appendix W - Biologic Stygofauna Survey and Risk 2022
- Appendix X - Surface Water Assessments
- Appendix Y - Hydrogeological Report
- Appendix Z - Soil Characterisation Report
- Appendix zAA - Stage 1 Waste Rock Characterisation Report, 2021
- Appendix zBB - Stage2 Waste Rock Characterisation, 2021
- Appendix zCC - Havieron Tailings Characterisation Study, 2021
- Appendix zDD - Mine Closure Plan Rev 4
- Appendix zEE - Offset Management Plan v2
- Appendix zFF - Lake Waukarlicarly Night Parrot Desktop Review 2022
- Appendix zGG - Lake Waukarlicarly Targeted Night Parrot Survey 2023
- Appendix zHH – Night Parrot Habitat Review, N Leseberg, 2025
- Appendix zII – Targeted Night Parrot Habitat Assessment, Red Dog, 2025

EXECUTIVE SUMMARY

The Greatland Telfer Gold Mine is an existing approved facility in the Great Sandy Desert region of Western Australia, with the Shire of East Pilbara. It is located within the Martu People and Ngurra Native Title Determination area on unallocated Crown Land. The Havieron Underground Mine proposal (s.40AA Significant Amendment) is a greenfield gold-copper deposit located approximately 45 km east of Telfer. Havieron is considered to be a significant amendment to the existing Telfer Mine where ore would be processed, resulting in a single Ministerial Statement should approval be received.

The Telfer - Havieron Proposal comprises:

- The greenfield development of a gold-copper mine at Havieron
- Processing of Havieron ore at the existing approved Telfer site
- Amendment to existing historical Ministerial Statements for Telfer given the extension of life as a result of Havieron.

The s.40AA Significant Amendment aspect comprises:

- Continued use of 279 ha of early works disturbance completed under various approvals for a development decline, waste rock landform, evaporation ponds, widened access track, and temporary facilities
- Clearance of up to 630 ha of land within a total development envelope of 36,647 ha for:
 - Development and operation of an underground mine for recovery of gold and copper ore and haulage to Telfer for processing at existing facilities, with an operational life of 13 years followed by rehabilitation
 - Construction and operation of a 55km infrastructure corridor between Havieron and Telfer for the haulage of ore and backload of tailings for production of paste backfill, water pipeline, electricity, borrow material, and other materials and items as required
 - Expanded surface infrastructure, including a waste rock landform, infrastructure for paste production, additional evaporation ponds and associated pipelines and silt ponds, fleet management, administration and accommodation.
- Continued and, if required, expanded dewatering program, with abstraction of up to 2 gigalitres (GL) per year of groundwater for use on site, and any surplus sent to lined evaporation ponds.

The s.40AA Significant Amendment does not include any ore processing or tailings storage facilities, with all ore being transported to Telfer.

Relevant key environmental factors relevant to the proposal are:

- Social Surrounds
- Flora and Vegetation
- Subterranean Fauna
- Terrestrial environmental quality
- Terrestrial Fauna

- Inland waters

Other factors addressed in this referral are air quality and Greenhouse Gas Emissions.

Assessment of factors determined the most pertinent direct environmental impacts are clearance of native vegetation and loss of habitat for conservation significant species, including Night Parrot and Greater Bilby that are EPBC listed, and traffic risks to individuals. Whilst specialist assessment and targeted survey determined little or no suitable nesting or roosting habitat for Night Parrot, the proposal area may be utilised for flyways or foraging. Greater Bilby are resident in the Great Sandy Desert and critical habitat exists within the development envelope and is utilised from time to time depending on resource availability.

Greatland have developed a suite of contemporary and meaningful mitigation measures to avoid or minimise impacts to flora, vegetation and significant species. These align with current Commonwealth conservation advice and threat abatement plans, and best practice environmental management standards. Key mitigations are as follows:

- Clearing of no more than native vegetation 630 ha, minimised to the greatest extent possible through design and use of existing cleared areas
- No clearing of Night Parrot critical nesting or roosting habitat or active Greater Bilby burrows
- Preclearance survey prior to land clearance in accordance with DBCA guidelines
- Martu fauna spotters at the time of clearance for final dispersal due diligence
- Management of buffer zones for: active Greater Bilby burrows, with any required relocations as per DBCA guidelines; and Night Parrot critical nesting or roosting habitat in the unlikely event this is encountered
- No nighttime haulage of ore until uncertainty around Night Parrot utilisation of the development envelope for flyways or foraging is assessed and further approval received. This will occur through a landscape scale two-year acoustic monitoring program with specialist oversight
- Designed in avoidance and mitigations and operational management controls to reduce direct and indirect impacts to native vegetation and fauna, including *inter alia*:
 - Feral species control to minimise pressure from cats, foxes and camel
 - Weed control
 - Eco-ducts and traffic management to protect species from strike
 - Culverts and other civil controls to avoid altered surface water flows and habitat fragmentation
 - Operational controls of spark or flame generating processes and local fuel loads to prevent altered fire regimes, and real-time monitoring and local emergency services team to detect and respond to fires including from natural or community causes
 - Containment of highly saline mine dewater within lined evaporation ponds and strict operational management in accordance with existing licence conditions
 - Dust suppression on cleared areas and roads; and

- Progressive and end of mine life rehabilitation such that disturbed land can transition back to critical habitat in the future.

Management of significant species is governed by a Significant Species Management Plan, with actions defined at trigger and threshold levels to ensure objectives are achieved, monitored and reported annually.

After application of the abovementioned mitigations a significant residual impact to Night Parrot and Greater Bilby exists due to loss of habitat and potential for traffic strike. A direct offset is therefore applied for the life of the development to ensure populations, and their supporting habitats are not unduly impacted at the regional level.

The proposed offset is a biodiversity package at a landscape scale, with two key benefits:

- Habitat protection and threat reduction within an analogous area of the Martu Indigenous Protection Area (IPA); and
- Social contribution through funding of a ranger style program to implement the offset.

The proposed offset area comprises 3,200 ha in the Lake Waukarlycarly area of the Warla-Warrarn Martu IPA that has suitable habitat and known or likely presence of Night Parrot and Greater Bilby, and presence of direct and indirect threats. This offers significant scope for conservation gain and is proposed to be co-managed between Greatland and the Martu Prescribed Body Corporate, Jamukurnu-Yapalikurnu Aboriginal Corporation (JYAC) with whom Greatland have a strong and enduring relationship.

The offset assessment exceeds the EPBC minimum criteria of 90% for both Night Parrot (94.44%) and Greater Bilby (249.37%). An adaptive management framework is proposed to ensure offset objectives are informed by science, Martu knowledge, current conservation advice, and conservation actions are targeted, measurable and flexible.

The cumulative impact and residual risks are considered to be low given the following:

- The Significant Amendment is of a small scale, with no open pit, no ore processing, and no tailings storage
- Impacts to fauna habitats from existing authorised clearing as well as from the proposed additional Havieron clearance will not reduce any of the mapped extents of the six identified habitat types to less than 98%
- Cumulative impact to Priority 2 flora species *Goodenia hartiana* is less than 2.5% of the total population which widespread local occurrence as confirmed through targeted survey
- Cumulative impact in the bioregion is minimal, with 99% or more of pre-European vegetation types remaining. This includes regional disturbance associated with minor roads and tracks, approved mining operations at Telfer and Havieron early works, other exploration activities and Aboriginal settlements
- Impact assessment to EPBC criteria has been undertaken for migratory species and no significant impact criterion triggered
- Significant impact criterion for Night Parrot and Greater Bilby are triggered due to land clearance and traffic but are mitigated as far as possible on mine, and any residual impacts

accounted for through a proposed offset that meets EPBC criteria and contributes not only to the protected matter, but also to the Martu People who will lead implementation

- Subterranean fauna habitat exists at Havieron, and mine dewatering will cause a predicted groundwater drawdown zone. Of the 17 identified taxa: four occur outside the predicted drawdown zone; nine are known to be regionally widespread; and of the four within the drawdown zone only two are in a zone with a predicted maximum drawdown of 1m. Whilst this is not considered significant, ongoing monitoring and model validation against actual drawdown is expected to be a condition of approval; and
- Greenhouse gas emissions from the Havieron Proposal equates to 0.054% of Australia's emissions and have a downward trajectory of emissions intensity and does not prejudice the achievement of Australia's international commitments.

Based on the proposed mitigation and management measures the Significant Amendment is considered to meet the EPA objectives for each relevant factor and can be implemented without significant impacts on the health, diversity or productivity of the environment. An offset is proposed to address residual impacts to Night Parrot and Greater Bilby.

The Telfer – Havieron Proposal is socioeconomically significant at a local and regional scale and would extend the life of the processing plant at Telfer. Given the proposed mitigations, and rehabilitation of land to a standard at or approaching pre-disturbance habitat quality, Greatland consider the socioeconomic benefits can be realised without undue impact to the environment.

The Havieron Underground Mine Proposal was referred under the Commonwealth Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 and determined to be a Controlled Action (2021/9085) due to the presence of Night Parrot and Greater Bilby, and assessable by preliminary documentation. That assessment is occurring concurrent with this EPA Referral.

1. PROPOSAL

1.1 PROPOSAL CONTENT

Table 1-1: General proposal content description

Proposal title	Telfer – Havieron Gold Mining Project
Proponent name	Greatland Pty Ltd ABN: 92 108 498 997 c/o Level 3, 502 Hay Street Subiaco, Western Australia, 6008 Authorised contact person for the referral is louise.cherrie@greatland.com.au.
Short description	In 2004 Newcrest Mining Limited received approval for the recommencement and expansion of mining at the Telfer Gold Mine to include the mining and processing of 400 million tonnes of gold ore at a rate of up to 23 million tonnes per annum, and the transport of copper concentrate to Port Hedland by road. Telfer project also includes a power supply of up to 100 megawatts to the Telfer Gold Mine using a 440 km long power supply and infrastructure corridor from Port Hedland. Now under the ownership of Greatland, the Telfer – Havieron Gold Mining proposal is for the expansion of the Telfer Gold Mine to include the Havieron underground mine, within a development envelope encompassing both the Telfer-Havieron operations and inclusive of haul road for trucking of ore from Havieron to Telfer for processing, waste rock landforms, evaporation ponds and expanded ground water abstraction, for a combined total of 32 million tonnes of ore production. The proposal is located about 400 km south-east of Port Hedland in the Great Sandy Desert region of Western Australia, with the Telfer Mine site located 55 km to the west of the Havieron Gold Mine. The regional location is shown in Figure 1-1 Existing and proposed development envelope and indicative footprint are shown in Figure 1-2 to Figure 1-5

Table 1-2: Proposal content elements

Proposal element	Existing Proposal extent, capacity, or range (Telfer MS 605, 606 and 650)	Existing Proposal extent, capacity, or range (Havieron approved Stage 1 approved under secondary approvals)	Proposed amendment (Consolidation of telfer MS 605, 606, 650 and continued operation of approved Havieron Stage 1, development and operation of Havieron Stage 2)	Combined max extent, capacity, or range
Physical elements				
Development Envelope Figure 1-1	No Development Envelope previously defined	No Development Envelope previously defined	A single Development Envelope encompassing: - Telfer power supply corridor (MS 605 and 650) - Telfer mine operations and associated infrastructure (MS 606) - Havieron stage 1 (mining proposals 89453 and 121684) - Proposed Havieron stage 2 and infrastructure corridor between Havieron and Telfer	36,647 ha
Disturbance footprint Figure 1-2 to Figure 1-5	6,607 ha comprising: - Telfer power supply infrastructure corridor – 1,500 ha (completed under MS 605, with issuance of MS 650 to amend MS 605 with additional fauna management conditions). - Telfer Mine operational footprint – 4,921 ha (completed under MS 606). 186 ha of historic unaccounted for disturbance at Telfer (prior to MS 605 and MS 606).	279 ha comprising: - Havieron stage 1 mining proposal rev3 (Registration ID 89453) 203 ha - Havieron stage 1 mining proposal rev4 (Registration ID 121684) 76 ha	Additional 630 ha disturbance	No more than 7,516 ha of disturbance within the 36,647 ha Development Envelope

Proposal element	Existing Proposal extent, capacity, or range (Telfer MS 605, 606 and 650)	Existing Proposal extent, capacity, or range (Havieron approved Stage 1 approved under secondary approvals)	Proposed amendment (Consolidation of telfer MS 605, 606, 650 and continued operation of approved Havieron Stage 1, development and operation of Havieron Stage 2)	Combined max extent, capacity, or range
Waste rock landforms	Up to 1,562 million tonnes of waste rock (MS 606)	Up to 260,000 m ³ of waste rock	Addition of 5 million tonnes of waste rock	Up to 1,567 million tonnes of waste rock
Infrastructure corridor	NA	55km track between Havieron and Telfer	Widening and sealing of track to form a 55km infrastructure corridor (transport, electricity and water) between Havieron and Telfer	55km infrastructure corridor
Evaporation ponds	NA	Three evaporation pond cells (ponds 1-3) (maximum operating volume of 132,420m ³)	Addition of three evaporation pond cells (ponds 4 – 6) (maximum operating volume of 477,130m ³)	Six evaporation ponds for with a total maximum operating volume of 609,550m ³ and evaporation surface area of 60 ha
Raw water ponds	NA	NA	Raw water pond (5 ha)	Up to 5 ha raw water storage pond
Havieron permanent camp	NA	NA	Addition of permanent camp at Havieron (9 ha)	Up to 9 ha permanent camp at Havieron
Operational elements (within Development Envelope)				
Mining of gold copper ore	Up to 29 million tonnes of ore per year (including dump leach ore)	NA	Addition of up to three million tonnes of ore per year from the Havieron Project	Up to 32 million tonnes of ore per year (including dump leach ore)
Processing throughput of gold copper ore	Up to 26 million tonnes per year	NA	NA	Up to 26 million tonnes per year.
Electrical power generation	Up to 160 MW	NA	NA	Up to 160 MW generated at Telfer.
Waste rock production	Up to 90 million tonnes per year	NA	NA	Up to 90 million tonnes per year
Tailings production	Up to 550 million tonnes	NA	NA	Up to 550 million tonnes total
Tailings paste plant (for underground backfill)	NA	NA	Up to 21.6 million tonnes	Up to 21.6 million tonnes

Proposal element	Existing Proposal extent, capacity, or range (Telfer MS 605, 606 and 650)	Existing Proposal extent, capacity, or range (Havieron approved Stage 1 approved under secondary approvals)	Proposed amendment (Consolidation of telfer MS 605, 606, 650 and continued operation of approved Havieron Stage 1, development and operation of Havieron Stage 2)	Combined max extent, capacity, or range
Groundwater abstraction for water supply and mine dewatering	Up to 200 ML/year (MS 605) Up to 29,700 ML/year (MS 606)	Abstraction of up to 1,550 ML/year under GWL 202749 (varied on 9/02/2024)	Continued abstraction of up to 1,550 ML/year under GWL 202749 Potential for additional abstraction of up to 450 ML/year at Havieron	Abstraction of up to 31,900 ML/year
Greenhouse gas emissions				
Construction				
Scope 1	Estimated at less than 30,000 t CO ₂ -e	27,132 t CO ₂ -e	Predicted addition of less than 20,000 t CO ₂ -e for all sources.	Predicted to be less than 77,132 t CO ₂ -e
Scope 2	0 t CO ₂ -e	0 t CO ₂ -e	0 t CO ₂ -e	0 t CO ₂ -e ¹
Scope 3	Not assessable at the time	Included in combined Havieron GHG assessment	Estimated at 311 kt CO ₂ -e	Estimated at 311 kt CO ₂ -e
Operation				
Scope 1 Annual average ²	127 356 t CO ₂ -e	Included in combined Havieron Stage 1 and Stage 2 assessment	A predicted addition of 123,510 t CO ₂ -e	250,865.2 t CO ₂ -e
Scope 1 Total Life of Mine	1,655,625 t CO ₂ -e total emissions for all sources over Life of Mine (LOM)	Included in combined Havieron Stage 1 and Stage 2 assessment	A predicted addition of 1,605,626 t CO ₂ -e	A predicted total of 3,261,251 t CO ₂ -e
Scope 2	No scope 2 emissions due to electricity generation from the onsite power station.			0 t CO ₂ -e

¹ No purchased electricity at either Telfer or Havieron and construction power is diesel generators and therefore included in Scope 1 estimation.

² Peak annual average is equivalent to annual average LOM. Electricity is generated on site and there is no peak/off peak draw from the state power grid.

Proposal element	Existing Proposal extent, capacity, or range (Telfer MS 605, 606 and 650)	Existing Proposal extent, capacity, or range (Havieron approved Stage 1 approved under secondary approvals)	Proposed amendment (Consolidation of telfer MS 605, 606, 650 and continued operation of approved Havieron Stage 1, development and operation of Havieron Stage 2)	Combined max extent, capacity, or range
Scope 3	Included as combined assessment			A predicted annual average of 185 kt CO2-e per year
Rehabilitation				
Progressive rehabilitation at completion or redundancy of feature will be undertaken over the life of the mine to achieve a safe stable and functioning landform which is consistent with the surrounding landscape and other environmental values. Rehabilitation complete within 10 years of cessation of operations.				
Commissioning				
NA				
Decommissioning				
Removal of above-surface and buried infrastructure within 5 years of cessation of operations. Closure of the project will leave the site in a safe stable condition such that tenements can be relinquished without any future liability for the proponent or the community.				
Other elements which affect extent of effects on the environment				
Maximum project life	Approximately 25 years (2027) (MS606) Scheduled depletion of mineral resource 2027.	NA	Additional 18 years	43 years
Construction Phase	NA	NA	~2.5 years	~2.5 years
Operations Phase	NA	NA	13 years	13 years
Decommissioning Phase	NA	NA	5 years	5 years

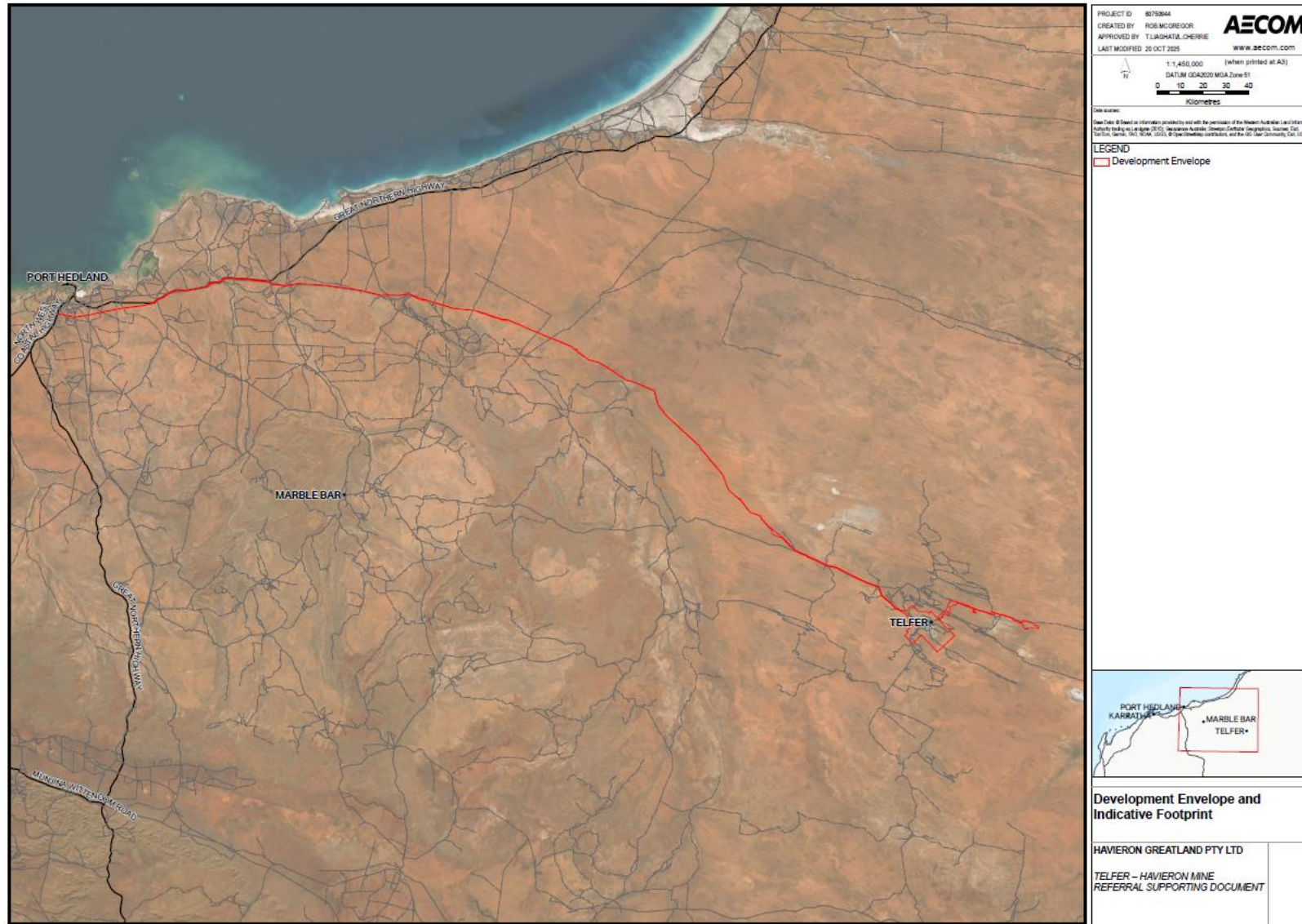


Figure 1-1: Proposal regional location

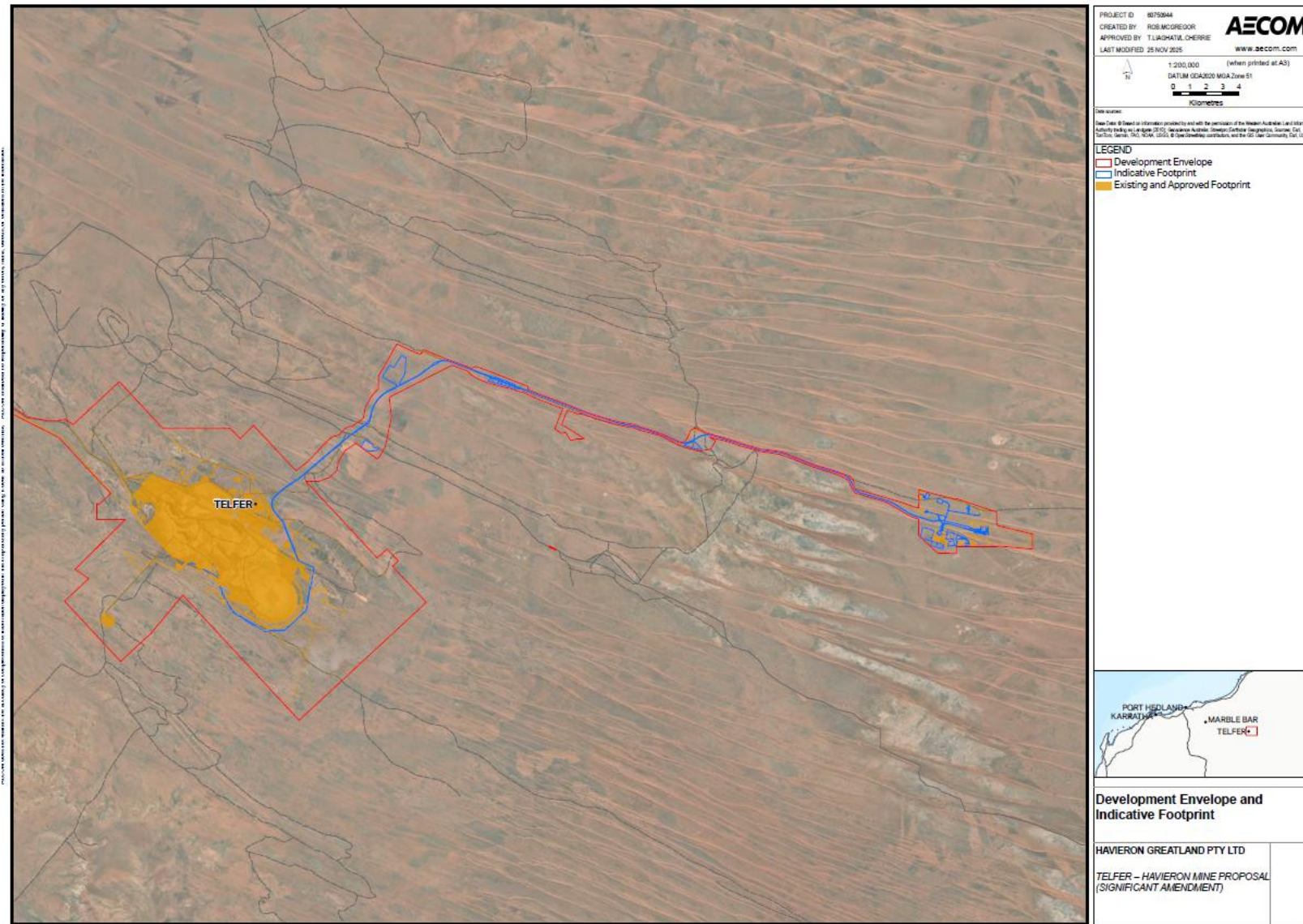


Figure 1-2: Development Envelope and land disturbance footprint – Telfer-Havieron Proposal

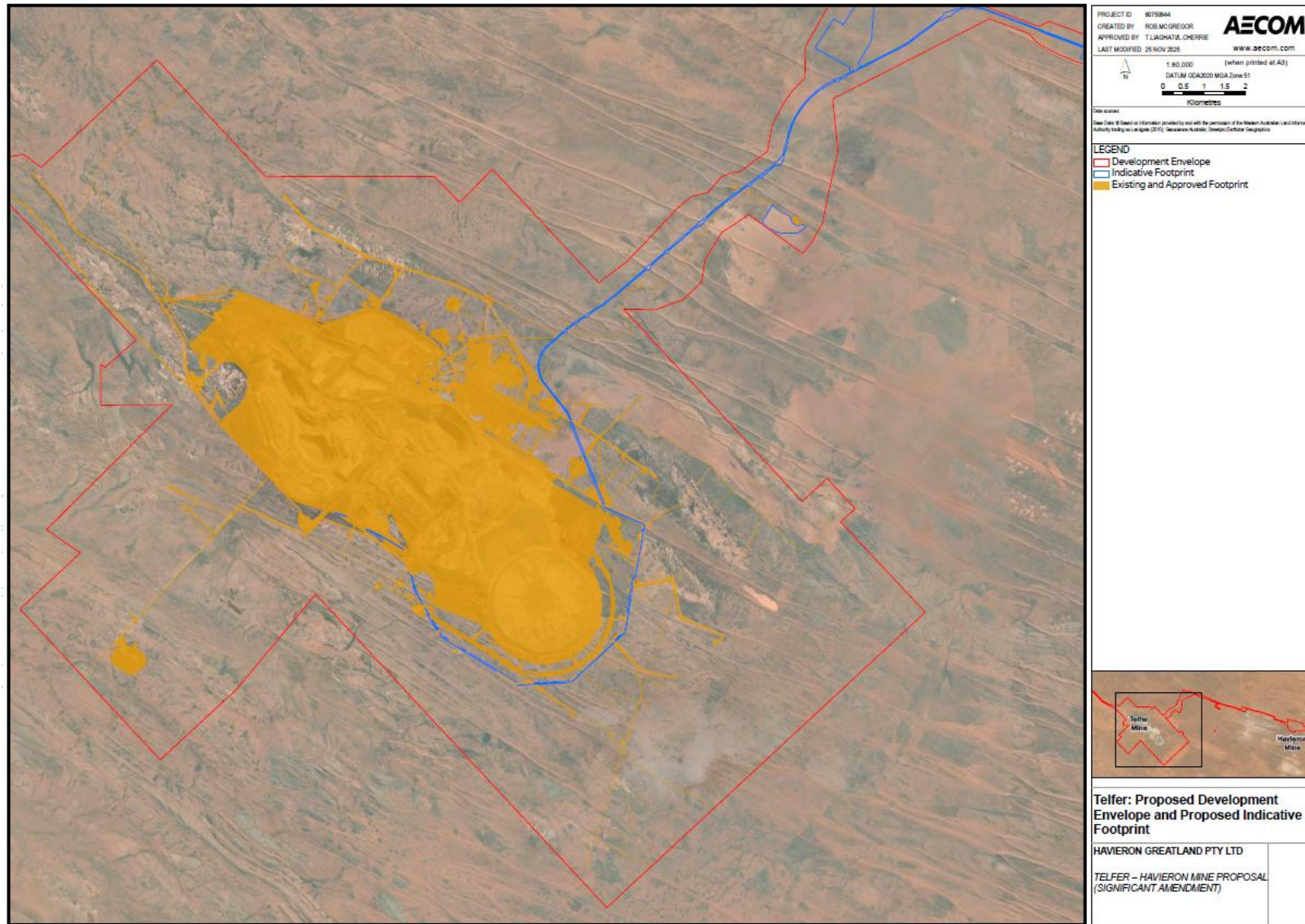


Figure 1-3: Development Envelope and land disturbance footprint – Telfer Mine

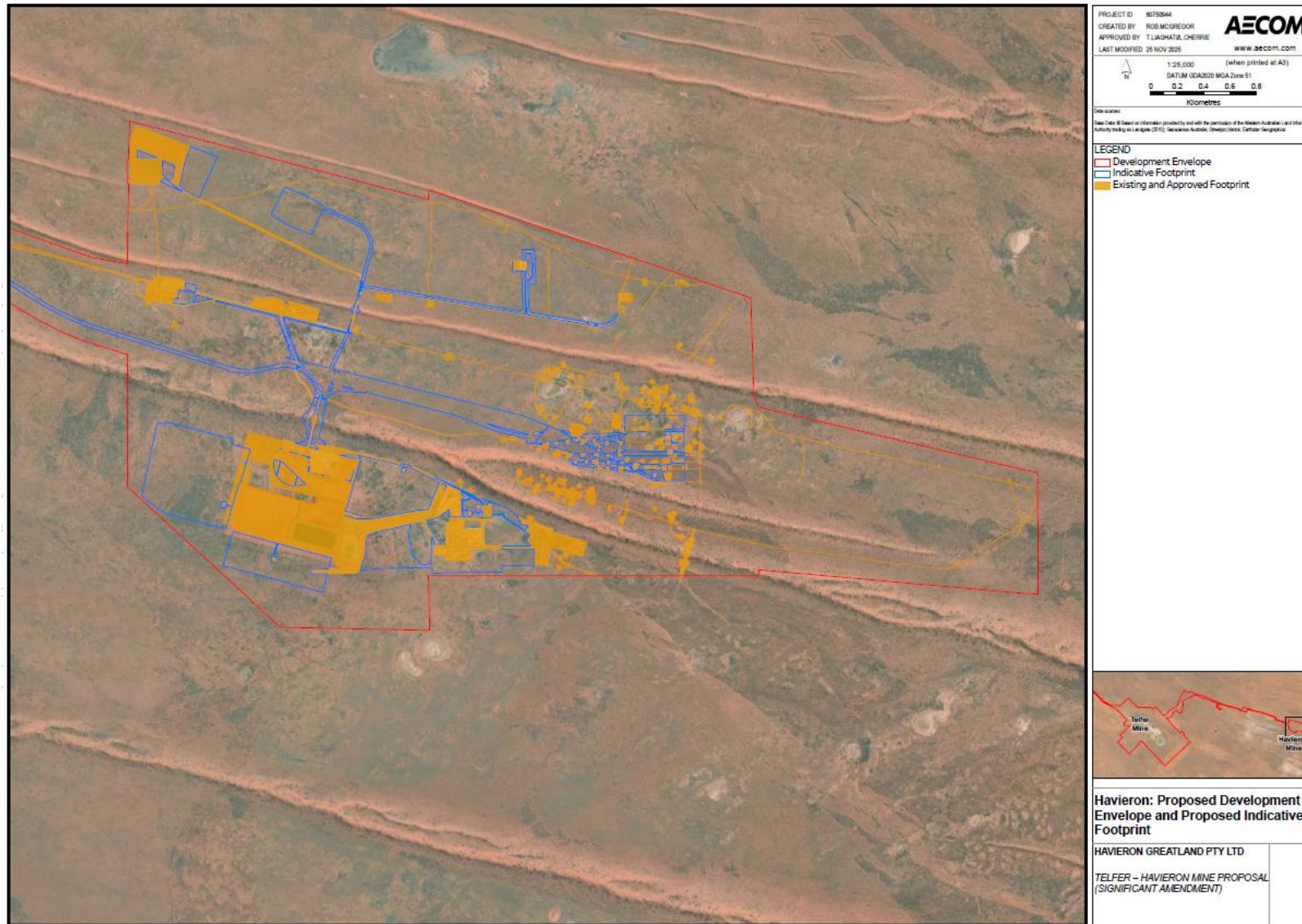


Figure 1-4: Development Envelope and land disturbance footprint - Havieron Mine

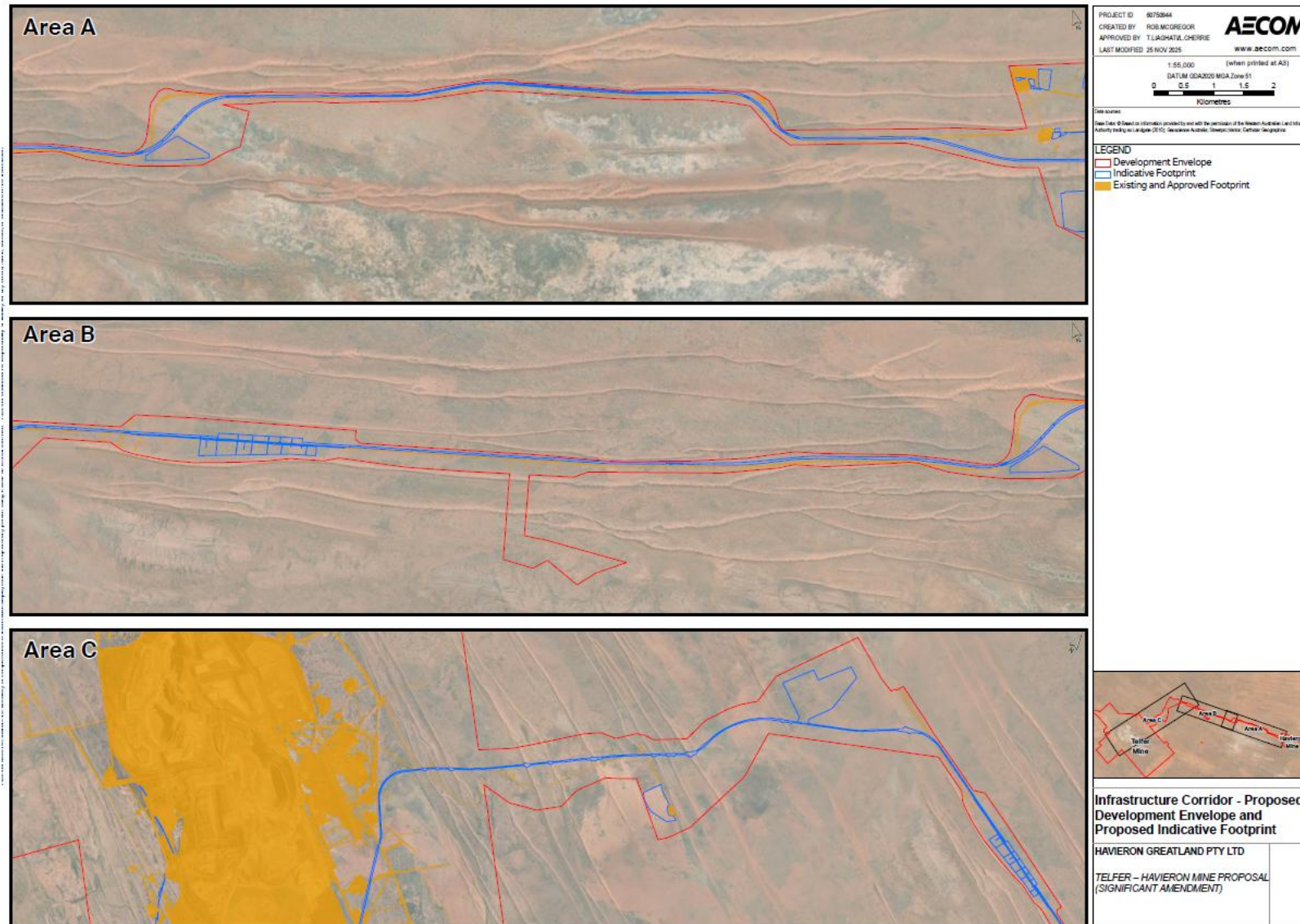


Figure 1-5: Development Envelope and land disturbance footprint - Infrastructure Corridor

1.1.1 APPROVED PROPOSAL DETAILS (TELFER)

Telfer is an open pit and underground gold-copper mine owned by Greatland with ore processing facilities and includes electrical power generation via a gas-fired power station of up to 160-megawatt (MW) supplied by natural gas along a 440 kilometre (km) long pipeline from Port Hedland in Western Australia (WA). Telfer is located in the Great Sandy Desert region as shown in Figure 1-1. It is located within the Martu People and Ngurrara Native Title Determination area on unallocated Crown Land.

The Telfer Mine was constructed in 1975 by Newmont Australia in a joint venture with BHP, and was operated until 2000, when it was placed into care and maintenance. Ownership of the Telfer Project was transferred to Newcrest Mining Limited (Newcrest) and, in 2002, two related proposals were referred to the EPA for assessment:

- Telfer Project Power Supply and Infrastructure Corridor (Assessment 1444); and
- Telfer Project Mine and Borefield Extensions (Assessment 1445).

The EPA (EPA; 2002a, 2002b) identified key factors as relevant and concluded at the time that, due to remote location and in a fairly uniform environment, it did not raise any major site-specific environmental issues. The predicted environmental impacts were not considered significant at the regional scale, and the EPA concluded that environmental systems and procedures would be put in place to properly manage and minimise those impacts.

Following assessment, the Minister for the Environment published the following Ministerial Statements and amendments:

- MS605: Telfer Project Power Supply and Infrastructure Corridor (1 Oct 2002)
- MS606: Telfer Project Expansion of Gold Mine (1 Oct 2002) and four additional amendments
- MS650: Telfer Project Power Supply and Infrastructure Corridor – Amendment to Conditions (27 May 2004) purpose of adding a condition (Fauna Management – Open Trench) to MS605.

The proposal is to construct and operate a new mine to access the identified Havieron gold-copper deposit for processing at the existing Telfer facility. This is considered to be a significant amendment to the existing approved Telfer Gold Mine and together they form the Telfer – Havieron Gold Mining Project. If approved, these facilities will operate under a single Ministerial Statement.

Existing Telfer aspects are discussed throughout this RSD where necessary for local context and regionally for socioeconomic benefits and assessment of cumulative impacts.

1.1.2 S.40AA SIGNIFICANT AMENDMENT DETAILS (HAVIERON)

Havieron is a greenfield gold-copper deposit located approximately 45 km east of the Greatland Telfer Gold Mine. The proposed mine comprises clearance of up to 630 ha of land within a development envelope of 36,637 ha for:

- Development and operation of an underground mine for the recovery of gold and copper ore and haulage to Telfer for processing at existing facilities (also owned by Greatland), with an operational life of 13 years followed by rehabilitation
- Construction and operation of a 55km infrastructure corridor between Havieron and Telfer for the haulage of ore and backload of tailings for production of paste backfill, water pipeline, electricity, borrow material, and other materials and items as required
- Expanded surface infrastructure, including a waste rock landform, infrastructure for paste production, additional evaporation ponds and associated pipelines and silt ponds, fleet management and administration, and accommodation.
- Continuation and expansion (if required) of the mine dewatering program, with abstraction of up to 2 gigalitres (GL) per year of groundwater for use on site, with any surplus sent to lined evaporation ponds.

Key aspects of the Significant Amendment are detailed in Table 1-3.

Early works activities began in December 2020 for the purpose of resource definition, determining a suitable soft rock mining method, and feasibility assessment. Approvals were based on detailed baseline environmental and cultural heritage surveys, and targeted pre-clearance cultural heritage and fauna surveys. At that stage, the WA Environmental Protection Authority (EPA) did not require referral. A permit was granted for native vegetation clearing under the *WA Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, and Mining Proposal (RegID 89453) issued by the WA Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) under the *WA Mining Act 1978*, along with Works Approval for construction of evaporation ponds. Early works activities on tenements M45/1287 and L45/582 included: clearance of 147 hectares (ha) and use of 56 ha of existing approved disturbance; underground mine development; temporary office, workshop and accommodation facilities; 29 ha of hypersaline water containment cells (1-3) and silt ponds for mine dewater; 6 ha Waste Rock Landform; bore field; access roads; borrow pit; batch plant; and temporary ancillary services. The access road from Telfer was later widened from 4.5m to 10m and additional resource definition bores approved under DEMIRS Program of Works (POW).

The project has now defined the resource and confirmed the intent to move forward with final feasibility and design for the project. Mine development ceased in November 2023 pending EPBC referral 2021/9085 assessment, and assessment under Part IV of the Western Australian *Environment Protection Act 1986* (EP Act).

Table 1-3: s.40AA Significant Amendment details

Aspect	Detail
Indicative Footprint (IF)	Up to 630 ha of native vegetation clearance
Estimated life of Havieron Mine	18 years including 5 years of rehabilitation
Havieron Underground mine	- Development of the underground mine below 420 mbgl for extraction of 2 – 4 Mtpa gold-copper ore through Sub-Level Open Stoping (SLOS*) method - Underground crusher *SLOS offers lower technical risk and significantly reduces environmental and cultural impacts
Mine surface infrastructure	- Underground (UG) mine ventilation system - Paste plant for production of approximately 70m3 per day of backfill for ground supports - Run Of Mine (ROM) pad for storage of ore - Development of a 12 ha Waste Rock Landform - Emulsion and explosive storage - Maintenance and fabrication workshops Note that there are no ore processing or Tailings Storage Facilities at Havieron, with these remaining at the existing approved Telfer Mine.
Mine dewatering	- Continued and expanded (if required) groundwater abstraction (mine dewater and borefield) under GWL202749(4) with an anticipated maximum take of up to 2 GL per year (subject to licence variation). - Three lined Hypersaline Water Cells (Ponds 4 – 6), to complement the existing cells (Ponds 1 – 3) and associated silt traps and dewatering pipeline and groundwater monitoring bores.
Facilities and health infrastructure	- Demountable administration complex, including offices, first aid and emergency services, workshop, warehouse and laydown areas 250-person camp with associated Waste Water Treatment Plant and potable water system - Communications Tower - Raw water pond for storage of water from Telfer and abstracted under GWL202749(4).
Infrastructure corridor and roads	- Infrastructure corridor from Havieron mine (M45/1287) to Telfer Process Plant via L45/636 comprising: 55 km haul road with 2 coat seal suitable for triple and quad prime mover haulage - Overland pipeline to transport raw water from Telfer - HV powerlines (66kV) - Approximately 30km of internal site roads. - Borrow pits for extraction of construction materials.

The Indicative Footprint is fixed at 630 ha but may be modified within the s.40AA development envelope as a result of targeted pre-clearance surveys. The siting of infrastructure within the Indicative Footprint is also conditional upon detailed design configuration and pre-clearance surveys. The proposed construction timeframe is summarised in Figure 1-6.

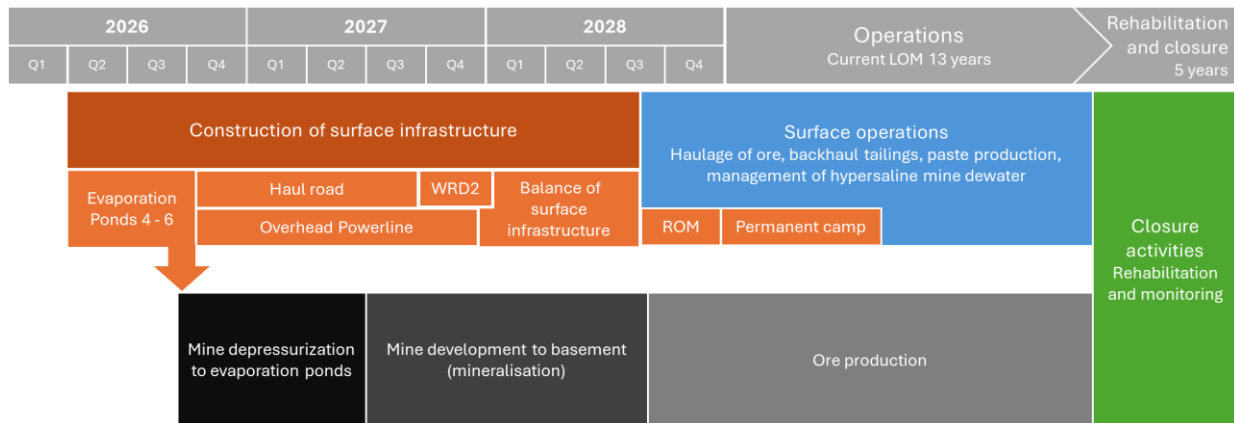


Figure 1-6: Havieron construction schedule summary

1.2 PROPOSAL ALTERNATIVES

The Havieron Project is crucial to extending the life of Telfer's processing plant (albeit at a reduced rate), which is due to end in 2027 based on current mineral reserves. The Telfer Project currently employs around 1,700 personnel (contractors and employees). It also provides support to Martu communities, and planning for life after Telfer is a priority for JYAC. The following benefits of the Significant Amendment and continued operation of the Telfer site are noteworthy:

- Continued sociocultural and economic investment in Martu through extension of the Social Investment Plan and ILUA commitments, including the payment of mining royalties at 0.5% of realised revenue into a Trust
- Operational revenue stream to the WA government through the payment of taxes, and royalties paid at 2.5% for Gold and 5% on other base metals
- Economic contribution from significant capital investment, with a 'source local' philosophy seeing those funds preferentially spent within Western Australia
- Construction phase employment averaging 360 people over the 2-year construction period
- Direct and ongoing employment for the operational period of Havieron estimated at up to 595 people (noting the reduction in processing capacity after depletion of the Telfer mineral resource)
- Indirect employment through partnering contractors and flow on effects to offsite suppliers throughout the operational phase.

In addition to socioeconomic benefits, 15-30% of revenue is from copper, which is a Strategic Material listed by the Australian Government due to its importance in the global transition to net zero.

The alternative to the development of Havieron is to close the Telfer site after the planned depletion of mineral resource. Extending the life of the Telfer allows for realisation of the socioeconomic and other benefits outlined above. The feasibility study has considered multiple project configurations, and the use of existing infrastructure is the most efficient and effective option.

The location of surface infrastructure for both Telfer and Havieron is limited by the need for proximity to the ore bodies. However, there is some flexibility in the selection of the infrastructure corridor route connecting these two sites. The following changes were made to preliminary designs for the infrastructure corridor and are included in the Significant Amendment:

- Use of existing tracks and cleared areas
- Siting based on fauna habitat surveys, with targeted survey undertaken for Night Parrot to ensure that no disturbance is caused to critical nesting or roosting habitat
- Early and ongoing engagement with the Traditional Owners has resulted in a footprint that avoids or minimises impacts to key landscape features that are also of high cultural importance, namely the sand dunes, ridgelines and claypans.

Beyond these changes, there are no feasible alternative options for the reduction of environmental impacts, particularly considering that the major component of the Telfer-Havieron Project is an existing operation. Suitable avoidance and mitigation measures are proposed to ensure the socioeconomic benefits are not at the expense of biodiversity and protected matters, and that Havieron can be developed in line with Traditional Owner expectations.

Approval of the Significant Amendment does not prejudice the meeting of all existing and likely future environmental and cultural obligations. Existing and future contingent environmental liabilities are able to be resolved through progressive rehabilitation and mine closure planning.

1.3 LOCAL AND REGIONAL CONTEXT

1.3.1 TRADITIONAL LANDS

The combined Telfer-Havieron Proposal is located within the traditional lands of the Martu People, which extend across much of the Gibson, Great Sandy and Little Sandy deserts. The Martu People hold exclusive possession of native title rights and interests to some 130,000 km² of land around and to the east of the Significant Amendment and the rights also extend to flowing and subterranean water.

Jamukurnu-Yapalikurnu Aboriginal Corporation (JYAC) is the registered native title body corporate that administers and manages the native title land on behalf of the Martu People and an ILUA has been entered into and registered with the Native Title Registrar. Strict cultural heritage restrictions apply under the ILUA that governs all development on Martu land within a 60km radius of Telfer Mine.

Regionally, the following areas are present but not impacted by the proposal:

- Karlamilyi National Park is located 26 km southeast of the Havieron Project area and has important cultural significance for the Martu People, and is surrounded by the Martu native title determination
- Martu manage two significant Indigenous Protected Areas (IPAs) in the local area. One of the IPAs (the Warla-Warrarn Martu IPA) covers Lake Waurkarlicarly approximately 20 km north of the Telfer operation and is proposed as the location of the biodiversity offset (refer

13). The second IPA is approximately 60km from Havieron and abuts the eastern boundary of the Karlamilyi National Park, with a portion covering the Percival Lakes system.

1.3.2 LAND USE

Land use in the Great Sandy Desert is predominantly tourism, mining and exploration, and remote community settlements. There are no pastoral leases within the unallocated crown lands area of Great Sandy Desert. A small percentage of grazing occurs within the bioregion (<10%), however the nearest cattle station is more than 100km from Havieron, and no known ranched stock in the vicinity.

Whilst the Shire of East Pilbara covers an area of over 372,000 km² and is the largest local government region in Australia, it has a population of less than 10,000 people. Regional communities of relevance to the Telfer-Havieron Proposal are outlined in Section 8 Table 8-4.

The nearest established mine is the Woodie Woodie manganese operation, almost 100 km west of Telfer. Nifty Copper Mine (currently in care and maintenance) is also located 95km west of Telfer. Active mineral exploration by a number of parties occurs within the Paterson Province.

Access to the Great Sandy Desert is by air, with Telfer being the closest airport to the Havieron project, and by unsealed roads and tracks. There is no rail infrastructure.

1.3.3 REGIONAL SURFACE WATERS

The Havieron Project is classified as being part of the Sandy Desert River Basin within the Western Plateau drainage division. The Sandy Desert River Basin is an internally draining basin with a catchment area of approximately 43,752,400 ha.

While there are no permanent surface water bodies, there are seasonal salt lakes of ecological and cultural importance. The most significant of these is the Lake Dora (Rudall River) system – WA041, which is the nearest DCCEEW listed Important Wetland (WA041). The system is located within the Rudell River National Park that provides for a wholly protected catchment³. Lake Dora is located 35 km southeast of the Significant Amendment area and receives periodic freshwater inflows from the southwest via the Rudall River, and from the southeast via a chain of lakes. These short, ephemeral creeks and rivers only flow after heavy rainfall.

Ephemeral clay pans and playa lakes are widespread within the region, being fed by run-off from adjacent dunes and minor creeks. There are no defined drainage lines within the Project area. Runoff is derived from linear, westerly-trending sand dunes that discharge after heavy rainfall as sheet flow and accumulates into widespread clay pans and playa lakes where it temporarily ponds where it infiltrates and evaporates.

³ DCCEEW Directory of Important Wetlands, accessed 30/04/2024.

There are no major streamlines or rivers located within a 10 km radius of the Project Area (WA Department of Water and Environmental Regulation [DWER] Hydrography Linear spatial dataset; Landgate dataset LGATE-053).

The Havieron Project is at an elevation of around 250 m Australian Height Datum (AHD), and the topography grades to the west towards the Percival Paleovalley (discussed further in 11.3.3). The Percival Paleovalley sits approximately 5 km from the Havieron Project and is a large valley running NW-SE at an elevation of around 242 m AHD between Havieron and Telfer.

1.3.4 REGIONAL AND LOCAL GROUNDWATER

Havieron is in the Paterson Province, to the east of the Archaean Pilbara Craton. Multiple deformed and metamorphosed Palaeo- to Mesoproterozoic sedimentary and igneous rocks of the Rudall Complex form basement in the area (Hickman and Bagas, 1998; Bagas, 2004) and are overlain by sedimentary rocks of the Neoproterozoic Yeneena and northwest Officer basins. These are in turn overlain by Phanerozoic sedimentary rocks of the Canning Basin. At Havieron, the Canning Basin includes the early Permian Paterson Formation. The Paterson Formation is laterally equivalent to the Grant Group, plus the Poole Sandstone, and the mid-Permian Triwhite Sandstone (Liveringa Group) which are well exposed elsewhere in parts of the Canning Basin such as along the shores of Lake Dora to the SE of Havieron.

Non-glaciogenic paleo valleys (i.e. formed by ancient rivers) such as the Percival Paleovalley are of presumed Cenozoic age. In places, these river valleys have been incised down to the Permian sediments. Away from the paleo valley, the surface geology is dominated by Quaternary-aged aeolian sand dunes (red sands), characteristic of the Great Sandy Desert. About 30 km west of Havieron, remnants of the Permian-Carboniferous fluvio-glaciation landforms outcrop. However, regionally the topographical lows of interdunal swales where the superficial deposits have completely eroded, the Permian-aged Paterson Formation is exposed.

Locally, the depth to the water table is generally greater than 10m at the Havieron mine site, becoming shallow to the west (up to 5m below ground level). The Havieron development area is intersected by three main aquifers hosted within the Permian Paterson Formation. Hydrogeological investigations and conceptual modelling have been undertaken for the proposal and is discussed in 11.3.

1.3.5 GEOLOGY

The Great Sandy Desert region is underlain by a range of Precambrian, Mesozoic and Cainozoic materials. Precambrian rocks form outcrops in the southern part of the Great Sandy Desert region. Mesozoic sedimentary rocks (Purcell & Purcell 1994) form sub crops throughout the entire desert region, forming as ranges, local hills, mesas, buttes and exhumed rock pavements (Van Etten 2019). A vast sheet of red aeolian sediment, late Cainozoic to Quaternary in age, forms the near-surface materials through the entire desert (Van Etten 2019).

Regionally, the Havieron Project Area is within the Paterson – Yeneena province (zone 152) (Tille 2006) which overlies the north-western Patterson Orogen and Yeneena Basin.

The Yeneena Basin contains Mesoproterozoic and Neoproterozoic sandstone, shale and carbonate. Also included is a small portion of the Waukarlycarly Embayment (Canning Basin) which contains Phanerozoic sedimentary rocks (Tille, 2006). These are in turn overlain by Phanerozoic sedimentary rocks of the Canning Basin. At Havieron, the Canning Basin includes the early Permian Paterson Formation.

The Permian overlaying the Havieron deposit comprises inter alia tillite and free running sands. Accessing the mineral resource required early works to develop a hybrid mining method combining traditional mining with civil tunnelling, which is globally unique.

1.3.6 CLIMATE

The Great Sandy Desert is a dry arid area, with the resultant distinctively desert vegetation that comprises the Western Australian Eremaean Botanical Province region (Department of Biodiveristy, Conservation and Attractions). Long-term monitoring at the Telfer Bureau of Meteorology classifies it as Tropical Semi-arid, with cyclones being a major source of rain, crossing the coast on average every 1-2 years, and bringing 200-400 mm of rainfall for a given cyclonic event (BOM 2023).

The Havieron Project Area is 45 km (direct) from Telfer, which receives an average annual rainfall of 363.8 mm (data from 1974 – 2023 [Station 013030, BOM 2023]), refer Figure 1-7. Most of the rainfall occurs in the summer months, with February being the wettest month with an average of 96.8 mm. Temperature data is also shown on Figure 1-7, with December having the highest mean maximum temperature with 42.7 °C. The highest maximum daily temperature was also in December with 46.1°C. The lowest daily temperature was 14.7 °C in July. The annual mean BOM daily evaporation is approximately 11.3 mm. Predominant winds are shown in Figure 1-8.

Official Telfer Aero BOM data is presented to agency assurance processes. However, two onsite meteorological stations have been established to provide comparative data with the official BOM site at Telfer and ensure design assumptions are correct for Havieron. As expected, the overall annual precipitation measured at onsite weather stations is equivalent to BOM recordings at Telfer, although individual rain events are generally received by either Telfer or Havieron but not both sites concurrently.

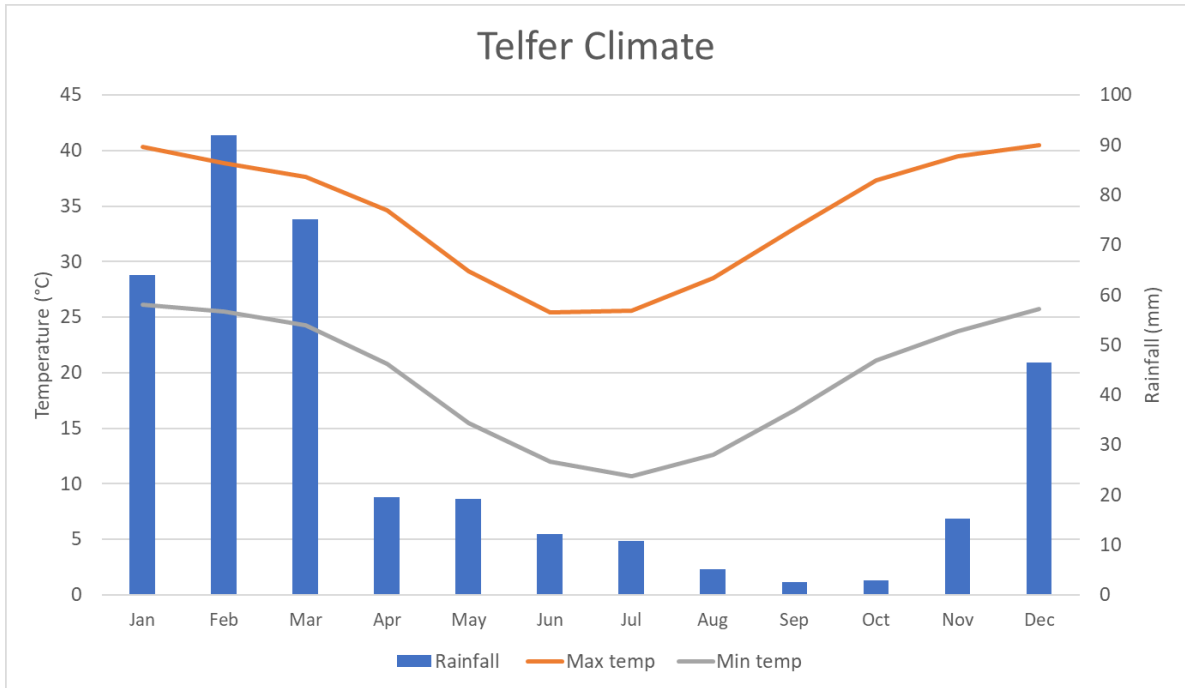
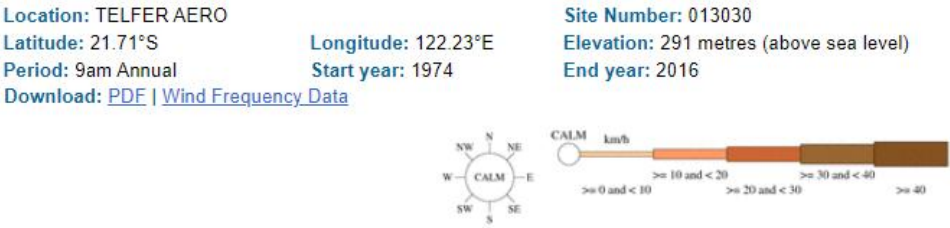


Figure 1-7: Telfer Rainfall and Temperature (BoM, 2024)



9 am
15147 Total Observations

Calm 1%

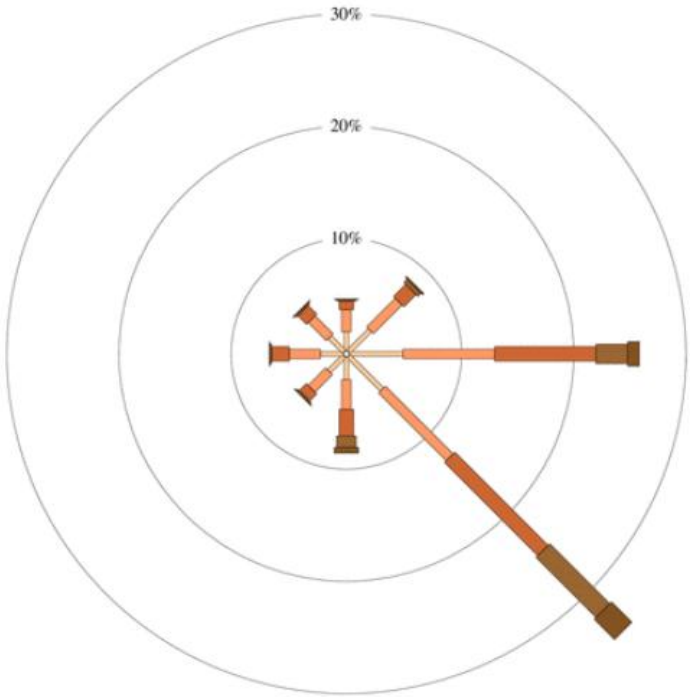


Figure 1-8: Telfer Wind Rose (BoM, 2024)

1.3.7 BIOGEOGRAPHIC REGION

The Great Sandy Desert (GSD) comprises an Interim Biogeographic Regionalisation for Australia (IBRA) bioregion of 395,250km², with the majority located within central north of Western Australia. The Havieron Project Area of 39.8km² is located within the 186,367km² Mackay subregion (GSD2).

GSD2 comprises open hummock grassland of *Triodia pungens* and *T. schinzii* with scattered trees of bloodwood (*Corymbia spp.*), and shrubs of *Acacia spp.*, *Grevillea wickhamii* and *G. refracta*. Gently undulating laterised uplands support shrub steppe, such as *A. pachycarpa* shrublands over *T. pungens* hummock grass. Calcrete and evaporite surfaces are associated with occluded paleo-drainage systems that traverse the desert; these include extensive salt-lake chains with samphire low shrublands, and *Melaleuca glomerata* - *M. lasiandra* shrublands (Kendrick 2001).

The Karlamilyi National Park (R 34607) is located 26 km southeast of the Havieron Project area and encompasses over 1.3 million ha between the Great Sandy Desert and the Little Sandy Desert. The area is characterised by desert dunes, spinifex grasslands, salt lakes and weathered plateaux and comprise of a central belt of stony hills and undulating plains. The National Park has important cultural significance for the Martu but is not impacted by the Havieron proposal.

1.3.8 VEGETATION

The vegetation of Western Australia, including within the Great Sandy Desert (GSD) was mapped at the 1:1,000,000 scale by Beard (1975) and was subsequently reinterpreted and updated to reflect the National Vegetation Information System (NVIS) standards (NVIS Technical Working Group 2017). There are two Regional Vegetation Associations relevant to the proposal: Vegetation Association 134; and Vegetation Association 157. The Havieron significant amendment is predominantly Vegetation Association type 134 (Hummock grasslands, grass steppe and soft spinifex), with 99.44% of vegetation to remain uncleared (refer Table 5-4).

Fire has shaped the vegetation of the Pilbara and been a factor in determining vegetation and community structure. Fire history is shown in Figure 5-3 and impacts discussed in 0.

1.3.9 INTRODUCED SPECIES

The following introduced species occur both within the Telfer–Havieron development envelope and regionally, based on formal surveys⁴, recordings, and anecdotal evidence. These are listed with a description of the threat they pose to significant species and supporting habitat:

Feral cat (*Felis catus*) is present in 99.9% of Australia's land area and are known to be a major threat to terrestrial mammals and ground-dwelling or ground-nesting birds up to 4kg.

⁴ A Threatened Species Program Plan for Martu WDLAC Native Title Lands, Rangelands Region of WA, Stakeholder Report, September 2009. Department of Environment and Conservation.

Cats are considered a significant threat to Greater Bilby and Night Parrot populations due to their threatened species status, critical weight range, and ecological uncertainty around the population capacity to withstand predation (DCCEEW, Threat abatement plan for predation for feral 2024).

Red Fox (*Vulpes vulpes*) are highly adaptive and present throughout a myriad of habitat types within mainland Australia. They are known to be a major threat to fauna within the same critical weight range and profile as those targeted by cats, although their abundance in the Pilbara is likely to be lower than cats. Eradication programs for cats also tend to include foxes.

Camel (*Camelus dromedarius*) were originally introduced to Australia in 1840 and now living as feral populations in arid regions. They compete for water and native vegetation as a food source and, whilst soft footed, can cause degradation to habitat.

Baseline data at Havieron for the above listed invasive species are provided in the proposed Significant Species Management Plan (Appendix J) to ensure feral animal controls are measurable and suitable triggers and thresholds applied.

Whilst dingo and dingo/dog hybrids do predate upon reptiles, terrestrial mammals and ground-dwelling or ground-nesting birds they are not included in mitigations due to the inverse relationship between high dingo numbers and low cat numbers⁵. Their presence is considered to be of net benefit to species through control of cat and fox populations.

Rabbits, donkeys, mice and European rat were noted in desktop assessment but are not pertinent to the Havieron proposal. Fortunately, Havieron and surrounds are not impacted by feral pigs, unmanaged goats or unfenced stock.

Some weed incursions have occurred around facilities at Havieron (refer Section 5) however there are no uncontrollable incursions and no Weeds of National Significance (WoNS). These are however a feature at the associated Telfer Mine and remain a focus for ongoing weed management.

2. LEGISLATIVE CONTEXT

2.1 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

This document has been prepared in accordance with *EPA instructions on how to prepare an Environmental Review Document (EPA 2021b)* to support referral of the Significant Amendment under EP Act s.38. It describes the specific studies and assessments in relation to key and other environmental factors, with the objectives being to:

- Ensure that the environmental and cumulative effects of the s.40AA Significant Amendment are properly understood

⁵ DCCEEW European Red Fox (*Vulpes vulpes*) Fact Sheet; DCCEEW Background document for the Threat Abatement Plan for predation by feral cats, 2008

- Inform environmental impact assessment and mitigation measures based on specialist studies and surveys
- Present information to allow for public comment on the proposal and ensure submissions have been considered in the avoidance and mitigation of impacts.

The Havieron Project has been referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the EPBC Act due to potential significant impacts to Matters of National Environmental Significance (MNES) (Greater Bilby and Night Parrot, refer significant impact assessment in Section 14.3). DCCEEW has determined the Havieron Project to be a Controlled Action (2021/9085) with assessment on Preliminary Documentation occurring concurrent with EPA referral. The Telfer Project was determined as Not a Controlled Action in 2002 (2002/787).

2.2 OTHER APPROVALS AND REGULATION

Decision-making authorities and required approvals relevant to the Telfer – Significant Amendment are outlined in Table 2-1. It should be noted that the existing Telfer ILUA is the primary permissive to development of Native Title land and is in place for areas within 60km of the Telfer Mine.

It should be noted that the Department of Planning, Lands and Heritage are not listed as a decision-making authority because no Section 18 applications under the *Aboriginal Heritage Act 2021* are required for the s.40AA Significant Amendment. Heritage Surveys have been undertaken by Martu within the indicative disturbance footprint, and all areas will be surveyed prior to clearing. These surveys will be undertaken by Martu prior to ground disturbance.

Martu have identified areas of cultural significance in the Development Envelope. The Indicative Footprint has been designed to avoid these areas. Martu will continue to undertake heritage surveys as required and will monitor aspects of project construction to ensure ILUA obligations are met. Martu and Greatland will continue to work collaboratively under the ILUA.

Table 2-1: Decision-making Authorities

Decision-making authority	Legislation or Agreement relating to the activity	Approval required
Cth Department of Climate Change, Energy, the Environment and Water (DCCEEW)	<i>Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 (Cth)</i>	The Telfer Project was referred under the EPBC Act in 2002 and assessed as Not a Controlled Action. Stage 2 of the Havieron Project (2021/9085) was referred under the EPBC Act on 25 October 2021 and determined as a Controlled Action on 20 December 2021 based on the presence of Matters of National Environmental Significance (threatened species). Assessment by DCCEEW based on preliminary documentation, and occurring concurrent with this EPA Referral.
Jamukurnu Yapalikurnu Aboriginal Corporation (JYAC)	<i>Native Title Act 1993 (Cth)</i> Indigenous Land Use Agreement (ILUA)	Approval required to develop land under exclusive Native Title. ILUA with JYAC, the Prescribed Body Corporate (PBC) registered in 2015 in accordance with the provisions of the Native Title Act. The ILUA supersedes all former agreements with the Martu People. Under the ILUA the Martu People agree to all mining tenements, titles and approvals for Greatland to carry out mining operations at the Telfer Gold Mine 'project area', being the area within a 60 km radius around the mine, except for the Karlamilyi National Park. This is conditional on ongoing consultation with the JYAC, oversight by Martu, and royalties paid at 0.5% of realised revenue
WA Environmental Protection Authority (EPA)	<i>Environmental Protection Act 1986 (WA) (Part IV)</i>	Ministerial Statement and conditions issued after assessment of this referral.
WA Department of Mines, Petroleum and Exploration (DMPE) (formerly DEMIRS)	<i>Mining Act 1978</i>	Mining Proposal and mine closure plan approved by DEMIRS (now DMPE). Havieron Project has an approved Mining Proposal RegID 121684 (formerly 89453) and Mine Closure Plan (RegID 101161) for Stage 1 early works (decline development to 420 mbgl and associated infrastructure but no mining of ore or further clearance). The current Mining Proposal and Mine Closure Plan for early works will be revised to include the development and operation of the Havieron Project should EPA approval be granted.
WA Department of Water, Environmental and Regulation (DWER)	<i>Environmental Protection Act 1986 (WA) (Part V)</i>	Telfer – Havieron require prescribed premises licence and Works Approval for construction of surface infrastructure. Telfer has a Prescribed Premises Licence (L6079/1988/13) for its operations. An amendment to Telfer's Licence (6079/13) will be required to allow Havieron ore processing and discharge of tailings. Existing approvals:

Decision-making authority	Legislation or Agreement relating to the activity	Approval required
		- Wastewater Treatment Plant (W6435/2020/1 – Category 85 Sewage facility) with registration received (R2532/2022/1) - Havieron Evaporation Ponds 1 – 3 (L9455,2024 – Category 6 Mine Dewatering) - Havieron Stage 1 Landfill (W6691/2022/1 – Category 89 – Putrescible Landfill site) (not constructed) - Havieron Evaporation Ponds 4 – 6 Works Approval (W6972/2024 – Category 6 Mine Dewatering), only to be used should EPA and EPBC approvals be granted. Following primary approvals for further works (EPBC and WA EP Act), relevant approvals under Part V of the EP Act will be sought for surface infrastructure. The Licence for the existing evaporation ponds 1-3 will be varied for future ponds 4-6.
WA Department of Water, Environmental and Regulation (DWER)	<i>Rights in Water and Irrigation Act 1914 (WA)</i>	Approval to construct or alter well, and groundwater abstraction licence required for Havieron. Approval to supply water from Telfer to Havieron. GWL150758(16) provides for the abstraction of 29,700,000 kL on Telfer tenements for dewatering for mining purposes, dust suppression, earthworks and construction purposes, mineral exploration and mineral ore processing. Abstraction is monitored and managed in accordance with the Telfer Groundwater Licence Operating Strategy (GLOS). An amendment to GWL 150758(16) will be required for the supply and use of Telfer water to Havieron. Existing Licence to Take Water (Section 5C): - GWL204105(1) for the abstraction of 20,000 kL on E45/2962, E45/3261, E45/4701 and L45/537 for service corridor water bores for road construction, maintenance and mineral exploration purposes. - GWL202749(3) for the abstraction of 1,550,000 kL/annum (1.5 GL) on M45/1287 for mineral exploration, mining camp, mining washdown, dust suppression and construction purposes. Amendments may be required in the future: - Amendment to GWL202749(3) to 2 GL/annum depending on the water balance and mine design. - Amendment to Telfer GWL150758(16) required for any supply of Telfer water to Havieron depending on whether abstraction is insufficient for mine backfill paste production.
WA Department of Health Shire of East Pilbara	<i>Health Act 1911 (WA)</i>	Permit to construct and operate Wastewater Treatment Plant (WWTP) Existing commercial WWTP constructed and approved by the Shire of East Pilbara and WA Department of Health. Expanded WWTP may be required depending on final accommodation decisions.

2.2.1 LAND TENURE

The Telfer - Significant Amendment is situation on Unallocated Crown Land subject to the Martu native title determinations of 2002, 2013 and 2023. Most of the determination area is assigned 'exclusive possession', including the proposed Havieron Development Envelope. An Indigenous Land Use Agreement (ILUA) was executed on 4/12/2015 and registered with the Native Title Registrar for access to and development of the project area.

Within the determined Native Title areas the Significant Amendment is situated within the boundaries of tenements as shown in Table 2-2 and Figure 2-1.

It should be noted that at the time of writing this RSD, Greatland are in the process of transferring tenements held by Newcrest, who was formerly the proponent. From 2019 until Greatland acquired the Telfer - Havieron project in December 2024, the project was undertaken with Newcrest as the managing authority under a farm-in agreement with Greatland and Greatland Gold plc.

Table 2-2: Proposal Tenure

Tenement	Tenement Holder	Commenced	Area (ha)
E 45/2932	Newcrest Mining Limited	4/07/2008	8,120
G 45/1	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	18/12/1982	200
G 45/2	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	18/12/1982	200
G 45/3	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	18/12/1982	200
G 45/4	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	18/12/1982	100
L 45/106	Newcrest Mining Limited	15/01/2001	4,545
L 45/3	Newcrest Mining Limited	12/01/1983	100
L 45/68	Newcrest Mining Limited	20/12/1991	4
L 45/69	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	20/12/1991	12
L 45/73	Newmont NOL Pty Ltd	24/07/1992	13
L 45/79	Newcrest Mining Limited	19/08/1994	14
L 45/80	Newcrest Mining Limited	19/08/1994	3
L 45/99	Newcrest Mining Limited	23/08/2000	23
L 45/582	Newmont NOL Pty Ltd	16/11/2020	321
L 45/583	Newmont NOL Pty Ltd	16/08/2022	327
L 45/603	Newmont NOL Pty Ltd	22/01/2021	3
L 45/622	Newmont NOL Pty Ltd	14/07/2022	45
L45/636	Newmont NOL Pty Ltd	14/02/2022	2,428

Tenement	Tenement Holder	Commenced	Area (ha)
M 45/6	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	18/12/1982	1,000
M 45/7	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	18/12/1982	1,000
M 45/8	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	18/12/1982	1,000
M 45/9	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	18/12/1982	450
M 45/11	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	18/12/1982	1,000
M 45/33	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	22/08/1984	1,000
M 45/203	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	4/02/1986	999
M 45/204	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	4/02/1986	999
M 45/205	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	4/02/1986	1,000
M 45/206	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	4/02/1986	1,000
M 45/207	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	4/02/1986	1,000
M 45/208	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	4/02/1986	1,000
M 45/209	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	4/02/1986	1,000
M 45/211	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	4/02/1986	1,000
M 45/249	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	5/06/1987	948
M 45/632	Newcrest Mining Limited	23/11/1994	944
M 45/709	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	28/04/2016	954
M 45/710	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	28/04/2016	923
M 45/720	Newcrest Mining Limited	11/04/2016	1,000
M 45/721	Newcrest Mining Limited	11/04/2016	997
M 45/763	Newcrest Mining Limited	15/04/2016	999
M 45/764	Newcrest Mining Limited	15/04/2016	991
M 45/765	Newcrest Mining Limited	15/04/2016	989
M 45/772	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	28/04/2016	464
M 45/775	Newcrest USA, Inc. (70%); Newmont Nol Pty Limited (30%)	28/04/2016	663
M 45/1287	Newcrest Operations Limited 40%; Greatland Pty Ltd 60%	10/09/2020	3,819

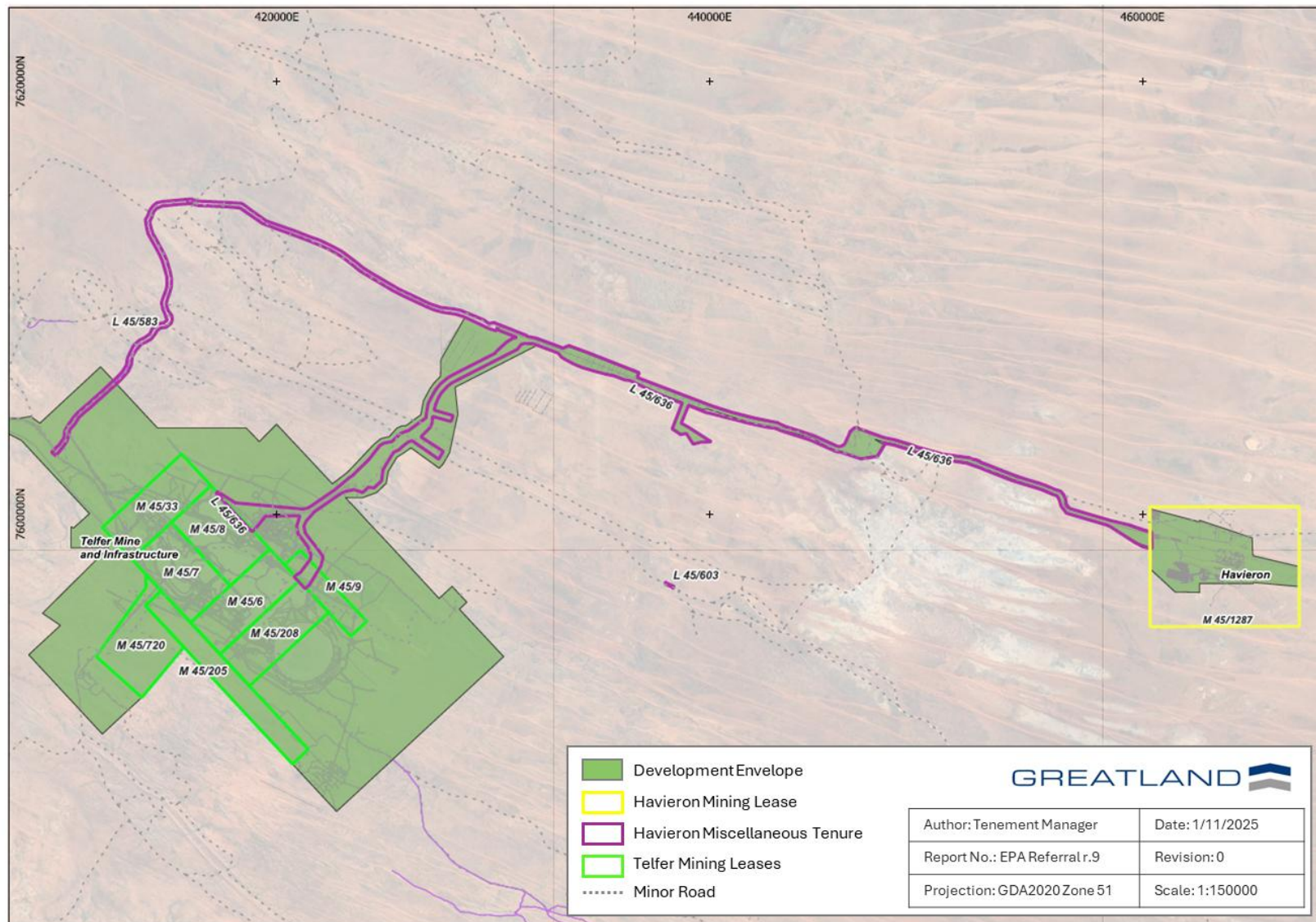


Figure 2-1: Telfer - Havieron tenure

3. STAKEHOLDER ENGAGEMENT

3.1 KEY STAKEHOLDERS AND INTERESTS

The key stakeholders identified for the Telfer-Havieron proposal are detailed in Table 3-1. Engagement commenced in 2019 for the Havieron s.40AA Significant Amendment and for the continued operation of Telfer. The engagement process is outlined in Section 3.2, with outcomes of engagement provided in Section 3.3.

Table 3-1: Key Stakeholders

Stakeholder Group	Stakeholder	Key Interests
Landowners	Martu People JYAC representing the Martu People as the Prescribed Body Corporate	Heritage/Cultural Sites Preservation of Martu social and cultural fabric Access Heritage clearances and avoidance of impacts on country Post-mining land use Indigenous Land Use Agreement (ILUA) obligations Rehabilitation and Closure Progress Responsible environmental management Responsible management of the cultural landscape Employment and business opportunities Benefit for communities.
Federal Government	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Referral and assessment under the <i>EPBC Act 1999</i> . The Havieron significant amendment has been determined a controlled action (2021/9085).
State Government	Environmental Protection Authority Service Unit (EPAS)	Assessment of referral under Part IV of the <i>Environmental Protection Act 1986</i> (EP Act) Furthering environmental protection through conformance to standards and guidelines
	Department of Water and Environmental Regulation (DWER)	Administration of the <i>Environmental Protection Act 1986</i> (EP Act) Prescribed Premises works approvals, licencing and compliance Native Vegetation Clearing Permits Surface and Groundwater Management Groundwater Licensing and Abstraction Contaminated sites
	Department of Mines, Petroleum and Exploration (DMPE) (formerly DEMIRS)	Administration of the Mining Act 1978 (Mining Act) Tenement conditions Mining Proposals Mining Rehabilitation Fund (MRF) Closure and rehabilitation Safety and health

Stakeholder Group	Stakeholder	Key Interests
	Department of Biodiversity, Conservation and Attractions (DBCA)	Administration of the <i>Biodiversity Conservation Act 2016</i> (BC Act) Flora, fauna and habitat conservation
	Minister for Mines and Petroleum Office Premier's Office Other Ministerial offices (Environment, Deputy Premier, Regional Development)	Economic/employment benefits Project approvals Biodiversity offset strategy Socioeconomic benefits of the Project Biodiversity offset strategy JYAC/Martu partnership/engagement
	Department of Planning, Lands and Heritage (DPLH)	Native title and Indigenous; requirements Heritage sites Next land use
	Department of Fire and Emergency Services (DFES)	Native title and Indigenous; requirements Heritage sites Next land use
Local Government	Shire of East Pilbara	Post-mining land use Access roads Employment and business opportunities Environmental health
Other Aboriginal organisations and communities	Yamatji Marlpa Aboriginal Corporation (YMAC) Punmu, Warralong, Gooda Binya, Kunawarritji, Strelley, Parnngurr, Jigalong, Pippingarra, Irungudji, Kiwirrkurra	Responsible environmental management Employment and business opportunities Road use Benefit for communities.
Non-government organisations and interest groups	Conservation Council of Western Australia Wildflower Society of Western Australia	Protection of conservation significant species Baseline and targeted flora and fauna survey data Population dynamics and measured ecological gain Threat abatement activities and learnings
	Nigh Parrot Recovery Team	
	Save the Bilby Fund	
Other Organisations	Neighbouring Mining Companies (Telfer Gold Mine, Antipa and Nifty)	Access agreements Use of access roads (Telfer Access Road) Use of waste management facilities

3.2 STAKEHOLDER ENGAGEMENT PROCESS

3.2.1 RELEVANT POLICIES AND GUIDELINES

The principles and process for stakeholder engagement have been informed by:

- Ministerial Council on Mineral and Petroleum Resources (MCMPR) Principles for Engagement with Communities and Stakeholders (2005)
- DCCEEW Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environmental Protection and Biodiversity Conservation Act 1999, 2023
- EPA Stakeholder Engagement Plan, December 2024 (Section 7, proponent obligations)
- EPA Environmental Factor Guideline – Social Surroundings, November 2023

3.2.2 ENGAGEMENT STRATEGY

Greatland is focused on developing and maintaining relationships with stakeholders in accordance with the principles outlined in Table 3-2. These apply throughout Life of Mine and are designed to build trust through fulfilled commitments.

Table 3-2: Principles of stakeholder engagement

Principle	Requirement
FPIC	Free, prior and informed consent.
Cultural safety	Cultural identity, wants and needs are protected, and diverse input and views are welcome
Communication	Communication must be open, accessible, clearly defined, two-way and appropriate.
Transparency	The process and outcomes of community and stakeholder engagement should wherever possible, be made open and transparent, agreed upon and documented.
Collaboration	A cooperative and collaborative approach to seek mutually beneficial outcomes
Inclusiveness	Early and genuine involvement of communities and stakeholders throughout the process.
Integrity	Community and stakeholder engagement should establish and foster mutual trust and respect.

The stakeholder engagement strategy applies to all phases of the project from operation through to final closure, and seeks to:

- Identify the full range of stakeholders with an interest in the Project (refer Section 3.1)
- Establish and maintain a consistent and coordinated approach for communication with the local community, government agencies, special interest groups and industry
- Identify known and emerging environmental, social and cultural heritage aspects of the Project which may be of interest or concern to stakeholders

- Inform stakeholders about key environmental, social and cultural heritage factors associated with the Project, and seek their view on the potential impacts and management measures to avoid or mitigate those impacts
- Consider stakeholder concerns during all phases of the Project decision-making process
- Ensure that there is timely and accurate feedback and provision of information on how impacts, concerns and issues will be managed.

3.2.3 SUMMARY OF ENGAGEMENTS

Social impact and associated studies have been used to inform consultation and are outlined in 8.3.1. Summary stakeholder engagement actions to date have included:

- Direct consultation with JYAC and Martu on project design, cultural heritage, and protection of biodiversity. Engagement utilises the pre-existing ILUA Relationship Committee with quarterly meetings and provision of all Havieron Project information.
- Community Survey co-developed with JYAC

This builds upon an existing survey that has previously been delivered in Martu communities. The survey was undertaken by JYAC staff and a number of community facilitators in late 2021 and early 2022. Entry to Martu desert communities was not possible due to COVID-19. Consequently, for surveys collected in 2022, JYAC identified Martu with interests in these communities located in Port Hedland, South Hedland, Newman and Perth.

The survey is a community-driven Martu resource that will be used to inform Greatland's understanding of baseline status and identified needs, views on Telfer and exploration in the region, and Martu concerns and aspirations regarding the Havieron Project.

- Key stakeholder interviews:

Key Martu stakeholders in community were consulted through formal and semi-formal interviews during two blocks – the first during May and June 2021 and the second between February and April 2022. Interviews were held by teleconference and telephone and included Aboriginal non-government organisation (NGO) stakeholders, Aboriginal corporation representatives, and representatives from community health, education and emergency services providers. The findings of these interviews were used to inform the understanding of community baseline issues and potential concerns and aspirations related to Havieron. In accordance with JYAC's wishes, these interviews occurred both alongside and after the delivery of the community survey.

- Workshops with JYAC:

Consultants for Greatland met with JYAC to discuss the findings of the Social Impact Assessment and obtain feedback on the potential impacts of the Havieron Project on Martu social values. In addition, Greatland has planned a workshop with JYAC with technical specialists from the environmental and social impact assessment study to support the feasibility study.

- Provision of information for 'browsing' stakeholders:

A number of stakeholders are considered 'browsers' or consumers of information and data on habitat and conservation species. No active engagement has occurred with these parties however the availability of information and public consultation occurs through Federal and State referrals, and through the ongoing submission of survey data on IBSA. The provision of data and information will occur for Life of Mine.

- Public advertising of the Telfer – Significant Amendment 24/11/2024 to 4/12/2024, and response to submissions (available on the EPA website and incorporated into this RSD revision).

3.3 STAKEHOLDER CONSULTATION OUTCOMES

Appendix A – Stakeholder Consultation Register provides details of consultation undertaken and summary outcomes recorded.

Greatland have worked closely with Martu, through JYAC, to secure the future of Telfer through the Havieron Proposal. This has been designed in consultation with JYAC, monitored by Martu, and all raised issues have been addressed. JYAC in their role as representing Martu, have provided a letter of support for the Telfer–Havieron Project and the continued involvement of Martu in protection of ngurra. Their support remains conditional upon fulfilment of commitments under the ILUA. This letter of support is provided in Appendix B.

A further letter of support for the proposed Offset has also been provided and is appended to the Offset Management Plan in Appendix zEE.

4. OBJECT AND PRINCIPLES OF THE EP ACT

4.1 PRINCIPLES

Table 4-1 describes how Greatland has given regard to the object of the *Environmental Protection Act 1986*, being to protect the environment through the application of principles, and how these principles have been considered in the proposal.

Table 4-1: Consideration of Object and Principles of the EP Act

Principle	Consideration
1. The precautionary principle <i>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</i> <i>In application of this precautionary principle, decisions should be guided by:</i> - careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and - an assessment of the risk-weighted consequences of various options.	Significant baseline and targeted survey effort has been applied to understand environmental aspects and values. This has informed a suite of contemporary measures outlined throughout this RSD, with all practicable opportunities to avoid impact taken, including but not limited to: - Designed-in avoidance of all critical habitat for Night Parrot and all active Greater Bilby burrows - Use of existing cleared areas, including 43km of existing road, to minimise loss and fragmentation of habitat - Containment of dispersive or contaminated materials, including: saline mine dewater in lined evaporation ponds; contained waste rock landforms; dust suppression; compliant storage and use of fuels and chemicals. An offset has been proposed for Night Parrot and Greater Bilby that comprises tangible land management actions to increase and maintain quality habitat.
2. The principle of intergenerational equity <i>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</i>	The small scale of the development within a continuous and expansive bioregion does not pose a risk to generational equity. Operational life of mine is 13 years followed by a 5-year rehabilitation period and no serious or irreversible damage is posed by the nature and scale of the proposal. The likelihood of returning cleared areas to a standard at or approaching pre-disturbance habitat quality is high based on existing experience within the Great Sandy Desert region of WA. Of most relevance is generational equity issues for Martu, the Traditional Owners of the land. The Significant Amendment is being progressed with their acceptance through an existing ILUA, and results in the extension of life for the existing Telfer processing operations and will be the replacement ore when Telfer reserves are exhausted in 2027. This allows for continued social and economic support to Martu communities through the ILUA. This includes programs for health, education, culture and protection of the cultural landscape.
3. Principles relating to improved valuation, pricing and incentive mechanisms <i>Environmental factors should be included in the valuation of assets and services.</i> <i>The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</i> <i>The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the</i>	Environmental constraint avoidance and management costs have been considered in the planning and design of the Havieron amendment proposal. All costs associated with environmental mitigations, ongoing monitoring, the proposed biodiversity offset, and final closure are included in project feasibility and borne by Greatland. The final closure standard will require no further input from the State or community. Mining royalties will be paid as follows: state-based royalties, paid at 2.5% for Gold and 5% on other base metals to DEMIRS under the Mining Act 1978 to ensure community return on mining developments; and

Principle	Consideration
<i>use of natural resources and assets and the ultimate disposal of any waste.</i> <i>Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.</i>	• ILUA-based royalties, paid at 0.5% of realised revenue into a Trust administered by Traditional Owners for use in education, health, funeral costs and eligible projects (25% apportioned to JYAC for administration).
4. The principle of the conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Actions both within the Development Envelope and the proposed offset area are anticipated to deliver conservation gain sufficient to account for 630 ha of land clearance and indirect impacts from operations. Mitigations are applied on the hierarchy of avoid→mitigate→offset and align with relevant WA and Commonwealth standards, conservation advice, and industry best practice.
5. The principle of waste minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	The hierarchy of waste controls are applied throughout all phases of the proposal: avoid, minimise, reuse, recycle and safe disposal. Provision in design is made for a putrescible landfill that is approved for construction and will be licenced and operated in accordance with EP Act requirements. Greatland are yet to determine whether final design will include this facility or whether wastes will continue to be transported to existing approved facilities at Telfer. Mine waste (tailings) deposited at Telfer will be reclaimed for production of paste backfill for underground workings at Havieron. This is a waste to resource initiative and paste production is current best practice.

4.2 ENVIRONMENTAL FACTORS

The environmental factors identified by the EPA cross sea, land, water, air and people are determined as critical to the responsible development of resources. These establish the objectives and factors to be addressed as part of proposal environmental impact assessment.

Greatland has reviewed the environmental factors identified by the EPA and has formed a view as to any additional factors relevant. In summary:

Key factors relevant to the Proposal are:

- Social Surrounds
- Flora and Vegetation
- Subterranean Fauna
- Terrestrial environmental quality
- Terrestrial Fauna
- Inland waters

Other environmental factors identified as relevant to the proposal are:

- Air Quality
- Greenhouse Gas Emissions.

Table 4-2 outlines the reasons for the above determinations.

Table 4-2: Identification of key environmental factors

Factor	EPA Objective	Relevance to Proposal	Key factor
Sea			
Benthic Communities and Habitats	Protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.	The Proposal is related within the Great Sandy Desert some 500km from the coast. The use of existing Port Hedland facilities does not include an intensification or change to that use.	Not relevant
Coastal Processes	Maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected		
Marine Environmental Quality	Maintain the quality of water, sediment and biota so that environmental values are protected		
Marine Fauna	Protect marine fauna so that biological diversity and ecological integrity are maintained.		
Land			
Flora and Vegetation	Protect flora and vegetation so that biological diversity and ecological integrity are maintained.	Potential impacts arising from clearance of 630 ha for mine development. This includes both direct and indirect impacts to flora and vegetation, and cumulative impacts with regards to existing land clearance.	Key factor
Terrestrial Fauna	Protect terrestrial fauna so that biological diversity and ecological integrity are maintained	Potential impacts arising from the clearance of habitat for conservation significant fauna, including EPBC listed threatened species Greater Bilby and Night Parrot. Potential direct and indirect impacts to fauna and their supporting critical and important habitats from the operation of the proposal.	Key factor
Subterranean Fauna	Protect subterranean fauna so that biological diversity and ecological integrity are maintained	Surveys recorded stygofauna within groundwaters that could be affected by dewatering and abstraction for mine use.	Key factor
Landforms	Maintain the variety and integrity of significant physical landforms so that environmental values are protected	There are no unique or uncommon natural landforms that will be affected by the proposal. All local landforms occur widely across the broader area. Landforms with high cultural value (e.g. dunes, claypans) are discussed in Social Surroundings and Inland Waters factors.	Not relevant

Factor	EPA Objective	Relevance to Proposal	Key factor
Terrestrial Environmental Quality	Maintain the quality of land and soils so that environmental values are protected	Potential impacts from localised contamination of land, aboveground storage of waste rock, and the recovery of tailings for use in paste production. There is no tailings storage at Havieron, and the storage of Havieron tailings within existing approved facilities at Telfer does not alter or intensity that activity but is discussed.	Key factor
Water			
Inland Waters	Maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected	Mine dewatering will occur for the operational life of mine and bore abstraction will through the full period to mine closure. Whilst there are no permanent surface water bodies, there is ephemeral systems of high cultural and environmental value.	Key factor
Air			
Air Quality	Maintain air quality and minimise emissions so that environmental values are protected	Potential for ambient dust generated from cleared land, vehicle movement, and mine processes. The proposal is not expected to substantially alter air quality, does not introduce new air toxics to the air shed, and is not associated with sensitive receptors.	Relevant but not a key factor
Greenhouse Gas Emissions	Minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable	Combined Scope 1 greenhouse gas emissions have been calculated to be greater than 100,000 tCO ₂ -e and will be managed under the Clean Energy Regulators safeguard mechanism. Irrespective, discussion of assessment and mitigations are required to be provided in accordance with the GHG environmental factor 2024.	Relevant but not a key factor
People			
Human Health	To protect human health from significant harm	There is no processing at Havieron nor the use of cyanide or other toxics. Analyses have shown the ore to be free of Naturally Occurring Radioactive Materials (NORMs). There is potentially fibrous materials, however this is an aspect managed under the <i>WHS (Mines) Regulations 2022</i> with assessment and validation of information underway and to be reflected in final design decisions. A Human Health and Ecological Risk Assessment has been conducted and is discussed under Social Surroundings in Section 8.	Not relevant
Social Surroundings	Protect social surroundings from significant harm	The proposal is located on the traditional lands of the Martu people who hold exclusive native title. There is potential for impacts to aboriginal cultural heritage and cultural practices, aesthetic and other social values.	Key factor

5. FLORA AND VEGETATION – KEY FACTOR

5.1 EPA OBJECTIVE

The EPA's environmental objective for the factor Flora and Vegetation is "To protect flora and vegetation so that biological diversity and ecological integrity ⁶ are maintained."

5.2 RELEVANT POLICIES AND GUIDELINES

Table 5-1: Policy and guidance relevant to flora and vegetation

Environmental Factor	EPA and other State or Commonwealth policy or guidance	Consideration of policy and guidance
Flora and Vegetation (EPA December 2016)	Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)	Design of flora and vegetation surveys
	Guidance Statement No. 6 — Rehabilitation of Terrestrial Ecosystems (EPA 2006).	Noted and considered in rehabilitation of cleared areas
	Western Australian Organism List (WAOL)	Comparison of surveys against WA listings for declared plants and Federal listing of Weeds of National Significance (WoNS)
	Australian Weeds Strategy (DAFF Invasive Plants and Animals Committee)	
	Biodiversity Conservation Regulations 2018 Fact Sheet for Environmental Consultants, DBCA (2019)	Alignment of controls for weed management to national efforts Licencing for collection of flora specimens for taxonomic assessment

5.3 RECEIVING ENVIRONMENT

5.3.1 FLORA AND VEGETATION STUDIES

Approved Proposal

The previous flora and vegetation surveys undertaken to inform the assessment of the Approved Proposal are categorised in Table 5.2. These are available on the EPA website as parts of the proposal documentation for the Telfer Project Power Supply (Assessment No. 1444) and Gold Mine Expansion (Assessment No. 1445), respectively.

⁶ In accordance with the EPA Environmental Factor Guideline: Flora and Vegetation (2016) *ecological integrity* is the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements.

Table 5-2: Flora and Vegetation surveys undertaken for the Approved Proposal

Report Author	Date	Survey Description	Area	Details
Hart, Simpson & Associates (2001)	Sep-Oct 2001	Level 1 survey desktop & site reconnaissance)	Telfer to Port Hedland Infrastructure Corridor	In addition to desktop reviews, representative sites along the 440 km corridor were surveyed in detail, with opportunistic recordings during vehicle traverses.
Hart, Simpson and Associates (2002)	May 1999 and May 2001	Detailed survey	Telfer Study Ecological Area	Detailed flora survey with two single phased surveys. Extensive foot traverses, based on aerials were undertaken. Opportunistic collections were made with no quadrats installed. Survey conducted before EPA guidance was released. Does not meet EPA guidance (EPA 2016e).
Syrinx Environmental (2013)	June 2011 and October 2011	Flora, Vegetation and Fauna Desktop Review. Level 2 Flora & Vegetation Survey, field assessment of GDE	Optimisation Study Area	Two phase flora and vegetation survey. The Survey Area was traversed by vehicle and on foot, 21, 50 x 50 m quadrats were established that were representative of vegetation assemblages determined from aerial photography. Survey meets EPA guidance (EPA 2016e).

s.40AA Significant Amendment

The flora and vegetation surveys undertaken to inform the current and previous assessments of the Havieron Project are described in Table 5.3.

The survey areas (the Flora and Vegetation Expanded Survey Area) and survey sites are shown in Figure 5-1. Note the survey area includes an alternate access route to Havieron that has not been adopted and is excluded from the Development Envelope.

Due to the presence of *Goodenia hartiana* (P2) targeted survey was undertaken for the s.40AA Significant Amendment. For cumulative assessment this is included on a map with existing targeted surveys for the Approved Proposal, with a summary shown in Figure 5-2. A map series that provides higher resolution maps for these surveys is provided in Appendix I.

Fire is a common occurrence over the survey area, with fire history is shown in Figure 5-3. An October 2018 fire covered most of the Havieron Project Area. This led to a minor limitation to the data collected. For the survey of the Infrastructure Corridor, most quadrats were able to be installed within pockets of unburned vegetation which remained after the fire. For the mine site, while fire impacted a significant amount of the area, most quadrats (30 of 41) were able to be installed within pockets of unburned vegetation which remained after the fire.

Table 5-3: Flora and Vegetation surveys undertaken for the Significant Amendment

Title	Field Dates	Survey Description	Area	Details
Detailed Flora and Vegetation Survey - Havieron Mine Area, Strategen JBS&G (2020a) Appendix C	4-12 March 2020 28 June-5 July 2020	Detailed survey including assessment for Groundwater Dependent Ecosystems (GDEs)	Stage 1 Mining Lease	41 quadrats with four supplementary plots with a minimum of three quadrats for all vegetation communities.
Reconnaissance Flora and Vegetation Survey, Strategen JBS&G (2020b) Appendix D	April 2020	Reconnaissance	Stage 1 Access Road	19 relevés.
Detailed Flora and Vegetation Survey, Havieron Infrastructure Corridor, Strategen JBS&G (2021) Appendix E	9 – 19 April 2021	Detailed survey with Martu Ecological Advisors	Stage 2 – Infrastructure Corridor area	45 quadrats with a minimum of three quadrats for all vegetation communities. Note that reconnaissance was conducted pre and post wet season on 3-13 March and 14-21 September 2020 respectively to inform the main survey.
Telfer-Havieron Project Desktop Flora Assessment, Spectrum (2022a) Appendix F	Not applicable	Desktop Assessment	Telfer Project – Powerline area	Desktop assessment of historical surveys.
Havieron Operations Weed Assessment, Spectrum (2022) Appendix G	Aerial remote sensing May 2022 Field survey of target areas 1 September 2022	Baseline weed assessment	Havieron Mine and access road	Aerial remote sensing by light plane for baseline vegetation Field survey of areas identified from remote sensing: Camp, Exploration area, and MIA.
Havieron Mine and Service Infrastructure Corridor Targeted Flora Survey, Ecoscape (2024) Appendix H Appendix I map series	19–23 August 2024	Targeted Survey for <i>Goodenia Hartiana</i> with Martu Ecological Advisors	Havieron Mine and Infrastructure Corridor	A combination of extensive traverses on foot, vehicle-based traverses and drone-assisted survey.

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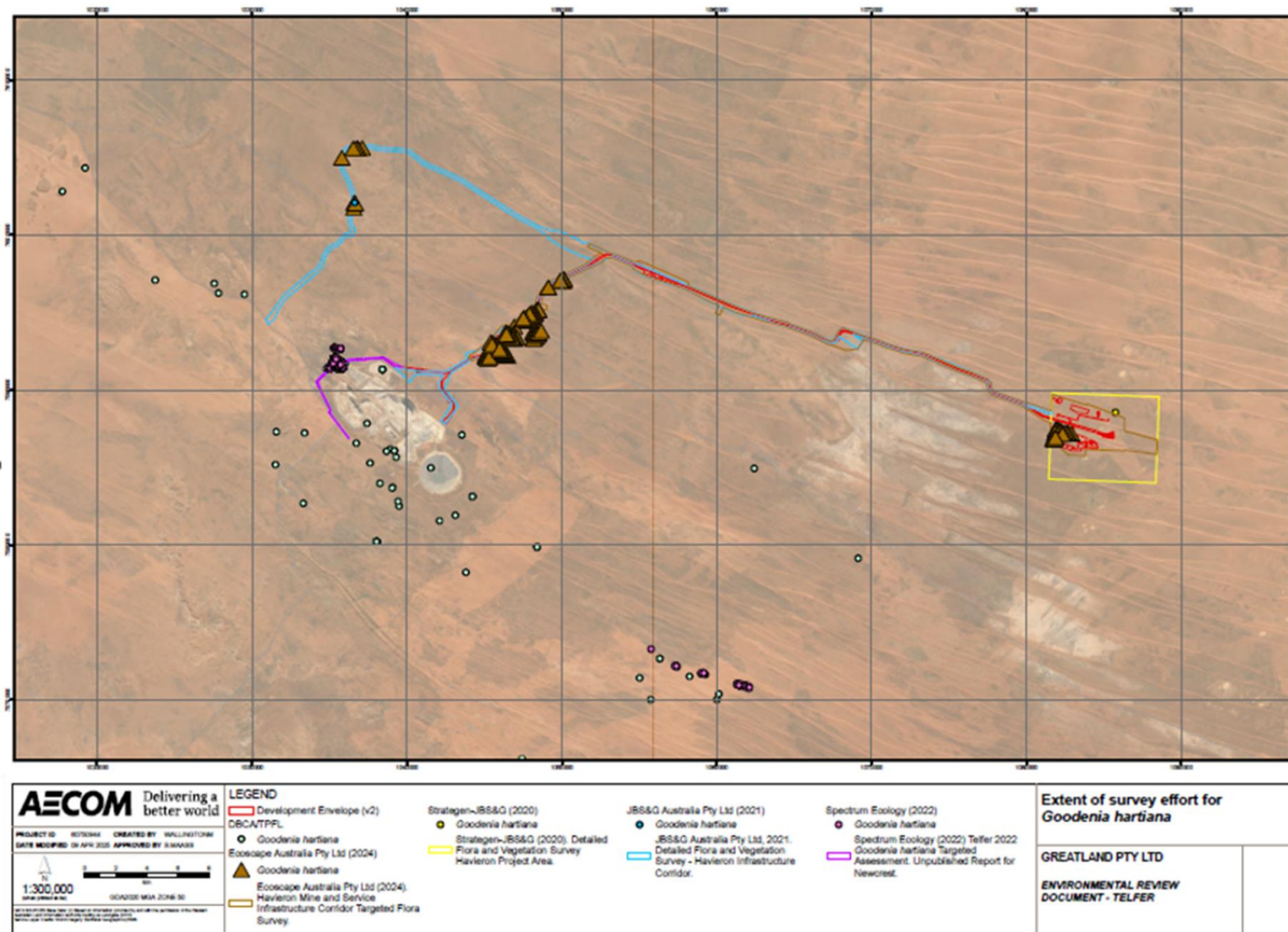


Figure 5-2: Targeted *Goodenia hartiana* survey extent

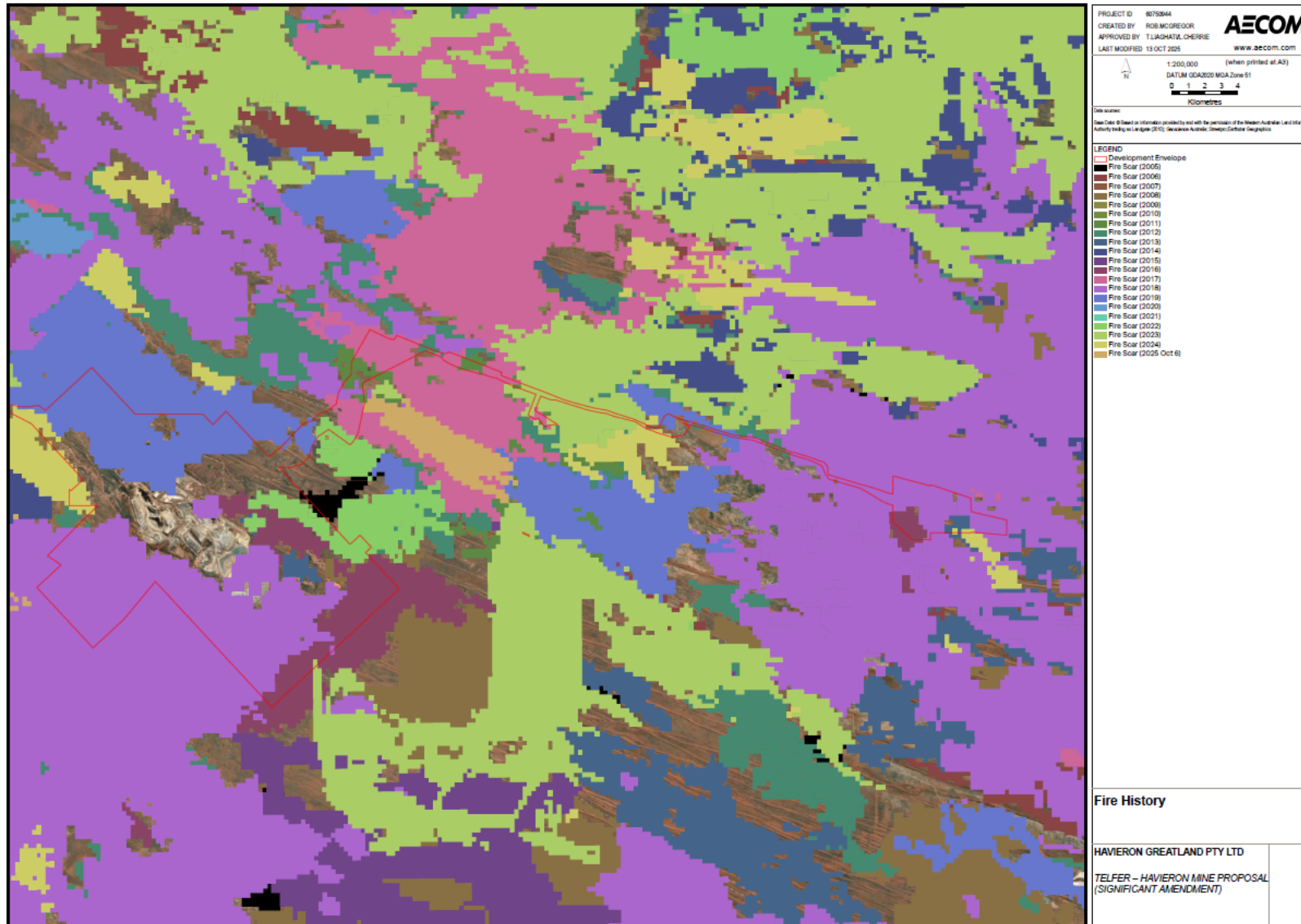


Figure 5-3: Fire History

5.3.2 VEGETATION TYPES

The Significant Amendment (excluding the gas pipeline corridor from Port Hedland, which has been largely rehabilitated) is located across two of the vegetation associations mapped in accordance with the National Vegetation Information System, both of which are extensive in the region and largely uncleared (refer Table 5-4).

Table 5-4: Broad Vegetation Associations Within the Study Area

Vegetation Association	Vegetation Description	Area Mapped in the GSD (ha)	% Remaining
134	Hummock grasslands, grass steppe; soft spinifex	219,367	99.44
157	Shrublands; teatree scrub	62,254	99.78
Total		281,621.00	

Within the Flora and Vegetation Expanded Survey Area, 18 vegetation types were described and mapped (Table 5-6 and Figure 5-4), comprising in broad terms of *Eucalyptus* woodlands, *Acacia* shrublands and *Triodia* grasslands. The dominant vegetation type mapped was type 6b (7,762ha, or 52% of the Expanded Survey Area), which is typified by *Acacia stellaticeps* and *Triodia* grass lands dominated by *Triodia basedowii* with scattered Senna and Grevillea shrubs. It is noted that historically, fires have occurred throughout the region (refer Figure 5-3).

None of the vegetation types mapped and described are listed as Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs).

The overall vegetation condition within the Expanded Study Area is generally in excellent condition (Table 5-5) with the exception of the cleared areas. Vegetation condition was only assessed as part of the Strategen JBS&G surveys (Strategen 2021). The species diversity and abundance are consistent with the ecology and diversity of the region and previous surveys of this level within the local area.

Table 5-5: Vegetation Condition

Condition Rating	Area (ha)	% of Study Area (Strategen JBS&G 2021)
Excellent	15,480	99.70
Completely Degraded	46	0.30
Total	15,526	100

Table 5-6: Mapped Vegetation Typesⁱ

Code	Vegetation types	Dominant Landform	Vegetation Condition	Area (ha)	% Study Area
Corymbia Open Woodland					
1d	<i>Corymbia aspera</i> and <i>C. opaca</i> Open Woodland over Scattered Shrubs of <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> over <i>Triodia pungens</i> and <i>T. aff. basedowii</i> Very Open Hummock Grassland	Plain	Excellent	122.34	0.82
Acacia High Shrubland					
3c	<i>Acacia</i> spp. High Shrubland over <i>Acacia stellaticeps</i> Low Open Shrubland over <i>Triodia</i> aff. <i>basedowii</i> Hummock Grassland	Dune swale	Excellent	273.36	1.83
4b	Scattered Trees of <i>Corymbia</i> over <i>Acacia stipuligera</i> , <i>Grevillea wickhamii</i> , <i>Acacia stellaticeps</i> , <i>Jacksonia aculeata</i> and <i>Calytrix carinata</i> Low Open Shrubland over <i>Triodia basedowii</i> and <i>T. schinzii</i> Closed Hummock Grassland	Dune	Excellent	1,181.86	7.92
Triodia Hummock Grassland					
6b	<i>Grevillea wickhamii</i> Open Shrubland over <i>Acacia stellaticeps</i> and <i>Tribulus</i> spp. Low Open Shrubland over <i>Triodia epactia</i> Hummock Grassland	Plain	Excellent	7,762.38	52.05
6c	<i>Grevillea stenobotrya</i> over <i>Triodia</i> cf. <i>basedowii</i> Hummock Grass	Ironstone rocky hill	Excellent	0.22	0.001
6e	Fringing vegetation associated with Clay Pans. Typical community consists of <i>Acacia stellaticeps</i> over <i>Triodia epactia</i> and <i>Triodia basedowii</i>	Clay Pan	Excellent	28.00	0.19
6f	<i>Acacia</i> spp. Tall open shrubland over <i>Acacia stellaticeps</i> , <i>Calytrix carinata</i> , <i>Jacksonia aculeata</i> low shrubland over <i>Triodia schinzii</i> hummock grassland	Plain	Excellent	2,947.84 (inc./ 5.28ha of inferred *6f)	19.77
6g	Scattered Tall Shrubs of <i>Grevillea wickhamii</i> and <i>Hakea chordophylla</i> over <i>Triodia</i> aff. <i>basedowii</i> Hummock Grassland	Plain	Excellent	297.31	2.00
6i	Scattered trees of <i>Eucalyptus victrix</i> over <i>Acacia cuthbertsonii</i> subsp. <i>cuthbertsonii</i> and <i>Senna artemisioides</i> subsp. <i>oligophylla</i> open shrubland over <i>T. schinzii</i> hummock grassland	Plain	Excellent	0.53	0.004
6j	Scattered Trees of <i>Melaleuca glomerata</i> , over <i>Tecticornia</i> and <i>Cyperus squarrosus</i> , <i>Eragrostis falcata</i>	Salt Flat	Excellent	602.17	4.04
6k	Tall <i>Acacia</i> over mixed heath over <i>Eragrostis setifolia</i> and <i>Triodia epactia</i>	Rocky hill	Excellent	852.21 (inc. 18.22ha of inferred *6k)	5.72

Code	Vegetation types	Dominant Landform	Vegetation Condition	Area (ha)	% Study Area
Other (from desktop assessment by Spectrum, 2022)					
VT1	<i>Corymbia opaca</i> low open woodland, with <i>Eucalyptus kingsmillii</i> low open mallee woodland over <i>Acacia ancistrocarpa</i> , <i>Acacia stipuligera</i> , and <i>Grevillea eriostachya</i> mid to tall, isolated shrubs, over <i>Triodia basedowii</i> low closed hummock grassland	Sandplain	Not determined	642.94	4.31
VT2	<i>Acacia pteraneura</i> tall shrubland, over <i>Acacia wanyu</i> , <i>Anthobolus leptomerioides</i> and <i>Psydrax latifolia</i> mid shrubland, over <i>Eremophila tietkensii</i> and <i>Eremophila latrobei</i> subsp. <i>latrobei</i> low open shrubland, and <i>Triodia basedowii</i> low open hummock grassland (Banded Mulga)	Clay Pans	Not determined	17.47	0.12
VT3	<i>Triodia schinzii</i> low closed hummock grassland	Clay Pans	Not determined	15.05	0.10
VT4	<i>Grevillea stenobotrya</i> , <i>Acacia dictyophleba</i> , and <i>Acacia stipuligera</i> tall open shrubland, over <i>Triodia schinzii</i> low open hummock grassland, with <i>Gompholobium simplicifolium</i> low isolated shrubs	Dunes	Not determined	10.59	0.07
VT5	<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> low isolated trees, over <i>Hakea lorea</i> and <i>Senna glutinosa</i> subsp. <i>x luerssenii</i> mid open shrubland, over <i>Triodia basedowii</i> low closed hummock grassland	Hills	Not determined	136.61	0.92
VT6	<i>Acacia wanyu</i> tall open shrubland, over <i>Eremophila tietkensii</i> , <i>Senna sericea</i> and <i>Senna glutinosa</i> subsp. <i>x luerssenii</i> mid open shrubland, over <i>Triodia basedowii</i> and/or <i>Triodia epactia</i> low hummock grassland, with over <i>Acacia stellaticeps</i> low isolated shrubs.	Hills	Not determined	15.38	0.10
VT7	Scattered mixed trees in disturbed areas	Various	Not determined	6.96	0.04
Total				14,913.22	100.00

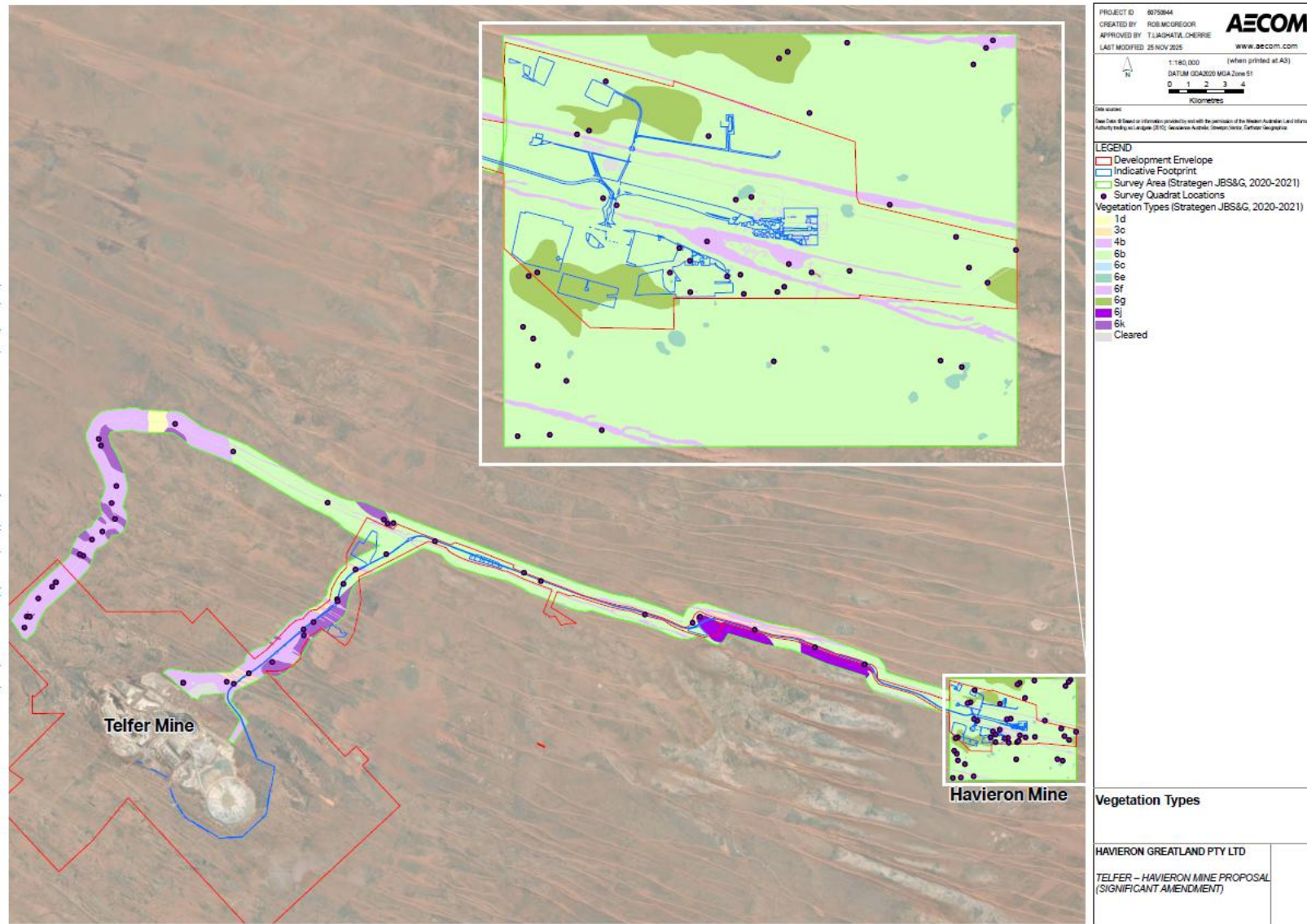


Figure 5-4: Recorded Distribution of Local Vegetation Types

Five vegetation types within the Expanded Survey Area (refer Figure 5-4) may be associated with surface and groundwater as follows:

- Vegetation type 6i has recorded within the Development Envelope contains scattered *Eucalyptus victrix*, a species associated with increased water availability and aligns with a demarcated heritage site and so will not be cleared.
- Vegetation type VT2 consists of a sheet flow dependent vegetation association (Banded Mulga present on slopes of between 0.2-2.0%). Mulga vegetation types play an important role in water and nutrient capture and ecosystem function and may support or provide refuge to restricted flora and fauna species, therefore considered significant.
- Vegetation type 6j is associated with salt pans but is widely represented in the local region with an approximate extent of at least 5,340 ha, therefore is not considered significant.
- Vegetation type 6e is associated with claypans but does not include species associated with groundwater dependency. For this reason, VT 6e is considered reliant on occasional inundation of surface water and not on groundwater. Claypans have cultural significance to the Martu people and therefore, will be avoided wherever possible. 6e has a limited distribution within the Expanded Survey Area but is considered likely to occur elsewhere in association with claypans, and therefore not considered significant.
- Vegetation type 6b contains the species *Eucalyptus camaldulensis* which is associated with surface water and groundwater. 6b was the dominant vegetation type of the Expanded Study Area and is very widespread, therefore is not considered significant. Whilst not environmentally significant, *Eucalyptus camaldulensis* is culturally significant to Martu and will be avoided where possible.

5.3.2.1 INTRODUCED SPECIES

Weed survey (refer Appendix G) for the Significant Amendment identified eight weed species:

- Seven species listed as 'Permitted – s11' in the WAOL
- One species, *Euphorbia hirta*, is not listed on the WAOL) but is classified as 'Alien to Western Australia' on Florabase (DPIRD, 2021; Western Australian Herbarium, 2022).

No weeds of national significance (WoNS) or WA Declared Pests were recorded within the survey area.

Telfer was originally established in 1976 and has since operated as a mining community on and off. Weeds are an established feature of the site. A weed survey undertaken in 2019 within the Telfer Project area recorded a total of 17 weed species, including two WoNS/Declared Pest species: *Tamarix aphylla* (Athel Tree) and *Cylindropuntia fulgida* var. *mamillata* (Boxing Glove Cactus). The Boxing Glove Cactus was recorded for the first time at the site. Most weeds recorded represent species that are commonly recorded throughout the region in areas subjected to some form of land disturbance (Astron, 2019).

Due to the interconnectedness and proximity, mitigations apply across both Telfer and Havieron, with particular focus on preventing the spread of weeds and seeds between the two premises (refer mitigations in 5.5).

5.3.3 SIGNIFICANT FLORA

Based on the information provided in the studies in Table 5.3, the potential for the plant species to occur within the Havieron underground mine Development Envelope (DE) was assessed according to general habitat requirements and distribution. The Desktop Study identified five Priority flora species as likely to occur within the DE. These species were:

- *Eremophila tenella* (P1)
- *Ptilotus wilsonii* (P1)
- *Goodenia hartiana* (P2)
- *Indigofera ammobia* (P3)
- *Goodenia nuda* (P4). This species has been delisted in February 2025 and therefore won't be discussed any further. <https://www.dbca.wa.gov.au/management/threatened-species-and-communities>

Baseline flora and vegetation surveys also described two taxa that have subsequently been excluded from further consideration, as follows:

- Fringed fire-bush *Seringia exastia* (Critically Endangered), excluded due to clarification by the WA Herbarium noting a taxonomic review⁷ meaning the individuals identified should be referred to as the common *Seringia elliptica*.
- A potential new species of *Myrtaceae* sp. (Tribe *Chamelaucieae*) recorded and a specimen collected at one location along the Camp Dome Road near Telfer was determined by the WA Herbarium to be common taxa *Calytrix carinata* and not novel. In addition, the area of collection no longer falls within the Development Envelope due to a re-alignment of the road for cultural heritage reasons in consultation with Martu.

Of the five species listed as potentially relevant from the desktop assessment, only *Goodenia hartiana* (P2) is of significance to the Havieron s.40AA Significant Amendment (discussed below). The other four species are not considered relevant for the following reasons:

- *Eremophila tenella* (P1) and *Ptilotus wilsonii* (P1) were considered likely to occur pre-survey, however species are associated with rocky ridgelines which were not mapped within the Havieron DE, are unlikely to occur and have not been discussed further.
- *Indigofera ammobia* (P3) was not recorded during the April 2021 survey by JBS&G. Two other *Indigofera* species were in flower (*Indigofera boviparda* subsp. *eremaea* and *Indigofera monophylla*). There is one record of *Indigofera ammobia* approximately 70 km from the Project Area⁸ (Syrinx 2013a). No individuals of *Indigofera ammobia* were recorded and further review of its likelihood was reduced to 'unlikely' (Ecoscape, 2024).

⁷ Binks, R. M., Wilkins, C. F., Markey, A. S., Lyons, M. N., & Byrne, M. (2020). Genomic data and morphological re-assessment reveals synonymy and hybridisation among *Seringia* taxa (Lasiopetaleae, Malvaceae) in remote north-western Australia. *Taxon*, 69(2), 307–320. <https://doi.org/10.1002/tax.12233>.

⁸ The O'Callaghan's Study Area is a 2,727.75ha portion of the overall 10,471ha Telfer Optimisation Project.

There is a high level of confidence that this species is not located within the DE of survey area (i.e. Havieron-Telfer infrastructure corridor).

- *Goodenia nuda* (P4) has been delisted as a Priority species.

5.3.3.1 *GOODENIA HARTIANA* (P2)

The area of occupancy for *Goodenia hartiana* is approximately 300 km north-south by 250 km east-west within the Great Sandy Desert bioregion (ALA, 2024). The species is associated with sand dunes and swales which are a common landform in this bioregion. The population size and extent are strongly associated with fire ecology and seasonal variation, where number of individuals are anticipated to fluctuate over time. The species is likely to be more common in the local region with numbers currently restricted to survey effort and access.

Ecoscape (2024) conducted a targeted survey for *Goodenia hartiana* within the Havieron Mine and infrastructure corridor area across five days in August 2024, including a likelihood assessment⁹ to identify the potential for the taxa to occur within the survey area. This recorded 6,610 individual *Goodenia hartiana* within a study envelope of 3,448.40 ha, inclusive of the proposed disturbance footprint (Ecoscape, 2024). This aligns with surveys undertaken for the Telfer Project where more than 67,000 individuals have been recorded historically (Syrinx Environmental, 2010, 2013; Spectrum 2022b and Ecoscape 2014).

5.4 POTENTIAL ENVIRONMENTAL IMPACTS

Potential impacts from the Proposal on flora and vegetation are the following:

- Direct loss of native vegetation
- Direct loss of individual plants of conservation significance
- Indirect impacts on flora and vegetation which includes:
 - Impacts of dust deposition on flora and vegetation
 - Impacts on flora and vegetation from overspray of water used for dust suppression
 - Altered surface drainage flow patterns (starving or flooding vegetation)
 - Altered fire regimes
 - Spread of weeds resulting in changes to vegetation structure and composition
 - Impacts on flora and vegetation from accidental loss of hydrocarbons and saline water.

Direct and indirect impacts are discussed in more detail in the following subsections.

⁹ Information to assess the likelihood of a species occurring includes ecological considerations as listed on FloraBase (WAH 1998a-2024). The likelihood of occurrence was re-evaluated following the field survey when actual survey area characteristics (vegetation types, vegetation condition, visibility for individual species) were better understood and the level of survey effort was considered.

5.5 MITIGATION

A summary of key management measures for flora and vegetation is provided in Table 5-7. Mitigations are selected on the hierarchy of **Avoid** → **Mitigate** → **Rehabilitate** → **Offset**

Where direct impacts can be avoided through design of infrastructure and use of existing tracks and clearances, these opportunities are prioritised, and this has resulted in an extremely small disturbance footprint of no more than 630 ha. Where avoidance is not possible, best practice environmental management measures are proposed to reduce the likelihood or consequence of exposure to the threat. Wherever possible, mitigations are independent of administrative control to increase their reliability (i.e. designed in and engineered controls).

Mitigation measures are given practical effect through operational policies, plans and procedures that will be implemented throughout life of mine and referenced throughout Table 5-7.

Table 5-7: Mitigation Measures

Threat	Impact factor	Hierarchy of Control	Description of measure
Direct impact			
Land clearance for Significant Amendment	Reduction in the extent of local vegetation.	Avoid	- Large trees in vegetation type 3c to be avoided (as instructed by Martu monitors during clearance) - Mine design: mining method (SLOS) to avoid open pit
		Minimise	- Clearance limited to a maximum of 630 ha of native vegetation - Design utilising existing tracks and cleared areas - Clearing of vegetation types VT2, 3a and VT6 limited to the extent specified in Table 5-9 - Surface Disturbance Permit process to ensure approved spatial extent is understood by clearing operators (includes spatial data and field inspection)
		Rehabilitate	- Mine closure plan and progressive rehabilitation of abandoned cleared areas and closed features - Sourcing and use of local provenance endemic seed stock
	Direct loss of individual plants of conservation or cultural heritage significance to Martu.	Avoid	- Surface Disturbance Permit process (700-675-EN-PRO-1012) to identify priority species (includes spatial data and field inspection) - Demarcation of ‘no go’ zones - Pre-clearance survey with Martu
	Inadvertent clearing or damaging access outside approved area.	Avoid	- Surface Disturbance Permit process for demarcation and approval of land disturbance - Martu monitors during land clearance
		Minimise	Unapproved offroad access is prohibited (strict cultural heritage restrictions apply)
		Rehabilitate	Clearing outside of approved areas is a notifiable incident triggering investigation and rehabilitation
Indirect impact			
Spread of weeds	Weed incursion displacing native vegetation or changing community structure	Minimise	- Significant Species Management Plan (Appendix J) commitment and actions to achieve to OUTCOME 4 – Weeds <10% cover in native vegetation areas within the Development Envelope - Pre-clearance survey includes weeds and controls to prevent spread of seeds or rootstock.

Threat	Impact factor	Hierarchy of Control	Description of measure
			• Weed monitoring and control in accordance with Weed Management Procedure (700-675-EN-PRO-1009), including remote sensing, field survey and treatment as required. • GIS registering of any WoNS or Declared Pests to ensure ongoing treatment and monitoring • Weed and seed hygiene certificate required for vehicles, plant and equipment engaged in ground disturbance or mobilising from outside the region • Management of topsoil, including: – Sourcing from weed free areas – Inspection and approval for use – Quarantining of topsoil containing weeds or weeds.
Dust deposition on flora and vegetation	Inhibited photosynthesis (slow or stunted growth, impaired seeding and flowering).	Minimise	• Access road conditioning and maintenance to minimise dust • Covered bulk haulage • Contained dusty processes (e.g. cement silo with hydraulic delivery) • Dust suppression on roads, stockpiles and Waste Rock Landforms
Spill of hypersaline water or overspray of water used for dust suppression	Accumulation of salt leading to salt-burning of vegetation. Inundation of vegetation.	Avoid	• Hypersaline mine water contained in lined evaporation ponds designed and constructed as per Works Approval W6468/2021/1 (ponds 1 – 3) and W6972/2024/1 (ponds 4-6, not yet constructed) • No use of hypersaline water for dust suppression
		Minimise	Hypersaline mine dewater managed as per licence L9455/2024/1, including: • Segregation of hypersaline mine dewater and weekly TDS testing to ensure salinity criteria met (<35,000mg/L TDS as per WA licence L9455/2024/1) • Designated dust suppression route • No dust suppression permitted on vegetated areas • Water cart standards for flow volume and distribution to avoid overspray • Daily tracking and operational control of water carts
Altered surface drainage flow patterns	Diversion of flow (starving) or impoundment of water (flooding) leading to deterioration of plant health.	Avoid	• Flood assessment and design of infrastructure to avoid impoundments, including installation of up to 50 culverts along the 55km road
		Minimise	• Catchment modelling to inform controls and repeated prior to installation of major surface infrastructure

Threat	Impact factor	Hierarchy of Control	Description of measure
			- Catchment management infrastructure (culverts, drains, scour protection etc) - Wet season planning process to prepare drains and other catchment controls
Altered fire regimes	Loss of vegetation.	Minimise	- Firefighting capabilities (dedicated emergency response team, tanker etc) that are applied to regional fires irrespective of source - Antenna mounted thermal camera at Mine Infrastructure Area (360° scan) - Satellite monitoring of regional fire status - Emergency Management Plan (700-900-ER-PLA-0001) that includes bushfires - Hot Works Management Plan (700-676-SA-PLA-1014) for control of spark or flame generating operational processes (hot works authorisation, work in cleared areas, task fire monitor etc) - Fuel reduction burns as required Note: traditional mosaic burning may be performed to reduce the severity of fire, however this is at the discretion of Martu and cannot be offered as a Greatland control measure
Hazardous chemical or saline water spill	Direct spills or spray onto plants, or contamination of surface water and soils impacting plant health	Avoid	Management of hydrocarbons and chemicals in accordance with the Hazardous Chemicals Management Plan (702-8000-SA-PLA-0009), including: - Risk assessment and approval of hazardous chemicals - Designated compliant storages and stillages for hazardous chemicals - Contained and bunded refuelling stations
		Rehabilitate	Spill areas cleaned and contaminated soils disposal as per 702-8000-SA-PLA-0009 and rehabilitated using local provenance seed selected for the area.

5.6 ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACT

Regional Vegetation Association Impacts

Of regional vegetation associations present in the Development Envelope and within the Significant Amendment subregion, 98% or more of vegetation associations remain (refer Table 5-8). Clearing native vegetation for the Significant Amendment is not considered significant in the regional context.

The impact of the Significant Amendment on the remaining extent of the two regional vegetation associations is shown in Table 5-8.

Table 5-8: Impact to remaining extent of Regional Vegetation Associations

Veg. Assoc.	Current Extent (ha)	Extent in Indicative Footprint (ha)	Extent in Indicative Footprint (%)	Remaining (%) After Proposal
134	219,367	525.09	0.24	99.20
157	62,254	106.9	0.17	99.61

Local Vegetation Community Impacts

The impact of the Significant Amendment on the mapped extent of the local vegetation types is shown in Table 5-9. Direct impacts on vegetation types within the s.40AA development envelope range from 0% to 12.21% of the originally mapped extents.

Impacts to significant vegetation types have been avoided or are capped (refer mitigations in Table 5-7). Dunes are culturally significant to Martu, and dune crossings for the haul road are minimised and agreed with JYAC in line with ILUA commitment. Associated impacts to vegetation types on linear dunes (mapped as 4b at Havieron and VT2 at Telfer) are also minimised.

Local vegetation type 6e (Fringing vegetation associated with clay pans), claypans do not appear to be widespread. However, there does appear to be a narrow band of them extending approximately 40 km to the south-east from the Project Area. Based on aerial imagery, within 5 km of the survey area, this zone contains a conservatively estimated additional 269 ha of claypans, which, due to their presence in the same soil-landscape system and vegetation association, means there is a high likelihood of equivalent vegetation. The clay pans occurring within the Havieron Project Area (24 ha) amount to less than 10% of the clay pans occurring locally. Of an area of 5.50 ha that lies within the Development Envelope, only 0.15 ha (0.04% of the clay pans occurring locally) lie within the Development Footprint.

Overall, impacts of the Significant Amendment on the distribution of local vegetation types are considered to be minor. Based on natural post-fire recovery and successful rehabilitation at Telfer and Havieron, there is reasonable expectation that vegetation values across the s.40AA Significant Amendment footprint will be returned to pre-disturbance quality of 'excellent'.

Table 5-9: Impact to remaining extent of local Vegetation Types

Vegetation Type	Extent Recorded in Expanded Survey Area (ha)	Extent within footprint of Other Approvals (%)	Extent within Indicative Footprint of s.40AA Significant Amendment		Local extent remaining after Significant Amendment and other approvals (%)
			(ha)	(%)	
1d	122.34	-	-	-	100
3c	273.36	0.95	6.327	2.31	96.74
4b	1,181.48	0.17	13.935	1.18	98.65
6b	7,768.46	2.47	372.301	4.79	92.74
6c	0.22	-	-	-	100.00
6e	28	0.39	0.040	0.14	99.47
6f	2,947.84 (incl. 5.28 ha of inferred* 6f)	1.43	110.541	3.75	94.82
6g	297.31	12.45	36.310	12.21	75.34
6i	0.53	-	-	-	100.00
6j	602.17	1.28	27.433	4.56	94.16
6k	852.21 (incl. 18.22 ha of inferred* 6k)	0.87	45.928	5.39	93.74
VT1	642.94	37.96	16.594	2.58	59.46
VT2	17.47	56.38	0.577	3.30	40.32
VT3	15.05	-	-	-	100.00
VT4*	10.59	78.14	0.259	2.45	19.41
VT5	136.61	91.6	0.226	0.17	8.23
VT6	15.38	16.32	0.331	2.15	81.53
VT7	6.96	50.47	-	-	49.53
TOTAL	14,918.92		630.802		

* Linear dunes are mapped as 4b by Strategen JBS&G 2020, 2021, with >98% remaining, and correspond to VT4 as mapped at Telfer.

Direct loss of Significant Flora

While no Threatened Flora or Priority flora were recorded within the Expanded Survey Area, *Goodenia hartiana* (P2) will occur within the indicative footprint of the s.40AA Significant Amendment based on targeted survey (discussion below). The presence and size of *Goodenia hartiana* populations is heavily dependent fire and rainfall and is considered variable. The species is known to occur across the Great Sandy Desert, Little Sandy Desert and Pilbara, and has been recorded previously in the area across a range of habitats (Strategen JBS&G 2021).

The *Goodenia hartiana* population in the area of the combined Telfer-Havieron Project is estimated at over 67,000 plants (Ecoscape, 2024). There were 1,592 individuals counted within the indicative disturbance footprint, which represents less than 2.5% of the total population. The impact on the 1,592 known plants within the Havieron disturbance footprint is unlikely to threaten the species' survival (Ecoscape 2024).

Specimens of *Eucalyptus camaldulensis* may occur in vegetation type 3c. These trees are of local cultural significance and will be avoided where possible in consultation with Martu.

Dust deposition on vegetation

Localised dust emissions will occur from proposed activities such as ore haulage inhibit plant growth and reduce photosynthesis when dust burdens are dense ($\geq 5\text{g/m}^2$) and/or daily dust deposition rates are high ($\geq 1\text{ g/m}^2/\text{d}$) (Farmer 1993, Turner 2013). However, experience at Telfer has not determined any significant impacts to vegetation condition arising from dust. Ongoing dust management measures will be implemented for life of mine and are known to be effective in reducing dust in mining operations. Monitoring of roadside dust fallout and vegetation health will be conducted through two yearly vegetation survey but are considered to be low.

Spillage of hydrocarbons, hypersaline water and chemicals impacting vegetation

Spillages of hydrocarbons, hypersaline water or chemicals can potentially result in vegetation death or impacted plant health due to direct contact or contamination of supporting soil and water. Risks to vegetation is minimised so far as is reasonably practicable as follows:

- All hypersaline water is contained in lined evaporation ponds, with strict design approval and operating licence criteria (discussed in more detail in Section 12.3.7).
- Dust suppression water must meet operating licence L9455/2024/1 criteria to ensure salinity and application does not impact native vegetation on verges or accumulate unduly in topsoils.
- All hydrocarbons and chemicals are transported in accordance with the Hazardous Chemicals Management Plan (702-8000-SA-PLA-0009), stored and handled in compliant facilities in accordance with the Globally Harmonised System for classification and labelling of hazardous chemicals, and the Work Health and Safety (Mines) Regulations 2022.
- Bulk diesel is (Flammable Liquid Category 4) stored in bunded facilities, with contained refuelling.
- Oily water separator for workshops and refuelling areas
- Dedicated bunded and self-bunded hydrocarbon waste facilities are provided onsite.

Impacts to vegetation are considered to be low with the continued application of the above measures.

Altered surface drainage flow patterns impacting vegetation

Surface water assessments (refer Section Appendix X) were undertaken for the Havieron Project to understand local catchments, flood potential, surface water flow and inform design and catchment controls. Due to the absence of permanent water courses crossing the s.40AA Significant Amendment development envelope, there will be no impact on the hydrology of the region. However, the construction of a haul road could give rise to localised flooding or impoundments resulting in deterioration of plant health through either inundation or reduced water supply.

To ensure the hydrological regimes of any surface water dependent vegetation communities will be unaffected, flood ways and culverts will be included in designs to transfer water flow across the Significant Amendment area and return it to its natural flow path. This includes drainage culverts with appropriate scour protection in the Development Envelope in the vicinity of the clay pans, salt lakes and Banded Mulga Vegetation Type to ensure flow regimes will be largely unaffected.

Spread of Weeds

As a greenfield site, the absence of WoNS or Declared Pests at Havieron is not remarkable. However, two WoNS are known to exist at Telfer and without careful management they could spread to Havieron and the Infrastructure Corridor. Because of the common environmental management and interconnectedness of the two sites the Telfer Biodiversity Management Plan and associated Weed Management Procedure will be applied. Control measures have, to date, prevented the regional spread of WoNS from Telfer since recommencement of operations in 2004. This includes annual weed survey (including remote sensing), and control of incursions as they are identified. The Significant Species Management Plan (Appendix J) includes a specific outcome and actions (Outcome 4) to maintain weeds at <10% in native vegetation areas. The SSMP is anticipated to be a statutory plan attached to EP Act and EPBC Act approvals.

Standard hygiene processes including vehicle inspections (weed hygiene certificate required for outside region mobilisation of ground engaging equipment), weed spraying, and procedures to control vehicle and personnel movements within weed infested areas. It is proposed that procedures from the Stage 1 Project, such as the weed and seed procedure, will be implemented to reduce the spread of weeds. This includes regular inspections for weeds and active management if discovered.

Revegetation areas are managed against rehabilitation criteria as outlined in the approved Mine Closure Plan. Similar criteria will be adopted for the Havieron Mine Closure Plan. An example of due diligence applied to the ongoing management of weeds is shown in Figure 5-5.

Weed control will remain an ongoing focus throughout life of mine but can, with the measures proposed, contain and control weeds to minimise impacts on native vegetation.

Completion Criteria

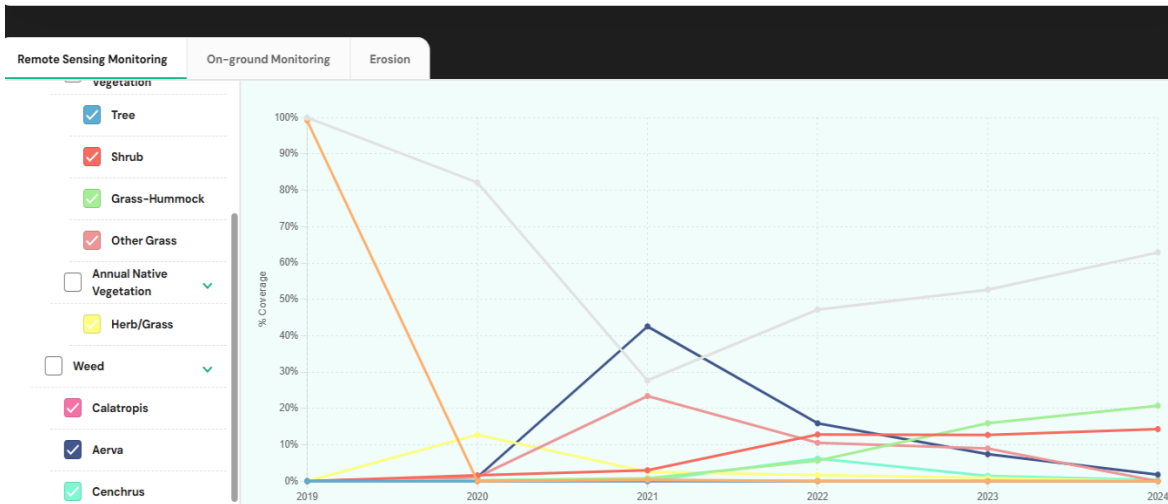
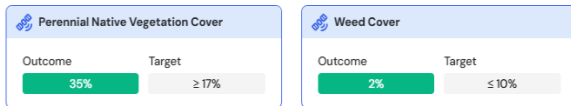


Figure 5-5: EIA monitoring of weeds and native vegetation

Alteration of Fire Regimes

Long term fire history is shown in Figure 5-3, with no recorded fires being mine related. This does not mean they could not happen in the future, and high intensity or increased frequency of fires could substantially change vegetation communities on a large scale, contributing to altered vegetation community structure and reduced fauna habitats.

Proposed mitigations include local and regional fire monitoring and detection (including a thermal camera at the Havieron MIA), hot works permit process that includes restrictions to ground-engaging activities (e.g. grading) on days of total fire ban, and local response capabilities. The existing Telfer Emergency Response Team has and will continue to respond to non-mine related fires in the vicinity of Telfer-Havieron.

Given the majority of fires are from natural or non-mine causes, the proposed mitigations will bolster regional capabilities to detect and contain fires and are considered a net benefit to the region.

5.7 CUMULATIVE IMPACTS

At the regional level, existing disturbance in the bioregion is minimal, with 99% or more of pre-European vegetation associations remaining, with disturbance associated with minor roads and tracks, approved mining operations at Telfer and Havieron, other exploration activities, and Aboriginal settlements. To undertake a cumulative impact assessment of the significant amendment, a review of clearing impacts for the existing Telfer Project is outlined below.

The existing Telfer Project is for the expansion of mining at the Telfer Gold Mine to include the mining and processing of gold ore, and the transport of copper concentrate to Port Hedland by road, as documented in Ministerial Statement 606. According to Attachment 4 to MS 606, Telfer project has a

Total land disturbance area of 4,921 ha, which includes the original Telfer Gold Mine land disturbance of 2,278.23 ha.

The clearing for native vegetation has not been defined in any of the assessment and approval documents available for Telfer Project. Ministerial Statement 606 for Telfer Project does not include a Development Envelope. It only specifies the total land disturbance area. In the absence of this information, the extent to which Telfer Project contributes to the cumulative impact of this significant amendment proposal on the significant flora species cannot be accurately quantified. However, in light of the most recent studies listed in Table 5-10, and the historical surveys undertaken for the Telfer project in Table 5-11 (provided in Appendix K). The only priority flora species that is common across the Havieron mine, infrastructure corridor and Telfer mine, and likely to be impacted by the significant amendment is *Goodenia hartiana*.

No priority or threatened species were identified under the EPBC Act.

Table 5-10: Recent surveys of Havieron and Telfer

Species	Conservation Code BC / DBCA Act	Infrastructure corridor (JBS&G 2021)	Powerline (Telfer) (Spectrum 2022)	Havieron Mine & Infrastructure Corridor (Ecoscape 2024)
<i>Eremophila tenella</i>	P1	-	-	-
<i>Ptilotus wilsonii</i>	P1	-	-	-
<i>Goodenia hartiana</i>	P2	X	X	X
<i>Indigofera ammobia</i>	P3	-	-	-
<i>Thysanotus</i> sp. Desert East of Newman ¹⁰	P2	-	-	X

¹⁰ A single plant recorded from the Havieron Mine area within the development envelope but outside the disturbance footprint. This single plant will be avoided.

Table 5-11: Historical surveys Telfer

Source	Survey Type	Author
Telfer Study Ecological Survey	Detailed survey	Hart, 2002
Power Supply Infra Corridor	Rare and priority flora targeted survey	Ecologia Environment, 2003
Telfer Waste Dump Expansion	Detailed survey	Syrinx Environmental, 2006
Telfer Borefield Flora and Fauna	Detailed survey	Syrinx Environmental, 2007
Goodenia hartiana survey Telfer	Targeted regional flora survey	Syrinx Environmental, 2010
Level 2 Flora and Fauna Survey O'Callaghan's	Flora, veg and fauna desktop review. Level 2 flora & veg survey, field assessment of groundwater dependant ecosystems (GDE)	Syrinx Environmental, 2013a
Level 2 Flora and Fauna Survey Optimisation Study Area	Flora, veg and fauna desktop review. Level 2 flora & veg survey, field assessment of GDE	Syrinx Environmental, 2013b
Reconnaissance flora and vegetation survey of Havieron Service Corridor	Desktop assessment and reconnaissance assessment	Strategen JBS&G, 2020b
Havieron Flora and Vegetation Report	Detailed survey	Strategen JBS&G, 2020a

Goodenia hartiana is primarily found in the Great Sandy Desert bioregion, covering an area of about 300 km north-south and 250 km east-west (ALA 2024). Consequently, its suitable habitat extends well beyond the s.40AA development envelope. Several targeted surveys have been undertaken for *Goodenia hartiana* in the area surrounding Telfer including those by Syrinx Environmental in 2010 and 2013) that documented 51,000 plants and Spectrum Ecology (2022) and Ecoscape (2024) which documented 9,081 and 6,610 plants. Therefore, the population in the Telfer and Havieron area, based on combined surveys, is presumed to be at least 67,000 plants (Ecoscape, 2024). Within the disturbance footprint for the Havieron mine, 1,592 individuals were counted, indicating an impact of less than 2.5% of the total population. However, due to the lack of quantitative data on the extent of native vegetation clearing and the historical impact from the Telfer mine on this species, it is not possible to accurately quantify the cumulative impact of the s.40AA significant amendment as a whole.

Notwithstanding the above, land clearance of up to 630 ha is extremely small scale, having taken all opportunities to minimise disturbance, particularly to *Goodenia hartiana*, with total impact of the s.40AA being less than 2.5%.

5.8 ENVIRONMENTAL OUTCOME

The s.40AA Significant Amendment will result in the extent of pre-European vegetation remaining at greater than 98%. Similarly, the majority of local vegetation types will have more than 80-90% of their mapped extent remaining. All local vegetation types are present outside of the development envelope and no local vegetation type or the species it hosts will be at an increased risk of loss as a result of the Significant Amendment.

The operational Life of Mine of the Havieron Mine is expected to be 13 years, after which rehabilitation will occur. A Mine Closure Plan for the Significant Amendment is included in this documentation

(Appendix zDD) and expected to achieve flora and vegetation similar to pre-disturbance quality over time.

Mitigations and monitoring for indirect threats to flora and vegetation (weeds, dust, spills, hypersaline water, altered surface water flows, and altered fire regimes) are considered to be best practice and able to preserve local flora and vegetation quality and extent.

Cumulative impacts are expected to be low due to the continuity of habitat and small scale of clearing in a bioregion that remains largely intact. Impacts to *Goodenia hartiana* (P2) equate to 2.5% of the total population and not considered significant given local widespread occurrence.

The outcomes for flora and vegetation for the s.40AA Significant Amendment can be summarised as:

- Clearance of native vegetation not to exceed 630 ha
- Important vegetation types will be avoided where possible or minimised as stated in Table 5-9
- Flora and vegetation surveys will be conducted 2-yearly at a suitable time to detect and measure the presence, extent and condition of Priority flora species and important vegetation types
- Weeds will be controlled to <10% incursion into native vegetation in accordance with Outcome 4 of the SSMP (Appendix J), with annual weed surveys to be completed and the management program adapted based on results
- Alteration of surface waters will be avoided or minimised through design such that surface water dependent ecosystems do not reduce in range from baseline
- Hypersaline waters will remain contained within lined evaporation ponds and managed continuously under the strict conditions of Licence L9455 to avoid discharge to the environment
- Assure that fire control, detection and response capabilities are maintained for early and swift response to fire
- Progressively (where possible) and final rehabilitation to meet Mine Closure Plan criteria and achieve pre-disturbance flora and vegetation extent and quality.

The assessment of direct and indirect impacts on flora and vegetation from Proposal activities, once all mitigation measures are implemented, results in no significant residual impact on flora and vegetation values. Therefore, the Proposal meets EPA's objective: *"to protect flora and vegetation so that biological diversity and ecological integrity are maintained."*

6. TERRESTRIAL FAUNA – KEY FACTOR

6.1 EPA OBJECTIVE

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

6.2 RELEVANT POLICIES AND GUIDELINES

Table 6-1: Policy and guidance relevant to terrestrial fauna

Environmental Factor	EPA and other State or Commonwealth policy or guidance	Consideration of policy and guidance
Terrestrial Fauna (EPA 2016)	Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020)	Considered in the design of terrestrial fauna surveys
	Technical Guidance: Sampling of Short-range Endemic Invertebrate Fauna (EPA 2009)	
	Survey Guidelines for Australia's Threatened Mammals (DSEWPaC 2011)	
	Survey Guidelines for Australia's Threatened Reptiles (DSEWPaC 2011)	
	Survey Guidelines for Australia's Threatened Birds (DEWHA 2010)	
	Survey Guidelines for Australia's Threatened Bats (DEWHA (2010)	
	Guidelines for surveys to detect the presence of bilbies, and assess the importance of habitat in Western Australia (DBCA 2017)	Assessment of impacts on conservation significant species
	Significant impact guidelines 1.1: Matters of national environmental significance (Department of the Environment 2013).	
	Threatened Species Committee (2016) - Conservation Advice <i>Macrotis lagotis</i> Greater Bilby	Considered in the design of mitigations both within the proposal development envelope and the proposed offset area
	DCCEEW (2023) Recovery Plan for the Greater Bilby (<i>Macrotis lagotis</i>) 2023	
	Threatened Species Scientific Committee (2016) - Conservation Advice <i>Pezoporus occidentalis</i> Night Parrot	
	Draft Conservation Advice for <i>Pezoporus occidentalis</i> (night parrot) 2024 (noting this document only forms part of consultation on a future update to advice)	
	Guidance Statement No. 6 — Rehabilitation of Terrestrial Ecosystems (EPA 2006)	Noted as part of rehabilitation and closure planning

6.3 RECEIVING ENVIRONMENT

6.3.1 FAUNA SURVEYS

Approved Proposal

Fauna surveys undertaken to inform original assessment of the Approved Proposal are provided in Table 6-2 and are available on the EPA website as parts of the proposal documentation for the Telfer Project Power Supply (Assessment No. 1444) and Gold Mine Expansion (Assessment No. 1445), respectively.

Table 6-2: Fauna surveys undertaken for the Approved Proposal

Report Author	Date	Survey description	Area	Details
Hart, Simpson & Associates (2001)	Sep-Oct 2001	Level 1 survey desktop & site reconnaissance).	Telfer to Port Hedland Infrastructure Corridor	In addition to desktop reviews, representative sites along the 440 km-long corridor were surveyed in detail, with opportunistic recordings during vehicle traverses.
Hart, Simpson and Associates (2002)	May 1999 and May 2001	Detailed survey.	Telfer Study Ecological Area.	Detailed program with two single phased surveys. Trapping (10 sites) and opportunistic records. Extensive foot searches for secondary evidence and for habitat assessment. Survey conducted before EPA guidance was released. Does not meet current EPA guidance.

s.40AA Significant Amendment

Fauna surveys and analysis reports conducted for or relevant to the Significant Amendment are provided in Table 6.3 including details and summary findings. This is a large table, so for ease they listed below:

- Detailed Vertebrate and Short-Range Endemic (SRE) Invertebrate Fauna Survey, Biologic (September 2020) – **Appendix L**
- Havieron Project Infrastructure Corridor Detailed Vertebrate and SRE Invertebrate Fauna Survey, Biologic (October 2021) – **Appendix M**
- Conservation Significant Species Assessment, Telfer, Spectrum (2021) – **Appendix N**
- Night Parrot Monitoring, Telfer Operations, Spectrum (2022) – **Appendix O**
- Havieron Project Bilby monitoring, Biologic, 2021 - **Appendix P**
- Havieron Project Greater Bilby Monitoring, Biologic, 2022 - **Appendix Q**
- Telfer Significant Fauna Monitoring Report, Spectrum, 2023 - **Appendix R**

Given the revision of Night Parrot to Critically Endangered on 5 September 2025 and to ensure the currency of habitat information Greatland commissioned a specialist review and targeted survey for Night Parrot habitat as follows:

- Havieron Night Parrot Habitat Review, Nick Leseberg, Adaptive NRM, September 2025 – **Appendix zHH**
- Targeted survey for potential Night Parrot habitat along the Telfer to Havieron Development corridor, Red Dog, September 2025 – **Appendix zII**

The total extent of survey area from the above-listed surveys is shown in Figure 6-1.

To align with Martu request and conservation advice (avoiding public access), the location of Night Parrot have been redacted from relevant attachments. The unredacted reports have been provided in-confidence to EPA Services to allow for assessment but cannot be made public.

Results from fauna surveys have been used to assess suitable habitats and the potential impacts of the Significant Amendment on terrestrial fauna. These fauna survey reports are summarised in Table 6-2 and Surveys completed at Telfer are included because they have been used to assess cumulative impacts.

Table 6-3: Terrestrial fauna and habitat surveys and key findings

Report title	Date	Survey Description and Key Findings																					
Biologic (2020) Detailed Vertebrate and Short-Range Endemic (SRE) Invertebrate Fauna Survey Appendix L	<u>Phase 1:</u> 16-27 March 2020 <u>Phase 2:</u> 31 May-14 June 2020	Survey Area: Stage 1 Mining Lease and Service Corridor Survey Overview: The detailed survey covered a 5,153-ha area, consisting of: • Project Area: 3,815 ha • Service Corridor: 1,337.98 ha (connecting to Telfer) • Regional Mapping Area (desktop): 180,459.83 ha (10 km buffer around the detailed Survey Area for habitat mapping) Limitations: Limitation in relation to fire affected zones, overcome by focusing survey effort on unaffected zones (refer report for further details). Survey Phases: • Phase 1: Systematic trapping to define faunal assemblages. • Phase 2: Further systematic trapping to supplement Phase 1 results and targeted sampling for conservation-significant species. Methods included: ○ Systematic trapping (pitfall, Elliott, funnel, and cage traps) ○ Avifauna census, spotlighting, motion-sensor cameras ○ Acoustic sound and bat echolocation recording ○ Targeted searches (bilby plots, marsupial mole trenching) ○ Habitat assessments ○ Short-range endemic (SRE) species sampling via active searches, soil sieving, and opportunistic captures at trap sites. Key Findings: Fauna Habitat Types: Habitat assessments were undertaken in the field to characterise and define habitats and their significance to vertebrate fauna. The detailed Survey Area (5,153 ha) recorded six broad fauna habitats: <table border="1"> <thead> <tr> <th>Habitat Type</th><th>Area (ha)</th><th>% of Survey Area</th></tr> </thead> <tbody> <tr> <td>Sand Plain</td><td>4,487.35</td><td>87.1%</td></tr> <tr> <td>Sand Dune</td><td>404.53</td><td>7.8%</td></tr> <tr> <td>Stony Plain</td><td>220.94</td><td>7.3%</td></tr> <tr> <td>Claypan</td><td>21.45</td><td>0.4%</td></tr> <tr> <td>Stony Hill/Breakaway</td><td>14.42</td><td>0.3%</td></tr> <tr> <td>Saltpan</td><td>4.95</td><td>0.1%</td></tr> </tbody> </table> These habitats are widespread across the Great Sandy Desert, supporting common and broadly distributed fauna species.	Habitat Type	Area (ha)	% of Survey Area	Sand Plain	4,487.35	87.1%	Sand Dune	404.53	7.8%	Stony Plain	220.94	7.3%	Claypan	21.45	0.4%	Stony Hill/Breakaway	14.42	0.3%	Saltpan	4.95	0.1%
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		Regional Mapping Area (RMA) (180,459.83 ha) fauna habitat mapping: <table border="1"> <thead> <tr> <th>Habitat Type</th><th>Area (ha)</th><th>% of RMA</th></tr> </thead> <tbody> <tr> <td>Sand Plain</td><td>113,229.58</td><td>62.7</td></tr> <tr> <td>Stony Plain</td><td>32,629.26</td><td>18.1</td></tr> <tr> <td>Sand Dune</td><td>13,788.26</td><td>7.6</td></tr> <tr> <td>Salt pan</td><td>10,061.09</td><td>5.6</td></tr> <tr> <td>Stony Hill/Breakaway</td><td>849.34</td><td>4.7</td></tr> <tr> <td>Saltpan</td><td>287.47</td><td>0.2</td></tr> <tr> <td>Cleared/disturbed</td><td>2,014.83</td><td>1.1</td></tr> </tbody> </table> Conservation-Significant Species: • Greater Bilby: Twenty-two (22) bilby sites were sampled during Phase 1, and 99 further sites during Phase 2. The Bilby was recorded 272 times over both phases, through secondary evidence (diggings, scats, tracks, burrows: n=268) and direct sightings via motion cameras (n=4), at 24 sites. The survey effort included a total of 66.5 hours person hours of targeted sampling. • Northern Marsupial Mole (Endangered): Observed seven times via secondary evidence (tunnels) at four sites. • Night Parrot: Acoustic recorders deployed at 13 locations during both phases (including four of the systematic trapping sites). Deployed between 6-7 nights each for a total of 79 recording nights. No recordings of Night Parrot occurred during this survey. However, recent recordings near Telfer Mine (Havieron site, 45 km west) have confirmed their presence in the area. Habitat types within the Biologic (2020a) Survey Area suitable for this species include Sand Dune, Sand Plain, and Saltpan. Vertebrate Fauna Recorded: A total of 96 species were documented: • Mammals: 18 species (16 native, 2 introduced) • Birds: 38 species • Reptiles: 35 species • Amphibians: 5 species Invertebrate Fauna (Short-Range Endemics): • Potential SRE species identified: 6 (1 mygalomorph spider, 4 scorpions, 1 terrestrial isopod) • Specimens collected: 60 (41 scorpions, 19 isopods) • Collected primarily in Sandy/Stony Plain habitats, which are widespread and not isolated refugia, making it unlikely they are restricted to the Survey Area. Additional Insights: • Night Parrot Habitat: Recent mapping suggests additional suitable habitat, though ground-truthing has not been conducted to verify long-unburnt spinifex presence (Note: Greatland have completed this verification, refer Red Dog 2025 survey Appendix xII).	Habitat Type	Area (ha)	% of RMA	Sand Plain	113,229.58	62.7	Stony Plain	32,629.26	18.1	Sand Dune	13,788.26	7.6	Salt pan	10,061.09	5.6	Stony Hill/Breakaway	849.34	4.7	Saltpan	287.47	0.2	Cleared/disturbed	2,014.83	1.1
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		• Artificial Water Sources at Telfer Mine (dams, bores, sewage ponds) provide wetland habitat for various bird species. • Rainfall Preceding Survey Recorded at 227.8 mm, indicating low rainfall conditions.
Biologic (2021) Havieron Project Infrastructure Corridor Detailed Vertebrate and SRE Invertebrate Fauna Survey Appendix M	<u>Phase 1:</u> 23 October- 7 November 2020 (wet season)	Survey Area: Stage 2 Infrastructure Corridor (Detailed Survey Area). Survey Overview: A detailed fauna survey was conducted over a 2,899.38 ha area to: • Identify and classify faunal assemblages using systematic trapping. • Assess fauna habitat for its significance to vertebrate and SRE invertebrate species. • Conduct field-based habitat assessments at 161 locations, including all sampling sites. • Apply various sampling methods, including: ○ Systematic trapping (pitfall, Elliott, funnel, and cage trapping). ○ Avifauna census & nocturnal searches. ○ Acoustic call recording. ○ Bat ultrasonic echolocation recording. ○ Targeted searches (including 2 ha Bilby plots). ○ Marsupial Mole trenching & habitat assessments. ○ Short-range endemic sampling via: ▪ Active searches. ▪ Litter and soil sieving. ▪ Opportunistic pit-trap captures at vertebrate trapping sites. Sampling has been conducted throughout the Survey Area and in additional areas of suitable habitat in the vicinity of the Survey Area using primarily acoustic recorders. Targeted sampling of the species was undertaken in accordance with DPaW (2017). A total of 6 systematic trapping sites were established, with sites representing most fauna habitats present within the Survey Area (7 consecutive nights, checked daily, every 3 hours since sunrise). SM4 acoustic recorders were deployed for between 4 and 29 consecutive nights at 37 sampling locations, for a total of 336 recording nights over both survey phases. Conditions during the recording periods were generally good, with no rain and low wind interference recorded. Limitation: Fire and access were a potential limitation but overcome by the availability of suitable representative areas of habitat (refer report for further details). Findings: A total of 102 vertebrate fauna species, comprising 19 mammal species (16 native and three introduced), 45 birds, 37 reptiles and one amphibian, were recorded from the Study Area during the current survey. Apart from some species of conservation significance (particularly night parrot), the majority of species recorded were typical of assemblages for the broad fauna habitats present and the Great Sandy Desert region generally (as identified by the desktop assessment).

Report title	Date	Survey Description and Key Findings																																
		Five vertebrate fauna species of conservation significance were recorded within, or directly adjacent to, the Survey Area during the current survey, including: - Night Parrot: recorded on three occasions from call via acoustic recorder. - Greater Bilby: recorded on 16 occasions by secondary evidence, comprising 8 inactive burrows, 7 track recordings and one digging. - Gull-Billed Tern (<i>Gelochelidon nilotica</i> – Migratory): record on one occasion from call via acoustic recorder. - Brush-Tailed Mulgara: recorded on two occasions from secondary evidence, comprising one track and one scat record. - Northern Marsupial Mole: recorded on 18 occasions at mole trenches by secondary evidence, comprising 50 inactive burrow/tunnel records. Habitat Suitability for Conservation-Significant Species Habitat assessments were undertaken in the field to characterise and define habitats and their significance to vertebrate fauna. Fauna habitat mapping was completed for the Survey Area using the vertebrate fauna habitat assessments completed during the field surveys, as well as high-resolution aerial imagery, vegetation, topographical, geology and soil mapping. Habitats were delineated and mapped across the Survey Area at a scale of approximately 1:20,000. The availability of suitable habitat within the Survey Area varies. Special attention was given to two highly significant species: Night Parrot and Greater Bilby. Key Habitat Distribution Night Parrot: <table><tr><th>Habitat Type</th><th>Area (ha)</th><th>Percentage of Survey Area</th><th>Description</th></tr><tr><td>Primary Nesting & Roosting Habitat</td><td>103.21</td><td>3.6%</td><td>Mature <i>Triodia</i> hummock grasses</td></tr><tr><td>Primary Foraging Habitat</td><td>29.73</td><td>1.0%</td><td><i>Atriplex</i> & <i>Tecticornia</i> chenopods providing a year-round food source</td></tr><tr><td>Secondary (Seasonal) Foraging Habitat</td><td>2,756.20</td><td>95.1%</td><td>Seasonally seeding <i>Triodia</i>, other grass-dominated areas</td></tr></table> Greater Bilby: <table><tr><th>Habitat Type</th><th>Area (ha)</th><th>Percentage of Survey Area</th><th>Description</th></tr><tr><td>Primary Breeding, Foraging & Dispersal Habitat</td><td>99.44</td><td>3.4%</td><td>Mature/unburnt <i>Triodia</i> hummock grassland and open <i>Acacia</i> shrubland</td></tr><tr><td>Secondary Foraging & Dispersal Habitat</td><td>2,560.58</td><td>88.3%</td><td>Post-fire regrowth zones, <i>Triodia</i> grasslands, and varying <i>Acacia</i> shrublands</td></tr><tr><td>Unsuitable (Cleared/Disturbed) Habitat</td><td>239.35</td><td>8.3%</td><td>Areas affected by habitat clearance or disturbance</td></tr></table> Habitat types: A total of 5 broad fauna habitat types were recorded and mapped across the Survey Area (and ground-truthed):	Habitat Type	Area (ha)	Percentage of Survey Area	Description	Primary Nesting & Roosting Habitat	103.21	3.6%	Mature <i>Triodia</i> hummock grasses	Primary Foraging Habitat	29.73	1.0%	<i>Atriplex</i> & <i>Tecticornia</i> chenopods providing a year-round food source	Secondary (Seasonal) Foraging Habitat	2,756.20	95.1%	Seasonally seeding <i>Triodia</i> , other grass-dominated areas	Habitat Type	Area (ha)	Percentage of Survey Area	Description	Primary Breeding, Foraging & Dispersal Habitat	99.44	3.4%	Mature/unburnt <i>Triodia</i> hummock grassland and open <i>Acacia</i> shrubland	Secondary Foraging & Dispersal Habitat	2,560.58	88.3%	Post-fire regrowth zones, <i>Triodia</i> grasslands, and varying <i>Acacia</i> shrublands	Unsuitable (Cleared/Disturbed) Habitat	239.35	8.3%	Areas affected by habitat clearance or disturbance
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	- The extent of primary habitat for the Night Parrot is expected to increase over time as vegetation matures. - Regeneration of fire-affected areas may lead to an expansion of suitable habitat availability, contingent on regional rainfall patterns.																								
Phase 2: 26 April-7 May 2021 (post wet/dry season)	Survey Overview:																								
	Objective:																								
	- Supplement Phase 1 survey results with targeted species sampling. - Determine the occurrence of conservation-significant species, identified in the desktop assessment, within the Survey Area. - Ultrasonic Bat recording and Acoustic recording continued																								
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Spectrum (2021) Targeted conservation	6-13 November 2020	Survey Area: Telfer Operations Survey overview Objective:																							

Report title	Date	Survey Description and Key Findings																		
significant species survey		- Establish a baseline for conservation-significant species within the Telfer Survey Area. - Integrate survey results with three relevant database searches covering the Survey Area plus a 40 km buffer. - Conduct habitat mapping (September 2021) within and around the Survey Area, by desktop after the field survey, supplemented by previous Biologic (2020a) mapping (desktop analysis only; no ground truthing). - Targeted fauna surveys.																		
Appendix N		Partial Limitation: Partial. Unable to obtain Ground Disturbance Permit for trench surveys for Northern Marsupial Moles, optimised survey timing was not possible for each species, and some areas were fire affected. Refer to report for the impacts of these on survey results. Survey Scope & Effort: - Fauna habitat types are identified and mapped based on the following information: - Havieron Project Detailed Vertebrate and SRE Invertebrate Fauna Survey (Biologic, 2020a) - Pre-European vegetation mapping - Landforms - Geological units - Soil substrate - Aerial imagery.																		
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		Key Findings: Potential conservation-significant species: Database review suggest up to 20 species may occur regionally (DBCA, NatureMap, PMST) New records: Survey identified two bird species previously unlisted in relevant databases. Recorded species: Eight conservation-significant species confirmed during the survey: Native non-volant mammals (3 species): - Greater Bilby (<i>Macrotis lagotis</i>) - Crest-tailed Mulgara (<i>Dasycercus cristicauda</i>) / Brush-tailed Mulgara (<i>Dasycercus blythi</i>)																		

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		- Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) Birds (5 species): - Wood Sandpiper (<i>Tringa glareola</i>) - Red Knot (<i>Calidris canutus</i>) - Common Sandpiper (<i>Actitis hypoleucos</i>) - Sharp-tailed Sandpiper (<i>Calidris acuminata</i>) - Gull-billed Tern (<i>Gelochelidon nilotica</i>) Additional records: Night Parrot and Red Goshawk confirmed through previous site assessments. Fauna Habitat Types Recorded (adapted from Biologic 2020): <table><tr><th>Habitat Type</th><th>Extent (ha)</th><th>% of Survey Area</th><th>Total Area Extent (ha)</th><th>% of Total Area</th></tr><tr><td>Sand Plain</td><td>45,716.7</td><td>35.2</td><td>158,833.7</td><td>51.2</td></tr><tr><td>Stony Plain</td><td>34,214.2</td><td>26.3</td><td>65,434.2</td><td>21.1</td></tr><tr><td>Sand Dune</td><td>27,395.5</td><td>21.1</td><td>41,774.6</td><td>13.5</td></tr><tr><td>Stony Hill, Breakaway or other Outcropping</td><td>18,230.0</td><td>14.0</td><td>26,922.1</td><td>8.7</td></tr><tr><td>Claypan</td><td>1,086.5</td><td>0.8</td><td>1,606.4</td><td>0.5</td></tr><tr><td>Saltpan</td><td>446.8</td><td>0.3</td><td>10,652.3</td><td>3.4</td></tr><tr><td>Cleared/Disturbed</td><td>2,826.6</td><td>2.2</td><td>4,854.2</td><td>1.6</td></tr><tr><td>Total</td><td>12,9916.2</td><td>100</td><td>310,077.7</td><td>100</td></tr></table>	Habitat Type	Extent (ha)	% of Survey Area	Total Area Extent (ha)	% of Total Area	Sand Plain	45,716.7	35.2	158,833.7	51.2	Stony Plain	34,214.2	26.3	65,434.2	21.1	Sand Dune	27,395.5	21.1	41,774.6	13.5	Stony Hill, Breakaway or other Outcropping	18,230.0	14.0	26,922.1	8.7	Claypan	1,086.5	0.8	1,606.4	0.5	Saltpan	446.8	0.3	10,652.3	3.4	Cleared/Disturbed	2,826.6	2.2	4,854.2	1.6	Total	12,9916.2	100	310,077.7	100
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Spectrum (2022)	1-23 April 2022	Survey Area: Telfer Operations Survey Scope & Recording Conditions - The survey took place between the 01 – 23 April 2022 and was conducted in accordance with the Interim Guideline for Preliminary Surveys of the Night Parrot (<i>Pezoporus occidentalis</i>) in Western Australia (DPaW 2017). Recording Nights: 47 nights of acoustic recordings were conducted across eight locations within two separate areas. Call Analysis: 21,978 potential calls were manually assessed for Night Parrot vocalizations by Nigel Jakkett (leading expert on Night Parrot ecology and call analysis). Survey Conditions: Weather conditions were favourable, with no significant interference from wind, rain, or insect noise. Limitations: Limitation in relation to fire affected zones, and in relation to limited ecological information for night parrot (refer Appendix O for further details). Night Parrot Presence & Habitat Context																																													
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Report title	Date	Survey Description and Key Findings
		• Detection Results: No calls identified as Night Parrot vocalisations were detected during the analysis. • Roosting & Foraging Likelihood: The findings indicate low probability of a stable Night Parrot roost within 200m of surveyed locations or active foraging during the assessment period. • Foraging Conditions: Despite recent significant rainfall, optimal foraging conditions were present due to increased abundance of seasonal grasses, herbs, and seeding Triodia hummock grasses. • Stony Plain habitat is not always clearly defined and often blends with the Sand Plain habitat. Areas of suitable habitat which overlapped with areas of the longest unburnt vegetation were determined to have the highest probability of Night Parrot occurrence. Historical Context & Survey Interpretation • Previous Night Parrot Detection: A Night Parrot call was previously recorded near Area 1, but current survey results suggest the individual may have been moving between roosting, drinking, or foraging locations rather than establishing a stable roost. • Detection Variability: Night Parrot detectability varies significantly based on seasonal food and water availability. • Survey Limitations: The absence of detections in the two-week period does not confirm complete absence of a Night Parrot population within the broader region.
Biologic (2021) Greater Bilby Monitoring 2021 Appendix P	25 October – 1 November 2021	Survey Area: Havieron mine area (M45/1287). Survey Overview: First annual monitoring event of the Greater Bilby population, to establish a baseline dataset for future comparisons. • Survey Coverage: 4,125 ha, with a total of 17 sites established, with 12 within the Survey Area and five just outside (within 2 km) for contextual data and control purposes. • Bilby Presence: Of 45 scats submitted for genetic analysis, only eight were successfully genotyped, identifying two individual bilbies (one male, one female). No recent evidence of Greater Bilby presence recorded, and all previously recorded burrows were inactive. • Other Species: Six non-target species were observed, including three introduced mammals (camel, dingo, cat), one bird (Australian bustard), and two reptiles (sand goanna, thorny devil). Introduced mammal presence was noted at every site, including a cat using an inactive bilby burrow at site VHBM-18. • Camera Trap Records: Two camera traps captured evidence of species using bilby burrows—one cat at site VHBM-09 and one sand goanna at VHBM-18. The recorded cat was confirmed as the same individual seen using the burrow during targeted searches. • Environmental Disturbances: Mining, exploration, road activity, and recent fires were recorded as disturbances, with exploration activity increasing exponentially since the 2020 survey. Site VHBM-14 was the closest to active disturbances (110 m). Fire-affected sites included VHBM-04, VHBM-05, VHBM-11, VHBM-16, and VHBM-17. • Influence on Bilby Occurrence: Factors such as fire, mining activities, and feral predators were identified as possible impacts on bilby presence. Burnt areas still provide secondary foraging and dispersal habitats and may regain primary habitat value as regeneration progresses. Bilbies have previously been recorded foraging in disturbed areas, suggesting they may still use such habitats despite development. Limitations noted: Yes. Limitation in relation to fire affected zones across a broad area of monitoring (refer report for further details).

Report title	Date	Survey Description and Key Findings
Biologic (2022) Havieron Project: Greater Bilby Monitoring Appendix Q	20-27 October 2022	Survey Area: Telfer Operations Survey Scope & Habitat Changes • Monitoring Sites: 20 sites assessed, 16 revisited and four newly established; 15 within the Survey Area and five nearby (within 2 km) as controls. • Primary Habitat Expansion: Primary bilby habitat increased by 11.38% (from 192.31 ha in 2020 to 545.67 ha in the current survey). Habitat remains fragmented due to previous widespread fires, but post-fire regeneration has led to the emergence of isolated patches across most of the Survey Area. • Habitat Outlook: Previously burnt areas are expected to be utilized more frequently as regeneration continues, with habitat quality expected to improve over time. Greater Bilby Records & Monitoring • First Recent Evidence Since 2020: The species was recorded 600 times within the Survey Area. • Recorded Signs: ○ Burrows: 23 total (11 active, 12 inactive) ○ Diggings: 506 across 58 locations ○ Scats: 36 ○ Tracks: 35 • Genotyping Results: Two unique individuals were identified, though indirect signs suggest multiple individuals of different age classes. • Burrow Monitoring: ○ All previously known bilby burrows (n = 6) exhibited recent activity. ○ Six additional active burrows were found. ○ Long-term camera traps were placed at all 12 burrows to confirm bilby usage and record visits by other species; data will be included in the 2023 monitoring report. Environmental & Anthropogenic Disturbances • Fire Impact: Signs of recent fires were recorded intermittently at multiple sites, though burnt areas still serve as secondary foraging and dispersal habitats. Utilisation is expected to increase as regeneration progresses. • Mining & Exploration Disturbance: ○ Mining and exploration activity has significantly increased since the Biologic 2020a survey. ○ Evidence of bilby occurrence was recorded approximately 600m from active mining areas. ○ Bilbies have previously foraged and dispersed in disturbed areas during pre-clearance surveys. ○ A shift in mining activity to operational phases could alter disturbance patterns. • Feral Predator Presence: ○ Feral cats (<i>Felis catus</i>) were recorded as a significant potential threat. ○ Dingoes (<i>Canis lupus</i>) may play a regulatory role, potentially controlling feral cat populations. ○ Newcrest's 2022 feral cat management program may help mitigate risks to local bilby populations.

Report title	Date	Survey Description and Key Findings										
		Long-Term Monitoring Considerations • Survey Comparison: No bilby evidence was recorded during the previous 2021 monitoring survey (Biologic 2022a), but presence has now been confirmed. • Ongoing Research Needs: It remains uncertain whether previous absence was due to natural population shifts, predator activity, fire, or mining/exploration disturbances. • Monitoring Program Value: Continued assessments are expected to provide deeper insights into bilby occurrence, abundance, and environmental influences.										
Spectrum (2023) Telfer Operations Significant Fauna Monitoring Appendix R	7-16 March 2023	Survey Area: Telfer Operations Survey Overview: Objective • Conduct continued baseline monitoring of significant species at Telfer (Biannual event) • Gain a deeper understanding of local and regional populations of conservation-significant species. • Manage potential impacts of mining activities on critical habitats. • Ground truth the terrestrial fauna habitats across the Survey Area and apply species specific methods to detect the presence of significant fauna Survey Methods & Sampling Effort <table><tr><th>Survey Component</th><th>Details</th></tr><tr><td>Targeted Searches</td><td>41 combined Bilby and Mulgara searches (Transect & 2 ha search areas) in suitable habitat, and 5 Northern Marsupial Mole sites (3 Trenches per site).</td></tr><tr><td>Night Parrot Acoustic Monitoring</td><td>10 sites, one recorder per site for 6 nights</td></tr><tr><td>Bird Surveys</td><td>20-minute surveys at 9 migratory bird sites</td></tr><tr><td>Motion Cameras (Bilby & Mulgara)</td><td>10 cameras at recent secondary evidence sites, deployed for 3 nights</td></tr></table> <i>*The Report does not state the Survey Area extent (ha), refer Figure 6-1</i> Habitat Mapping & Updates • Original mapping completed by Biologic (2020a) and adapted by Spectrum including fine-scale adjustments. • New habitat mapping incorporated: ○ Pre-European vegetation mapping. ○ Landform classification. ○ Geological unit analysis. ○ Soil substrate recordings. ○ Aerial imagery assessment.	Survey Component	Details	Targeted Searches	41 combined Bilby and Mulgara searches (Transect & 2 ha search areas) in suitable habitat, and 5 Northern Marsupial Mole sites (3 Trenches per site).	Night Parrot Acoustic Monitoring	10 sites, one recorder per site for 6 nights	Bird Surveys	20-minute surveys at 9 migratory bird sites	Motion Cameras (Bilby & Mulgara)	10 cameras at recent secondary evidence sites, deployed for 3 nights
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Report title	Date	Survey Description and Key Findings																								
		*No ground truthing of the updated mapping was conducted. Fauna Habitat Mapping Survey Coverage Mapping within the Survey Area was reviewed for this report, identifying five habitat types: <table border="1"> <thead> <tr> <th>Habitat Type</th><th>Extent (ha)</th><th>Percent of Survey Area (%)</th></tr> </thead> <tbody> <tr> <td>Stony Plain</td><td>3,186.8</td><td>30.7</td></tr> <tr> <td>Sand Plain</td><td>1,765.6</td><td>16.9</td></tr> <tr> <td>Sand Dune</td><td>369.3</td><td>3.6</td></tr> <tr> <td>Claypan</td><td>296.7</td><td>2.7</td></tr> <tr> <td>Stony Hill, Breakaway, or Other Outcropping</td><td>277.1</td><td>2.8</td></tr> <tr> <td>Total</td><td>10,394</td><td>100</td></tr> <tr> <td>Cleared/Disturbed Areas (Mining Activity & Development)</td><td>4,496.7</td><td>43.3</td></tr> </tbody> </table> Recorded Significant Species Species recorded during monitoring: Mammals: - Greater Bilby (<i>Macrotis lagotis</i>) (secondary evidence only) - Brush-tailed Mulgara (<i>Dasycercus blythi</i>) - Northern Marsupial Mole (<i>Notoryctes caurinus</i>) Migratory Birds: - Sharp-tailed Sandpiper (<i>Calidris acuminata</i>) - Additional Species (not outlined in Significant Species Management Plan (SSMP)): - Oriental Plover (<i>Charadrius veredus</i>) *No Night Parrot calls were detected during the analysis. Feral Species Recorded - Red Fox (<i>Vulpes vulpes</i>)** detected via motion camera at one site for three consecutive nights. - Predation Threats: Red Fox poses a potential risk to protected species in the SSMP including: - Greater Bilby - Night Parrot - Mulgara - Migratory Birds Feral Species Control Considerations: Management actions should be considered to mitigate risks at Telfer.	Habitat Type	Extent (ha)	Percent of Survey Area (%)	Stony Plain	3,186.8	30.7	Sand Plain	1,765.6	16.9	Sand Dune	369.3	3.6	Claypan	296.7	2.7	Stony Hill, Breakaway, or Other Outcropping	277.1	2.8	Total	10,394	100	Cleared/Disturbed Areas (Mining Activity & Development)	4,496.7	43.3
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Total	10,394	100																								
Cleared/Disturbed Areas (Mining Activity & Development)	4,496.7	43.3																								

Report title	Date	Survey Description and Key Findings
Red Dog, 2025 Targeted survey for potential Night Parrot habitat along the Telfer to Havieron Development corridor Attachment zII	15 – 18 September 2025	Survey Area: Havieron Infrastructure Corridor (Telfer to Havieron) and Havieron mine area. Survey Scope and details: Night Parrot habitat assessment against revised survey guidelines and conservation advice, and comparison with previous survey results. 19 habitat points were visited for physical/visual assessment for roosting and/or foraging habitats in accordance with Guidelines for preliminary surveys of night parrot (<i>Pezoporus occidentalis</i>) in Western Australia (DBCA, 2024). Locations selected using previously mapped habitat, fire age data, aerial imagery with a spatial resolution of 10cm per pixel. This survey was a habitat assessment only and did not include acoustic monitor deployment, taking the likelihood of presence from the Biologic (2021) results (Attachment I). Survey findings: No critical habitat (roosting/breeding habitat) for the Night Parrot was identified using the criteria outlined in 2024 Guidelines (DBCA, 2024a). A total of 3,409 ha was mapped as flyway or dispersal habitat. 2,200 ha of the surveyed area was fire scarred variously over the past 14 years further reducing the likelihood of suitable Night Parrot breeding/roosting habitat.

6.4 FAUNA HABITATS

Approved Proposal

For the Port Hedland–Telfer corridor, general fauna habitat (Newcrest 2002a) consisted of:

- Sandplains of the Pilbara and the edge of the Great Sandy Desert, with shrubs over spinifex, interspersed with drainage lines and large rivers
- Granite rocks scattered throughout the corridor
- Small, isolated areas of stony hills and valleys
- Extensive swale and sand dune system of the Great Sandy Desert.

For the mine expansion (Newcrest 2002b), the fauna habitats included the above (except for the scattered granite rocks) as well as the following:

- Claypan
- Small, short drainage lines.

Overall, the EPA found that the proposal area lay within much larger area of similar environmental values and did not contain any fauna of particular significance (EPA 2002b).

s.40AA Significant Amendment

A total of six broad fauna habitats occurring regionally and within the Development Envelope were mapped by Spectrum (adapted from Biologic, 2020) through aerial imagery and desktop analysis. These are shown in Figure 6-2.

The Regional Mapping Area comprises 310,077.7 ha mapped by Biologic (2020) and Spectrum (2021). This provides a 40km buffer around the development envelope. Of the combined mapped area, 1.6% has previously been cleared or disturbed due to mining or exploration activity. The fauna habitat extent within the regional mapping area is shown in Table 6-4.

Table 6-4: Extent of fauna habitats within the Regional Mapping Area (Spectrum 2021)

Habitat	Extent in Regional Mapping Area (RMA)	
	Area (ha)	Area (%)
Claypan	1,606.4	0.5%
Saltpan	10,652.3	3.4%
Sand Dune	41,774.6	13.5%
Sand Plain	158,833.7	51.2%
Stony Hill, Breakaway or Other Outcropping	26,922.1	8.7%
Stony Plain	65,434.2	21.1%
Cleared/disturbed	4,854.2	1.6%
Total	310,077.7	100%

A description of each habitat and the potential significant species it supports is given in Table 6-5. Habitat utilisation is based on referenced research that considers all theoretical circumstances, such as ecosystem pressures (e.g. fire, flood) resulting in dispersal and use of non-preferred habitat. Site-specific utilisation of the s.40AA Significant Amendment area is provided in Section 6.5 for each species.

All fauna habitats mapped occur more broadly, forming larger expanses of relatively homogeneous and continuous landscape (refer Figure 6-2). Sand Plain and Sand Dune habitats are widespread and occur more broadly across the Great Sandy Desert bioregion where they are the dominant fauna habitats occurring in the region.

It should be noted, the widespread occurrence of recent fires at the time of survey (refer Figure 5-3) is likely to have resulted in a reduced suitability for fauna in some areas. However, post-fire regeneration continues and fire, along with rainfall, is the dominant process that shapes the Australian Rangelands. Survey limitations are noted for each survey in Table 6-3 and did not affect the veracity of results.

Table 6-5: Description of fauna habitats and their potential utilisation by significant species

Habitat	Description	Potential habitat utilisation by significant fauna species	
		EPBC Act listed threatened species	WA Priority species
Sand Plain  158,833.7 ha 51.2% of RMA	Comprised flat to low undulating areas, often between parallel Sand Dune habitat with vegetation dominated by <i>Triodia</i> hummock grasses of various life stages and scattered patches of various small to medium shrub species (including <i>Acacia</i> and <i>Melaleuca</i> species) on sandy to clay loam substrates. Occasionally intermixed with small, isolated patches of Stony Plain, with similar vegetation on heavy clay substrates. At the time of baseline survey (2020/21) large extent of the Study Area comprised recently burnt areas with little to no vegetation (refer study limitation). Scattered small and relatively isolated unburnt areas (~15–20+ years unburnt) with large mature <i>Triodia</i> hummock grassland and open <i>Acacia</i> shrubland present in parts of the Study Area.	Night parrot – Night parrots roost and nest in long-unburnt <i>Triodia</i> hummock and will also forage on <i>Triodia</i> and other grasses (DPaW, 2017; Murphy, et al, 2017) Greater bilby – Bilbies use sandy substrates for digging burrows, breeding and to forage in shrublands or grasslands. Their ability to burrow means the bilby can exploit habitats that have been recently burnt or have naturally sparse cover (Southgate, 2006) Great desert skink –breeding and foraging	Northern marsupial mole – breeding, foraging and a dispersal Brush-tailed mulgara – breeding, foraging and dispersal Peregrine falcon – foraging Grey falcon – foraging
Sand Dune  41,774.6 ha 13.5% of RMA	Comprised low to high red parallel sand dunes, often separated by Sand Plain habitat with vegetation largely dominated by <i>Triodia</i> hummock grasses and various scattered small to medium shrubs (usually <i>Acacia</i>) with scattered tree and mallee eucalypts occurring on upper dune slopes and crests, on sandy or sandy loam substrates. At the time of baseline survey (2020/21) large areas of recently burnt areas with little to no vegetation remaining or only limited recent natural post-fire regrowth.	Listed under s.18 Night parrot – Dune fields with long-unburnt <i>Triodia</i> are important nesting, roosting and foraging habitat for the night parrot (DPaW, 2017) Greater bilby – Sand dunes can be used for burrowing, breeding and foraging (Dziminski & Carpenter, 2018; Skroblin, et al, 2017) Great desert skink –breeding and foraging	Brush-tailed mulgara – breeding, foraging and dispersal Northern marsupial mole – breeding, foraging and dispersal

Habitat	Description	Potential habitat utilisation by significant fauna species	
		EPBC Act listed threatened species	WA Priority species
Stony Plain  65,434.2 ha 21.1% of RMA	Stony Plain habitat comprises flat to low undulating areas with vegetation dominated by <i>Triodia</i> hummock grasses of various life stages and scattered patches of various small to medium <i>Acacia</i> and <i>Hakea</i> shrub species on gravelly loam or clay loam substrates. Some small, isolated patches of Stony Plain intermixed with Sand Plain habitat, particularly low-lying areas between dunes subject to movement of substrates over time (second photo). At the time of baseline survey (2020/21) large patches of recently burnt areas with little to no vegetation remaining or limited post-fire natural regrowth.	Night parrot – Night parrots roost and nest in long-unburnt <i>Triodia</i> hummock, which may also be used for foraging (DPaW, 2017; Murphy, et al, 2017) Greater bilby – Substrate that is too tough or rocky is less suitable for burrowing and will result in lower occupancy of the Bilby (Skrobin, et al, 2017; Southgate, 2006). However, Bilbies are dietary generalist so they might exploit this habitat type for foraging (Gibson, 2001), the intermixed sand plain habitat might be suitable for burrowing/Breeding if deep enough (Southgate, 2006; Cornelsen, et al, 2024).	Western pebble-mound mouse – breeding, foraging and dispersal Brush-tailed mulgara – breeding, foraging and dispersal Peregrine falcon – foraging Grey falcon – foraging
Saltpan  10,652.3 ha 3.4% of RMA	Saltpan habitat within the Study Area is characterised by low lying areas subject to infrequent flooding. Often vegetated with <i>Triodia</i> hummock grasses and mixed small to medium shrubs, including <i>Acacia</i>, <i>Melaleuca</i> and chenopod species (<i>Atriplex</i> and <i>Tecticornia</i> spp.) forming a patchy density cover with scattered patches of exposed substrate, often with a saline crust on the surface. Substrate often comprised of fine clay or loamy sands with scattered calcrete outcropping.	Night parrot – Old-growth <i>Triodia</i> hummock grasses can be used as roosting and nesting sites (DPaW, 2017) even if the <i>Triodia</i> patches are not large (Murphy, et al, 2017). Historic records have reported roosting at sites dominated by chenopods (DBCA, 2024; Kearney, et al, 2016). Chenopod species are an important food sources that also provides hydration during summer, with research suggesting that night parrots may occupy habitats dominated by <i>Triodia</i> spp. during wet periods and move into chenopod habitats	Grey falcon – foraging Peregrine falcon – foraging

Habitat	Description	Potential habitat utilisation by significant fauna species	
		EPBC Act listed threatened species	WA Priority species
		during dry periods (Kearney, et al, 2016; Murphy, et al, 2017). Greater bilby – Bilbies are known to occupy the edges of salt-lakes where samphire or <i>Melaleucas</i> are present and may use the area for foraging (Australian Government, 2006). Burrowing and breeding may occur if substrate is not too tough to dig (Skroblin, et al, 2017). Migratory shorebirds and waterbirds – seasonal foraging habitat (potential occurrence only)	
Stony Hill, Breakaway or Other Outcropping  26,922.1 ha 8.7% of RMA	Comprised low to moderate hills and undulating plains with often sparse vegetation cover dominated by a <i>Triodia</i> hummock grassland with scattered <i>Acacia</i> and <i>Grevillea</i> shrubs on a gravelly clay loam substrate. Rocky outcropping is often sparse within this habitat and confined to the larger hills.	Night parrot – Potential roosting / foraging site for night parrot due to <i>Triodia</i> hummock grassland. Research in Queensland showed that stony hills in close proximity to fertile plains supporting chenopod and/or grass species were more often occupied than other habitats (Murphy, et al, 2017). The topological complexity of hills and breakaways can provide protection from fire for areas of <i>Triodia</i> which can then provide suitable roosting and foraging habitat (DBCA, 2024). Greater bilby – Rocky outcropping and gravelly clay loam substrate is less suitable for burrowing, however stony soils are prevalent to containing root-dwelling larvae making it suitable foraging habitat (Southgate, et al, 2018).	Western pebble-mound mouse – breeding and foraging

Habitat	Description	Potential habitat utilisation by significant fauna species	
		EPBC Act listed threatened species	WA Priority species
Claypan  1,606.4 ha 0.5% of RMA	Comprised low lying areas, often amongst Sandy Plain habitat often sparsely vegetation or with deceased vegetation from periods water was present (i.e. rushes and various tussock grasses) on a hard clay to clay loam substrate. The structure and condition of vegetation within Claypan habitat is likely to vary seasonally, particularly following heavy rainfall events when inundation is likely to occur.	Night parrots - venture out to periodically inundated clay plans that support ephemeral herbs and annual grasses to forage. Free standing water may also be utilised as a seasonal water source (Kearney, et al, 2016). Greater bilby – Whilst claypans are less likely to be utilised for burrowing and breeding if more suitable deep sandy soils are available, it does occur (Skroblin, et al, 2017; Cornelsen, et al, 2024). Clay soils are important for foraging especially following inundation and increased seasonal availability of food resources (Cornelsen, et al, 2024; Gibson, 2001). Migratory shorebirds and waterbirds – roosting, foraging and dispersal (potential occurrence only)	

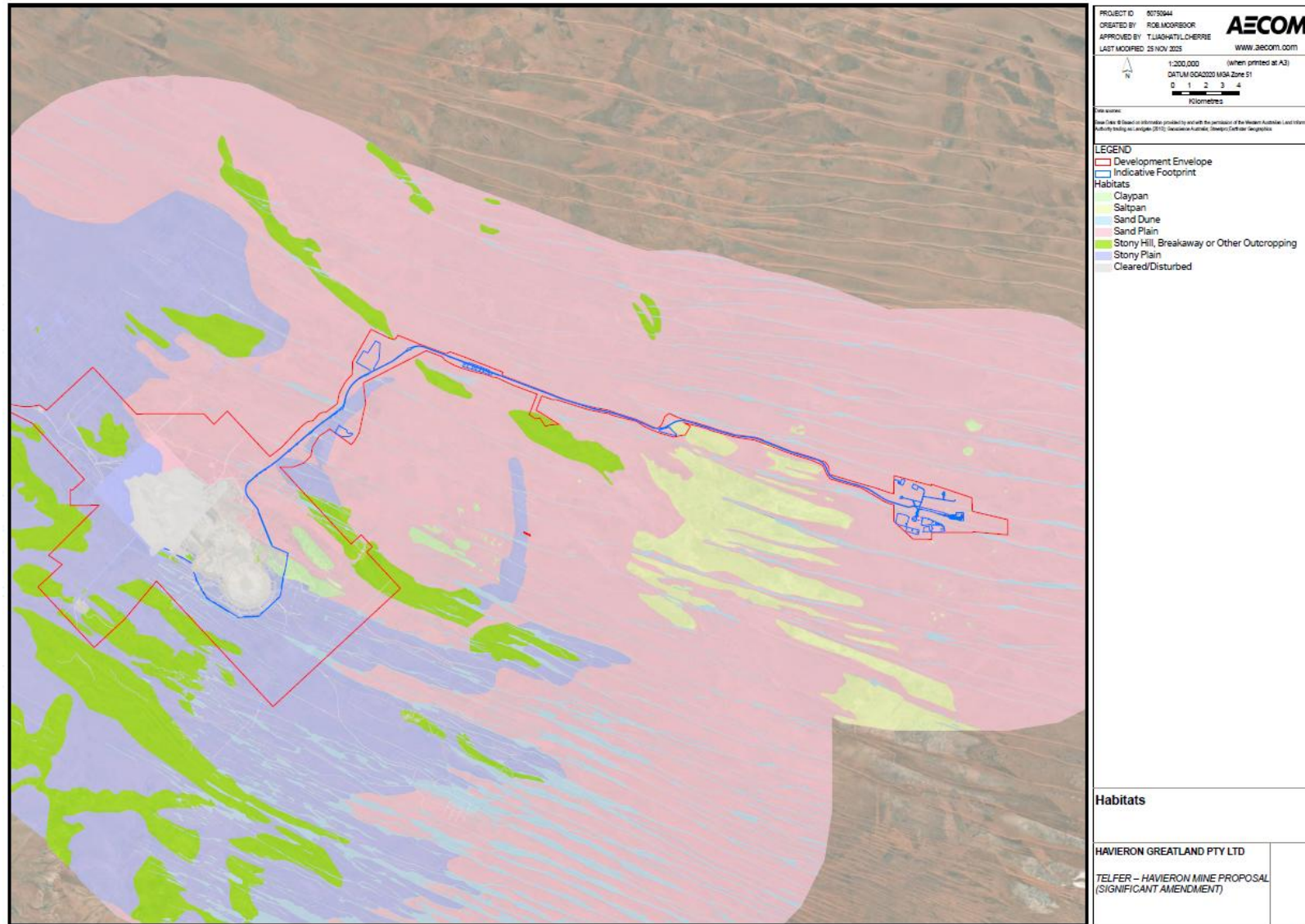


Figure 6-2: Fauna habitats

Habitat utilisation is summarised in Table 6-6, which outlines the interactions between the conservation significant species and the available fauna habitats.

Table 6-6: Habitat-Species relationships

Fauna Habitat Type	Habitat Functions	Species Supported	Seasonality Influence
Sand Plain & Sand Dune	Breeding, nesting, seasonal foraging	Night Parrot, Greater Bilby, Great Desert Skink	More viable in unburnt areas
Saltpan	Nesting and annual foraging	Night Parrot (given spinifex (<i>Triodia</i>) + chenopods (<i>Atriplex</i> and <i>Tecticornia</i>))	Migratory shorebirds post-rainfall
Stony Plain & Outcroppings	Burrowing & mound construction	Western Pebble-mound Mouse, Brush-tailed Mulgara	Opportunistic foraging for Night Parrot & falcons
Claypans	Temporary water habitat	Migratory shorebirds & waterbirds	Used only when inundated; intermittent presence
Telfer-Havieron Project-Affected Habitats	Habitat connectivity impacted	Various species	Some local loss but continuity beyond the Survey Area

6.5 FAUNA SPECIES

Approved Proposal

Fauna surveys of the Port Hedland – Telfer corridor identified 18 conservation significant fauna species as present or potentially present (Newcrest 2002a), while 12 conservation significant fauna were recorded for the mine expansion area (Newcrest 2002b). These reports are available on the EPA website.

s.40AA Significant Amendment

Detailed survey results for conservation significant terrestrial fauna species is provided in Appendix 1 of this document and summarised below in Table 6-7. Likelihood of occurrence is taken from Biologic (2020 and 2021) surveys, and Spectrum (2021).

Likelihood of occurrence for migratory bird species is adopted from Spectrum (2021, Table 4.4 of Appendix N) given the proximity to Telfer. Where a species has recently been recorded at Telfer the species is considered to have a high potential to occur at Havieron. Where a species was not noted in the Spectrum 2021 survey and not recorded at Telfer, the likelihood listed as ‘possible’ to reflect the Biologic (2020) desktop assessment.

Ecological descriptions and further details of the circumstances of recordings can be found in technical surveys (Appendices L to R).

Table 6-7: Summary of conservation significant fauna species

Species	Conservation status			Recorded or likely to occur in Significant Amendment study area	Recorded at Telfer
	EPBC Act s.18	BC Act	DBCA		
Brush-tailed mulgara <i>Dasyurus blythi</i>			P4	Yes (by secondary evidence, but highly likely to be resident)	Yes
Western pebble-mount mouse <i>Pseudomys chapmani</i>			P4	No	Yes*
Northern marsupial mole <i>Notoryctes caurinus</i>			P4	Yes	Yes
Greater bilby <i>Macrotis lagotis</i>	VU	VU		Yes	Yes
Night Parrot <i>Pezoporus occidentalis</i>	CR	CR		Yes	Yes
Red Goshawk <i>Erythrotriorchis radiatus</i>	EN	EN		No, but possible it could occur	Yes
Grey Falcon <i>Falco hypoleucos</i>	VU	VU		No, but possible it could occur	No
Peregrine Falcon <i>Falco peregrinus</i>		OS		No, but possible it could occur	Yes
Princess Parrot <i>Polytelis alexandrae</i>	VU		P4	No, but possible it could occur	No
Great Desert Skink <i>Liopholis kintorei</i>	VU	VU		No, but likely to occur	No (Spectrum (2023) noted it 100km to the east)
Red Knot <i>Calidris canutus</i>	VU/MI	EN		Yes (by call)	Yes
Curlew Sandpiper <i>Calidris ferruginea</i>	CR/MI	CR		No, very low likelihood of occurrence	No
Fork-tailed Swift <i>Apus pacificus</i>	MI	MI		No, medium likelihood of occurrence	Yes (2009)

Species	Conservation status			Recorded or likely to occur in Significant Amendment study area	Recorded at Telfer
	EPBC Act s.18	BC Act	DBCA		
Wood Sandpiper <i>Tringa glareola</i>	MI	MI		No, but high likelihood of occurrence	Yes
Common Sandpiper <i>Tringa hypoleucos</i>	MI	MI		No, but moderate likelihood of occurrence	Yes (not since 1981)
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	VU/MI	MI		No, but high likelihood of occurrence	Yes
Gull-billed Tern <i>Gelochelidon nilotica</i>	MI	MI		Yes (by call)	Yes
Oriental Plover <i>Charadrius veredus</i>	MI	MI		No, very low likelihood of occurrence	No
Caspian Tern <i>Hydroprogne caspia</i>	MI	MI		No, but possible it could occur*	No
White-winged Black Tern <i>Chlidonias leucopterus</i>	MI	MI		No, but possible it could occur*	No
Pectoral Sandpiper <i>Calidris melanotos</i>	MI	MI		No, very low likelihood of occurrence	No
Red-necked Stint <i>Calidris ruficollis</i>	MI	MI		No, but possible it could occur*	No
Common Greenshank <i>Tringa nebularia</i>	EN/MI	MI		No, but possible it could occur*	No
Glossy Ibis <i>Plegadis falcinellus</i>	MI	MI		No, very low likelihood of occurrence	No

* Species not noted in Spectrum 2021 survey likelihood assessment. Likelihood listed as 'possible' as stated in Biologic (2020) desktop assessment.

6.5.1 GREATER BILBY (VULNERABLE)

Bilby records were not confined to any one area, being recorded across the Survey Area. Recordings of Greater Bilby are shown on maps Figure 6-3 to Figure 6-5. along with their habitat utilisation.

Baseline surveys by Biologic in 2020 and 2021 (Appendix L and M respectively) recorded the Greater Bilby 288 times including:

- Seven active burrows
- Ten inactive burrows
- Two possible burrows (one active and one inactive)
- 32 tracks
- 199 diggings
- 40 scats
- Four direct observations via motion camera

Additionally, 1 burrow, 11 scats and 14 diggings surrounding Telfer were found by Spectrum in 2023 (Appendix R).

The proximity to infrastructure and disturbance does not appear to influence the presence of Bilby, as almost half of the records occur within the mining envelope.

Population monitoring in 2021 (Appendix P) did not identify any evidence. Previously active burrows were determined to be inactive with evidence of other species (feral cat and sand goanna) using burrows. Several of the monitoring sites consisted of areas recently burnt, however still providing secondary foraging and dispersal habitat.

Population monitoring in 2022 (Appendix Q) recorded Greater Bilby a total of 600 times:

- 23 burrows (11 active and 12 inactive)
- 506 diggings (from 58 locations)
- 36 scats
- 35 track records.

Genotyping of scats collected during the field survey identified two unique individuals occurring within the Area, however, it is likely additional individuals occur.

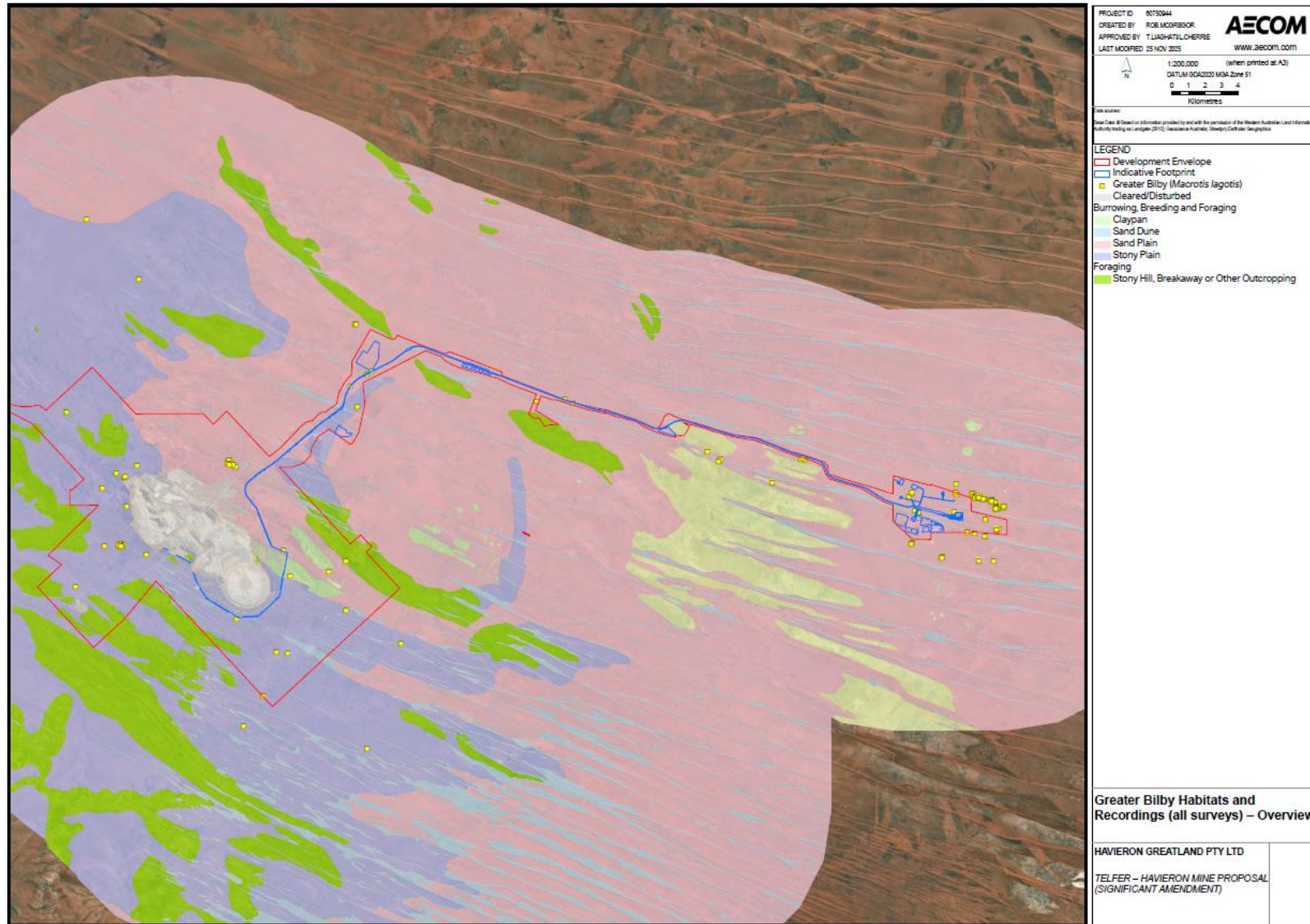


Figure 6-3: Greater Bilby recordings and habitats - Overview

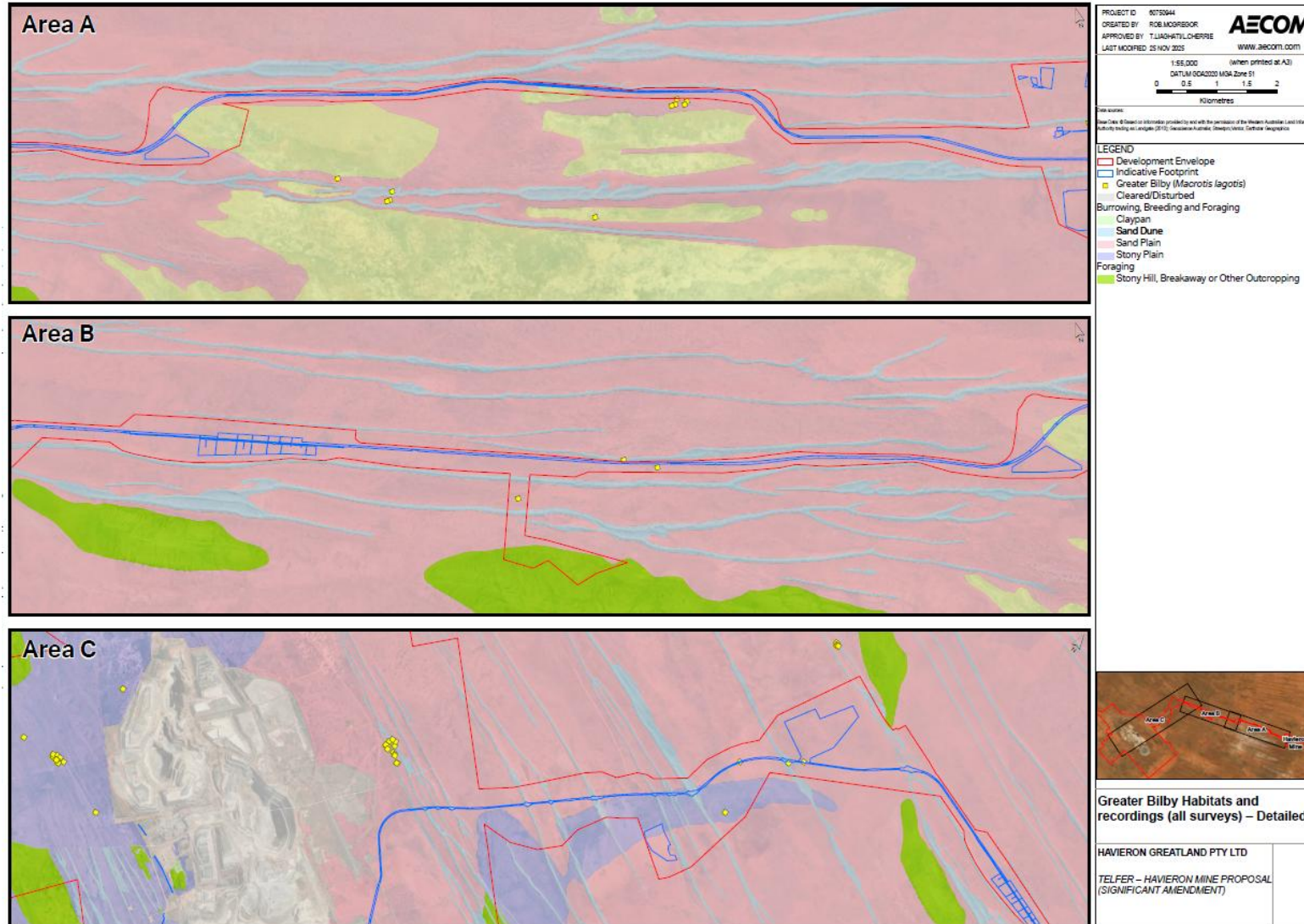


Figure 6-4: Greater Bilby recordings and habitats – Infrastructure Corridor

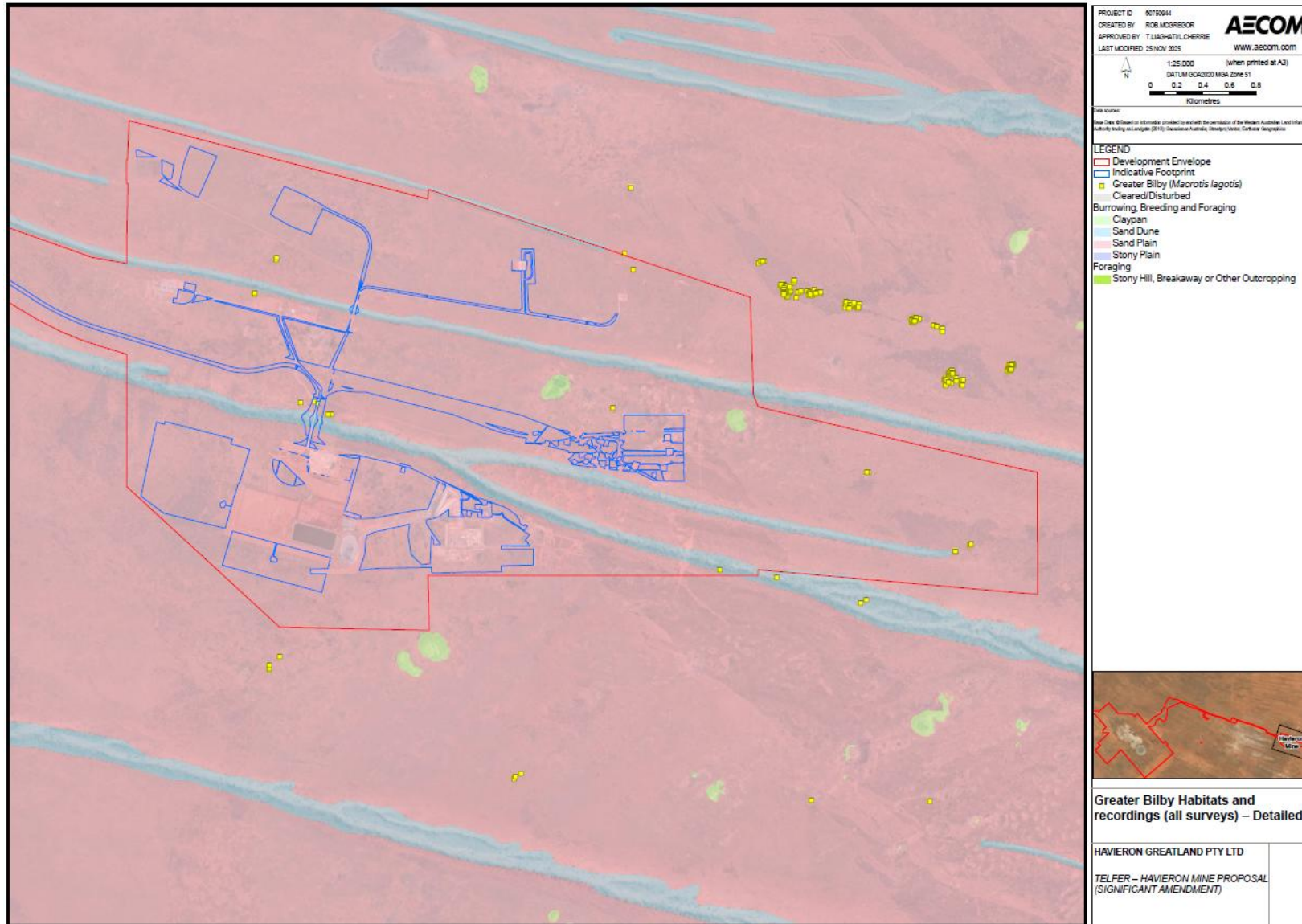


Figure 6-5: Greater Bilby recordings and habitats – Haveron Mine

The number of dog/dingo records has substantially decreased between the baseline fauna survey (Biologic 2020) and the most recent monitoring survey (Biologic 2022). In contrast, feral cat was recorded for the first time as part of the survey and an increase in records has been observed¹¹.

The extent of habitat and a summary of potential utilisation by Greater Bilby is shown in Table 6-8. It should be noted that potential utilisation is based on various research and conservation advice (as referenced in Table 6-5) and may not result in actual utilisation when preferred habitat is available.

Table 6-8: Summary of Greater Bilby habitat utilisation and extent within the mapped area

Habitat Type	Potential habitat utilisation by Greater Bilby	Extent in Regional Mapping Area* (Ha)	Extent within Havieron Indicative Footprint	
			(Ha)	(% of RMA)
Claypan	Burrowing Breeding Foraging	1,606.44	0.00	-
Saltpan	Foraging Burrowing Breeding	10,652.3	2.04	0.17
Sand Dune	Burrowing Breeding Foraging	41,774.6	14.78	0.04
Sand Plain	Burrowing Breeding Foraging	158,833.7	564.97	0.36
Stony Hill / breakaway	Foraging	26,922.1	4.44	0.02
Stony Plain	Foraging Burrowing/breeding if intermixed with sand plain	65,434.2	43.67	0.07
Total		305,223.34	629.90	

*Spectrum, 2023 (Appendix N), excluding cleared/disturbed area of 4,854.2 ha

Greater Bilby is most likely to occur within Sand Plain and Sand Dune habitats where suitable burrowing substrates are present, particularly where vegetation provides cover. Suitable

¹¹ Feral cat trapping effort has been significantly increased at Havieron since the findings of the 2021 report; follow-up surveys in 2022, as well as motion cameras deployed and managed by Greatland, confirm an increase in Bilby numbers, particularly to the north-east of the Havieron project area (outside of the Development Envelope).

vegetation types noted in the recovery plan (citing Cramer *et al*, 2016) and present at Havieron comprise:

- Low shrub cover of *Acacia* spp. Over hummock and tussock grasses, on sandy soils, loams and red earth
- Spinifex grasslands with low shrub cover of *Acacia* and *Melaleuca* spp. On sandy and sandy loam soils.

Greater Bilby can forage broadly across habitats and can be highly mobile in response to resource availability. Fire has been identified as an important process in the species' ecology and occurrence, due to fire-germinated species plant making up the direct diet of Greater Bilby or the diet of host prey species (Southgate, 1990b; Southgate & Carthew, 2007; Southgate & Carthew, 2006; Southgate *et al.*, 2007). As such, Greater Bilby are known to utilise mosaic habitats comprising unburnt areas but venturing into areas at various stages of post-fire regeneration during foraging and dispersal movements (Southgate & Carthew, 2007; Southgate & Carthew, 2006; Southgate *et al.*, 2007). Biologic (2022) noted that previously fire-affected habitat had recovered, increasing available critical habitat by 353 ha (Appendix Q, page 30).

Greater bilbies are regarded as having low site fidelity and high mobility (Southgate *et al.*, 2007). Males regularly move distances of 2–3 km and up to 5 km between burrows over consecutive nights, while females tend to move up to 1.5 km (Southgate *et al.*, 2007). Home ranges for Greater Bilby are between 1–3 km², averaging 3.16 km² for males and 0.18 km² for females (Moseby & O'Donnell, 2003). Variation in the species range is likely to be influenced by the presence and suitability of habitat and availability of resources (Southgate, 1987).

Whilst utilisation of the s.40AA Significant Amendment development area by Greater Bilby is sporadic and low density, all habitat where the species are known or likely to occur is considered critical in accordance with the Recovery Plan for Greater Bilby 2023. For that reason, strong commitments have been made to mitigate impacts during land clearance, and the full proposed extent of land clearance of up to 630 ha is included in the offset calculation.

6.5.2 NIGHT PARROT (CRITICALLY ENDANGERED)

The Night Parrot is a cryptic and elusive, nocturnal parrot that is primarily ground dwelling. Historically, the species occurred over much of the semi-arid and arid zone of Australia (Garnett, Szabo and Dutson 2011).

A summary of surveys and survey effort specifically including acoustic monitoring for Night Parrot is provided in Table 6-9, with an overview shown in Figure 6-6. Call analysis for 120 nights of Havieron acoustic survey was conducted by avifauna specialist Nigel Jackett.

Table 6-9: Night Parrot acoustic survey effort summary

Survey and field dates	Time	Recording units (RU)	Number of sites	Sound files
Biologic 2020 Phase 1 - March 2020	24 nights	4 Song Meter 4 Bioacoustic recording units (SM4)	4	1,108
Biologic 2020 Phase 2 June 2020 Appendix L	55 nights	6 SM4	9	802
14 – 20 Dec 2020 Nigel Jackett review of calls	24 nights	4 SM4	4	264
Biologic 2021, Phase 1 Oct 25 – 5 Nov 2020	41 nights	4 SM4	8	489
Biologic 2021, Phase 2 April/May 2021 Appendix M	41.5	7 Song Meter Mini Bioacoustic recording units	7	481
15 Dec – 17 Jan 2021 Nigel Jackett review of calls	120 nights	6 SM4, 2 AudioMoth Bioacoustic RU	12	1,882
Spectrum 2021 6 - 13 November 2020 Appendix N	12 nights, 22.67 person hours	6 SM4	6	NA
Spectrum 2022 1 – 23 April 2022 Appendix O	47 nights	4 Song meter mini bioacoustics recording units	8	865
Spectrum 2023 7 – 16 March 2023 Appendix R	77	10 Song meter mini- Bioacoustics recording units	10	61570 Kaleidoscope detections

Night Parrot expert Dr Nick Leseberg also undertook assessment of Night Parrot habitat in and surrounding the Havieron project area (refer Appendix zHH). Additional targeted survey for potential Night Parrot breeding and roosting habitat along the infrastructure corridor was also undertaken in accordance with the revised *DBCA Guideline for considering the presence of Night Parrot, Version 1.0, March 2024* as final due diligence for design of the proposed haul road (Red Dog, 2025, refer Appendix zII).

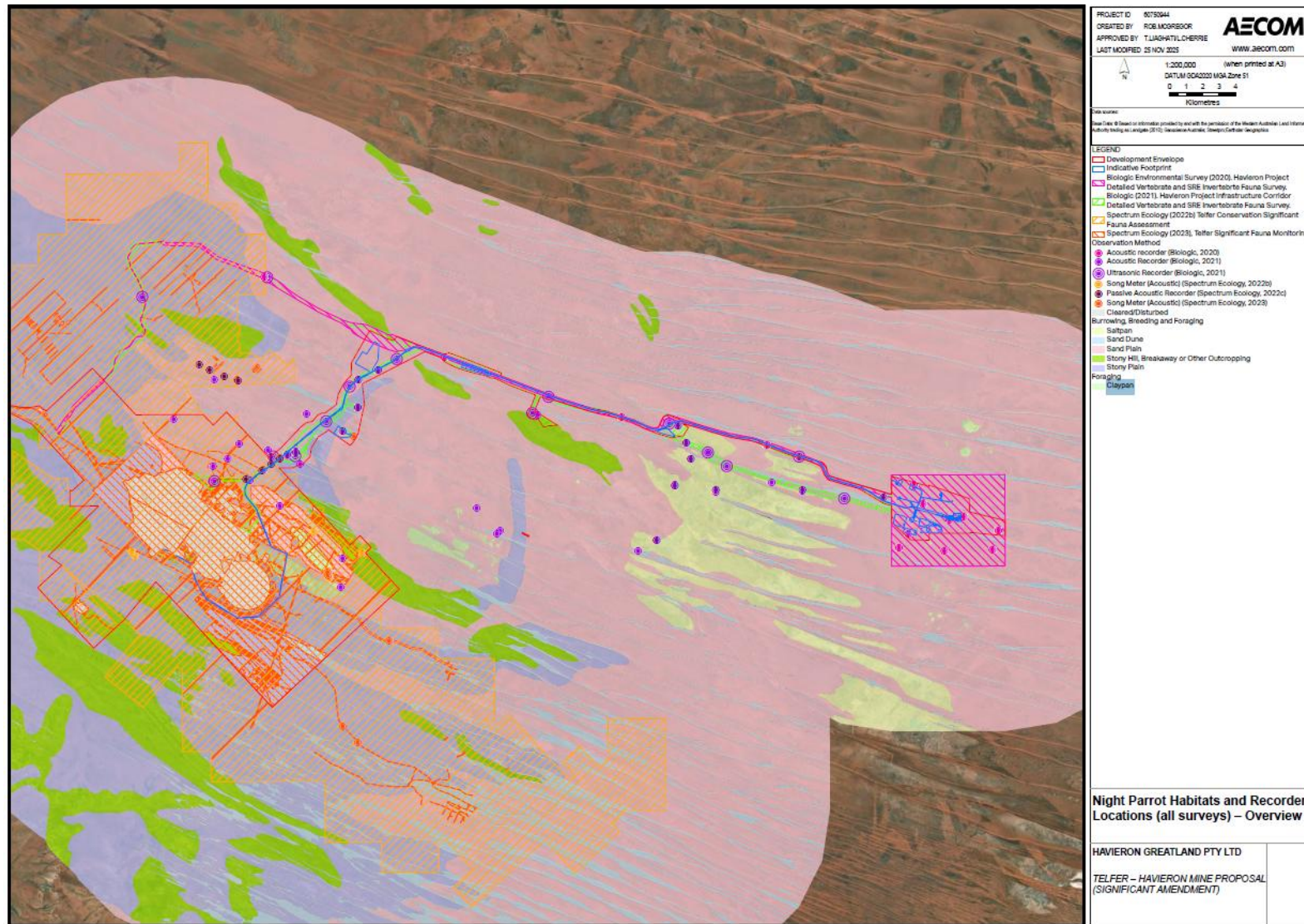


Figure 6-6: Night Parrot habitat surveys and acoustic recording sites

For total survey effort for the Havieron Proposal and associated Telfer operations 2020-2023, only one survey detected Night Parrot, being the Biologic 2021 survey of the Infrastructure Corridor (Attachment I). Night Parrot was recorded by acoustic recorder on three occasions over 41.5 recording nights: two confirmed calls from the same location and one unconfirmed but suspected call from a different location. All three recordings were associated with Sand Plain habitat.

Specialist call analysis by Nigel Jakkett determined the two confirmed calls were structurally consistent with known calls of the species (a two-note hollow whistle¹²). Details of each call are as follows:

- Call 1, 25 October 2020

The timing of the single call recorded on (approximately one hour after sunrise), suggests the species may have roosted within a relatively close proximity to the recorder's location.

The probable distance and direction of the potential roost site could not be determined however, a small area of suitable breeding/roosting habitat occurs approximately 1.5 km east of the recorder's location. An acoustic recorder was also deployed within that area of habitat at the same time as the recorder that detected the species, however no evidence of Night Parrot was detected at that location.

- Call 2, 26 October 2020

The timing and characteristics of the call (decreasing in volume with each call) suggest the individual was flying over the site. Although the direction of the call cannot be determined, based on habitats present at and near the site, the species' occurrence is likely attributed to dispersal or resource-searching behaviour (i.e. flying to or searching for food or water) by an individual.

- Call 3, 18:30hrs 1 May 2021 (unconfirmed due to faint call, but suspected to be Night Parrot)

A single call was detected and was structurally similar to a known call type, being an abbreviated form of the one-note warble described by Leseberg *et al* (2019). However, as the call was faint, confirmation of the species as Night Parrot was not possible. As only a single call was detected over six recording nights at the site, it is unlikely that roosting or foraging was occurring within 200m of the site. Considering the call time (approximately one hour after sunset), it is likely to be attributed to dispersal or resource-searching behaviour (i.e. flying to or searching for food or water; N. Jakkett *pers. comm.* 25 May 2021).

¹² Leseberg, N.P., Murphy, S.A., Jakkett, N.A., Greatwich, B.R., Brown, J., Hamilton, N., Joseph, L. & Watson, J. (2019). Descriptions of known vocalisations of the Night Parrot *Pezoporus occidentalis*. *Australian Field Ornithology*, **36**, 79-88.

Subsequent sampling using acoustic recorders has been undertaken near Telfer (refer Appendices N, O and R). None of these efforts have recorded Night Parrot.

Whilst the three calls were recorded, no suitable habitat to support a persistent breeding or roosting population was present (refer discussion and addressing residual uncertainty in the following sections).

6.5.2.1 NIGHT PARROT HABITAT SPECIALIST REVIEW AND SURVEY (2025)

In accordance with revised Conservation Advice for Night Parrot (DCCEEW, 5 September 2025) habitat critical to the survival of Night Parrot includes the combined availability of:

Breeding and roosting habitat: Low dense vegetation on flat and open terrain. This is most commonly long-unburnt old growth (>20 years old) *Triodia* patches, but may also be provided by thickets of lignum, dense shrubby samphire, and chenopods

Food resource habitat: Run-on areas, floodplains, salt or clay pans, salt-lake margins, and other areas of relatively high vegetative or seed productivity such as those associated with paleodrainage systems

Flyways: areas between feeding and breeding or roosting habitat through which night parrots traverse

Water: Permanent or ephemeral sources of free water, and potentially areas that support vegetation that offers a source of metabolic water for vertebrates; and

Gastrolith sources: Ironstone plains, rocky breakaways, and other areas where stones of appropriate size and shape can be ingested to aid in food digestion.

Feeding and roosting habitat must be within efficient flying distance to one another and be available for sufficient duration to sustain breeding fitness for a breeding cycle. Outside of breeding cycles it assumed that Night Parrot are sustained by regularly productive feeding habitats or resource pulses (e.g. in response to rainfall or post-fire regeneration) within feeding habitats across areas tens to hundreds of square kilometres (Conservation Advice, 2025).

As a result of the change to conservation advice and updated DBCA Night Parrot survey guidelines for WA in 2024, Greatland sought specialist advice and undertook a targeted survey completed in September 2025.

Specialist review of habitat

Specialist desktop review by Dr Nick Leseberg was commissioned by Greatland to understand the nature and potential for Night Parrot presence within and surrounding the Telfer-Havieron area (refer Appendix zHH). This concluded that the area may be utilised for flyways from time to time but does not provide the long-term stability required to support a persistent population of Night Parrot. While the surrounding Sand Plain, Sand Dune, and probably Stony Plain habitats could support roosting and foraging habitat, dependent on local fire and rain, the availability of roosting and foraging habitat within these associations is likely to be ephemeral, and Night Parrots possibly only moving in into these systems occasionally when conditions are suitable. This is supported by acoustic detection at one site during one survey despite multiple monitoring nights.

A 12,000 ha expanse of paleo drainage system 40km to the southeast is likely to provide the habitat stability to support a population of Night Parrot (refer Figure 6-7). A small patch of roosting habitat (7.7 ha) does exist however, its size and position within the broader landscape of available habitat suggests Night Parrots may only use it occasionally if at all. There is however uncertainty about the utilisation of flyways and roosting habitat within and surrounding the s.40AA Significant Amendment development envelope, and this is discussed below (refer *Addressing uncertainty*).

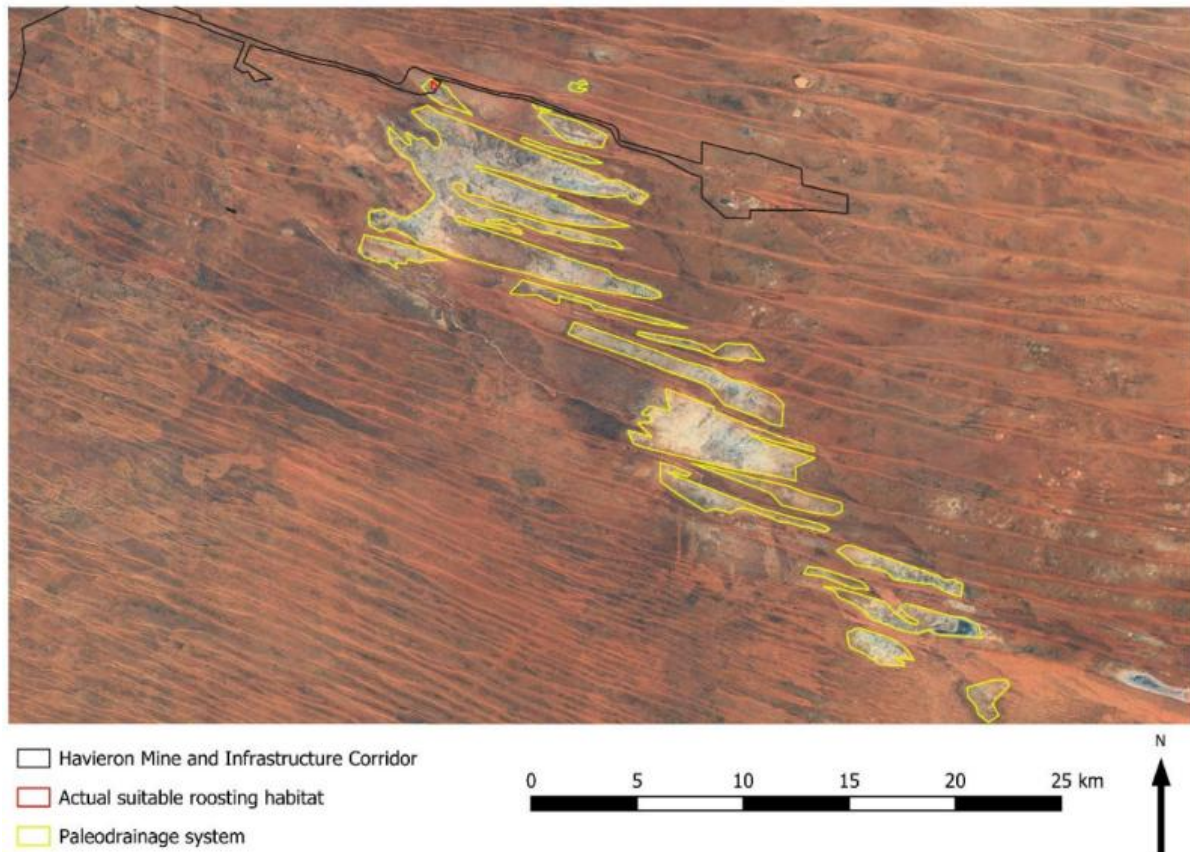


Figure 6-7: Specialist assessment of suitable Night Parrot habitat (source: N. Leseberg, AdaptiveNRM habitat review, 2025, Appendix zHH)

Targeted Night Parrot habitat survey

On ground assessment was conducted in accordance with revised DBCA *Guideline for considering the presence of Night Parrot, Version 1.0, March 2024* (Red Dog, 2025, refer Appendix zII) using the following contained criteria:

- Presence of *Triodia* and/or chenopods with structural complexity (DBCA, 2024a; Leseberg et al., 2022; Murphy, Silcock, et al., 2017)
- Fire age of habitat greater than 20 years, with *Triodia* tending to form rings and provide suitable height (>40 cm) and thickness for Night Parrots (DBCA, 2024a; Jackett et al., 2017; Leseberg et al., 2022; Murphy, Silcock, et al., 2017)
- Presence of flat-open terrain with few shrubs or trees (Leseberg et al., 2022)
- *Triodia* occurring as a mosaic interspersed with fuel-free areas of bare stony ground which do not carry fire (Leseberg et al., 2022; Murphy, Austin, et al., 2017).

A total of 3,409 ha was mapped as flyway or dispersal habitat, with this shown in Figure 6-8. No critical habitat (roosting/breeding habitat) for the Night Parrot was identified using the criteria above, and an area formally considered roosting/breeding habitat within the Development Envelope was downgraded because it lacked the key characteristics, in particular an absence of large complex stands of aged *Triodia*.

Addressing uncertainty

Whilst both the specialist review and targeted survey confirm habitat classification as flyways, uncertainty remains around the presence of Night Parrot at the landscape scale and utilisation of flyways within the s.40AA Significant Amendment and broader Telfer Development Envelope. Individuals have been recorded moving distances of approximately 9.4 km between roosting/nesting sites and foraging sites over a single night (Murphy et al., 2017) and is predicted to cover up to 100 km per night, and greater than 100 km when resources are more sparsely distributed (i.e. during periods of drought; Night Parrot Recovery Team, 2017).

To address uncertainty, Greatland proposes a two-year acoustic monitoring program that will be peer reviewed by Dr Nick Leseberg at the design phase (i.e. prior to deployment) and periodically throughout the monitoring period. This will provide sufficient data to assess the impact of night haulage on Night Parrot. Nighttime haulage is not scheduled to commence until approximately 2 to 3 years from issuance of approvals, providing sufficient time for data collection, assessment and approval.

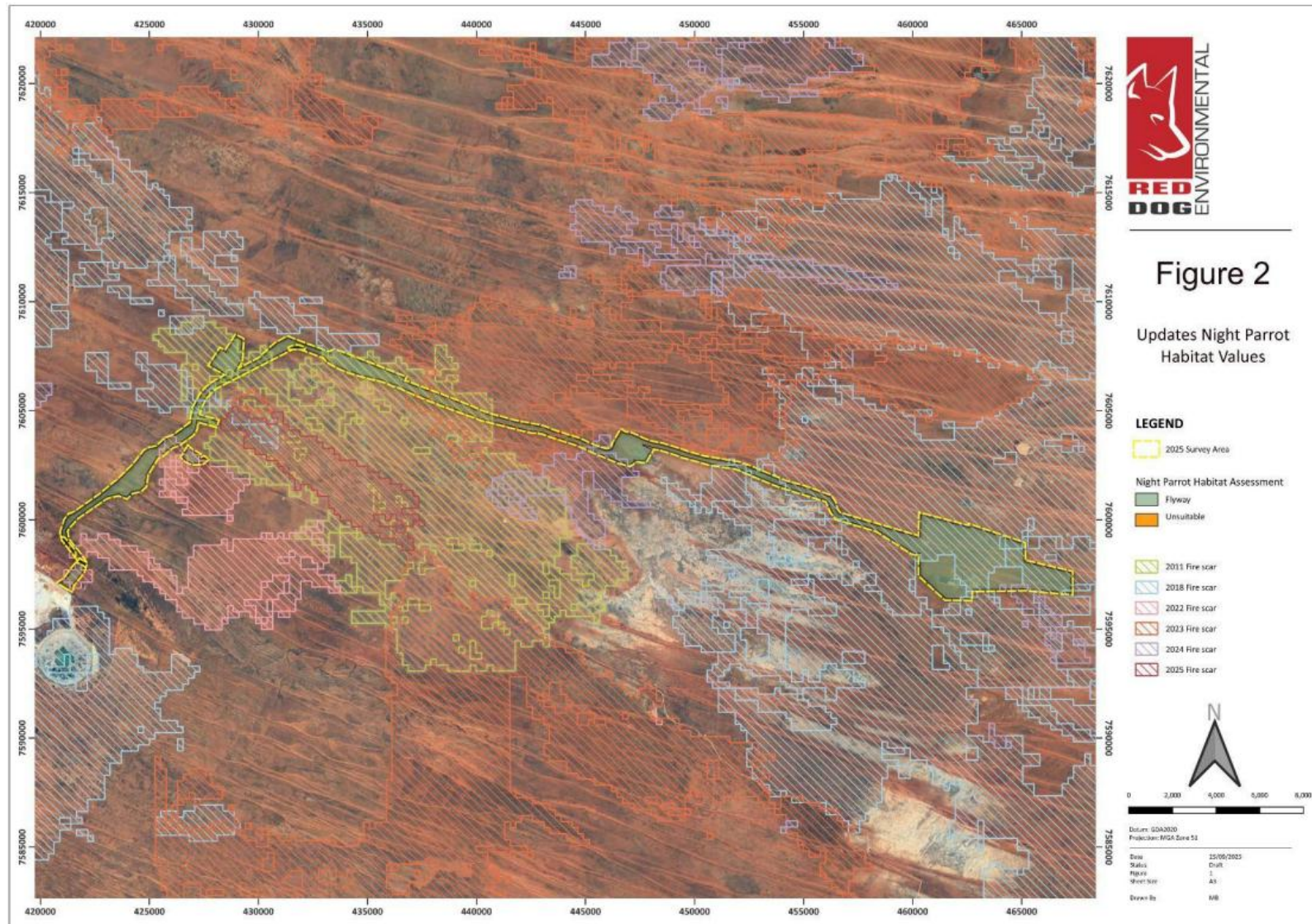


Figure 6-8: Night parrot habitat at Havieron (Source: Red Dog, 2025, Appendix zII)

6.5.3 GREAT DESERT SKINK (VULNERABLE – EPBC / BC ACT)

The Great Desert Skink was not recorded within the Fauna Survey Area but is considered likely to occur due to the availability of suitable habitat as shown in Table 6-10.

Table 6-10: Greater Desert Skink - impacts to fauna habitat

Habitat utilised by Greater Desert Skink	Extent in Regional Mapping Area (Ha)	Extent within Havieron Indicative Footprint	
		(Ha)	(%)
Sand Dune	41,774.6	14.78	0.04
Sand Plain	158,883.7	564.97	0.36
Total	200,658.3	579.75	0.4

Great Desert Skink has previously been recorded approximately 23 km south southeast of the Fauna Survey Area (DBCA 2020b). Based on the habitats present within the Fauna Survey Area, the species is considered likely to occur as a resident within Sand Plain and Sand Dune habitats. It is likely to use both unburnt areas and those recently burnt as regeneration occurs at various life stages for both shelter and foraging. The occurrence of Great Desert Skink within the Fauna Survey Area would likely be representative of the western limit of the species' current known range. As such, a population occurring within the Fauna Survey Area – if it occurred – is likely to represent an important population as defined by DoE (2013).

6.5.4 BRUSH-TAILED MULGARA (PRIORITY 4 - DBCA)

The Brush-Tailed Mulgara was recorded by secondary evidence within the Fauna Survey Area but is considered highly likely to be resident within the Survey Area due to the presence of suitable habitat as shown in Table 6-11.

Table 6-11: Brush-tailed Mulgara - impacts to fauna habitat

Habitat utilised by Brush-tailed Mulgara	Extent in Regional Mapping Area* (Ha)	Extent within Havieron Indicative Footprint	
		(Ha)	(%)
Saltpan	10,652.3	2.04	0.02
Sand Dune	41,774.6	14.78	0.04
Sand Plain	158,883.7	564.97	0.36
Stony Plain	65,434.2	43.67	0.07
Total	276,744.8	625.46	0.49

Habitation is primarily within Sand Plain, Sand Dune, Saltpan and, to a lesser extent, Stony Plain habitats, particularly where suitable vegetation cover and sandy or loamy substrates

permitting burrowing are present. Recent fires prior to Biologic surveys (2020, 2021) are likely to have impacted the species occurrence but they are considered likely to still use these areas to forage and disperse, particularly when occurring adjacent to or near unburnt areas with sufficient vegetation cover.

The occurrence of all habitats likely to support Brush-tailed Mulgara within the Survey Area are all part of larger expanses of these habitats beyond the Survey Area and within the broader vicinity of the Survey Area. The occurrence or extent of these habitats within the Survey Area is unlikely to provide habitat critical to the species persistence on a local or regional scale.

6.5.5 NORTHERN MARSUPIAL MOLE (PRIORITY 4 - DBCA)

The Northern Marsupial Mole was recorded during survey (Biologic, 2020 and 2021) and is presumed to be resident due to the availability of suitable habitat, with detections hindered by their cryptic nature and limited ecological knowledge of the species. Known habitat types and their extent of usage by Northern Marsupial Mole are shown in Table 6-12.

Little is known about the ecology of the Northern Marsupial Mole but they are primarily associated with sand dune habitats, and to a lesser extent sand plains, where loose sandy substrates permitting underground tunnelling (Benshemesh 2005; Woinarski et al. 2014). The species is likely to occur throughout Sand Dune and, to a lesser extent, Sand Plain habitats within the Survey Area as a resident.

Table 6-12: Northern Marsupial Mole - impacts to fauna habitat

Habitat utilisation by Northern Marsupial Mole	Extent in Regional Mapping Area* (Ha)	Extent within Havieron Indicative Footprint	
		(Ha)	(%)
Sand Dune	41,774.6	14.78	0.04
Sand Plain	158,883.7	564.97	0.36
Total	200,658.3	579.75	0.4

The occurrence of both Sand Plain and Sand Dune habitats within the Fauna Survey Area forms part of a much larger extents of both habitats that extends beyond the Survey Area and are well represented within and in the broader vicinity. Therefore, it is unlikely habitat present within the Fauna Survey Area provides critical habitat on which the species relies within the Fauna Survey Area or more broadly in the Great Sandy Desert region.

6.5.6 WESTERN PEBBLE-MOUND MOUSE (PRIORITY 4 - DBCA)

This species occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and

scattered shrubs (Anstee, 1996; Start et al. 2000). Based on habitat mapping, this species is unlikely to be affected by the Significant Amendment.

6.5.7 MIGRATORY BIRDS

A total of 11 migratory shorebird and waterbird species are considered to possibly occur within the Study Area (refer Table 6-7). Two species were identified by call in the Significant Amendment study area: Red Knot and Gull-Billed Tern.

As a MNES listed under s.20 of the EPBC Act, an assessment of significant impact against MNES criteria is provided in Table 14-3. No 'significant' criterion was triggered.

The existing Study Area currently does not constitute an important habitat for migratory species at any stage in their life cycle due to the absence of permanent waterways, salt lakes or wetlands. Claypan habitat is likely to be the most suitable for migratory birds following heavy rainfall events when inundation of claypans occurs and suitable foraging habitat is provided. As the occurrence of inundation is seasonal and highly irregular, their occurrence is likely to be irregular and may be used only opportunistically by transient or migrating individuals.

Of the 11 species of migratory shorebirds and waterbirds identified as possibly occurring, various species have previously been recorded as close as 15 km from the Study Area (DBCA, 2020b). These records are often associated with larger waterbodies in the broader vicinity of the Study Area (DBCA, 2020b); however, the Claypan habitat is likely to provide temporary and/or transient habitat when water is present.

It is highly unlikely that the proposed 28 ha of evaporation pond area for mine dewater (bringing the total pond area to 46.8 ha) will become important habitat for the following reasons:

- Evaporation ponds will not establish a self-sustaining wetlands type habitat due to the hypersalinity of mine water and are therefore unlikely to offer foraging opportunities
- There has been no recorded utilisation by migratory birds of the existing 28 ha of evaporation ponds for early works that have been in operation and monitored daily since 2022 (the progressive construction of three pond cells was completed in 2023).

It is noteworthy that in the unlikely event of transitory visitation by migratory birds, the evaporation ponds do not pose risk because they contain only hypersaline water.

6.5.8 SHORT-RANGE ENDEMIC (SRE) INVERTEBRATES

Two surveys were conducted for SRE invertebrates, Biologic (2020) and Biologic (2021). For more detailed survey results and species ecology and habitat, refer Appendix L, Section 5.2 and Appendix M, Section 5.2 respectively. A summary is provided below.

No Confirmed SRE were collected during the Biologic (2020) and Biologic (2021) surveys that included collection of a total of 142 specimens for taxonomic identification from 20 sites.

Based on specialist taxonomist information of each group, eleven invertebrate morphospecies taxa were considered Potential SRE invertebrate fauna (refer Table 6-13).

Table 6-13: Potential SRE invertebrate fauna collected (Biologic, 2020; Biologic, 2021)

Order / Family	SRE Status
Araneae (Mygalomorph spiders)	
<i>Aname 'black three spine'</i>	Potential
<i>Aname 'red two spine'</i>	Potential
Scorpiones	
<i>Lychas 'adonis'</i>	Widespread
<i>Lychas 'multipunctatus complex'</i>	Potential
<i>Lychas 'telfer'</i>	Potential
<i>Lychas 'annulatus complex' in both</i>	Potential
Urodacidae	
<i>Urodacus 'pale complex'</i>	Potential
<i>Urodacus sp. 1</i>	Potential
<i>Urodacus varians</i>	Potential
Pseudoscorpiones	
<i>Indolpium</i>	Potential
Isopoda	
<i>Buddelundia sp. '58'</i>	Potential
<i>Buddelundia sp. indet. A</i>	Potential

All the Potential SRE scorpions and isopods recorded have previously been recorded within 100 km of the Fauna Survey Area although the pseudoscorpion was a new record for the area. One species (*Urodacus sp. 1*) is the only morphospecies that has not previously been collected at any localities other than within the Fauna Survey Area. The latter two species (*Urodacus varians* and *Lychas 'multipunctatus complex'*) have been collected previously in other areas of the Pilbara, although both taxa are considered to comprise multiple species within the species complexes within which they occur.

Potential SRE species were collected from habitat characterised as Sandy/Stony Plain which is a widespread habitat and not the type of isolated, protected refugia that is typically associated with SRE species. Therefore, given the widespread nature of the habitats in which the potential SRE specimens were collected, it is unlikely that any of the potential SRE species collected in this survey will be restricted to the Fauna Survey Area.

6.6 POTENTIAL ENVIRONMENTAL IMPACT

Potential impacts from the s.40AA Significant Amendment are considered to be as follows:

Direct impacts from:

- Direct loss of up to 630 ha of land considered to provide critical habitat for conservation significant species
- Direct loss (injury or mortality) of individuals from clearing and construction works, and the movement of vehicles for life of mine during operations (haul road traffic volume is modelled at 76 trips per 24-hour period, equating to 3.3 passes per hour)
- Entrapment or drowning of individuals in site infrastructure (pipes, ponds, drains)

Indirect impacts from:

- Habitat fragmentation from construction and operation of a 55km haul road impacting dispersal and genetic diversity
- Increased potential for predation and competition from introduced fauna
- Potential displacement due to dust, light, noise and vibration
- Decline in habitat quality from dust, weeds, and altered surface drainage flow patterns
- Altered fire regimes resulting in fragmentation and temporary loss of suitable habitat
- Impacts to habitat quality from:
 - Altered surface water flows from the construction of mine infrastructure
 - Accidental discharge of hypersaline mine water to flora and vegetation important to conservation significant species (further discussion in Section 12.3.7)

Note, there are no impacts to habitat in relation to groundwater dependent ecosystems as outlined in Section 11.3.3.3.

Disease is not currently considered a threat due to the remote location of the Havieron Proposal. This will be monitored and adaptively managed throughout life of mine.

6.7 MITIGATION

Mitigation measures for fauna seek to achieve the following conservation objectives:

- Protect critical habitat from undue loss and degradation
- Maintain the current distribution of Greater Bilby and Night Parrot (noting uncertainty of distribution for the latter), and seek to expand this distribution in the offset area
- Monitor both habitat and population dynamics through targeted surveys and contribute results to national recovery efforts.

A summary of key management measures is provided in Table 6-14. In combination these seek to progress development without undue impacts on flora and vegetation and associated biodiversity within and surrounding the Havieron Development Envelope. The specific objectives are:

- Clearing of no more than 630 ha of fauna habitat
- No clearing of Night Parrot nesting and roosting habitat

- No clearing of active Greater Bilby burrows
- No nighttime haulage until further assessment of Night Parrot at a landscape scale through an acoustic monitoring program, and additional Greater Bilby population monitoring
- Feral predator and foraging herbivores monitored, and detections addressed through the appropriate feral animal control program to minimise numbers to at or below baseline as per Significant Species Management Plan (Appendix J)
- Protect habitat from impacts, including:
 - Design and construction of surface infrastructure shall not alter surface water flows that would result in impoundments, flooding or starving of native vegetation
 - Saline water impacts to native vegetation and soils shall be avoided through the management of mine dewater in lined evaporation ponds in accordance with DWER Licence to Operate L9455/2024/1, including the management of beneficial reuse for dust suppression (refer to further information in Section 11.3.4)
 - Manage hydrocarbons and hazardous chemicals in accordance with objectives of the EP Act 1986 and specific requirements of the WHS (Mines) Regulations 2022 Chapter 7 to minimise the risk of impacts to vegetation and soils.
 - Manage dust through suppression and conditioning of surfaces
- Targeted surveys to monitor the effectiveness of mitigations and inform any revisions of the (to be approved) Significant Species Management Plan
- Where land is under rehabilitation, criteria shall be set as per the Mine Closure Plan and monitored to completion.

Mitigations are selected on the hierarchy of **Avoid** → **Minimise** → **Rehabilitate** → **Offset** and have been informed by:

- Conservation advice for Night Parrot (2025)
- Conservation advice for Greater Bilby (2016) and Greater Bilby Recovery Plan (2023)
- DCCEEW Threat abatement plan for predation by feral cats 2024
- DEWHA Threat abatement plan for predation by the European Red Fox 2008¹³

Where direct impacts can be avoided through design and elimination of hazard at the source, these opportunities are prioritised. Where avoidance is not possible, best practice environmental management measures are proposed to reduce the likelihood or consequence of exposure to the stated threat.

Mitigation measures are given practical effect through operational policies, plans and procedures that will be implemented throughout life of mine. The Significant Species Management Plan will govern the implementation of fauna mitigations. This includes trigger criteria, thresholds, frequency, monitoring and reporting requirements for threats.

¹³ Whilst neither the Havieron Proposal nor the proposed offset area are listed as priority fox control areas for WA (DBCA [European fox | Department of Biodiversity, Conservation and Attractions](#) accessed 15/01/2025) they are known to be present and will be targeted by the proposed control program.

Table 6-14: Mitigations to protect Terrestrial Fauna and their habitats

Threat	Impact factor	Hierarchy of Control	Description of measure
Direct impacts			
Clearing of 630 ha of land	Clearing of critical habitat for MNES leading to displacement of individuals or reduction in population, displacement or habitat fragmentation	Avoid	- Utilisation of existing tracks with only widening undertaken as required for mine safety. - Critical breeding habitat to be considered in final design of surface infrastructure.
		Minimise	- Targeted survey current within two weeks of proposed land clearing. Survey conducted by suitably qualified fauna specialist with Martu monitor. 100m buffer around active Greater Bilby dens, or relocation as per DBCA guidelines 2018. 300m buffer around suitable Night Parrot nesting sites and development of further targeted survey in consultation with DBCA, specialist zoologist, and Martu. - Where targeted deployment of acoustic recorders for Night Parrot is recommended, this will occur as per the <i>Guidelines for determining the likely presence and habitat usage of night parrot (Pezoporus occidentalis) in Western Australia</i> (DBCA, 2024). - Clearing and relocations register.
	Accidental clearing outside of the approved footprint or in an allocated den/nest habitat buffer zone	Minimise	- Surface Disturbance Permit process ensuring accurate spatial delineation of work zones and pre-clearance approval. - Any buffer zones to be surveyed and demarcated in accordance with the Surface Disturbance Process. - Fauna spotter for clearance works to assure displacement.
	Cleared land not returned to critical habitat	Rehabilitate	- Progressive rehabilitation of disused clearances throughout life of mine. - Final rehabilitation and closure of disturbed areas to return the Indicative Footprint to a standard at or approaching pre-clearance habitat quality.
	Residual risk based on ecological uncertainty around Night Parrot and Greater Bilby	Offset	Biodiversity offset proposed (refer Section 13).

Threat	Impact factor	Hierarchy of Control	Description of measure
Traffic and the movement of plant and equipment	Injury or mortality to individuals on roads and other areas where vehicles operate	Minimise	- No night haulage proposed (pending assessment via 2-year acoustic monitoring program) - Strict traffic management rules (designated roads and tracks only, speed limits). - Clearing in daylight hours (both MNES are strictly nocturnal). - Signage for MNES and altered traffic management either side of active fauna sites. - Significant species register, reporting and investigation of significant species interactions.
Infrastructure and materials posing risk of entrapment or drowning	Drowning in ponds or silt traps	Minimise	- Fencing of all water assets onsite. - Egress matting in place. - Regular inspection of fences and egress points.
	Entrapment in pipes, pits or other openings	Minimise	- Fencing or point of egress provided for open excavations and trenches greater than 1m, or steep-walled holes when not in active use for operations (e.g. end of workday) that pose risk of entrapment. - All construction pipes, culverts or similar structures stored overnight will be inspected for wildlife prior to use. - Stop work issued where MNES identified, and trained handler called to assess.
Indirect impacts			
Feral animals (cats, foxes and camels)	Increased predation by cats and foxes, and competition for food	Minimise	- Mechanical trapping and selective approved baiting (e.g. grooming cat traps) and other animal controls as required. - Fencing and control of waste and food handling areas (e.g. small mesh caging on bins), and education of staff.
	Degradation of habitat by camels	Minimise	Monitoring of camel populations and adaptive management should numbers increase to the level where habitat degradation is occurring (e.g. fencing of critical habitat, relocation or cull of feral population).
	Alteration of dingo natural predation habits leading to an increase in foxes and cats	Minimise	- Fencing of facilities and wastes to ensure these do not provide a food source that deter natural predation on cats and foxes. - Strict site rules regarding food handling and feeding of dingos.

Threat	Impact factor	Hierarchy of Control	Description of measure
Operations causing dust, noise, light and vibration	Displacement due to nuisance factors	Minimise	- Operations and traffic only permitted in cleared and designated areas. - Lighting directed to cleared operational areas only. - Standard noise reduction devices fitted to vehicles and plant where required.
Impact habitat quality from saline emissions	Spill or leak of hypersaline water from evaporation ponds	Avoid	All mine waters report to lined evaporation ponds operated in accordance with WA Licence L9455.
		Minimise	Evaporation pond design freeboard to account for direct rainfall, salt accumulation and wave action and prevent overtopping (detailed conditions under existing operating licence L9455).
		Minimise	Groundwater abstraction licence and associated Groundwater Licence Operating Strategy (GLOS) includes water quality monitoring and annual reporting requirements.
	Dust deposition on vegetation	Minimise	- Dust suppression used on stockpiles, roads and cleared operational areas in accordance with operating licence conditions L9455. - Covered bulk material loads during transportation. - Containment of dusty processes (e.g. paste cement silo).
	Accumulation of salt from dust suppression water	Minimise	- Water segregated and tested to ensure it meets salinity criteria. - Application of dust suppression water in accordance with WA licence conditions issued for Havieron Mine.
			Periodic vegetation survey of dust suppression deposition routes.
Altered surface flows from constructed infrastructure	Flooding or starving of vegetation leading to loss, impacted plant health, and changes in vegetation community structure	Avoid	Design of infrastructure includes drains, culverts and swales to avoid pooling of water or impeded surface water flows.
Weeds	Weeds displacing native vegetation	Minimise	- Weed monitoring and control program. - Spatial recording of weed incursions. - Weed hygiene measures for vehicles, plant and equipment mobilising from outside the region.

Threat	Impact factor	Hierarchy of Control	Description of measure
Fire	Altered fire regimes leading to habitat fragmentation and degradation	Minimise	• Restrictions on sources of ignition (hot works authorisation, work in cleared areas, task fire monitor etc). • Firefighting capabilities (dedicated emergency response team, tanker etc). • Antenna mounted thermal camera at Mine Infrastructure Area (360° scan). • Satellite monitoring of regional fire status. • Emergency Response Plan and Bushfire Management Plan. • Cutting of emergency fire breaks where required (to avoid unnecessary land clearance, no permanent fire breaks are proposed).

6.8 ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACT

Impacts to significant species

No critical nesting or roosting habitat for Night Parrot and no active Greater Bilby burrows will be cleared. Direct impact to species during land clearance will be mitigated through pre-clearance surveys and fauna spotters at the time of disturbance.

Whilst loss of up to an additional 630 ha of fauna habitat will occur as a result of the s.40AA Significant Amendment, this is not significant within the overall context of the Great Sandy Desert (with an area well in excess of 90% of native vegetation remaining), refer Table 6-15. This clearing represents less than 0.2% of total vegetation type cover that is representative of fauna habitat. This impact is not a cumulatively significant contribution at a regional scale.

The majority of habitat for significant fauna species is widely distributed with potential impacts to each species not considered significant, except for MNES species Greater Bilby and Night Parrot for which an offset is proposed.

Table 6-15: Impact of land clearance on the extent of regional fauna habitat

Habitat	Regional extent in Mapping Area* (ha)	Extent in s.40AA Indicative Footprint (ha)	Impact to Regional Extent of habitat (%)
Claypan	1,606.44	0.00	-
Saltpan	10,652.3	2.04	0.17
Sand Dune	41,774.6	14.78	0.04
Sand Plain	158,833.7	564.97	0.36
Stony Hill, Breakaway or Other Outcropping	26,922.1	4.44	0.02
Stony Plain	65,434.2	43.67	0.07
Total	305,223.34	629.90	

* Spectrum (2021), Appendix N

Without controls, direct strike by vehicles could occur from the modelled traffic volume at 76 trips per 24-hour period, equating to 3.3 passes per hour. Whilst there is no recorded history of Night Parrot interaction, and one Greater Bilby strike reported in the long history of the existing Telfer Mine, this remains a plausible risk requiring ongoing measures as follows:

- Designed in eco-ducts and culverts along the haul road to provide safe movement and minimise habitat fragmentation
- Contemporary and strong traffic management controls including in vehicle monitoring of driver behaviour and contractual penalties for speeding.

Whilst these controls are considered sufficient to reduce the risk of strike to general fauna species to as low as reasonably practicable, there is uncertainty regarding Night Parrot utilisation of the development envelope. Residual risk to nocturnal species is therefore unable to be assessed at this time. No night haulage will occur until the proposed two-year Night Parrot acoustic monitoring program is completed and further approval sought. This period also provide time for additional annual Greater Bilby population surveys to be completed.

Impacts to Short-range Endemic species

The potential impacts to SRE habitat are not considered significant. Potential SRE invertebrates have been recorded outside of the Development Envelope and, given the Significant Amendment uses mostly existing disturbance, is not expected to significantly impact or fragment any restricted SRE habitat (which is not considered likely to occur).

The Significant Species Management Plan (Appendix J) provide a suite of outcomes-based and objectives-based mitigations that provide for the protection and monitoring of conservation significant species and their habitats.

Claypan habitat provides temporary roosting, foraging and dispersal habitat for up to 11 migratory shorebird and waterbird species (Migratory - EPBC/BC Act, refer Table 6-7), particularly when water is present following rainfall events.

Impact to migratory birds

Significant impact assessment against MNES guidelines was conducted for migratory birds was undertaken and determined no significant impact (refer Table 14-3). Whilst there is potential for temporary visitation by migratory species there are no suitable permanent waterbodies present at Havieron and hypersaline ponds unlikely to offer foraging opportunities for visiting species.

Rehabilitation and return of land to critical habitat

At the cessation of mining, where alterations to the original landform are not significant (e.g. evaporation ponds), there is reasonable expectation of rehabilitation success and the return of some pre-disturbance vegetation value with eventual progression over time to critical habitat of a quality suitable for support of significant species. Successful rehabilitation of disturbed land has been achieved at Telfer and for exploration drill pads at Havieron.

The only exception may be rehabilitated waste rock landforms (totalling 18 ha) that may not provide attractive habitat given the preference for Sand Plain, Sand Dune and Saltpan by significant species. However, 18 ha is not considered significant within the broader homogenous landscape, and rehabilitated waste rock landforms would still provide foraging opportunities for many fauna species.

6.9 CUMULATIVE IMPACTS

Based on the most recent studies listed in Table 6-3 the only priority fauna species that are likely to be impacted by the significant amendment are Greater Bilby and Night Parrot for which an offset is provided.

As previously discussed in the flora and vegetation sections, the clearing for native vegetation has not been defined in any of the assessment and approval documents available for Telfer Project. Furthermore, Ministerial Statement 606 for Telfer Project does not include a Development Envelope, only specifying the total land disturbance area. In the absence of this information, the extent to which Telfer Project contributes to the cumulative impact of this significant amendment proposal on the significant fauna habitat cannot be accurately quantified.

Whilst the original Telfer expansion studies did not define habitat type sufficiently to accurately assess cumulative impact, some inferences can be made to assist with assessment and are provided in Table 6-16. It should be noted that this total extent, whilst based on reasonable assumptions, is highly inferred and cannot be fully validated due to the absence of baseline survey pre-2000. For the purposes of this inferred extent the percentage of habitat type surveyed is applied to both Havieron and Telfer (Spectrum, 2021, Appendix N). This is considered reasonable based on the following factors: both sites occur within the regional mapped extent; and local variation is considered likely to be low given that Havieron and Telfer occur on the same geological unit (Puntapunta Formation), in the same paleochannel, and have the same predominant vegetation sub-associated (134). Further the Approved Proposal did not identify any unique fauna habitat features locally, and the habitats are replicated widely in the region with no fauna species present within the region that have very restricted ranges. The Survey Area was considered to have low conservation value except for the presence of Threatened mammal species (Hart, Simpson and Associates 2002). Inferred habitat is only for the area covering the original clearance of 4,921 ha for the Telfer expansion approved under MS 606 and excludes 1,500 ha approved under MS 605 and MS 650 because they extend beyond the Regional Mapping Area (Spectrum, 2021), utilised an existing route and include dissimilar habitat such that the assumptions cannot be applied. There is no Development Envelope specified under MS 606, so the focus is on the approved Development Footprint.

Table 6-16: Inferred extent of fauna habitat for Telfer – Havieron Proposal

Habitat type (% of Regional Mapped Extent)	Regional extent in Mapping Area* (Ha)	Mapped extent in s.40AA Indicative Footprint (Ha)	Inferred extent in MS 606 Development Footprint (Ha)	Combined extent (MS 606 and s.40AA) (Ha)
Claypan (0.5%)	1,606.44	0 (0%)	24.6 (1.5%)	24.6 (1.5%)
Saltpan	10,652.3	2.04	167.3	169.34

(3.4%)		(0.02%)	(1.57%)	(1.59%)
Sand Dune (13.5%)	41,774.6	14.78 (0.04%)	664.3 (1.59%)	679.08 (1.63%)
Sand Plain (51.2%)	158,833.7	564.97 (0.36%)	2,519.6 (1.59%)	3,084.57 (1.95%)
Stony Hill, Breakaway or Other Outcropping (8.7%)	26,922.1	4.44 (0.02%)	428.1 (1.59%)	432.54 (1.61%)
Stony Plain (21.1%)	65,434.2	43.67 (0.07%)	1,038.3 (1.59%)	1081.97 (1.66%)
Total Ha	305,223.34	629.9	4,842.2	5,472.1

*Spectrum 2021, Appendix N.

Greater Bilby preferred habitat is Sand Plain and Sand Dune habitats (refer Table 6-3). Further, Bilby records were not confined to any one area, they were recorded across the Regional Mapped Area. Furthermore, there is little to no Night Parrot critical habitat present (Leseberg, 2025). It is considered that the cumulative impact of the Approved Proposal and the s.40AA Significant Amendment does not appreciably alter the risk to the survival of these species and is compensated for through the proposed offset. Further information on the landscape scale presence of Night Parrot will inform future controls for traffic management but, given the absence of critical nesting and roosting habitat, cumulative impacts from land clearance are not considered to be significant.

6.10 ENVIRONMENTAL OUTCOME

Overall, the direct and indirect impacts to conservation significant species arising from the proposed action are considered to be low for the following reasons:

- Proposed clearance will retain the mapped extents of the six fauna habitats to greater than 98% per habitat type, and the extent of remaining native vegetation in the bioregion is 99%.
- Specialist advice has determined that no persistent population of Night Parrot is likely to be present and negligible impacts would occur given from land clearance given the absence of critical nesting and roosting habitat within the s.40AA development envelope.
- There will be no clearance of critical Night Parrot breeding or roosting habitat and active Greater Bilby burrows, with pre-clearance surveys conducted for final assurance
- Greater Bilby are highly mobile with expansive contiguous habitat available and their predominant recordings to the east of the Development Envelope will not be fragmented.
- No change to indirect impacts from feral animals is anticipated. Any anthropogenic drawcards are mitigated through feral animal control programs. Given the vast and remote region within which Havieron is proposed, these programs are likely to provide broader

positive impacts for feral species control that would otherwise not be performed, or responsibility would fall to Traditional Owners or Government.

- Indirect impacts from altered fire regimes are managed through contemporary technology to monitor for fires and provide for local response. Natural and non-mine related fires are likely to occur, and they remain a significant factor in shaping the vegetation of the Great Sandy Desert. The proposed mitigations will bolster regional capabilities to detect and contain fires and are considered a net benefit of the proposal.
- Indirect impacts from weeds, dust, spills and altered surface water flow patterns are minimised through mitigation and monitoring measures that will substantially reduce the potential of indirect impacts and are standard environmental best practice.
- At the cessation of mining, where alterations to the original landform are not significant, there is reasonable expectation of rehabilitation success and the return of some pre-disturbance vegetation value. Rehabilitated waste rock landforms (totalling 18 ha) may not provide attractive habitat given the preference for sandplain, salt plain and sand dune habitat. However, 18 ha is not considered significant.
- The probability of successful rehabilitation is high, based on experience at Telfer and other partnering mines who form the Pilbara Rehabilitation Group¹⁴.
- Application of a biodiversity offset for an area of 3,200 ha of land, upon which a ranger style program will be implemented (refer Section 13).

Due to uncertainty around the utilisation of the development envelope by Night Parrot, no night haulage (required in approximately 2-3 years from grant of permits) without assessment and further approval by DCCEEW and the WA EPA based on additional data as follows:

- A two-year acoustic monitoring program to detect Night Parrot at a landscape scale will be completed prior to Night Haulage.
- Annual Greater Bilby population surveys to complement the existing dataset. This will provide the data necessary when making the case for future night haulage

Mitigations align with current conservation advice and recovery plans for MNES (refer Section 14.4).

Given the application and monitoring of contemporary and outcome-based mitigations outlined throughout this section, the high probability of successful rehabilitation based on experience at Telfer and other partnering mines who form the Pilbara Rehabilitation Group¹⁵, and the application of a biodiversity offset it is expected that the Proposal will meet the EPA's objective *"to protect terrestrial fauna so that biological diversity and ecological integrity are maintained."*

¹⁴ The Pilbara Rehabilitation Group is formed by industrial rehabilitation specialists who share information and access to quality locally sourced seed to increase the likelihood of rehabilitation success in harsh desert conditions.

¹⁵ The Pilbara Rehabilitation Group is formed by industrial rehabilitation specialists who share information and access to quality locally sourced seed to increase the likelihood of rehabilitation success in harsh desert conditions.

7. GREENHOUSE GAS EMISSIONS

7.1 EPA OBJECTIVE

The EPA objective for greenhouse gas emissions is “To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable”.

7.2 RELEVANT POLICIES AND GUIDELINES

This section and supporting information have been prepared with regards to the policies and guidelines outlined in Table 7-1. Further context is provided in Section 7.2.1.

Table 7-1: Greenhouse gas emissions policy and guidelines

Environmental Factor	EPA and other State or Commonwealth policy or guidance	Consideration of policy and guidance
Environmental Factor Guideline: Greenhouse Gas Emissions (November 2024)	National Greenhouse and Energy Reporting Act 2007 (NGER Act)	Emissions reduction, and current and future reporting requirements
	National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015	Compliance with current and future reporting requirements under the Safeguard Mechanism
	National Greenhouse and Energy Reporting (Measurement) Determination 2008	Emissions estimations
	Greenhouse Gas Emissions Policy for Major Projects (State GHG Policy) (Government of Western Australia 2020).	Provision of sufficient information within this RSD to demonstrate conformance to the EPA objective
	Full Carbon Accounting Model (FullCAM) FullCAM guidelines, Department of Industry, Science, Energy and Resources (DISER, 2020)	Emissions factors used in greenhouse gas emissions calculations relating to land clearance
	Carbon Credits (Carbon Farming Initiative-Avoided Clearing of Native Regrowth) Methodology Determination 2015 (CER, 2018).	

7.2.1 REGULATORY AND POLICY CONTEXT

Western Australian Government's Greenhouse Gas Emissions Policy for Major Projects (2024)

- This policy guides government decision-making on GHG emissions for major projects assessed by the EPA. It supports achieving net-zero emissions by 2050, aligning with the WA Climate Policy and Sectoral Emissions Reduction Strategy. The policy acknowledges the strengthened Commonwealth Safeguard Mechanism and aims to avoid duplication of conditions.

EPA's Environmental Factor Guideline: Greenhouse Gas Emissions (November 2024)

- The EPA's approach to assessing GHG emissions from proposals under Part IV of the EP Act has been significantly updated in the November 2024 guideline.
- The EPA now recognises the strengthened Commonwealth Safeguard Mechanism laws that commenced on July 1, 2023. For proposals covered by the Safeguard Mechanism, the EPA will simplify information requirements for Scope 1 emissions, as the Mechanism is expected to meet the EPA's expectations in most cases.
- The guideline no longer explicitly requires a GHG Management Plan. Instead, it ensures that proponents provide information on how they will avoid, reduce, and mitigate greenhouse gas emissions.
- There is continued emphasis on achieving deep and sustained emissions reductions this decade, with a target of net-zero emissions by 2050 or earlier. This aligns with the Safeguard Mechanism requirement for covered emissions to be reduced to net-zero by 2050 following a straight-line trajectory.
- For new facilities, the guideline acknowledges the Safeguard Mechanism requirement for best practice emissions intensities, with most best practice values now legislated.
- The EPA aims to reduce overlap and avoid duplication with existing frameworks, including any reforms of relevant Commonwealth and/or State legal or policy instruments.

National Greenhouse and Energy Reporting Act 2007 (NGER Act) and associated Safeguard Mechanism Rule 2015

- The Telfer facility is a reporting facility under the NGER Act and is subject to the reformed Safeguard Mechanism, which commenced on July 1, 2023.
- The Safeguard Mechanism now sets a declining emissions baseline for the Telfer – Havieron Project, requiring annual reductions in line with Australia's national emissions reduction targets. If the facility exceeds its baseline, it must manage this exceedance by surrendering Australian Carbon Credit Units (ACCUs) or Safeguard Mechanism Credits (SMCs) to the CER by March 31 of the following year.
- The Safeguard Mechanism also provides additional flexibility options, such as multi-year monitoring periods and borrowing from future baselines. Given the enhanced alignment between state and federal frameworks, this section will provide information to ensure the state government can appropriately assess the project's GHG emissions within the context of the strengthened Safeguard Mechanism requirements and the facility's strategies to meet its declining baseline obligations.

Net Zero Plan (proposed for release in 2025)

Greatland notes the current development of a Net Zero Plan for Australia to support the achievement of nationally determined contributions (NDCs) under the UNFCCC Paris Agreement. Consideration and address to the proposed Net Zero Plan will occur through the adaptive management and continual improvement framework shown in Figure 7-2.

7.3 GREENHOUSE GAS EMISSIONS ASSESSMENT

As Telfer is currently operating under a Clean ER SGM transitional calculated baseline (Responsible Emitter: 20 005 683 625)¹⁶, this assessment will comply with the EPA guideline Option A and all required information will be provided to demonstrate the commitments required.

This section assesses Scope 1 and 3 GHG emissions associated with the Telfer-Havieron Project, aligning with the EPA's requirements as outlined in the Environmental Factor Guideline: Greenhouse Gas Emissions (November 2024). There are no Scope 2 emissions associated with Telfer-Havieron due to the onsite power plant (i.e. no purchased electricity).

Full third-party assessment reports for greenhouse gas emissions can be viewed in:

- Appendix S – Scope 1 Greenhouse Gas Emissions Assessment
- Appendix T – Scope 3 Greenhouse Gas Emissions Assessment

7.3.1 SCOPE 1 EMISSIONS ASSESSMENT

Based on forecast mining and processing throughput, total Scope 1 emissions for the combined Telfer-Havieron Project are estimated to be 3,261,251 tCO₂-e. This comprises:

- 1,625,735 tCO₂-e from the Telfer operation; and
- 1,605,626 tCO₂-e from the Havieron operation.

Electricity consumption is the major emission source across the project's life, although its relative contribution is expected to decrease over time as production declines.

These estimates have been prepared using Method 1 of the *National Greenhouse and Energy Reporting (Measurement) Determination 2008 (NGER Determination)*¹⁷, as applicable to the 2020-21 financial year (FY2021). This method specifies the use of designated emission factors in the estimation of emissions from fuel consumption. Emissions sources included in this estimate are:

Emissions from fuel combustion:

- Primary Power Station (PPS) comprising three GE LM6000 gas-fired turbines
- Secondary Power Station (SPS) comprising eight standby diesel-fired generators
- Diesel use in hybrid mobile equipment
- Diesel fuel use in non-transport heavy vehicles (haul trucks, loaders, excavators)
- Diesel fuel use in non-transport light vehicles (cars, utes, small trucks, gensets)
- Diesel fuel use for ore transport between the Havieron Project and the Telfer Project.

Emissions associated with loss of sequestration capacity from clearing of vegetation to facilitate the Havieron Project has been calculated using the Full Carbon Accounting Model

¹⁶ [Safeguard facility reported emissions data | Clean Energy Regulator](#)

¹⁷ [Federal Register of Legislation - National Greenhouse and Energy Reporting \(Measurement\) Determination 2008](#)

(FullCAM)¹⁸. Vegetation clearing for the Havieron Project has been calculated using the FullCAM guidelines produced by the Department of Industry, Science, Energy and Resources (DISER, 2020)¹⁹ and methodology outlined in the *Carbon Credits (Carbon Farming Initiative—Avoided Clearing of Native Regrowth) Methodology Determination 2015* (CER, 2018)²⁰.

The following emission sources have been excluded from this assessment:

- There are no Scope 2 emissions associated with this project
- Emissions associated with construction and post-closure monitoring and rehabilitation
- Emissions associated with the disposal of waste and wastewater (limited to diesel usage in pumping infrastructure and considered negligible due to the lack of quantifiable forecast pumping volumes available at the time of assessment)
- Emissions associated with land clearing for the Telfer Project (activities have already occurred and been included in NGER annual reports and Native Vegetation Clearance Permit reports)
- Use of explosives for mining operations.

7.3.1.1 SAFEGUARD MECHANISM BASELINE AND REDUCTION TRAJECTORY

The Telfer facility has been reporting under the Safeguard Mechanism since FY2016-17 (Responsible Emitter: 20 005 683 625)²¹. Historic production variables that were previously used to determine the calculated-emissions baseline have been utilised when applying for an emissions intensity determination application. This was externally audited for “Reasonable and limited assurance engagement under section 17 of the National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 (the Safeguard Rule)²².

Telfer has applied for facility-specific emissions intensity value for both production variables:

- Prescribed Production Variable: Run of Mine Metal Ore (ROM) (tonne)
 - Facility-Specific Emissions Intensity: 0.0072 tCO₂-e /tonne
- Electricity Generation (MWh)
 - Facility-Specific Emissions Intensity: 0.5765 tCO₂-e / MWh

The estimated net emissions based on these variables under the Safeguard Mechanism are shown in Figure 7-1.

¹⁸ [Full Carbon Accounting Model \(FullCAM\) - DCCEEW](#)

¹⁹ [FullCAM Guidelines for the 2021 Plantation Forestry Method](#)

²⁰ [Federal Register of Legislation - Carbon Credits \(Carbon Farming Initiative—Avoided Clearing of Native Regrowth\) Methodology Determination 2015](#)

²¹ [Safeguard facility reported emissions data | Clean Energy Regulator](#)

²² [Federal Register of Legislation - National Greenhouse and Energy Reporting \(Safeguard Mechanism\) Rule 2015](#)

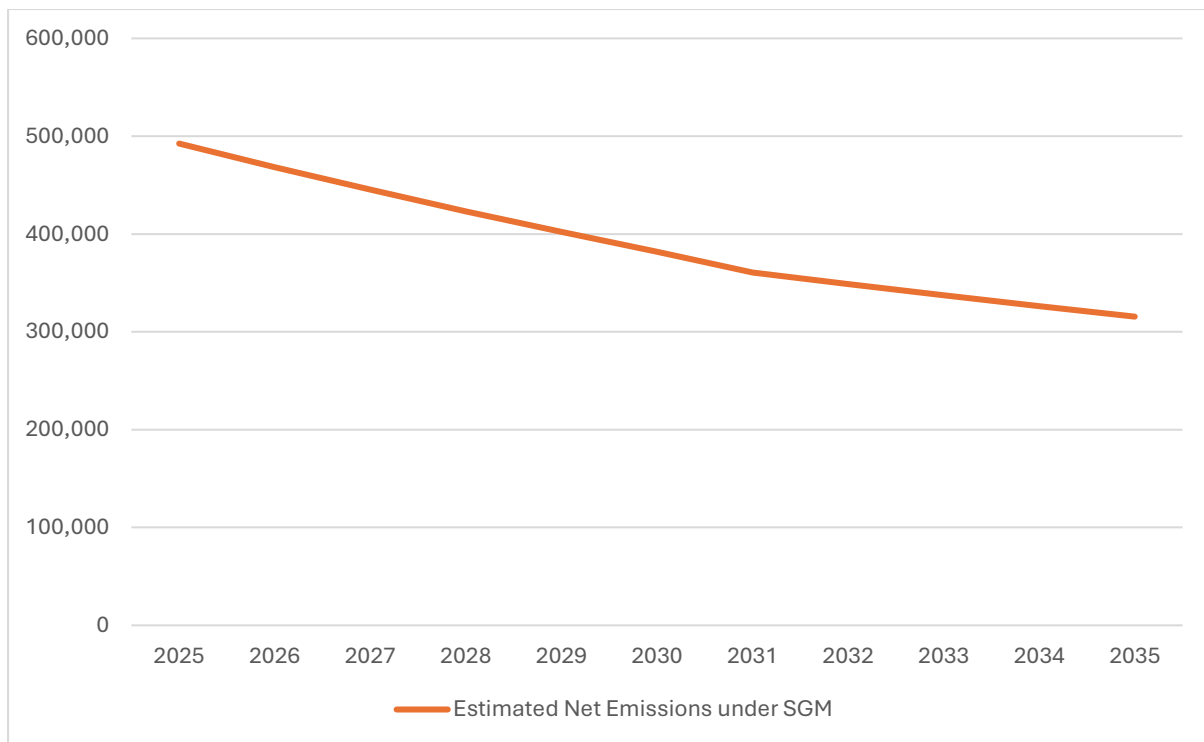


Figure 7-1: Estimated net emissions under the Safeguard Mechanism (subject to production)

7.3.2 SCOPE 3 EMISSIONS ASSESSMENT

Scope 3 emissions for the Telfer-Havieron Project encompass all indirect emissions that occur in the project's value chain, excluding those covered under Scope 1 and Scope 2. The assessment of these emissions follows the guidelines set by the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard ²³.

The project employs a combination of calculation methods to quantify Scope 3 emissions, as recommended by the GHG Protocol:

- Direct measurement: Used where possible for activities with available emissions data
- Calculation using activity data and emission factors: Applied for most categories where direct data is unavailable.

7.3.3 KEY SCOPE 3 CATEGORIES

Based on the assessment conducted, the following categories have been identified as material for the Telfer-Havieron Project:

- Category 1 (purchased goods and services)
- Category 2 (capital goods)
- Category 3 (fuel and energy related activities)

²³ [Corporate Value Chain \(Scope 3\) Standard | GHG Protocol](#)

- Category 4 (upstream transportation and distribution)
- Category 9 (downstream transportation and distribution)
- Category 10 (processing of sold products).

Their estimated Life of Mine (LOM) emissions and average annual emissions are shown in Table 7-2.

Table 7-2: Scope 3 emissions summary for the Telfer-Significant Amendment

Scope 3 Emissions - Category	LOM kt CO ₂ -e	Kt CO ₂ -e/year
Purchased Goods and Services	237.0	17.0
Capital Goods	311.2	22.2
Fuel and Energy Related Activities	433.6	31.0
Employee Commuting	3.5	0.3
Downstream Transportation and Distribution	300.1	21.4
Processing of Sold Products	1303.6	93.1
Total Scope 3	2,589.1	184.9

The Scope 3 emissions profile for the Telfer-Havieron Project is characterised by 'Processing of Sold Products' and 'Fuel and Energy Related Activities' as the most significant contributors. These categories are directly linked to the volume of ore processed and transported, and the energy required for those activities. Consequently, these emissions will be largely proportional to the Project's production levels. Therefore, as production from the Telfer-Havieron Project declines, particularly after the cessation of production of Telfer in 2027, then Havieron in 2035, the emissions from these categories will decrease, resulting in an overall reduction in Scope 3 emissions.

7.4 GHG MITIGATION AND BEST PRACTICE MEASURES

Mitigation measures have been implemented to reduce GHG emissions associated with the Telfer-Havieron Project, in accordance with the mitigation hierarchy of avoid, reduce, and offset. In identifying and assessing potential mitigation opportunities, consideration has been given to:

- Availability and suitability of best practice technology
- Estimated emissions reduction (cost-benefit)
- Timeline for implementation in relation to the projected Life of Mine
- Cost of implementation
- Regional constraints on the applicability of global best practice; and
- Local conditions affecting constructability, safe operability.

Significant constraints exist for broader design avoidance at the existing Telfer power plant and processing infrastructure.

7.4.1 AVOIDANCE AND REDUCTION MEASURES

The focus of Scope 1 emissions reduction is:

- Clean manufacturing principles
- Energy-efficient processes
- Selection and procurement of energy-efficient plant and equipment and maintenance for optimal performance in a mining setting
- Low emissions substances (e.g. low sulphur diesel and lubricants, ammonia and fuel oil-free blasting agents)
- Designed in mitigations for new development aspects e.g. siting of mine and surface infrastructure at Havieron to minimise haulage and vehicle wear.

Scope 1 emissions mitigation measures have been assessed and are outlined in Table 7-3.

Table 7-3: GHG emission reduction mitigation measures

Opportunity	Mitigation	Hierarchy	Status
Power generation (Telfer and Havieron supply)			
Renewable energy	Feasibility of renewable energy supply to decrease gas consumption.	Reduce	Under assessment
Reduce gas consumption by power station through gas plant efficiencies	Power station closed-cycle conversion for improving/increasing gas plant efficiency.	Reduce	Under consideration
	Combined cycle option/reduction of home load. Continuous process monitoring of power station performance to inform optimisation actions in real time and early operational intervention and inform reliability planning.	Reduce	Implemented
Increase gas turbine efficiency	Increase the GT heat rate/MW: Best efficiency is achieved when the GT is operated in the 80-100% of its capacity.	Reduce	Implementation planning underway
	Reduce the Spinning reserve: - Reduction of sprint water usage, which is currently in progress - Controlling the GT air inlet temperature – Effective use of chillers appropriately to the load requirements. Better load management: Communication with the SAOC team.	Reduce	
Process emissions reduction	Fuel additives for power engines to assist with fuel combustion.	Reduce	Implemented
	NOx water system optimisation as per GE Gas Turbine OEM to control thermally generated NOx gas and avoid NOx in-flue emissions.	Avoid	Implemented
Mining - Telfer			
Mining process optimisation	Reduce ore stockpile re-handling where possible to minimise diesel consumption.	Avoid	Implemented
	Precision / selective mining based on, as possible, ore minerology and characteristics to avoid generating additional waste requiring movement.	Avoid	Implemented
	Material designation optimisation to minimise haulage and re-handling.	Reduce	Implemented
	Modify stacker chutes and crusher spiders to reduce crusher downtime to minimise rehandle.	Reduce	Implemented
	Remove reef stope production bottleneck for most efficient use of underground fleet.	Reduce	Implemented

Opportunity	Mitigation	Hierarchy	Status
	Short-haul projects to identify and implement initiatives to reduce run hours and fuel usage.	Reduce	Implemented
Processing - Telfer			
Reduce power consumption through optimised crushing and grinding	Modify crushing screen size from 110mm to 120mm to decrease resistance and associated power usage (1MW/h saving).	Reduce	Implemented
	Reduce SAG Mill ball mill power lower set point to produce an optimised grind size (less fines).	Reduce	Implemented
	Maximise water recycling to minimise bore water extraction.	Reduce	Implemented
Mining - Havieron			
Design location for surface infrastructure	Location of Waste Rock Landform 2 adjacent to mine boxcut to minimise round trip haulage.	Reduce	2025 (per construction schedule)
Battery backup	Battery at Havieron for emergency backup required. Consideration of solar + batter and utilisation of Telfer spinning reserve.	Reduce	Under assessment
Plant, equipment and substances (Telfer and Havieron)			
Fleet fuel efficiency	Fuel additives for mining equipment (where in compliance with OEM) to improve oxidation of particles from combustion for efficiency.	Reduce	Implemented
	Fleet tracking system to improve utilisation and driver techniques.	Reduce	Implemented
	Removal of excess fleet to maximise utilisation and efficiency.	Reduce	Implemented
	Haul road maintenance to increase tyre life and reduce fuel consumption.	Reduce	Implemented
Efficient vehicles, plant and equipment	Specification of emission reduction devices on new vehicles, including diesel filters, catalytic converters and wet scrubbing systems (Tier 4 US EPA standard achieved wherever possible).	Avoid	Implemented
	Fleet maintenance program including emissions diagnostics and inspection of emission reduction devices.	Reduce	Implemented
Low emissions substances	Replacement of blasting emulsion in open pit with one that contains no ammonium nitrate or fuel oil.	Avoid	Implemented
	'Buy clean' approach to fuel and lubricants. Where possible ultra-low sulphur diesel and low sulphur lubricants are purchased.	Reduce	Implemented

7.4.2 CARBON OFFSETS

Whilst the focus remains on avoiding and continually reducing GHG emissions, it is acknowledged that offsets may be required to complement those mitigations for the period of shortfall in achieving targets.

To ensure the integrity and appropriate assurance of offsets for the Telfer – Havieron Project offsets will comprise:

- (a) Purchase of integrity-based offsets from schemes or programs that are verified.

Greatland will continuously monitor their obligations and emissions, purchasing integrity-based offsets to cover any shortfall if the Telfer-Havieron Project exceeds its Safeguard Mechanism baseline. It is expected that offsets will not exceed 30% of the anticipated baseline Scope 1 emissions for the proposal.

7.5 ADAPTIVE MANAGEMENT AND MONITORING

At a facility level, Greatland has embedded adaptive management and continual improvement by applying the model shown in Figure 7-2.

The continual improvement and adaptive management cycle is informed by and considers:

- Changes to public policy and a State, Federal and International level
- Changes to the uncertainties or assumptions
- Evaluation of routine GHG emissions monitoring data
- New and relevant data and information
- Effectiveness of internal processes and procedures to reduce and manage GHG emissions
- Changes in markets and technology
- Changes in regional infrastructure and energy resources
- Monitoring and corrective actions.

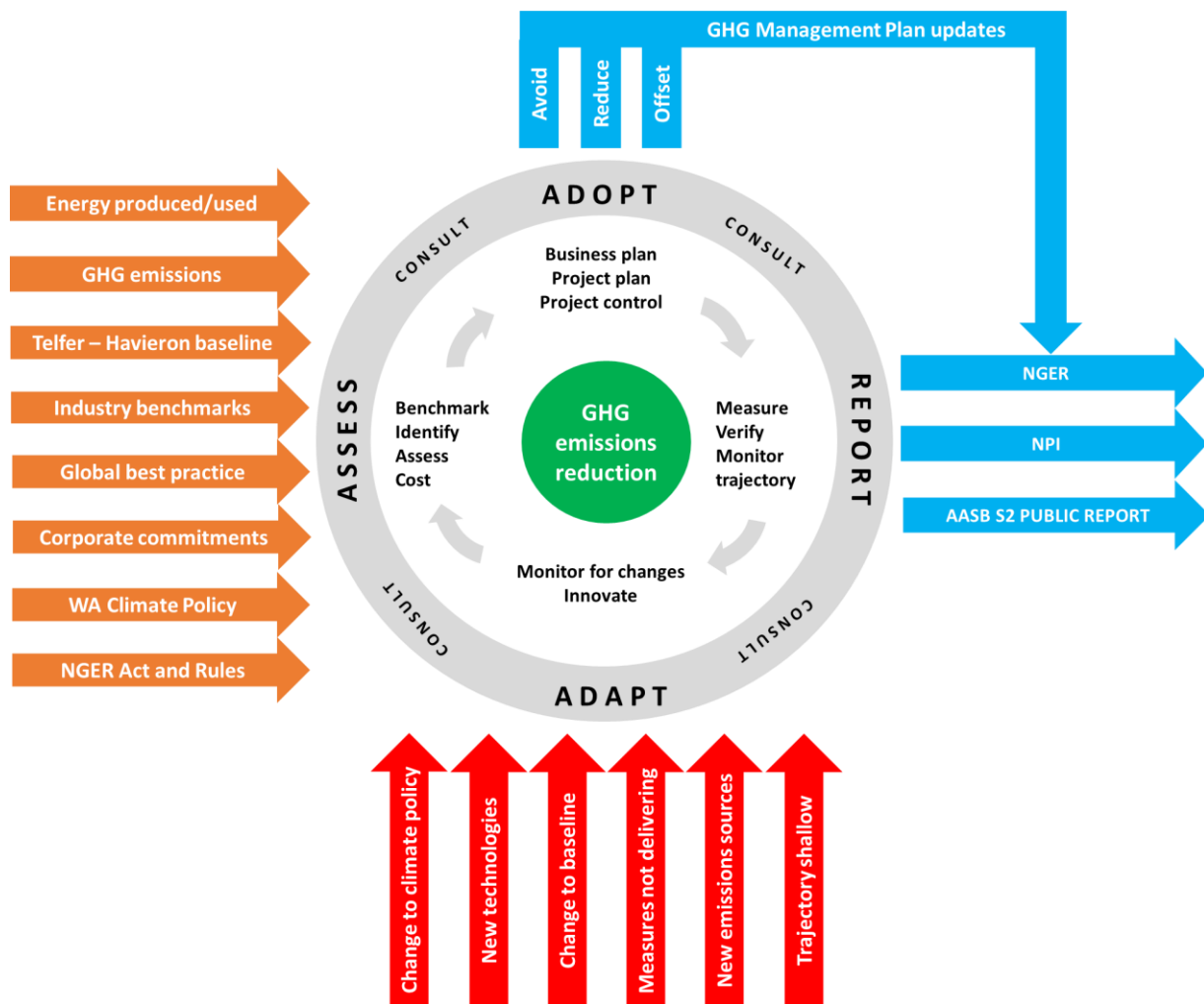


Figure 7-2: Adaptive management process for GHG emissions reduction

7.6 REPORTING

Public reporting of GHG emissions will be undertaken for the combined Telfer–Havieron Project throughout its operational life as follows:

- Annual report under the National Greenhouse and Energy Reporting Act 2007 (NGER Act) and associated NGERs (Safeguard Mechanism) Rule 2015
- Annual Australian Accounting Standards Board (AASB) S2 report for Climate-related Disclosures.

8. SOCIAL SURROUNDINGS – KEY FACTOR

8.1 EPA OBJECTIVE

The relevant EPA objective for Social Surroundings is “to protect social surroundings from significant harm”. This recognises the importance of ensuring that social surroundings are not significantly affected as a result of implementation of a proposal.

8.2 RELEVANT POLICIES AND GUIDELINES

Table 8-1: Social surroundings policy and guidelines

Environmental Factor	EPA and other State or Commonwealth policy or guidance	Consideration of policy and guidance
Environmental Factor Guideline: Social Surroundings (EPA 2023)	Technical Guidance EIA of Social Surroundings – Aboriginal Cultural Heritage (EPA 2023)	Design and conduct of surveys
	ACH Survey Report Guidelines – DPLH 2021	Informs the conduct and reporting of aboriginal cultural heritage surveys
	Aboriginal Cultural Heritage Act 2021 Statutory Guidelines	Current and future reporting requirements
	ACH Management Code – DPLH 2021	
	ACH Consultation Guidelines – DPLH 2021	Informing stakeholder engagement to understand the impact of the proposal to social surroundings
	Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environmental Protection and Biodiversity Conservation Act 1999, 2023.	Demonstrate conformance with the EPA objective

8.3 RECEIVING ENVIRONMENT

8.3.1 SOCIAL SURROUNDINGS STUDIES AND SURVEYS

A number of studies have been undertaken to understand the social surroundings of the Telfer-Significant Amendment, with a focus on the Havieron Project as a significant amendment. These are outlined in Table 8-2 and provided in Appendix U.

A significant number of aboriginal cultural heritage surveys have been conducted by specialists with Martu cultural advisors. Both archaeological and ethnographic surveys have been completed and are used in combination to determine significance of an area of object based on tangible and intangible elements. These are described in Table 8-3 and the survey areas shown in Figure 8-1. Aboriginal cultural heritage surveys are not included as appendices because details are considered confidential at the request of the Martu People.

Table 8-2: Social studies

Study	Report author	Description
Traffic assessment	GTA Consultants (GTA) (2021)	Baseline traffic study of public roads and implications of the Proposal's infrastructure corridor on the traffic and road safety of Punmu Road and other community routes
Visual amenity assessment	Ecoscape Australia (2021)	Visual amenity assessment including an analysis of the existing visual amenity of the Study Area and its surrounds. A desktop analysis, site photographs and a visual landscape evaluation (consistent with the Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design, WAPC 2007) were completed as part of the baseline assessment
Human health and ecological risk assessment (HHERA)	Tetra Tech Coffey (2022)	Assessment of potential contamination sources, pathways and receptors. The purpose of the HHERA was to assess the baseline conditions and potential impacts on off-site human populations and ecological receptors, to contaminants likely to be released to the environment as a result of activities associated with the Havieron Project. This work has been summarised in relation to Human Health (this section), Flora and Vegetation and Terrestrial Fauna
Cultural heritage risk assessment (including cultural heritage management plan)	Eco Logical Australia (ELA) (2021)	A review of completed heritage surveys to confirm heritage sites and development of a Cultural Heritage Management Plan to minimise impacts to heritage sites
Social risk assessment	Tetra Tech Coffey (2021b)	Baseline social assessment and identification of the Proposal's potential social and Aboriginal cultural heritage risks with preliminary management measures

Table 8-3: Aboriginal cultural heritage surveys for the Significant Amendment

Survey type*	Year conducted	Survey details
Archaeological and ethnographic	2019	Report of an Aboriginal Archaeological Work Area Clearance Survey of the Proposed Havieron Project and Punmu Road Access Track (E45/4701 and E45/2529) in the Martu People Native Title Determination Area, Great Sandy Desert, Pilbara, Western Australia [HERNEW011-A].
Ethnographic	2019	Final report regarding the ethnographic work program clearance and work area clearance heritage survey undertaken over Newcrest Mining Ltd's Havieron, Thomsons, Camp Dome, and AEM project areas undertaken by the Martu representatives and Yamatji Marpa Aboriginal Corporation (YMAC) [HERNEW011-E].
Ethnographic	2019	Preliminary advice regarding the ethnographic site avoidance heritage survey of the Havieron project area undertaken by the Martu representatives and YMAC [M45/1287].
Archaeological and ethnographic	2019	Final report regarding the archaeological and ethnographic work program clearance heritage survey of the Havieron Track Extension project area undertaken by Martu representatives and YMAC [HERNEW015].
Ethnographic	2019	Clearance of exploration sites (drill site, camp).
Archaeological and ethnographic	2019	Clearance of northern access road.
Consultation	2020	Short report regarding the community consultation of proposed sand dune crossings within Area B and Area C Havieron project areas undertaken by Martu representatives, Western Desert Lands Aboriginal Corporation (now JYAC), and YMAC [HERNEW026-C].
Archaeological and ethnographic	2020	Report: Archaeological and Ethnographic Work Area Clearance Survey of Areas F, G, and J at the Havieron Project, with the Martu Traditional Owners [HERNEW023].
Archaeological	2020	Report of an Aboriginal Archaeological Work Program Clearance Survey of the Proposed Havieron Project (E45/4701, E45/4518, E45/4867 and E45/2962) on the Martu Native Title Determination Area, Great Sandy Desert, Pilbara, Western Australia [HERNEW018-A].
Ethnographic	2020	Final report regarding the ethnographic heritage surveys of the Havieron Exploration Access Track, Havieron Areas A & B and Seismic Line Project areas undertaken by representatives of the Martu native title group and YMAC [HERNEW018-E].
Archaeological	2020	Heritage clearance of infrastructure corridor (excluding sand dune crossings).

Survey type*	Year conducted	Survey details
Archaeological and ethnographic	2021	Heritage clearance of infrastructure corridor (three sand dunes and consultation regarding other sand dunes).
Ethnographic	2021	Final report regarding the ethnographic heritage survey of an all-weather access road and infrastructure corridor to the Havieron Exploration Project areas undertaken by Martu representatives and YMAC [M45/1287, L45/537].
Archaeological	2021	Preliminary advice of an Aboriginal archaeological Work Area Clearance Survey of areas for proposed test pitting, dynamic penetrometer testing, drilling, and associated access tracks within the proposed Havieron Infrastructure Corridor (E45/5135, E45/5312, E45/4867, E45/4758, E45/4701, E45/5462, E45/5311, M45/765, L45/69, L45/106 and L45/80) in the Martu People Native Title Determination Areas, Great Sandy Desert, Pilbara, Western Australia [HERNEW030-A].
Archaeological	2021	Report of an Aboriginal Archaeological Work Area Clearance Survey of the Proposed Havieron Infrastructure Corridor (E45/5462, L45/106, G45/2, E45/4758, E45/5135, E45/4867, E45/4701 and E45/5311) in the Martu People Native Title Determination Area, Great Sandy Desert, Pilbara, Western Australia [HERNEW028-A].
Ethnographic	2021	Final report regarding the ethnographic heritage survey of an all-weather access road and infrastructure corridor to the Havieron Exploration Project areas undertaken by Martu representatives and YMAC [HERNEW028-E].
Ethnographic	2021	Ethnographic report regarding the heritage assessment of an all-weather access road and infrastructure corridor to the Havieron Project areas undertaken by Martu representatives and YMAC [HERNEW030-E].
Archaeological and ethnographic	2021	Report on an Archaeological and Ethnographic Work Area Clearance of TSF8 at Telfer Gold Mine, and an Archaeological and Ethnographic Consultation of Sand Dune Crossings at the Havieron Project, with the Martu Traditional Owners [HERNEW026].
Ethnographic	2021	Ethnographic heritage report on proposed works associated with an all-weather IC and access roads to the Havieron Exploration Project areas undertaken by Martu representatives and YMAC (YMAC 2021c).
Archaeological	2021	Report of an Aboriginal archaeological Work Area Clearance and Work Program Clearance Survey of proposed new tracks, drill pads, a camp location and polygons associated with proposed infrastructure activities in the Havieron Project area (E45/2962, E45/3261, E45/4758, L45/0106, M45/0205, M45/0033, M45/0007, M45/0720, M45/0763, M45/0765, M45/0772 and M45/0008, MK Minerals tenement E45/5462, Greatland tenement M45/1287 and Antipa Resources tenements E45/4867, E45/5135 & E45/5312), in the

Survey type*	Year conducted	Survey details
		Martu People Native Title Determination Areas, Great Sandy Desert, Pilbara, Western Australia HERNEW038 – Powerlines, Camp Dome and Southern Dune Crossing Survey.
Ethnographic	2021	Ethnographic heritage report on proposed Telfer Powerlines works associated with an all-weather access road and infrastructure corridor to the Havieron Project areas undertaken by Martu representatives and YMAC (YMAC 2021e).
Ethnographic		Final ethnographic heritage report on work area clearance survey of proposed Infrastructure Corridor Dune Crossings to the Havieron Project undertaken by Martu representatives and YMAC (YMAC, 2021d).
Archaeological	2021	Report of an Aboriginal archaeological Work Area Clearance and Work Program Clearance Survey of proposed new tracks, drill pads, a camp location and polygons associated with proposed infrastructure activities in Newcrest's Havieron Project area (E45/2962, E45/3261, E45/4758, L45/0106, M45/0205, M45/0033, M45/0007, M45/0720, M45/0763, M45/0765, M45/0772 and M45/0008, MK Minerals tenement E45/5462, Greatland tenement M45/1287 and Antipa Resources tenements E45/4867, E45/5135 & E45/5312), in the Martu People Native Title Determination Areas, Great Sandy Desert, Pilbara, Western Australia [HERNEW038-A]
Archaeological	2022	Final report regarding the archaeological Work Program Clearance heritage survey for the Proposed infrastructure corridor and core yard areas covering tenements G45/1 & G45/2; M45/7, M45/8, M45/33, & M45/205; & L45/106 AND L45/636, undertaken by Martu participants and YMAC [HERNEW041-A].
Ethnographic	2022	Ethnographic work program clearance within the Havieron Project Area M45/1287 and the proposed Infrastructure Corridor undertaken by Martu participants and YMAC, Western Australia [HERNEW044-E]

* Archaeological survey with regards to aboriginal cultural heritage is assessment of the landscape for physical evidence of human culture. It is generally prefaced by desktop review followed by field inspections. Surveys are conducted by archaeologists and Traditional Owners and/or knowledge holders.

Ethnographic survey with regards to aboriginal heritage is the assessment of the cultural, environmental, spiritual, historical and geophysical views of a landscape for evidence of connection and use. It is generally prefaced by desktop review followed by field inspections by anthropologists and Traditional Owners and/or knowledge holders

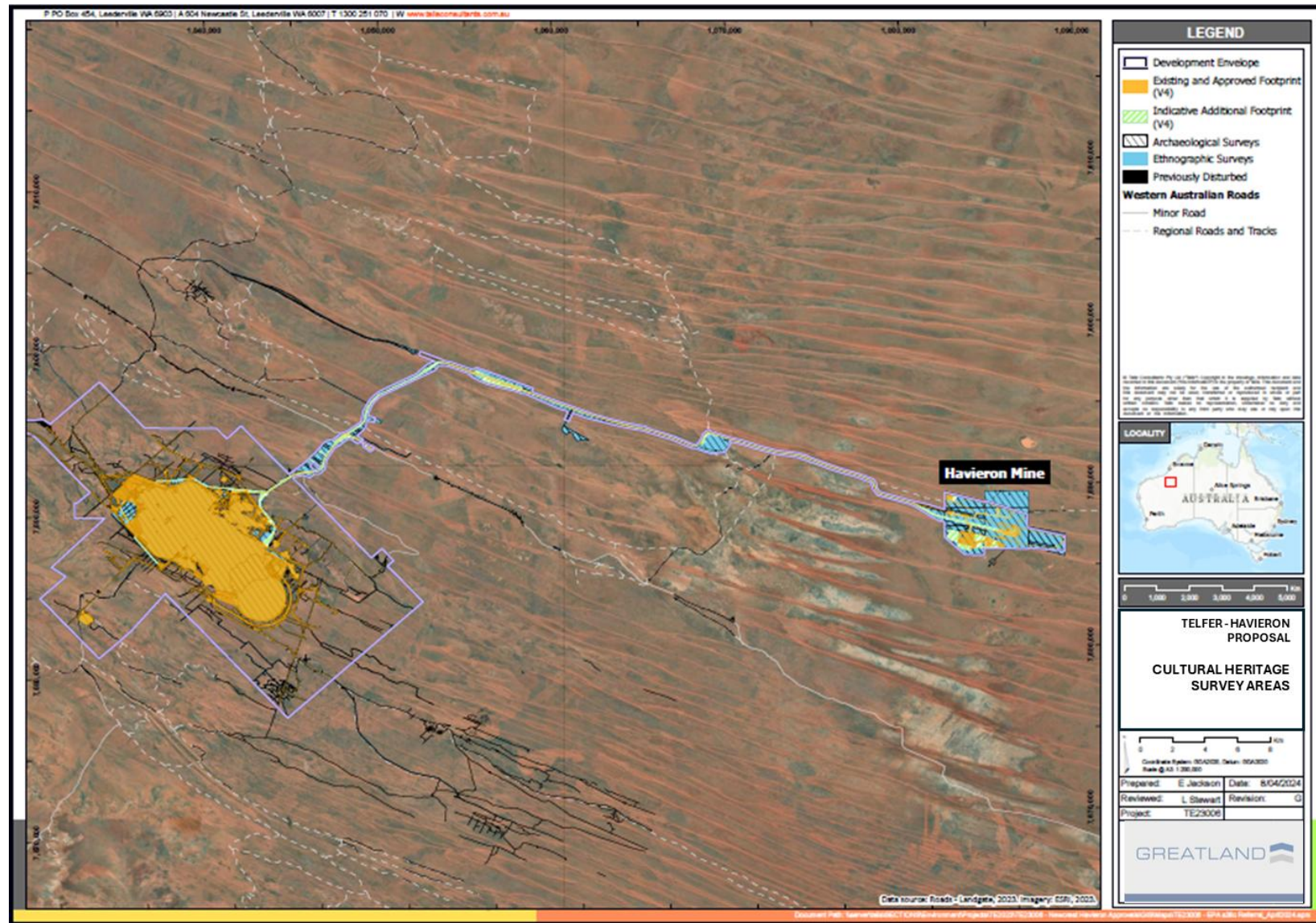


Figure 8-1: Cultural heritage survey areas

8.3.2 CULTURAL LANDSCAPE

The Telfer-Significant Amendment is located on Unallocated Crown Land subject to the Martu native title determinations of 2002, 2013 and 2023 in recognition of their continued connection with the land. Most of the determination area is assigned 'exclusive possession' and comprises some 130,000 km² of land around and to the east of the Telfer-Significant Amendment, and the rights also extend to flowing and subterranean water.

The formal legally binding relationship with Martu is through JYAC as the prescribed body corporate for the native title. An Indigenous Land Use Agreement (ILUA) was executed on 4/12/2015 and registered with the Native Title Registrar for access to and development of the project area within a 60km radius of the existing Telfer Mine. JYAC is the registered native title body corporate that administers and manages the native title land on behalf of the Martu People.

Greatland are guests upon their land and as such notification of works, provision of all documentation to JYAC, and monitoring by Martu is required. The heritage management provisions of the ILUA enable JYAC to formally object to any proposed and notified works.

Implementation and operation of the ILUA is principally through the Relationship Committee that comprises Martu, JYAC and Greatland representatives and meets approximately every 2-3 months. Matters include *inter alia* existing activities and programs at Telfer, environmental approval for the Havieron significant amendment, and associated management plans, closure planning and cultural heritage management and protection.

Through all phases of the Telfer-Significant Amendment and all dealings under the ILUA, Greatland acknowledge the following as guiding principles:

- Martu traditional lands are a 'Category 2: Organically Evolved Landscape continuing landscape' in accordance with the World Heritage Convention cultural landscape (Operational Guidelines 2008, Annex 3), being:
 - A relict (or fossil) landscape is one in which an evolutionary process came to an end at some time in the past, either abruptly or over a period. Its significant distinguishing features are, however, still visible in material form
 - A continuing landscape is one which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress. At the same time it exhibits significant material evidence of its evolution over time.

This category recognises not only Martu's ongoing connection to their landscape but provides a conceptual framework and recognition for the Martu's interconnectedness with all elements of their environment.

- "Nothing about Martu without Martu" guides all actions and is a cornerstone of the ILUA
- The definition of cultural significance is led by Martu and protects: Martu landscape elements of importance to them; the 'social surrounds' such as claypans, sand dunes, and rocky outcrops; specific species of trees, plants, animals, and their habitat; and

consequent material usage and ceremonial interrelationships and interconnectedness with *ngurra*.

- Martu communities are understood to collect bush foods and undertake hunting. Although foraging locations are selected based on seasonable availability of the food, habitat, technology and search strategy, foraging trips are generally located within 25 km to 50 km of communities.

JYAC works to advocate the cultural, social and economic strengths of Martu people. JYAC collaborates with Martu organisations to generate income, implement and monitor agreements for care, access and use of Martu country. JYAC also works with the Commonwealth, State, Local Government and industry to create partnerships and investments for Martu people. Greatland supports these objectives.

8.3.3 SOCIAL ENVIRONMENT

The social baseline identified communities that may be impacted by the Telfer-Significant Amendment and activities in the Pilbara region as follows:

- Punmu, Parnngurr (Cotton Creek), Jigalong and Kunawarritji (Well 33). These are Martu communities located within 200 km of the Proposal and who may have an interest in the lands and waters affected by the Telfer-Significant Amendment (hereafter referred to as Martu communities)
- Jigalong and other Martu communities located outside the Martu determination lands
- Newman and to a lesser extent Port Hedland, both of which have regional infrastructure and services and regional management stakeholders.

An overview of relevant communities is provided in Table 8-4.

Table 8-4: Overview of relevant communities

Community	Community Overview
Punmu Aboriginal community Population 126(a) ²⁴	Located within the Karlamilyi National Park Punmi is closest community to the existing Telfer mine, and approximately 127 km to the east by road from the Telfer-Significant Amendment. Punmu was established in the 1980s as part of the homeland movement ²⁵ . The community is comprised of residences, school, health clinic, airstrip, community facilities, and public accommodation. The community is managed by the Punmu Aboriginal Corporation.
Parnngurr Aboriginal community Population 117(b) ²⁶	Also known as Cotton Creek, Parnngurr is located within the Karlamilyi National Park approximately 257 km south of the Telfer-Significant Amendment by road. The community was established in the 1980s as part of the homeland movement ² . It is comprised of residences, school, airstrip, health clinic, community office, and visitor accommodation. The community is managed by the Parnngurr Aboriginal Corporation.

²⁴ (a) <https://www.indigenous.gov.au/community/punmu>

²⁵ Movement of Aboriginal people back to traditional country to live in 'homeland centres' that occurred from the early 1970's through to the late 1980's as an Aboriginal initiated movement.

²⁶ (b) <https://www.indigenous.gov.au/community/parngurr>

Community	Community Overview
Kunawarritji Aboriginal community Population 83(c) ²⁷	Kunawarritji is a small and very remote community located near Well 33 on the Canning Stock route approximately 301 km east of the Telfer-Significant Amendment by road. Established in the 1980s as part of the homeland movement, it comprises residences, school, health clinic, community office and a small hotel. The community is mostly Martu and managed by the Kunawarritji Council Aboriginal Corporation.
Jigalong Aboriginal community Population 306(d) ²⁸	Located to the east of Newman approximately 301 km south-west of the Telfer-Significant Amendment by road. Jigalong was established in 1907 as a works centre, converted to a mission in 1946, and finally became an Aboriginal community in the early 1970's. Jigalong is a relatively large Aboriginal community comprising residences, school, airstrip, police station, community facilities, and a guesthouse. Jigalong Community Incorporated manages the community.
Nullagine Aboriginal community and Town Population 1,159(d)	Located on the Nullagine River approximately 259 km southwest of the Telfer-Havieron Project by road. Nullagine was settled by Europeans during the old gold rush commencing in 1886. The town is not only a small regional centre, but also the home of the Yirrangadji Aboriginal community with mostly Martu residents.
Newman Town Population 6,922(e) ²⁹	Located approximately 500 km southwest of the Telfer-Havieron Project (direct accessible by a 10-hour road trip. Established by BHP in 1968 to service the Mt Whaleback Mine, Newman is now the headquarters of the Shire of East Pilbara local government. It Newman contains modern infrastructure, public and commercial services, and is considered the service hub for the wider region.
Port Hedland Town Population 17,247(f) ³⁰	Located approximately 530km north-west from the Telfer-Havieron Project by road and sealed highway. Established in the late 1800s, Port Hedland is the major community service centre in the Pilbara. After port dredging and construction of a railway in the 1960s, Port Hedland is now the world's largest bulk exporting port. Copper Concentrate from the Significant Amendment would be shipped in bulk from Port Hedland.

8.3.4 RESULTS OF STUDIES AND SURVEYS

8.3.4.1 CULTURAL HERITAGE FOR THE APPROVED PROPOSAL (TELFER)

Studies for the Port Hedland to Telfer corridor identified a small number of significant sites in the general vicinity of the corridor, but none were affected by the final alignment (Newcrest 2002a). The Telfer mine area had been surveyed previously by anthropologists from the University of Western Australia and the WA Museum in 1974/75, with no archaeological sites identified within the proposed mine disturbance areas (Newcrest 2002b).

²⁷ (c) <https://www.indigenous.gov.au/community/kunawarritji>

²⁸ (d) Australian Bureau of Statistics. 2021.

²⁹ (e) Shire of East Pilbara population data.

³⁰ (f) <https://www.porthedland.wa.gov.au/about-council/doing-business-with-the-town-of-port-hedland/economic-profile.aspx>.

During November 2001 supplementary surveys of previously unsurveyed areas within the proposed Project development and borefield areas were undertaken by the Ngaanyatjarra Council and representatives of the Martu Native Title claimants. The surveys identified two sites within the potential final extent of the proposed southern waste dump extension. The sites comprised two grinding stones in close proximity to each other near a natural claypan and a small ephemeral soak area. Discussions on the future of the two sites described above were underway with the traditional custodians and their legal representatives. At the time it was stated that further surveys and an archaeological assessment would be undertaken as part of the consultation process and, if necessary, applications under the *Aboriginal Cultural Heritage Act 2021* (ACH Act) would be lodged with the Aboriginal Cultural Materials Committee for approval before any site was disturbed ³¹ (Newcrest 2002b).

Previous heritage surveys around the Telfer Project have identified 15 registered sites and two additional 'lodged' sites within 20 km of the cultural heritage study area (Figure 8-2). These include stone arrangements, painted rock art, engraved rock art, historical camps, archaeological deposits, water sources, grinding patches, shell, ground stone artefacts (millstones and mullers), and stone artefact scatters. None are impacted by the Havieron proposed amendment.

³¹ No Registered Sites or Other Heritage Places have been declared/mapped within the Telfer footprint and no applications are on record, so if one or both of the sites have since been disturbed (noting that not all of the proposed footprint has yet been developed), the disturbance would have been in accordance with the consultation outcomes and not necessarily through Sections 16 or 18 of the AH Act.

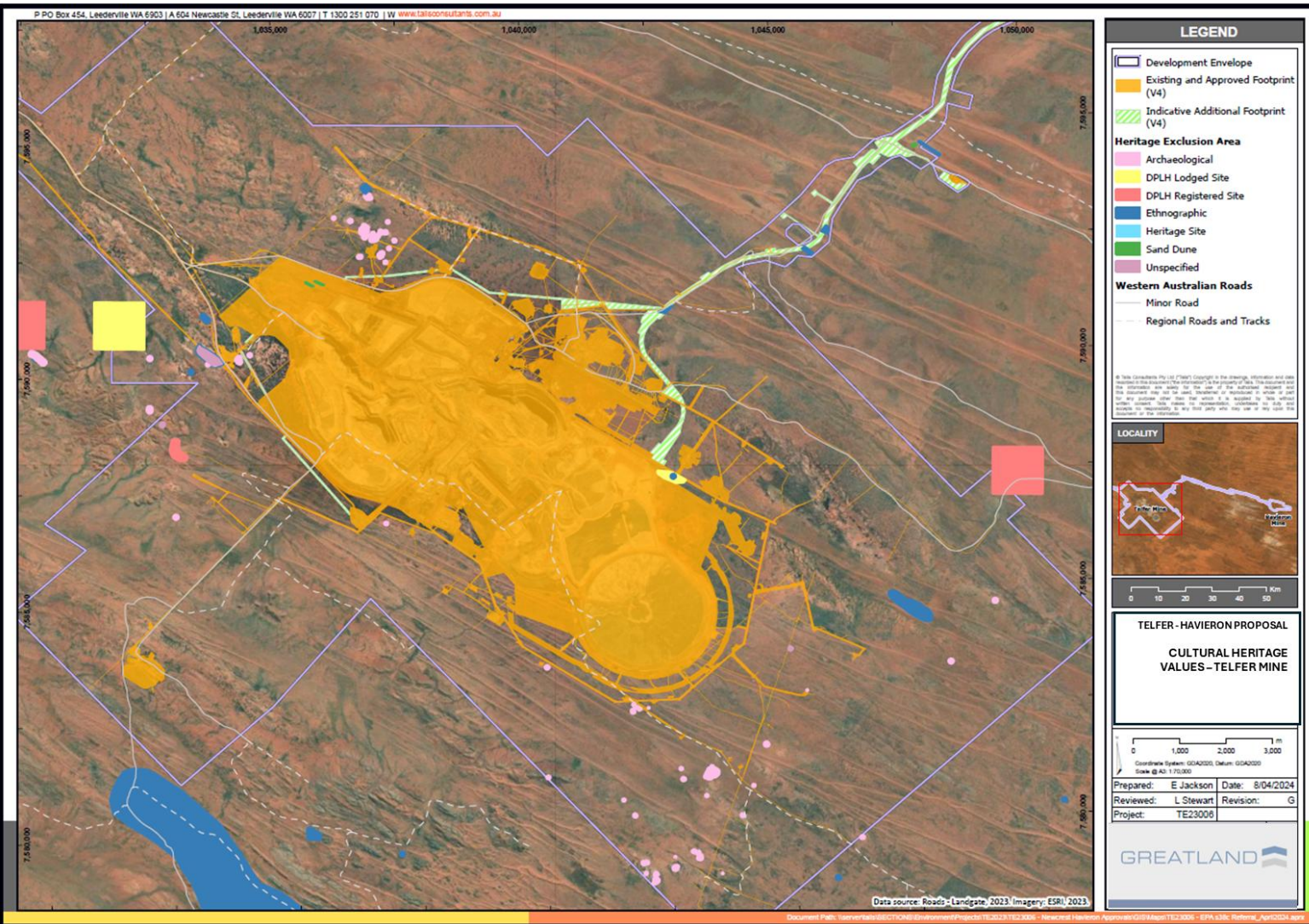


Figure 8-2: Cultural heritage values – Telfer Mine

8.3.4.2 HAVIERON PROPOSED AMENDMENT

Aboriginal cultural heritage

A search of the Aboriginal sites or heritage places (AHIS) Register, conducted on 23 May 2022 was conducted (Figure 8-1). There are no registered aboriginal heritage sites located within the Significant Amendment Development Envelope.

One previously lodged Other Heritage Place (21444 – Yirramirnti – Archaeological component consisting of artefacts/scatter, historical, camp with boundary) was last updated in 2004 (Figure 8-2). The Yirramirnti Heritage Place has recently been surveyed and reviewed with the Martu People (Terra Rosa 2021) and will not be impacted by the Significant Amendment.

Cultural heritage sites have been determined as per heritage surveys and consultation with Martu. The Cultural Heritage Risk Assessment (ELA 2021) reviewed completed heritage surveys to ensure impacts to cultural heritage were minimised.

The results of searches and surveys are mapped and shown in Figure 8-3.

While a significant portion of the uncleared Development Envelope has been subject to archaeological and ethnographic heritage surveys by Martu from 2019 to present, some areas are still to be fully surveyed, and this will occur as part of pre-disturbance mitigations should the Significant Amendment be approved.

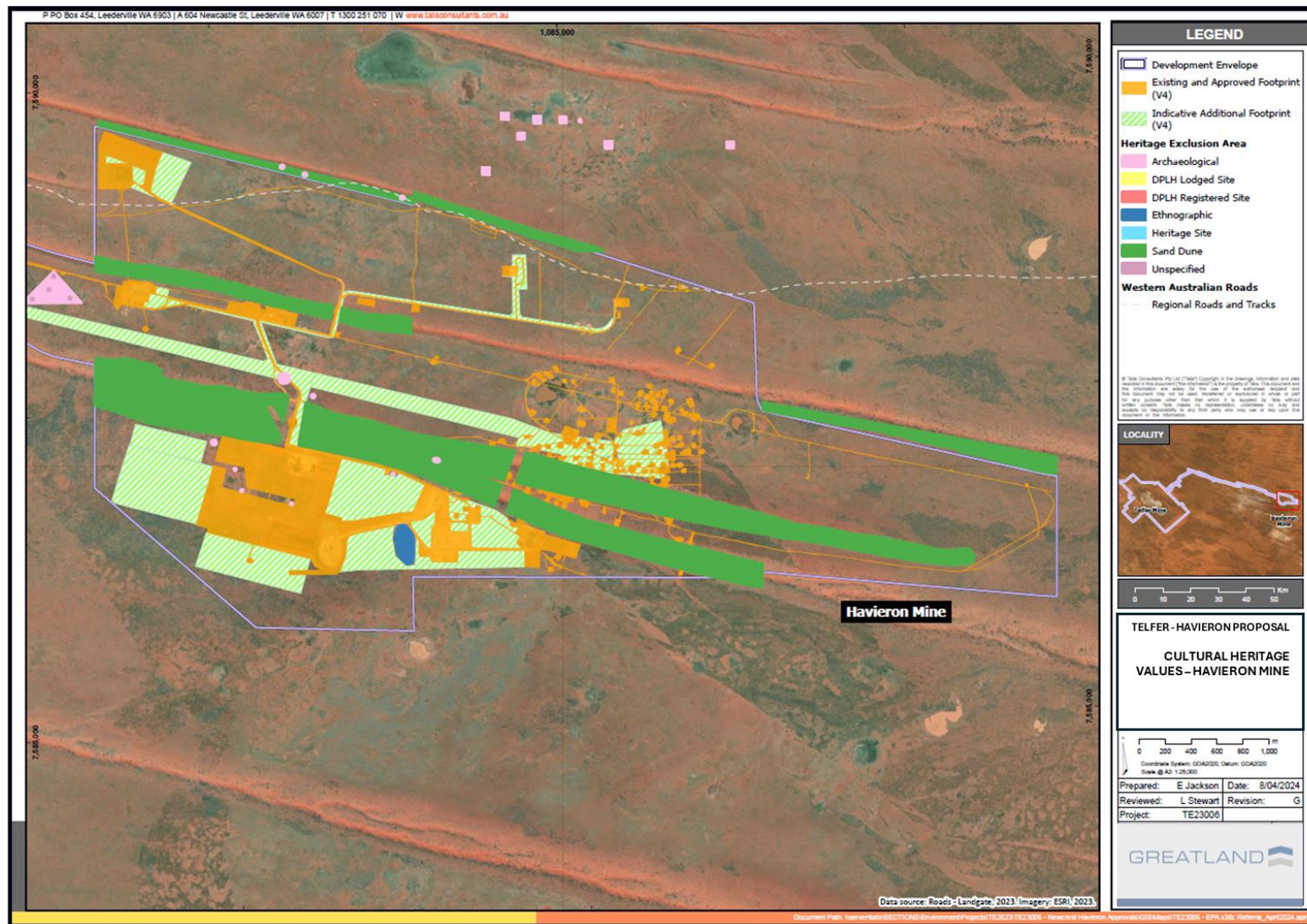


Figure 8-3: Cultural heritage values - Significant Amendment

Natural and historical heritage

No European heritage sites are within proximity to the Proposal.

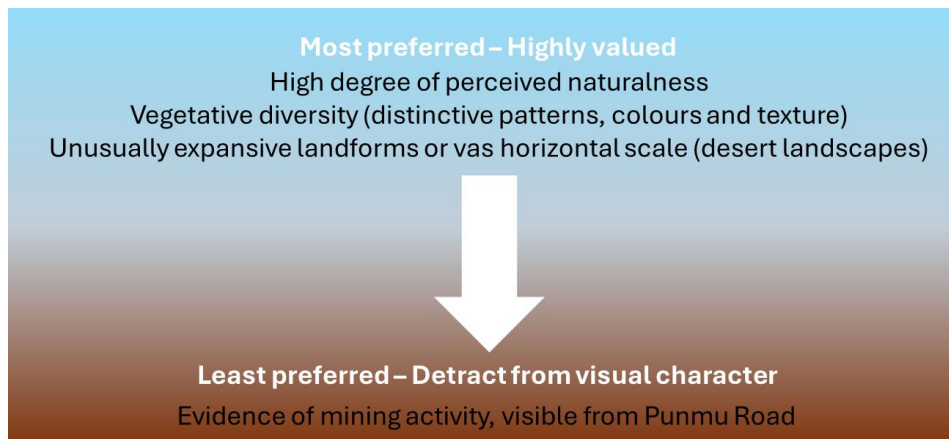
Amenity

Given the remoteness there are no sensitive social receptors for the Telfer-Significant Amendment, with the view of the local Martu community being of primary interest in assessing impacts. The Martu access the land for cultural, education, hunting and foraging purposes and have determined native title rights to land and waters.

Existing public infrastructure is limited, with the Punmu Road being the only public road within proximity to the Proposal, utilised predominantly by Martu. Other existing tracks are associated with historical exploration and mining activities.

Punmu Road provides access to the communities of Punmu and Kunawarritji and is an important link for the Punmu community visiting Telfer for supplies, with an average of ten vehicle movements per day (five Project-related and five public-related vehicle movements; GTA 2021).

Ecoscape (2021) undertook a visual amenity assessment for the Havieron Project. The value of the local landscape has been based on key character indicators defined by the Western Australian Planning Commission Visual Landscape Planning manual (2007) for natural environments. Most preferred visual characteristics to least preferred are shown below, with Martu the key stakeholder in determining these values.



The landscape of the Havieron Project and its surrounds is characterised by gently undulating plains, punctuated by low ridgelines and localised depressions, with an elevation ranging between 162 m and 373 m above sea level. Views from three vantage points are shown in Figure 8-4.

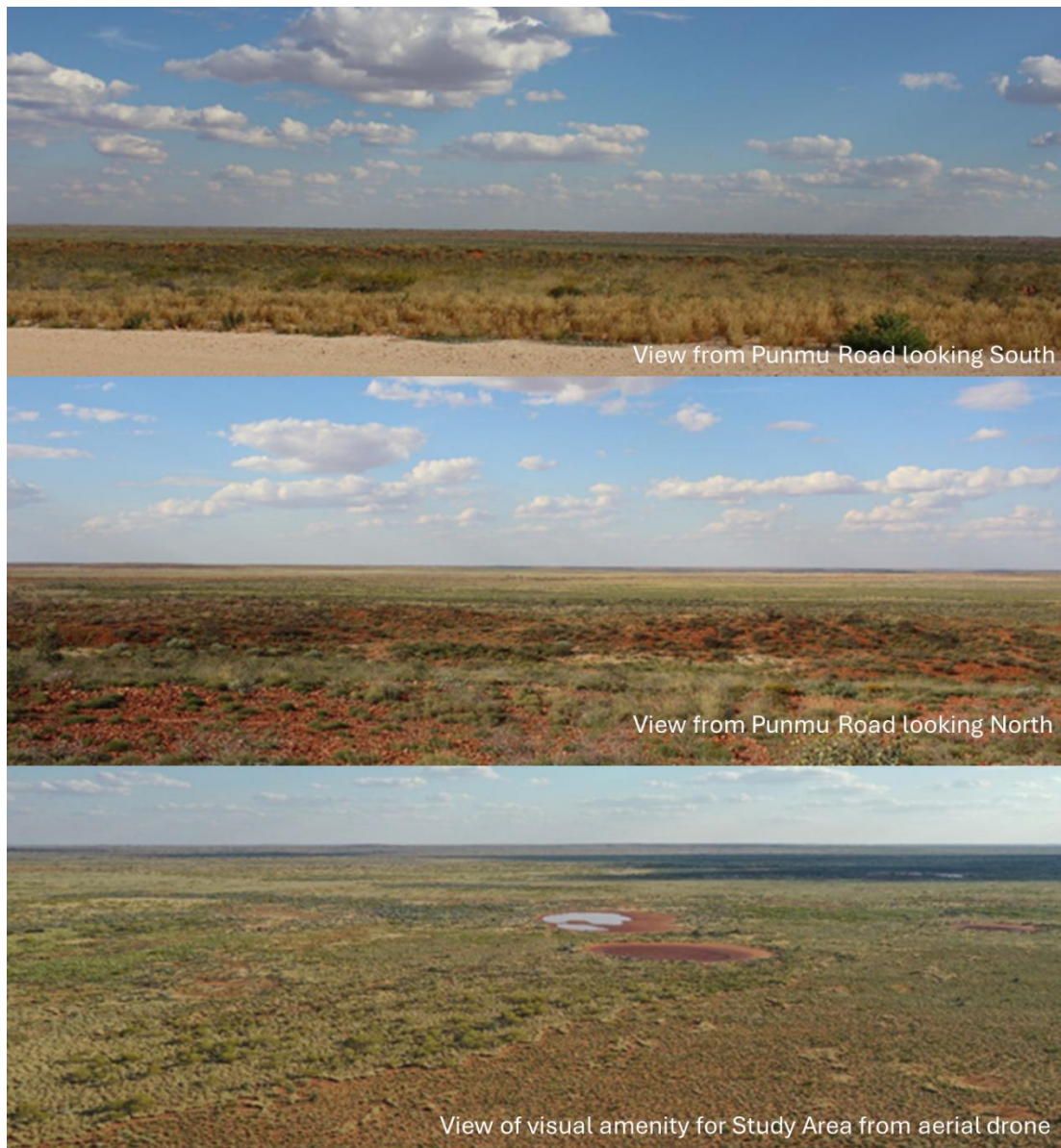


Figure 8-4: Pre-development visual amenity (2021)

8.4 POTENTIAL IMPACTS TO SOCIAL SURROUNDINGS

Potential impacts to social surroundings from the s.40AA Significant Amendment are considered to be:

- Direct impacts on aboriginal heritage and culture from:
 - clearing of land, including sand dunes and claypans of high cultural value to Martu
 - associated erosion and surface water flows from clearing and construction works.
- Indirect impacts to Aboriginal heritage sites or areas of significance from altered surface water or fire regimes, dust emissions or vegetation condition decline
- Loss of amenity through restricted access to land for cultural practices
- Increase in traffic crossing public roads and changed public road conditions, including wheel-generated dust

- Clearing of native vegetation which provides traditional food and other resources
- Visual impacts from sand dune crossings and permanent waste rock landforms.

8.5 MITIGATION

A summary of key management measures is provided in Table 8-5. The management measures are applicable to the maintenance and protection of social surroundings. These are proposed to apply through all phases of the proposal from finalisation of design, pre-clearance surveys, operation, rehabilitation and final closure. Martu, coordinated through JYAC, will remain central to the application of many of the proposed measures.

Table 8-5: Mitigation measures to protect social surroundings

Threat	Impact factor	Hierarchy of Control	Description of measure
Direct impact			
Land clearance for Significant Amendment	Impacts to heritage sites and sites of significance, traditional food resources	Avoid	- All Heritage Exclusion Zones avoided through design, including claypans and sand dunes (except where dune crossings have been agreed with Martu). - Installation of delineation, signage or fencing around heritage sites, and ongoing monitoring and maintenance program for the sites as per Martu request. - Large trees in vegetation to be avoided (as instructed by Martu monitors during clearance). - Design utilising existing tracks.
		Minimise	- Heritage Exclusion Zones georeferenced and not be amended without prior consultation with Martu. - Pre-clearance survey. - Martu monitors.
		Rehabilitate	Sand dunes to be rehabilitated as part of closure planning in consultation with Martu.
	Dune crossing not aligned with Martu requirements	Avoid	Field consultation with Martu and design of sand dune crossings approved through JYAC.
	Damage or loss to chance finds of archaeological items	Avoid	- Pre-clearance survey. - Martu monitors.
		Minimise	Chance Finds Procedure and supporting awareness training.
	Inadvertent clearing or damage to Heritage Restricted Zones or unsurveyed areas	Avoid	- Surface Disturbance Permit process to identify cultural heritage. - Demarcation of 'no go' zones. - Martu monitors.
		Minimise	- Surface Disturbance Permit process for demarcation and approval of clearing. - Martu monitors. - Cultural heritage register - Fencing, delineation and signage of Heritage Restricted Zones.

Threat	Impact factor	Hierarchy of Control	Description of measure
			Unapproved offroad access is prohibited (strict cultural heritage restrictions apply).
	Surface water and sediment flows from cleared areas	Minimise	Implementation of erosion control measures during clearance and construction activities where required.
Unauthorised access to Heritage Exclusion Zones	Damage or removal of archaeological items and breach of ILUA commitments	Minimise	Cultural heritage induction and awareness training, and strict site cultural heritage rules.
Indirect impact			
Land Access	Operations restricting free and safe access to traditional lands	Minimise	Land Access Procedure to be developed in consultation with JYAC and implemented to allow safe access to Martu land
Visual amenity	Waste rock landforms remaining onsite after closure	Minimise	- Reuse suitable non-dispersive waste rock where possible. - Havieron waste rock landforms constrained to approximately 20m in height, below height of local sand dunes.
Traffic increase	Visual and audible disturbance	Minimise	Consultation with JYAC and Shire of East Pilbara regarding Traffic Management Plan and crossing of Punmu Road.
	Increased traffic risk on Punmu Road	Avoid	Overpass designed at the Punmu Road intersection to separate community traffic from mine haul trucks
		Minimise	Signposted and enforced traffic management standards.
Dust	Visual disturbance disruption to amenity	Minimise	- Manage wheel-generated dust from haul trucks if visibility and amenity are affected at the Punmu Road intersection. - Dust suppression water applied by water cart to roads and hardstand areas. - Access road conditioning and maintenance to minimise dust. - Covered bulk haulage. - Dust suppression on stockpiles and dumps.
	Loss of vegetation or degradation of habitat quality	Minimise	Mitigations for the protection of vegetation and flora (Table 5-7) and fauna (Table 6-14)

Threat	Impact factor	Hierarchy of Control	Description of measure
Altered fire regimes	Loss of vegetation or degradation of cultural places	Minimise	Mitigations for the protection of vegetation and flora (Table 5-7)

8.6 ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

Aboriginal heritage and culture

The proposed Development Envelope contains 17 archaeological sites of significance and one ethnographical site of significance; all of which will be avoided as per agreements with JYAC and are protected within Heritage Exclusion Zones that are georeferenced.

Full archaeological and ethnographic heritage surveys have occurred across 8,278 ha of the Significant Amendment Development Envelope, including sand dune crossings, and a further 61 ha that have had ethnographical surveys completed. Heritage surveys are ongoing, and outcomes can be provided on request. Sufficient flexibility exists in the proposed Development Envelope to ensure any heritage sites identified are avoided.

With the application of avoidance and mitigations, and ongoing engagement with Martu, there is not considered to be significant residual impacts to aboriginal heritage and culture.

Sand dune crossings

The Significant Amendment will consist of up to 13 new sand dune crossings and expansion of approximately 11 existing sand dune crossings to access Havieron (subject to final design and JYAC approval). Five of these crossings are for powerlines that are expected to have minimal impact. Approved early works for the Havieron Project included two sand dune crossings, which were agreed with Martu through a process of heritage surveys and consultation. The Telfer Project includes historical sand dune crossings that have been consulted and approved by Martu. Consultation included discussion on detailed design, crossing locations and rehabilitation requirements. Heritage monitors were utilised for sand dune crossing construction. Greatland will implement similar processes to ensure sand dune crossings minimise impacts and are in line with Traditional Owner requirements.

Detailed and approved dune crossing designs, ongoing heritage surveys, avoidance of Heritage Exclusion Zones, and closure planning will occur in accordance with the engagement principles outlined in 3.2. This is Martu-led given the high cultural value of sand dunes. Given this due diligence, the application of Martu monitoring during construction of approved crossings, there is not considered to be significant residual impacts. Based on Telfer experience and engagement with Martu knowledge holders, the rehabilitation of sand dunes as part of closure is likely to return to a standard at or approaching pre-disturbance quality.

Amenity

The Significant Amendment includes the construction a haul road and infrastructure corridor from Telfer to Havieron. This haul road is approximately 50 km in length and proposed to be designed for the use of vehicles up to Quad Road Train size (53.5m in length). The route of the proposed haul road intersects with Punmu Road, which is a public road that provides access to existing communities to the east, including Punmu and Kunawarritji. Punmu Road receives relatively light traffic, of between five and ten vehicles per day, the majority of which are light vehicles.

Community stakeholders have raised concerns to Greatland (and Newcrest previously) about the potential for increased traffic safety risk on Punmu Road as a result of the establishment of the haul road. A Traffic Study (GTA 2021, refer Appendix U) to evaluate the design of the intersection between Punmu Road and the haul road. The Traffic Study recommended that the proposed haul road would be the priority road. However, further consultation is required to determine the final arrangement but some form of traffic control (e.g., a stop / give way sign, grade control, gate control or over/underpass) will be required. Greatland will continue to consult with the Punmu community and Shire of East Pilbara with regards to the final design of the Punmu Road crossing, to ensure road safety for existing and future road users.

Wheel-generated dust from haul trucks is not expected to create visibility or amenity issues, however standard dust control mitigations are proposed and will be applied throughout the life of operation.

The potential impact on Martu use of the Significant Amendment area for food resources is considered to be minimal, given the Significant Amendment is affecting 0.3% of the current vegetated extent of the Great Sandy Desert and no restricted vegetation communities are affected. Indirect impacts to vegetation and fauna food resources are expected to be minimised through mitigation measures detailed in Section 5 (Flora and Vegetation).

Consultation and planning will continue with the Martu to ensure safe access to their lands can continue and there is not considered to be significant residual impact to current or future amenity.

Visual amenity

Punmu Road is the closest route past the Havieron Project. It is an unsealed road that is used to access the Punmu Aboriginal Community. There are no designated lookouts, rest bays or tourist destinations identified along Punmu Road within the general area. Two viewpoints along Punmu Road were selected by TetraTech Coffey-Ecoscape (2022) to assess the visual impacts of the proposed mine development at locations where the public were most likely to see the proposed mine. Photo montages were prepared for the assessment to show an indicative view of the Havieron Project during operations (Figure 8-5) and post-closure (Figure 8-6).



Figure 8-5: Viewpoint 1 – Punmu Road (west) showing the modelled Havieron Mine area in pink

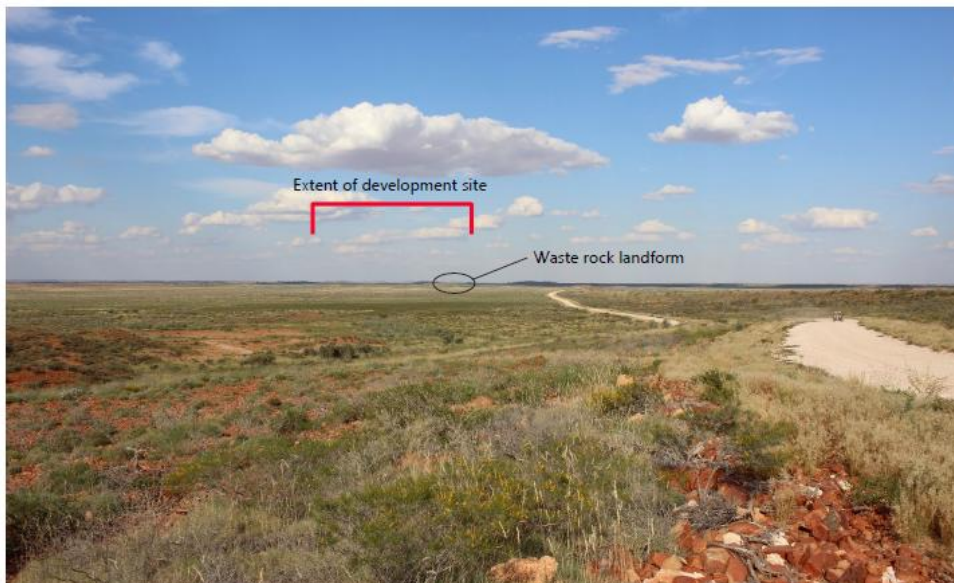


Figure 8-6: Viewpoint 1 - Punmu Road (west) post-closure

Visual assessment (Appendix U: Tetrattech Coffey, Ecoscape 2022) determined that given the significant distance from Viewpoint 1 to the development (>16km), the development would be in the background of the view, defined as 6.5km – 16km and beyond. The development therefore takes up a smaller proportion of the observer's field of vision, and correspondingly the potential visual impact diminishes. Haul Road borrow pits are not expected to be visible from this location.

Additionally, it is likely that the viewer will be travelling in a vehicle along Punmu Road, which diminishes the time that the experience of Viewpoint 1 will be available to them.

An alternative viewpoint along Punmu road was also selected and modelled (Figure 8-7). The Havieron Project would not be visible at that Viewpoint due to screening from localised topography and vegetation immediately adjacent to Punmu Road. Even if roadside vegetation

was lost (e.g. fire), it is likely the development would still be screened by the local variation in topography that restricts views.

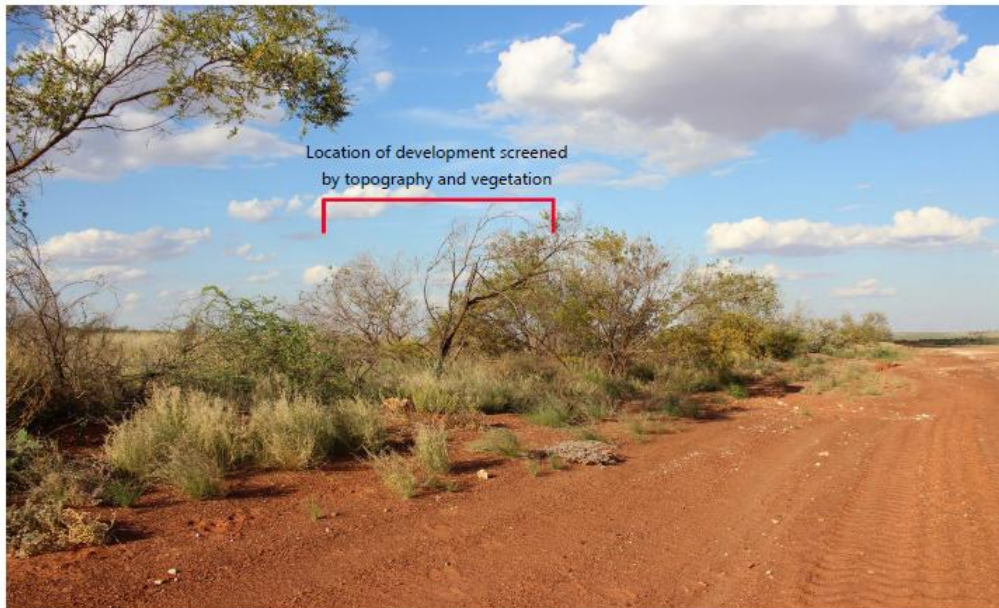


Figure 8-7: Viewpoint 2 – Punmu Road (east)

Overall, the Significant Amendment is expected to cause minimal visual impacts within the surrounding landscape at Havieron, given the highest infrastructure will be the Waste Rock Landform, with a maximum height of 25 m, which is lower than the surrounding sand dunes.

8.7 ENVIRONMENTAL OUTCOME

Sites of significance have been identified within the proposed Development Envelope and these will continue to be avoided by the application of Heritage Exclusion Zones. Cultural values associated with the landscape or identified through ongoing surveys will be managed through a jointly developed and implemented Cultural Landscape Management Plan with JYAC. Indirect impacts on sites of significance, particularly the ethnographic sites will be minimised through the mitigation measures proposed throughout this document.

Existing mining projects (including existing Telfer Mine and Havieron early works) exist within the local region, which consists of a widespread continuous landscape. Given the scale and height restrictions of the Significant Amendment, visual amenity impacts are not considered significant.

The outcome for Social Surroundings can be summarised as:

- No direct disturbance to sand dunes without heritage clearances completed by the Martu Traditional Owners

No direct disturbance to any heritage exclusion zones developed in consultation with the Martu Traditional Owners.

Given the level of consultation completed, mitigation measures and commitment to ongoing consultation, Newcrest believes the Significant Amendment meets EPA's objective *"to protect social surroundings from significant harm"*.

9. SUBTERRANEAN FAUNA – KEY FACTOR

9.1 EPA OBJECTIVE

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

9.2 RELEVANT POLICIES AND GUIDELINES

Table 9-1: Subterranean fauna policy and guidelines

Environmental Factor	EPA and other State or Commonwealth policy or guidance	Consideration of policy and guidance
Environmental Factor Guideline — Subterranean Fauna (EPA 2016)	Technical Guidance – Subterranean Fauna surveys for environmental impact assessment (EPA 2021d).	Informed the design and reporting of subterranean fauna surveys

9.3 RECEIVING ENVIRONMENT

9.3.1 SUBTERRANEAN FAUNA SURVEYS

Stygofauna sampling was completed as part of the Approved Proposal (Telfer) and is shown in Table 9-2

Table 9-2: Subterranean fauna surveys (Telfer MS606 proposal)

Report Author	Timing	Survey Description	Area	Details
Biota (2001)	August 2001	Desktop assessment and single survey	Telfer mine area, borefields and surrounding region	17 bores were sampled, including 4 regional bores and 13 bores within the Telfer mine and borefields.

Stygofauna sampling for the Havieron amendment proposal was completed on 33 groundwater bores established at Havieron and 41 existing bores at Telfer (Biologic, 2020), refer Table 9-3.

An additional 25 samples and DNA analysis on a sub-set of those was completed (Biologic, 2021). Habitat modelling was completed based on the Havieron hydrogeological model to determine impacts on stygofauna habitats from the drawdown of groundwater associated with abstraction of mine water (Rockwater, 2021).

Table 9-3: Subterranean fauna surveys undertaken for the s.40AA Significant Amendment

Report Author	Timing	Survey Description	Area	Details
Biologic (2020b) Appendix V	21-26 November 2019 18-21 Feb. 2020 30 Mar-3 Apr 2020 14-19 Apr 2020	Desktop assessment and two season survey	Havieron and Telfer Study Areas	Sampled 33 holes at Havieron and 41 in the Telfer region. Samples consisted of 50 hauls, four pumps and 32 traps.
Biologic (2021c; 2022b) Appendix W	3-7 May 2021	One season survey	Havieron Study Area	Sampled 25 sites. DNA analysis was completed for a selection of samples. Sediment hatching trials were undertaken for sediment collected from claypans. Habitat modelling was completed based on the hydrogeological model (Rockwater 2021)

The subterranean fauna survey of the Telfer-Havieron project by Biologic in 2021 was conducted across the range of geological and hydrogeological structures in the area and intersected a range of potential stygofauna habitats (refer Figure 9-1). The assessment of stygofauna values is constrained generally by the limited subterranean fauna dataset in the region. The main constraints are summarised by Biologic (2022) as:

- Sampling was only conducted on relevant tenements and concentrated in the Havieron Project impact area, and a few bores in the infrastructure corridor. Sample sites provide a reasonable assessment of species distribution within the impact area but limited outside that area. The constraint of limited regional sampling is somewhat mitigated by the small extent of predicted groundwater impacts and by the widespread, largely uniform geologies.
- Genetic analysis – regional comparisons of sequences were limited to the few that were available from sampling at Telfer. This limits the power of genetic comparisons to extend the known ranges of species recorded in the Havieron study area.
- 3-D habitat modelling was limited by several factors, including that the geological investigations were focussed on the area and depth of the orebody and did not contain a lot of information about the upper geological units, or on areas outside the potential zone of impact, where they were generally widely spaced

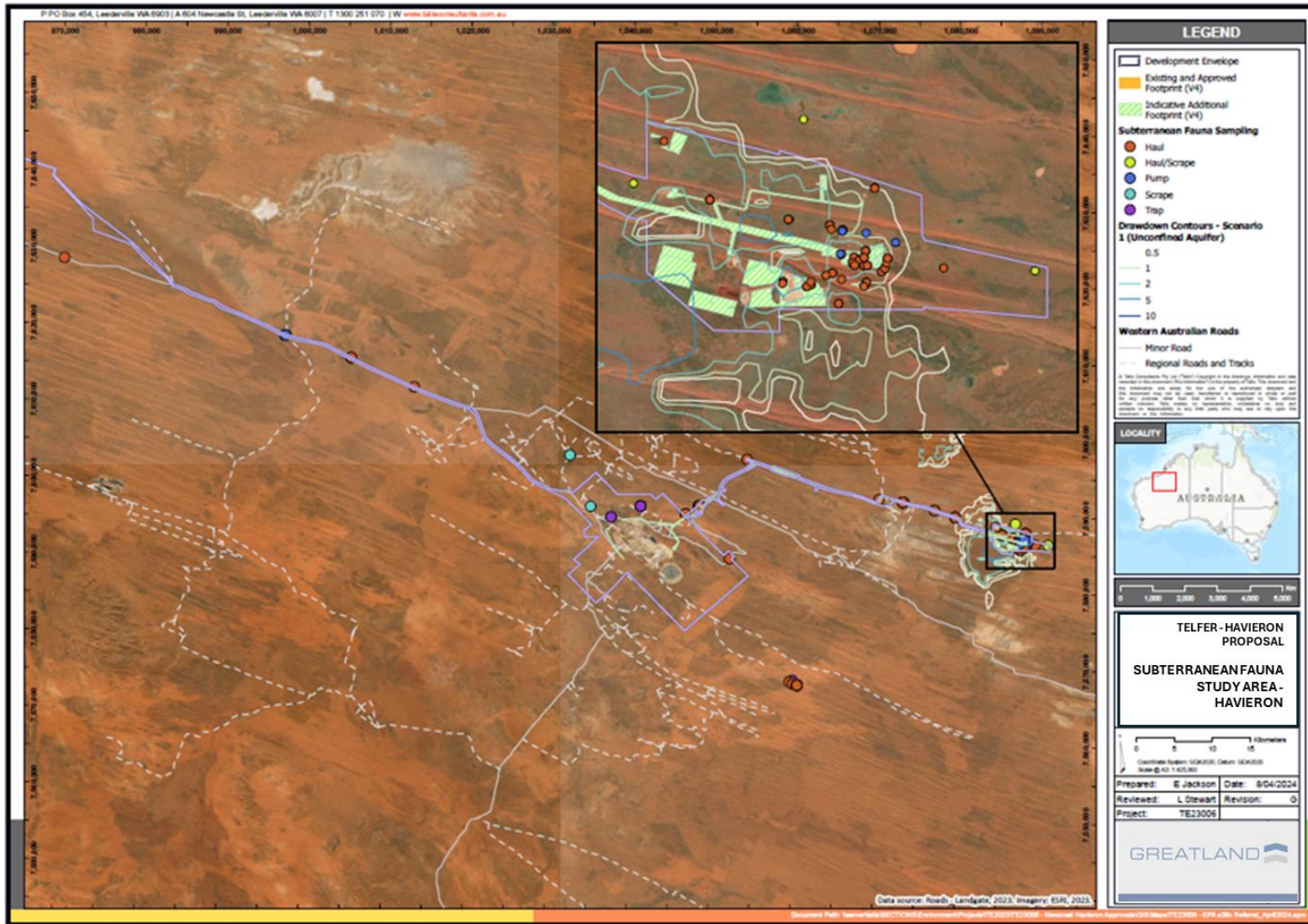


Figure 9-1: Subterranean fauna study area

9.3.2 SUBTERRANEAN FAUNA HABITAT

Approved Proposal

Since the commencement of stygofauna sampling and monitoring at the Telfer Project in 2001, results have consistently shown that stygofauna richness and abundance are greater at the regional bores than at near-mine bores. The difference is attributed to the regional bores being hosted in saturated calcrete, which is known to often support significant stygofauna communities, compared to the bores at and near Telfer that are located in dolomite and sandstone geological units (Biologic 2022b). The MS 606 condition for ongoing stygofauna monitoring at Telfer was considered satisfied and the compliance reporting obligation removed by the EPA in 2015 (the MS condition remains).

s.40AA Significant Amendment

Subterranean habitat assessment within the Havieron study area by Biologic (2022b) was based upon available geological and hydrogeological reports, surface geology maps and three-dimensional (3D) geological and hydrogeological modelling based on drill-hole logging data (Rockwater 2021a).

The Havieron Project covers widespread geologies and hydrogeological units including some that may offer habitat to stygofauna. Stygofauna habitat within and around the Havieron study area consists of the following:

- Zones within a superficial aquifer, specifically calcrete, alluvium and weathered saprolite zones that contain connected voids that are permanently saturated with groundwater of suitable quality. Permanent saturation is maintained by two processes across the study area:
 - In the central and eastern portions of the study area, the groundwater level is maintained by an underlying layer of mudstone of variable thickness that limits hydraulic connectivity with the underlying confined aquifers.
 - In areas to the west of the study area, the mudstone thins out or is absent and the unconfined and underlying aquifers discharge to overlying calcrete formations in a palaeovalley (Refer to figures 3 and 5 of Rockwater 2021a).
- Zones within the upper confined aquifer, specifically within the Upper Williams Mudstone (UWM) geological unit, where there is sufficient porosity or fracturing, and suitable water conditions. Overall, however, the UWM unit acts as an aquitard, separating the unconfined and upper confined aquifers³². Where these porous zones (which can include sandstone)

³² Interaction between the unconfined and upper confined aquifers does exist and is expected to relate directly to the thickness of the UMW, which thins to the west. Overall, the interaction is minimal (Rockwater, 2021c) with up to a 3 m difference between water levels in the unconfined and upper confined aquifers (Advisian 2022).

are in direct contact with the overlying geological strata of the unconfined aquifer, these zones are, in effect, also part of the unconfined aquifer and greatly increase the thickness of the aquifer and therefore availability of potential stygofauna habitat (e.g., at least 13 m thick at HAHY013 and 17 m thick at HAHY025; in Rockwater 2021a).

Other aquifers, including the Lower Confined and deeper Proterozoic aquifers, are not prospective for stygofauna due to their salinity, distance from the surface and the absence of interconnectivity with upper aquifers (Biologic 2002b).

Potential habitats for troglifauna appear to be very thin to absent within the Havieron study area (refer Appendix H), where the upper 15 m of the soil profile comprises unconsolidated sediments, made up of aeolian sand, alluvium and evaporites. The sediments may provide a lot of tiny pore spaces with high humidity and moderate vertical connectivity, however, as the superficial water table lies between 6 and 14 mbgl, the vertical extent of suitable habitat is limited (Biologic 2020b).

9.3.3 SUBTERRANEAN FAUNA SURVEY RESULTS

Approved Proposal

A stygofauna survey was conducted in the Telfer region in 2019 to 2020 as part of regional effort for Stage 1 of the proposed Havieron Project (Biologic 2020b). A total of 375 stygofauna specimens were recorded including paramelitid amphipods, cyclopoid and harpacticoid copepods, ostracods, parabathynellid syncarids, microcerberid isopods and oligochaetes.

The stygofauna conservation values in the vicinity of Telfer occur at Access Road in calcretes (refer Figure 9-2). While there may have been disturbance to the stygofauna at Telfer in areas of groundwater drawdown, the stygofauna community at the Access Road reference bores and in near mine bores appears to be the same community and a depauperate one. There is no evidence of continuing change in the stygofauna community at the near-mine bores.

With up to 15 species recorded in single samples from Access Road, it constitutes an area of significant stygofauna richness in the Pilbara (Halse et al. 2014). This community occurs in an area that has not been affected by mining and groundwater drawdown at Telfer.

MS606 condition for ongoing monitoring of stygofauna was considered completed and removed by the EPA in 2015 due to the absence of impacts (refer 9.6).

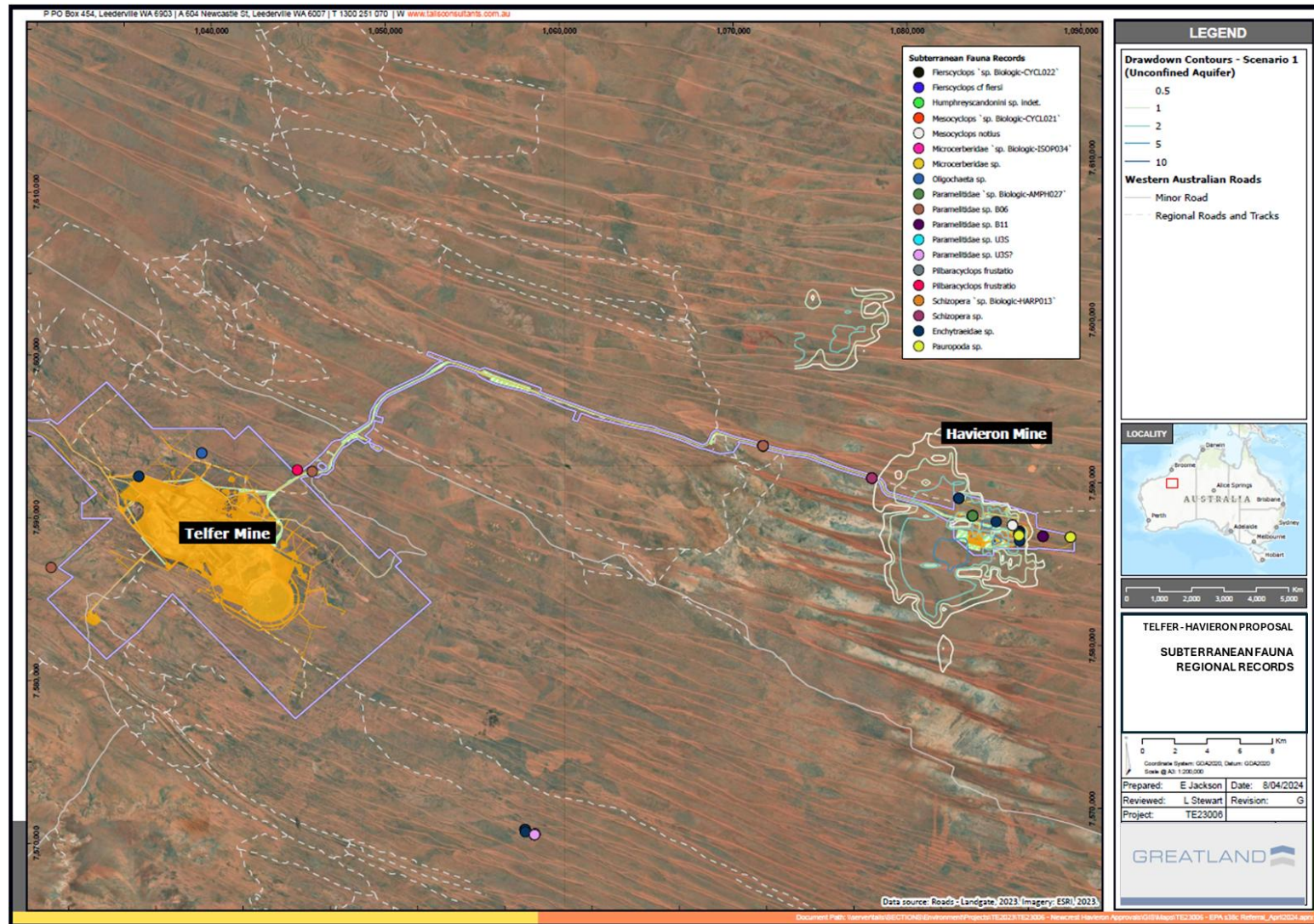


Figure 9-2: Subterranean fauna regional records

s.40AA Significant amendment Subterranean Fauna

To date, over 500 specimens belonging to eight stygal and nine amphibious taxa have been recorded across 13 sites in the Havieron study area as summarised in Table 9-4, with distributions shown in Figure 9-3 for stygofauna and Figure 9-4 for amphibious taxa. Note that 20 of the 33 sites sampled in total did not return any stygofauna specimens. Most specimens have been assigned to morphospecies while a small number of amphipod and oligochaete specimens could not be identified beyond higher order classifications. Additional regional specimens were recorded but are not discussed further if the species did not also occur within the Project area.

Sediment rehydration trials were undertaken to determine if *Humphreyscandonini* sp. Indet (Figure 9-5) was potentially sourced from an adjacent claypan within the Project area. The species was represented by two dead valves (shells) collected in a single sample in a historical water production bore located adjacent to a clay pan, therefore may have washed into the bore. Ostracoda was the primary group of interest for the rehydration trials and taxonomic identifications were only undertaken for this group. Four ostracod genera were recorded as well as two taxa that could not be identified to genus due to specimen condition or maturity of the specimens. While a relatively diverse ostracod assemblage was recorded in the rehydration trial, the target taxon *Humphreyscandonini* sp., was not recorded, nor were any species belonging to the same family (*Candonidae*). The valve (exterior shell) morphology of *Humphreyscandonini* sp. was distinctly different to the ostracod taxa recorded during the trial.

Paramelitidae sp. Biologic-AMPH027 was recorded on numerous occasions at a historical camp production bore (Figure 9-5) and also in the regional area (12 km to the east at HAE009). The *Microcerberidae* species was also recorded at the historical camp production bore. Other undescribed species of the taxa have been recorded in the regional area but not been identified elsewhere.

Two specimens of *Microcerberidae* `sp. Biologic-ISOP034` were recorded at site HAVWB03 (Figure 9-5). This taxon is a *stygobite* (true stygofauna) and a potential SRE. Generally, *Microcerberids* are adapted to subterranean and interstitial (inhabiting saturated aquatic sediments) habitats and might be able to disperse during flood events; however, very little work has been done on this group in Australia (Biologic 2021c).

Table 9-4: Subterranean fauna results for the Havieron Project Area

Taxon	Sites, specimens and survey events	Habitat/Distribution/Comments	Linear range (km)	Subterranean & SRE Status	Recorded in Area of Impact	Unique to area of impact
STYGOFAUNA						
<i>Amphipoda</i>						
<i>Amphipoda</i> sp.	HAE009 (11, b)	Habitat (alluvials and calcareous concrete). Considered likely to belong to either of the recorded Paramelitidae species	Single site	Stygobite, likely SRE	No	No
<i>Paramelitidae</i> `sp. Biologic-AMPH027`	HAE009 (4, a, b) HAVWB03 (14, a, b)	Habitat (alluvials and calcareous concrete)	12.7	Stygobite, likely SRE	Yes	No
<i>Paramelitidae</i> `sp. Biologic-AMPH031`	HAE009 (3, a, b)	Habitat (alluvials and calcareous concrete)	Single site	Stygobite, likely SRE	No	No
<i>Isopoda / Microcerberidae</i>						
<i>Microcerberidae</i> `sp. Biologic-ISOP034`	HAVWB03 (2, b)	Habitat (alluvials and calcareous concrete). Cryptic group with uncertain distribution trends Separated from other microcerberid species based on sequencing results, with a <i>Microcerberidae</i> sp. identified 31km to the south-west Species of <i>Microcerberidae</i> are stygobites and highly likely to be SREs, although little is known about the ecology of the Australian subterranean species.	Single site	Stygobite, potential SRE	Yes	Yes
<i>Cyclopoida / Cyclopidae</i>						
<i>Fierscyclops</i> `sp. Biologic-CYCL022`	HAE009 (208, a, b)	-	Single site	Stygobite/phile, potential SRE	No	No
<i>Mesocyclops</i> `sp. Biologic-CYCL021`	HAVWB02 (2, b)	<i>Mesocyclops notius</i> occurs in surface waters including lakes, dams and reservoirs (Ueda & Reid, 2003), pointing to the possibility that this morphologically	Single site	Stygobite/phile, potential SRE	Yes	Yes

Taxon	Sites, specimens and survey events	Habitat/Distribution/Comments	Linear range (km)	Subterranean & SRE Status	Recorded in Area of Impact	Unique to area of impact
		similar species may also be a reasonably widespread stygoxene, although there is no direct evidence to support this notion				
Harpacticoida / Ameiridae						
Parapseudoleptomesochra cf. tureei	HAE003 (2, b)	This genera contains SRE species, with diverse radiations at the species-level often observed within single ecological communities.	Single site	Stygobite, likely SRE	No	No
Harpacticoida / Miraciidae						
Schizopera `sp. Biologic-HARP013`	HAE003 (5, b)	Genera contains SRE species, with diverse radiations at the species-level often observed within single ecological communities.	Single site	Stygobite, likely SRE	No	No
Ostracoda / Candonidae						
Humphreyscandonini sp. indet.	HAVWB01 (2, a)	Habitat (alluvials and calcareous concrete) occurs patchily within the Quaternary cover that forms part of the extensive perched/unconfined aquifer. Represented by two valves (dead shells). Indeterminate tribe-level taxon identification, likely unique species. The family Candonidae is known to contain both Confirmed SREs and Widespread species and should be treated as a Potential SRE until further collections are made. Species not recorded on sediment rehydration trials and it is considered highly likely that the specimens collected belong to a stygobitic species.	Single site	Stygobite/phile, potential SRE	Yes	Yes
AMPHIBIOUS FAUNA						
Oligochaeta						
Oligochaeta sp.	BIO_014 (76, b)	Other Oligochaeta sp. records were identified in association with Telfer, however sequencing cannot confirm species.	Single site	Uncertain	Not applicable – amphibious species	
Enchytraeidae						

Taxon	Sites, specimens and survey events	Habitat/Distribution/Comments	Linear range (km)	Subterranean & SRE Status	Recorded in Area of Impact	Unique to area of impact
<i>Enchytraeidae</i> `sp. Biologic-OLIG023`	BIO_014, HAC9502, HAE001 (145, a, b)	Present throughout aquatic and subterranean habitats, catchment, or basin scale distribution Highly likely to have distributions of catchment-scale to basin-scale, or greater. They appear to tolerate extremes in temperature, salinity and depth and are generalists, principally living off plant residues (Didden, 1991; Ponge, 1991). There is mounting evidence that enchytraeids should not be considered SREs. Therefore, any 'new' species are very likely to be artefacts of a significant lack of knowledge, both in terms of taxonomy and collection records Classed as amphibious based on results of other subterranean surveys, grey literature and the results of the Stage 1 survey, as specimens from this family are frequently collected in samples from both above and below the water table	2.94	Amphibious, unlikely SRE	Not applicable – amphibious species	
<i>Enchytraeidae</i> `sp. Biologic-OLIG024`	HAD001 (18, a, b) HAE009 (1, b)		77.2			
<i>Enchytraeidae</i> `sp. Biologic-OLIG025`	HAD004 (6, a) HAE004 (1, a)		1.48			
<i>Enchytraeidae</i> `sp. Biologic-OLIG060`	HAE015 (1, b)		Single site			
<i>Enchytraeidae</i> `sp. Biologic-OLIG061`	HAE017 (1, b)		Single site			
<i>Enchytraeidae</i> `sp. Biologic-OLIG062`	HAE016 (1, b)		Single site			
<i>Enchytraeidae</i> `sp. Biologic-OLIG063`	HAE016 (2, b)		Single site			
<i>Enchytraeidae</i> `sp. Biologic-OLIG064`	HAE017 (1, b)		Single site			
<i>Enchytraeidae</i> `sp. Biologic-OLIG065`	HAE017 (1, b)		Single site			

^Survey events: a = Biologic 2020; b = Biologic 2021

Telfer – Havieron Gold Mining Project

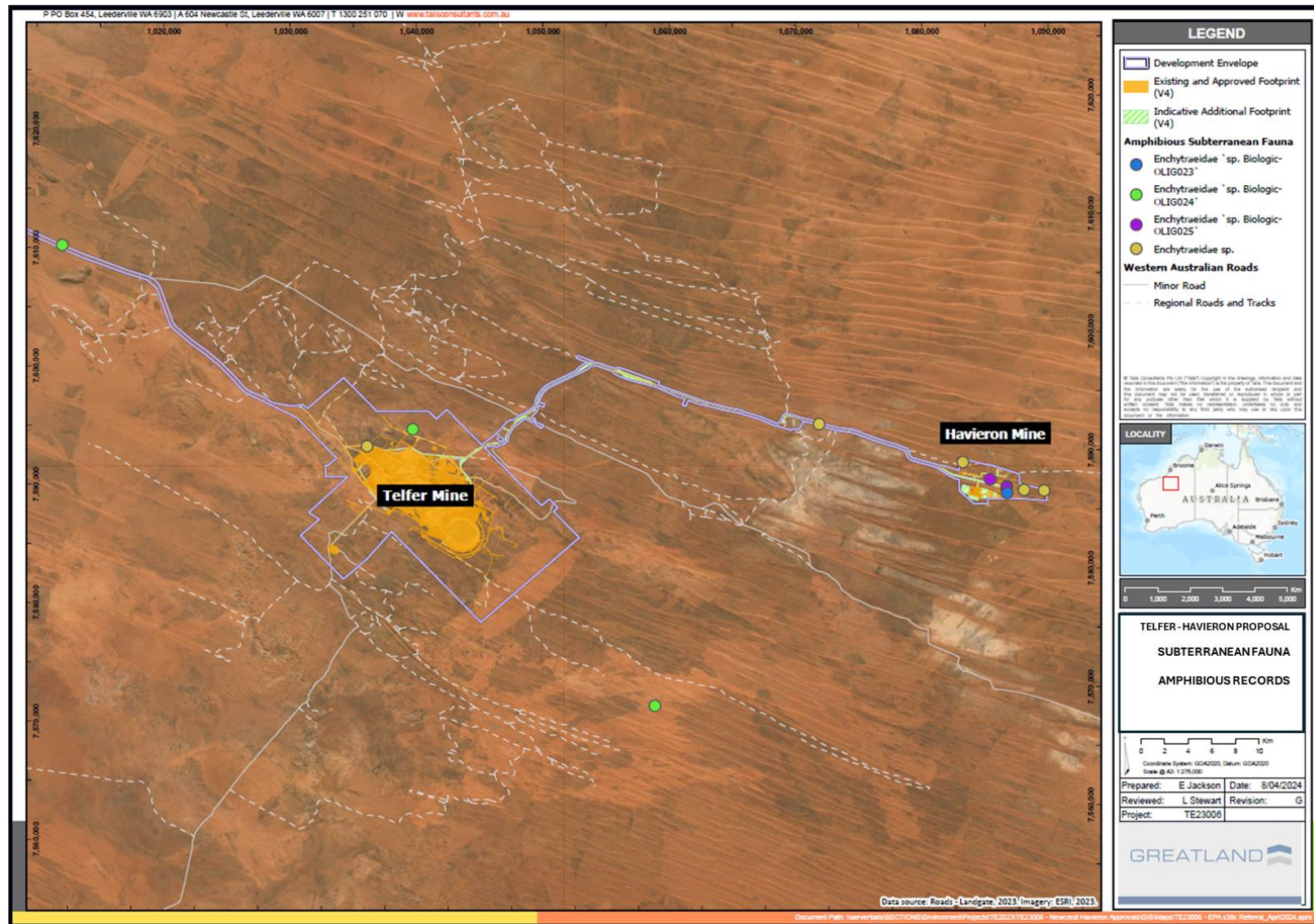


Figure 9-4: Subterranean fauna - Amphibious records

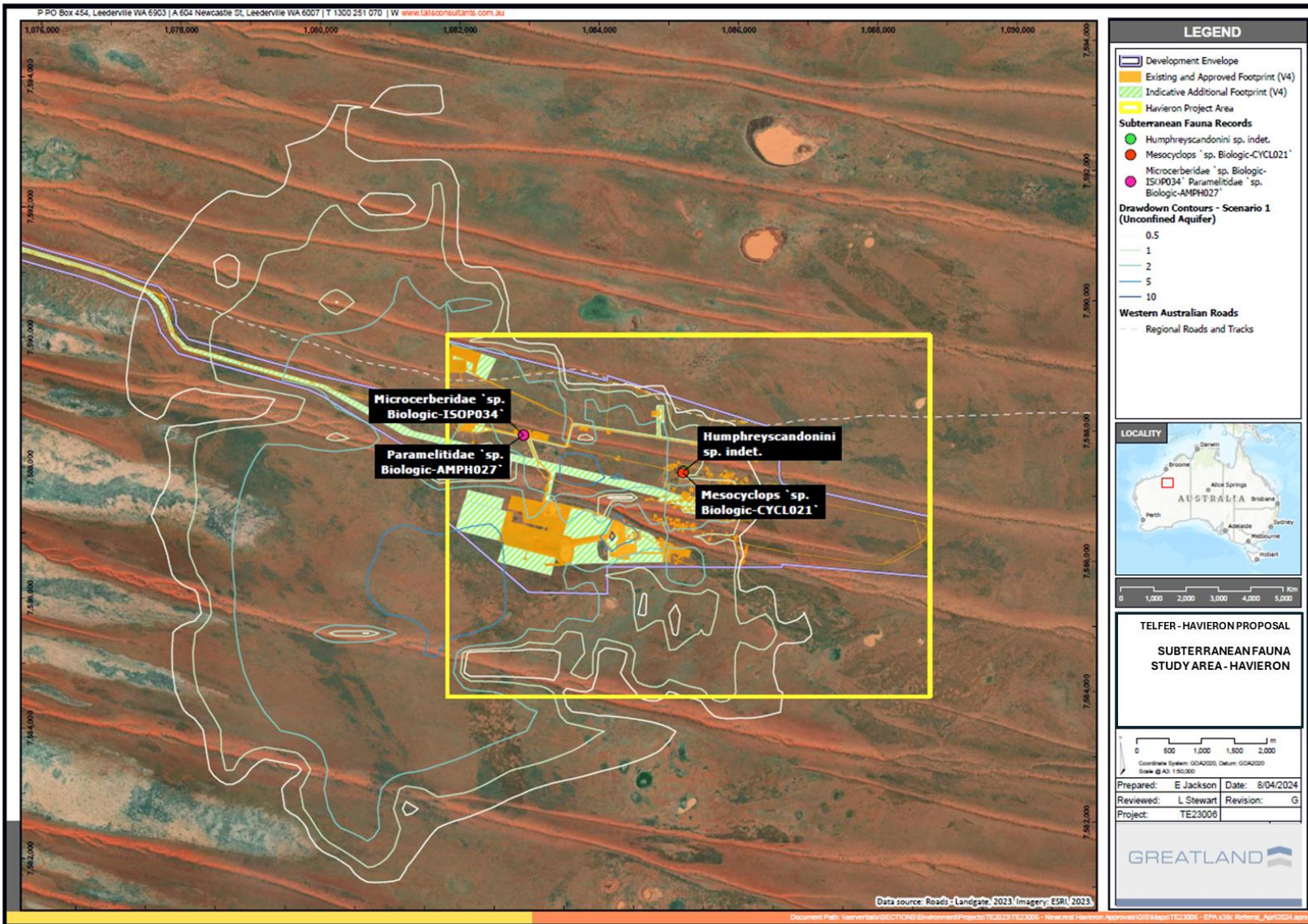


Figure 9-5: Stygofauna unique to the Significant Amendment area of impact

Given that so few of the bores sampled at Havieron returned specimens (20 of the 22 bores sampled returned no results), it is important to understand the hydrogeological conditions at those bores from where specimens were recorded, particularly those within the area of impact and where multiple species were found, namely HAVWB01, 02 and 03. All three bores were drilled under previous exploration programmes (2019) before being converted to supply or monitoring bores, and no geological logs are available, but some details have been identified or can be inferred from adjacent, newer drill holes:

- HAVWB01 and HAVWB02 are both located at the edge of a claypan/playa (Figure 9-5), which is known to flood after rainfall and hold water for an extended period (months). Hydrogeology is quite varied, with nearby bores (HAE013 and HAHY005) showing groundwater within calcrete, cemented sandstone and alluvials underlain by a thick layer of mudstone; however, the depth of the screens in these two bores cannot be confirmed but could be up to 90 m below ground level (bgl).
- HAVWB03 is screened in the unconfined aquifer and is approximately 350m away from another claypan (Figure 9-5), however, the Piper diagram in Rockwater (2020a) shows that the groundwater chemistry of the two HAVWB bores (HAVWB03 and HAVWB04; HAVWB01 and HAVWN02 weren't monitored for that report) aligns very closely with HAE013, which is right next to a claypan. The Piper diagram shows the groundwater at those sites to be slightly more elevated in Ca, Mg, CO₃ and SO₄ ions, which are characteristics commonly associated with gypsum and calcrete formations (Mann & Deutscher 1978).

Havieron is currently approved for groundwater abstraction under *RIWI Act 1914*, for mine dewatering and depressurisation of aquifers for safe mining (GWL202749), and production bores for water supply (GWL204105). Associated with this are 34 monitoring bores (22 within the unconfined aquifer, 13 in confined aquifers) and 15 vibrating piezometer arrays for monitoring and reporting under groundwater licences. Additional bores will be installed to monitor the impact of any further mine development and operation and expanded surface infrastructure. These will be installed in accordance with DWER standards to prevent cross-contamination of aquifers.

9.4 POTENTIAL ENVIRONMENTAL IMPACTS

No impacts or changes are expected which would impact Subterranean Fauna associated with the Telfer Project.

Potential impacts from the Havieron amendment proposal on subterranean fauna are considered to be the following:

- Ongoing groundwater drawdown for mine dewatering and production bores, decreasing prospective stygofauna habitat through desiccation
- Contamination of subterranean fauna habitats from hydrocarbons, chemicals, or saline water, including from leakage between aquifers caused by boreholes
- Indirect impacts from siltation from Waste Rock Landform, hydrology or nutrient balance changes.

These impacts are only applicable to activities associated with the Havieron Project, as the proposed changes to the Telfer Project are minor and not expected to result in any different or significantly additional impacts to subterranean fauna.

9.5 MITIGATION

A summary of key management measures that will be implemented for the Havieron amendment proposal is provided in Table 9-5.

Table 9-5: Subterranean Fauna - Mitigation measures

Impact	Hierarchy of Control	Management Measure
Groundwater drawdown	Minimise	Minimise dewatering to only the extent required for safe underground conditions and maximise re-use of mine dewater to minimise the need to abstract groundwater from other sources (most of the water requirements for Havieron will be met by piped supply from Telfer borefields).
	Avoid	No production wells will be developed or operated within 100 m of claypans, which may be habitat for SRE subterranean fauna such as <i>Humphreyscandonini</i> sp. indet. and <i>Mesocyclops</i> sp. Biologic-CYCL021`.
	Minimise	Continue to monitor groundwater levels and chemistry of the unconfined and upper confined aquifers as per the Water Management Plan, which includes trigger values and additional management responses and is approved by DEMIRS.
	Minimise	Expand the monitoring network to complement the existing network and, where required by specialist advice, identify suitable analogue sites beyond the predicted drawdown zone to confirm species/assemblages are not locally restricted and better understand the extent of the unconfined aquifer with the objective of ensuring at least 50% of pre-disturbance potential stygofauna habitat remains saturated at key locations.
Groundwater contamination	Minimise	Sediment and erosion controls around operational and construction areas, and stockpiles.
	Avoid	Compliant storage of hazardous materials, including hydrocarbons and chemicals.
	Minimise	Spill response training and equipment available.
	Avoid	Lined hypersaline evaporation cells and design inclusion of sufficient freeboard to account for direct rainfall, salt accumulation and wave action and prevent overtopping (refer existing operating licence L9455)
	Minimise	Dispersive waste rock materials contained within WRL cells, with surface flows contained.
	Minimise	Groundwater abstraction licence and associated Groundwater Licence Operating Strategy includes water quality monitoring requirements.
Groundwater aquifer cross-contamination	Minimise	Production and monitor bores constructed to industry standards, and depressurisation bores physically disconnected from the unconfined aquifer.
	Rehabilitate	All bores and drill holes decommissioned and rehabilitated at end of use in accordance with DWER standards.
	Minimise	Vent raises to be cement-lined.

Impact	Hierarchy of Control	Management Measure
	Rehabilitate	Decline will be sealed at identified aquitards upon closure.
	Minimise	Groundwater abstraction licence and associated Groundwater Licence Operating Strategy includes water quality and volume monitoring requirements. Annual groundwater monitoring report.
	Minimise	Monitoring of abstraction volumes and adjacent monitoring bores (flow meters installed).

9.6 ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

Areas of significant stygofauna conservation values in the vicinity of Telfer are located away from the mine at the Access Road in calcretes. Ongoing monitoring showed no impacts to subterranean fauna and an application was made to cease monitoring. The Office of the EPA advised on 7 April 2015 that compliance with Condition 6 had been clearly demonstrated, and the General Manager was satisfied that the objective of the plan “to increase scientific knowledge about subterranean fauna to assist in the conservation” had been achieved. Condition 6 was therefore considered complete and the requirement for ongoing subterranean fauna monitoring removed from the compliance reporting obligation under MS 606 (noting it technically remains in the MS).

Troglofauna

The absence of prospective troglofauna habitat at the Havieron Project will avoid any significant impact to the species. Whilst one troglofaunal species was identified, its location was 3 km to the west of the mining area.

Stygofauna – Groundwater Drawdown

Biologic (2022b) undertook a risk impact assessment based on stygofauna habitat mapping and groundwater drawdown (area of impact) for the modelled operational period of 13 years. The area of impact is based on the hydrogeological assessment on the unconfined aquifer completed by Rockwater (2021a) and is shown in Figure 11-4. The risk assessment excluded 13 of the stygofauna and amphibious fauna taxa as they either occurred outside of the predicted extent of the groundwater drawdown (4 taxa) or they were known to represent regionally widespread species (9 Enchytraeid taxa).

Four stygofauna species have been recorded within the Havieron Project:

- One species (*Paramelitidae* `sp. Biologic-AMPH027`) was recorded at two sites, including one reference site well outside of the area of impact (HAE009), and was locally abundant (14 specimens). The species family includes both relatively widespread species and SREs (Finston et al., 2011). Based on its known distribution at Havieron, it is reasonable to suggest that this amphipod may occur more widely than just the two locations where it has been found to date and is not considered to be at risk from the Significant Amendment.
- Two specimens of *Microcerberidae* `sp. Biologic-ISOP034` were recorded only from site HAVWB03, which is screened in the unconfined aquifer and will only experience negligible

drawdown (0.02 m, Rockwater 2021a³³). To confirm the prediction, the first measurement on record for HAVWB03 is from 30/05/2020 (prior to groundworks commencing for Stage 1) and records a water level of 6.8 m below surface. The monitoring record for 22/05/2022 (18 months after the commencement of construction of the decline) returns a water level of 5.3 m below ground surface. The 1.5 m increase in groundwater level over that period is attributable to significant rainfall received at the project in early 2022 (Advisian 2022). Accordingly, *Microcerberidae* `sp. Biologic-ISOP034` is not considered to be at risk from the Significant Amendment.

- Several specimens of two separate species, *Humphreyscandonini* sp. indet.³⁴ and *Mesocyclops* `sp. Biologic-CYCL021` were recorded from sites HAVWB01 and HAVWB02, respectively. The sites are very close to each other and can be considered together. The predicted long-term drawdown in the unconfined aquifer at HAVWB01 is estimated at approximately 1.0 m (Rockwater 2021a). Based on nearby bores such as HAE005 and HAE013 (Biologic 2022b), the aquifer (habitat) thickness in the area varies between 7.5 and 13 m thick, so a 1 m drawdown would represent an estimated 8 – 15% reduction in available potential habitat. While this level of loss would not expect to result in significant residual impacts (noting the progressive refinement of the hydrogeological model).

Through early works mine development the reliability of the hydrogeological model and drawdown predictions continues to increase. The model will be revised as required. Data and monitoring capabilities will be bolstered, with new locations added to the existing 34 monitoring bores (22 within the unconfined aquifer, 13 in confined aquifers) and 15 vibrating piezometer arrays for monitoring and reporting under groundwater licences GWL202749 and GWL204105.

Indirect Impacts from groundwater contamination

The potential for indirect impacts from habitat removal or contamination is not considered significant, given the scale of the Havieron amendment proposal in relation to extent of stygofauna habitat.

Groundwater contamination from surface spills or leaks is possible but able to be managed through standard best practice measures for containment and spill response for hazardous chemicals and hydrocarbons and fully contained evaporation ponds designed to account for direct rainfall, salt accumulation and wave action. It is considered that all conditions relating to the design, construction and operation of mine dewatering and hypersaline evaporation ponds can be managed by DWER through Part V approves under the EP Act, and subsequent licensing of infrastructure.

The potential cross-contamination of aquifers is highly unlikely given the disconnection between the upper unconfined aquifer hosting subterranean fauna and the underlying

³³ Biologic (2022b) states the drawdown at HAVWB03 is up to 2m, based on information from the superceded Rockwater (2020a) report, and bases its risk assessment conclusions on that significantly larger number.

³⁴ It is noted that *Humphreyscandonini* sp. Indet. identification is tentative, with the only records being two dead shells (Biologic, 2022).

confined aquifers. Any drill holes are physically disconnected from the unconfined aquifer and rehabilitated at end of use.

9.7 ENVIRONMENTAL OUTCOME

Whilst the Approved Proposal (Telfer) includes conditions associated with Subterranean Fauna, it is proposed these are removed due to conditions being completed (the compliance reporting obligation was removed in 2015). The subterranean fauna assemblage at Telfer is considered to be separate from Havieron due to differing hydrogeological settings and the absence of connectivity. It is proposed that a revised Subterranean Fauna condition is included for the Havieron Project impacts to stygofauna, as discussed below.

The absence of prospective troglofauna habitat at the Havieron Project will avoid any significant impact in this regard.

More than 500 specimens belonging to eight stygal taxa and nine amphibious taxa were recorded across 13 of the 33 bores in the Havieron study area. The remaining 20 sites monitored recorded no specimens. Of the 17 taxa, four occurred outside the predicted groundwater drawdown zone, and a further nine are known to be regionally widespread. These 13 taxa and will not be impacted by the Significant Amendment. Of four taxa within the predicted drawdown zone: two are at locations where groundwater drawdown will be insignificant; and two are in a zone predicted to have drawdown of a maximum of 1m. Whilst the latter is not considered significant, ongoing monitoring and model validation against actual drawdown is required to confirm this and is expected to be a Havieron-specific condition of approval.

Stygofauna occur within the superficial aquifer and within some of the shallower strata in the upper confined aquifer. To date, three potentially restricted stygofauna taxa have been recorded only from sites within the associated groundwater drawdown area of impact; however, the scale of drawdown associated with the impact area is expected to be 1 – 2m, equating to an estimated 15% reduction in habitat. One taxon was recorded outside of the area of impact (*Paramelitidae* 'sp. Biologic-AMPH027') and the remaining are considered to have sufficient suitable continuous habitat to all justify a low-risk rating. It is considered likely that their distribution extends beyond Project impacts as suitable continuous habitat is expected to remain outside of and below the proposed extent of groundwater drawdown.

It is considered that the management of the drawdown of aquifers can be adequately managed by DWER – Water under the RIWI Act. Consultation with DWER on stygofauna habitat mapping and drawdown impacts has already occurred as a result of the early works GWL (GWL202749 and GWL204105) and associated GLOS and Water Management Plan. The GLOS requires amendment and approval for the development of the Havieron amendment proposal. It is considered that the presence of continuity of habitat or lower drawdown impacts will require confirmation for approval of the GLOS.

There are no predicted impacts to the long-term viability or survival of stygofauna species from the Havieron amendment proposal. Therefore, the Proposal meets EPA's objectives "to protect subterranean fauna so that biological diversity and ecological integrity are maintained".

10. AIR QUALITY

10.1 EPA OBJECTIVE

The EPA environmental factor objective for Air Quality is “to maintain air quality and minimise emissions so that environmental values are protected”.

10.2 RELEVANT POLICIES AND GUIDELINES

Table 10-1: Air quality policy and guidelines

Environmental Factor	EPA and other State or Commonwealth policy or guidance	Consideration of policy and guidance
Environmental Factor Guideline — Air Quality (EPA 2020)	National Clear Air Agreement, Australian Government, 2015	Ensuring the Telfer-Significant Amendment does not prejudice the WA Government from meeting intergovernmental agreements
	National Environmental Protection (Ambient Air Quality) Measure (NEPM)	Comparison of emissions estimations to national goals
	Greenhouse Gas Emissions Policy for Major Projects (State GHG Policy) (Government of Western Australia 2020).	Considered in GHG assessment in Section 7

10.3 RECEIVING ENVIRONMENT

The Pilbara is an arid and remote region and, whilst there are limited sensitive receptors, the area is acknowledged as having dust levels higher than other areas of WA³⁵. The nearest ambient air monitoring station is Background 3 located at Newman as part of the Newman Air Quality Monitoring program²³. PM₁₀ (inhalable dust) concentrations are generally less than 0.02 mg/m³ as a 24-hour average, with peak loads up to less than 0.05 g/m³ most likely associated with wind or vehicles movements from a nearby roadway. The air quality NEPM 24-hour target is 0.15 mg/m³.

Air quality was not considered to be a key factor in the assessments of the power station/corridor (EPA 2002a) or the mine expansion (EPA 2002b). Descriptions of the baseline environment highlight the remoteness of the proposed activities, lack of sensitive receptors and the high variability of ambient dust levels in the area, with peaks associated with wildfires and dust storms (Newcrest 2002b).

Due to the remote and greenfield location at Havieron there is no data on the background air quality for the expanded project area and surrounds. However, but it is likely to be extremely good, impacted only temporarily through ambient emissions from fires (particulates and phototoxic substances associated with bushfire smoke) and strong winds, and vehicle

³⁵ [Newman Air Quality | Western Australian Government](#) DWER, 2024.

movements that can generate elevated levels of dust. Winds are mostly from the south-east and may generate dust when they exceed 30 km/h (refer wind rose in Figure 1-8). Localised dust events associated with vehicle movements on unsealed roads will also occur.

Pending approvals, Havieron ore is scheduled to be extracted from late 2027 onwards. Havieron ore contains actinolite and, to a lesser degree, tremolite and anthophyllite. These minerals have the potential to present in fibrous form and are therefore classified as Potentially Fibrous Material (PFM). A total of 22 samples analysed (Glossop 2020; 2021). Respirable fibres were identified but were at levels below 0.1% concentration (by weight) and therefore too low to be considered a carcinogen (Glossop 2021) therefore not classified as a Dangerous Good or Hazardous Substance. Potentially Fibrous Materials are therefore being considered as a workplace health consideration only, and not of public concern. The Glossop studies were conducted as part of workplace exposure health risk assessment and to assist with final design of mine and surface infrastructure to minimise workplace exposures.

10.4 POTENTIAL ENVIRONMENTAL IMPACTS

Potential impacts from the Significant Amendment on air quality are as follows:

- Fugitive dust emissions from land clearing, waste rock landforms, vehicle movements, ore transport and paste fill tailings transport and storage
- PFM emissions from ore and tailings exposure including during transport, stockpiling, and processing.

10.5 MITIGATION

The following mitigation measures will be applied to minimise emissions:

- Road trains transporting ore and tailings for paste fill will be covered
- Water carts will be used during earthworks and on access and haul roads, laydown areas and other open areas
- Topsoil stockpiles will be stabilised to prevent dusting
- Dust suppression will be used on tailings stockpiles if excessive dust lift-off occurs
- Other dust suppression measures will be undertaken as required, and may include use of polymers for surface stabilisation
- Minimisation of dust emission from active TSFs through tailings deposition strategy
- Ore crusher dust suppression and collectors
- No burning will be undertaken except in conjunction with the Martu People for land management purposes, emergency response training and fuel reduction to protect key infrastructure (other relevant permits will also be obtained).

Given the long lead time before PFM will be encountered, further work is being conducted into: the potential for this material to be present as 'asbestiform'; identify any potential for release of fibres through the entire logistics chain from mine to port; and to ensure sufficient controls in accordance with the *WHS (Mines) Regulations 2022* to protect worker health.

Update of the Fibrous Material Management Plan, as required by DEMIRS under the *Work Health and Safety (Mines) Regulations 2022*.

10.6 ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

The key emissions to air from the Havieron amendment proposal will be fugitive dust from mine areas and vehicle movement. However, there are no sensitive receptors close enough to the mine operations to be affected.

There is some potential for dust generation along the infrastructure corridor. This will comprise wheel-generated dust (in particular, the area where the infrastructure corridor crosses a public road, the Punmu Road), and dust from the transport of ore (to Telfer) and tailings (from Telfer).

Significant levels of dust from transported materials are not anticipated due to the rocky nature of the material. The moisture levels of Telfer tailings used for paste backfill should prevent significant dusting during transport of the material to Havieron, however covered containers will be utilised. Stockpiled tailings at Havieron may have some potential for dusting but tailings will only be brought to Havieron as required – there will be no long-term stockpiles.

Whilst PFM identified was below classification of Dangerous Goods and Hazardous Substances, it is noted that it represents an occupational health risk should the material be present in ‘asbestiform’³⁶ at various stages of the process. Current PFM risk assessment and validation will inform final design and controls to prevent workplace exposures and uncontrolled release of fibres at all stages from mine to port. PFM is considered to be sufficiently managed by DEMIRS regulatory processes and clear obligations under the *WHS (Mines) Regulations 2022*, Parts 8.4, 8.5 and 8.9 given the absence of sensitive receptors.

10.7 ENVIRONMENTAL OUTCOME

The Havieron amendment proposal will not result in a significant impact on air quality values due to the absence of sensitive receptors, licensable point source emissions (stacks), and the implementation of best practice dust mitigation management measures, and controls articulated in a conforming PFM management plan in accordance with *WHS (Mines) Regulations 2022*. Therefore, the Significant Amendment meets EPA’s objectives “*to maintain air quality and minimise emissions so that environmental values are protected.*”

³⁶ Not all PFM is asbestiform. ‘Asbestiform’ is determined by morphology and properties of fibres, including: longer than 5 µm, width less than 3 µm and with an aspect ratio (length to width) of not less than 3:1; flexible; bio-insoluble.

11. INLAND WATERS – KEY FACTOR

11.1 EPA OBJECTIVE

To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.

11.2 RELEVANT POLICIES AND GUIDELINES

Table 11-1: Inland waters protection policy and guidelines

Environmental Factor	EPA and other State or Commonwealth policy or guidance	Consideration of policy and guidance
Environmental Factor Guideline — Inland Waters (EPA 2018).	DCCEEW Directory of Important Wetlands	Considered in searches, with the presence of the nearest listed important wetland (Lake Dora Rudell River system WA041)
	DCCEEW Australian National Guidelines for Ramsar Wetlands	Considered in searches but not relevant to the proposal

11.3 RECEIVING ENVIRONMENT

11.3.1 STUDY EFFORT

The results from several proposal-specific hydrogeological and surface hydrology studies have been used to support the assessment of potential impacts of the Significant Amendment on inland waters. The supporting studies are summarised in Table 12-2. Surface water assessment reports are included in Appendix X. The hydrogeological assessments are provided in Appendix Y.

Table 11-2: Surface and Groundwater Assessment Reports

Report author	Report description
Rockwater (2020a)	Surface water assessment for Stage 1 area
Rockwater (2020b, 2020c)	H3 Hydrogeological Assessment for Stage 1 dewatering and production bores
Rockwater (2021a)	Flood modelling for Infrastructure Corridor
Rockwater (2021b)	Interim hydrogeological results for SLOS mining method
Rockwater (2021c)	H3-Level Hydrogeological Assessment of the Havieron Project

It should be noted that, whilst not policy, best practice assessment of flood assessment utilises the Regional Flood Frequency Estimation (RFFE) Model. Given that the project location is in an arid region further than 300km from the nearest gauged catchment location used to develop the RFFE Model, it was necessary to utilise the Australian Runoff and Rainwater (ARR) 1987

methods to validate model results and comparative peak flow estimates. This is reflected in technical assessment reports.

11.3.2 APPROVED PROPOSAL (TELFER)

The Port Hedland-Telfer corridor crossed a number of significant rivers/creeks, including De Grey River, Tappa Tappa Creek, Strelley River, Petermarer Creek, 9-Mile Creek, etc. Specific impacts to groundwater systems were not considered during the assessment (Newcrest 2002a, EPA 2002a).

For the mine expansion, key surface water resources were identified as Lake Waukarlycarly and Lake Dora, both of which were ephemeral and remote from the Telfer operations. Most of the focus was on the potential for mineral waste to pose a threat to surface waters (mine impoundments) by acid and metalliferous drainage (AMD). Groundwater systems were described in the context of water sources associated with the borefields where groundwater of continues to be abstracted under licence. Salinity levels were between <500mg/L and 3,500mg/L TDS. Studies determined that since 1975, mining operations had lowered the water table to the depth of mining but this drawdown appeared largely constrained to the wider area of operations. Abstraction from the borefields had also lowered groundwater levels to a much lesser extent, and noted that levels recovered rapidly when abstraction from the borefields was reduced for operational reasons (i.e. demand met from dewatering) between 1994-2000 (Newcrest 2002b).

Dewatering was considered by the EPA to be a key factor because of the presence of stygofauna in some of the borefield aquifers and the paucity of knowledge of such fauna and their response to groundwater drawdown (EPA 2002b). Impacts to stygofauna have not materialised and in 2015 the MS 606 reporting obligation condition was removed by the EPA (refer 9.6).

Groundwater monitoring results from the Telfer Operations 2018-2019 borefield monitoring review indicated groundwater quality in the Telfer area as neutral to slightly alkaline at pH 6.8-8.14 and slightly saline at 420-2,780 mg/L TDS, with minor enrichment in a number of elements including arsenic, iron, copper, and zinc, (Newcrest, 2019).

No changes to surface water or groundwater impacts associated with the Approved Proposal are expected. Telfer's surface and hydrogeological environment is considered to be separate from Havieron.

11.3.3 HAVIERON AMENDMENT PROPOSAL

11.3.3.1 SURFACE WATER

The Havieron Project is classified as being part of the Sandy Desert River Basin within the Western Plateau drainage division. The Sandy Desert River Basin is an internally draining basin with a catchment area of approximately 43,752,400 ha.

To the north, Lake Waukarlycarly is also part of the Percival Lakes drainage system with Havieron. However, there is a drainage divide in the system as shown in Figure 11-1. At Havieron, the surface drainage flows west towards the Percival lake system and then south toward Lake Dora. North of the drainage divide, surface water flows toward Lake

Waukarlycarly. Therefore, any changes to surface water flows in the Havieron catchment will not affect Lake Waukarlycarly.

There are no major streamlines or rivers located within a 10 km radius of the Project Area (WA Department of Water and Environmental Regulation [DWER] Hydrography Linear spatial dataset; Landgate dataset LGATE-053). However, there are seasonal salt lakes of ecological and cultural importance. The most significant of these is the Lake Dora (Rudall River) system – WA041, which is the nearest DCCEEW listed Important Wetland (WA041). The system is located within the Rudell River National Park that provides for a wholly protected catchment³⁷. Lake Dora is located 35 km southeast of the Significant Amendment area and receives periodic freshwater inflows, from the southwest via the Rudall River and from the southeast via a chain of lakes. These short, ephemeral creeks and rivers only flow after heavy rainfall.

Ephemeral clay pans and playa lakes are widespread within the region, being fed by run-off from adjacent dunes and minor creeks. There are no defined drainage lines within the Project area. Runoff is derived from linear, westerly-trending sand dunes that discharge after heavy rainfall as sheet flow and accumulates into widespread clay pans and playa lakes where it temporarily ponds where it infiltrates and evaporates.

The Havieron Project is at an elevation of about 250 m Australian Height Datum (AHD), and the topography grades to the west towards the Percival Paleovalley (discussed in 3.4.2). The Percival Paleovalley sits approximately 5 km from the Havieron Project and is a large valley running NW-SE at an elevation of about 242 m AHD between Havieron and Telfer.

At the Havieron Project local level, a number of small claypans occur within the proposed mine area (Figure 11-2). These are dependent on small scale runoff during rainfall events and are not believed to be directly connected to groundwater although some accumulated water may infiltrate the unsaturated zone beneath the claypans and move towards the water table. The claypans have cultural significance to the Martu People and so have been excluded from the proposed disturbance footprint.

As part of their work referred to above, Rockwater undertook a hydrological assessment for the Havieron Project and service corridor routes. This hydrological assessment covered the management of surface water flows in the planned area of operations and includes an assessment of pre-mining hydrological conditions, potential impacts of mining on the surface water environment; and any mitigation measures required to protect the proposed mine infrastructure. It also includes a numerical groundwater model for the dewatering required for the construction of the boxcut and decline through the Permian cover as part of Havieron early works (Rockwater, 2021).

³⁷ DCCEEW Directory of Important Wetlands, accessed 30/04/2024.

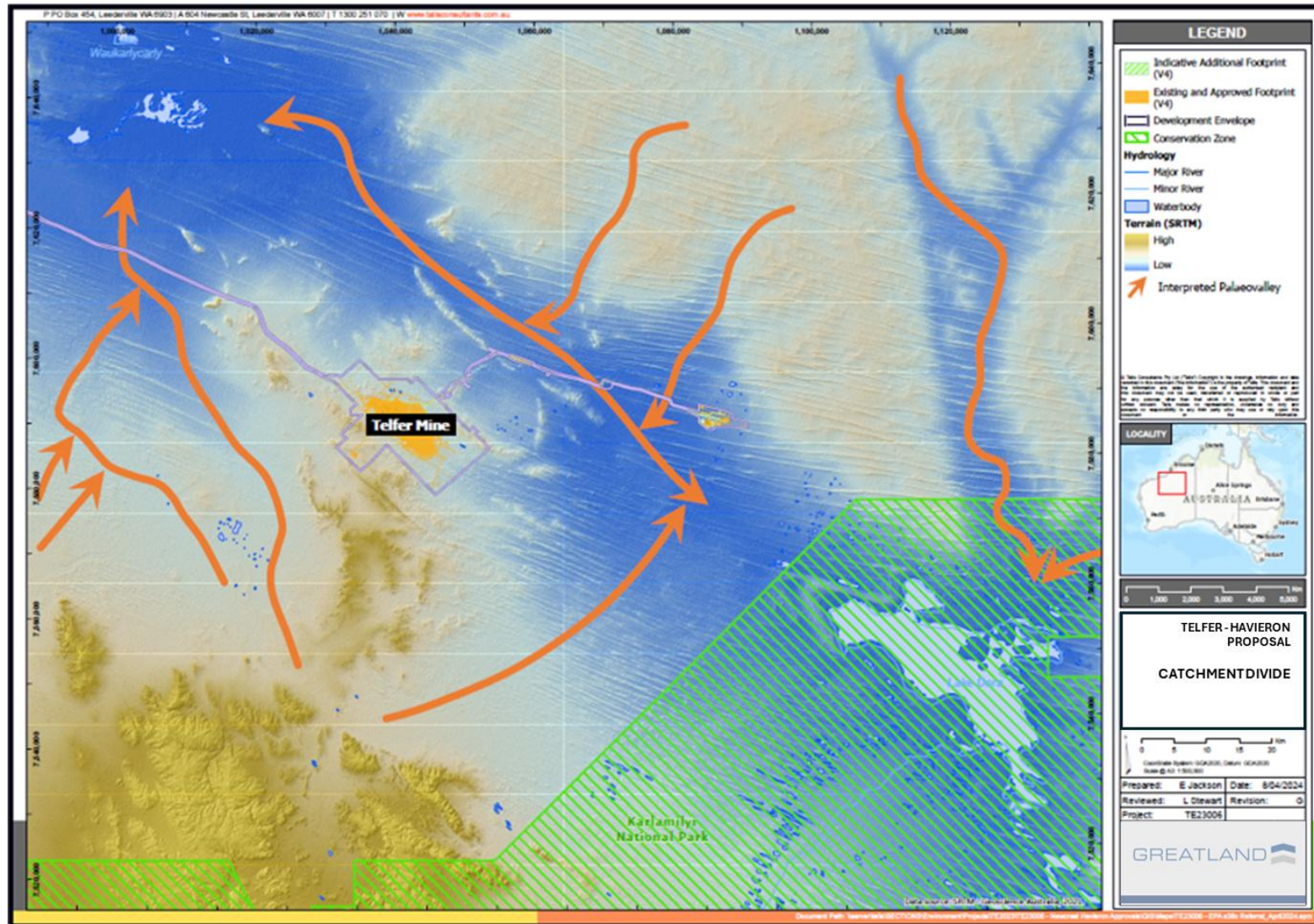


Figure 11-1: Catchment divide east of Telfer

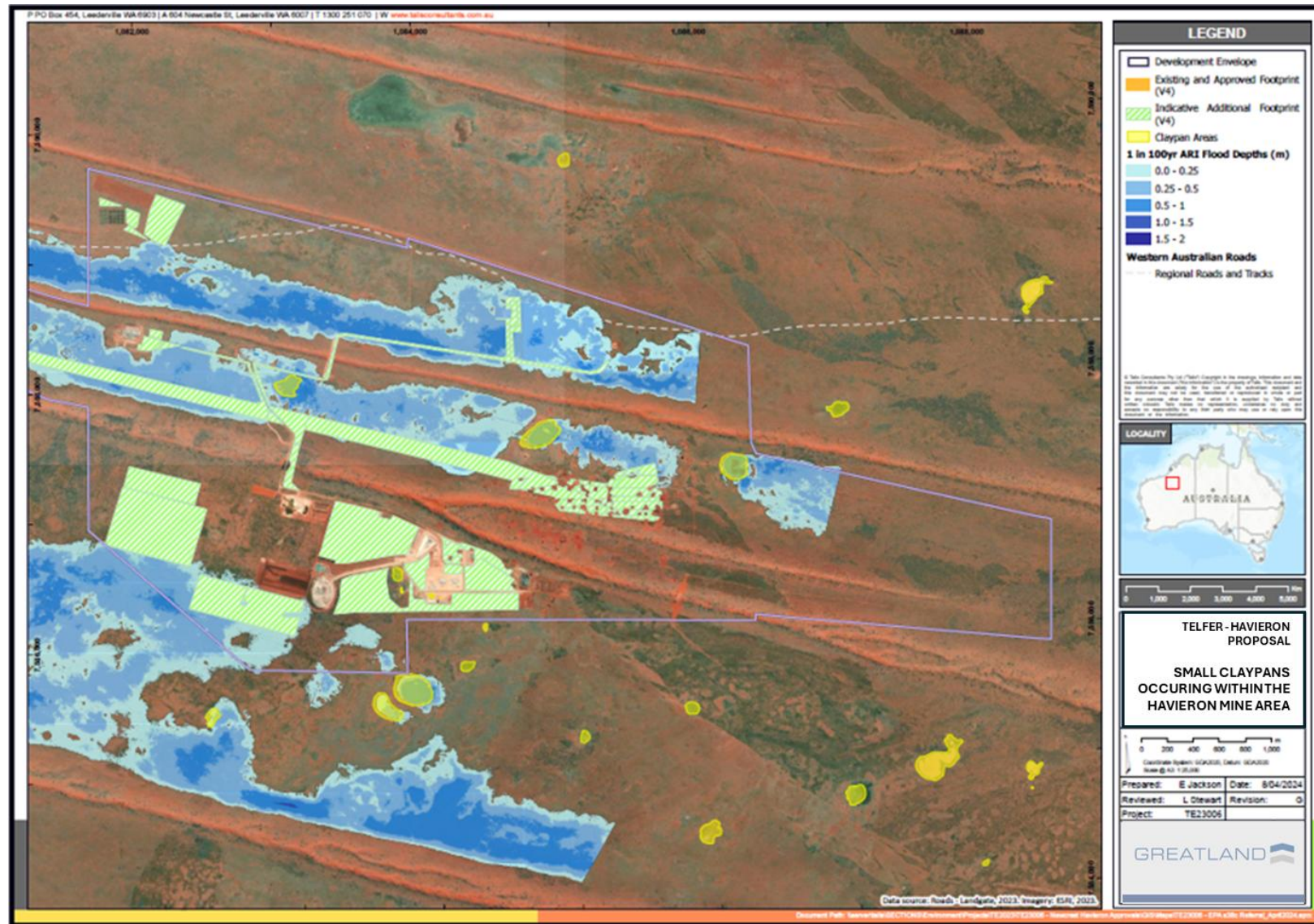


Figure 11-2: Claypans occurring within the Havieron Mine area

As part of flood modelling, the Proposed Layout was amended to ensure key infrastructure is located outside of the 1 in 100 ARI flood event. The key outcomes included:

- Proposed mine infrastructure all fall outside the predicted 1 in 100 ARI flood extent between the interdunal corridors. Therefore, no flood mitigation measures are required
- Land disturbance may adversely affect the quality of runoff; therefore sediment management measures will be undertaken.

Groundwater – Regional Hydrogeology

Havieron is located in the Paterson province, to the east of the Archaean Pilbara Craton. Multiple deformed and metamorphosed Palaeo- to Mesoproterozoic sedimentary and igneous rocks of the Rudall Complex form basement in the area (Hickman and Bagas, 1998; Bagas, 2004) and are overlain by sedimentary rocks of the Neoproterozoic Yeneena and northwest Officer basins. These are in turn overlain by Phanerozoic sedimentary rocks of the Canning Basin. At Havieron, the Canning Basin includes the early Permian Paterson Formation. The Paterson Formation is laterally equivalent to the Grant Group, plus the Poole Sandstone, and the mid-Permian Triwhite Sandstone (Liveringa Group) which are well exposed elsewhere in parts of the Canning Basin (for example along the shores of Lake Dora to the SE of Havieron).

Non-glaciogenic paleovalleys such as the Percival Paleovalley (Figure 11-3) are of presumed Cenozoic age. In places, these river valleys have been incised down to the Permian sediments. Away from the paleovalley, the surface geology is dominated by Quaternary-aged aeolian sand dunes, characteristic of the Great Sandy Desert. About 30 km west of Havieron, remnants of the Permian-Carboniferous fluvio-glaciation landforms outcrop. However, regionally the topographical lows of interdunal swales where the superficial deposits have completely eroded, the Permian-aged Paterson Formation is exposed.

11.3.3.2 HAVIERON HYDROGEOLOGICAL SETTING

A conceptual hydrogeological model has been developed (Rockwater 2020b) as shown in Figure 11-4. The depth to the water table is generally greater than 10m at the Havieron mine site, becoming shallow to the west (up to 5m below ground level).

Hydrogeological works by Rockwater and subsequent refinement of the hydrogeological model have identified four key aquifer units at the Havieron Project, underlain by a disconnected Proterozoic aquifer that is not affected by the proposal. These aquifers have a regional extent and are thought to occur outside of the extent of the tenement. The aquifers key characteristics are summarised in Table 11-3 and further described below that.

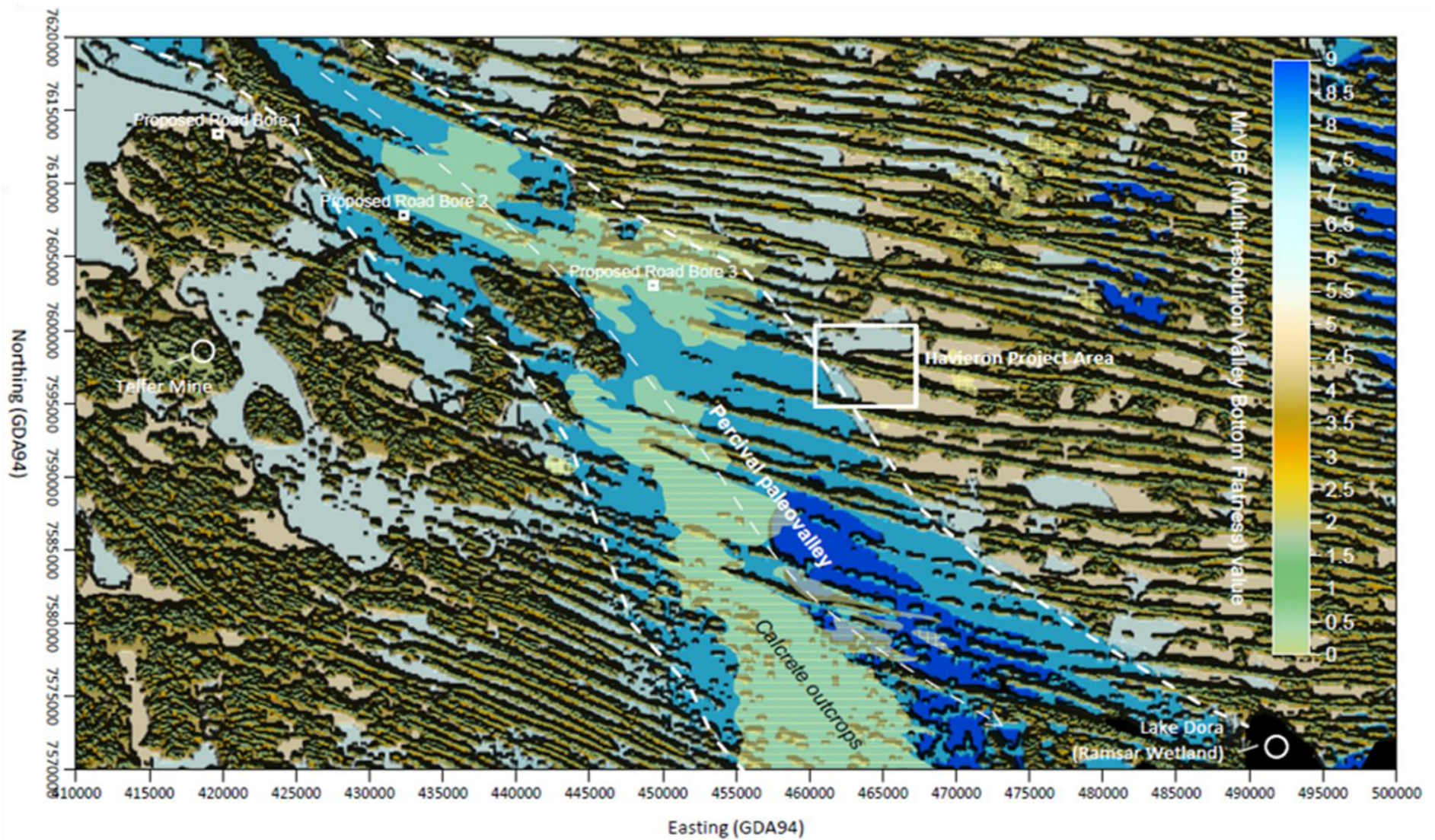


Figure 11-3: Havieron regional hydrogeological setting (Rockwater, 2021c)

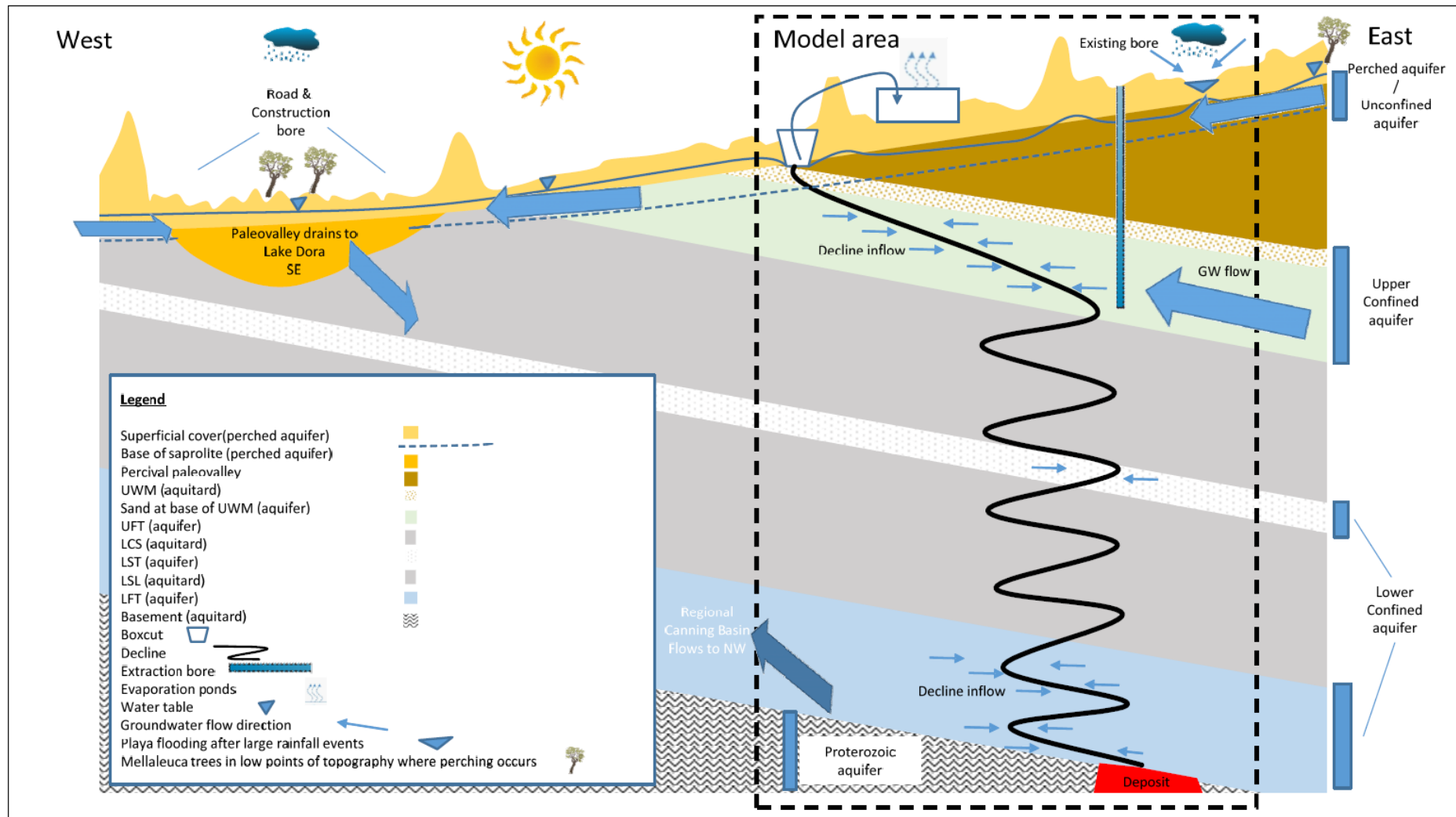


Figure 11-4: Haviron Conceptual Hydrogeological Model (Rockwater, 2020b)

Table 11-3: Aquifer Characteristics – Havieron

Aquifer	Depth	Primary Porosity / Fractured	Hydraulic Transmissivity (m ² /day)	Salinity (mg/L TDS)	Water elevation (mRL)
Unconfined /perched	Within the uppermost 15m and absent elsewhere	Primary Porosity	0.37	15,000-40,000* Highly saline- Hypersaline	240-250
Upper Confined	Top of aquifer from 15m in the west to up to 110m in the east	Both	2.0	2,000-20,000** Brackish-Highly saline	240-247
Middle Brown-stone	Typically 240m to 280m	Both	0.13	19,000 Brackish-Highly saline	230 -0280
Lower Confined	Typically about 150m deeper than the Upper Confined Aquifer	Both	0.9	55,000 Hypersaline	221-235
Proterozoic Aquifer	Underlying the Lower Confined Aquifer	Fractured	Not determined, not relevant to the proposal		

* As measured near Playa lakes, hundreds of metres away from the Playas, salinity likely to be around 2,000 – 5,000 mg/L

** Increasing with depth

Unconfined/perched aquifer

Comprised of:

- Superficial sediments (though they are generally unsaturated at Havieron given their thickness of 5-15 m and the average water table depth of 14 m)
- The underlying upper saprolite, lower saprolite and sap-rock subunits of the Upper Williams Mudstone (UWM) (typically about 12 m thickness) have the potential to host a perched aquifer, particularly where these weathered sub-units are underlain by a thick succession of very low permeability claystone and mudstone of the upper UWM group.

It is suggested the UWM group underlying the unconfined/perched aquifer is probably not allowing any leakage from the unconfined/perched aquifer into the underlying Upper Confined Aquifer. However, where the UWM has been eroded out the aquifer is well connected to the underlying Upper Confined Aquifer and is considered to be one single aquifer since a perched water table was not observed.

Recharge is considered to be negligible, except following significant rainfall events near playa, over the dune, or where the UWM is absent and the aquifer is underlain by the Lower Tillite. Discharge may occur via evaporation in shallow water table locations or into calcrete aquifers to the west of the Proposal or downward leakage where the UWM is absent.

Groundwater chemistry is highly saline to hypersaline, slightly alkaline with a sodium-chloride type with elevated sulphate concentrations. The dissolved iron concentration is approximately 0.45 mg/L.

Upper Confined Aquifer

This unit comprises the basal upper silt/sandstone beds of the UWM and entire UFT. It is confined by the UWM except where UWM is absent (to the north-west of the Proposal) or UWM remnants are 20 m thick in the south-west. The aquifer is likely recharged away from the Proposal where the unit outcrops. Discharge may be into the Percival Paleochannel.

Groundwater chemistry is brackish to highly saline, slightly alkaline with a sodium-chloride type with elevated sulphate concentrations. The dissolved iron concentration is approximately 0.64 mg/L. This aquifer has been encountered and successfully developed through as part of Havieron early works.

Middle brownstone aquifer

This aquifer is within the Lower Siltstone Formation that hosts laminated siltstone and minor sandstone. The unit hosts the Middle Brown Sandstone a medium grained sandstone with fine interbedded silts. The Middle Brown Sandstone is approximately 30m thick where intersected in drilling. However, the unit is not consistently mapped across the region. Limited hydraulic testing has been completed on the Middle Brown Sandstone, with only packer testing completed.

One sample from the middle confined aquifer indicates neutral water, 7.13 pH, and considered high saline water (19,000 mg/L). This aquifer has been encountered and successfully developed through as part of Havieron early works.

Lower confined aquifer

This aquifer comprises two units – the LST and entire LFT. It is confined by the low permeability siltstones of the LCS and is underlain by basement Permian rocks. Aquifer recharge is likely small and away from the Mine. Discharge is likely to be into other onshore Canning Basin aquifers away from the study area.

Groundwater chemistry is hypersaline, slightly circumneutral with a sodium-chloride type with elevated sulphate concentrations. Dissolved iron concentration is approximately 4.8 mg/L.

11.3.3.3 GROUNDWATER DEPENDENT ECOSYSTEMS

Vegetation unit 6i occurs in an interdunal swale. The substrate in this area is aeolian sand, alluvium, and evaporites. It is unlikely that the *Eucalyptus victrix* occurring in this area are groundwater dependent to any significant degree. The groundwater level sits at 5-15 m below the surface and is saline (15,000-40,000 mg/L Total Dissolved Solids). Observations made during the assessment suggest that the patch of vegetation occurs within an area of localised surface water accumulation via run-off.

This small area has been excluded from the proposed footprint.

11.3.4 BENEFICIAL USERS

Beneficial use provides social and/or economic value and is therefore an important consideration in balance with environmental impact and sociocultural value.

The Punmu community is on the eastern shore of Lake Punmu (10,000 kL water entitlement), approximately 60 km to the southeast of Havieron. The water supply at Punmu is from the Triwhite Sandstone which is laterally equivalent to the Paterson Formation at Havieron but significantly more permeable. No impact to the Punmu water resources is expected.

The clay pans in the area are of cultural significance to the Martu People as they were historically used as a source of freshwater during and after rainfall events. They use water from across the landscape and not just from sources linked to the stationary communities. Claypans are avoided and monitored, and design has taken into account flood patterns and no impact to this value is expected.

No other significant beneficial groundwater users exist for either the approved Telfer proposal or the Havieron amendment proposal.

11.4 POTENTIAL ENVIRONMENTAL IMPACTS

For the assessment of potential impacts to Inland Waters posed by the Significant Amendment, the associated activities relate to the continuation of groundwater abstraction, including for dewatering, and of mining activities at both project locations. A slight increase to the total groundwater abstraction limit is proposed (500ML/year to a combined total of 31,900ML/year).

Potential impacts from the Proposal on inland waters are considered to be:

- Groundwater drawdown from mine dewatering and/or from production bore abstraction
- Alteration of natural surface water flow
- Potential for surface water contamination from sedimentation, hydrocarbons, chemicals, sewage, saline water or WRL leachate
- Potential for ground water contamination from hydrocarbons, chemicals, sewage, saline water or waste rock leachate
- Cross contamination of groundwater aquifers due to underground mine, bores and drilling.

11.5 MITIGATION

A summary of key mitigations is provided in Table 11-4.

Table 11-4: Inland Waters - Mitigation Measures

Impact	Hierarchy of Control	Management Measure
Surface and ground water contamination	Minimise	Sediment and erosion controls around operational and construction areas, and stockpiles.
	Avoid	Compliant storage of hazardous materials, including hydrocarbons and chemicals.
	Minimise	Spill response training and equipment available.

Impact	Hierarchy of Control	Management Measure
	Avoid	Lined hypersaline evaporation cells and design inclusion of sufficient freeboard to account for direct rainfall, salt accumulation and wave action and prevent overtopping (refer existing operating licence L9455).
	Minimise	Dewatering lines to be hydro-tested and located in accordance with DWER works approval and laid in a manner than prevents impact (e.g. cover or culvert).
	Minimise	Dispersive waste rock materials contained within WRL cells, with surface flows contained.
	Minimise	Groundwater abstraction licence and associated Groundwater Licence Operating Strategy includes water quality monitoring requirements.
	Minimise	Sediment and erosion controls around operational and construction areas, and stockpiles.
	Minimise	Use of saline water in dust suppression to comply with operating licence conditions L9455.
	Minimise	Minimise clearing in sandy areas and areas with >40% vegetation cover
Surface water altered flow	Minimise	Surface water controls (i.e., culverts, floodways, etc.) included along infrastructure corridor
	Avoid	Key infrastructure within the mining area (evaporation ponds, waste rock landforms and box cut) have been located outside of the one in 100-year flooding extent
	Avoid	Avoidance of new disturbance to claypans and maintain micro catchments to the extent possible
	Minimise	Develop and implement a monitoring program for the clay pans in partnership with the Martu
Groundwater drawdown	Minimise	Groundwater abstraction licence and associated GLOS includes monitoring requirements and trigger values
	Minimise	Flow monitoring of abstraction volumes and adjacent monitoring bores
	Minimise	Annual groundwater monitoring report
Groundwater aquifer cross contamination	Minimise	Production and monitor bores constructed to DWER – Water standards
	Minimise	Decline will be sealed at identified aquitards upon closure
	Minimise	Groundwater abstraction licence and associated Inland Waters Management Plan includes monitoring requirements
	Minimise	Monitoring of abstraction volumes and adjacent monitoring bores (flow meters installed)
	Minimise	Annual groundwater monitoring report
	Minimise	Water bores to be constructed as per CAW requirements

11.6 ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

No changes to the Approved Proposal surface and groundwater impacts are expected. Telfer's surface and hydrogeological environment is considered to be separate from Havieron. Whilst Telfer will supply groundwater to Havieron, it will not exceed current Approval Proposal limits. In the event that Staggers Borefield is used, the abstraction of this groundwater is considered a beneficial impact due to the removal of groundwater mounding from the TSF. Associated impacts to subterranean fauna have not occurred and MS606 condition for ongoing monitoring of stygofauna was considered completed and removed by the EPA in 2015 due to the absence of impacts (refer 9.6).

Groundwater Drawdown

The results of the hydrogeological assessment indicate that the dewatering of the proposed underground decline will result in drawdown of the Upper Confined Aquifer during construction and operations. The predicted zone of impact at 2034 (as defined by the 2 m drawdown contour after 12 years of mining) is predicted to have dimensions of 10.3 km x 8.0 km in the Upper Confined Aquifer. For the Lower Confined Aquifer, the zone of impact larger and is predicted to range from 16.1 km x 17 km. However, it is unlikely to have any detrimental impact on regional aquifers within the Paterson Formation. The area of drawdown is shown in Figure 11-5.

No other beneficial water users have been identified within proximity to the Significant Amendment. The closest water user is the Punmu Community water supply, which is located approximately 60 km southeast of Havieron. Groundwater flow is to the west towards the Percival Paleochannel and potential impacts are not considered significant.

The current approved RIWI Act Groundwater Licences (GWL) and associated Groundwater Licence Operation Strategy (GLOS) for the Havieron Project will require revision to allow Stage 2 mining (extraction of ore). Therefore, further details on mitigation measures will be provided to DWER as part of the revised GLOS. Consultation with DWER has occurred on approved GWL Applications and associated DEMIRS Water Management Plans and GLOS.



Figure 11-5: Predicted drawdown of the Upper and Lower Confined Aquifers at Havieron

Surface Water Flow – Alteration

Preliminary results indicate flooding in cyclone events is likely and appropriate surface water controls will require design and implementation. Key landforms (waste rock landforms, box cut and evaporation ponds) have been located outside of the flooding areas. Where possible, access and haul roads are located outside of the flooding areas. However, the haul road does intercept areas prone to flooding. The haul road will be fitted with drainage measures in instances where ponding is significant.

At the local level, there may be some reduction in inflows to small claypans occurring within the mine area due to the presence of surface mine infrastructure. Claypans are well represented locally, including outside of the DE (Figure 6-1), and are of importance to Martu and support ecosystems dependent on intermittent inundation.

Given mitigation measures proposed, alteration of surface water flows is not considered to be significant.

Surface and Groundwater Contamination

Groundwater contamination from surface spills or leaks is possible but able to be managed through standard best practice measures for containment and spill response for hazardous chemicals and hydrocarbons and fully contained evaporation ponds designed to account for direct rainfall, salt accumulation and wave action.

Groundwater Aquifer Cross-contamination

The potential for aquifer cross contamination is considered limited, considering the existing aquitards between aquifers. However, there is potential for aquifers to be connected via the decline and through bore holes that pass through more than one aquifer. Mitigation measures are proposed to limit the potential for this to occur, including construction in accordance with DWER standards.

11.7 ENVIRONMENTAL OUTCOME

Impacts to surface water are expected to be minimal given key infrastructure at Havieron has been placed outside of the one in 100-year flooding extent and mitigation measures proposed.

The dewatering zone of impact is predicted to have approximate dimensions of 10.3 km x 8.0 km in the Upper Confined Aquifer and 16.1 km x 17 km in the Lower Confined Aquifer. These aquifers have a regional extent beyond this predicted zone of impact. The water balance indicates that the natural groundwater discharge to the west of the model extent (where there are Calcrete aquifers) is unaffected by the proposed extraction. This will continue to be confirmed by monitoring in accordance with the Water Management Plan (approved as part of Havieron early works).

The predicted outcome for Inland Waters can be summarised as:

- No impacts to beneficial users (Punmu community) or regional water resources (Percival Paleochannel) will occur

- Drawdown will occur within stygofauna habitat however impact is low and suitable habitat is expected to occur outside of the impact area
- Localised and minor changes to surface water flows around claypans.

The assessment of direct and indirect impacts on inland waters from Proposal activities once all mitigation measures are implemented, results in no significant residual impact on inland waters values. Therefore, the Proposal meets EPA's objectives *"to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected."*

12. TERRESTRIAL ENVIRONMENTAL QUALITY – KEY FACTOR

12.1 EPA OBJECTIVE

The relevant EPA objective for Terrestrial Environmental Quality is "to maintain the quality of land and soils so that environmental values are protected."

12.2 RELEVANT POLICIES AND GUIDELINES

Table 12-1: Terrestrial Environmental Quality policy and guidelines

Environmental Factor	EPA and other State or Commonwealth policy or guidance	Consideration of policy and guidance
Environmental Factor Guideline — Terrestrial Environmental Quality (EPA 2016).	Statutory Guideline for Mine Closure Plans – DEMIRS (March 2020, updated January 2023)	Considered in proposed Mine Closure Plan (post-approval pending final design)
	Guidance Statement No. 6 — Rehabilitation of Terrestrial Ecosystems (EPA 2006)	Considered in the response to any land contamination arising from mine activities
	Guidance note on environmental non-compliance and incident reporting, DEMIRS (2022)	Noted as a requirement for spills or other unplanned discharges to the environment
	Identifying and reporting contaminated sites, DWER (October 2024)	Not required but noted and considered in the response to hypersaline water discharge

12.3 RECEIVING ENVIRONMENT

12.3.1 SOILS

The dominant geomorphology of the Mackay has been described as Quaternary red longitudinal sand dune fields overlying Jurassic and Cretaceous sandstones of the Canning and Amadeus Basins (Kendrick 2001). Individual and bifurcated longitudinal dunes exist within the Development Envelope of the Havieron Project and are of high cultural value to Martu.

Claypans are widespread within the region and are of cultural significance to the Martu People, therefore excluded from the proposed disturbance footprint.

Soils within the Havieron Project area were characterised (Landloch, 2020, refer Appendix Z) in accordance with three systems of classification as follows:

- Australian Soil Classification (ASC) classification³⁸ defined Havieron soils as:
 - Rudosol, being soils with negligible (rudimentary) pedological organisation apart from minimal development of an A horizon, or the presence of less than 10% of B horizon material in fissures
 - Kandosol, being gradational soils with massive or weakly structured B horizons (subsoils). The B horizon has a clay content that exceeds 15%.
- The WA Great Soil Groups (GSG) ³⁹ classification defined Havieron soils as:
 - Red Deep Sand, being sand greater than 80 cm depth. Red within surface 30 cm
 - Red Sandy Earth, being soils with a sandy surface grading to loam by 80 cm. May be clayey at depth. Red within surface 30 cm
 - Red Loamy Earth, being soils with a loam surface and either loamy throughout or grading to clay by 80 cm. Red within surface 30 cm, massive or poorly structured, earthy fabric.
- Soil Mapping Units (SMU) ⁴⁰ identified three SMUs in the Havieron project area as follows:
 - Deep Sands, being wind-blown aeolian sands associated with sand dunes present throughout the landscape. These soils are dominated by fine sands with no appreciable silt or clay and no pedological development
 - Gradational Loams, characterised by a thin layer of wind-blown aeolian sands that grade rapidly to sandy loam, with a gradual increase in clay content from clay loam to light clay at depth. The influence of wind-blown aeolian sands is less apparent in these soils
 - Gradational Sands, similar to Deep Sands, except for a change in texture from sand to loam in the deeper B horizon. These soils are characterised by a buried horizon at depth that represents the original soil profile that was covered in wind-blown aeolian sands.

The Soil Mapping Units are likely to occur across the regional area and are considered representative of the Great Sandy Desert. The Tertiary Cover has physical and chemical characteristics most similar to local topsoils (Landloch 2020a).

³⁸ ASC is the national system for soil classification. The scheme defines soil classes on real soil bodies using a key. Classes are allocated based on diagnostic horizons and the arrangement of materials in a vertical sequence as seen in an exposed soil profile and accounting for geographic attributes of the landform.

³⁹ Western Australia-specific standardised method that provides common names to the main soils to assist with communicating information collected as part of land resource and rangeland mapping programs. Classes are allocated based on soil texture and depth.

⁴⁰ SMU is the basic geographic component of a soil map and can be associated with a single or multiple soil types with definable characteristics. SMUs are developed based on recurring landscape and soil attributes, with minor variations in soil properties allowable within each unit. The purpose of SMUs is to group soils by their management requirements (e.g., depth, salinity, sodicity).

The landscape within the immediate Telfer area exhibits longitudinal dune systems, swales, and stony outcrops, resulting in four major soil units:

- Deep linear sand dunes of loose red sands separated by flat sandy swales, with low silt and clay content, and low nutrient content
- Flat sandplains of red-brown loose to hard-setting sands with poor soil structure, sometimes comprising gravel in the upper topsoils and subsoils
- Stony outcrops with loose stones, rock exposures, and scree slopes with fine skeletal red-brown soils of high silt and nutrient content; and
- Low-lying areas and claypans with pale brown clayey soils, high in silt and nutrient content.

12.3.2 TELFER WASTE ROCK

Historical studies have defined the geochemical character of the chief lithologies pertinent to Telfer Waste Rock. Most lithologies have varying proportions of both PAF and NAF sub-variants. However, some lithologies are mostly NAF, and others are mostly PAF. The key outcomes of waste rock studies (GCA 2017) are that:

- Malu Quartzite (MQM) is calcareous (dolomites and ankerites), and at Main Dome is primarily NAF. This resulted in NAF MQM being defined by Total S values < 1%, This reflects the strongly calcareous nature of the MQM groundmass (e.g. at least 5% as CaCO₃)
- OSM is dominated by NAF rock with appreciable fines (gravels, sands, silts and clays) content following blasting and excavation. The groundmass of the OSM unit is devoid of carbonates; and
- Other lithologies (e.g. MSM, RSM, etc.) have varying proportion of NAF, Low Capacity PAF and High Capacity PAF categories. Like the OSM, these lithologies have a groundmass devoid of carbonates.

Telfer WRLs have been constructed from multiple waste rock lithology types and the current WRL surfaces demonstrate this. The key source of durable rock at Telfer is the MQM; most other rock types are less durable and more prone to erosion. Given the history of mining at Telfer, controls for the selective handling and management of waste rock have only been implemented in recent times, in order to preserve durable rock armour resources (including MQM) and to avoid placement of more erodible waste rock types (especially the Outer Siltstone Member [OSM]) on/near final WRL slopes.

Fine-fraction particle assessment of waste rock material identified OSM lithology as being highly dispersive and prone to tunnel erosion. This was primarily due to high proportions of fine sand (38.4- 50.6%), silt (17.0-41.8%), and dispersive clay (7.0-14.6%). Rocky sandstone waste materials were also found to contain a high proportion of silt (49.6%). Both of the materials exhibited fracturing and disaggregation during water absorption testing, suggesting that these materials would be highly prone to weathering if exposed to atmospheric conditions. These materials are not considered to be suitable for use on external surfaces (Landloch 2010).

12.3.3 TELFER TAILINGS

Geochemical classification of tailings is provided in Table 12-2. at Telfer has varied over time, with historical test work indicating NAF tailings, and more recent test work indicating tailings material with higher proportions of sulphide material with potential to generate acid. This is primarily due to the variation between MQM and non-MQM ores entering the ore feed over the life of mine (LOM), which reflect different mineralogies and sulfide content.

Geochemical testwork of tailings has typically indicated varying sulfur values between 0.05-2.5 %, with NAGpH values ranging between 2.5 and 8.5. The mineralogy of tailings at Telfer is dominated by dolomite, which comprises strong acid buffering properties and is reflected by the high ANC values, ranging from 50-200 kg sulfuric acid per tonne (kg H₂SO₄/t). Tailings have typically exhibited low concentrations of metals, with only notable enrichment in arsenic and copper, with some instances of elevated bismuth.

COOE Associate Consultants (COOE) provided an overview of acid-base characteristics for TSF7 underflow in 2014. Acid-base parameters measured for tailings material deposited into TSF7 indicated variable sulfide content in the tailings underflow (0.1-11 %), demonstrating that sulfide content throughout the vertical profile of TSF7 is variable and comprises stratigraphic areas of PAF material (high sulfide content) interspersed with NAF acid-neutralising units. pH ranged between slightly acidic and moderately alkaline (pH 6.1-9.2), which is generally considered too high for acid generating potential.

Approximately 10% of tailings samples indicated moderate ANC values (16-52.5 kg H₂SO₄) with an average value of 110.6 kg H₂SO₄, and approximately 90 % of the underflow samples tested demonstrated high ANC values > 50 kg H₂SO₄ (COOE 2014).

It is expected that approximately 70 % of future tailings material produced at Telfer will be NAF and 30 % will be PAF. Oxidation of pyrite and other sulfide-based materials is likely to occur shortly after tailings deposition and may continue up until the end of the LOM. The dominating dolomite lithology comprises effective acid buffering capacity, which is expected to neutralise any acid generation in the tailings and reduce sulfide values well below PAF classification criteria.

Any acidic materials or dissolved heavy metals entering the underlying geological profile below TSF8 are expected to be neutralised by underlying acid-buffering units of dolomite and calcrete prior to leaching within proximity any groundwater, which occurs approximately 40 meters below ground level (mbgl) (COOE 2014; KCB 2020).

Table 12-2: Telfer active and historical tailings characterisation

Parameter / aspect	TSF 7 (Active)	TSF 1 (historical)	TSF 2 (historical)	TSF 3 (historical)	TSF 4 (historical)	TSF 5 (historical)	TSF 6 (historical)
Level of certainty	High – Approved Mining Proposal RegID 116032 (COOE Consultants assessment 2014)	Moderate – Sufficient geotechnical and geochemical test work has been completed for a reclamation Mining Proposal to be developed for any of TSFs 1-6. Certainty is based on: - Recent drilling and sampling campaign completed. Historical operating data pre-2000 is not available. - Telfer TSFs 1-6, Historical Data Report, Klohn Crippen Berger, 2022 - Drilling program completed in 2020 for resource definition					
Type of tailings deposited	Sulphide-ore-flotation tailings	Oxide carbon in leach tailings	Oxide carbon in leach tailings	Oxide carbon in leach tailings	Sulphide-ore-flotation tailings	Oxide and sulfide carbon in leach tailings	Oxide and sulfide carbon in leach tailings
Acid potential							
Total sulphur	0.05 - 02.5 wt%	425 ppm average of 73 samples Range 120 to 2350 ppm	559 ppm average of 75 samples Range 140 to 8160 ppm	235 ppm average of 63 samples Range 50 to 900 ppm	4678 ppm average of 48 samples) Range 1170 to 18,980 ppm	2382 ppm average of 178 samples Range 10 to 15,150 ppm	3743 ppm average of 162 samples Range 170 to 25,850 ppm
Mean Potential Acidity	5 – 80 kg H ₂ SO ₄ /t	3.4 kg/H ₂ SO ₄ /t (GCA Nov 1996)	3.4 kg/H ₂ SO ₄ /t (GCA Nov 1996)	3.4 kg/H ₂ SO ₄ /t (GCA Nov 1996)	-100 kg/H ₂ SO ₄ /t (GCA Feb 1997)	3.4 kg/H ₂ SO ₄ /t (GCA Nov 1996)	3.4 kg/H ₂ SO ₄ /t (GCA Nov 1996)
Acid Neutralising Capacity	50 – 200 kg H ₂ SO ₄ /t	3.3 kg/H ₂ SO ₄ /t (GCA Nov 1996)	3.3 kg/H ₂ SO ₄ /t (GCA Nov 1996)	3.3 kg/H ₂ SO ₄ /t (GCA Nov 1996)	110 to 120 kg/H ₂ SO ₄ /t (GCA Feb 1997)	3.3 kg/H ₂ SO ₄ /t (GCA Nov 1996)	3.3 kg/H ₂ SO ₄ /t (GCA Nov 1996)
Mineralogy	Dolomite, quartz and sulphides. Sulphides are dominated by pyrite and chalcopyrite, with lesser	Dolomite, quartz and sulphides. Oxidised material closer to surface with higher Au:Cu.	Dolomite, quartz and sulphides. Oxidised material closer to surface with higher Au:Cu.	Dolomite, quartz and sulphides. Oxidised material closer to surface with higher Au:Cu.	Dolomite, quartz and sulphides. Sulphides are dominated by pyrite and chalcopyrite, with	Dolomite, quartz and sulphides. Oxidised material closer to surface with higher Au:Cu.	Dolomite, quartz and sulphides. Oxidised material closer to surface with higher Au:Cu.

Parameter / aspect	TSF 7 (Active)	TSF 1 (historical)	TSF 2 (historical)	TSF 3 (historical)	TSF 4 (historical)	TSF 5 (historical)	TSF 6 (historical)
	chalcocite, bornite and minor cobaltite and nickel sulphide. Dolomite is the dominate acid neutralising mineral.				lesser chalcocite, bornite and minor cobaltite and nickel sulphide.		
Neutral metalliferous leaching	pH 6.8 – 7.2	Additional data to be sourced if TSF identified for reclamation and Mining Proposal required					
Metals/ metalloids	Low concentration of most metals and metalloids and saline water extractions of the tailings.	Low concentration of most metals and metalloids. Ranges for the analyses completed: Au: 0.06 to 3.31 ppm Ag: 0 to 1.63 ppm Cu: 6 to 5190 ppm As: 200 to 1002 ppm Co: 0 to 217 ppm Ca: 240 to 10130 ppm Mg: 227 to 1117 ppm Bi: 0 to 23.7 ppm Fe: 0.12 to 22.0% Ni: 0 to 39 ppm Pb: 12 to 196 ppm Sn: 0 to 10 ppm Zn: 2 to 227 ppm	Low concentration of most metals and metalloids. Ranges for the analyses completed: Au: 0.03 to 1.37 ppm Ag: 0 to 1.57 ppm Cu: 23 to 11,082 ppm As: 60 to 1030 ppm Co: 0 to 302 ppm Ca: 310 to 4820 ppm Mg: 0 to 1587 ppm Bi: 0 to 6 ppm Fe: 0.34 to 14.4% Ni: 0 to 881 ppm Pb: 0 to 150 ppm Sn: 0 to 6 ppm Zn: 0 to 193 ppm	Low concentration of most metals and metalloids. Ranges for the analyses completed: Au: 0.03 to 1.01 ppm Ag: 0 to 1.08 ppm Cu: 0 to 491 ppm As: 50 to 1090 ppm Co: 0 to 76 ppm Ca: 10 to 3950 ppm Mg: 143 to 1311 ppm Bi: 0 ppm Fe: 0.77 to 15.7% Ni: 0 to 18 ppm Pb: 8 to 67 ppm Sn: 0 to 850 ppm Zn: 0 to 29 ppm	Low concentration of most metals and metalloids. Ranges for the analyses completed: Au: 0.03 to 3.53 ppm Ag: 0 to 3.84 ppm Cu: 473 to 1160 ppm As: 30 to 390 ppm Co: 27 to 277 ppm Ca: 1230 to 43520 ppm Mg: 713 to 17235 ppm Bi: 0 ppm Fe: 1.02 to 9.68% Ni: 0 to 52 ppm Pb: 17 to 191 ppm Sn: 0 ppm Zn: 0 to 57 ppm	Low concentration of most metals and metalloids. Ranges for the analyses completed: Au: 0.03 to 1.22 ppm Ag: 0 to 1.23 ppm Cu: 20 to 2229 ppm As: 0 to 1020 ppm Co: 0 to 191 ppm Ca: 370 to 33000 ppm Mg: 114 to 3802 ppm Bi: 0 to 50 ppm Fe: 0.52 to 31.9% Ni: 0 to 48 ppm Pb: 0 to 134 ppm Sn: 0 to 20 ppm Zn: 0 to 548 ppm	Low concentration of most metals and metalloids. Ranges for the analyses completed: Au: 0.03 to 0.36 ppm Ag: 0 to 0.9 ppm Cu: 38 to 7230 ppm As: 20 to 880 ppm Co: 0 to 230 ppm Ca: 20 to 33600 ppm Mg: 175 to 6616 ppm Bi: 0 to 20 ppm Fe: 0.43 to 11.2% Ni: 0 to 73 ppm Pb: 0 to 360 ppm Sn: 0 to 20 ppm Zn: 0 to 679 ppm

Parameter / aspect	TSF 7 (Active)	TSF 1 (historical)	TSF 2 (historical)	TSF 3 (historical)	TSF 4 (historical)	TSF 5 (historical)	TSF 6 (historical)
Tailings liquor	pH	Dry system since 2004. No process liquor to analyse.					
	Alkalinity						
Overall potential for Acid and Metalliferous Drainage	Low Not considered PAF based on NAG pH, and with ANC >50 kg H ₂ SO ₄ /t	Oxide ore tailings classified as barren materials due to negligible capacity to both produce and consume acid (Graeme Campbell and Associates Pty Ltd, Nov 1996)			Sulfide ore flotation tailings classified as non-acid forming (Graeme Campbell and Associates Pty Ltd, Feb 1997)	Oxide ore tailings classified as barren materials due to negligible capacity to both produce and consume acid (Graeme Campbell and Associates Pty Ltd, Nov 1996)	

12.3.4 TELFER TAILINGS STORAGE FACILITIES

Telfer consists of eight Tailings Storage Facilities (TSF):

- TSF8 is operational and was approved by a s.45C application in 2020. TSF8 will provide a long-term solution for tailings disposal for the duration of the Significant Amendment.
- TSF7 is currently under a Prohibition Notice (see below) but expected to be operational after completion and validation of remediation
- TSF1-6 are decommissioned with some rehabilitation completed

TSF8 is located directly north of the currently operational TSF7 and will operate in tandem with TSF7. Initially, the TSF7 and TSF8 impoundments will operate independently, with a shared embankment. The intent is to combine the impoundments and migrate the decant pond to be within TSF8 to form an integrated closure landscape for both TSFs.

TSF8 is bounded by new zoned earth and rockfill saddle dams to the west and east, a combination of lined faces of existing mine waste stockpiles and a saddle dam to the north, and a shared wall with the operational TSF7 to the south. To reduce seepage from TSF8, the WRLs to the north are lined with compacted Outer Siltstone Member (OSM) waste rock. The shared wall between TSF7/TSF8 also have a compacted OSM seepage liner. The purpose of the liner is to provide a platform for tailings deposition and to reduce seepage from TSF8 into the toe of TSF7.

In December 2023, and April 2024, there were two significant tailings storage facility events on TSF7 and TSF8 (DEMIRS Incident 1870) that resulted in Telfer ceasing ore processing for an extended period. The following regulatory instruments were issued:

- TSF8 Prohibition Notice issued by DEMIRS 27/12/2023 to prohibit deposition of tailings. Remediation was completed and this was lifted 13/09/2024.
- TSF8 Environmental Protection Notice issued by DWER 24/06/2024 to prohibit discharge of tailings or process water into TSF7 and TSF8 and directing that dam safety and environmental investigations are carried out to ensure risk of environmental harm is reduced and determine if pollution had occurred. This was lifted for TSF8 on 20/09/2024, and 14/03/2025 for TSF7 (noting that no deposition is permitted until the Prohibition Notice is lifted).
- TSF7 Prohibition Notice issued by DEMIRS 18 April 2024 prohibiting the deposition of tailings slurry and any fluids. Remediation works have been substantially progressed, but this Prohibition Notice remains in force at the time of writing.

The failure of TSF8 related to a water ingress through a compromised area of liner OSM materials that was not constructed in accordance with design as per the original Works Approval. As part of investigation and remediation the original design has been validated and the area remediated to the original approved design. Investigation verified that the facility was operated in accordance with the Operating Maintenance and Surveillance Manual.

The failure of TSF7 related to the long-term wicking or 'piping' of liquor into the central causeway allowing it to flow towards the dam wall. When restricted and emergency use of

TSF7 commenced due to the unavailability of TSF8 for the aforementioned reasons, liquor finally wicked through the dam wall resulting in a visible seep. The use of the TSF7 was an emergency and the operational status considered abnormal and therefore not operated as per operational criteria and protocols. Dam safety will be verified upon completion of remediation works and TSF7 operation will not recommence until notified in writing by DMPE.

DEMIRS (now DMPE) have concluded their investigation and on 12 June 2025 determined that the incident shall be closed without enforcement action and restating the expectation that actions will be completed to prevent future recurrence.

12.3.5 HAVIERON WASTE ROCK

Approximately 420 m of Permian cover overlays the Havieron underground mine, which occurs within the Proterozoic. Stage 1 of the Project (approved Mining Proposal RegID 121684) included the decline development through the Permian cover. Volumes of expected waste rock for both the development and mining phases are shown in Table 12-3.

Table 12-3: Waste rock volumes for decline development and underground mining

Geology	Rock Type	Volume (m ³)	Proportion (%)
Permian	Saprolite	2,072	0.12
	Shale	24,097	1.36
	Sandstone	182,429	10.30
	Mudstone	6,565	0.37
	Upper Tillite	50,489	2.85
	Lower Tillite	84,745	4.79
	Conglomerate	29,213	1.65
	Siltstone	74,510	4.21
Total Development waste rock (WRL1)		454,120	25.65
Proterozoic	Dolerite	380,586	21.49
	Crescent Zone	16,156	0.91
	Crackle Breccia	81,877	4.62
	Calcite Cemented Breccia	197,943	11.18
	Bedded Sediments	615,618	34.76
	Actinolite cemented Breccia	24,593	1.39
Total waste rock arising from underground mining (WRL2)		1,316,773	74.35
Total waste rock		1,770,893m³	100%

Waste characterisation studies have been completed by Landloch as follows:

- Waste Rock Characterisation for Stage 1 – **Appendix zAA**
- Waste Rock Characterisation for Stage 2 – **Appendix zBB**

- Havieron Tailings Characterisation – **Appendix zCC**

It should be noted that waste tonnages at the time may change depending on ground conditions as mine development progresses.

The Permian waste rock arising from development has minimal deleterious characteristics. Whilst it is currently stored within a Waste Rock Landform, it is the intention of Greatland to seek approval to draw down on this stockpile and repurpose the materials to civil works. If approved this will remove the landform as a closure feature.

The key issue with waste rock is the ability to safely and permanently store materials so that the potential for emissions – acidic, metalliferous and/or saline leachate, or sediment loss through wind or water erosion – is eliminated and the site requires no maintenance post-closure. The characterisation work identified the following waste rock types that will require encapsulation to allow for safe storage, which are currently estimated at 10% of total waste rock volume. These materials are:

- Crescent zone (approximately 1% of all waste rock) and Diorite waste rock (unknown proportion) (metalliferous enrichment and some potential for acid formation [PAF-LC])
- Crackle breccia (metalliferous enrichment) making up approximately 5% of all waste rock
- Actinolite and calcite cemented breccia portion which has a higher PAF risk
- Conglomerate and Siltstone at the base of the Permian cover (expected to be a minor fraction of waste rock) due to poor durability, salinity and high proportion of fines
- Other high sulphur waste rock (metalliferous enrichment, saline leachate)
- Other rock with a PAF-LC classification or other feature requiring management.
- Other materials were benign and prospective for use in rehabilitation and armouring of the landform. These rock types were:
 - Dolerite and Bedded Sediment materials which form in excess of 50% of all waste rock
 - Actinolite Cemented Breccia and Calcite Cemented Breccia which constitute 14% of all waste rock (except for material close to the ore zone)
 - Upper, middle and lower Permian rock which is benign but not suitable for rock armouring.

The data suggest there is a favourable balance of suitable materials with which to construct a stable, permanent landform, although ongoing waste characterisation and scheduling will be necessary to validate modelled waste rock with actual arisings.

12.3.6 HAVIERON TAILINGS

Tailings arising from the processing of Havieron ore at Telfer have been characterised by Landloch (2021, refer Appendix zCC). The results of laboratory test work suggest that tailings produced are likely to have the following key attributes:

- Non-acid forming but classified as NAF-HS because of a high iron sulphide content, and an abundance of reactive net neutralising carbonate minerals
- Significant elemental enrichment
- Potential for PFM to be encountered in voids and breccias (validation work underway for final design and specification of controls)

- Short term contact of the tailings with an unbuffered water source may generate drainage with the following characteristics:
 - Slightly alkaline
 - Slightly elevated concentrations of total cyanide, sulphate and copper and zinc
 - A moderate amount of first flush salinity (predominated by sulphate) as reflected by a paste EC value of 1120 $\mu\text{S}/\text{cm}$ which would diminish over time providing the tailings are not exposed to oxidising conditions
 - Negligible concentrations WAD cyanide (that includes both free cyanide and copper, nickel and zinc cyanide complexes)
 - Negligible concentrations of most metals and metalloids.
- If there is extended exposure of the tailings to oxidising conditions then drainage should remain slightly alkaline but would likely have an elevated concentration of sulphate and possibly slightly elevated concentrations of molybdenum, selenium and zinc
- Negligible bioavailable aluminium regardless of the conditions that the tailings are exposed.

Overall, the results suggest the tailings should not be a significant source of acidity, however significant loadings of sulphate salinity and slightly elevated loadings of some metals may be generated under certain conditions (e.g. upon exposure to oxidising conditions).

Results for supernatant water quality suggests the process water fraction may have the following attributes: alkaline, slightly elevated in salinity (sulphate the predominant anion), total and WAD cyanide, cobalt, copper, iron and molybdenum, but negligible concentrations of most metals and metalloids.

12.3.7 HAVIERON HYPERSALINE WATER

Mine development at Havieron intersects three aquifers as outlined in Table 11-3. Encountered groundwater ranges in salinity from around 5,000 mg/L TDS to 55,000 mg/L TDS. This are pumped to lined evaporation ponds licenced by DWER (L9455) that currently comprise three cells (Ponds 1 – 3) with a total capacity of 132,420m³ and an evaporative surface area of 220,430m². These provide evaporative capacity to manage mine dewater, with the rate dependent upon temperature, water depth, and area. During winter months the evaporation rate is lower but significant rainfall is also low compared to the November to March period (wet season).

The s.40AA Significant Amendment proposes an additional three cells (Ponds 4 – 6) to provide sufficient capacity for mine dewater for the remainder of mine development. This will provide an additional 477,130m³ of capacity and 290,000m² of evaporation surface area. Greatland have received Works Approval (W6972/2024/1) for the future construction of additional ponds, and DWER have advised their intention to vary existing licence L9455 to encompass operation of additional the ponds.

Both the current and proposed evaporation ponds are designed with sufficient freeboard to receive mine dewater, direct rainfall from a 1% AEP 72-hour rain, and have a wave allowance to

prevent loss of saline water to the environment. Dewatering and pond capacity are balanced and monitored in real time to ensure design capacity is not exceeded.

Water of a suitable salinity (<35,000 mg/TDS) is permitted to be used on roads and hardstand, with controls specified in L9455. Dust suppression water is tested weekly (compliance) and more often as required. Mine dewater is segregated based on the aquifer of origin to ensure lower salinity water is not comingled with hypersaline waters thereby allowing for beneficial reuse. Dust suppression water is drawn from a sedimentation pond (turkeys' nest) prior to entering the hypersaline evaporation ponds.

Hypersaline water emergency discharge incident

A hypersaline water discharge associated with Ponds 1 - 3 occurred in March 2024 (DEMIRS incident notification ENV-PEB-189). This occurred after the cells reached design capacity due to a significant rainfall event on 4 March 2024 totalling 137.2mm in a 24-hour period. This was preceded by heavy rainfall totalling 208mm for the 72-hour period, and a previous significant event on 23 January 2024 totalling 138mm creating sodden conditions. With forecast heavy flows, high runoff, and ingress of rainwater from a breached diversion bund, the decision was made to initiate temporary emergency discharge of saline water to unapproved areas (borrow pit and cleared verge adjacent to ponds) to prevent uncontrolled overtopping and potential dam wall damage. With continued discharge the saline water inundated an area of approximately 22 ha of native vegetation causing localised impacts.

The root cause of this incident was the ingress of rainwater into the evaporation pond system outside of design criteria resulting in insufficient capacity. Cells are designed to accept hypersaline mine dewater only, with freeboard sufficient for direct rainfall and wave action only. They are not designed to receive catchment flows. The latent factor in catchment stormwater entering the cells was insufficient catchment control infrastructure.

Evaporation pond capacity is a known constraint that had prompted the site being placed into informal Care and Maintenance in November 2023 pending environmental approval for construction of additional evaporation cells. At the time of this RSD development at Havieron continues to be paused.

In response to the emergency discharge Greatland implemented the following corrective and preventive actions:

- Revised catchment modelling and specification of controls to divert and detain stormwater flows. These were installed prior to wet season 2024
- Wet season preparedness procedure implemented to ensure infrastructure is
- Purchase and installation of temporary bladders to raise the height of spillways to prevent ingress and increase total capacity should it be required
- Ecological assessment of the salt discharge zone that determined no impact to native vegetation cover, with an ongoing monitoring program implemented during recovery.

It should be noted that the most effective preventive measure is the construction of additional evaporation capacity, being the proposed cells 4 – 6 for which Works Approval has been granted. This is contingent upon EPBC and EPA approvals.

DWER attended site and, after consideration of factors, has determined that corrective actions are sufficient to prevent recurrence and the incident has been closed without further regulatory or enforcement action.

12.4 POTENTIAL ENVIRONMENTAL IMPACTS

Potential impacts to terrestrial environmental quality are considered to be:

- Erosion and dust for the following reasons:
 - Due to the low clay content and high sand content of Deep Sands and Gradational Sands, wind erosion is likely to occur. The deeper, loamy material may be less prone to wind erosion. The risk of wind erosion is also related to the direction and speed of prevailing winds and vegetation cover.
 - Deep Sands and Gradational Sands are likely to be susceptible to water erosion, as whilst highly permeable, erosion rates are very high.
 - The clearing of native vegetation, exposure of soils and placement of construction material may lead to an increase in sediment movement
 - The removal of vegetation could increase the risk of wind erosion with areas that have greater than 40% vegetation cover considered unlikely to be prone to wind erosion. A reduction in vegetation cover to less than 10% could increase erosion potential by more than one order of magnitude
- Permanent surface storage of waste rock has some potential to lead to discharge of acid and metalliferous drainage or saline leachate. Potentially dispersive material has also been identified with the potential to cause instability in the structure
- Spillage of saline water, hydrocarbons or chemicals may result in contamination of surrounding soils
- Spillage or dust emissions of tailings as part of tailings transport and storage for paste fill, resulting in contamination of surrounding soils
- Discharge of tailings in the Telfer TSF Storage Facility may result in spills or seepage which contaminate surrounding soils (noting that no tailings dams are proposed for Havieron)
- Accumulation of salt from use of saline water from dust suppression
- Discharge of hypersaline mine dewater from pumping lines or evaporation ponds.

12.5 MITIGATION

- No use of dispersive or saline material for construction or roads or other civil elements
- 'Just in time' clearing of land staged with construction to avoid erosion of exposed soils
- Surface Disturbance Permit process to be followed at all times
- Recovery and stockpiling of approximately 100mm of topsoil for future use as a growth medium in rehabilitation works
- Topsoil stockpiles will not exceed 2 m in height and placed in an East - West direction, where possible, to match natural sand dunes and minimise wind erosion
- Stabilisation of stockpiles to prevent erosion (e.g. cover, spray seal, vegetation)

- Bunded and compliant storage and use of hydrocarbons and other hazardous chemicals
- Spill kits and training for onsite personnel
- Covered transport of recovered tailings from Telfer to Havieron for use in paste backfill production
- Bunded storage of paste fill tailings (used for mine backfill) and dust suppression as required
- Waste rock landform design and management to contain dispersive materials and prevent erosion.

Mitigation measures for management of waste rock include:

- All waste rock to be characterised to inform design of WRL
- Rock armouring of WRL with competent material
- Construction of crest bund and concave top surface of landform to ensure landform is 'water retaining'
- Dispersive or PAF material to be stored within core of WRL, requiring ongoing waste rock characterisation and a waste rock management plan.

A preliminary design for the final rehabilitated landform has been developed. It includes drainage protection to prevent erosion that could result in extreme rainfall events.

Mitigation measures for management of tailings include:

- Tailings deposition will occur into currently approved TSF7 and TSF8
- TSF design includes seepage controls
- TSF operational procedures including inspections and monitoring.

12.6 ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

The Significant Amendment has similar impacts associated with soil, waste rock and tailings to those associated with the Approved Proposal. Similar management measures will be implemented and additional approvals and management through DEMIRS and DWER – Industry Regulation will occur.

Given the consistent terrestrial environment throughout the Great Sandy Desert, the cumulative impacts of the Approved and Significant Amendment are not considered significant once mitigation measures are implemented.

12.6.1 SOIL CONTAMINATION

Mitigation measures for land contamination from hydrocarbons and other chemical are considered industry standard and the potential impact from soil contamination is not considered significant. Any unplanned emissions are to be reported, notified where required

by scale, and rehabilitated to prevent washing of contaminants through the soil provide posing risk of contamination of the unconfined aquifer.

12.6.2 WASTE ROCK LANDFORMS

There is no deleterious materials in the material arising from mine development under Mining Proposal Stage 1. Once the Havieron deposit is reached in late 2027 (proposed Mining Proposal 2 under development) some deleterious material is expected to be encountered. However, sufficient material is available for encapsulation within the proposed Havieron Waste Rock Landform. Waste Rock Management practices are considered industry standard and will align with the Approved Proposals current practices. Therefore, potential impacts from waste rock are not considered to be significant.

Currently the development Waste Rock Landform (WRL1) is precautionarily marked under Mining Proposal Stage 1 to remain onsite at closure. However, given the absence of deleterious materials and the presence of competent materials suitable for civil works, Greatland will make application to draw down on WRL1 towards final removal and re-purpose of the cleared footprint. Whilst consultation with JYAC, DWER and DEMIRS is yet to commence, this initiative, if approved, is considered to provide net environmental benefits to terrestrial environmental quality.

12.6.3 HAVIERON TAILINGS DEPOSITION

Havieron tailings are proposed to be deposited into TSF8. However sufficient capacity exists in both TSF7 or TSF8 for deposition of Havieron tailings. The Havieron tailings chemical composition does not present a greater risk to the environment in comparison to Telfer tailings.

Tailings management will continue as per the Approved Proposal to minimise environmental impacts, including all additional Licence conditions arising from the TSF incidents outlined in 12.3.4.

Greatland have proposed to use TSF8 or TSF7 for the deposition of Havieron tailings. Use of TSF7 will only be possible after completion of all works required to lift the Prohibition Notice and return TSF7 to operational status. Regulation of this is proposed to remain with DMPE and DWER.

12.6.4 REHABILITATION AND MINE CLOSURE PLANNING

Telfer Mine Closure Plan RegID 500231 was approved 3 April 2025. Progressive rehabilitation towards final closure is an expectation of all miners. Greatland have been in recent discussions with DEMIRS about the rate of rehabilitation of high-risk facilities such as waste rock dumps, tailings storage facilities and dump leaches. The quality and the success of the progressive rehabilitation has not been questioned by DMPE however it is noted that there is a strong desire for an increased rate of completion for individual domains.

Progressive rehabilitation has been undertaken at Telfer for 20 years across various domains and landforms as they become inactive, including the tailings storage facility (TSF 1 - 3), waste rock dumps (WRDs) (WRD6, WRD10, WRD13 and Southern Waste Dump/OSM64), airport and borefield areas. Rehabilitation trials have been undertaken, which the informs the

rehabilitation treatments used for each landform. The trials success was most recently assessed by Mine Earth (Mine Earth, 2024) and outlines the treatment that has been most successful at Telfer. This success, and alignment with analogue sites, is increased through the sourcing and use of high-quality endemic seed, mixed specifically to the location and remnant native vegetation.

Rehabilitation monitoring is undertaken annually at Telfer using remote sensing metrics, with the results compared to the approved completion criteria identified in the Mine Closure Plan. The 2024 rehabilitation monitoring (Spectrum, 2024) found “remote sensing metrics indicated 75.4% (421.4 ha) of the 559.3 ha of rehabilitated land at Telfer is meeting all completion criteria. The total rehabilitated land achieving all completion criteria increased by 13.8% relative to 2023”.

The above demonstrates that successful rehabilitation of flora and vegetation assemblages is likely to be achieved at Havieron.

The current preliminary Mine Closure Plan is provided in Appendix zDD and covers all current features at Havieron. An updated Mining Proposal and Closure Plan (MDCP), being the reviewed format required by DMPE, has been drafted and will be finalised in early 2026. Closure completion criteria and monitoring system as implemented at Telfer are likely to be adopted for the Havieron MDCP.

12.7 ENVIRONMENTAL OUTCOME

Impacted soils are considered indicative of the wider local region with the portion of clearing not expected to significantly impacts soil profiles, given mitigation measures proposed. With the application of proposed mitigations for land clearance, prevention of soil contamination, and stockpiles, there is not considered to be significant impacts on soils from the Havieron proposed amendment.

It is considered that all conditions relating to the design, construction and operation of mine dewatering and hypersaline evaporation ponds can be managed by DWER through Part V approves under the EP Act, and subsequent licensing of infrastructure. Operating licence L9455 is in place for existing early works evaporation cells, and it is proposed to vary this licence for future additional evaporation cells.

The proposed WRL 2 (for life of mine) may contain material which is PAF or have potential for metalliferous drainage, or saline leachate. However, problematic materials are in the minority and allowance has been made in WRL design so that these materials can be permanently encapsulated.

The Approved Proposal included the requirement for a Waste Rock Management Plan in Schedule 2. It is proposed that Schedule 2 is removed as Waste Rock Landforms are managed through the MDCP approved and administer by DMPE under the Mining Act. Both the Havieron and Telfer Projects have approved Mining Proposals which includes Waste Rock Landform management. Greatland has reviewed waste characterisation for WRD 1 and intend suitable competent rock to civil works given the absence of deleterious materials. This is

considered to be of net benefit for Terrestrial Environmental Quality by returning the landscape to a topography similar to pre-disturbance, and only WRL 2 remaining as a site closure feature.

The Telfer Waste Rock Management Plan operates in conjunction with the Mine Closure Plan and PAF Management Plan and consultation occurs as required when and if these plans are revised. A Havieron Waste Rock Management Plan will be developed which aligns with the standards implemented at Telfer.

Greatland have proposed to use TSF 8 or TSF 7 for the deposition of Havieron tailings. Use of TSF 7 will only be possible after completion of all works required to lift the Prohibition Notice and return TSF 7 to operational status. Regulation of this aspect is proposed to remain with DEMIRS and DWER, including any licence amendments required as part of lifting of the TSF 7 prohibition notice.

Mine closure plans are in place at both Telfer and Havieron are in place. The current Havieron Mine Closure Plan will be updated pending approval and final design that ensures all closure domains and actions align with Greatland's plans. An updated MCP will be submitted to DEMIRS for assessment prior to development that requires construction of WRL2. The program of progressive rehabilitation is the subject of current discussions with DEMIRS but does not detract from the success of the rehabilitation that has been completed and does not prejudice the granting of the Havieron proposed amendment.

It is considered that management of terrestrial environmental quality by DEMIRS under Mining Proposals and DWER under Prescribed Premises licences can sufficiently manage any environmental impact. Given the application of proposed mitigations to prevent land contamination or disbursement of deleterious materials, the Havieron proposed amendment will not result in a significant residual impact to Terrestrial Environmental Quality. Therefore, the Significant Amendment is expected to meet EPA's objective for Terrestrial Environmental Quality.

13. OFFSETS

This section outlines the biodiversity offset proposed due to the potential for significant residual impact to Night Parrot, and secondarily to Greater Bilby.

Carbon offsets for greenhouse gas emissions are not proposed at the outset, however it is acknowledged they may be required where an annual or temporary shortfall exists. This is discussed in 7.4.2.

13.1 RELEVANT POLICIES AND GUIDELINES

Table 13-1: Environmental offsets policy and guidelines

Environmental Factor	EPA and other State or Commonwealth policy or guidance	Consideration of policy and guidance
Environmental Factor Guideline: Terrestrial fauna	EPBC Act environmental offsets policy, DCCEE, 2012	Structure and calculation of the offset.
	Offsets Assessment Guide for use in determining offsets under the EPBC Act, DCCEE, 2012 (and associated 'how to guide')	Calculation of offset sufficiency and ecological gain.
	Environmental Offsets Guidelines, Government of WA, 2014	Comparison to ensure the use of the EPBC Act offset policy and calculator is equivalent to or exceeds WA requirements.

13.2 REASON FOR THE OFFSET

After application of all practicable mitigations to avoid, minimise and rehabilitate impacts to listed threatened species (Night Parrot and Greater Bilby), there is considered to be a significant residual impact due to:

- Clearing of 630 ha of habitat for Night Parrot and Greater Bilby
- Potential for indirect impacts on individual species from reduced habitat quality and access (dust, noise, light and fragmentation)
- Uncertainty on the Potential for direct loss of fauna due to vehicle strike (considered to be a plausible but low risk)
- Uncertainty around the ecology of Night Parrot meaning the impacts of the above cannot be ruled out.

A direct offset is therefore applied for the life of the development to ensure populations, and their supporting habitats are not unduly impacted at the local or regional level. This is outlined in Appendix zEE: Offset Management Plan and summarised in the below sections.

13.3 OFFSET TYPE AND LOCATION

13.3.1 OFFSET TYPE

A direct offset is proposed through a biodiversity package at a landscape scale, comprising two key benefit areas:

- Habitat protection and threat reduction in the Lake Waukarlycarly area of the Martu Indigenous Protection Area (IPA); and
- Social contribution through funding of a ranger style program to implement the biodiversity offset.

It is proposed to co-manage the offset with the Martu people through JYAC, with funding hypothecated for life of mine for Martu-lead aspects of caring for country, threat reduction, administration and support.

Offset calculations are provided in 13.3.3, with the main conservation gain to be achieved being:

- The increase of high-quality critical habitat for Greater Bilby and Night Parrot through weed and fire management and control of foraging herbivores
- Maintaining and enhancing the presence of high-quality unburned spinifex and chenopod scrubland preferred by Night Parrot for breeding and roosting; and
- Controlling feral predators to the level where they do not impede the successful breeding of the endemic population and encourage recruitment of breeding sub-adults into the area (noting that eradication is not an achievable goal given unrestricted movement from outside the IPA).

There is no proposed research component to the offset. However, implementation and monitoring of the offset does contribute to research as follows:

- Survey data is collected by qualified persons to recognised standards and are submitted to the WA Index of Biodiversity Surveys for Assessments (IBSA) database. IBSA biodiversity data is available to any research project or interested party and progressively builds the knowledge base; and
- For Night Parrot the incidental recordings by rangers make up most sightings in WA and is contributing to updated conservation advice (Table 1, draft Conservation Advice, 2023).

Whilst these contributions are considered extremely important in informing conservation advice and recovery programs, they do not meet the EPBC criteria for a research offset and are therefore not claimed as such.

13.3.2 OFFSET SELECTION AND LOCATION

The offset area comprises 3,200 ha within the Warla-Warrarn Martu IPA area of 2,191,044 ha. The selected area contains critical habitat for both Night Parrot and Greater Bilby located in and around the riparian zone of Lake Waukarlycarly.

Suitability is satisfied by: the known presence of Greater Bilby and likely presence of Night Parrot; critical habitat; and the presence of direct and indirect threats to the protected matters. This offers conservation opportunity.

Specialist surveys for Night Parrot are outlined in Table 13-2, with summary results as follows:

- Desktop habitat mapping identified 24,152-ha of nesting, roosting and foraging areas for Night Parrot. This assessment included consultation with Martu.
- Targeted Lake Waukarlycarly survey for Night Parrot identified 658.8 ha of potential roosting and/or nesting habitat, and 23,513.18 ha of potential foraging habitat within the study area. 842 acoustic recorder sampling nights did not detect any Night Parrot.

Table 13-2: Offset area surveys

Survey	Survey Type	Survey details
Desktop assessment for Lake Waukalicauli, Biologic, 2022 Appendix zFF	Desktop Assessment	• Desktop review of previous Night Parrot records • Habitat mapping on a 1:20,000 scale by Night Parrot specialist Nigel Jackett.
Lake Waukalicauli Targeted Night Parrot Assessment, Biologic, July 2023 Appendix zGG	Targeted survey for Night Parrot, building upon the desktop review	• Study area comprised 357,714 ha. • Field survey 16 - 20 January 2023 and 14 – 15 February 2023 • 31 motion cameras 26-28 consecutive nights (842 camera trap nights) • 21 acoustic recorders for 29 consecutive nights (456 recording nights)

Whilst no Night Parrot were identified, given the known presence in the region, including at sites within 100 km of the survey area, it is possible, and perhaps probable that Night Parrot do occur within the survey area (Leseberg, 2023 as referenced in Attachment zFF).

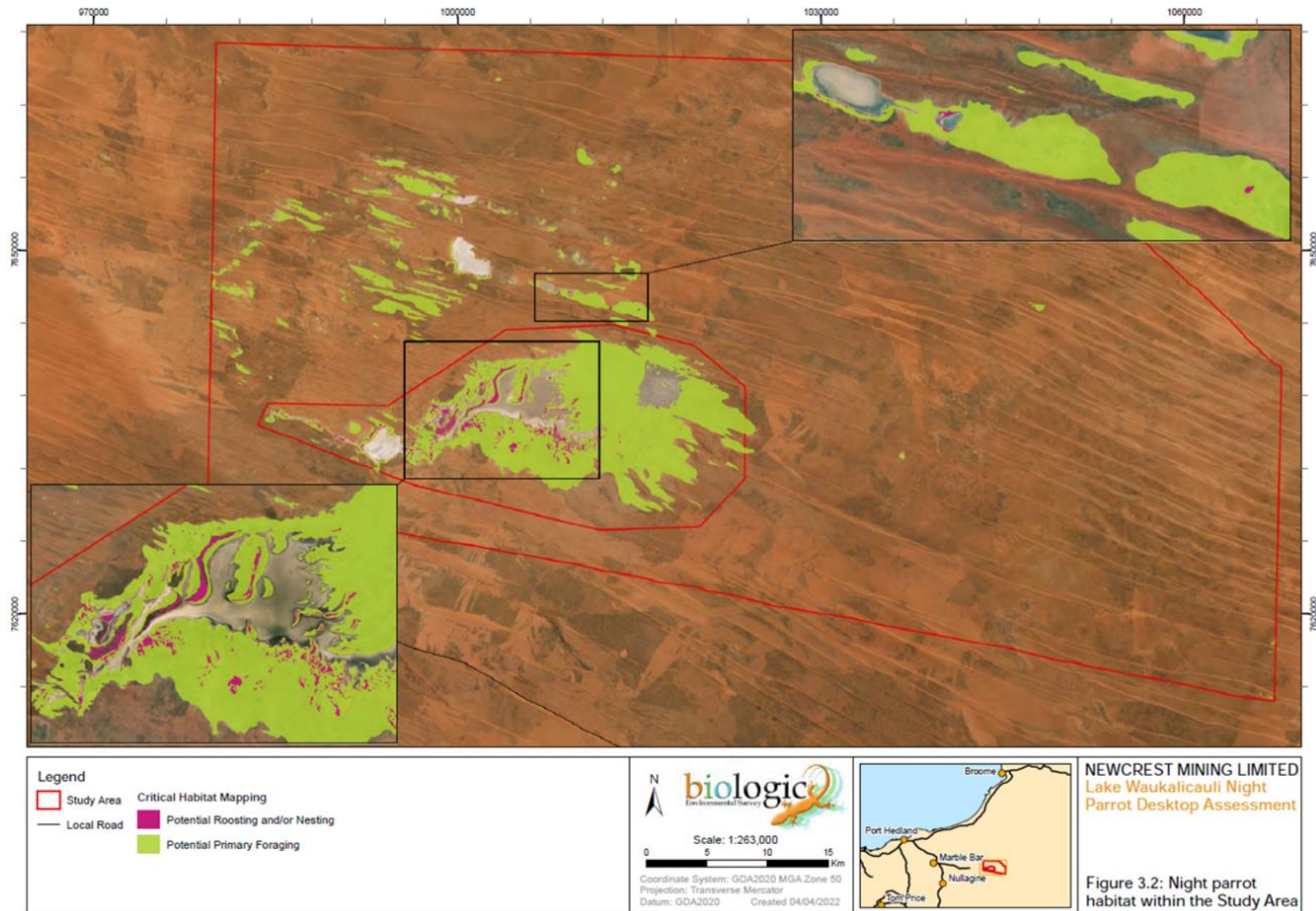


Figure 13-1: Night Parrot habitat assessment in proposed offset area (Biologic, 2022)

The Lake Waukarlycarly IPA area is subjected to current threats to MNES and their habitat as evidenced by the following:

- Works on country and surveys⁴¹ as part of the Martu IPA Management Plan note the presence of Greater Bilby and the potential presence of Night Parrot (refer [IPA-booklet.pdf](#) accessed 18/01/2025 and added to the OMP in Attachment zEE). Martu also confirm the presence of threats, including feral animals, altered fire regimes, and habitat degradation meaning the area offers an opportunity for improved habitat quality and population increase.
- Cat, fox, dog/dingo, and camel were identified by camera trap during targeted survey (Biologic, 2023, Attachment zGG) and represent a direct and indirect threat to Night Parrot and Greater Bilby.
- Exploration over the Lake Waukarlycarly area from 1995 comprises access tracks, drilling, surface sampling and ground geophysics surveys (refer Figure 13-2). Whilst the extent and quality of rehabilitation has not verified, the offset area is not wholly undisturbed land thereby reducing the start quality.

⁴¹ Access to IPA surveys was not available for review, but the sharing of information will be formalised under the approved Offset Management Plan and associated land use agreement that will occur after project approvals.

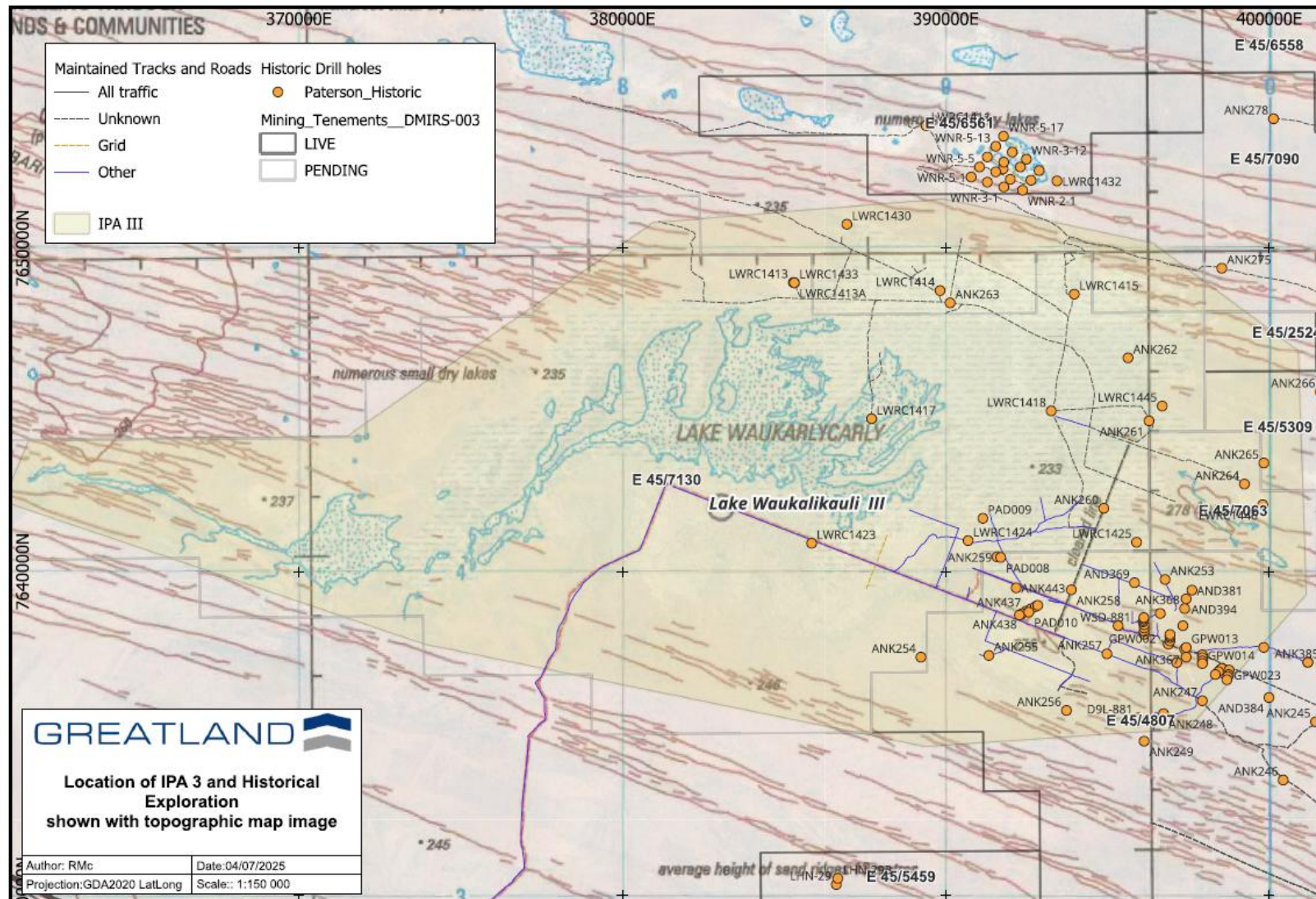


Figure 13-2: Historical exploration within proposed offset area

Lake Waukarlycarly is located 80km from Havieron. Whilst offset areas are normally close to the controlled action, Lake Waukarlycarly was selected for the following reasons:

- Surveyed habitat is comparable to those mapped within the Havieron Proposal area and has similar characteristics for vegetation structure and composition
- It is not fragmented from the Havieron Proposal area by roads or other developments and therefore contiguous with the proposed Controlled Action
- It is located in the same ancient drainage system that forms the Percival Paleovalley (refer Figure 13-3). Although a drainage divide does exist with water from Havieron flowing to the west the landscape is continuous from a habitat perspective
- It is the preferred location for the offset as selected by the Martu People and is of particularly high ecological and cultural value; and
- Locating the offset within the broader IPA allows for more efficient conservation effort when combined with existing IPA actions. Given the size of the IPA the offset funding by Greatland allows for expansion of conservation into areas currently unable to be managed (refer to 13.4.4.1 for discussion of non-duplication of IPA obligations).

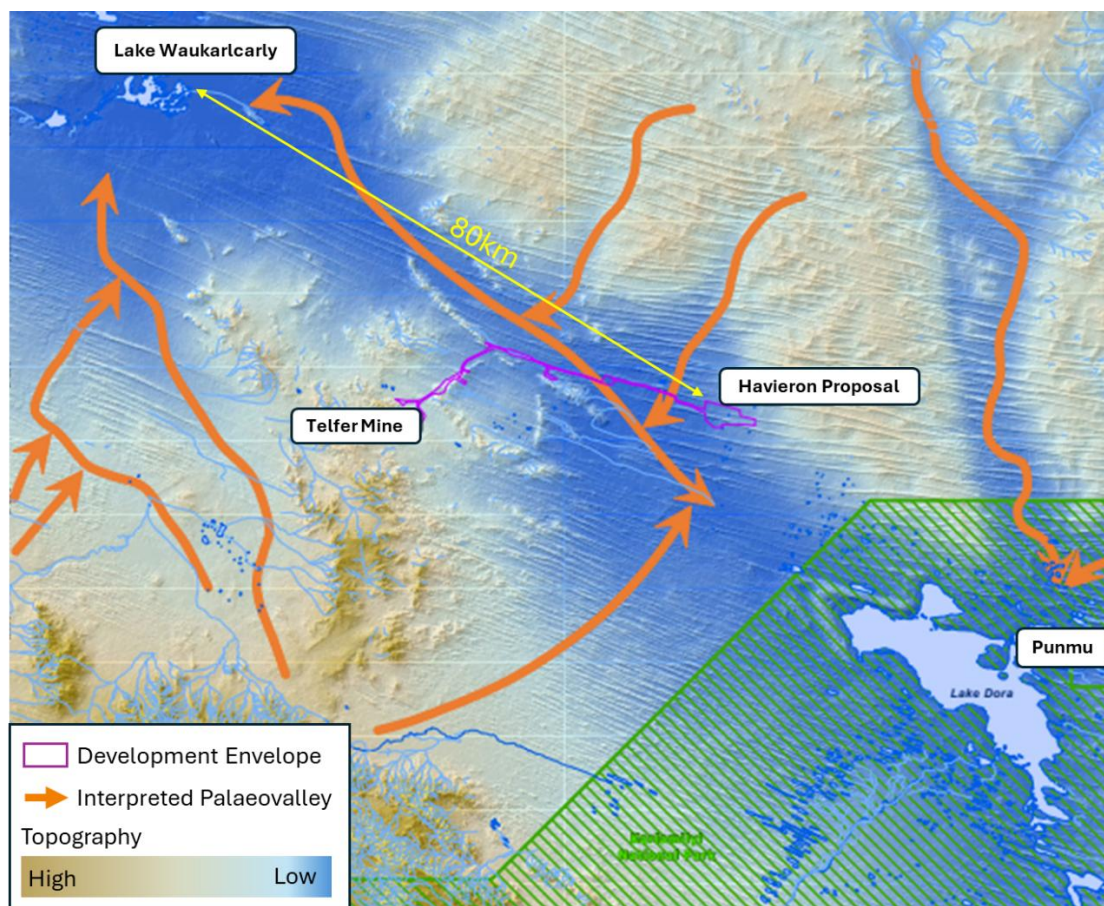


Figure 13-3: Regional and hydrogeological setting

13.3.3 OFFSET AREA TENURE

The Warla-Warrarn Martu Indigenous Protection Area (IPA 3), Lake Waukarlycarly proposed offset area is Unallocated Crown Land subject to the Martu native title determinations of 2002, 2013 and 2023, with most of the determination area being 'exclusive possession'. The area has existing exploration tenements as detailed in Table 13-3 and Figure 13-4.

Table 13-3: Proposal Tenure relevant to the proposed biodiversity Offset Area

Tenement	Tenement Holder	Commencement date	Area (ha)
E 45/4807	Rio Tinto Exploration Pty Limited Operated by Greatland Paterson South Pty Ltd	4/12/2017	25,513.167
	A 40% Compulsory Partial Surrender was completed on to ensure the protection of a heritage exclusion zone Lake Waukarlycarly (desktop heritage survey completed by Greatland and Martu)	1/12/2023	16,916.457 (excluded)
E 45/4834	Rio Tinto Exploration Pty Limited Operated by Greatland Paterson South Pty Ltd	1/05/2017	14,686.525

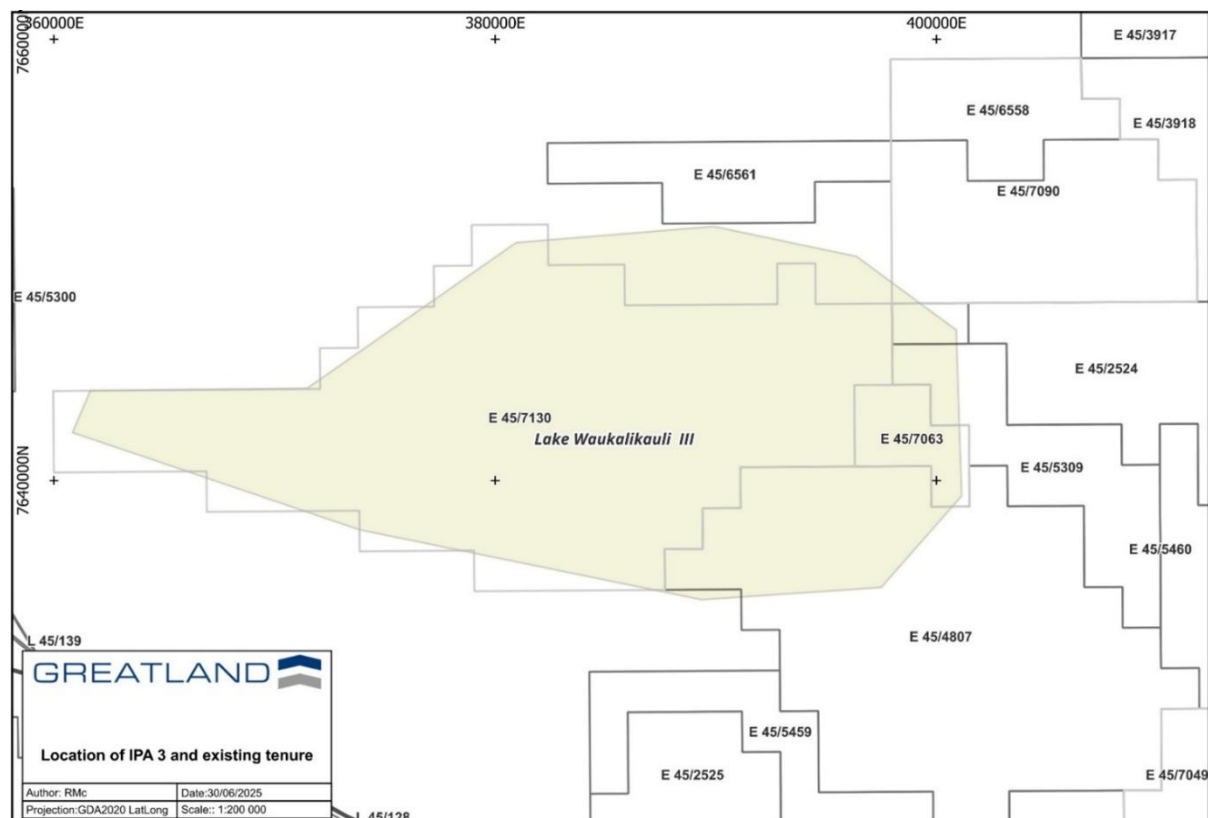


Figure 13-4: Proposed Offset area tenure

13.3.4 PROTECTION FROM RISK OF LOSS

Subject to approvals, the OMP will be formalised through an agreement between Greatland and JYAC. This provides the legal basis for utilising the IPA area for environmental offsets.

Greatland has received a letter of support and to “...offer security of access to the IPA3 for the purposes of the Havieron offset for the nominated life of mine” (refer Attachment zEE).

To ensure no other activity occurs within the offset area, Greatland has applied for tenement E45/7130 over a large section of the proposed offset area to protect it in the short term from loss to other mining parties. JYAC have stated in their letter of support (Attachment zEE)...

“While Martu hold exclusive possession native title over the determination area, we acknowledge the presence of existing exploration tenements within the IPA3. JYAC strongly objects to any proposed development within the IPA3 due to its cultural and ecological significance to Martu”.

Concurrently Greatland have made enquiries for suitable land tenure that would complement the proposed use for conservation purposes and exclude mining, however this remains a protracted and problematic pathway. Greatland have confidence that Martu exclusive Native Title over the land and the existence of the IPA3 offer suitable protections. Greatland may also make a request to the Minister for Mines for the creation of an area to be exempted from mining under Section 19 of the WA *Mining Act 1978*. This would protect the tenement from being surrendered due to non-activity.

With regards to active exploration in the proposed offset area and broader Paterson Province, Greatland has already relinquished some tenure and will continue to reduce its presence in heritage and adjacent areas. This includes surrender and partial surrender of Greatland operated Exploration Licences E45/4834 and E45/4807 respectively (both held in Joint Venture with Rio Tinto Exploration Pty Ltd).

13.3.5 OFFSET ASSESSMENT CALCULATIONS

Indicative offset calculations are provided in Table 13-4. This utilises the EPBC Offset Assessment Guide and is based on the proposed offset area and studies completed. Descriptors for attributes and impacts are provided following the table.

Table 13-4: Indicative Offset calculations

Attribute and Inputs	Night Parrot	Greater Bilby	Information source
Quality of the proposed 630 ha habitat to be cleared	10	10	Whilst there is some existing disturbance and fire scarring at Havieron, flora and vegetation surveys note all vegetation in Excellent condition except where cleared or recently burned (JBS&G, 2020 and 2021, citing condition scale from EPA 2016 guideline ⁴²).
Time over which loss is averted	13 years	13 years	Operational life of mine
Start quality (0 – 10)	7	7	Start quality is informed by the presence of ecosystem pressures: Feral cat, fox and dog/dingo recorded by camera trap resulting in direct predation; camels recorded by camera trap that can degrade habitat and compete for water and food (refer Attachment P). The Martu IPA Management Plan notes the presence of feral cat, fox, dog/dingo, camels, and buffel grass (added to OMP in Attachment zEE). The offset sits within the Paterson Province, known to have potential mineral resources. Exploration over the Lake Waukarlycarly area from 1995 comprises access tracks, drilling, surface sampling and ground geophysics surveys (refer Figure 13-2). Whilst the extent and quality of rehabilitation has not verified, the offset area is not wholly undisturbed land thereby reducing the start quality.
Future quality without offset (0 – 10)	5	5	Martu knowledge that has informed the IPA Management Plan lists the current threat levels to <i>ngurra</i> as follows: introduced predators 'very high'; weeds, inappropriate fire regimes 'high', and feral herbivores 'Medium' (added to OMP in Attachment zEE). Without the offset, risk of loss to exploration activity is increased. The IPA is extremely large, and current funding is not sufficient to undertake conservation activities over the entire area. Left unchecked the current threats will remain and likely escalate in threat level.

⁴² EPA (2016). Technical Guidance – Flora and Vegetation surveys for environmental impact assessment. Environmental Protection Authority.

Attribute and Inputs	Night Parrot	Greater Bilby	Information source
Future quality with offset (0 – 10)	8	9	The proposed focus on feral animal control, weed control, mosaic burning, and population monitoring aligns with the Recovery Plan for Greater Bilby 2023 and are actions known to deliver conservation gain. Future quality for Night Parrot is conservatively set slightly lower because no recovery plan exists that outlines targeted conservation actions and Night Parrot have more specialised habitat requirements. Nonetheless the offset actions are highly likely to deliver significant benefits.
Risk of future loss without offset	40%	40%	Presence of exploration tenements over the proposed offset area (refer Figure 13-4). The risk of loss without offset would be higher, however Martu have confirmed they would strongly object to any proposed developing on the offset area (refer letter of support). Risk of loss is therefore confined to exploration disturbance, should JYAC accept an application, with no prospect of future mining.
Risk of future loss with offset	0%	0%	The offset is on Martu exclusive possession Native Title land and within the IPA3 area. JYAC have stated in writing (letter of support addended to the OMP, Appendix zEE) that they will object to all applications for mining activities. Suitable other tenure may be sought by Greatland if required through the Department of Planning, Lands and Heritage (DPLH) to further ensure no mining activities can occur.
Time until ecological benefit	5 years	3 years	<i>Night Parrot</i> True time to ecological benefit for Night Parrot is difficult given population uncertainty. Leseberg, 2023 used expert elicitation to conclude “<i>Field research on the Night Parrot has only been possible since 2013. Because the species is extremely cryptic and genuinely rare, obtaining data and knowledge required to confidently implement conservation management strategies will take years, and probably decades.</i>” However, targeted Night Parrot survey for the offset identified suitable critical habitat and considered it likely they would occur (Attachment zGG). Immediate benefits would occur to individual present through feral species control and removal of camel that degrade habitat and compete for food and water. In addition, the preference but not definite need for old spinifex and varying growth rates in arid areas means no time-based metric can be put on achieving suitable nesting and

Attribute and Inputs	Night Parrot	Greater Bilby	Information source
			roosting habitat (refer references noted under 'Time to ecological benefit'). References for this statement are: - The DPaW guideline 2017⁴³ notes that old and large spinifex clumps (often >50 years unburned) are primarily used by Night Parrot to roost and nest, especially hummocks that are ring-forming. However, DBCA (2024) guidelines note that there is no known minimum extent of <i>Triodia</i> expanse that would prohibit establishing a roost so long as the plant is structurally suitable⁴⁴. - True age of vegetation in desert regions, including <i>Triodia</i> grasslands, is difficult to ascertain as growth rates are highly variable and heavily influenced by rainfall, moisture, soil fertility and temperature (Bogusiak <i>et al.</i>, 1990; Casson & Fox, 1987; Gibson <i>et al.</i>, 2016; Wright <i>et al.</i>, 2014). Given these uncertainties, and the more specialised habitat requirements, time to ecological gain is considered slightly higher than that for Greater Bilby. <i>Greater Bilby</i> Immediate benefits are provided through feral species control. Greater Bilby have a flexible ecology and known to respond quickly to resource availability. Three years has been selected based on local experience validated by survey. Within the Havieron Development envelope, post-fire regeneration can occur with three years to the extent that it provides critical habitat for Greater Bilby (Biologic, 2022. Attachment K). Given Greater Bilby flexibility the time to ecological benefit is likely to be shorter, however no definitive references could be offered.
Confidence in result	70%	90%	Programs implemented for feral species control provide high and immediate gain and the benefits are well recognised. The benefits of controlled burns to enhance foraging opportunities and promote regeneration and seeding is known for Bilby (Response Plan 2023 citing Southgate &

⁴³ DPaW *Interim guideline for preliminary surveys of night parrot (Pezoporus occidentalis) in Western Australia*, 2017.

⁴⁴ DBCA Guidelines for determining the likely presence and habitat usage of night parrot (*Pezoporus occidentalis*) in Western Australia, Version 1.0, March 2024

Attribute and Inputs	Night Parrot	Greater Bilby	Information source
			Carthew 2006; Southgate & Carthew, 2007). Ngururrpa Rangers <i>et al.</i> (2024) suggest that strategic (traditional) burning can help preserve <i>Triodia</i> patches, thereby protecting and enhancing night parrot habitat. The confidence in result is decreased for Night Parrot simply due to the paucity of suitable research into the specific ecological needs of Night Parrot and the absence of a recovery plan defining targeted conservation activities. Greatland consider the confidence to be higher in practice, however no definitive reference could be offered.
Total Proposed offset area	3,200 ha	3,200 ha	The selected riparian zone around Lake Waukarlycarly provides the highest level of ecological services to both Night Parrot and Greater Bilby due to the presence of suitable critical habitat and the proximity to water.
Net present value (adjusted ha)	594.95 ha	1,571.01 ha	Calculated figure from EPBC Offsets assessment guide
% of impact offset (minimum required is 90%)	94.44%	249.37%	Calculated figure from EPBC Offsets assessment guide

13.4 OFFSET ACTIONS AND ADAPTIVE MANAGEMENT

13.4.1 CONSERVATION OBJECTIVES

Objectives for the offset align with conservation advice and are intended to contribute to national recovery efforts for the Greater Bilby. They apply for the period of the offset.

The offset objectives are:

- The monitored number of Greater Bilby and Night Parrot detections increase from baseline surveys (noting quantification for Night Parrot cannot be assured due to its cryptic nature)
- The extent, connectivity and quality of critical habitat within the offset area is increased from baseline surveys
- The genetic diversity in Greater Bilby is maintained or increased from baseline levels
- Martu Traditional Owners lead conservation efforts and the number of Martu involved in conservation and formal conservation training is expanded.

13.4.2 CONSERVATION ACTIONS

Conservation actions will comprise the following key focus areas:

- Weed control
- Feral animal control informed by Commonwealth Threat Abatement Plans for cats and fox, and the National Plan for Feral Camels
- Fire management to minimise encroachment by vegetation⁴⁵
- Revegetation and rehabilitation
- Threatened species mapping
- Monitoring feral animal and invasive species
- Re-introduction of traditional land management activities
- Undertake monitoring of progress against annual area-specific objectives and baseline.

Alignment of actions with conservation advice is provided in Section 14.4.

13.4.3 PERFORMANCE CRITERIA

Due to the size of the offset area and potential for conservation ‘frontline’ areas to move with ecosystem and species changes, completion criteria is established annually for each area. This forms a key part of the adaptive management framework that governs the offset, as outlined in 13.4.4.

Conservation gain against criteria is reviewed annually as part of the process shown in Figure 13-5. This ensures conservation gain is achieved at the required rate, or offset actions are adapted accordingly.

⁴⁵ Night parrot roosting and nesting occurs in clumps of *Triodia* within open areas that act as natural fire breaks (Murphy et al., 2017)

13.4.4 ANNUAL WORK PLANNING AND ADAPTIVE MANAGEMENT

An adaptive management framework applies to the offset in recognition of ecological uncertainty and the dynamic nature of threats. The process is outlined in Figure 13-5, and ensures:

- Offset actions are based on sound science and Traditional Owner knowledge, and suitably flexible to address changing or emerging threats
- Emerging or escalating threats, or changes to Commonwealth threat abatement plans can be responded to in a swift and agreed manner
- Where science or knowledge is insufficient actions can be agreed (e.g. commissioning additional surveys, expanding acoustic monitoring)
- Actions and strategies can be adapted as conservation advice changes or species knowledge increases
- Stakeholders can see and, where relevant, be involved in the development and refinement of actions for conservation gain.

In a practical sense the output of the adaptive management framework is the **Annual Work Plan**. This is a collaborative and iterative process year on year.

The key steps are governed by the existing ILUA Relationship Committee established between Greatland and JYAC:

- 1 Establish specific annual objectives informed by results, emerging science, changes to conservation advice, Martu knowledge, and threats (e.g. cats, foxes, weeds)
- 2 Establish the target area where greatest conservation gain is likely
- 3 Establish the baseline and SMARTER targets to address key threats
- 4 Monitor implementation
- 5 Review progress against objectives. This is proposed to include periodic re-survey to quantify conservation gain.
- 6 EPBC Act Annual Compliance Report including offset performance.

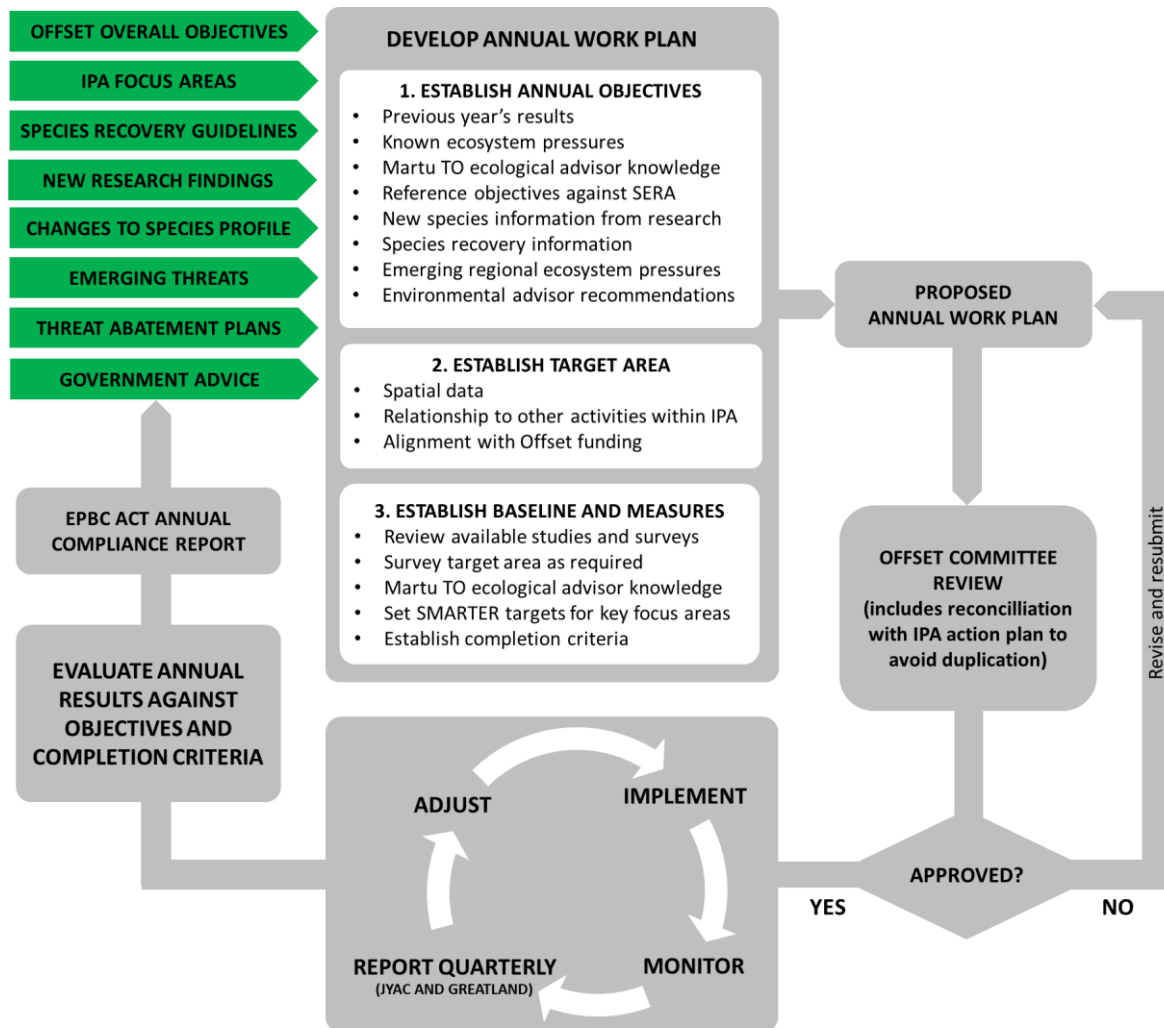


Figure 13-5: Offset Adaptive Management framework

Refinement of activities will occur as the Offset Management Plan progresses and adapts to achieve annual and overall objectives. Detailed performance and completion criteria will be outlined in each Annual Work Plan however they may include the following:

- No increase in weed species or coverage from baseline measurements
- No increase in feral animals from baseline measurements (particularly feral cat)
- No unplanned fire events burning uncontrollably
- No decrease in dimensions of mature spinifex from baseline measurements
- No decrease in critical habitat areas from baseline surveys.

Greatland recognises and respects that the Traditional Owners have well defined threatened species protection strategies, and extensive experience and skills in a range of monitoring, protection and management activities. A Martu-lead program is considered integral to the success of the offset for the life of the project.

13.4.4.1 ACTIONS OVER AND ABOVE EXISTING IPA COMMITMENTS

Actions under the offset must be over and above existing IPA obligations for which Martu receive Commonwealth funding. This is assured by the following:

- Annual Work Plan for the offset includes reconciliation with the IPA work plan to ensure no overlap of area (refer Figure 13-5)
- Annual EPBC Act Compliance report and IPA 5-yearly activity report provide documented evidence that actions are not duplicated.

The IPA is extremely large. The volume of activities through the offset partnership allows for greater conservation gain than would otherwise be possible. To indicate the magnitude of the conservation required for the full IPA a hypothetical offset assessment calculation utilising the full 24,152 ha of mapped critical habitat within the IPA (i.e. the conservation opportunity) returned a ratio of 758:1. Offset funding from Greatland will significantly enhance conservation efforts that would not otherwise be possible.

13.4.5 PROPOSED TIMEFRAME FOR OFFSET MANAGEMENT AND MONITORING ACTIVITIES

The proposed timeframe for management and monitoring activities has been developed with JYAC and is shown in Table 13-5.

It is also acknowledged that monitoring and control methods may change over time. The adaptive management framework outlined in Figure 13-5 applies to all management and monitoring activities to ensure conservation gain is achieved in line with the offset objectives.

Table 13-5: Proposed timeframe for offset management and monitoring activities

Task	Description	Timeframe (indicative)
Regional Survey	Additional regional surveys to further inform Night Parrot and Greater Bilby populations and ongoing offset activities.	Years: 1-2
Feral Predator Monitoring Program	Establishment of 2 years of baseline data and then ongoing monitoring of feral predators. The objective of the Feral Predator Monitoring Program is to inform the effectiveness of the method and intensity of the Feral Predator Control Program and to inform adaptive management, including • Undertake baseline monitoring of feral predator numbers prior to the implementation of feral predator control • Undertake ongoing monitoring of feral predator numbers after the implementation of feral predator control to evaluate the effectiveness and inform adaptive management; and • Provide opportunities for direct engagement of Martu rangers, allowing opportunities for knowledge sharing and connection to country.	Years: 3-4: Baseline data Years: 5+ Ongoing Monitoring
Threatened Fauna Monitoring program	Establishment of 2 years of baseline data and then and ongoing monitoring of threatened fauna. The objective of the Threatened Fauna Monitoring Program is to evaluate the effectiveness of feral predator control undertaken in the Feral Predator Control Program on the persistence and potential recovery of the Night Parrot and Greater Bilby within the region in the Offset Area. To address this objective the following will be undertaken: • Monitor changes in population abundance over time compared to abundance of feral predators • Monitor the movement of individuals in the landscape in response to resources and environmental factors; and • Provide opportunities for direct engagement of Martu rangers, allowing opportunities for knowledge sharing and connection to country.	Years: 3-4: Baseline data Years: 5+ Ongoing Monitoring
Feral Predator Control Program	Implementation of the feral predator control. The objective of the Feral Predator Control Program is to reduce the existing threat of feral predators to the Night Parrot and Greater Bilby within the Offset Area for the life of the Project. • Ongoing control of feral predators within the offset area • Targeted approach for feral predator control in proximity to known significant fauna populations; and • Provide opportunities for direct engagement of Martu rangers, allowing opportunities for knowledge sharing and connection to country.	Years: 5+

Task	Description	Timeframe (indicative)
Invasive Weed Monitoring Program	Establishment of 2 years of baseline data and then ongoing monitoring of feral predators. The objective of the Invasive Weed Species Program is to monitor weed presence within the Offset Area, including: • Ongoing monitoring of invasive weed species within the Offset Area; and • Provide opportunities for direct engagement of Martu rangers, allowing opportunities for knowledge sharing and connection to country.	Years: 3-4: Baseline data Years: 5+ Ongoing Monitoring
Invasive Weed Control Program	Implementation of the invasive weed control. The objective of the Invasive Weed Species Program is to control weed presence within the Offset Area, including: • Ongoing control of invasive weed species within the Offset Area • Targeted approach for invasive weed species control in proximity to known significant fauna populations; and • Provide opportunities for direct engagement of Martu rangers, allowing opportunities for knowledge sharing and connection to country.	Years: 5+
Regional Fire Management	Strategy to be determined in consultation with Martu Rangers	Year 3+ ongoing as required

14. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

14.1 SUMMARY OF LISTED THREATENED SPECIES AND ECOLOGICAL COMMUNITIES (EPBC ACT S.18 AND 18A)

The following EPBC listed threatened species were determined through surveys to be present within the Development Envelope for the Havieron significant amendment:

- Greater bilby *Macrotis lagotis* – Vulnerable
- Night parrot *Pezoporus occidentalis* – Endangered

All details of surveys, results, assessment and mitigations are provided in Section 6.

EPBC listed species not identified during surveys but with the potential to be recorded are:

- Great desert skink *Liopholis kintorei* – Vulnerable
- Red goshawk *Erythrorhynchus radiatus* – Endangered
- Princess parrot *Polytelis alexandrae* – Vulnerable
- Red knot *Calidris canutus* – Endangered / Migratory
- Curlew sandpiper *Calidris ferruginea* – Critically endangered / Migratory

There are no EPBC listed threatened ecological communities present on the Havieron Project area.

14.2 EPBC ACT REFERRAL OF THE SIGNIFICANT AMENDMENT

The Significant Amendment was referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) in and was determined to be a Controlled Action (2021/9085) on 21 December 2021 due to the presence of listed threatened fauna species. After consideration of the submission, DCCEEW determined on 5 July 2022 to assess by preliminary documentation, and a request for further information was issued on 10 August 2022.

On 23 December 2024 a variation to the Proposed Action was approved. This was necessitated by: the administrative alignment of the development envelope to relevant tenements and the WA EPA referral; to reflect changes in surface infrastructure required to support safe mining; and to remove areas disturbed as part of early works from the proposed action. A revised package of documentation was submitted, and assessment of the Significant Amendment under the EPBC Act is happening concurrent with WA EPA referral assessment.

14.3 SIGNIFICANT IMPACT ASSESSMENT FOR MNES

Significant impacts on MNES have been assessed in accordance with the EPBC MNES Significant Impact Guidelines 1.1, 2013 (accessed December 2024).

Assessment against each criterion relevant to the status of the species has been made. Where uncertainty exists a precautionary approach is applied (i.e. in the absence of data or information a significant impact could potentially occur).

Assessment against the relevant stated criteria for determining if an action is likely to have a significant impact is provided in the following tables:

Significant impact assessment for Night Parrot against the criteria for endangered species is provided in Table 14-1.

The proposal triggered 'significant impact' against four of the nine criteria largely due to ecological uncertainty around Night Parrot, which limits equivocal assessment. An offset is proposed (refer Section 13).

Significant impact assessment for Greater Bilby against the criteria for vulnerable species is provided in Table 14-2.

The proposal triggered 'significant impact' against three of the nine for any criterion. An offset is proposed (refer Section 13).

Significant impact assessment for migratory species listed in s.20 is provided in Table 14-3.

The proposal did not trigger 'significant impact' for any criterion. Two migratory species were identified by call (Red Knott and Gull-Billed Tern) but do not use Havieron at any stage of their life cycle (transiting visits only). Assessment is included due to the proposed construction and operation of evaporation ponds.

Table 14-1: Significant impact assessment for listed critically endangered species (Night Parrot) s.18

Significant impact criteria for critically endangered species (Night Parrot)	Assessment	Reason for assessment
Lead to a long-term decrease in the size of a population	No significant impact	Based on specialist review (Leseberg, 2025) a persistent population of Night Parrot is unlikely to occur within the Development Envelope given the absence of critical nesting and only 7.7 ha of roosting habitat, with the area only utilised from time to time for foraging. Given the expansive availability of suitable habitat to the southeast, the proposed clearance of 630 ha is insignificant.
Reduce the area of occupancy of the species	Potential significant impact	Whilst extremely small in scale, land clearance of 630 ha prevents that area from progressing to future critical breeding habitat and future extension of range.
Fragment an existing population into two or more populations	Potential significant impact	The proposal includes 630 ha of land clearance and construction of 55km haul road and services corridor. Because there is uncertainty about the existence of other sub-populations in the regions an impact could occur. Whilst the area has been assessed as not having suitable breeding habitat to support a persistent population, utilisation for foraging is unknown. This criterion will be reassessed after completion of a 2-year acoustic monitoring program to detect night parrot at the landscape scale.
Adversely affect habitat critical to the survival of a species	No significant impact	Night Parrot critical habitat is known to exist both at a local level and regional scale, within other areas of northern WA. Nine recordings have been made in the region since 1967 (within 250 km of Lake Waukarlycarly, refer Appendix zFF, Table 3.1). Survival of the species is not at risk from the small scale of foraging and flyway habitat proposed for clearance and the availability of preferred habitat to the southeast of Havieron.
Disrupt the breeding cycle of a population	No significant impact	A Night Parrot breeding population does not persist at Havieron and there are no permanent water sources. Activities within the Development Envelope are unlikely to affect the breeding cycle of Night Parrot who are more likely to persist in more suitable habitat within the Percival paleo drainage channel 40km to the southeast of Havieron (Leseberg, 2025).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No significant impact	Uncertainty exists regarding the species habitat utilisation however the Havieron Proposal is considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitats to the extent that the species is likely to decline, given:

Significant impact criteria for critically endangered species (Night Parrot)	Assessment	Reason for assessment
		• Small scale of the proposed land clearance • Wide expanse of suitable habitat for the Night Parrot in the surrounding region • Proposed direct mitigations for controlling dust, noise, vibration and light • Containment of hypersaline mine water in lined evaporation ponds monitored in real time • Net benefit to naturally occurring fires through monitoring and early containment measures • No proposed use of cyanide or other large-scale use of environmentally hazardous substances at the proposed Havieron Mine (mining, crushing and stockpiling only).
Result in invasive species that are harmful to critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No significant impact	Cats and foxes pose an active threat to Night Parrot populations but are already resident within the Great Sandy Desert. The application of active control measures is considered to provide net benefit to controlling cats and foxes in the region.
Introduce disease that may cause the species to decline	No significant impact	Introduction of disease that may affect the Night Parrot is not a risk associated with implementation of the Proposal. No animals will be introduced that may act as vectors for disease spread. Introduced species will be managed through Outcomes in the Significant Species Management Plan (Appendix J).
Interfere with the recovery of the species	No significant impact	No critical breeding habitat is present within the Development Envelope. The small-scale nature of clearing will occur within a homogenous landscape with expansive available foraging habitat and preferably breeding and roosting habitat to the southeast. With the implementation of proposed mitigation measures land clearance and operations are considered unlikely to interfere substantially with the recovery of the species.

Table 14-2: Significant impact assessment for listed vulnerable species (Greater Bilby) s.18

Significant impact criteria for endangered species (Greater Bilby)	Assessment	Reason for assessment
Lead to a long-term decrease in the size of an important population of the species	Potential significant impact	The reduction of available habitat is considered unlikely to decrease the size of the population due to the available contiguous habitat and highly mobile nature of Greater Bilby. However, vehicle strikes whilst also considered unlikely, could occur. Vehicle incident data for the long-term Telfer Mine has recorded one Greater Bilby death (reported to DBCA in 2020).
Reduce the area of occupancy of an important population	Potential significant impact	Whilst extremely small in scale, land clearance of 630 ha would occur reducing the occupancy of that area.
Fragment an existing important population into two or more populations	Potential significant impact	The proposal includes 630 ha of land clearance and construction of 50km haul road and services corridor that could fragment the local population. The risk of habitat fragmentation is considered low for the following reasons: • Sufficient continuous habitat is present locally to allow for movement and interactions. • Design utilises 43 km of existing disturbance and includes culverts and eco-ducts. • Low risk of altering fire regimes given on mine mitigations and emergency response capabilities. However, local and regional fires have occurred from natural causes and could fragment Greater Bilby habitats. The proposed fire mitigation measures are considered a net benefit for the region through early detection and containment of natural fires.
Adversely affect habitat critical to the survival of a species	No significant impact	Survival of Greater Bilby is not considered to be affected given the small scale of proposed habitat clearance, available contiguous habitat locally and regionally, and highly mobile species profile.
Disrupt the breeding cycle of an important population	No significant impact	Genotyping of scats following the methodology of Southgate (2005) found individuals of various age classes currently occur within the proposed Development Envelope, with evidence of all three age classes (i.e. large male, female/small male and immature). Proposal activities may disrupt population dynamics on a local scale, but are unlikely to disrupt breeding activities on a regional scale and significant impact is not considered to occur because:

Significant impact criteria for endangered species (Greater Bilby)	Assessment	Reason for assessment
		- Pre-clearance surveys for active dens, and implementation of a bilby relocation process in accordance with DBCA guidelines will be undertaken. - Greater Bilby can breed are polyoestrous (more than one oestrous cycle in a year) with potential to produce four litters annually (Southgate et al., 2000).
Modify, destroy, remove, isolate or decrease the availability or quality of habitats to the extent that the species is likely to decline	No significant impact	Proposed Havieron land clearance is small scale and indirect impacts to the quality of habitats is highly unlikely to lead to species decline for the following reasons: - Small scale of the proposed land clearance - Contiguous available habitat available and highly mobile species profile - Proposed direct mitigations for controlling dust, noise, vibration and light - Containment of hypersaline mine water in lined evaporation ponds monitored in real time - Net benefit to naturally occurring fires through monitoring and early containment measures - No proposed use of cyanide or other large-scale use of environmentally hazardous substances at the proposed Havieron Mine (mining, crushing and stockpiling only). The coexistence of Greater Bilby is evident through the increased detections during targeted survey in 2022 from baseline despite early works activities onsite.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	No significant impact	Cats and foxes pose an active threat to Greater Bilby populations but are already resident within the Great Sandy Desert. The application of active control measures are considered to be of net benefit to controlling cats and foxes in the region (managed through stated outcomes in the Significant Species Management Plan, Appendix J)
Introduce disease that may cause the species to decline	No significant impact	Introduction of disease that may affect the Greater Bilby is not a risk associated with implementation of the Proposal. No animals will be introduced that may act as vectors for disease spread.
Interfere substantially with the recovery of the species	No significant impact	The small-scale nature of clearing associated with the Indicative Footprint within continuous habitat and the implementation of proposed mitigation measures are considered unlikely to interfere substantially with the recovery of the species. Greater Bilby are highly mobile and utilise habitat based on resource availability. Rehabilitation post-mining will restore habitat.

Table 14-3: Significant impact assessment for listed migratory species s.20

Significant impact criteria for listed migratory species	Assessment	Reason for assessment
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	No significant impact	- The Havieron Proposal does not constitute an important habitat for migratory species at any stage in their life cycle due to the absence of permanent waterways, salt lakes or wetlands. - It is highly unlikely that the proposed 28 ha of evaporation pond area for mine dewater (bringing the total pond area to 46.8 ha) will become important habitat because: - Evaporation ponds will not establish a self-sustaining wetlands type habitat due to the hyper salinity of mine water - There has been no recorded utilisation by migratory birds of an existing 28 ha of evaporation ponds for that have been in operation and monitored daily since 2022 (the progressive construction of three pond cells was completed in 2023). - Regional salt lakes (e.g. Lake Dora, ~35 km SE of the study area) are likely to be preferred and even then, visitation considered to be opportunistic while transiting (Biologic, 2020). - Claypan with the Development Envelope may provide suitable habitat for migratory birds however, the value and extent of species' occurrence would be seasonal, following high rainfall events when the habitat is most likely to be inundated. These species would be expected to be absent at all other times, particularly as they remain dry for a large portion of the year (Biologic, 2020). They are therefore not considered important habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	No significant impact	- The Havieron Proposal does not constitute an important habitat for migratory species at any stage in their life cycle (reasons stated above). - The nearest available area that could provide important habitat to migratory birds is 35km away at Lake Dora. Any invasive species incursions within the Development Envelope are unlikely to spread given the actions to detect and control these (noting similar actions at the existing long-term Telfer Mine have been successful).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	No significant impact	The site is not used by migratory birds and not likely to become important habitat (reason stated above) and will therefore not impact an ecologically significant proportion of the population.

Significant impact criteria for listed migratory species	Assessment	Reason for assessment
		• Transitory utilisation of evaporation ponds for rest and foraging does not pose a toxicity risk to migratory birds for the following reasons: • Contained water is hypersaline, ranging from 11,700 to 150,000 TDS (ocean salinity is approximately 35,000 TDS) and is a neutral pH (ranging from 7.4 to 7.9 pH) and monthly water sampling shows no risk of toxicity from heavy metals or hydrocarbons • No process chemicals are added to the pond and only periodic use of additives to underground water to prevent pumping line blockages. • Inundated saltpan and claypan (the only available suitable habitat) is limited onsite and is not currently used by migratory birds, and therefore will not impact an ecologically significant proportion of the population (again noting the preferential use of salt lakes in the area as stated above).

14.4 ALIGNMENT WITH CONSERVATION ADVICE FOR MNES

Alignment of the Significant Amendment with recovery plans and threat abatement plans occurs through design and ongoing operational mitigation measures to address the specified conservation priorities. Conservation advice is also a key input to actions proposed to be undertaken as part of the offset.

14.4.1 NIGHT PARROT

Specific alignment of the proposal to Night Parrot conservation advice is provided in Table 14-4. This assessment is to the 2016 advice available at:

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/59350-conservation-advice-15072016.pdf>

It is noted that a review of conservation advice for Night Parrot is underway. Once issued, any impacts to activity mitigations or offset actions will be reviewed and the plans revised accordingly. The adaptive management framework that feeds Offset annual work planning will ensure updated conservation advice is included in on ground actions for continued conservation gain.

There is no recovery plan for Night Parrot.

Table 14-4: Alignment with current Night Parrot conservation advice

Priority	Priority action for Night Parrot conservation	Proposal alignment
Invasive Species impacts (including from grazing, trampling, predation)	Monitor for fox activity in localities where night parrots are known or likely to occur and control foxes using shooting, baiting, trapping and other population management measures.	Feral animal control programmes will be undertaken for life of mine to minimise predation impacts in line with threat abatement plans for cat and European Red Fox. This includes mechanical trapping and selective approved baiting (e.g. grooming cat traps) and other animal controls as required. The Offset Management Plan (Attachment zEE) provides for feral animal control in collaboration with the Traditional Owners. Effectiveness will be measured through current and ongoing monitoring of baseline populations of feral species, noting that these can change significantly due to non-mine related factors such as weather.
	Monitor for cat activity (tracking, searching for sign, and camera traps) near roosting habitat known or suspected of being occupied by night parrots and undertake: - Assessing/profiling of individual cats in the vicinity of night parrots to gauge whether they pose a threat to the species. Cats that do not overlap with the microhabitat areas used by night parrots may pose limited risk, whereas removing them could encourage new cats, with more risky hunting behaviours, to immigrate into the vacancy (Murphy et al. 2023). - Targeted removal of cats near the roosting habitat using traditional hunting or grooming traps or other emergent technologies, and - If knowledge about local cat immigration and movement is known and suggests that cat control is beneficial, apply continuous cat suppression (such as shooting and baiting) in the surrounding area.	
	Avoid the introduction or intensification of grazing by domestic stock in habitats likely to be used by night parrots.	
	Avoid the establishment 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 and, where relevant, consider grazing as a management tool for buffel grass.	
	Monitor for feral herbivore (feral goats, camels, donkeys, horses, pigs, and rabbits) activity in localities where night parrots are known or likely to occur and develop sustainable control plans for these species through shooting, baiting, trapping, and other population control methods, especially post-fire	
	Conduct localised buffel grass control using an adaptive management approach through potentially relevant options (i.e. mechanical and chemical methods) in known or likely night parrot habitat, ensuring methods do not negatively affect night parrots.	

Priority	Priority action for Night Parrot conservation	Proposal alignment
		control program will be implemented and address any future incursions.
Habitat loss, disturbance and modification impacts	Avoid changes to land management in areas known to be used by night parrots.	Habitat for Night Parrot is classified as flyways, with no critical nesting or roosting present within the Development Envelope. Land clearance is minimised to a maximum of 630 ha for the development of the Havieron Mine. This occurs within an expansive and homogenous landscape, with extensive preferred habitat to the southeast.
	Support land managers to covenant or otherwise increase the security of conservation management of areas known to be used by night parrots.	Not relevant to the Havieron Mine area. Land security for the proposed Havieron Offset area is provided through the existence of exclusive possession Native Title held by Martu, and the IPA 3 established over the area.
	Avoid the extent of fencing in areas likely to be used by night parrots. Where fencing cannot be removed in areas likely to be used by night parrots, avoid the use of barbed wire, convert the top wire to plain and floppy and run flagging on remaining wires.	Fencing only occurs around accommodation facilities and created water bodies. There is no fencing of habitat proposed.
	Protect existing natural water sources within night parrot habitat from disturbance or modification	There are no permanent water bodies at Havieron.
	Avoid human visitation to known night parrot roosts. Continue to keep exact localities from the public record to protect these sites from disturbance by human visitation.	Havieron is extremely remote and mine access restrictions apply to the general area.
	Avoid establishing roads through areas likely to be used by night parrots.	The establishment of a haul road is unavoidable. Utilisation of the area by night parrot for flyways will be determined through a 2-year landscape scale acoustic monitoring program. Residual impacts compensated for through the proposed Havieron Offset.
	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.	Baseline surveys have identified night parrot, but specialist review (N. Leseberg, 2025) has confirmed a persistent population is not present within the Development Envelope due to the absence of stable critical nesting and roosting habitat.

Priority	Priority action for Night Parrot conservation	Proposal alignment
		Utilisation of the Development Envelope as flyways is still uncertain and will be addressed through the landscape scale acoustic monitoring program.
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.	Acoustic monitoring is proposed over a 2-year period to account for seasonal changes. Information will be used to inform conservation action and provided for others to utilise in conservation advice.
Fire	At localities that currently support a habitat matrix of night parrot foraging and feeding habitat and are at risk of fire due to continuous perennial grass cover, implement fire regimes that maximise the amount of long-unburnt structurally complex <i>Triodia</i> within the landscape over time. This may include: - Establishing strategic firebreaks to prevent fire reaching areas where night parrots are known to roost. - Fragmenting large areas of long-unburnt spinifex through burning or fuel removal to prevent entire patches being burned during single wildfire events. - Recording fire history and management	Measures to detect and contain fires will be implemented through life of mine. The local availability to monitor and respond to regional fires started through natural or non-mine activities is considered a net benefit of the proposal. Fire management involving controlled burns, should they be required, will be managed in partnership with Martu and utilise traditional burning methods as appropriate and in consultation with specialist ecologists.
	At sites proximate to known night parrot locations which support a suitable habitat matrix except for the availability of long-unburnt spinifex, 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.	No fire breaks are proposed given the absence of suitable nesting and roosting habitat. The Bushfire Management Plan provides for emergency cutting of fire breaks to address approaching fires as required.
Stakeholder engagement	Continue to support Indigenous Ranger and other First Nations organisations to survey and monitor for night parrots in areas known and likely to be used by night parrots.	Martu ecological advisors accompany all flora and fauna surveys for the Havieron Proposal and in the proposed offset area.
	Support better integration of First Nations involvement and co-leadership in national conservation planning and management for night parrot recovery.	The Havieron Offset Annual Work Plans will be informed by a range of stakeholders, including Martu, technical experts, DBCA and consultants. Conservation works funded by the Greatland Managed Offset Fund are approved in partnership with JYAC for implementation by Martu.
	Support and educate pastoralists in appropriate methods to survey for night parrots in areas known and likely to be used by the species and raise awareness of potential threats and	Not relevant to Havieron.

Priority	Priority action for Night Parrot conservation	Proposal alignment
	methods to mitigate them, including the range of feral animals that impact night parrots and the need to manage all these species.	
	Adopt best practice for effective threat management through an adaptive management approach based on partnerships around co-design, co-implementation and social learning. Promote wide acceptance and capacity building, including explicit use of local knowledge in planning, management actions. and monitoring.	Martu (through JYAC) provide ecological monitoring and pest control services to Havieron and are integral to the implementation of the SSMP. The Annual Work Plan process for the proposed offset places Martu knowledge holders at the centre of conservation activity workplan design. The proposed offset is a ranger-style program that includes capability-building to provide opportunities for time on country that provides measurable conservation gain.
Survey and monitoring	Develop a national survey plan, including the identification of areas of potential occurrence, aimed at determining the distribution and population structure of the night parrot. Survey for night parrots in areas of potential occurrence.	The results of the proposed 2-year landscape scale night parrot acoustic monitoring program will be made available to national efforts.
	Monitor areas known to be used by night parrots to understand pattern of usage and detect long-term changes in pattern of usage	The proposed 2-year landscape scale night parrot acoustic monitoring program will provide data. The acoustic monitoring program thereafter will be informed by peer-reviewed results.
	Develop and implement monitoring plans to assess the outcomes of management activity for the night parrot where management is applied.	The adaptive management framework includes annual review of effectiveness and conservation gain against objectives.
	Investigate the application of novel emerging technologies to support monitoring and remote detection of night parrots, to ensure minimal impact on key sites	Greatland have already commenced trial of pattern recognition using satellite imagery and will explore additional deep learning required to calibrate the model. Further use of emerging technologies will be applied based on conservation advice.
	Monitor the extent of buffel grass and other weed species in and around known night parrot habitat.	Weed surveys will be conducted annually, and controls applied periodically to ensure weeds do not impact native vegetation areas. This will occur through Life of Mine. Buffel Grass is not currently onsite, however it is known to occur

Priority	Priority action for Night Parrot conservation	Proposal alignment
		in the East Pilbara region and will remain on the weed control program 'watch and act' list.
	Monitor feral predators (foxes and cats) in areas known or likely to be used by night parrots to determine any changes in their density, distribution and behaviour.	Feral species are a key focus of the Significant Species Management Plan (Attachment J) and will be implemented for Life of Mine at Havieron and at the proposed offset area to improve regional prospects for Night Parrot.
Information and research priorities	Examine sub-adult dispersal and mortality to better understand social structure, habitat use, dispersal behaviour and threats to recruitment.	The proposed 2-year landscape scale night parrot acoustic monitoring program will be made available to national efforts.
	Initiate a program to collect night parrot scats and feathers to enable genetic analyses to provide information on population size and structure.	To be included in the ranger-style land management program to be implemented by Martu in the proposed Havieron Offset area.
	Build understanding on the impacts of buffel grass on night parrot reproduction and survival to support better management outcomes	The research element is not relevant to the Havieron proposal and Buffel Grass is not currently present onsite. However, it is known to occur in the East Pilbara region and will remain on the weed control program 'watch and act' list.
	Investigate the potential impacts of emerging diseases on the night parrot.	Havieron is extremely remote, and biosecurity risks not considered a current threat. This will be monitored.

14.4.2 GREATER BILBY

Specific alignment of the proposal to Greater Bilby conservation advice is provided in Table 14-5. This assessment is to the 2016 advice available at:

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/282-conservation-advice-15072016.pdf>.

Conservation actions align with the objectives of the revised Greater Bilby Recovery Plan 2023, and is available at:

<http://www.dcceew.gov.au/environment/biodiversity/threatened/publications/recovery/greater-bilby-2023>.

Greatland consider that the proposed action will not prejudice the meeting of any of the following objectives for the stated reasons.

Objective 1: The size of the Greater Bilby population has grown

Direct and indirect threat mitigations within the Significant Amendment Development Envelope are considered sufficient to not impact overall population numbers. Greater Bilby are highly mobile and move freely within continuous available habitat. As an example, targeted Greater Bilby survey identified a significant recovery of a population within the Development Envelope as a result of post-fire habitat regeneration. Where no current activity was identified in 2021, 600 detections were made in 2022 indicating the mobility and quick response to resource availability pertinent to the species.

In addition, actions within the proposed offset area are designed to address threats and aim to increase the quality of available habitat. Actual conservation gain will be measured throughout the period of the offset.

Objective 2: The extent of occurrence and area of occupancy of the Greater bilby has been maintained or increased

Clearance of 494 ha of secondary habitat is 7.39% of the mapped study area and does not fragment habitat. Given the highly mobile nature of Greater Bilby and the availability to continuous and expansive surrounding critical habitat, the extent of occurrence is not considered to be impacted, although the distribution may change.

Progressive and post-mining rehabilitation will return the majority of the cleared area to suitable critical habitat. Areas that may not be returned to suitable Greater Bilby habitat are the two waste rock landforms (18 ha in total) that will remain as elevated revegetated structures that may remain distinct from the preferred sand plain, salt plain and sand dune habitat. This is not considered significant.

Objective 3: The genetic diversity of the Greater Bilby has been maintained and retains the potential for evolutionary change through adaptation and selection

The proposed Infrastructure Corridor is a widening and intensification of linear infrastructure that poses a risk of habitat fragmentation. Genotyping of Greater Bilby scats has not shown

an impact from the current access road. Periodic targeted survey will continue to include genotyping of scats to monitor genetic diversity.

Objective 4: Indigenous organisations, communities, and individuals have a greater role in bilby conservation

Martu are central to the conservation of species through ongoing consultation with JYAC, and Martu ecological monitors in place for pre-clearance and other surveys. The proposed offset within the Warla-Warrarn Martu IPA is Martu led, with senior ecological advisors contributing Traditional Owner knowledge to the offset Annual Work Plan.

Table 14-5: Alignment with current Greater Bilby conservation advice

Priority	Priority action for Greater Bilby conservation	Proposal alignment
Invasive Species	Develop regional predator management strategies	Feral animal control programmes will be undertaken for life of mine to minimise predation impacts in line with threat abatement plans for cat and European Red Fox. This includes mechanical trapping and selective approved baiting (e.g. grooming cat traps) and other animal controls as required. Contemporary measures are trialled (e.g. Felixer™). The Offset Management Plan provides for feral animal control in collaboration with the Traditional Owners. Current feral camel populations are small but will be monitored and adaptively managed as required through life of mine. There is no current rabbit population within the Development Envelope, but this will continue to be monitored through life of mine and adaptively managed as required.
	Manage feral cats and foxes to reduce predation on bilbies, by refining, trialling, and implementing introduced predator control techniques in and around areas where bilbies occur (primarily baiting, grooming trap, shooting, training rangers and neighbouring pastoralists to trap, traditional hunting, fox and feral cat-specific baiting, trapping, grooming trap, shooting).	
	Reduce the numbers of introduced herbivores, including rabbit populations, in and around areas where bilbies occur.	
Habitat loss and fragmentation	Enlarge and reconnect wild populations that are fragmented; work with landholders and neighbouring pastoralists to maintain and improve habitat quality and manage feral predators.	Proposed mitigations are designed to maintain habitat quality within the Development Envelope and improve habitat quality within the offset area. Feral animal control program will be applied for life of mine as outlined above. There is no agricultural land use in the vicinity of the proposal.
	Manage and restore habitat with the aim of creating sufficiently large areas to support subpopulations of up to 10 000 individuals.	Indirect impacts to critical habitat are managed through a suite of proposed mitigations outlined in Mitigation tables. Land will be progressively rehabilitated through life of mine (reported annually in WA), and at final mine closure. Based on regional experience the certainty of rehabilitation success is high.
Impacts of domestic species	Manage levels of feral herbivores below thresholds at which they impact habitat quality for bilbies	Stock is not relevant to the Significant Amendment or the proposed offset area.

Priority	Priority action for Greater Bilby conservation	Proposal alignment
Fire	Define and promote appropriate region-specific fire management to minimise large scale fires and promote mosaics of vegetation with heterogeneous structure and age classes, e.g. through patch burning, traditional burning, linear fire breaks etc.	Fire management measures will be applied throughout life of mine and are outlined in mitigation tables.
Breeding, propagation and other ex-situ recovery action	Develop a greater bilby metapopulation management plan that guides the use of the reintroduced populations on islands and within fenced sanctuaries, exchanges between these and the wild population, and how they might be used for the long term conservation of the species.	Not relevant to the Significant Amendment.
Stakeholder engagement	Have an effective recovery team to lead and coordinate the conservation and recovery of the greater bilby nationally.	Greatland cannot influence national efforts but can contribute information, data and land management actions to contribute to conservation advice and recovery of Greater Bilby.
	Develop an engagement strategy which realises opportunity for participation and support, and which engenders community awareness and understanding for greater bilby conservation. All potential relevant parties will be included in this – public sector, resource sector, agricultural sector, Traditional Owners, NGOs and general community.	All survey data is submitted to IBSA for access by interested stakeholders and to contribute to the knowledge base for conservation advice.
	Land managers (including pastoralists, indigenous communities, Indigenous Protected Areas, etc) should be given information about managing fire and invasive species for the benefit of the greater bilby.	Martu ecological advisors accompany all flora and fauna surveys for the Significant Amendment and in the proposed offset area. Offset Annual Work Plans will be informed by a range of stakeholders, including Martu, technical experts, DBCA and consultants.
Survey and monitoring	Implement national monitoring and survey protocols to assess national trends.	Not applicable.
	In addition, implement an integrated monitoring program of threats (especially fire, predators) at important occupied habitat, to assess the effectiveness of current management actions and inform future management actions.	Baseline survey of habitat, populations, and threats have been undertaken. Ongoing targeted survey for Greater Bilby habitat is proposed pre-clearance (within 2 weeks) and periodically within the Havieron Development Envelope and as part of the offset Annual Work Plan.

Priority	Priority action for Greater Bilby conservation	Proposal alignment
Information and research priorities	Develop a prioritised, targeted research program incorporating social, cultural and ecological elements which informs effective greater bilby conservation (exhaustive plan aspects are not re-stated here).	Greatland cannot influence the broader research program but can influence The proposed offset includes contribution to research through: • baseline and ongoing surveys to quantify the success of the biodiversity conservation element. Surveys are conducted by qualified persons to recognised standards and are submitted to the WA IBSA database, which is available to any research project or interested party and progressively builds the knowledge base to inform conservation efforts; • surveys and incidental recordings of Greater Bilby by Martu as part of offset area conservation activities.
	Prioritise research into biological controls to manage predation.	Not applicable.

14.5 ALIGNMENT WITH EPBC ACT

With specific regard to the objects of the EPBC Act outlined in s.3 (1) and 3A, Greatland consider the proposal to align with all items as outlined in Table 14-6.

With regards to associated reporting obligations under s.516(A), implementation of the Significant Amendment does not prejudice the WA Minister and Federal Minister meeting and reporting upon the principles of ecologically sustainable development.

Table 14-6: Alignment with EPBC Act objectives

EPBC Act aspect	Alignment of the Significant Amendment
Section 3 (1) – Objects of Act	
(a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and	There are considered to be no significant impact to vulnerable and migratory species. Where significant impact is considered to exist in regard to endangered Night Parrot, an offset is proposed. The offset is designed to protect and enhance suitable habitat and will contribute to ecological information that informs conservation advice.
(b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and	There are not considered to be issues of generational equity from the extraction of mineral reserves at Havieron. Life of mine is 13 years followed by a 5-year period of rehabilitation and mine closure that is intended to return the land to a standard at or approaching pre-development habitat quality.
(c) to promote the conservation of biodiversity; and	Mitigations to control weeds and feral animals, and to avoid or minimise impacts from land clearance result in no assessed net loss of biodiversity. The proposed offset seeks to actively promote conservation of biodiversity in an analogous area.
(ca) to provide for the protection and conservation of heritage; and	Strict cultural heritage rules apply under the ILUA, and this has informed the designed location infrastructure to protect aboriginal cultural heritage (noting the realignment of some infrastructure at the request of Traditional Owners). Martu monitors accompany all pre-clearance surveys to ensure Greatland understand and avoid what is of cultural significance to Martu.
(d) to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples; and	Government assessment of the Significant Amendment under Part IV of the EP Act includes public participation. The proposed offset is a partnership between Greatland and JYAC, with implementation on country by Martu.
(e) to assist in the co-operative implementation of Australia's international environmental responsibilities; and	The nature and small scale of the Significant Amendment does not prejudice Governments from fulfilling international commitments as follows: ▪ No impact to implementation of Australia's Strategy for Nature 2024-2030 nor the application of the Kunming Montreal Global Biodiversity Framework for the following reasons: – no risk of extinction of species of national significance – impacted or degraded land arising from the Significant Amendment will be rehabilitated – mitigations for pollution and invasive species result in no significant residual impacts – no impact to inland or coastal waters. ▪ No significant impact to achieving Australia's Nationally Determined Contribution (submitted 2022) to the United Nations Framework Convention on Climate Change (UNFCCC) Paris Accord. The Significant Amendment equates to 0.047% contribution to National emissions. When combined

EPBC Act aspect	Alignment of the Significant Amendment
	with the processing plant at Telfer, exceedance of baseline may temporarily occur resulting in the need to purchase integrity-based offsets.
(f) to recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and	Traditional Owners are central to the following: ▪ Martu ecological advisors accompany surveys ▪ design and implementation of the offset which will be run as a partnership ▪ ongoing consultation through JYAC to ensure ILUA obligations are fulfilled.
(g) to promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.	The offset adaptive management includes Martu knowledge as a key input to the design of annual work plans and objectives.
Section 3A – Principles of ecologically sustainable development	
(a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;	Approval under the EPBC Act and WA EP Act will result in stringent regulation of environmental aspects through life of mine to final closure and return of habitat. The Significant Amendment is socioeconomically important at a regional and state level and sufficient mitigations are proposed to ensure these benefits are not at the expense of MNES. Havieron results in the extension of life for the existing Telfer processing operations and will be the replacement ore when Telfer reserves are exhausted in 2027. This allows for continued social and economic support to Martu communities through the ILUA. This includes programs for health, education, culture and protection of the cultural landscape.
(b) it there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;	The only matter of national significance is the presence of MNES. Proposed clearance of 630 ha within continuous and expansive available habitat for MNES is not considered significant because: habitat will not be fragmented; clearance will retain the mapped extent of the six fauna habitats to greater than 98% per habitat type; and 99% of native vegetation will remain within the bioregion. There are no irreversible environmental threats to land or habitat quality relating to the Significant Amendment (i.e. no persistent organic pollutants, no metalliferous emissions that could bioaccumulate within species or soils, no tailings storage dams). Suitable mitigations are applied throughout life of mine for all potential emissions of hypersaline water, dust, noise, and light that could have indirect impacts on MNES. Cleared land will be returned to a standard at or approaching pre-disturbance quality. Ecological uncertainty regarding Night Parrot distribution and population is addressed through: design to avoid clearance of suitable breeding habitat; mitigations to minimise indirect impacts; and progressive and final land rehabilitation at the end of a 13-year mine life; and proposed offset to account for uncertainty.

EPBC Act aspect	Alignment of the Significant Amendment
(c) the principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;	The small scale of the development within a continuous and expansive bioregion does not pose a risk to future generation. Life of mine is 13 years followed by a 5-year rehabilitation period and no serious or irreversible damage is posed by the nature and scale of the proposal. The likelihood of returning cleared areas to a standard at or approaching pre-disturbance habitat quality is high based on existing experience within the Great Sandy Desert region of WA. Of most relevance is generational equity issues for Martu, the Traditional Owners of the land. The Significant Amendment is being progressed with their acceptance through an existing ILUA, and Greatland will partner with them throughout life of mine (refer f above).
(d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;	Actions both within the Development Envelope and the proposed offset area are anticipated to deliver conservation gain sufficient to account for land clearance and indirect impacts from mine operation. There is considered to be no threat to overall biodiversity or the ecological integrity of land within or surrounding the Significant Amendment.
(e) improved valuation, pricing and incentive mechanisms should be promoted.	Two types of mining royalties will be paid: - state-based, paid at 2.5% for Gold and 5% on other base metals to the WA Department of Environment, Mining, Infrastructure and Resources for WA Mining Act 1978 to ensure community return on mining developments; and - ILUA-based, paid at 0.5% of realised revenue into a Trust administered by Traditional Owners for use in education, health, funeral costs and eligible projects (25% apportioned to JYAC for administration). The Significant Amendment includes provision for: a review of renewables opportunities to minimise risk of exceeding the Safeguard Mechanism (likely to be applied to Havieron if combined with Telfer). Any exceedance will trigger the purchase of verified integrity-based credits.

15. HOLISTIC IMPACT ASSESSMENT

A thorough understanding of the environmental aspects and surrounding environment has been achieved through the baseline studies presented above and through the management of the Telfer Approved Proposal and Stage 1 of the Havieron Project.

Cumulative impact to native vegetation and priority flora have been assessed and are not considered significant (refer Section 5.7). Cumulative impacts to terrestrial fauna have also been assessed and are not considered significant for priority species (refer Section 6.8 and 6.9), however a residual impact to MNES species Greater Bilby and Night Parrot does exist due to the loss of critical habitat and an offset is proposed to compensate (refer below).

A suite of contemporary and meaningful mitigation measures are proposed on the hierarchy of avoid, minimise, rehabilitate, offset. Key mitigations are as follows:

- Mitigations align with current conservation advice for Night Parrot and Greater Bilby and threat abatement plans for feral species
- No clearance of critical roosting or nesting habitat for Night Parrot or active Greater Bilby burrows
- Pre-clearance surveys will be conducted to DBCA guidelines within 2 weeks of proposed land clearance with Martu monitor in place
- Any relocations of Greater Bilby will be managed in accordance with DBCA guidelines or a 100m buffer maintained
- In the unlikely event Night Parrot are encountered, a 300m buffer will be established and advice sought from DBCA and Martu. No clearance will occur without further approvals
- Impacts from land clearance will be avoided to the greatest extent possible through design of infrastructure layout to priority flora (e.g. realignment of the proposed haul road), and use of existing cleared areas
- Where avoidance is not possible, the suite of proposed mitigations are contemporary, implementable, and robust and include *inter alia*:
 - Pre-clearance survey (specialist with Martu monitors)
 - Feral species control
 - Weed control
 - Traffic management
 - Preservation of quality habitat through control of altered surface water flows and altered fire regimes
 - Containment of highly saline water within evaporation ponds
 - Dust suppression on cleared areas and roads.
- Progressive and end of mine life rehabilitation will occur to return secondary habitat and maintain it such that it may transition to critical habitat in the future.

After application of the abovementioned mitigations a significant residual impact to Night Parrot remains due to uncertainty on ecology and habitat utilisation. The proposed direct offset aligns with Commonwealth offset policy and therefore meets the WA Offsets policy. The offset

is proposed to be co-managed between Greatland and the Martu People through JYAC. An adaptive management framework will ensure offset objectives are informed by Martu knowledge, current conservation advice, and are targeted, measurable and flexible.

With regard to other issues, 'key' and 'other' environmental factors have been considered against EPA objectives and relevant guidelines. Based on the mitigation measures proposed and the continuation of existing management measures, the Amended Proposal is considered to meet the EPA's objective for each environmental factor, and it is further considered that the Amended Proposal (combined Telfer-Havieron) can be implemented without significant impacts on the health, diversity or productivity of the environment.

With regards to Greenhouse Gas emissions, the Telfer – Havieron Proposal has a downward trajectory of emissions intensity (Figure 7-1) and opportunities will be assessed throughout Life of Mine to further reduce and implement renewables strategies as appropriate. This is not only our obligation to contribute to meeting the WA Net Zero by 2050 goal but is simply good business sense.

ABBREVIATIONS AND ACRONYMS

Below are the abbreviations and acronyms specific to this proposal or those that may assist in understanding of specialised aspects. Standard units and commonly accepted nomenclature is excluded. Referenced studies also apply a glossary specific to terms used therein.

Abbreviations/Acronym	Full Title
AH Act	Aboriginal Heritage Act 1972
AHD	Australian height datum
AHIS	Aboriginal Heritage Inquiry System
ARI	Assessment on Referral Information
AS	Australian Standard
BC Act	Biodiversity Conservation Act 2016
CAW	Licence to Construct or Alter Well
CEO	Chief Executive Officer
CPS	Clearing Permit
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DBCA	Department of Biodiversity, Conservation and Attractions
DE	Development Envelope
DEWHA	Department of the Environment, Water, Heritage and the Arts
DMA	Decision-Making Authority
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DPLH	Department of Planning, Lands and Heritage
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
DWER	Department of Water and Environmental Regulation
ELA	Eco Logical Australia
EP Act	Environmental Protection Act 1986
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPA	Environmental Protection Authority
EPAS	Environmental Protection Authority Services

Abbreviations/Acronym	Full Title
FOS	Fauna Offset Strategy
GDE	Groundwater Dependent Ecosystem
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GL	Gigalitre
GSD	Great Sandy Desert
GTA	GTA Consultants
GWL	Groundwater Well Licence
ha	Hectares
HDPE	High Density Polyethylene
Health Act	Health Act 1911
HHERA	Human Health and Ecological Risk Assessment
IBRA	Interim Biogeographic Regionalisation for Australia
ILUA	Indigenous Land Use Agreement
IPA	Indigenous Protected Area
JYAC	Jamukurnu Yapalikurnu Aboriginal Corporation (formerly WDLAC [Western Desert Lands Aboriginal Corporation])
kL/d	Kilolitres per day
km	Kilometre
km ²	Square kilometres
LCS	Upper Siltstone geological formation (Permian)
LFT	Lower Tillite geological formation (Permian)
LST	Middle Sandstone geological formation (Permian)
m	Metres
mbgl	Metres below ground level
MCMPR	Ministerial Council on Mineral and Petroleum Resources
mg/L	Milligrams per Litre
Mt	Million tonnes
MW	Megawatt
NAF	Non-Acid Forming

Abbreviations/Acronym	Full Title
Newcrest	Newcrest Operations Limited; Newcrest Mining Limited (former proponent)
NGER Act	National Greenhouse and Energy Reporting Act 2007
Ngurra	Martu word for land
NORMS	Naturally Occurring Radioactive Materials
NVIS	National Vegetation Information System
PAF	Potentially Acid Forming
PAF-LC	Potentially Acid Forming – Low Capacity
PEC	Priority Ecological Community
PoW	Program of Work
RIWI Act	Rights in Water and Irrigation Act 1914
SDP	Surface Disturbance Permit
SLOS	Sub-level Open Stopping
SRE	Short-Range Endemic
SWL	Standing Water Level
TEC	Threatened Ecological Community
TDS	Total Dissolved Solids
tCO ₂ -e	Tonnes of carbon dioxide equivalent
UCL	Unoccupied Crown Land
UWM	Upper Mudstone geological unit (Permian)
WA	Western Australia
WAC	Work Area Clearance
WAM	Western Australian Museum
WAPC	Western Australian Planning Commission
WoNS	Weeds of National Significance
WPC	Work Program Clearance
WRL	Waste Rock Landform
YMAC	Yamatji Marlpa Aboriginal Corporation

GLOSSARY

Term	Definition
Approved Proposal	Telfer Gold Mine as operating under Ministerial Statements 605, 606 and 650
Amendment Proposal	Significant amendment to the existing approved Telfer Gold Mine to construct and operate the Havieron Mine
Clearing Permit	Permit required from DWER to undertake clearing unless an exemption applies.
Cultural Landscape	An 'Associative Cultural Landscape' under UNESCO's Cultural Landscape Operational Guidelines 2008, Annex 3.
Crescent Zone	A geological formation hosting a significant gold ore body.
Development Envelope (DE)	The maximum area within which the proposal footprint will be located and the boundary of the area to be assessed.
Decision-Making Authority	Approval authority for the Project.
Fauna Assemblage	A group of associated fauna species.
Groundwater Dependent Ecosystem	Natural ecosystems that require access to groundwater to meet all or some of their water requirements.
Greenhouse Gas	Carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O), sulphur hexafluoride (SF ₆), hydro fluorocarbons (HFCs) and perfluorocarbons (PFCs).
Indicative Footprint	The location where the physical proposal elements are expected to occur within the Development Envelope.
Priority Ecological Community	Ecological communities that are adequately known and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list.
Relevé	A relevé is an unmarked area within which data on flora and vegetation are collected.
Short-Range Endemic	All species with very localised ranges.
Study Area	The area over which surveys (desktop and field) have been conducted. The area may vary between different studies.
Surface Disturbance Permit	An internal process of checks required before land clearing can proceed. The resulting Permit specifies the conditions and any prior activities that are required before clearance proceeds e.g. pre-clearing fauna surveys.
Threatened Ecological Community	An ecological community that fits into one of the following categories: "presumed totally destroyed"; "critically endangered"; "endangered" or "vulnerable".

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APPENDIX 1 – DETAILED CONSERVATION SIGNIFICANT TERRESTRIAL FAUNA

Conservation significant vertebrate fauna recorded or likely to be within the Development Envelope (DE) (Surveys: Biologic 2020, 2021, 2022, Spectrum 2021, 2022 and 2023).

Species	Conservation Status				Potential Critical Habitat Within the Survey Area					Comments from Significant Amendment surveys	Identified in Approved Proposal	Likelihood of Occurrence in Significant Amendment DE
	EPBC Act	BC Act	DBCA	Sand Plain	Sand Dune	Saltpan	Stony Hill,	Claypan	Stony Plain			
Brush-tailed mulgara <i>Dasycercus blythi</i>			P4	•	•	•			•	Recorded on two occasions from secondary evidence (tracks and scat) in Sand Plain and Sand Dune habitats. Four scats, one digging and one burrow was recorded within the Telfer Project area (Spectrum 2022b). Furthermore, 15 occasions of tracks and Diggings, as well as 2 burrows were found by Spectrum 2023. Species likely to occur throughout the area, particularly within Sand Plain and Stony Plain habitats, and to a lesser extent Saltpan and Stony Plain habitats where suitable burrowing substrates are present. Occurrence and abundance may fluctuate seasonally when desirable conditions occur, and resources are abundant.	Yes (as <i>D. cristicauda</i> and <i>D. hillieri</i>)	Recorded by secondary evidence but highly likely to be resident
Western pebble-mound mouse <i>Pseudomys chapmani</i>			P4				•		•	May occur as a resident in Stony Plain and Stony Hill, Breakaway or Other Outcropping habitats where suitable stony substrates present. Records of the species in the broader vicinity of the Fauna Survey Area scarce and often associated secondary evidence of former occurrence (i.e. old inactive pebble-mounds) (DBCA, 2021). An old mound was recorded within the Telfer Project area (Spectrum 2022b) due to the degraded nature of the mound this species is considered unlikely to occur in the Development Envelope area.	No	Possible
Northern marsupial mole <i>Notoryctes caurinus</i>			P4	•	•					Recorded a total of 29 times from secondary evidence (inactive burrows/tunnels) at mole trenching sites with a total of 60 inactive burrows (tunnels) recorded in Sand Dune habitat (Biologic 2020a (7 occasions), Biologic 2021a (18 occasions) and Spectrum 2023, (4 sites)). Likely to occur as a resident within Sand Dune and Sand Plain habitats throughout the Fauna Survey Area.	Yes	Recorded

Species	Conservation Status				Potential Critical Habitat Within the Survey Area				Comments from Significant Amendment surveys	Identified in Approved Proposal	Likelihood of Occurrence in Significant Amendment DE
	EPBC Act	BC Act	DBCA	Sand Plain	Sand Dune	Saltpan	Stony Hill,	Claypan	Stony Plain		
Greater Bilby <i>Macrotis lagotis</i>	VU	VU		•	•	•				Yes	Recorded

Species	Conservation Status				Potential Critical Habitat Within the Survey Area					Comments from Significant Amendment surveys	Identified in Approved Proposal	Likelihood of Occurrence in Significant Amendment DE
	EPBC Act	BC Act	DBCA	Sand Plain	Sand Dune	Saltpan	Stony Hill,	Claypan	Stony Plain			
Night Parrot <i>Pezoporus occidentalis</i>	EN	CR		•	•	•				Recorded on three occasions, comprising two confirmed and one unconfirmed, in Sand Plain habitat from call recording within and adjacent to the Fauna Survey Area (Biologic 2021a). Timing and characteristics of calls were indicative of foraging and/or dispersing individuals. The species may occur as a resident if nesting/roosting occurs within the Fauna Survey Area, or as an occasional visitor to forage if nesting occurs in the broader vicinity of the Fauna Survey Area. Biologic (2020a) and Spectrum (2022b) did not have any sightings or recordings of the Night Parrot. Nesting and/or roosting may occur in areas where suitably sized old growth <i>Triodia</i> is present, particularly in Sand Plain and Saltpan habitat where large mature <i>Triodia</i> hummocks and chenopods occur together in areas; however, foraging may occur more broadly within and outside the Fauna Survey Area. Foraging habitat is widespread, with annual foraging habitat occurring within Saltpan habitat and secondary (seasonal) foraging habitat occurring more broadly within Sand Plain and Stony Plain habitats dominated by <i>Triodia</i> hummock grasses. The suitability and likelihood of utilisation by the species in Sand Plain and Stony plain habitats are likely to be dependent on seasonal seeding of grasses, particularly after large rainfall events (Spectrum 2023).	Yes	Recorded
Wood Sandpiper <i>Tringa glareola</i>	MI	MI								Commonly found in low numbers on the edges of inland water bodies such as artificial dams. Typically occupies freshwater river and pool habitats though rarely associated with brackish, salt lake and estuary environments (Spectrum 2022b).	Yes (not since 1994)	Possible
Common Sandpiper <i>Tringa hypoleucos</i>	MI	MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence is likely to be the resultant of cyclonic activity from the northwest and may only represent transient or migrating individuals. Spectrum (2022b) recorded three photos within proximity to Telfer Project.	Yes	Possible
Red Knot <i>Calidris canutus</i>	EN/ MI	EN				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence is likely to be the resultant of cyclonic activity from the northwest and may only represent transient or migrating individuals. Spectrum (2022b) recorded two photos within proximity to Telfer Project.	No	Possible

Species	Conservation Status				Potential Critical Habitat Within the Survey Area					Comments from Significant Amendment surveys	Identified in Approved Proposal	Likelihood of Occurrence in Significant Amendment DE
	EPBC Act	BC Act	DBCA	Sand Plain	Sand Dune	Saltpan	Stony Hill,	Claypan	Stony Plain			
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	MI	MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence is likely to be the resultant of cyclonic activity from the northwest and may only represent transient or migrating individuals. Spectrum (2022b) recorded one photo within proximity to Telfer Project. Spectrum (2023) recorded one individual foraging on the edge of a water body.	Yes	Possible
Gull-billed Tern <i>Gelochelidon nilotica</i>	MI	MI				•		•		Recorded on one occasion from acoustic recorded deployed in Sand Plain habitat in far east of Fauna Survey Area. Record likely to represent a migrating individual flying over the area and unlikely to be residing or visiting the site due to the absence of suitable habitat to support the species. May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence likely to be resultant of cyclonic activity from northwest and may only represent transient or migrating individuals. Spectrum (2022b) recorded one photo within proximity to Telfer Project.	Yes	Recorded (by call)
Red Goshawk <i>Erythro-triorchis radiatus</i>	VU	VU								Previously recorded in vicinity of Telfer from a radio tracked individual in January 2021. The species may infrequently occur with the Survey Area during foraging and/or dispersal activities. The species' occurrence within the Fauna Survey Area is likely to be limited to infrequent visitation only and nesting unlikely to occur within the Fauna Survey Area due to the lack of suitable nesting habitat.	Yes	Possible
Fork-tailed Swift <i>Apus pacificus</i>	MI	MI		•	•	•	•	•	•	May occasionally occur within the airspace above the Fauna Survey Area to forage; unlikely to land or nest within Fauna Survey Area.	Yes	Possible
Oriental Plover <i>Charadrius veredus</i>	MI	MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence likely to be resultant of cyclonic activity from northwest and may only represent transient or migrating individuals. Spectrum (2023) identified 8 individuals, opportunistically, sheltering under a tree in a recently burnt area.	Yes	Possible

Species	Conservation Status				Potential Critical Habitat Within the Survey Area					Comments from Significant Amendment surveys	Identified in Approved Proposal	Likelihood of Occurrence in Significant Amendment DE
	EPBC Act	BC Act	DBCA	Sand Plain	Sand Dune	Saltpan	Stony Hill,	Claypan	Stony Plain			
Grey Falcon <i>Falco hypoleucos</i>	VU	VU		•	•	•	•	•	•	May occur within the Fauna Survey Area occasionally to forage within all habitats present, nesting unlikely due to absence of suitable nesting sites.	No	Possible
Peregrine Falcon <i>Falco peregrinus</i>		OS		•	•	•	•	•	•	May occur within the Fauna Survey Area occasionally to forage within all habitats present, nesting unlikely due to absence of suitable typical nesting sites.	Yes	Possible
Caspian Tern <i>Hydroprogne caspia</i>	MI	MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence likely to be resultant of cyclonic activity from northwest and may only represent transient or migrating individuals.	Yes	Possible
White-winged Black Tern <i>Chlidonias leucopterus</i>	MI	MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence likely to be resultant of cyclonic activity from northwest and may only represent transient or migrating individuals.	Yes	Possible
Princess Parrot <i>Polytelis alexandrae</i>	VU		P4	•	•				•	May occur within the Fauna Survey Area, particularly within suitably vegetated Sand Plain and Stony Plain habitats. The species occurrence and abundance within the Fauna Survey Area is likely to be influenced by rainfall, following which resources are more abundant.	No	Possible
Curlew Sandpiper <i>Calidris ferruginea</i>	CR/MI	CR/MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence is likely to be the resultant of cyclonic activity from the northwest and may only represent transient or migrating individuals.	No	Possible
Pectoral Sandpiper <i>Calidris melanotos</i>	MI	MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence is likely to be the resultant of cyclonic activity from the northwest and may only represent transient or migrating individuals.	Yes	Possible

Species	Conservation Status				Potential Critical Habitat Within the Survey Area					Comments from Significant Amendment surveys	Identified in Approved Proposal	Likelihood of Occurrence in Significant Amendment DE
	EPBC Act	BC Act	DBCA	Sand Plain	Sand Dune	Saltpan	Stony Hill,	Claypan	Stony Plain			
Red-necked Stint <i>Calidris ruficollis</i>	MI	MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence is likely to be the resultant of cyclonic activity from the northwest and may only represent transient or migrating individuals.	Yes	Possible
Common Greenshank <i>Tringa nebularia</i>	MI	MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence is likely to be the resultant of cyclonic activity from the northwest and may only represent transient or migrating individuals.	Yes	Possible
Glossy Ibis <i>Plegadis falcinellus</i>	MI	MI				•		•		May infrequently occur in Saltpan habitat following heavy rainfall and inundation. Occurrence is likely to be the resultant of cyclonic activity from the northwest and may only represent transient or migrating individuals.	No	Possible
Great Desert Skink <i>Liopholis kintorei</i>	VU	VU		•	•					Not recorded in surveys but likely to occur in Sand Plain and Sand Dune habitats throughout the Fauna Survey Area where suitable burrowing substrates are present. Likely to use both burnt and unburnt areas of these habitats within the Fauna Survey Area.	No Spectrum Ecology report (2023) indicates this species recorded 100km east but was not found at Telfer during that survey	Likely