

BHP

Newman Hub (Western Ridge) MS1105 Terrestrial Fauna Environmental Management Plan

January 2023



Version Control

Version	Description of version	Key changes	Issue date
Draft v0	Draft for comment	Original document	14/10/2022
Version 1	Version submitted to EPA	Additional text provided in Table 3 for clarity.	16/01/2023

Abbreviations and Definitions

Term	Meaning
BC Act	<i>Biodiversity Conservation Act 2016 (WA)</i>
BHP	BHP Iron Ore Pty Ltd
CAR	Compliance Assessment Report
CEO	Chief Executive Officer
Clearing	As defined in section 51A of the <i>Environmental Protection Act 1986 (WA)</i>
DBCA	Department of Biodiversity Conservation and Attractions
DE	Development Envelope
DP	Derived Proposal
DWER	Department of Water and Environmental Regulation
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
GIS	Geographic Information System
MS	Ministerial Statement
Mtpa	Million tonnes per annum
SRE	Short-range Endemic Invertebrate Fauna
TEC	Threatened Ecological Community
TFEMP	Terrestrial Fauna Environmental Management Plan
WA	Western Australia
WAIO	Western Australia Iron Ore
WC Act	<i>Wildlife Conservation Act 1950 (WA)</i>

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Executive Summary

Western Ridge Fauna Management Plan	
Proposal name	Western Ridge
Proponent name	BHP Iron Ore Pty Ltd
Ministerial Statement	1105
Purpose of the TFEMP	To meet the requirements of implementation Conditions 6 (Condition Environmental Management Plans) and 8 (Terrestrial Fauna Environmental Management Plan) of Ministerial Statement 1105 (MS1105).
Key environmental factors and TFEMP objectives	Terrestrial Fauna To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
Condition clauses	6-1 Prepare and submit Condition Environmental Management Plans 8-2 Prepare a Terrestrial Fauna Environmental Management Plan
Key components of the plan	See Table 4
Proposed construction date	Q1 2024
TFEMP required pre-construction?	Yes

1 Context, scope and rationale

BHP Iron Ore Pty Ltd (BHP) has prepared this Western Ridge Terrestrial Fauna Environmental Management Plan (TFEMP) to meet the requirements under Part IV of the *Environmental Protection Act 1986* (EP Act). The plan is submitted as a draft with the referral documentation for the Newman Hub (Western Ridge) Derived Proposal (the Proposal) (BHP 2022). The intent for the TFEMP is to meet the requirements of the Strategic Proposal MS1105 Condition 6 (Environmental Management Plans) and Condition 8 (Terrestrial Fauna Environmental Management Plan), should the Proposal be approved for implementation.

BHP has prepared this TFEMP to be consistent with the *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (the Instructions) (EPA 2021).

1.1 Proposal

Future mining expansions at Newman were identified in BHP's Pilbara Public Environmental Review Strategic Proposal (PERSP) (BHP Billiton 2016) and in the EPA's report on the Strategic Proposal (EPA Report 1619). The Proposal is within the Strategic Proposal boundary and forms part of the future expansion proposal of Newman identified in Schedule 1 of MS1105.

The Proposal is located approximately 2 km southwest of Newman (with nearest mine pits approximately 7 km southwest of Newman town), in the Pilbara region of Western Australia (Figure 1). The scope of the TFEMP is the proposed operations at Western Ridge.

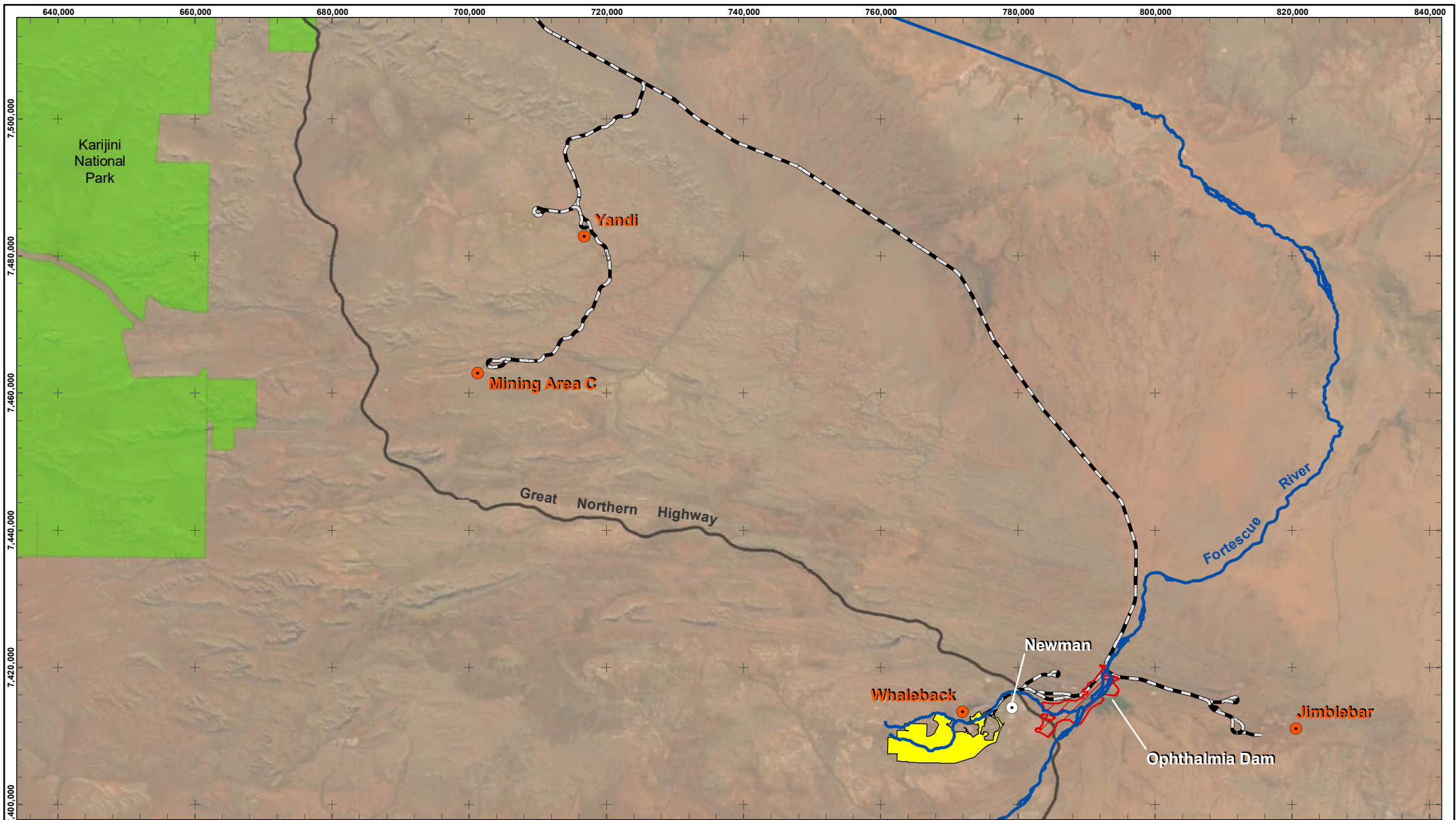
BHP proposes to develop the Proposal to mine four iron ore deposits, namely Eastern Syncline, Bill's Hill, Silver Knight and Mount Helen, with a life of 31 years (Figure 2).

The Proposal includes the following main elements and activities:

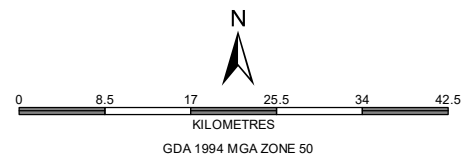
- mine pit excavation above and below the water table
- dewatering for below water table mining and surplus water discharge and supporting infrastructure including water bores and pipelines
- surface water management including creek diversions and culverts
- overburden storage areas, ore stockpiles and topsoil stockpiles and associated stacking, reclaiming and loading activities
- haul and access roads
- borrow pits and laydown areas
- ground disturbance and earthworks (vegetation, habitat and landform removal)
- ore processing infrastructure including 30 Mtpa crusher
- ore transportation infrastructure including overland conveyor
- ancillary infrastructure including ore sampling station
- administration and workshop buildings, repair yards, vehicle maintenance areas, assembly areas
- water abstraction, water supply, water storage, water treatment, drainage and stormwater management
- waste management
- support infrastructure including power distribution infrastructure, powerlines and communication towers.

Mining will be undertaken as typical open pit operation.

Consistent with the hub approach proposed for the Strategic Proposal, the Proposal will utilise existing Mount (Mt) Whaleback infrastructure including ore processing at Mt Whaleback, and non-process infrastructure including existing approved surplus water pipeline to Ophthalmia Dam, heavy vehicle maintenance facilities, Ammonium Nitrate Fuel Oil (ANFO) storage, potable water supply, laboratory analysis services, medical services and sub-station power supply. Any minor modifications required to existing Newman infrastructure to accommodate the Proposal will be addressed separately under existing approvals that regulate Mt Whaleback operations.



- BHP operations
- BHP rail
- Development Envelope
- Great Northern Highway
- National Park
- Threatened Ecological Community
- Waterways

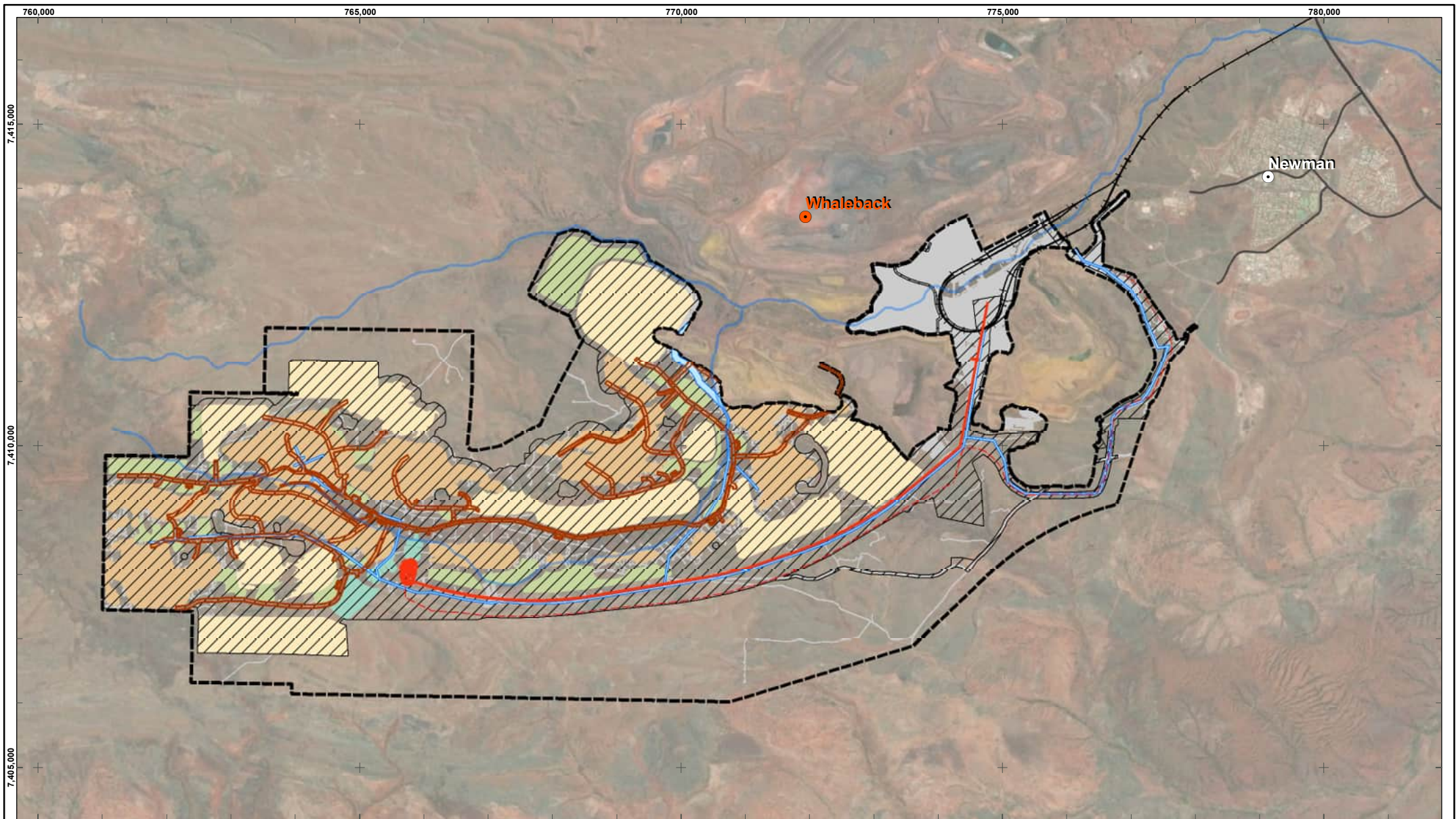


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**WESTERN RIDGE
 TERRESTRIAL FAUNA MANAGEMENT PLAN**
 Proposal location

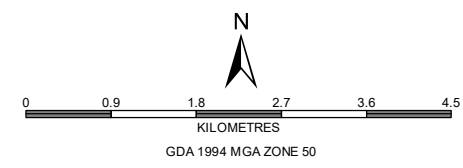
PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:750,000	PREPARED: M. ENGLISH	FIGURE: 1	
DATE: 21/09/2022	REQUESTOR: ENV. APPROVALS	NO: 979/135B	
	REVIEWED: N. McALINDEN		



- BHP operations
- Development Envelope
- Existing rail
- Indicative Cleared Area as at FY2021
- Indicative Footprint
- Roads
- Waterways

- Proposed infrastructure
- Proposed powerline
 - Overland conveyor
 - Water pipeline corridor
- Proposed mining disturbance
- Pit
 - ROM Pad
 - Topsoil storage
 - Haul road
 - OSA



BHP PUBLIC

**WESTERN RIDGE
TERRESTRIAL FAUNA MANAGEMENT PLAN**
Proposal overview

PLANNING & STANDARDS - IRON ORE			
SCALE @ A4:	1:80,000	PREPARED:	M. ENGLISH
DATE:	21/09/2022	REQUESTOR:	ENV. APPROVALS
		REVIEWED:	N. McALINDEN
		FIGURE:	2
		NO:	979/136B

1.2 Key environmental factors

Table 1 below describes the environmental values, activities and potential impacts on Terrestrial Fauna addressed in this TFEMP.

Table 1: Key environmental values, activities and potential impacts

Key environmental factor	Environmental values	Proposal activities	Actual/Potential impacts
Terrestrial Fauna	Conservation significant terrestrial vertebrate fauna and invertebrate fauna (i.e. Short-range Endemics)	Direct clearing of native vegetation for mining and associated activities	<p>Direct impacts</p> <p>Loss of conservation significant fauna from clearing</p> <p>Loss of conservation significant fauna habitat/habitat features from clearing, including:</p> <ul style="list-style-type: none"> • Direct loss of two category 4 Ghost Bat roosts (potential nocturnal roosts and non-critical) and potential loss of an additional three category 4 roosts. • Loss of roosting and foraging/hunting habitat for Ghost Bat and Pilbara Olive Python. • Potential loss of habitat for the Short-range Endemic <i>Antichiropus verutus</i>.
		Barbed wire fencing	<p>Direct Impacts</p> <p>Injury or mortality of Ghost Bats from entanglement in barbed wire fencing installed within the Development Envelope.</p>
		Blasting activities	<p>Indirect Impacts</p> <p>Potential indirect impacts to up to two potential Ghost Bat nocturnal roosts from vibration and/or dust.</p> <p>Potential physical damage to caves from blast vibrations.</p>

1.3 Condition requirements

BHP's strategic approach is to manage the environment at the subregional or hub level. BHP considers the following conditions in the Strategic Proposal Ministerial Statement (MS) 1105, as relevant to the Proposal:

- Condition 6 - Condition Environmental Management Plan/s (entire condition)
- Condition 8 – Terrestrial Fauna Environmental Management Plan.

The relevant sub-clauses of Condition 8 (Terrestrial Fauna Environmental Management Plan) of Strategic Proposal MS1105 and where they are addressed in this TFEMP are outlined in Table 2 below.

Table 2: MS1105 Condition 8 requirements

Condition number and wording	Applicable to this TFEMP	Relevant section of this TFEMP
8 Terrestrial Fauna Environmental Management Plan		
8-1 The proponent shall manage the implementation of the Proposal to meet the following environmental objective: (1) protect terrestrial fauna so that biological diversity and ecological integrity are maintained, and in particular:	Yes	Section 2
(a) maintain the local and regional populations of terrestrial fauna taxa that are listed as threatened or specially protected under the relevant legislation;	Yes	Section 2
(b) avoid and minimise direct and indirect impacts on the habitat of terrestrial fauna that is specially protected under the relevant legislation;	Yes	Section 2
(c) avoid and minimise direct and indirect impacts on terrestrial fauna listed as priority fauna, and its habitat; and	No	N/A
(d) avoid and minimise direct and indirect impacts on conservation significant short-range endemic fauna.	Yes	Section 2
8-2 The proponent shall prepare a Terrestrial Fauna Management Plan required by condition 6-1 that satisfies the requirements of condition 6-2, to meet the objectives specified in condition 8-1, in consultation with the agency responsible for administration of <i>the Wildlife Conservation Act 1950</i> and the <i>Biodiversity Conservation Act 2016</i> .	Yes	This document
8-3 The Terrestrial Fauna Management Plan required by condition 6-1 shall include provisions required by condition 6-2 to address impacts on conservation significant fauna, where relevant, including from, but not limited to:	Yes	Section 2
loss of habitat;	Yes	Section 2
changes to surface water regimes;	No	N/A
risk of vehicle strikes;	No	N/A
changes to fire regimes;.	No	N/A
emissions of dust, light and noise;	No	N/A
and impacts from feral animals.	No	N/A
8-4 The proponent shall continue to implement the version of the Terrestrial Fauna Management Plan most recently approved by the CEO until the CEO has confirmed by notice in writing that the plan required by condition 6-1 satisfies the requirements of condition 6-2 to meet the objectives specified in condition 8-1.	Yes	Section 5

BHP has provided the condition requirements (objectives-based) of Condition 6 Condition Environmental Management Plans in Section 2, which the Instructions allow for, if there are multiple conditions and/or condition clauses.

1.4 Rationale and approach

As required by the Instructions, this section provides a description of the rationale and approach for the components in this TFEMP.

1.4.1 Management approach

BHP applied a risk-based approach to identify and prioritise the components of this TFEMP. The purpose of the components is to protect the environmental values identified in Table 1. In developing the components, BHP has used available scientific information from recent targeted investigations and has applied learnings from the management of terrestrial fauna at other BHP and third party mine sites in the Pilbara.

As described in the Instructions, the term 'Environmental Management Plan' is used generically to refer to documents that set out management information required as an implementation condition (EPA 2021). BHP considers that this TFEMP meets the requirements of Condition 6 and Conditions 8-1 and 8-3 of the Strategic Proposal MS1105.

At the site level and prior to any disturbance activities, BHP implements an internal ground disturbance permit system to ensure that any legislative and regulatory requirements associated with the environment, Aboriginal heritage and land tenure relevant to the area, are met.

In accordance with Condition 8-4, BHP shall continue to implement the version of the TFEMP most recently approved by the CEO until the CEO has confirmed by notice in writing that the plan required by Condition 6-1 satisfies the requirements of Condition 6-2 to meet the objectives specified in Condition 8-1.

Condition 5 of MS1105 requires BHP to make this TFEMP publicly available. BHP will make the latest endorsed version of this TFEMP available to stakeholders, including members of the public, upon request.

1.4.2 Rationale

Table 3 describes the rationale for the TFEMP components identified in Section 2, including:

- management objectives
- survey and study findings
- key assumptions and uncertainties
- rationale for choice of management actions.

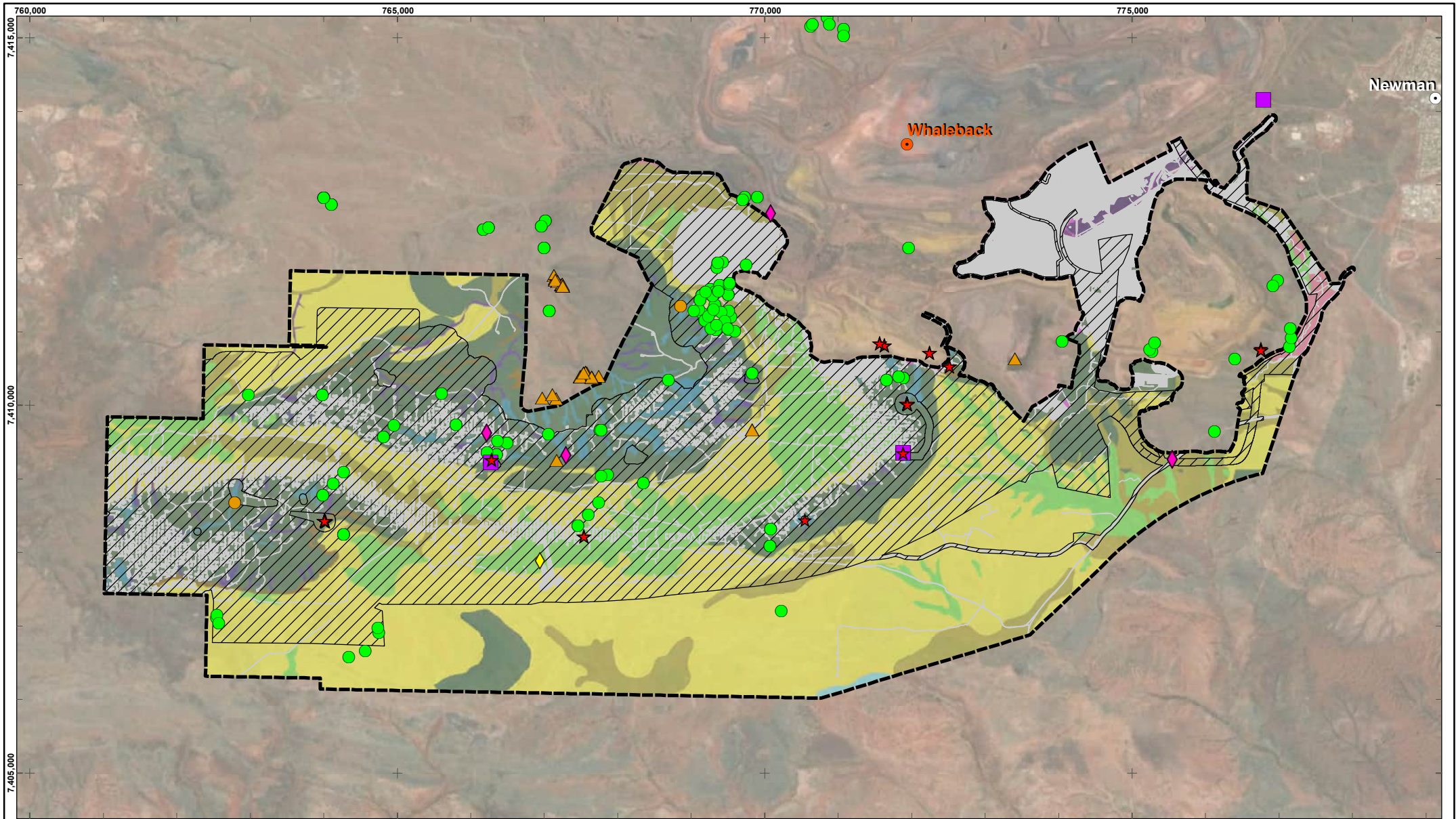
Table 3: Rationale for EMP Components

Surveys and studies	Survey and study findings	Key assumptions and uncertainties	Risk-based approach and rationale for choice of indicators/management actions
<p>Environmental value: Conservation significant fauna</p>			
<p>EMP proposed objective: Avoid and minimise direct and indirect impacts on conservation significant fauna and short-range endemic fauna and their habitats.</p>			
<p>The surveys and studies used to develop the EMP components related to conservation significant fauna are listed below:</p> <ul style="list-style-type: none"> Bennelongia (2021a) <i>Coombanbunna Short-range Endemic Fauna Field Survey</i> Bennelongia (2021b) <i>Western Ridge Short-range Endemic Invertebrate Fauna Survey</i> BHP Billiton (2016a) <i>CSIRO model - Using community-level modelling to map levels of biodiversity significance in the Pilbara bioregion</i> BHP Billiton (2016b) <i>Flora and Fauna Screening Assessment</i> BHP Billiton (2016c) <i>Short-range Endemic Invertebrate Review and Risk Assessment</i> Biologic Environmental Survey (Biologic) (2021) <i>Western Ridge Matters of National Environmental Significance Fauna Study</i> Biologic (2020a) <i>Western Ridge Targeted Vertebrate Fauna Survey</i> Biologic (2020b) <i>Coombanbunna Well Level 2 Vertebrate Fauna Survey</i> Biologic (2017) <i>West Angelas Ghost Bat Monitoring Rio Tinto January 2018</i> Biologic (2016a) <i>Western Ridge Southern Tenements Vertebrate Fauna Desktop Assessment</i> Biologic (2016b) <i>Western Ridge Southern Tenements SRE Invertebrate Fauna Desktop Assessment</i> Biologic (2014) <i>Consolidated Fauna Habitat Mapping</i> Onshore Environmental (2018) <i>Western Ridge E52/3448 Desktop Flora and Fauna Assessment</i> Process Minerals International, (2013) <i>Poondano Iron Ore Project: Compliance Assessment Report March 2013</i>. Cited within Rio Tinto (2017) Referral of Proposed Action Mesa H Proposal. 	<p>Fauna</p> <ul style="list-style-type: none"> Four vertebrate fauna listed as Threatened Fauna under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) and <i>Biodiversity Conservation Act 2016</i> (BC Act) have been recorded in the Development Envelope (BHP 2021) (Figure 3). <p>Ghost Bat (<i>Macroderma gigas</i>) – Vulnerable, EPBC Act; Endangered, BC Act.</p> <ul style="list-style-type: none"> 35 records of Ghost Bat exist from seven locations within the Development Envelope, recorded over numerous years (Figure 3). One of the locations was an acoustic recording belonging to a transient individual; the remaining six locations are associated with cave locations. Elevated levels of progesterone have been recorded from scats at the category 2 cave CWER-01 indicating usage of caves by pregnant or lactating females. Genetic analyses, including genotype identification, have been undertaken on Ghost Bat scats collected in 2016, 2017, 2018 and 2019 at the confirmed maternity cave CWER-01 and in 2016 in the potential maternity cave CWER-03 (See Appendix 2). Data shows consistent usage of the maternity roost CWER-01 by bats with numbers of individuals varying from one to six amongst monitoring events. Seven individuals were recorded at the potential maternity roost on one sampling occasion in 2016. <p>Pilbara Olive Python (<i>Liasis olivaceus</i> subsp. <i>barroni</i>) – Vulnerable, EPBC Act; Vulnerable, BC Act.</p> <ul style="list-style-type: none"> Three records including direct observations of individuals and indirect evidence (i.e. scats) exist from the Development Envelope. Two records (scats) are associated with Gorge/Gully habitat and one record (observation) was associated with an artificial water feature. <p>Northern Quoll (<i>Dasyurus hallucatus</i>) – Endangered, EPBC Act, Vulnerable, BC Act.</p> <ul style="list-style-type: none"> One confirmed historical scat and two unconfirmed scats, from two caves within the Gorge/Gully habitat. No motion sensor camera detections or recent scats have been recorded. No resident population is considered to be present. <p>Pilbara Leaf-nosed Bat (<i>Rhinonicteris aurantia</i>) – Vulnerable, EPBC Act; Vulnerable, BC Act.</p> <ul style="list-style-type: none"> One acoustic record from Mulga Woodland habitat within the Development Envelope, considered to represent an isolated foraging individual. 	<p>Assumptions</p> <ul style="list-style-type: none"> Given the extensive survey effort over the Development Envelope, it is considered that most conservation significant fauna species likely to occur within the Development Envelope have been recorded and all habitat types present have been mapped. This TFEMP only pertains to the fauna species highlighted in the Derived Proposal as requiring targeted management, which includes Ghost Bat, Pilbara Olive Python and the confirmed SRE <i>Antichiropus verutus</i>. 'Retained caves' refers to those protected in a Mining Exclusion Zone (MEZ), protected by a buffer or not predicted to be impacted. MEZ protect one or more caves and connected habitats by excluding all disturbance; while buffers are applied to a single cave and exclude all disturbance. Disturbance to a Ghost Bat cave is considered to be a change or alteration to the cave whereby it renders it temporarily or permanently unsuitable for use by Ghost Bat. Disturbance to two and potentially an additional three Category 4 roosts will occur during daylight hours when bats are unlikely to be present in the caves, as these caves are potentially used as nocturnal roosts only and are not considered suitable for diurnal roosting. Ghost bats tend to exit cave entrances in the first two to three hours after sunset to commence foraging. Blast management implies that vibration levels will be monitored and managed to remain below a defined limit, so as not to cause structural damage to caves. Two category 4 roosts (potential nocturnal roosts) (CWER-02 and CWER-12) will be directly impacted. A further three category 4 roosts have the potential to be impacted (directly or indirectly) by the Proposal as they are located within the Indicative Footprint (CWER-05, CWER-08 and CWER-13). The Northwestern, Southwestern and Eastern MEZ and buffers for Ghost Bats recommended in the Proposal to avoid habitat fragmentation are implemented (Figure 7 and Figure 8, see Appendix 1 for details of buffers applied). MEZ will exclude all active mining include drilling, blasting and excavating, mine pits and overburden storage areas (OSAs). Monitoring sites for Ghost Bats will target retained Ghost Bat caves (with exception of CWER-11 (category 4) and 	<p>Type of components</p> <ul style="list-style-type: none"> In accordance with Condition 8-3, this TFEMP shall include components required by Condition 6-2 to address impacts to terrestrial fauna. BHP has chosen objective-based components to address the requirements of Condition 6-2 of MS1105 and meet the objectives specified in Condition 8-1. Objective-based components have been chosen on the basis of the following: <ul style="list-style-type: none"> Management actions and targets are appropriate to satisfy the objectives of Condition 8-1. A sufficient understanding of the population dynamics or population size/occurrence of Ghost Bat and Pilbara Olive Python does not yet exist at Western Ridge. Thus, numerical triggers and thresholds based on population size cannot be developed to achieve the objective listed in Condition 8-1 'maintain the local and regional populations of terrestrial fauna taxa that are listed as threatened or specially protected under the relevant legislation.' Management actions and targets will be used to improve understanding of the population dynamics and size/occurrence of Ghost Bat and Pilbara Olive Python from which outcome-based components may be developed in the future. <p>Rationale for choice of management actions</p> <p><u>Physical clearing of habitat</u></p> <ul style="list-style-type: none"> The key impact to terrestrial fauna of conservation significance at Western Ridge is loss of habitat from direct clearing of native vegetation. The management actions and targets (Table 4) focus on avoiding and minimising disturbance to certain habitats, known locations of conservation significant fauna and to established exclusion and avoidance zones. BHP considers that its internal ground disturbance permit process is an appropriate tool to manage clearing, in order to minimise impacts to conservation significant fauna and their habitats. Maintenance of current GIS spatial layers for regulatory requirements and any exclusion zones or avoidance zones and records of conservation significant fauna is key to ensuring that clearing remains within defined limits. The Proposal has recommended implementation of Ghost Bat MEZ and buffers and SRE Avoidance Zones. A key target of this plan to ensure that these areas are maintained. The maintenance of buffer zones is predicted to minimise impacts to threatened fauna. <p><u>Pre-disturbance roost inspections</u></p> <ul style="list-style-type: none"> BHP proposes to implement pre-disturbance roost inspections to confirm the absence of Ghost Bats prior to cave disturbance/ impact. The cave will be inspected prior to disturbance. Ghost Bats present will be displaced and the cave entrance sheeted, if required. Disturbance to caves will occur during daylight hours when bats are unlikely to be present (as the caves are not suitable for diurnal roosting).

Surveys and studies	Survey and study findings	Key assumptions and uncertainties	Risk-based approach and rationale for choice of indicators/management actions
	<p>Fauna habitat</p> <ul style="list-style-type: none"> Ten fauna habitat types have been mapped within the Development Envelope (Figure 4): <ul style="list-style-type: none"> Breakaway/ Cliff (<1% of Development Envelope) Gorge/Gully (2%) Hillcrest/Hillslope (25%) Drainage Area/Floodplain (11%) Major Drainage Line (<1%) Minor Drainage Line (1%) Mulga Woodland (13%) Sand Plain (<1%) Stony Plain (47%) Hardpan Plain (<1%) These habitat types are not considered regionally significant as they are broadly distributed and well represented across the Pilbara bioregion. Gorge/Gully and Breakaway/Cliff habitat types are considered locally significant as they represent critical roosting and denning habitat for the Ghost Bat and Pilbara Leaf-nosed Bat. Creek lines and surface water features in the Development Envelope are ephemeral. No formally recognised Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) have been recorded from within, or adjacent to, the proposed Development Envelope. <p>Habitat Features</p> <ul style="list-style-type: none"> Seventeen caves have been recorded in Gorge/Gully and Breakaway/Cliff habitat within the Development Envelope (Figure 4). All but one of these caves have been classified as potential Ghost Bat roosts based on the cave's features and structure, as well as evidence of usage by Ghost Bats. There are two category 2 roosts, three category 3 roosts and 11 category 4 roosts located in the Development Envelope. CWER-01 is a confirmed maternity roost and category 2 roost (DWER critical habitat) as per Bat Call WA (2021). CWER-03 is a known day roost and potential maternity roost and category 2 roost (DWER critical habitat) as per Bat Call WA (2021) based on the structure and features of the cave. CWER-10, CWER-16 and CWER 17 are potential day roosts and category 3 roosts (non-critical) as per Bat Call WA (2021). 	<p>CWER-16 (category 3)) and will be confirmed after further site reconnaissance to assess safe access. The sites listed are provisional only.</p> <ul style="list-style-type: none"> The category 3 roost CWER-16 has been rendered unsafe for access following a BHP geotechnical investigation and cannot be entered for Ghost Bat scat collection. Pilbara Olive Python recorded near temporary surface water features may also utilise connected habitats north of the Development Envelope. Blasting or vibration effects are assumed to not impact the Pilbara Olive Python as the closest record of a temporary surface water feature with evidence of the Pilbara Olive Python is approximately 300 m from the Indicative Footprint, with the majority occurring over 400 m from proposed disturbance. At this distance, coupled with the topography at the location of the water features (being shelters in Gorge/Gully habitat), the potential impact to Pilbara Olive Python from vibration is expected to be minimal. The SRE Avoidance Zones for <i>Antechinus verutus</i> recommended by the Proposal are implemented (Figure 9). These have been developed to protect areas of suitable habitat, surrounding five broad locations of <i>Antechinus verutus</i> records. The surface water flow to temporary water features, is not anticipated to be altered as a result of the Proposal. The temporary surface water features are located within a Whaleback Creek tributary which is not expected to be affected by the Proposal. <p>Uncertainties</p> <ul style="list-style-type: none"> Until further Ghost Bat monitoring data is collected over different months and years, it is not possible to develop quantitative triggers and thresholds to monitor abundance, population size or usage. Natural variation of the population size of Ghost Bats in the Pilbara and sub-regions (Hamersley and Chichester) is currently unknown. Given the cryptic nature of Pilbara Olive Python, they are often difficult to detect. To date there is no long-term monitoring data (i.e. > 2 years of data) from the Western Ridge area for Pilbara Olive Python from which abundance or population size may be estimated. The population size in the Pilbara is also currently unknown. Given this limited knowledge, it is not possible to develop quantitative triggers and thresholds to monitor abundance or population size. Very little is known about habitat usage during the juvenile stage of Pilbara Olive Python or where they may occur. Most of the information available to date on Pilbara Olive Python has come from adults which are 	<p><u>Improvement of knowledge of Ghost Bat population dynamics, abundance and cave usage</u></p> <ul style="list-style-type: none"> BHP proposes to implement a monitoring programme for Ghost Bats at Western Ridge based on retained Ghost Bat caves (which are to be confirmed to be safe to access) to monitor numbers of Ghost Bat present, and to detect any temporal changes in abundance or presence of breeding females. This data collection may enable the development of triggers and thresholds in future reviews of the Plan. Monitoring of Ghost Bat caves will avoid the Ghost Bat breeding period (i.e. late pregnancy and pre-weaning - October to December), when pregnant females and juveniles may be present. Selection of retained caves for Ghost Bat monitoring will consider: <ul style="list-style-type: none"> The value of the Ghost Bat cave e.g. category 2 maternity caves (high value) vs. category 4 nocturnal roosts (low value). The frequency of Ghost Bat usage of the cave by – site selection will target caves more frequently used by Ghost Bats. Safe access. Quarterly monitoring will be undertaken at selected caves. This may include CWER-01 (category 2), CWER-03 (category 2), CWER-04 (category 4), CWER-10 (category 3) and CWER-17 (category 3). Annual monitoring will be undertaken for other retained caves showing less frequent signs of usage, i.e. the category 4 roosts CWER-07, CWER-09, CWER-14 and CWER-20. It is assumed that should high activity be indicated at these caves between annual events, the monitoring frequency will be reviewed. Scat collection and analysis allows the determination of presence and absence, deposition rates, genetic analyses (to determine individual genotypes and genetic diversity), population estimates, hormone analyses (to identify visitation by pregnant females) and use of caves across the local area. Ultrasonic recording and motion cameras will be deployed for caves considered most significant following the site reconnaissance. The use of genetic analyses to estimate cave usage is preferred over counts via video or call recordings where identification of unique individuals can be difficult. A limitation of genetics analysis is the time the analysis takes to determine the individual genotypes (expected to be six months minimum). <p><u>Blasting effects</u></p> <p>Blast management will be implemented within 300 m of the category 2 roosts CWER-01 and CWER-03, and the category 3 and category 4 roosts CWER-10, CWER-16 and CWER-17, to avoid damage to structural integrity of caves.</p> <p><u>Improvement of knowledge of Pilbara Olive Python population dynamics, juvenile life history, habitat usage and patterns of movement</u></p> <ul style="list-style-type: none"> Insufficient data exists at this stage to establish triggers and thresholds for Pilbara Olive Python abundance and population size at Western Ridge to meet Condition 8-1(1) 'show maintenance of local and regional populations of terrestrial fauna taxa that are listed as threatened or specially protected under the relevant legislation'. The cryptic nature of the species, the difficulty in detecting adults, and even greater difficulty

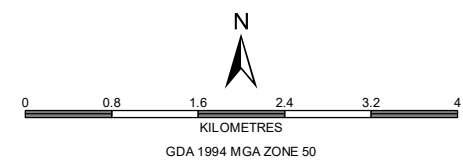
Surveys and studies	Survey and study findings	Key assumptions and uncertainties	Risk-based approach and rationale for choice of indicators/management actions
	<ul style="list-style-type: none"> CWER-02 and CWER-14 are classified as a feeding and/or nocturnal roosts and category 4 roosts (non-critical) as per Bat Call WA (2021). the remaining caves are classified as potential feeding or nocturnal roosts and are category 4 roosts. Six caves have had scats recorded - CWER-01, CWER-02, CWER-03, CWER-10, CWER-14, CWER-16, with individuals observed and or acoustic records also obtained for CWER-01 and CWER-03. None of the seventeen caves present in the Development Envelope are suitable roost sites for Pilbara Leaf-nosed Bat (Biologic 2021). Three natural ephemeral surface water features have been recorded within the Development Envelope, all of which represent potential foraging/hunting habitat for the Pilbara Olive Python (Figure 5). No permanent water features are present within the Development Envelope. An additional two artificial water features (WWER-12 and WWER-20) are associated with the adjacent Whaleback mine (i.e. turkeys nest). <p>Short-range Endemic Fauna</p> <ul style="list-style-type: none"> Two confirmed SRE invertebrate fauna species, <i>Antichropus cristatus</i> and <i>Antichropus verutus</i> and 19 potential SRE invertebrate fauna species are known to occur in the Development Envelope (Figure 6). <p>Mining Activities and interaction with Ghost Bats</p> <ul style="list-style-type: none"> Ghost Bats have been reported as tolerating different levels of vibration across different sites in the Pilbara, suggesting that local geology and specific blasting methods may influence vibration levels. Bat Call WA (2020) reported vibrations of up to 100 mm/s as being tolerable for Ghost Bats at Miralga Creek in the Pilbara, whilst at other sites in the Pilbara they have tolerated vibrations of approximately 15 mm/s (R. Bullen pers. comm. Bat Call WA). Bat Call WA (2017) assessed Ghost Bat caves within Rio Tinto's Robe Valley to determine the impact of mining on Ghost Bat presence. Bat Call WA (2017) concluded that the retention of a façade greater than 20 m around the mesa perimeter will result in no loss of roosts. Rio Tinto have committed to retain a 40 m mining exclusion zone between the back of each cave and the proposed mine pit to protect the integrity of roosts. Process Minerals International's Poondano Iron Ore Project applied a buffer zone in excess of 50 m from a Ghost Bat cave. Ghost Bats were recorded in this cave during 2009 and following the commencement of mining in 2012 they were subsequently recorded in this cave in 2012, 2013, 2014 and 2015 (Process Minerals 2013). 	<p>themselves difficult to detect. There is also very little known about levels of breeding as egg clutches are rarely visible. As a result, the inability to detect and monitor juveniles means that population level impacts affecting juveniles may go undetected for decades.</p> <ul style="list-style-type: none"> Records of the confirmed SRE <i>Antichropus verutus</i>, currently only located within the Development Envelope, may exist outside of the Development Envelope. 	<p>in detecting egg clutches or juveniles poses constraints in understanding the population structure and abundance.</p> <ul style="list-style-type: none"> Monitoring methodologies for Pilbara Olive Python are still being developed. BHP proposes to develop a monitoring programme for Pilbara Olive Python at Western Ridge to improve understanding of population dynamics, juvenile life history, habitat usage and patterns of movement. Monitoring methods may include but are not limited to: <ul style="list-style-type: none"> Targeted searches – to date this is the most common technique for recording Pilbara Olive Python. Genetic analyses of tissue/sloughs to assess genetic variability using microsatellite markers proven to be reliable and variable in the species (P. Spencer pers. comm 2021; Pearson & Spencer, in prep, 2021). Individual genotypes determined from genetic analyses may also provide information on population abundance. DNA material may also identify relationships between individuals and inform age structure and recruitment. eDNA - this allows for the detection of Pilbara Olive Python in water features through shed skin cells. Remote cameras - Pilbara Olive Python presence may be detected on camera. Monitoring will focus on temporary surface water features within the Development Envelope and within the semi-permanent to permanent pools at Nankunya (Afghan Springs) north of the Development Envelope. Monitoring is likely to target the wet season when water features hold water and Pilbara Olive Python utilise them as ambush areas for prey.

Surveys and studies	Survey and study findings	Key assumptions and uncertainties	Risk-based approach and rationale for choice of indicators/management actions
	<ul style="list-style-type: none"> At BHP Goldsworthy operations a long-term (10 year) study of Ghost Bats and Pilbara Leaf-nosed Bats (<i>Rhinonictis aurantia</i>) was undertaken at a cave located approximately 400 m from an active pit (Gleeson & Gleeson 2012), and this study showed no change in bat activity for either species over the duration of the monitoring. 		



- BHP operations
- Development Envelope
- Indicative Cleared Area as at FY2021
- Indicative Footprint
- ★ Ghost Bat (*Macroderma gigas*) (VU)
- ◆ Northern Quoll (*Dasyurus hallucatus*) (EN)
- ◆ Peregrine Falcon (*Falco peregrinus*) (OS)
- ▲ Pilbara Olive Python (*Liasis olivaceus* subsp. *barroni*) (VU)
- ◆ Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) (VU)
- Pilbara Flat-headed Blind Snake (*Anilius ganeji*) (P1)
- Western Pebble-mound Mouse (*Pseudomys chapmani*) (P4)

- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

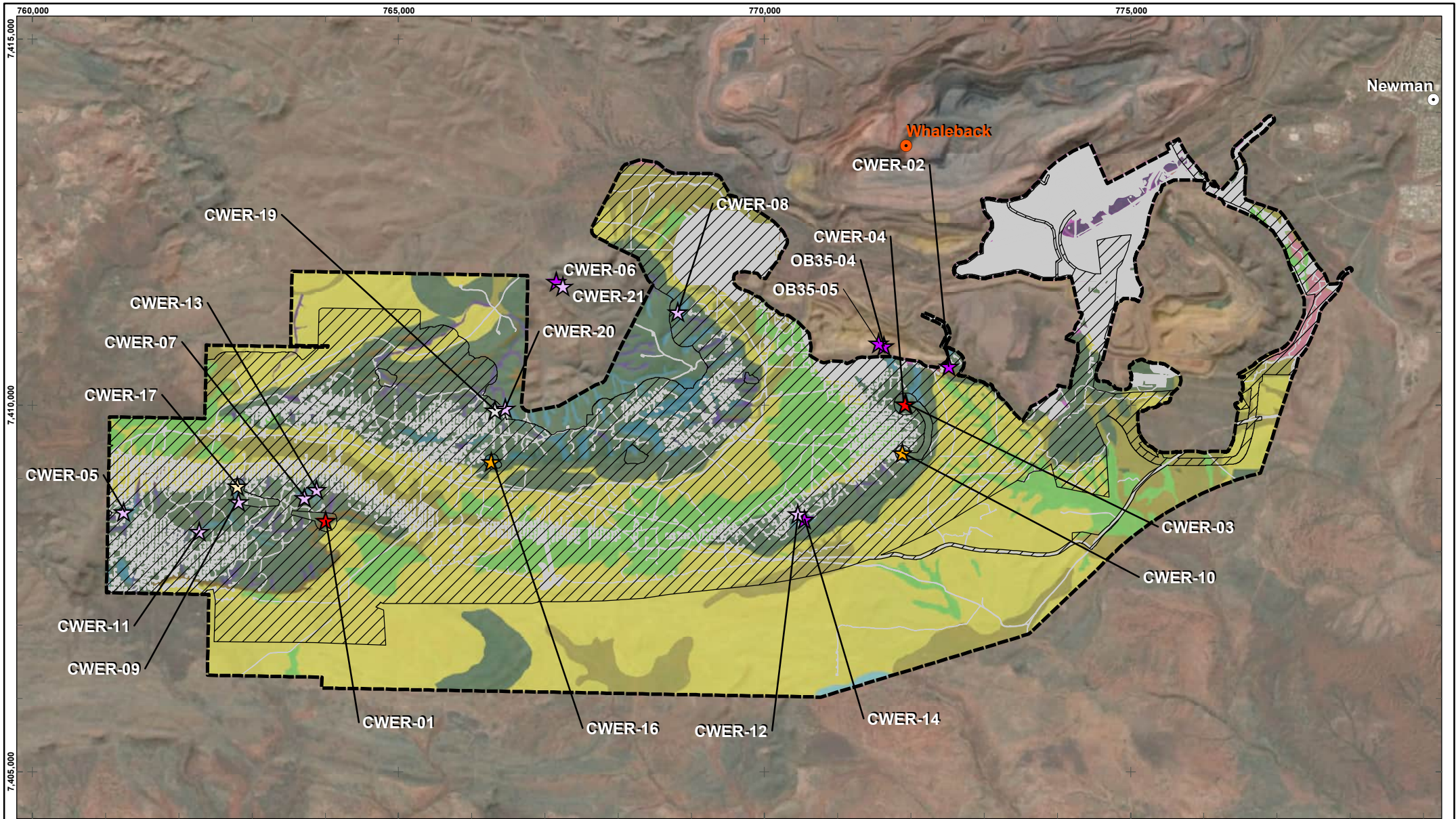


BHP PUBLIC

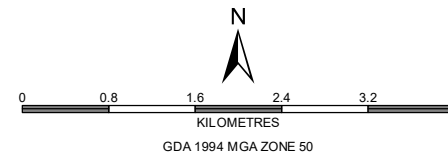
**WESTERN RIDGE
TERRESTRIAL FAUNA MANAGEMENT PLAN**
Conservation significant vertebrate fauna species records in the Development Envelope

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:70,000	PREPARED: M. ENGLISH	FIGURE: 3
DATE: 19/09/2022	REQUESTOR: ENV. APPROVALS	NO: 979/148B
	REVIEWED: N. McALINDEN	



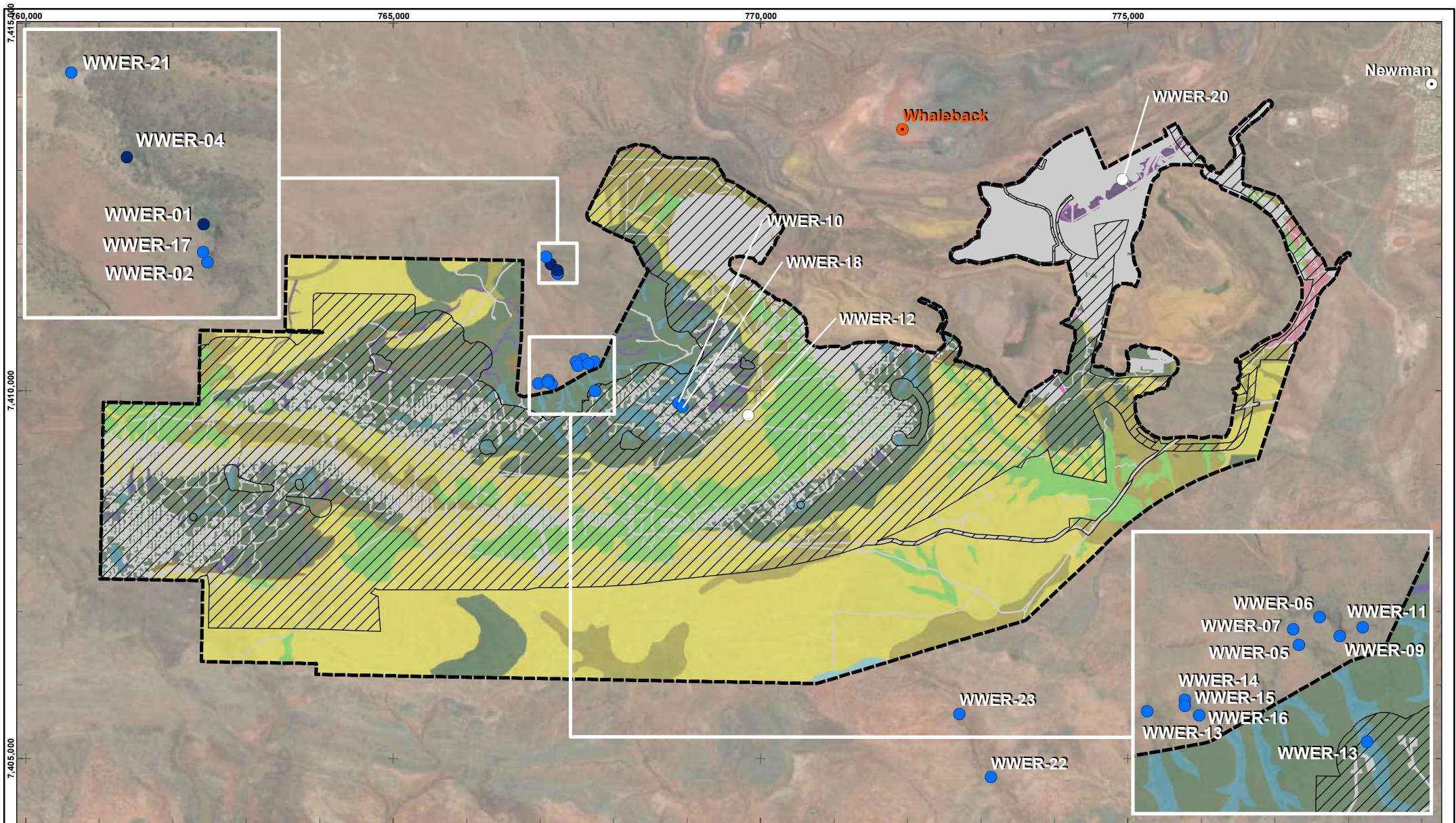
- BHP operations
- Development Envelope
- Indicative Cleared Area as at FY2021
- Indicative Footprint
- ★ Category 2
- ★ Category 3
- ★ Category 3 (no evidence of Ghost Bats)
- ★ Category 4
- ★ Category 4 (no evidence of Ghost Bats)
- ★ Nil (no evidence of Ghost Bats)



BHP PUBLIC

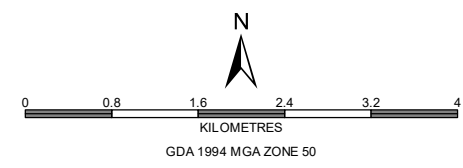
**WESTERN RIDGE
TERRESTRIAL FAUNA MANAGEMENT PLAN**
Fauna habitats and cave features
in the Development Envelope
PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:70,000	PREPARED: M. ENGLISH	FIGURE: 4	
DATE: 14/11/2022	REQUESTOR: ENV. APPROVALS	NO: 979/149B	
	REVIEWED: A. EDGAR		



- BHP operations
- Development Envelope
- Indicative Cleared Area as at FY2021
- Indicative Footprint
- Water feature
 - Artificial
 - Permanent Seep
 - Temporary surface water features

- Breakaway/ Cliff
- Cleared/ Disturbed
- Mulga Woodland
- Drainage Area/ Floodplain
- Sand Plain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Stony Plain
- Minor Drainage Line

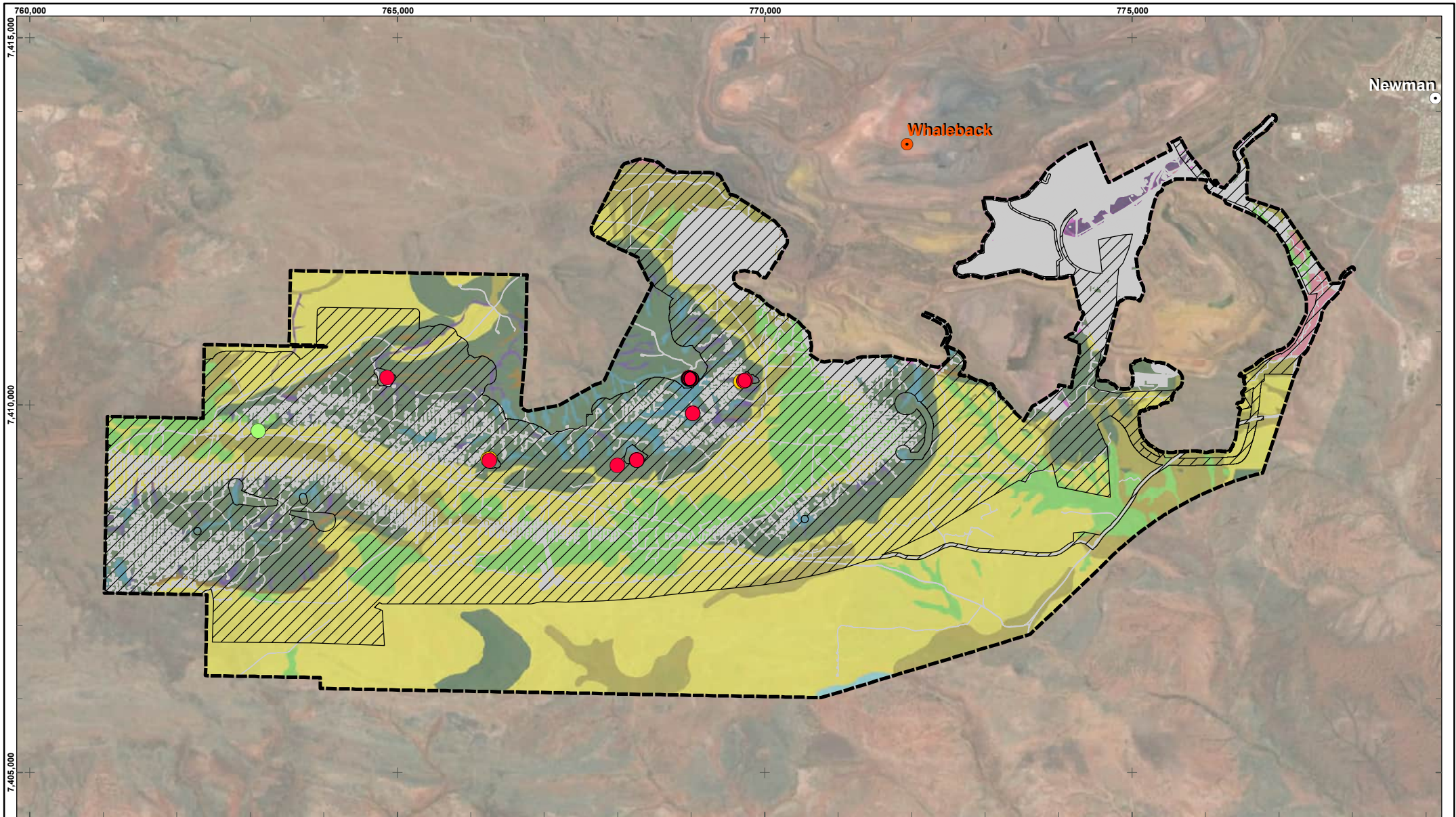


BHP PUBLIC

**WESTERN RIDGE
TERRESTRIAL FAUNA MANAGEMENT PLAN**
Fauna habitats and water features
in the Development Envelope

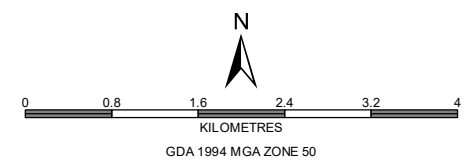
PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:70,000	PREPARED: M. ENGLISH	FIGURE: 5
DATE: 20/09/2022	REQUESTOR: ENV. APPROVALS	NO: 979/150C
	REVIEWED: A. EDGAR	



- BHP operations
- Development Envelope
- Indicative Cleared Area as at FY2021
- Indicative Footprint
- *Antichiropus cristatus*
- *Antichiropus* sp. indet. (Considered most likely to be *A. verutus* but are unable to be identified to species level due to juvenile age)
- *Antichiropus verutus*
- Breakaway/ Cliff
- Cleared/ Disturbed

- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

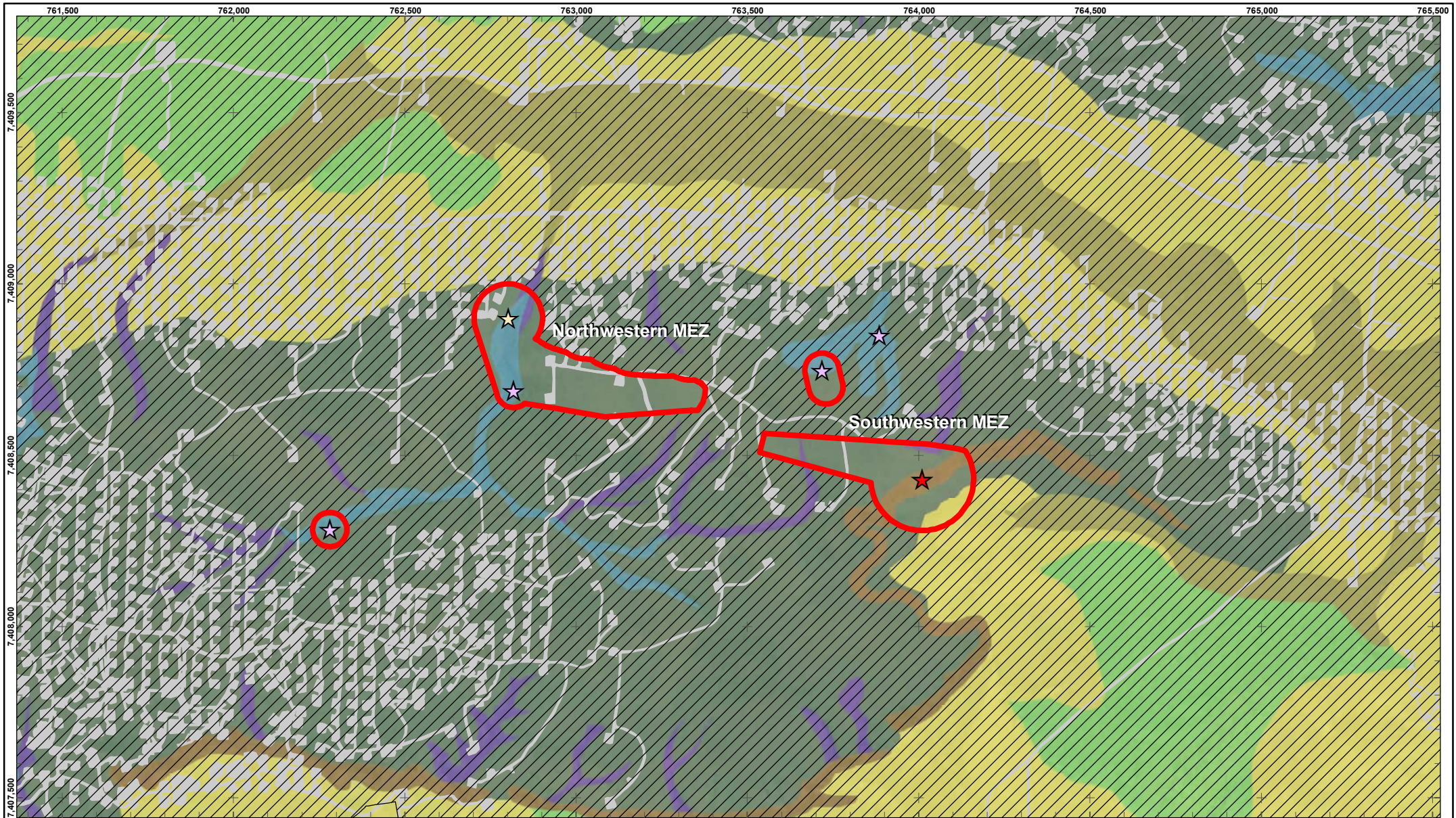











BHP PUBLIC

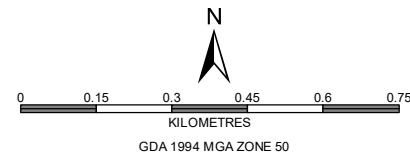
WESTERN RIDGE
TERRESTRIAL FAUNA MANAGEMENT PLAN
 Confirmed short-range endemic invertebrate fauna species recorded in the Development Envelope

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:70,000	PREPARED: M. ENGLISH	FIGURE: 6	
DATE: 20/09/2022	REQUESTOR: ENV. APPROVALS	NO: 979/151B	
	REVIEWED: A. EDGAR		



-  Development Envelope
-  Ghost Bat Northwest and Southwest Mining Exclusion Zone
-  Indicative Cleared Area as at FY2021
-  Indicative Footprint
-  Category 2
-  Category 3 (no evidence of Ghost Bats)
-  Category 4 (no evidence of Ghost Bats)
-  Breakaway/ Cliff
-  Drainage Area/ Floodplain
-  Gorge/ Gully
-  Hillcrest/ Hillslope
-  Minor Drainage Line
-  Mulga Woodland
-  Stony Plain

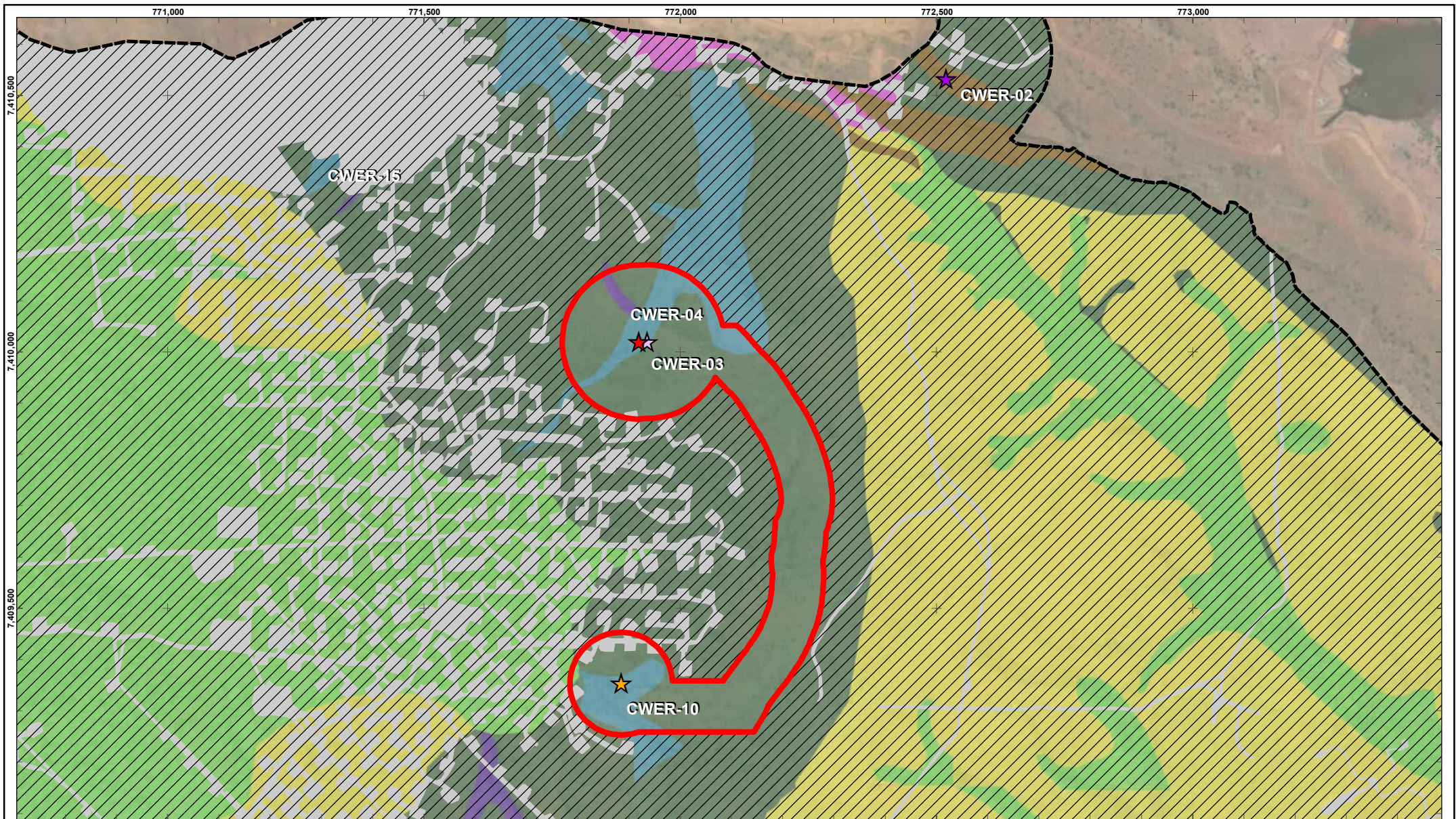


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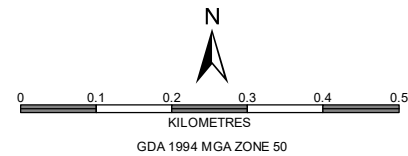
**WESTERN RIDGE
TERRESTRIAL FAUNA MANAGEMENT PLAN**
Ghost Bat Northwest and
Southwest Mining Exclusion Zone

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:15,000	PREPARED:	M. ENGLISH	FIGURE:	7
DATE:	20/09/2022	REQUESTOR:	ENV. APPROVALS	NO.:	979/153B
		REVIEWED:	N. McALINDEN		



- | | |
|---|---------------------------|
| Development Envelope | Breakaway/ Cliff |
| Ghost Bat Eastern Mining Exclusion Zone | Cleared/ Disturbed |
| Indicative Cleared Area as at FY2021 | Drainage Area/ Floodplain |
| Indicative Footprint | Gorge/ Gully |
| Category 2 | Hillcrest/ Hillslope |
| Category 3 | Minor Drainage Line |
| Category 4 | Mulga Woodland |
| Category 4 (no evidence of Ghost Bats) | Stony Plain |

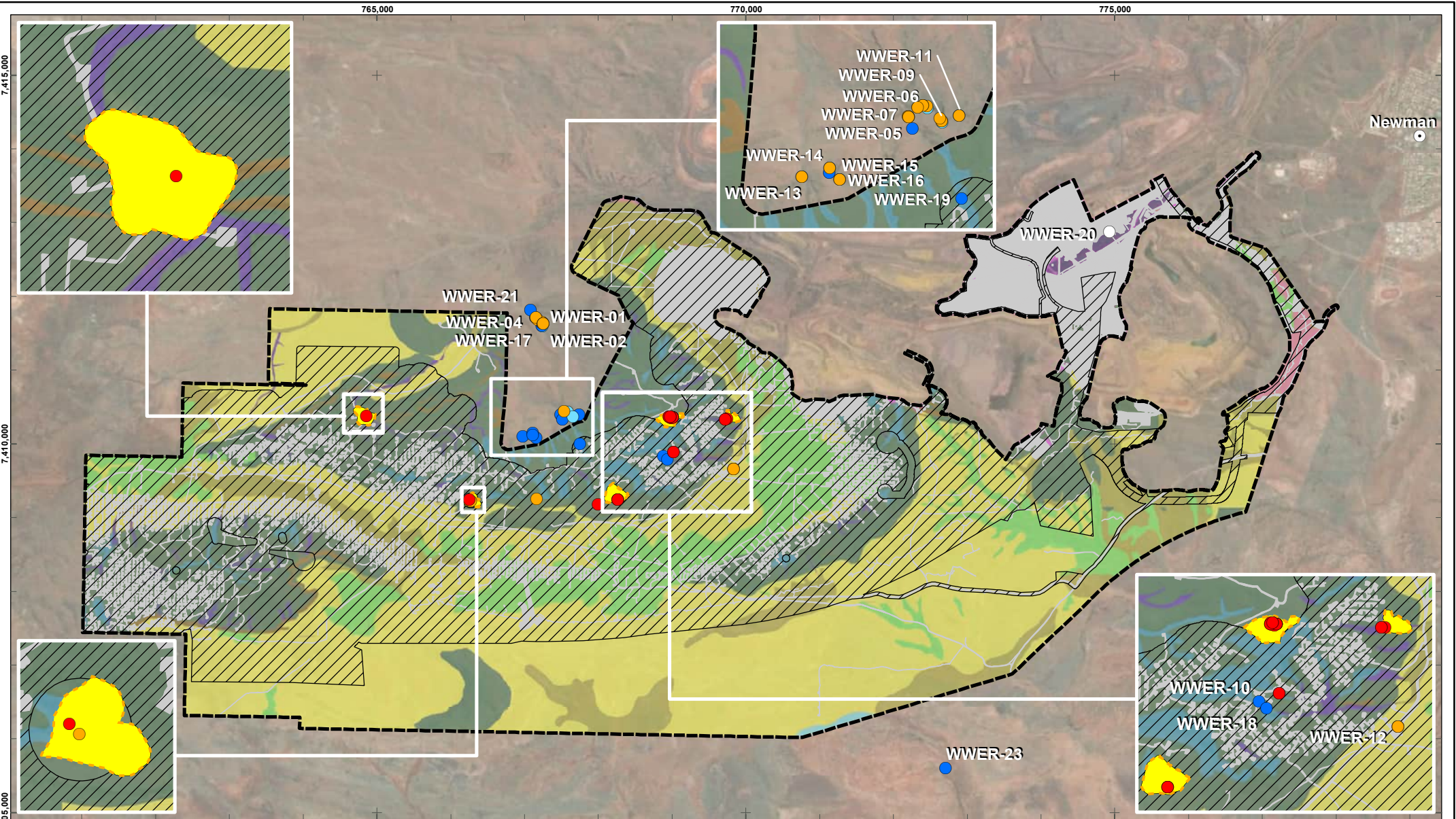


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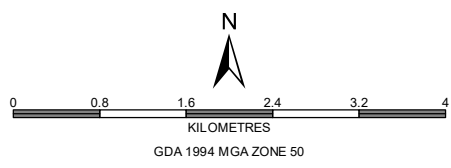
**WESTERN RIDGE
TERRESTRIAL FAUNA MANAGEMENT PLAN
Ghost Bat Eastern Mining Exclusion Zone**

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:10,000	PREPARED: M. ENGLISH	FIGURE: 8
DATE: 20/09/2022	REQUESTOR: ENV. APPROVALS	NO: 979/152B
	REVIEWED: A. EDGAR	



- *Antechinus verutus*
- Development Envelope
- Indicative Cleared Area as at FY2021
- Indicative Footprint
- Pilbara Olive Python
- SRE exclusion zone
- Water feature
- Artificial
- Permanent Seep
- Temporary Seep
- Temporary Surface Pool
- Habitat Area
- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain



BHP PUBLIC

**WESTERN RIDGE
TERRESTRIAL FAUNA MANAGEMENT PLAN
Avoidance Zones**

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:70,000 PREPARED: M. ENGLISH FIGURE: 9
 DATE: 20/09/2022 REQUESTOR: ENV. APPROVALS NO: 979/154C
 REVIEWED: A. EDGAR

2 EMP Components

BHP has provided detail of the TFEMP components in Table 4, as per the preferred approach outlined in the Instructions. BHP has not used the 'Schedule' approach (which the Instructions state may be used), as this TFEMP covers only one operation. BHP may adopt the 'Schedule' approach in future for this TFEMP, should additional activities, operations or Ministerial Statements apply.

In accordance with Condition 6-4 of MS1105, BHP will implement the components of the TFEMP and continue to implement the TFEMP until the CEO has confirmed by notice in writing that BHP has demonstrated the objectives specified in the relevant conditions referred to in the Section 45B Notice for the Proposal have been met.

Table 4: Objective-based components

Purpose: To meet the requirements of Condition 6-2 and to meet the objectives specified in Conditions 8-1 and 8-3 of Ministerial Statement 1105.

Rationale: Objective-based components (i.e. management actions) best meet intent of Conditions 8-1 and 8-3.

EPA Factor and objective:	Terrestrial Fauna – to protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
EMP objectives	Maintain the local and regional populations of terrestrial fauna that are listed as threatened or specially protected under the relevant legislation; avoid and minimise direct and indirect impacts on conservation significant fauna and short-range endemic fauna; and avoid and minimise direct and indirect impacts on the habitat of terrestrial fauna that is specially protected under the relevant legislation.
Key environments values:	Conservation significant fauna (Ghost Bat, Pilbara Olive Python and the confirmed SRE <i>Antechinus verutus</i>) and their habitat within the Development Envelope.
Key impacts and risks:	Risk to biological diversity and/or ecological integrity of conservation significant fauna, due to direct impacts from clearing of native vegetation or mining activities

Objective-based components			
Management Targets	Management Actions	Monitoring and timing / frequency of actions	Reporting
	<p>Condition 8-1¹ The proponent shall manage the implementation of the proposal to meet the following environmental objective: (1) protect terrestrial fauna so that biological diversity and ecological integrity are maintained, and in particular: (a) maintain the local and regional populations of terrestrial fauna taxa that are listed as threatened or specially protected under the relevant legislation; (b) avoid and minimise direct and indirect impacts on the habitat of terrestrial fauna that is specially protected under the relevant legislation; (c) avoid and minimise direct and indirect impacts on terrestrial fauna listed as priority fauna, and its habitat; and (d) avoid and minimise direct and indirect impacts on conservation significant short-range endemic fauna.</p> <p>Condition 8-3 The Terrestrial Fauna Management Plan required by condition 6-1 shall include provisions required by condition 6-2 to address impacts on conservation significant fauna, where relevant, including from, but not limited to: loss of habitat, changes to surface water regimes; risk of vehicle strikes; changes to fire regimes; emissions of dust, light and noise; and impacts from feral animals.</p> <p>Condition 8-4 The proponent shall continue to implement the version of the Terrestrial Fauna Management Plan most recently approved by the CEO until the CEO has confirmed by notice in writing that the plan required by condition 6-1 satisfies the requirements of condition 6-2 to meet the objectives specified in condition 8-1.</p>		<p>Condition 6-2 (14) Provide the format and timing to demonstrate that the relevant conditions referred to in the Section 45A Notice for the proposal have been met for the reporting period in the Compliance Assessment Report required by condition 4-6 including but not limited to: (a) verification of the implementation of management actions; and (b) reporting on the effectiveness of management actions against management target(s).</p> <p>Condition 6-5 If monitoring, tests, surveys or investigations indicate non-achievement of management target(s) specified in a Condition Environmental Management Plan(s), the proponent shall: (1) report the non-achievement in writing to the CEO within twenty-one (21) days of the non-achievement being identified; (2) investigate to determine the cause of the management target(s) not being achieved; (3) provide a report to the CEO within ninety (90) days of the non-achievement being reported as required by condition 6-5(1). The report shall include: (a) the cause(s) of the management targets not being achieved; (b) the findings of the investigation required by conditions 6-5(2); (c) details of revised and/or additional management actions to be implemented to prevent non-achievement of the management target(s); and (d) relevant changes to proposal activities.</p> <p>Condition 6-6 If monitoring, tests, surveys or investigations indicate that one or more management actions specified in a Condition Environmental Management Plan(s) has not been implemented, the proponent shall: (1) report the failure to implement the management action(s) in writing to the CEO within seven (7) days of identification; (2) investigate to determine the cause of the management action(s) not being implemented; (3) investigate to determine the potential environmental harm or alteration of the environment that occurred due to the failure to implement the management action(s); (4) provide a report to the CEO within twenty-one (21) days of the reporting required by condition 6-6(1). The report shall include: (a) the cause of the failure to implement the management actions (b) the findings of the investigations required by conditions 6-6(2) and 6-6(3) (c) relevant changes to proposal activities (d) measures to prevent, control or abate the environmental harm which may have occurred.</p>

¹ Note that only those potential impacts that are considered relevant to the Proposal are addressed in this TFEMP. Therefore, the TFEMP does not include specific measures related to priority fauna, feral animals, noise or light.

Objective-based components			
Management Targets	Management Actions	Monitoring and timing / frequency of actions	Reporting
<p>1. No unauthorised clearing within the Ghost Bat MEZ or buffers and SRE Avoidance Zones within the Development Envelope.</p>	<p>1. No disturbance within the following Ghost Bat MEZ:</p> <ul style="list-style-type: none"> Southwestern MEZ (including category 2 roost CWER-01). Northwestern MEZ (including category 4 roost CWER-09 and category 3 roost CWER-17). Eastern MEZ (including category 2 roost CWER-03, category 4 roost CWER-04 and category 3 roost CWER-10). <p>2. No disturbance within other retained potential Ghost Bat roosts (category 4 roosts CWER-07, CWER-11, CWER-14 and category 3 roost CWER-16).</p> <p>3. No disturbance within the SRE Avoidance Zones.</p> <p>4. Spatial boundaries of all Ghost Bat MEZ or buffers and SRE Avoidance Zones to be uploaded into the GIS spatial system.</p> <p>5. All MEZ, buffers and Avoidance Zones to be flagged on the ground to clearly identify boundaries.</p>	<p>Annual review of caves and habitat retained within the Ghost Bat MEZ and buffers (Figure 4, Figure 7 and Figure 8) and SRE Avoidance Zones (Figure 9) in relation to land disturbance within the Development Envelope.</p>	<p>Exception reporting</p> <p>If a management target has not been achieved:</p> <ul style="list-style-type: none"> Notify the CEO of DWER in writing within 21 days of identifying the non-achievement of the target. Investigate to determine the cause of the management target not being achieved. Provide a report to the CEO within 90 days of the non-achievement of the target being reported. The report shall include: <ul style="list-style-type: none"> (a) the cause(s) of the management targets not being achieved; (b) the findings of the investigation required by condition 6-5(2); (c) details of revised and/or additional management actions to be implemented to prevent non-achievement of the management target(s); and (d) relevant changes to proposal activities. <p>If a management action has not been implemented:</p> <ul style="list-style-type: none"> notify the CEO of the DWER in writing within 7 days of identifying the failure to implement a management action. provide a report to the CEO including any corrective actions identified, within 21 days of the failure to implement a management action being identified. investigate to determine the cause of the management action not being implemented investigate to determine the potential environmental harm or alteration of the environment that occurred due to the failure to implement the management action(s); provide a report to the CEO within twenty-one (21) days of the reporting required by condition 6-6(1). The report shall include: <ul style="list-style-type: none"> a) the cause of the failure to implement the management actions; (b) the findings of the investigations required by conditions 6-6(2) and 6-6(3); (c) relevant changes to proposal activities; and (d) measures to prevent, control or abate the environmental harm which may have occurred. <p>Regular reporting</p> <ul style="list-style-type: none"> Submit an annual compliance assessment report as part of the Annual Environment Report to the DWER by 1 October each year. The compliance assessment report will include, but not be limited to the requirements of Condition 4-7.
<p>2. No disturbance to the Category 4 roosts (CWER-02, CWER-12, CWER-05, CWER-08 and CWER-13) without prior inspection to verify absence of Ghost Bats from the roost or in the case of presence, the displacement of Ghost Bats from the roost.</p>	<p>6. Inspection of the Category 4 roosts (CWER-02, CWER-05, CWER-08, CWER-12 and CWER-13) undertaken prior to disturbance.</p> <p>7. If present, displace Ghost Bats from a roost during the inspection via physical presence in the cave or use of deterrents (i.e. noise or light).</p> <p>8. Sheet the cave entrance/s to prevent Ghost Bats from re-entering where required and practical.</p> <p>9. Complete roost pre-disturbance check list.</p>	<p>Inspection of caves to be completed prior to disturbance.</p> <p>Annual review of Ghost Bat roost pre-disturbance check list.</p>	<p>(d) measures to prevent, control or abate the environmental harm which may have occurred.</p> <p>Regular reporting</p> <ul style="list-style-type: none"> Submit an annual compliance assessment report as part of the Annual Environment Report to the DWER by 1 October each year. The compliance assessment report will include, but not be limited to the requirements of Condition 4-7.

Objective-based components			
Management Targets	Management Actions	Monitoring and timing / frequency of actions	Reporting
3. Minimise risk of injury or mortality to Ghost Bats from entanglement in barbed wire fencing.	<p>10. Avoid use of barbed wire fencing within the Development Envelope as far as practicable, except where required by legislation.</p> <p>11. Where fencing is required to be installed within the Development Envelope, design and install fencing with single strand top wire and bat reflectors, where practicable, to deter bat interaction which may cause injury or mortality.</p>	Inspect any areas which legally require barbed wire fencing after installation, to ensure that bat reflectors have been installed.	
4. No significant damage to Ghost Bat caves as a result of blast vibrations.	<p>12. Implement blast management measures within 300 m of the following caves:</p> <ul style="list-style-type: none"> • CWER-01 category 2 roost • CWER-03 category 2 roost • CWER-10 category 3 roost • CWER-16 category 3 roost • CWER-17 category 3 roost. 	<p>Visual monitoring of caves prior to, and following, blast activity to assess for any visual signs of structural damage.</p> <p>Monitor blast vibration levels in mm/s within 300 m of identified caves, during blast activities.</p>	
5. Improve understanding of the local Ghost Bat population abundance/dynamics.	13. Implement Ghost Bat monitoring at caves retained in MEZ and buffers (identified above), where safe to do so, to detect Ghost Bat presence/absence and any potential trend in Ghost Bat occupation over time.	<p>Quarterly monitoring at caves retained in MEZ. Maternity caves will not be subject to field visits during the breeding season approximately from September to January.</p> <p>Annual monitoring at other caves retained in buffers.</p> <p>Monitoring methods may include scat collection and analysis, use of motion sensor cameras in some caves, ultrasonic recordings and/or microclimate recordings. BHP may implement additional monitoring methods depending on the particular circumstance.</p>	
6. Restrict access to Ghost Bat caves.	14. Monitoring of caves is to occur outside of the Ghost Bat breeding season (September to January).	Annual review of Ghost Bat monitoring report.	
7. Improve understanding of Pilbara Olive Python population abundance/dynamics, juvenile life history and habitat usage within the pools to the north of the Development Envelope and Nankunya.	15. Develop and implement a Pilbara Olive Python monitoring program.	Annual monitoring in the wet season of temporary surface water features located to the north of the Development Envelope and Nankunya (exact sites to be confirmed) (Figure 5).	

3 Adaptive management and review of the EMP

3.1 Adaptive management approach

BHP applies an adaptive management framework for implementing management measures identified in this TFEMP, which is consistent with the Instructions. Adaptive management is a structured, iterative process to decision making. The framework embeds a cycle of monitoring, reporting and implementing change where required. It allows an evaluation of the management and mitigation measures so that they are progressively improved and refined, or alternative solutions adopted, to ensure that environmental objectives and outcomes in the plan are achieved. The key steps of the adaptive management approach are outlined in Figure 10.

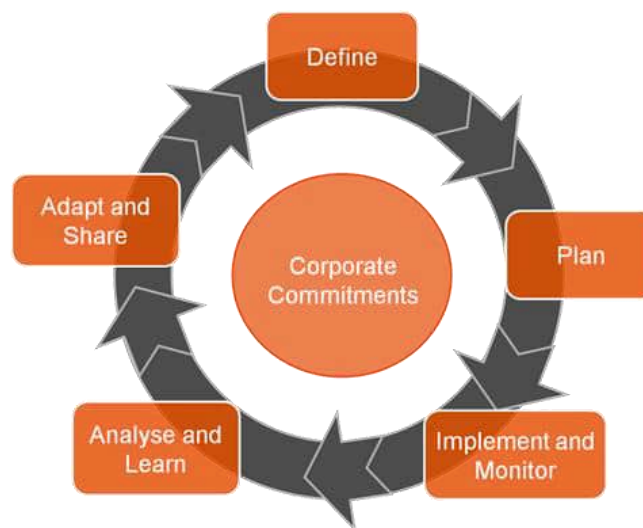


Figure 10: BHP's adaptive management approach

Where the TFEMP is a requirement of a Ministerial Statement (MS) condition, BHP notes that if it chooses to amend a TFEMP component in Table 4 based on information gained through adaptive management, it must seek formal approval from the Department of Water and Environmental Regulation (DWER).

3.2 Review and revision of this TFEMP

BHP will review this TFEMP (and revise it if required), to ensure that it achieves the identified environmental objectives and meets MS conditions. A review may arise from the following:

- where required by MS1105 condition 6-8(2)
- if initiated by BHP as part of the adaptive management process
- if triggered by a MS condition (e.g. for non-achievement of management targets and/or failure to implement management actions).

Changes to the endorsed version of the TFEMP may arise from the following:

- BHP reviews the TFEMP if the EPA or relevant government agencies develop new, or amend existing guidance or policy
- BHP adds components when a change to the existing operation is proposed

- BHP adds or amends components when there is a change to the proposal and/or MS conditions
- The CEO of DWER directs BHP to revise the TFEMP
- The CEO of DWER confirms by notice in writing that it has been demonstrated that the objective and/or outcome in the relevant condition is being and will continue to be met and therefore implementation of certain condition requirements addressed in the TFEMP are no longer required.

In accordance with Condition 6-9, BHP shall implement the latest revision of the TFEMP, which the CEO has confirmed by notice in writing, satisfies the requirements of Condition 6-2.

4 Stakeholder consultation

In accordance with Condition 8-2, BHP has prepared this TFEMP required by Condition 6-1 that satisfies the requirements of Condition 6-2, to meet the objectives specified in Condition 8-1, in consultation with the agency responsible for administration of *the Wildlife Conservation Act 1950* and the *Biodiversity Conservation Act 2016*.

BHP discussed the Newman Hub Derived Proposal (BHP 2021) with the DBCA, DWER and Nyiyaparli Traditional Owners during meetings held in 2021 and 2022.

BHP will continue to consult with government agencies (including decision-making authorities) and Nyiyaparli Traditional Owners (through targeted consultation and via administration of the comprehensive Indigenous Land Use Agreement), where relevant, in relation to the revision of this EMP.

Table 5 Stakeholder consultation

Stakeholder	Date	Topics/issues discussed	BHP response and outcome
Shire of East Pilbara	10 February 2021	Overview of Proposal including scope, timeline, approvals and engagement, and identification of issues, opportunities and deliverables. Access through town to be avoided.	BHP to continue to provide updates to the Shire.
	18 March 2021	General information briefing on the Proposal and discussion of access road into town.	BHP to continue to engage with the Shire on access to the Proposal area.
Prairie Downs pastoral station	20 May 2021	Access to Prairie Downs Requested single point of contact with BHP. Progression of activities towards Prairie Downs to address depletion of ore at Newman. Western Ridge Proposal overview and timelines, survey and exploration requirements. BHP tenure on pastoral lease.	BHP to provide map of tenure BHP to establish single point of contact
DWER - EPA Services	10 June 2021	Pre-referral meeting to introduce the Proposal, key components and activities, avoidance and mitigation measures, potential significant residual impacts and offsets.	BHP to review Development Envelope and consider EPA Services advice on relevant mitigation.
Department of Biodiversity, Conservation and Attractions (DBCA)	15 July 2021	Overview of the Proposal, including key values, potential impacts, proposed monitoring programs and collaboration with key experts, likely Part IV approvals pathway.	None applicable
Nyiyaparli Traditional Owners, through KNAC	18 and 19 May 2021	Overview of Western Ridge Proposal, including potential impacts and management	BHP to provide all biodiversity spatial files.
	28-29 July 2021	Review of water values and proposed changes to hydrological regime. Discussion of dust	BHP and Nyiyaparli to progress surveys of ethnobotanical species.

Stakeholder	Date	Topics/issues discussed	BHP response and outcome
		management and recent air quality improvements.	BHP representatives to undergo cultural awareness training. BHP and Nyiyaparli to continue to work together to ensure ongoing access to country.
	20-23 September 2021	Recap of Western Ridge Proposal and ethnobotanical survey on country.	BHP and Nyiyaparli to undertake a survey of traditional hunting values at next social surroundings engagement in 2022.
	18-22 July 2022	Overview of project, predicted impacts, management including on country site visit and focused discussions on water, ethnozoological values and closure.	BHP and KNAC agreed to further engagement in September 2022 to consolidate understanding of values, interests and feedback on the Proposal. BHP agreed to revise the Development Envelope to exclude temporary surface water features which support Pilbara Olive Python.
	5-9 September 2022	Overview of project, predicted impacts and management including on country site visits to proposed pits, waste dumps, and key infrastructure. Discussions on water and heritage management.	BHP and KNAC to further co-develop the SCHMP.
	21 October 2022	Provision of draft Terrestrial Fauna EMP to KNAC for review and comment.	Minor edits to TFEMP to clarify potential impacts.
KNAC, Preston Consulting and Stevens Heritage Services	12 September 2022	Workshop to further co-develop the SCHMP. KNAC requested BHP consider potential for dust monitoring at Nankunya to ensure protection of surface water values from dust.	BHP agreed to investigate opportunities for dust monitoring at Nankunya.

5 Changes to an EMP

This TFEMP (v1) is the original version submitted to the EPA.

6 References

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Appendices

Appendix 1: Ghost Bat roost classification, evidence of use and proposed management

Cave ID ²	Roost classification (Bat Call WA 2021)	Evidence of use by Ghost Bats (Biologic 2020a, Biologic 2021)	Proposed avoidance and management	Avoid or impact
CWER-01	Category 2 (confirmed maternity)	Yes - individuals observed; old and recent scats	Retained within Southwestern MEZ. 100 m buffer applied for any disturbance and 150 m mining exclusion buffer applied. Blast management measures within 300 m of the roost.	Direct and indirect impacts avoided
CWER-02	Category 4	Yes - old and recent scats	No direct avoidance measures. This cave is shallow and structurally simple. It is not considered suitable for diurnal usage – considered to provide potential feeding or nocturnal roost only. The cave will be inspected prior to disturbance, any bats present will be displaced and the cave entrance sheeted, if required. Impact to cave will occur during daylight hours when bats are unlikely to be present.	Will be directly impacted
CWER-03	Category 2 (potential maternity)	Yes - individuals observed; acoustics calls; old and recent scats	Retained within Eastern MEZ. 150 m mining exclusion buffer applied. Blast management measures within 300 m of the roost.	Direct and indirect impacts avoided
CWER-04	Category 4	No	Retained within Eastern MEZ. 50 m buffer applied for mining.	Direct and indirect impacts avoided
CWER-05	Category 4	No	No direct avoidance measures. Within Indicative Footprint but outside of pit and OSA boundaries. This cave is shallow and structurally simple. It is not considered suitable for diurnal usage – considered to provide potential feeding or nocturnal roost only. No evidence of use. The cave will be inspected prior to disturbance, any bats present will be displaced and the cave entrance sheeted, if required. Impact to cave will occur during daylight hours when bats are unlikely to be present.	Potential for direct and indirect impacts

² CWER-19 has been excluded from this table as recent investigation has shown it is not suitable for Ghost Bat usage.

Cave ID ²	Roost classification (Bat Call WA 2021)	Evidence of use by Ghost Bats (Biologic 2020a, Biologic 2021)	Proposed avoidance and management	Avoid or impact
CWER-07	Category 4	No	Greater than 50 m buffer applied for mining.	Direct impacts avoided. Potential for indirect impacts
CWER-08	Category 4	No	No direct avoidance measures. Within Indicative Footprint but outside of pit and OSA boundaries. This cave is shallow and structurally simple. It is not considered suitable for diurnal usage – considered to provide potential feeding or nocturnal roost only. No evidence of use. The cave will be inspected prior to disturbance, any bats present will be displaced and the cave entrance sheeted, if required. Impact to cave will occur during daylight hours when bats are unlikely to be present.	Potential for direct and indirect impacts
CWER-09	Category 4	No	Retained within Northwestern MEZ. 50 m buffer applied for mining.	Direct impacts avoided. Potential for indirect impacts
CWER-10	Category 3	Yes - old scats	Retained within Eastern MEZ. 100 m buffer applied for mining. Blast management measures within 300 m of the roost.	Direct and indirect impacts avoided
CWER-11	Category 4	No	50 m buffer applied	Direct impacts avoided. Potential for indirect impacts
CWER-12	Category 4	No	No direct avoidance measures. This cave is shallow and structurally simple. It is not considered suitable for diurnal usage – considered to provide potential feeding or nocturnal roost only. No evidence of use. The cave will be inspected prior to disturbance, any bats present will be displaced and the cave entrance sheeted, if required. Impact to cave will occur during daylight hours when bats are unlikely to be present.	Will be directly impacted

Cave ID ²	Roost classification (Bat Call WA 2021)	Evidence of use by Ghost Bats (Biologic 2020a, Biologic 2021)	Proposed avoidance and management	Avoid or impact
CWER-13	Category 4	No	No direct avoidance measures. Within Indicative Footprint but outside of pit and OSA boundaries. This cave is shallow and structurally simple. It is not considered suitable for diurnal usage – considered to provide potential feeding or nocturnal roost only. No evidence of use. The cave will be inspected prior to disturbance, any bats present will be displaced and the cave entrance sheeted, if required. Impact to cave will occur during daylight hours when bats are unlikely to be present.	Potential for direct and indirect impacts
CWER-14	Category 4	Yes - old scats	50 m buffer applied	Direct impacts avoided. Potential for indirect impacts
CWER-16	Category 3	Yes - recent scats	100 m buffer applied for mining. Blast management measures applied within 300 m of the roost.	Direct and indirect impacts avoided
CWER-17	Category 3	No	Retained within Northwestern MEZ. 100 m buffer applied for mining. Blast management measures within 300 m of the roost.	Direct and indirect impacts avoided
CWER-20	Category 4	No	No avoidance measures	Direct impacts avoided. Potential for indirect impacts

Appendix 1: Pre-existing (pre-2020) Ghost Bat scat monitoring data for caves at Western Ridge

Cave ID	Monitoring occasion	No. of individuals recorded
CWER-01	13/12/2016	6
CWER-01	20/10/2017	4
CWER-01	9/01/2018	1
CWER-01	14/05/2018	4
CWER-01	23/07/2018	3
CWER-01	19/02/2019	2
CWER-01	27/05/2019	2
CWER-01	2/12/2019	2
CWER-03	13/05/2016	7