



## **Environmental Management Plan – Pilbara Leaf-nosed Bat**

Gudai-Darri (Koodaideri) Iron Ore Mine and  
Infrastructure Project

RTIO-HSE-0325714

Mount Bruce Mining Pty Limited

152-158 St Georges Terrace, Perth

GPO Box A42, Perth WA 6837

### Disclaimer and Limitation

This Environmental Management Plan has been prepared by Rio Tinto's Iron Ore group (Rio Tinto) with input from Stantec Australia Pty Ltd (Stantec), on behalf of Mount Bruce Mining Pty Limited (the Proponent), specifically for the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project. Neither the document nor its contents may be referred to without the express approval of Rio Tinto, unless the document has been approved for implementation under Ministerial Statement 999.

Document Status					
Rev	Author	Reviewer/s	Date	Approved for Issue	
				To Whom	Date
1a	Rio Tinto	P. Royce L. Turner	July 2016	-	-
2a	T. Savage/ Rio Tinto	P. Royce	October 2016	OEPA Compliance	October 2016
3a	P. Royce/Rio Tinto	Rio Tinto	July 2018	EPA Services	July 2018
4a	P. Royce/ Rio Tinto	Rio Tinto	September 2018	EPA Services	September 2018
1b <sup>1</sup>	Rio Tinto / Stantec Australia	Rio Tinto	December 2023	DWER	December 2023

<sup>1</sup> Xa versions relate to the current approved Pilbara Leaf-nosed Bat Management Plan and the subsequent updates (our ref: RTIO-HSE-0325714), Xb is this document which aligned with the current Environment Protection Authority (EPA) guidance on how to prepare management plans EPA (2021b).

## EXECUTIVE SUMMARY

This Environmental Management Plan (EMP) has been prepared by Rio Tinto, on behalf of Mount Bruce Mining Pty Limited (the Proponent) for the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project (the Project). The EMP's management approach has been prepared to align with recent revisions to the EPA's guidelines - 'How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans: Instructions' (EPA 2021b).

This EMP specifically addresses the following environmental factors associated with the Project:

- Terrestrial Fauna
  - Matters of National Environmental Significance (MNES) fauna species and high value habitats: Pilbara Leaf-nosed Bat (*Rhinoicteris aurantia*).

Summary Table 1 below presents the environmental outcomes and objectives for the environmental factor to be met through implementation of this EMP, as required by Ministerial Statement (MS) 999 Condition 7, as well as the environmental criteria and management targets to measure achievement of the associated environmental outcomes and objectives.

**Summary Table 1: Environmental criteria and targets to measure achievement of environmental outcomes and objectives**

<b>Proposal title</b>	Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project	
<b>Proponent</b>	Mount Bruce Mining Pty Limited	
<b>Ministerial Statement Number</b>	999	
<b>EPBC Decision Notice Number</b>	2012/6422	
<b>Purpose of this EMP</b>	This EMP provides management for environmental values with the potential to be impacted by the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project and fulfills the requirements of Condition 7 of MS 999 (WA) and Condition 2 of EPBC 2012/6422 (Commonwealth)	
<b>Terrestrial fauna – MNES fauna species and high value habitat</b>		
<b>EPA Objective:</b> <i>to maintain representation, diversity, viability and ecological function at the species, population and assemblage level.</i>		
<b>Outcome based provisions</b>	<b>Environmental outcomes</b>	<ul style="list-style-type: none"> <li>• The Proponent shall ensure that the proposal is implemented in a manner that maintains the K75W Adit/cave System colony of the Pilbara Leaf-nosed Bat (<i>Rhinoicteris aurantia</i>) (MS999: 7-1).</li> </ul>

	<b>Trigger criteria</b>	<ol style="list-style-type: none"> <li>1. Direct disturbance<sup>2</sup> moves within the 400 m monitoring zone, but outside the Adit/Cave System Protection Zone, attributable to the Project.</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>2. Vibration levels recorded between 8 - 10 mm/s<sup>-1</sup> peak particle velocity at the Warrie (K75W) Adit /cave System, attributable to the Project.</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>3. Total nightly calls at the Warrie (K75W) Adit/cave System remains below wet-season lower call limit (LCL) (25) OR dry-season<sup>3</sup> LCL (236) for between 5 and 14 consecutive nights during the respective season.</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>4. Total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge during the dry-season<sup>3</sup>, remain below 5 for 5 consecutive nights, when PLNB are roosting within the Warrie (K75W) Adit/cave System.</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>5. Total nightly calls at the gorge containing the KBH12 site, remain below 5 during the dry-season<sup>3</sup>, for 5 consecutive nights, when PLNB are roosting within the Warrie (K75W) Adit/cave System.</li> </ol>
	<b>Threshold criteria</b>	<ol style="list-style-type: none"> <li>1. Direct disturbance<sup>2</sup> occurs within the Adit/cave System Protection Zone, attributable to the Project.</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>2. Vibration levels exceed 10 mm/s<sup>-1</sup> peak particle velocity at the Warrie (K75W) Adit /cave System, attributable to the Project.</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>3. Total nightly calls as the Warrie (K75W) Adit/cave System remain below wet-season lower call limit (LCL) (25) OR dry-season<sup>3</sup> LCL (236) ≥15 consecutive nights during the respective season.</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>4. Total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge, are 0 during the dry-season<sup>3</sup> for 5 consecutive nights.</li> </ol> <p>OR</p> <ol style="list-style-type: none"> <li>5. Total nightly calls at the gorge containing the KBH12 site, are 0 during the dry-season<sup>3</sup>, for 5 consecutive nights.</li> </ol>
<b>Objective based provisions</b>	<b>Environmental objectives</b>	<ul style="list-style-type: none"> <li>• To ensure that the bat colony continues to use the important foraging locations of Koodaideri Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1))</li> <li>• To ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))</li> </ul>

<sup>2</sup> With the exception of low impact activities associated with monitoring, management and implementation of contingency actions.

<sup>3</sup> Wet-season occurring between December and April, and dry-season being between May and November; see Appendix 3 Development of Seasonal Environmental Criteria for Gudai-Darri PLNB.

	<p><b>Management target</b></p>	<ol style="list-style-type: none"> <li>1. The long-term persistence of a viable PLNB colony at the Warrie (K75W) Roost.</li> <li>2. The Gudai-Darri (Koodaideri) Spring Gorge remains an important foraging location for the PLNB colony during construction and operation of the Kara (K58W) pit.</li> <li>3. Allow PLNB to adapt to impacts of construction and operation within the Kara (K58W) and Warrie (K75W) mine pits.</li> <li>4. Minimise direct project-related interactions (e.g. vehicle strike) resulting in PLNB injury or mortality.</li> </ol>
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**Corporate endorsement**

I hereby certify that to the best of my knowledge, the provisions within this Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project Pilbara Leaf-nosed Bat Environmental Management Plan are true and correct.

**Name:**

**Signed:**

**Designation:** GM,

**Date:**

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**Appendix 2:** Detailed Descriptions of Proposed Monitoring Programs, Baseline Data and Proposed Analyses

**Appendix 3:** Development of Seasonal Environmental Criteria for the Gudai-Darri PLNB.

## Abbreviations

ACAR	Annual Compliance Assessment Report
ASEZ	Adit/cave System Exclusion Zone
AWT	Above water table
BC Act	Biodiversity Conservation Act 2016
BWT	Below water table
DAWE	Department of Agriculture, Water and the Environment (Cwth)
DBCA	Department of Biodiversity, Conservation and Attractions
DWER	Department of Water and Environmental Regulation
EMP	Environmental Management Plan
EP Act	<i>Environmental Protection Act 1986</i>
EPA	Western Australian Environmental Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ERD	Environmental Review Document
EZ	Exclusion Zone
LCL	Lower Call Limit
Management level	Level of management appropriate for an environmental value, as determined by assessment described in the Framework for the Development of Rio Tinto Environmental Management Plans
MNES	Matters of National Environmental Significance
MPA	Mine/Plant Area
MS	Ministerial Statement
PLNB	Pilbara Leaf-nosed Bat
Proponent	Mount Bruce Mining Pty Limited
Project	Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project
Framework for EMPs	Rio Tinto Framework for development of EMPs as described in <b>Appendix 1</b> .
SIC	Southern Infrastructure Corridor
SPR	A ' <i>causal pathway conceptual model</i> ' (Pressure, Stressor, Receptor) approach for potential impacts due to project (refer to <b>Appendix 1</b> ).
WRC	Western Rail Corridor

## 1. CONTEXT, SCOPE AND RATIONALE

This Environmental Management Plan (EMP) has been prepared by Rio Tinto with input from Stantec, on behalf of Mount Bruce Mining Pty Limited (the Proponent) for the Gudai-Darri (Koodaideri)<sup>4</sup> Iron Ore Mine and Infrastructure Project (the Project). This EMP replaces the existing approved management plan associated with the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project (Rio Tinto 2018)(our ref: RTIO-HSE-0325714). The revision of the EMP has been undertaken for approval by the CEO as prescribed in Condition 7-9 and implementation in accordance with Condition 7-10 of Ministerial Statement (MS) 999 (EPA 2015).

This EMP was developed in accordance with and to fulfil the requirements of Condition 6-1, 6-2 and Condition 7 of Ministerial Statement (MS) 999 (EPA 2015) and is aligned with the Conceptual Framework for the Development of Rio Tinto EMPs (internal guidance described in Appendix 1). This framework provides a standardised approach to environmental management at Rio Tinto's Pilbara Iron Ore Operations, in accordance with Western Australian (WA) and Commonwealth Policy and Guidance, including:

- Environment Protection Authority's (EPA) *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures (EPA 2021a)*;
- *How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans: Instructions (EPA 2021b)*;
- *Environmental Impact Assessment (Divisions 1 and 2) Procedures Manual EPA (2020a)*;
- *Interim Guidance for Environmental outcomes and outcomes-based conditions EPA (2021c)*
- Department of the Environment DotE (2014) *Environmental Management Plan Guidelines*;
- DotE (2016b) Outcomes-based conditions policy; and
- DotE (2016a) Outcomes-based conditions guidance.

This EMP is subject to approval by the Environmental Protection Authority (EPA) and will subsequently be implemented. Under MS 999 Condition 7-8, this EMP is subject to notice in writing from the CEO of DWER that the EMP satisfies the requirements of MS 999 Condition 7-5 and 7-6.

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<sup>4</sup> Through consultation with Banjima Elders, Rio Tinto's operation formally known as Koodaideri, is now pronounced and spelt in Banjima's language as Gudai-Darri.

## 1.1 Proposal Description

The Project is located 110 km northwest of Newman in the Pilbara region of Western Australia (**Figure 1-1**) and includes the construction of an open-cut iron ore mining and processing operation with product transported to existing ports via Rio Tinto's heavy freight railway network. The Project area is defined by a specific outer boundary or 'Development Envelope' that covers 65,888 ha and is comprised of three main components; the mine and plant area and two infrastructure corridors (**Figure 1-1**) that connect with existing Rio Tinto infrastructure networks. These three elements are referred to as the:

- Mine/Plant Area (MPA) - containing the mining areas and the associated ore processing facilities (e.g. ore crushing, stockyards, administration, workshops) – the MPA covers approximately 19,188 ha
- Western Rail Corridor (WRC) - for ore transport by rail and for associated infrastructure (e.g. service road, communications) – the WRC covers approximately 34,697 ha
- Southern Infrastructure Corridor (SIC) – for power, water and road infrastructure to the MPA – the SIC covers approximately 5,465 ha

The Project includes, but is not limited to the following (**Figure 1-2**):

- A series of predominantly (greater than 90%) above water table (AWT) open cut mine pits<sup>5</sup> (named Warrie (K75W), Kara (K58W) and Belele (K38W)) along the strike of four discrete iron ore deposits (named Warrie (K75W), Kara (K58W), Belele (K38W) and Hillside (K21W)).
- In-pit sumps for removing water from the ore resource located below the water table, with collected water used for on-site dust control.
- Ore handling and processing infrastructure (including ore stockyards, dry and future wet processing facilities, train load-out and rail loop facilities).
- Waste dumps and stockpiles, including mineralised waste rock dumps, low grade ore dumps, and topsoil and sub-soil stockpiles (some waste rock dumps will be located within mine pits once sufficient space becomes available).
- Mine support facilities (e.g. offices, Heavy Vehicle and Light Vehicle workshops, explosives storage, waste water treatment plants, waste transfer station, fuel storage facilities, warehouses).
- An accommodation village for the FIFO operations workforce.
- A regional sized airport facility.
- Ore transport infrastructure providing the connection to Rio Tinto's railway network, comprising a railway from the MPA through the WRC to Lyre Siding.
- Road infrastructure (mine access, internal road network, haul roads, infrastructure service roads).
- Power supply and communications infrastructure, including that associated with AutoHaul™ (driverless trains).
- Water supply infrastructure, including use of water from local bores within the Development Envelope (during early works, construction and initial operations stages), and from in-pit sumps, decant water from the WFSF and potable water from local bores within the MPA for both construction and operations.

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<sup>5</sup> This refers to current pits and conceptual pits that are planned to be mined throughout the life of Mine.

Seven Exclusion Zones (EZs) relating to PLNB are included as part of the Gudai-Darri Project (**Figure 1-2**) comprising:

- Adit/cave System Exclusion Zone (ASEZ): is established 100 m from the predicted lateral extent of the Warrie (K75W) Adit/cave System, to exclude mine excavation and blasting activities, and minimise indirect disturbance in proximity to the Pilbara Leaf-nosed Bat roost.
- Gudai-Darri (Koodaideri) Spring Gorge EZ: approximately 55.4 ha, has been protected at the Gudai-Darri (Koodaideri) Spring Gorge, to exclude mine excavation and blasting activities, and minimise indirect disturbance to PLNB high value foraging habitat.
- KBH12 EZ: approximately 3 ha, is established at the KBH12 PLNB monitoring site to exclude mine excavation and blasting activities and minimise indirect disturbance to PLNB high value foraging habitat.
- PLNB EZ: approximately 325 ha, has been implemented to the north of the Kara (K58W) pit, to exclude mine excavation and blasting activities, and limits ground disturbance to 5 % for linear infrastructure.
- Kara (K58W) Troglifauna EZ: approximately 341.2 ha, has been implemented to the north of the Kara (K58W) pit, to exclude mine excavation and blasting activities, and minimise impacts to Troglifauna. The Kara (K58W) Troglifauna EZ includes the additional benefit of minimising direct and indirect disturbance to PLNB foraging and dispersing habitat.
- Warrie (K75W) Troglifauna EZ: approximately 256 ha, has been implemented to the north of the Warrie (K75W) pit, to exclude mine excavation and blasting activities, and minimise impacts to Troglifauna. The Warrie (K75W) Troglifauna EZ includes the additional benefit of minimising direct and indirect disturbance to PLNB foraging and dispersing habitat.
- Belele (K38W) Troglifauna EZ: approximately 436 ha, has been implemented to the north of the Belele (K38W) pit, to exclude mine excavation and blasting activities, and minimise impacts to Troglifauna. The Belele (K38W) Troglifauna EZ includes the additional benefit of minimising direct and indirect disturbance to PLNB foraging and dispersing habitat.

#### Adit/cave System Protection Zone

In addition to the exclusions zones defined above, an additional protection zone, the Adit/Cave System Protection Zone (**Figure 1-3**), is in place in response to the outcome of the Adit/cave System Structural Report, required under Condition 7-2 and 7-3, prior to mining Warrie (K75W) Pit. The Adit/Cave System Protection Zone (endorsed by Bat Call WA (2022)) provides an increased area of protection, to maintain the structural integrity of the Adit/cave System, retain potential lateral extents within the Cave system, and breakaway habitat/landforms surrounding the Adit entrance fly away zone. The Adit/Cave System Protection Zone incorporates the following features:

- The known Adit/cave system
- The Adit/cave System Exclusion Zone (ASEZ)
- The Adit/cave System Lateral Extent – the defined extent of laterals where PLNB individuals are likely to be roosting, within 100m of the known cavern<sup>6</sup>, as defined in the Adit/cave System Structural Report,
- A 150m buffer on top of the defined extent of laterals, so structural integrity can be maintained to the lateral void spaces during blast activities with appropriate blast management.
- A portion of the Warrie (K75W) Troglifauna EZ
- A portion of the Northern Quoll habitat restriction zone
- Retention of breakaway habitat / landforms to the north, northeast, northwest and east of the adit entrance, which will likely act as a physical barrier to mining operations in these directions

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<sup>6</sup> Subject matter experts advised that the PLNB would be unlikely to travel more than 30m along any lateral void that extended from the main chamber/cavern, as travelling further would expend unnecessary energy when suitable roosting is available in the main chamber/cavern and surrounds. Leaving the outer 70m of the defined extent of laterals as being highly unlikely to be utilised by PLNB.

and is expected to assist in reducing the risk of indirect impacts (such as noise, dust, light, vibration).

The Adit/cave System Protection Zone operates as an extension to the Adit/cave System Exclusion Zone, with substantially the same level of management applied. No direct disturbance will occur within the Adit/cave System Protection Zone except for activities that support monitoring, management and implementation of contingency actions (if required) as outlined in this EMP.

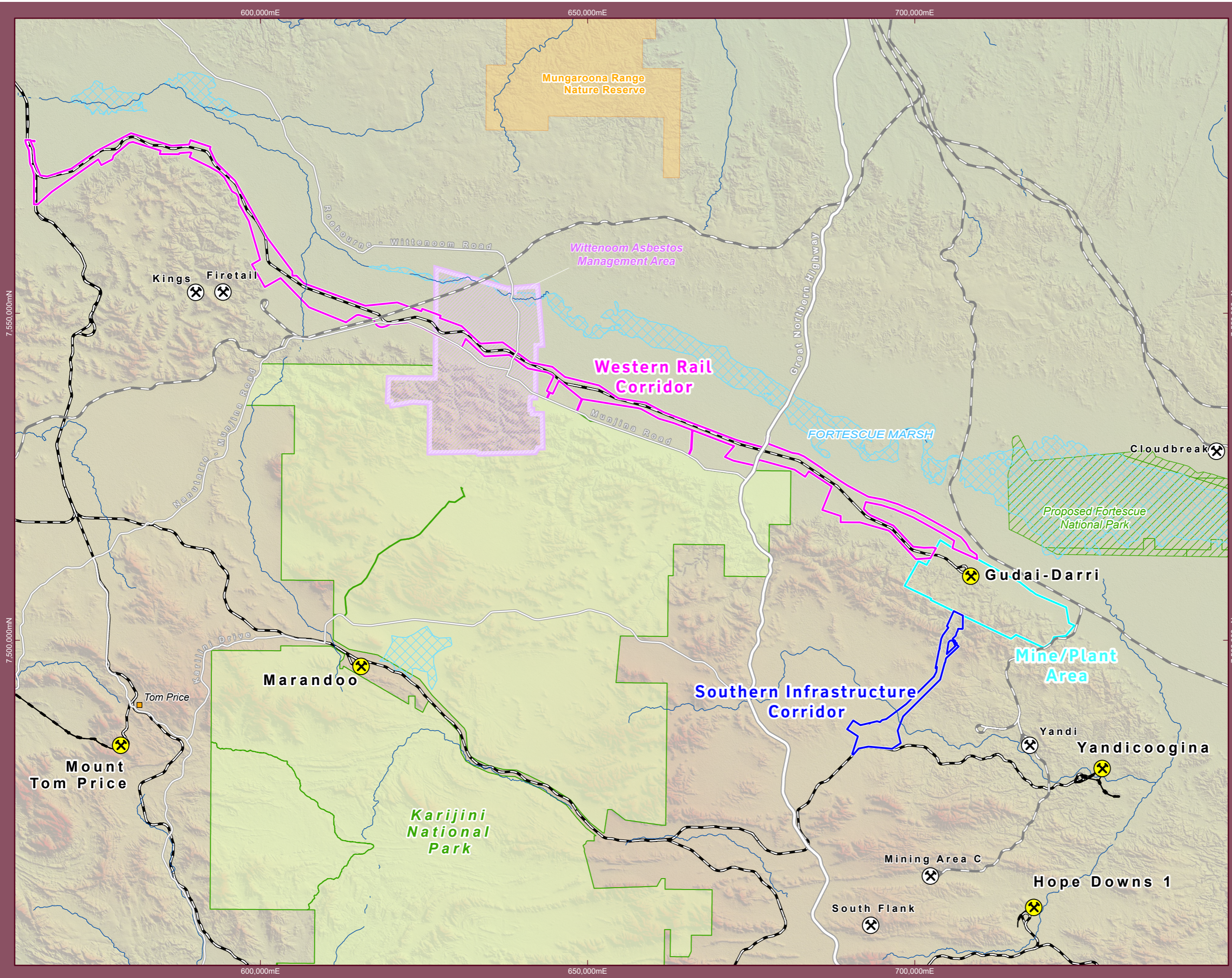
Definitions:

Warrie (K75W) Adit/cave System: The physical adit/cavern, including defined lateral extent, and microclimate.

Warrie (K75W) Colony: The aggregation of PLNB that resides within the Warrie (K75W) Adit/cave System.

## 1.2 Key Environmental Factors

The key environmental factors relevant to the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project as identified in the Environmental Review Document (ERD) (Eco Logical 2013), Condition 7 of MS 999 (EPA 2015) and Condition 2 of EPBC Decision Notice 2012/6422 (DotE 2015) and addressed in this EMP, are described in **Table 1-1**.



**Legend**

- Rio Tinto Mine
- Third Party Mine
- Town
- Rio Tinto Conveyor
- Rio Tinto Railway
- Third Party Railway
- Highway
- Major Road
- Major Creek
- Proposed Fortescue Marsh National Park
- National Park
- Land Subject to Inundation
- Mungaroona Range Reserve
- Wittenoom Asbestos Management Area
- MS 999 Development Envelope**
- Mine/Plant Area
- Southern Infrastructure Corridor (SIC)
- Western Rail Corridor

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Regional Location of the Gudai-Darri Iron Ore Mine and Infrastructure Project

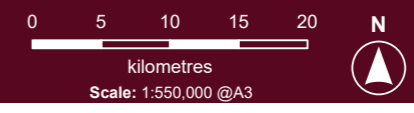
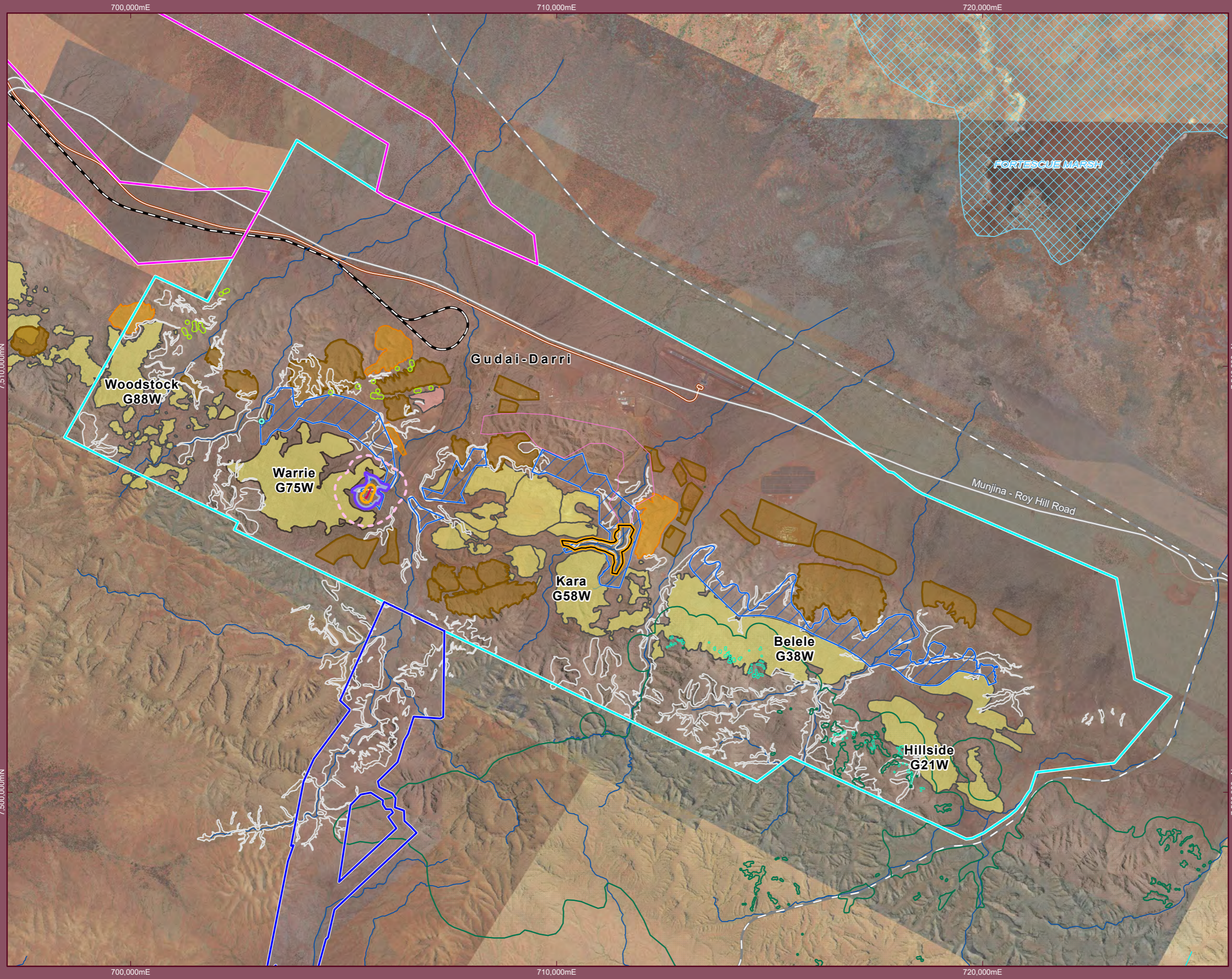


Figure 1-1: Regional Location of the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project.



**Legend**

**MS 999 Development Envelope**

- Mine/Plant Area
- Southern Infrastructure Corridor (SIC)
- Western Rail Corridor

**Proposed Mine Layout**

- Pit
- Waste Rock Landform
- Stockpile
- SubSoil

**Exclusion Zones**

- Gudai-Darri Spring Gorge
- Troglotauna
- Pilbara Leaf-nosed Bat
- KBH12
- Lepidium catapycnon* 50m radius buffer
- Synostemon hamersleyensis*
- Synostemon* Habitat Draft Restriction Zone
- Northern Quoll Habitat

**Warrie (G75W) Adit/Cave System**

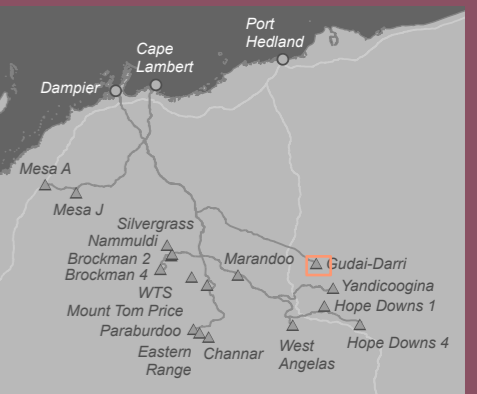
- Warrie Adit/Cave System
- Revised PLNB 400m Monitoring Zone (PLNB EMP)
- K75W Adit/Cave System Exclusion Zone (MS999)
- Warrie Adit/Cave System Protection Zone

**Infrastructure and Features**

- Rio Tinto Railway
- Third Party Railway
- Site Access Road
- Minor Road
- Major Creek
- Land Subject to Inundation

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Development Envelope and Conceptual Footprint  
 of the Gudai-Darri Iron Ore Mine and Infrastructure Project

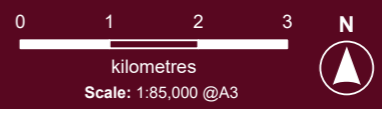


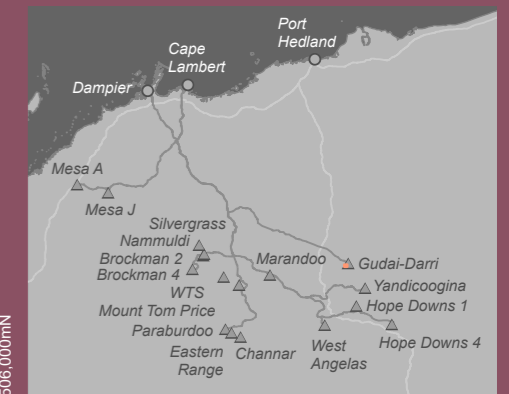
Figure 1-2: Development Envelope and conceptual footprint of the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project.



- Legend**
- Warrie (G75W) Adit/Cave System
- Warrie Adit/Cave System
  - K75W Adit/Cave System Exclusion Zone (MS999)
  - Adit/Cave System Lateral Extent
  - Warrie Adit/Cave System Protection Zone
  - Revised PLNB 400m Monitoring Zone (PLNB EMP)
- Exclusion Zones
- Troglifauna
  - Northern Quoll Habitat
- Proposed Mine Layout
- Pit
  - Waste Rock Landform
  - Stockpile

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**Warrie (G75W) Adit/Cave System Protection Zone**  
 at the Gudai-Darri Iron Ore Mine and Infrastructure Project (Outcome of the Structural Report)



**Figure 1-3: Warrie (K75W) Adit/cave System Protection Zone at the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project (outcome of the Structural Report)**

**Table 1-1: Key environmental factors associated environmental values, and potential impacts from the Project as addressed in this EMP (as per the SPR model<sup>7</sup>).**

Environmental value (receptor)	Predicted impacts		Potential impacts Not predicted to occur	
	Direct (stressor, pressure)	Indirect (stressor, pressure)	Direct (stressor, pressure)	Indirect (stressor, pressure)
<b>Terrestrial Fauna</b> <u>Tier 1:</u> Pilbara Leaf-nosed Bat ( <i>Rhinonictoris aurantia</i> ) and high value habitat, including Warrie (K75W) roost.	<b>Conceptual Footprint</b>	<b>Development Envelope (high value foraging habitat)</b>	<b>Development Envelope</b>	<b>Development Envelope</b>
	<b>Clearing</b> <ul style="list-style-type: none"> <li>Loss or modification of foraging habitat</li> </ul>	<b>Dust and artificial light</b> <ul style="list-style-type: none"> <li>Changes to the environment from general activities may influence/change behaviour, and/or use of habitats within the Development Envelope i.e. Artificial light may delay nightly departure from roost and disrupt foraging and commuting behaviour. Rows of lighting may present a barrier to landscape connectivity. Artificial light may reduce invertebrate abundance with impacts on bats' food resource. Aggregations of insects at light sources may assist some (light-tolerant) bat species in the short term and disadvantage others.</li> </ul>	<b>Fauna Interactions</b> <ul style="list-style-type: none"> <li>Fauna injury or death due to workforce presence, vehicle movements and/or infrastructure.</li> </ul>	<b>Vibration</b> <ul style="list-style-type: none"> <li>Blasting may cause structural damage to Warrie (K75W) Adit/cave System (and other caves) in the Development Envelope including collapse or generation of new openings resulting in a change to the microclimate (i.e. temperature and humidity).</li> </ul> <b>Feral animals</b> <ul style="list-style-type: none"> <li>Increase presence in feral animals, with potential to predate on PLNB.</li> </ul> <b>Other threatening processes (noise, dust, artificial light and fauna interactions)</b> <ul style="list-style-type: none"> <li>Changes to the environment from general activities may influence/change behaviour, and/or use of habitats within the Development Envelope (including Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site)</li> </ul> <b>Altered Hydrogeology</b> <ul style="list-style-type: none"> <li>Modification of high value foraging habitat from abstraction</li> <li>Modification of the Warrie (K75W) Adit/cave System microclimate from dewatering of the Warrie (K75W) pit</li> </ul>

<sup>7</sup> A 'causal pathway conceptual model' (Stressor, Pressure, Receptor [SPR]) approach for potential impacts due to the Project (**Appendix 1**).

### 1.3 Condition Requirements

The Project has been assessed under Part IV of the *Environmental Protection Act 1986* (EP Act) and under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This EMP fulfills the requirements of MS 999 Condition 7 (EPA 2015).

Condition 2 of EPBC Decision Notice 2012/6422 also requires compliance with conditions 6-1, 6-2, and Condition 7 of MS 999 for better protection of the Pilbara Leaf-nosed Bat.

### 1.4 Approach

This EMP was drafted in accordance with the Conceptual Framework for the Development of Rio Tinto Environmental Management Plans (internal guidance described in **Appendix 1**). This conceptual approach to management considers the conservation significance of the environmental value (receptor) based on conservation status at local, state and regional levels. Management level (low, moderate or high) is assigned in order to achieve the environmental objective and/ or outcome according to the conservation significance of the environmental value and the significance of impact/s predicted over spatial and temporal scales. Assessment of the pathways over which impacts may occur provides the rationale for choice of provisions and choice of appropriate indicators to measure against the environmental outcome and/or objective.

This EMP provides provisions for potential impacts to environmental values specific to the Project. The significance of all potential threats to environmental values present within the Development Envelope, including threatening processes to MNES fauna (that is: presence of weed species and fauna, vibration, dust, light, noise, fire and fauna interactions), are considered during the conceptual framework assessment to ensure appropriate provisions.

### 1.5 Management Rationale

This EMP adopts a combination of outcome and objective-based provisions, in order to achieve the environmental objectives of MS 999 Condition 7 and the EPBC Decision Notice 2012/6422 Condition 2.

#### *Outcome-based EMP provisions*

Outcome-based provisions are applied where a sufficient level of information exists to establish specific measurable outcomes (EPA 2020b). Environmental criteria are defined to assess performance against the environmental outcome. These are:

**Early Response Criteria** Provide information on changes that are precursors to an environmental impact, used to initiate early response actions before or at the onset of environmental impacts.

**Trigger criteria** Measures set at a conservative level to forewarn the approach of threshold criteria and ensure trigger level actions are implemented well in advance of the environmental outcome being compromised.

**Threshold criteria** Framed to represent the limit of acceptable impact beyond which there is likely to be a significant effect on the environment. This indicates there is risk that the environmental outcome will not be met.

#### *Objective-based EMP provisions*

Objective-based (formerly management-based) provisions are applied where a level of uncertainty exists or where performance cannot be measured against trigger or threshold criteria. In this case, management targets are established to measure success of management actions in achieving the environmental objective.

Complementary provisions (including both outcome and objective-based) may be applied to address values where a High<sup>8</sup> level of management is required, and/or a degree of uncertainty and complexity exists. The rationale for the choice of provisions is provided in **Table 1-2**.

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<sup>8</sup> In accordance with the Rio Tinto conceptual framework for development of EMPs (Appendix 1).

**Table 1-2: Rationale for choice of provisions**

Current knowledge and description of impacts	Key assumptions and uncertainties	Rationale for choice of provision
<b>Terrestrial Fauna: Pilbara Leaf-nosed Bat (<i>Rhinonicteris aurantia</i>) and high value habitat (roosts &amp; important foraging sites)</b>		
Level of Management <sup>9</sup> High		
Key surveys and studies: (Armstrong 2001; Biologic 2019; Biota 2012a; b; c; d; e; f; g; 2013a; b; 2014; 2018; 2020; PSM 2022; Stantec 2021; 2022; 2023)		
<p><b>High value habitat: Warrie (K75W) Roost</b></p> <p>Preliminary fauna surveys conducted at Gudai-Darri (Koodaideri) recorded the Pilbara Leaf-nosed Bat (PLNB) from an old mine adit adjacent to the Warrie (K75W) deposit within the Development Envelope. The adit intersects a large natural cavern in which a fluctuating population (recently 50-100 individuals between 2019 and 2023, with a peak of 500+ individuals in 2014-2015) of PLNBs roost. Cavern auto-scanning conducted down the existing KOOD0018 drill hole (<b>Figure 1-2</b>) and a geotechnical assessment of the Adit/cave System revealed the natural cavern to be located 14 m below the surface, is approximately 30 m x 30 m in plan and 4 m in height. The Cavern is inclined at approximately 30° towards the east.</p> <p>The Warrie (K75W) Colony is defined as the aggregation of PLNBs that resides within the Warrie (K75W) Adit/cave System. Permanent diurnal PLNB roosts are governed by a strict temperature (28 – 32°C) and humidity (85 – 100%) requirements. The Warrie (K75W) Adit/cave System maintains a temperature of approximately 31°C, and 98 – 100% relative humidity.</p> <p>No direct disturbance will occur within the Adit/cave System Protection Zone except for activities that support monitoring, management and implementation of contingency actions (if required) as outlined in this EMP. The Adit/cave System Protection Zone operates in extension of the ASEZ (<b>Figure 1-4</b> and <b>Figure 1-3</b>) to:</p> <ul style="list-style-type: none"> <li>• Avoid direct disturbance.</li> <li>• Mitigate threatening processes, including light, noise, dust and vehicle and machinery movements.</li> <li>• Minimise the impact of vibrations from blasting on the structure of the Warrie (K75W) Adit/cave System.</li> <li>• Protect the integrity of the habitat values of the Warrie (K75W) Adit/cave System.</li> <li>• Protect the structural integrity of the Warrie (K75W) Adit/cave System, potential lateral caverns/extends and breakaway habitat/landforms surrounding the adit entrance fly away zone.</li> </ul> <p>Adaptive blasting techniques (low intensity blasting, pre-splitting in advance of blasting, controlled blasting) will be implemented to manage vibration from blasting to ensure the structural integrity of the Warrie (K75W) Adit/cave System is maintained, reduce blast/vibration effects on the PLNB and acclimatise PLNB's as mining moves to within the monitoring zone, 400 m from the Adit/cave System Protection Zone (as revised based on the outcome of the Structural Report). The 400m monitoring zone has accordingly been extended to be applied to the revised Adit/cave System Protection Zone as a more conservative approach than stipulated in Condition 7-6 (4) of the MS999, to monitor PLNB behaviour as mining progresses within the proposed Warrie (K75W) developments. Progressive and staged development of mine pits will be implemented to prolong the availability of foraging habitat for PLNB. Some disturbance from mining operations (i.e. material spillage and flyrock from drill and blast activities) may extend into the Adit/cave System Protection Zone however mining pit crests and landforms will not.</p> <p><b>High value habitat: Important foraging sites</b></p> <p>Preliminary fauna surveys conducted at Gudai-Darri (Koodaideri) recorded high call activity at two locations within the Development Envelope: Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site. The timing of call recordings at these locations was consistent with bats dispersing from the Warrie (K75W) Adit/cave System and the high call activity at these locations suggests that they may be locally important foraging areas. The gorge containing the KBH12 site is adjacent to the Warrie (K75W) mine pit and approximately 2.8 km northwest of the Warrie (K75W) Adit/cave System. Mean total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge over the baseline period (2013 – 2018) was 550 calls, with a median of 412. Baseline monitoring (2015 – 2018) recorded a mean of 77 total nightly calls for the Gorge containing the KBH12 site, with a median of 47.</p> <p>The Gudai-Darri (Koodaideri) Spring Gorge is located approximately 5 km east of the Warrie (K75W) Adit/cave System and it has been demonstrated that PLNBs visit the site nightly. Given their susceptibility to dehydration, a nearby water-source is considered important in maintaining the colony's persistence. PLNB colonies are typically associated with permanent water sources, usually within a flying distance of less than 5 km from the roost site.</p> <p>Targeted surveys on the movement and flight paths of individuals from the Warrie (K75W) Colony, indicate that PLNBs exit the roost in all directions, the most common being to the west. Initial surveys indicated the most frequent used flight path was a direct flight west-east between the Warrie (K75W) Adit/cave System and the Gudai-Darri (Koodaideri) Spring Gorge, other flight paths recorded PLNBs flying to/from the plains north of Gudai-Darri (Koodaideri) and south along the north-south running drainage features either side of the Kara (K58W) pit. Subsequent targeted surveys suggest that PLNBs do not fly directly from the Warrie (K75W) Adit/cave System to the Gudai-Darri (Koodaideri) Spring Gorge upon emergence, rather that the PLNBs will visit the Gudai-Darri (Koodaideri) Spring Gorge at another point during the night, and thus from any other location within their</p>	<p><b>Assumptions:</b></p> <ul style="list-style-type: none"> <li>• Protection of high value habitat (roosts and foraging sites) will enable the persistence of the Pilbara Leaf-nosed bat within the Development Envelope</li> <li>• The additional exclusion zones (i.e. <u>Troglofauna EZs</u>) will further assist in protection of the high value PLNB habitat</li> <li>• This EMP has been developed on the assumption that there are no other major roosts in the vicinity of the Project. Further data from targeted survey work may indicate/locate a satellite roost(s).</li> </ul> <p><b>Uncertainties:</b></p> <ul style="list-style-type: none"> <li>• Limited data on the sensitivity of Pilbara Leaf-nosed Bat behaviour to noise, light, dust and vibration.</li> <li>• Limited understanding of the long-term behaviour of Pilbara Leaf-nosed Bat in relation to movement between roosts locally in the vicinity of the Project, and regionally.</li> <li>• The lateral extent of the Warrie (K75W) Adit/cave System has not been confirmed, however is not predicted to extend further than 100 m from the known cavern extents.</li> <li>• Limited data on the likely impact of climate change and drought on the Pilbara Leaf-nosed Bat.</li> <li>• A satellite roost is likely to occur in the vicinity of the Adit/cave System. It is possible that PLNBs from the Warrie (K75W) colony may move between these locations, at certain times.</li> <li>• Tagging programmes have not captured a sufficient data set to make informed decisions on PLNB behaviour and dispersal at Gudai-Darri operations.</li> </ul>	<p>A high management zone classification is considered appropriate to manage direct and indirect impacts (<b>Table 1-1</b>) to the Pilbara Leaf-nosed Bat and high value habitat (Tier 1) within the Development Envelope</p> <p><b>High value habitat: Warrie (K75W) Adit/cave System</b></p> <p>MS (999) Condition 7-5(2) objective - <i>The Proponent shall ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))</i></p> <p>The overall management strategy for the Warrie (K75W) PLNB Roost environment is to maintain the integrity of the Warrie (K75W) Adit/cave System to ensure the viability of the population at a local and regional scale is maintained. It is proposed that the condition 7-5(2) is achieved through the implementation of the Adit/cave System Protection Zone and monitoring zone within 400 m of the Adit/cave System Protection Zone (as revised following the Structural Report outcomes) through outcome and objective-based provisions. The following management measures are in place:</p> <ul style="list-style-type: none"> <li>• Trigger and threshold criteria (criteria relating to calls developed as per Appendix 3) to assess extent of direct (clearing) and indirect impact and inform appropriate response actions (as specified in <b>Table 2-1</b>)</li> <li>• Targets to measure the success of management actions in order to achieve the environmental outcome (as specified in <b>Table 2-2</b>)</li> </ul> <p>The Warrie (K75W) Adit/cave System Protection Zone and monitoring zone have been applied to mitigate impacts from threatening processes on PLNB behaviour, including light, dust, noise, vibration and vehicle machinery movements.</p> <p><b>High value habitat: Important foraging sites</b></p> <p>MS (999) Condition 7-5(1) objective - <i>The Proponent shall ensure that the bat colony continues to use the important foraging locations of Koodaideri Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1)).</i></p> <p>The overall management strategy for PLNB high value foraging habitat is to maintain the ecological function and viability of the habitat through implementation of monitoring and mitigation measures to minimise impacts and implementation of EZs around these sites. The following management measures are in place:</p> <ul style="list-style-type: none"> <li>• The Proponent will ensure no direct disturbance, attributable to the Project, within the Adit/cave System Protection Zone, except for activities that support monitoring, management and implementation of contingency actions (if required) as outlined in this EMP.</li> <li>• The Proponent will ensure no direct disturbance, attributable to the Project, within the Kara (K58W) PLNB EZ, other than existing and authorised disturbance prescribed in MS999.</li> <li>• Trigger and threshold criteria to assess extent of direct (clearing) and indirect impact and inform appropriate response actions (as specified in <b>Table 2-1</b>).</li> <li>• Targets to measure the success of management actions in order to achieve the environmental outcome (as specified in <b>Table 2-2</b>).</li> </ul> <p>The potential for operations to cause a fire that impacts high value habitats is considered to be low and specific provisions to manage this have not been applied.</p> <p><b>Colony</b></p> <p>The following environmental measures are in place:</p> <ul style="list-style-type: none"> <li>• Targets to measure the success of management actions in order to achieve the environmental outcome (as specified in <b>Table 2-2</b>).</li> <li>• Trigger and threshold criteria to assess extent of direct (interaction) and indirect impact and inform appropriate response actions (as specified in <b>Table 2-1</b>).</li> <li>• Census of the Warrie (K75W) Colony undertaken annually to measure colony size and utilisation of the permanent diurnal roost within the Warrie (K75W) Adit/cave System.</li> </ul>

<sup>9</sup> Assessment of required management level, as per the conceptual framework for development of Rio Tinto's EMPs (Appendix 1).

foraging range. PLNB have been recorded utilising the PLNB EZ and Troglifauna EZs, which may offer alternative routes to the Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site. The Troglifauna EZs north of the Warrie (K75W) and Kara (K58W) pits are likely to provide foraging habitat and an alternative route from the Warrie (K75W) Adit/cave System to the Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site. Therefore, dispersal routes are unlikely to be constrained to an extent that PLNBs would not be able to modify them in response to Project related activities.

**Satellite Roost Search**

Call data from KBH25 indicates that use of the satellite roost typically occurs during the ‘dry-season’ indicative of April to November with available data and communication with Subject Matter Expert (SME) Bob Bullen indicating that the satellite roost is most likely a semi-permanent diurnal (category 3) roost (Bat Call WA 2021; DoE 2016). During 2023 three trips to locate the satellite roost in an attempt to improve the understanding of its relationship with the PLNB colony located at the Adit/cave system were carried out.

During the search 100 locations were surveyed and PLNBs were detected at 25 (**Figure 1-5**), from these, seven indicated the presence of an alternative roost site, other than the Adit/cave System. The closest call in relation to civil twilight (CT) was recorded at BAT01\_0710, where PLNB calls were detected as early as 6 minutes post CT indicating a maximum theoretical travel distance of 2.30 km (the Adit is located 6.92 km away). The closest call to CT at KBH25 (14min post CT) indicated a maximum theoretical travel distance of 5.37 km (the Adit is located 11.79 km away). The call timings and subsequent maximum theoretical travel distance from BAT01\_0710 and KBH25 provide an indicative 914 ha search area where the Satellite Roost is most likely located (**Figure 1-5**)

**VHF Tagging**

Transmitters were attached to 13 PLNBs captured at the Warrie (K75W) Adit/Cave System over three trapping events: 21<sup>st</sup> July 2022, 28<sup>th</sup> July 2022 and 18<sup>th</sup> August 2022. The 13 PLNBs, seven males and six females, were tagged and released. A total of 76,233 detections were recorded over the tracking period from the 13 individuals. Each individual was recorded from between 921 to 18,233 detections, with transmitters remaining attached for an average of 5 nights, with a minimum of one night (one male; 2 x females) and a maximum of eight nights (one male). Preliminary results suggest that there is a high level of activity surrounding the Warrie (K75W) Adit/cave system, in the hills immediately south of the Adit/cave system, the Spring and area north of KBH12. Whilst individuals were recorded at KBH25, the Grand Canyon, and in the PLNB EZ between the Adit and the Spring Gorge, these areas did not appear to be of increased significance.

**Colony**

The Pilbara Leaf-nosed Bat is listed as Vulnerable pursuant to the EPBC Act and the BC Act, and is a Matter of National Environmental Significance (MNES). Evidence of this species has been recorded from 78 locations, during baseline surveys, within the Development Envelope (**Figure 1-5**). The Warrie (K75W) Colony was estimated at approximately 400 individuals in the baseline period (2013-2108). Subsequent monitoring and investigations including tracking, infra-red camera census counts, echolocation monitoring, and bat expert advice have identified a decline in the PLNB colony between the baseline (2013-2018; 400-530 bats) to 2021. This analysis indicates a stabilisation of the colony, with approximately 50-100 individual bats present at the Adit/cave System over the past two years during mining operations. Baseline monitoring (2013-2018) of total nightly calls at the Warrie (K75W) Adit/cave System indicates a mean of 851 calls with a median of 697 calls. Baseline echolocation monitoring indicates a highly fluctuating and cyclical colony, with declines in total nightly calls during the wet-season. The mean number of calls during the wet-season (December – April) was 620 calls, compared with a mean of 997 calls during the dry-season (May – November). PLNB aggregations in the winter months are likely to be for breeding, and individuals range nomadically from the roost when wet-season (summer) conditions allow the species to move to other roosts, caves and/or crevices.

The PLNB Adit/cave System Protection Zone and EZs have been applied to mitigate impacts to PLNB colony from the following threatening processes, including light, dust, noise/vibration, vehicle and machinery movements. Conventional dust suppression measures will be applied, and a weather station will monitor rainfall and temperature.

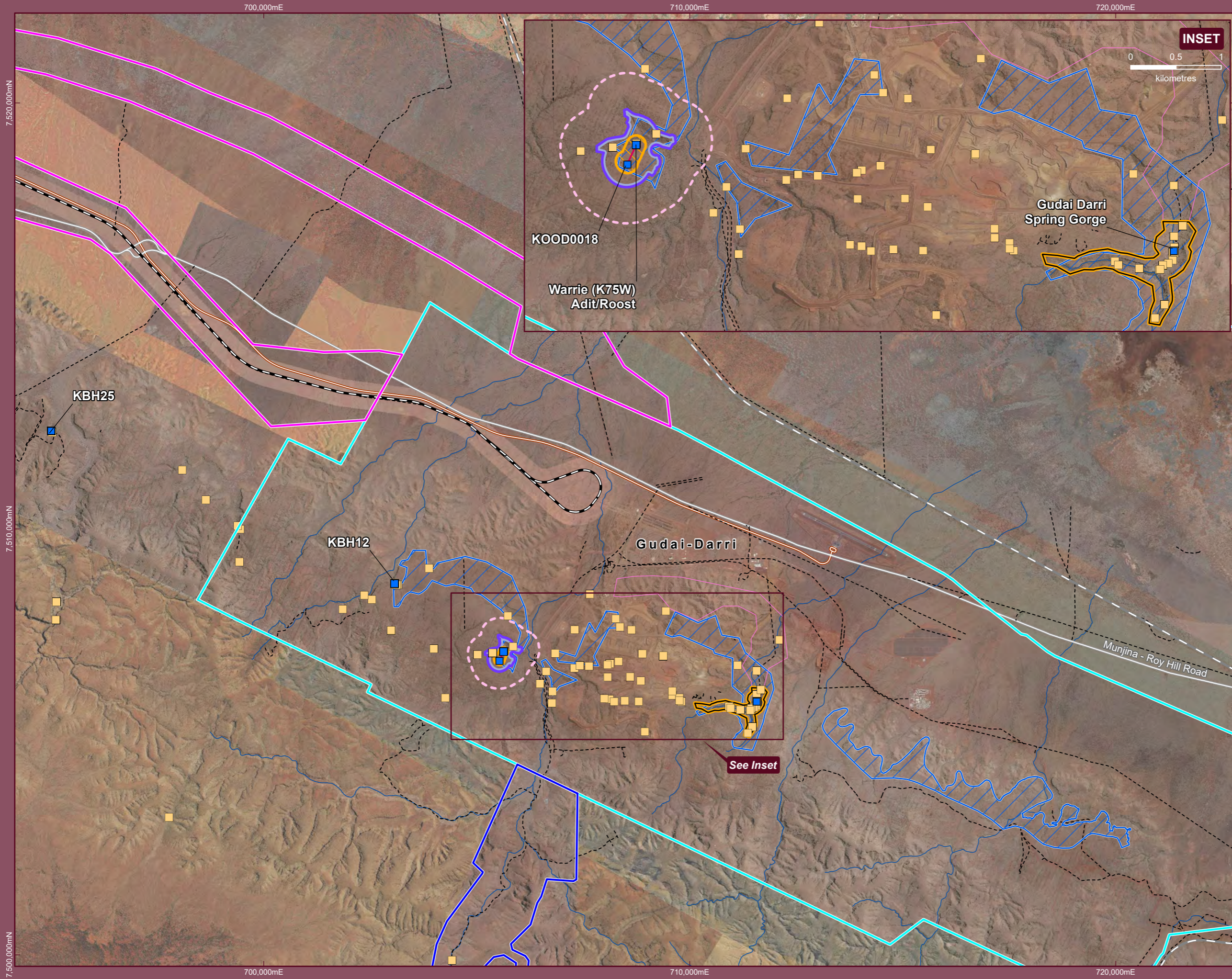
Additional management parameters to address other threatening processes (Gudai-Darri (Koodaideri) Spring Gorge water levels and vegetation, and feral predators) and support this objective are included in **Table 2-2** and include:

- Management of Gudai-Darri (Koodaideri) Spring Gorge water levels and vegetation will be managed in accordance with the provisions (including monitoring and reporting) within the Gudai-Darri (Koodaideri) Spring Gorge EMP<sup>10</sup>.

Although not identified by the EPA as a key impact to PLNB, feral predators will be managed in accordance with the objective-based provisions (including monitoring and reporting provisions) within the Gudai-Darri (Koodaideri) Northern Quoll EMP.

The management approaches are presented in **Table 2-1** and **Table 2-2** and will be updated as required with consideration of additional baseline data and adaptive management (as described in Section 3).

<sup>10</sup>The revised Gudai-Darri Spring Gorge Environment Management Plan was submitted to DWER on the 01 October 2021 and is awaiting approval.



### Legend

**Pilbara Leaf-nosed Bat Roost Location**

- Rio Tinto PLNB Monitoring Site
- Baseline PLNB Records

**Exclusion Zones**

- Gudai-Darri Spring Gorge
- Troglofauna
- Pilbara Leaf-nosed Bat
- KBH12

**Warrie (G75W) Adit/Cave System**

- Warrie Adit/Cave System
- K75W Adit/Cave System Exclusion Zone (MS999)
- Warrie Adit/Cave System Protection Zone
- Revised PLNB 400m Monitoring Zone (PLNB EMP)

**MS 999 Development Envelope**

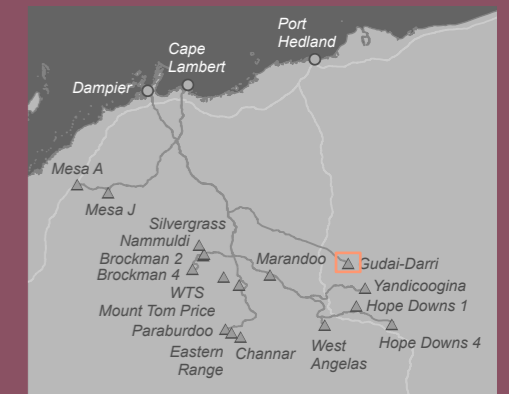
- Mine/Plant Area
- Southern Infrastructure Corridor (SIC)
- Western Rail Corridor

**Infrastructure**

- Rio Tinto Railway
- Third Party Railway
- Minor Road
- Site Access Road
- Track
- Major Creek

Drawn: L.Fuentes-Vasquez  
 Plan: RTIO-1018434v1  
 Date: January 2024

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## PLNB Monitoring Locations, Baseline records and Other Fauna Exclusion Zones at the Gudai-Darri Iron Ore Mine and Infrastructure Project

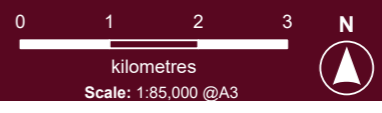
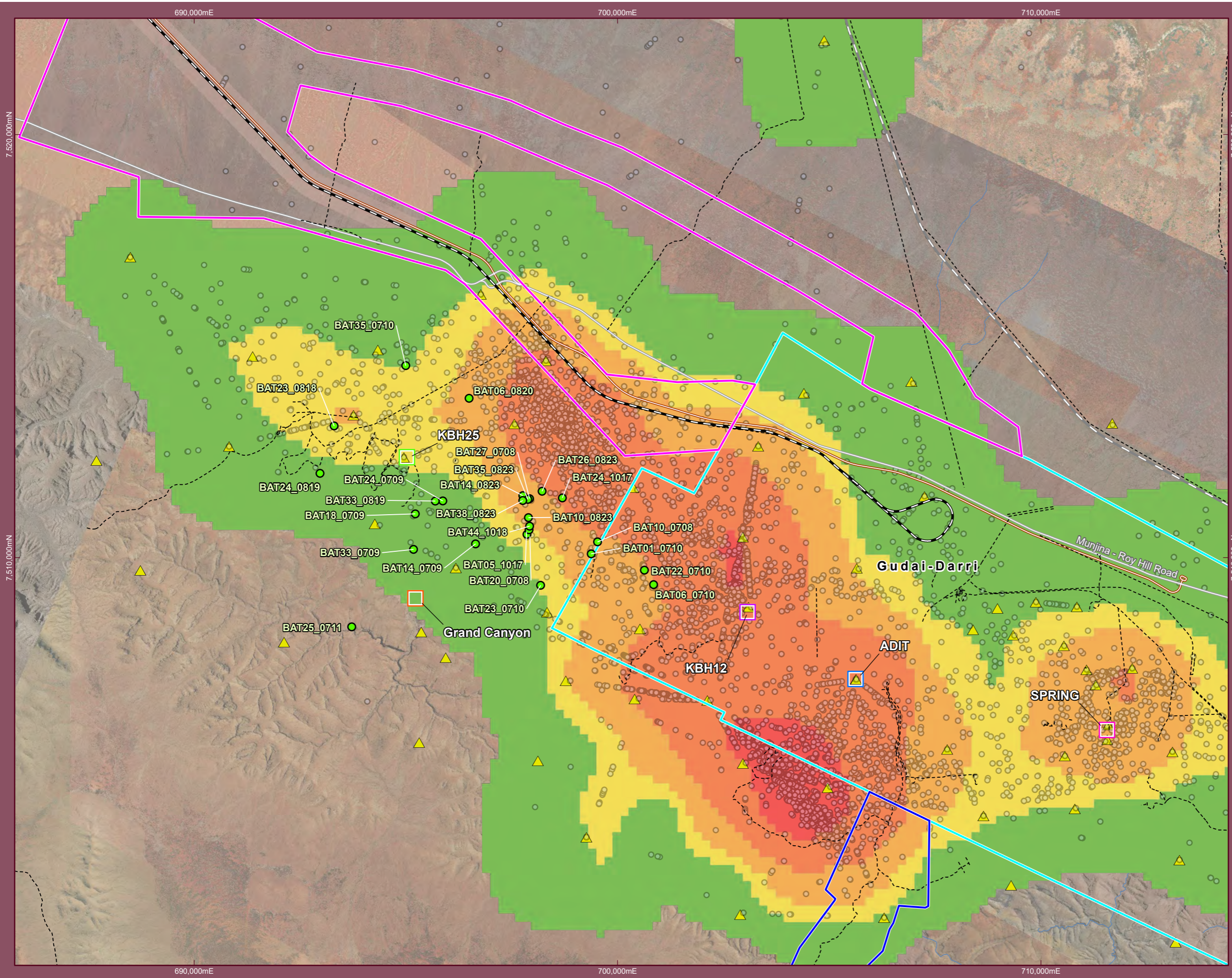


Figure 1-4: Exclusion Zones and PLNB records at the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project.



**Legend**

- ▲ Sensor Node
- Weighted Average Location

**Site**

- Adit
- Approx KBH25
- Grand Canyon
- KBH12
- Spring

**Kernel Density Estimate**

- High (Red)
- Low (Green)

**Pilbara Leaf-nosed Bat Roost Location**

- Rio Tinto PLNB Monitoring Site

**MS 999 Development Envelope**

- ▭ Mine/Plant Area
- ▭ Southern Infrastructure Corridor (SIC)
- ▭ Western Rail Corridor

**Infrastructure**

- Rio Tinto Railway
- Third Party Railway
- Minor Road
- Site Access Road
- - - - Track

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**PLNB Records -Subsequent Surveys  
 at the Gudai-Darri Iron Ore Mine and Infrastructure Project**



Figure 1-5: PLNB records from Satellite Roost Search and Tagging efforts at the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project.



## 2. EMP PROVISIONS

This section of the EMP identifies the provisions that the Proponent will implement to ensure that the defined environmental outcomes and objectives are met during implementation of the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project. Outcome- and objective-based provisions are detailed in **Table 2-1** to **Table 2-2** including monitoring and reporting provisions.

The EMP will be updated to align with the adaptive management approach (refer to **Section 3**).

**Table 2-1: EMP Provisions – Threatened Fauna (Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia*) and high value habitat (roosts and important foraging sites))**

**Rationale:** To maintain the ecological function and viability of high valued foraging sites (Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site) through the implementation of monitoring protocols/procedures (triggers/threshold criteria) and mitigation measures (contingency actions) to minimise the indirect impacts (including dust, noise, light), which have the potential to diminish the environmental quality of the foraging sites and corresponding PLNB activity and usage.

<p><b>EPA Factor:</b> Terrestrial Fauna  <b>EPA objective:</b> To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.  <b>Outcome:</b> The Proponent shall ensure that the bat colony continues to use the important foraging locations of Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1)). The Proponent shall ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))  <b>Key environmental values:</b> MNES species, Pilbara Leaf-nosed Bat (<i>Rhinonictoris aurantia</i>)  <b>Key impacts and risks:</b> Potential loss or degradation of high value habitat (roost and important foraging sites), potential loss of species from the Development Envelope, as a result of implementation of the Project</p>					
<p><b>Outcome-based provisions</b></p>					
<p><b>High Management Level – Warrie (K75W) Roost and important foraging sites</b></p>					
<p><b>MS999 (Page 6) Condition 7-6 (6): “criteria to trigger implementation of management or contingency measures to prevent disturbance to the Pilbara Leaf-nosed Bat colony within the Warrie (K75W) Adit/cave System during drilling and blasting required for the development of the Pit Warrie (K75W)”</b></p> <p><b>MS999 (Page 6) Condition 7-6 (4): “protocols and procedures to monitor behaviour as the proposal’s activities move to within 400 metres of the Warrie (K75W) Adit/cave Systems Exclusion Zone required by condition 6-1 during the development of Pit Warrie (K75W)”</b></p>					
<p><b>Indicators:</b> Breach of Adit/cave System Protection Zone, noise &amp; vibration monitoring; changes in internal temperature or humidity of the Warrie (K75W) Adit/cave System and changes to the adit entrance</p>	<p><b>Response Actions</b></p>	<p><b>Monitoring</b></p>	<p><b>Timing/Frequency</b></p>	<p><b>Responsible</b></p>	<p><b>Reporting</b></p>
<p><b>Trigger criteria</b></p> <p>1. Direct disturbance<sup>11</sup> moves to within the 400 m monitoring zone, but outside of the Adit/cave System Protection Zone, attributable to the Project.</p> <p>AND/OR</p> <p>2. Vibration levels recorded between 8 - 10 mm/s<sup>-1</sup> peak particle velocity at the Warrie (K75W) Adit /cave System, attributable to the Project.</p>	<p><b>Investigate potential cause of exceedance by review of:</b></p> <ul style="list-style-type: none"> <li>In-field inspections (Unmanned Aerial Vehicle (UAV) or visual);</li> <li>Site specific observations; clearing extent, blast vibration predictions;</li> <li>Blast vibration monitoring data;</li> <li>Temperature and humidity monitoring data to determine if the Warrie (K75W) Adit/cave System microclimate has been compromised;</li> <li>Other monitoring and supporting data (e.g. seasonal, climatic data, mine plan).</li> </ul> <p><b>If investigations and on-ground survey (if applicable) indicate that trigger exceedance is attributed to the Project, implement appropriate trigger level response actions, for example:</b></p> <ul style="list-style-type: none"> <li>Temporarily pause blasting activities until investigation of potential cause of vibration exceedance is completed and an inspection of the Warrie (K75W) Adit/cave System, is undertaken, prior to the next planned blast. <ul style="list-style-type: none"> <li>Investigate and determine if damage to the structural integrity of the Warrie (K75W) Adit/cave System has occurred following the blast.</li> <li>Where no structural damage to Warrie (K75W) Adit/cave System is observed, the blast engineer is to review and re-calibrate blast conditions accordingly, as required, to within modelled predictions, prior to undertaking subsequent blast.</li> <li>Update blasting model and blast management procedures accordingly.</li> </ul> </li> <li>Report internally as an event (incident).</li> <li>Undertake on-going monitoring (see <b>Appendix 2</b>) as Project activities move within 400 m of the Adit/cave System Protection Zone.</li> <li>Implement work practices (physical demarcation of Adit/cave System Protection Zone, toolbox meetings and training needs), as required.</li> <li>Ensure that mining pit crests do not extend into the Adit/cave System Protection Zone (some disturbance from mining operations (i.e. material spillage and flyrock from drill and blast activities) may extend into the Adit/cave System Protection Zone).</li> <li>Undertake horizontal ground displacement monitoring (<b>Table 2-2</b>)</li> </ul> <p>If causal factors for disturbance cannot be identified, consider expanded on-ground assessment (if appropriate, expand the frequency of monitoring).</p>	<ul style="list-style-type: none"> <li>Land clearing reconciliation (against GIS avoidance layers and disturbance layers) to ensure the Adit/Cave System Protection Zone is not impacted or entered without authorisation.</li> <li>Annual review of events (incidents) of unauthorised access to the identified restriction zones.</li> <li>Aerial image capture and disturbance review (satellite or Remotely Piloted Aircraft).</li> <li>Pit crest and ground surface monitoring (supporting management in <b>Table 2-2</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Annual, or as triggered by clearing reconciliation.</li> <li>Annual imagery capture and analysis.</li> </ul>	<ul style="list-style-type: none"> <li>Operations Environment team</li> </ul>	<ul style="list-style-type: none"> <li>The environmental outcome will be reported against the trigger criterion for each calendar year by 30 April in the ACAR.</li> <li>If any trigger criterion was exceeded during the reporting period, the ACAR will discuss potential reasons for exceedance of the trigger criterion and include a description of the effectiveness of trigger level actions.</li> </ul>
	<ul style="list-style-type: none"> <li>Temporarily pause blasting activities until investigation of potential cause of vibration exceedance is completed and an inspection of the Warrie (K75W) Adit/cave System, is undertaken, prior to the next planned blast. <ul style="list-style-type: none"> <li>Investigate and determine if damage to the structural integrity of the Warrie (K75W) Adit/cave System has occurred following the blast.</li> <li>Where no structural damage to Warrie (K75W) Adit/cave System is observed, the blast engineer is to review and re-calibrate blast conditions accordingly, as required, to within modelled predictions, prior to undertaking subsequent blast.</li> <li>Update blasting model and blast management procedures accordingly.</li> </ul> </li> <li>Report internally as an event (incident).</li> <li>Undertake on-going monitoring (see <b>Appendix 2</b>) as Project activities move within 400 m of the Adit/cave System Protection Zone.</li> <li>Implement work practices (physical demarcation of Adit/cave System Protection Zone, toolbox meetings and training needs), as required.</li> <li>Ensure that mining pit crests do not extend into the Adit/cave System Protection Zone (some disturbance from mining operations (i.e. material spillage and flyrock from drill and blast activities) may extend into the Adit/cave System Protection Zone).</li> <li>Undertake horizontal ground displacement monitoring (<b>Table 2-2</b>)</li> </ul> <p>If causal factors for disturbance cannot be identified, consider expanded on-ground assessment (if appropriate, expand the frequency of monitoring).</p>	<ul style="list-style-type: none"> <li>Blast vibration monitoring for all blasts within the monitoring zone, 400m of the Adit/cave System Protection Zone (in accordance with <b>Appendix 3</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Event-based, all blasts within 400 m of the Adit/cave System Protection Zone</li> </ul>	<ul style="list-style-type: none"> <li>Mine Technical Services – Drill and Blast team</li> <li>Operations Environment team</li> </ul>	
	<ul style="list-style-type: none"> <li>Temporarily pause blasting activities until investigation of potential cause of vibration exceedance is completed and an inspection of the Warrie (K75W) Adit/cave System, is undertaken, prior to the next planned blast. <ul style="list-style-type: none"> <li>Investigate and determine if damage to the structural integrity of the Warrie (K75W) Adit/cave System has occurred following the blast.</li> <li>Where no structural damage to Warrie (K75W) Adit/cave System is observed, the blast engineer is to review and re-calibrate blast conditions accordingly, as required, to within modelled predictions, prior to undertaking subsequent blast.</li> <li>Update blasting model and blast management procedures accordingly.</li> </ul> </li> <li>Report internally as an event (incident).</li> <li>Undertake on-going monitoring (see <b>Appendix 2</b>) as Project activities move within 400 m of the Adit/cave System Protection Zone.</li> <li>Implement work practices (physical demarcation of Adit/cave System Protection Zone, toolbox meetings and training needs), as required.</li> <li>Ensure that mining pit crests do not extend into the Adit/cave System Protection Zone (some disturbance from mining operations (i.e. material spillage and flyrock from drill and blast activities) may extend into the Adit/cave System Protection Zone).</li> <li>Undertake horizontal ground displacement monitoring (<b>Table 2-2</b>)</li> </ul> <p>If causal factors for disturbance cannot be identified, consider expanded on-ground assessment (if appropriate, expand the frequency of monitoring).</p>	<ul style="list-style-type: none"> <li>Inspections (on-ground) for structural damage to Adit/cave System entrance/opening (<b>Figure 1-4</b>)</li> <li>Temperature and humidity logging monitoring at the Warrie (K75W) Adit/cave System for all blasts within 400 m of the Adit/cave System Protection Zone, to identify potential changes in internal structure (<b>Figure 1-4</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly, or as triggered</li> <li>Continuous (device dependant) monitoring, with quarterly analysis or as triggered</li> </ul>	<ul style="list-style-type: none"> <li>Operations Environment team</li> </ul>	

<sup>11</sup> With the exception of low impact activities associated with monitoring, management and implementation of contingency actions

**EPA Factor:** Terrestrial Fauna

**EPA objective:** To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

**Outcome:** The Proponent shall ensure that the bat colony continues to use the important foraging locations of Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1)). The Proponent shall ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))

**Key environmental values:** MNES species, Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*)

**Key impacts and risks:** Potential loss or degradation of high value habitat (roost and important foraging sites), potential loss of species from the Development Envelope, as a result of implementation of the Project

<p><b>Threshold Criteria:</b></p> <p>1. Direct disturbance<sup>12</sup> occurs within the Adit/cave System Protection Zone, attributable to the Project.</p> <p>AND/OR</p> <p>2. Vibration levels exceed 10 mm/s<sup>-1</sup> peak particle velocity at the Warrie (K75W) Adit/cave System, attributable to the Project.</p>	<p><b>Threshold contingency action:</b></p> <p>Implement as appropriate, previously determined threshold contingency actions, as applicable:</p> <ul style="list-style-type: none"> <li>Pause disturbance activities within the Adit/cave System Protection Zone, as applicable.</li> <li>Temporarily pause any planned blasting activities within the monitoring zone, 400 m of the Adit/cave System Protection Zone.</li> <li>Check demarcation of disturbance areas has been undertaken effectively.</li> <li>Inspections (on-ground or UAV) for structural damage to Adit/cave System.</li> <li>Undertake corrective land disturbance rehabilitation as required.</li> <li>Investigate and determine if damage to the structural integrity of the Warrie (K75W) Adit/cave System has occurred following threshold exceedance.</li> <li>Where any identified damage is considered likely to affect ongoing use by PLNB (i.e. damage which may prevent exit/entry or could result in a compromised microclimate) <ul style="list-style-type: none"> <li>Undertake any practical corrective rehabilitation as required (e.g. removal of significant rockfall).</li> <li>Identify alternative locations for an entrance to the natural cavern of the Warrie (K75W) Adit/cave system, in the unlikely event the adit entrance is compromised.</li> <li>In the unlikely event that damage to the lateral extent of the Warrie (K75W) Adit/cave System has occurred, investigate options in consultation with DBCA/ DWER and/or Subject Matter Experts. Indicative corrective measures may include: <ul style="list-style-type: none"> <li>Attempt to seal and close the cavity with suitable material (e.g. rock fill, black metal sheeting, clay/concrete substrate)</li> <li>Undertake sealing with consideration to minimise disturbance to bats: <ul style="list-style-type: none"> <li>Consider undertaking corrective works at night time;</li> <li>Consider infra-red camera data to ensure majority of PLNB colony have left the roost to forage for the night</li> <li>Consider work practices to minimise disturbance from noise, vibration and light spill.</li> </ul> </li> </ul> </li> </ul> </li> <li>Undertake further consultation with relevant stakeholders (e.g. DWER/DBCA/DCCEEW) and implement corrective measures as agreed by relevant stakeholders, which may include: <ul style="list-style-type: none"> <li>Re-assess work practices and training needs;</li> <li>Review and/or update the Adit/Cave System Protection Zone, as required;</li> <li>Alter/update short-term mine plan to avoid blasting activities within 400 m of the Adit/cave System Protection Zone;</li> <li>Review and revise monitoring schedule and parameters accordingly.</li> <li>Consider building of an artificial roost, as a last resort</li> </ul> </li> </ul> <p>Continue to implement threshold contingency actions until the CEO has confirmed by notice in writing that it has been demonstrated that the impact is below the threshold and trigger criteria.</p> <p>Monitor to validate success of threshold contingency actions.</p>	<ul style="list-style-type: none"> <li>Land clearing reconciliation (against GIS avoidance layers and disturbance layers) to ensure the Adit/Cave System Protection Zone is not impacted or entered without authorisation.</li> <li>Annual review of events (incidents) of unauthorised access to the identified restriction zones.</li> <li>Aerial image capture (satellite or Remotely Piloted Aircraft).</li> </ul>	<ul style="list-style-type: none"> <li>Annual, or as triggered clearing reconciliation</li> <li>Annual imagery capture and analysis</li> </ul>	<ul style="list-style-type: none"> <li>Operations Environment team</li> </ul>	<ul style="list-style-type: none"> <li>In the event that monitoring, tests, surveys or investigations indicate exceedance of threshold criteria, the exceedance will be notified in writing to the CEO within seven (7) days of the exceedance being known.</li> <li>The Proponent will provide a report to the CEO of DWER within twenty-one (21) days of the exceedance being reported.</li> <li>The environmental outcome will be reported against the threshold criterion for each calendar year in the ACAR.</li> <li>If the threshold criterion was exceeded during the reporting period, the ACAR will include a description of the effectiveness of threshold contingency action/s that have been implemented to manage the potential impact</li> </ul>
	<ul style="list-style-type: none"> <li>Blast vibration monitoring for all blasts within the monitoring zone, 400m of the Adit/cave System Protection Zone (in accordance with <b>Appendix 2</b>).</li> </ul>	<ul style="list-style-type: none"> <li>Event-based, all blasts within 400 m of the Warrie (K75W) Adit/cave System Protection Zone</li> </ul>	<ul style="list-style-type: none"> <li>Mine Technical Services – Drill and Blast team</li> </ul>		
	<ul style="list-style-type: none"> <li>Inspections (on-ground or UAV) for structural damage to Adit/cave System entrance/opening (<b>Figure 1-4</b>)</li> <li>Temperature and humidity logging monitoring (<b>Appendix 2</b>) at the Warrie (K75W) Adit/cave System for all blasts within 400 m of the Adit/cave System Protection Zone, to identify potential changes in internal structure (<b>Figure 1-4</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Bi-Monthly, or as triggered, for the Warrie (K75W) Roost</li> <li>Continuous (device dependant) monitoring, with quarterly analysis</li> </ul>	<ul style="list-style-type: none"> <li>Operations Environment team</li> </ul>		

<sup>12</sup> With the exception of low impact activities associated with monitoring, management and implementation of contingency actions.

**EPA Factor:** Terrestrial Fauna

**EPA objective:** To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

**Outcome:** The Proponent shall ensure that the bat colony continues to use the important foraging locations of Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1)). The Proponent shall ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))

**Key environmental values:** MNES species, Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*)

**Key impacts and risks:** Potential loss or degradation of high value habitat (roost and important foraging sites), potential loss of species from the Development Envelope, as a result of implementation of the Project

**MS999 (Page 6) Condition 7-6 (2): “protocols and procedures to monitor activity levels of Pilbara Leaf-nosed Bats foraging at the Koodaideri Spring Gorge and the gorge containing the KBH12 site”**

**MS999 (Page 6) Condition 7-6 (7): “criteria to trigger implementation of management or contingency measures to respond to a reduction of Pilbara Leaf-nosed Bat foraging calls at the gorge containing the KBH12 site and the Koodaideri Spring Gorge to levels below baseline during mining of Pits Warrie (K75W) and Kara (K58W)”**

**MS999 (Page 6) Condition 7-6 (8): “management and or contingency measures to be implemented in the event that the trigger criteria required by condition 7-6(6) and/or condition 7-6(7) have been reached**

Indicators: Presence of PLNB within the Development Envelope	Response Actions	Monitoring <sup>13</sup>	Timing/Frequency	Responsible	
<p><b>Early response criteria:</b></p> <p>1. Total nightly calls at the Warrie (K75W) Adit/cave System remains below wet-season LCL<sup>14</sup> (25) OR dry-season LCL (236) between 1 and 4 consecutive nights during the respective season.</p> <p>AND/OR</p> <p>2. Total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge or the gorge containing the KBH12 site, remain below 5 for between 5 and 14 consecutive nights, when PLNB are roosting at the Warrie (K75W) Adit/cave System<sup>15</sup>.</p>	<p><b>Early response action:</b></p> <p><b>Investigate potential cause of exceedance by review of:</b></p> <ul style="list-style-type: none"> <li>• Authorised and unauthorised access to Adit/Cave System Protection Zone;</li> <li>• Noise and vibration levels at the Warrie (K75W) Adit/Cave System for the period of the exceedance;</li> <li>• Long-term trends in early response criterion exceedances through analysis of total nightly calls.</li> <li>• Rolling average of total nightly calls over a seven day and 30-day period.</li> <li>• Environmental conditions (e.g. rainfall, Gudai-Darri (Koodaideri) Spring Gorge water levels, vegetation and fire).</li> </ul>	<ul style="list-style-type: none"> <li>• Echolocation monitoring and assessment (call data using echolocation recorder) to determine total nightly calls (activity) and monitor presence (Figure 1-4), as per Appendix 2.</li> <li>• Monitor PLNB call activity from the KOOD0018<sup>16</sup> drill hole (Figure 1-4) as project moves within 400 m monitoring zone.</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous (device dependant) with bi-Monthly<sup>17</sup>, or as triggered, analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Operations Environment team</li> </ul>	<ul style="list-style-type: none"> <li>• If the trigger or threshold criterion was exceeded during the reporting period, the ACAR will include review of early response criteria, if relevant to the exceedance.</li> </ul>

<sup>13</sup> Program will be reviewed and, where appropriate, will be updated to align with current methodologies and in consultation with internal/external experts and/or regulators (i.e. DBCA)

<sup>14</sup> Development, rationale and validation of seasonal Lower Call Limits described in Appendix 3.

<sup>15</sup> Time of PLNB calls in relation to civil twilight (i.e. 15 mins pre/post civil twilight) will be used to determine if PLNB are roosting at the Warrie (K75W) Roost, assessed as part of the ongoing echolocation monitoring detailed in Appendix 2.

<sup>16</sup> Echolocation monitoring down the KOOD0018 drill hole will provide 24-hour/day baseline call activity (rather than emergence/ only data from adit entrance echolocation), that can be reviewed to detect any unusual call activity/behaviour that may indicate disturbance to the Roost.

<sup>17</sup> With current technology real time analysis of data is not feasible. A lag in potential criteria exceedance and data analysis times may occur.

**EPA Factor:** Terrestrial Fauna

**EPA objective:** To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

**Outcome:** The Proponent shall ensure that the bat colony continues to use the important foraging locations of Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1)). The Proponent shall ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))

**Key environmental values:** MNES species, Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*)

**Key impacts and risks:** Potential loss or degradation of high value habitat (roost and important foraging sites), potential loss of species from the Development Envelope, as a result of implementation of the Project

<p><b>Trigger criteria:</b></p> <ol style="list-style-type: none"> <li>Total nightly calls at the Warrie (K75W) Adit/cave System remains below wet-season LCL (25) OR dry-season LCL (236) for between 5 and 14 consecutive nights during the respective season.</li> </ol> <p>AND/OR</p> <ol style="list-style-type: none"> <li>Total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge during the dry-season, remain below 5 for 5 consecutive nights.</li> </ol> <p>AND/OR</p> <ol style="list-style-type: none"> <li>Total nightly calls at the gorge containing the KBH12 site, remain below 5 during the dry-season, for 5 consecutive nights.</li> </ol>	<p><b>Trigger criteria action:</b></p> <p><b>Investigate potential cause of exceedance by review of:</b></p> <ul style="list-style-type: none"> <li>PLNB call activity at reference sites and other regional PLNB data sets;</li> <li>Infra-red (IR) camera data against call activity to provide context for change in call activity in relation to PLNB count and accuracy of call data;</li> <li>Environmental conditions (e.g. rainfall, Gudai-Darri (Koodaideri) Spring Gorge water levels and vegetation, fire);</li> <li>Review echolocation call data to determine if PLNB are roosting at the Warrie (K75W) Adit/cave System<sup>18</sup> during the period of the exceedance.</li> <li>Noise and vibration levels at the Warrie (K75W) Adit/cave System for the period of the exceedance;</li> <li>Authorised and unauthorised access to Adit/Cave System Protection Zone;</li> <li>Mine activity plan;</li> <li>Mine blast plan;</li> <li>Other data, including monitoring of roost structural integrity through humidity and temperature loggers.</li> </ul> <p><b>If investigations and on-ground survey (if applicable) indicate that trigger exceedance is associated with the Project, implement relevant trigger level response actions, for example:</b></p> <ul style="list-style-type: none"> <li>Report internally as an event (incident).</li> <li>Monitoring and mitigation of light, noise and/or dust.</li> <li>Re-assess work practises and training needs.</li> <li>Consider updating mine and blast activities and plans.</li> <li>appropriate measures as agreed by relevant stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>Echolocation monitoring and assessment (call data using echolocation recorder) to determine total nightly calls (activity) and monitor presence (Figure 1-4), as per Appendix 2.</li> <li>Monitor PLNB call activity from the KOOD0018<sup>19</sup> drill hole (Figure 1-4) as project moves within 400 m monitoring zone.</li> </ul>	<ul style="list-style-type: none"> <li>Continuous (device dependant) with bi-monthly<sup>17</sup>, or as triggered, analysis</li> </ul>	<ul style="list-style-type: none"> <li>Operation Environment team</li> </ul>	<ul style="list-style-type: none"> <li>The environmental outcome will be reported against the trigger criterion for each calendar year by 30 April in the ACAR.</li> <li>If any trigger criterion was exceeded during the reporting period, the ACAR will discuss potential reasons for exceedance of the trigger criterion and include a description of the effectiveness of trigger level actions.</li> </ul>
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<sup>18</sup> Time of PLNB calls in relation to civil twilight (i.e. 15 mins pre/post civil twilight) will be used to determine if PLNB are roosting at the Warrie (K75W) Adit/cave System, assessed as part of the ongoing echolocation monitoring detailed in Appendix 2.

<sup>19</sup> Echolocation monitoring down the KOOD0018 drill hole will provide 24-hour/day baseline call activity (rather than emergence/ only data from adit entrance echolocation), that will be used to detect any unusual call activity/behaviour that may indicate disturbance to the Colony.

**EPA Factor:** Terrestrial Fauna

**EPA objective:** To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

**Outcome:** The Proponent shall ensure that the bat colony continues to use the important foraging locations of Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1)). The Proponent shall ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))

**Key environmental values:** MNES species, Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*)

**Key impacts and risks:** Potential loss or degradation of high value habitat (roost and important foraging sites), potential loss of species from the Development Envelope, as a result of implementation of the Project

<p><b>Threshold criteria:</b></p> <ol style="list-style-type: none"> <li>Total nightly calls at the Warrie (K75W) Adit/cave System remain below wet-season LCL (25) OR dry-season LCL (236) ≥15 consecutive nights during the respective season.</li> </ol> <p>AND/OR</p> <ol style="list-style-type: none"> <li>Total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge, are 0 during the dry-season for 5 consecutive nights.</li> </ol> <p>AND/OR</p> <ol style="list-style-type: none"> <li>Total nightly calls at the gorge containing the KBH12 site, are 0 during the dry-season, for 5 consecutive nights.</li> </ol>	<p><b>Threshold criteria action:</b></p> <p><b>Implement threshold contingency actions, in addition to early response and trigger criteria actions, where appropriate, for example:</b></p> <ul style="list-style-type: none"> <li>Investigate potential cause of exceedance: <ul style="list-style-type: none"> <li>Review PLNB call activity at reference sites and other regional PLNB data sets.</li> <li>Review echolocation call data to determine if PLNB are roosting at the Warrie (K75W) Roost<sup>20</sup> during the period of the exceedance.</li> <li>Review Infra-red (IR) camera data against call activity to provide context for change in call activity in relation to PLNB count and accuracy of call data (<b>Appendix 2</b>).</li> <li>Review monitoring and mitigation of secondary impacts such as light, noise/vibration or dust, as appropriate.</li> <li>Review ratio of PLNB calls between the Spring Gorge and the Warrie (K75W) Roost.</li> <li>Review environmental conditions (e.g. rainfall, Gudai-Darri (Koodaideri) Spring Gorge water levels and vegetation, fire).</li> </ul> </li> <li>Temporarily cease disturbance within 400 m of the Adit/cave System Protection Zone until total nightly calls at the Warrie (K75W) Adit/cave System return to above trigger level.</li> <li>Conduct census within 30 days at the Warrie (K75W) Roost (to compare against baseline and to place change in call activity from echolocation monitoring into context).</li> <li>Review and revise (i.e. increase) frequency of monitoring accordingly.</li> <li>Re-assess work practices and training needs.</li> <li>Update mine blast plan, if required.</li> <li>Review and consider requirement for PLNB flight path study.</li> <li>Undertake further consultation with relevant stakeholders (e.g. DWER/DBCA/DCCEEW and/or Subject Matter Experts), as required. Implement corrective measures as agreed by relevant stakeholders, which may include: <ul style="list-style-type: none"> <li>Review and/or update the Adit/Cave System Protection Zone, Gudai-Darri (Koodaideri) Spring Gorge EZ, KBH12 EZ and PLNB EZ, as required.</li> <li>Alter/update short-term mine plan to avoid blasting activities within 400 m of the Adit/cave System Protection Zone.</li> <li>Review and revise monitoring schedule and parameters accordingly in consultation with DWER/ DBCA.</li> </ul> </li> </ul> <p>Continue to implement threshold contingency actions until the CEO of DWER has confirmed by notice in writing that it has been demonstrated that the impact is below the threshold and trigger criteria.</p> <p>Monitor to validate success of threshold contingency actions accordingly</p>	<ul style="list-style-type: none"> <li>Echolocation monitoring and assessment (call data using echolocation recorder) to determine total nightly calls (activity) and monitor presence (<b>Figure 1-4</b>), as per <b>Appendix 2</b>.</li> <li>Monitor PLNB call activity from the KOOD0018<sup>21</sup> drill hole (<b>Figure 1-4</b>) as project moves within 400 m monitoring buffer, as per <b>Appendix 2</b>.</li> </ul>	<ul style="list-style-type: none"> <li>Continuous (device dependant) with bi-monthly<sup>17</sup>, or as triggered, analysis</li> </ul>	<ul style="list-style-type: none"> <li>Operation Environment team</li> </ul>	<ul style="list-style-type: none"> <li>In the event that monitoring, tests, surveys or investigations indicate exceedance of threshold criteria, the Proponent will investigate and provide a report to the CEO of DWER within twenty-one (21) days of the exceedance being known.</li> <li>In the event that the above investigation finds the threshold exceedance is attributable to the project, the Proponent will report to the CEO of DWER within 7 days of the finding being known, pursuant to section 4-5 of MS999.</li> <li>The environmental outcome will be reported against the threshold criterion for each calendar year in the ACAR.</li> <li>If the threshold criterion was exceeded during the reporting period, the ACAR will include a description of the effectiveness of threshold contingency action/s that have been implemented to manage the potential impact.</li> </ul>
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**Supporting monitoring parameters as described in Table 2-2, will provide additional information for interpretation of monitoring data and assessment against criteria**

<sup>20</sup> Time of PLNB calls in relation to civil twilight (i.e. 15 mins pre/post civil twilight) will be used to determine if PLNB are roosting at the Warrie (K75W) Adit/cave System, assessed as part of the ongoing echolocation monitoring detailed in Appendix 2.

<sup>21</sup> Echolocation monitoring down the KOOD0018 drill hole will provide 24-hour/day baseline call activity (rather than emergence/ only data from adit entrance echolocation), that will be used to detect any unusual call activity/behaviour that may indicate disturbance to the Roost.

**Table 2-2: EMP Provisions – Threatened Fauna (Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*) and high value habitat (roosts and important foraging sites))**

**Rationale:** To maintain the ecological function and viability of high valued foraging sites (Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site) through the implementation of monitoring protocols/procedures (triggers/threshold criteria) and mitigation measures (contingency actions) to minimise the indirect impacts (including dust, noise, light), which have the potential to diminish the environmental quality of the foraging sites and corresponding PLNB activity and usage.

<p><b>EPA Factor:</b> Terrestrial Fauna</p> <p><b>EPA objective:</b> To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.</p> <p><b>Objective:</b> The Proponent shall ensure that the bat colony continues to use the important foraging locations of Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1)). The Proponent shall ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))</p> <p><b>Key environmental values:</b> MNES species, Pilbara Leaf-nosed Bat (<i>Rhinonictis aurantia</i>)</p> <p><b>Key impacts and risks:</b> Potential loss or degradation of high value habitat (roost and important foraging sites), potential loss of species from the Development Envelope, as a result of implementation of the Project</p>					
Objective-based provisions					
Moderate Management Level					
MS999 (Page 6) Condition 7-6 (4): “protocols and procedures to monitor Pilbara Leaf-nosed Bat behaviour as the proposal’s activities move to within 400 metres of the Warrie (K75W) Adit/cave Systems Exclusion Zone required by condition 6-1 during the development of Pit Warrie (K75W)”					
<p><b>Indicators:</b></p> <p>Ground disturbing or construction activity within the monitoring zone, 400 m of the Adit/cave System Protection Zone</p>	<b>Management Actions</b>	<b>Monitoring<sup>22</sup></b>	<b>Timing/Frequency</b>	<b>Responsible</b>	<b>Reporting</b>
<p><b>Management target:</b></p> <p>1. The long-term persistence of a viable <sup>23</sup> PLNB colony at the Warrie (K75W) Roost.</p>	<ul style="list-style-type: none"> <li>Undertake on-going monitoring of the Warrie (K75W) Colony (<b>Appendix 2</b>).</li> <li>Undertake works to locate and monitor a potential satellite roost(s) detected near KBH25.</li> <li>Implementation appropriate operational dust suppression measures, for example:                             <ul style="list-style-type: none"> <li>Water carts and sprinklers for dust suppression</li> <li>Using equipment enclosures and dust extraction at crushing and screening facilities; and,</li> <li>Enforcing speed limits on roads to reduce dust lift-off.</li> </ul> </li> <li>Undertake monitoring of light, noise/vibration and dust at the Warrie (K75W) Adit/cave System.</li> <li>Apply blasting restrictions on blast hole diameter and adjust blast methods to ensure compliance with 10 mm/s<sup>-1</sup> peak particle velocity limit applicable to the Warrie (K75W) Adit/cave System.</li> </ul>	<ul style="list-style-type: none"> <li>Monitor PLNB call activity from the KOOD0018<sup>24</sup> drill hole (<b>Figure 1-4</b>), as per <b>Appendix 2</b>.</li> <li>Monitor temperature and humidity within the Warrie (K75W) Adit/cave System, as per <b>Appendix 2</b>.</li> <li>Monitor Warrie (K75W) Adit/cave System entrance for visual signs of rockfall or structural damage.</li> <li>Monitor vibration levels at the Warrie (K75W) Adit/cave System, as per <b>Appendix 2</b>.</li> <li>Annual census of the Warrie (K75W) Roost (<b>Figure 1-4</b>), as per <b>Appendix 2</b>.</li> </ul>	<ul style="list-style-type: none"> <li>Continuous (device dependant) monitoring, with analysis after each blast event within 400 m of the Adit/cave System Protection Zone</li> <li>Annual PLNB census program</li> </ul>	<ul style="list-style-type: none"> <li>Operations Environment team</li> <li>Mine Technical Services – Drill and Blast team</li> </ul>	<ul style="list-style-type: none"> <li>The environmental objective will be reported against the management target for each calendar year by 30 April in the ACAR.</li> <li>If any management target was not met during the reporting period, the annual report will include discussion of the effectiveness of the management actions and whether revision of management actions is required.</li> </ul>
MS999 (Page 6) Condition 7-6 (3): “protocols and procedures to monitor the Pilbara Leaf-nosed Bat movement and foraging activity between Warrie (K75W) Adit/cave system and the Koodaideri Spring Gorge during the development of Pit Kara (K58W)”					
<p><b>Indicators:</b></p> <p>Presence and movement of PLNB between Warrie (K75W) Adit/cave System and the Gudai-Darri (Koodaideri) Spring Gorge</p>	<b>Management Actions</b>	<b>Monitoring</b>	<b>Timing/Frequency</b>	<b>Responsible</b>	<b>Reporting</b>

<sup>22</sup> Indicative program to be implemented when Project moves within the 400 m monitoring buffer, as described in Appendix 2. Program will be reviewed and, where appropriate, will be updated to align with current methodologies and in consultation with internal/external experts and/or regulators (i.e. DBCA).

<sup>23</sup> A viable colony is one that is self-sustaining (evidence of recruitment) and maintained within natural variation despite stochastic events and climate change.

<sup>24</sup> Echolocation monitoring down the KOOD0018 drill hole will provide 24-hour/day baseline call activity (rather than emergence/ only data from adit entrance echolocation), that will be used to detect any unusual call activity/behaviour that may indicate disturbance to the Colony.

<p><b>EPA Factor:</b> Terrestrial Fauna</p> <p><b>EPA objective:</b> To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.</p> <p><b>Objective:</b> The Proponent shall ensure that the bat colony continues to use the important foraging locations of Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1)). The Proponent shall ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))</p> <p><b>Key environmental values:</b> MNES species, Pilbara Leaf-nosed Bat (<i>Rhinonictis aurantia</i>)</p> <p><b>Key impacts and risks:</b> Potential loss or degradation of high value habitat (roost and important foraging sites), potential loss of species from the Development Envelope, as a result of implementation of the Project</p>					
<p><b>Management target:</b></p> <p>1. The Gudai-Darri (Koodaideri) Spring Gorge remains an important foraging location for the PLNB colony during construction and operation of the Kara (K58W) pit.</p>	<ul style="list-style-type: none"> <li>Undertake on-going PLNB activity monitoring (see <b>Appendix 2</b>) during development of the Kara (K58W) Pit.</li> <li>Implementation of staged vegetation clearing of the Kara (K58W) Pit.</li> <li>No unauthorised disturbance to the Adit/Cave System Protection Zone, Gudai-Darri (Koodaideri) Spring Gorge EZ or PLNB EZ.</li> <li>Implementing appropriate mitigation measures to reduce potential impacts of artificial lighting to PLNB, including consideration of the National Light Pollution Guidelines for Wildlife (DCCEEW 2023)(Appendix I: Bats).</li> <li>Reporting of any PLNB interactions (injury or mortality).</li> <li>Implement the Gudai-Darri (Koodaideri) Spring Gorge Environmental Management Plan.</li> </ul>	<ul style="list-style-type: none"> <li>Echolocation monitoring and assessment (call data using echolocation recorder) to determine total nightly calls (activity) and monitor presence, as per <b>Appendix 2</b>.</li> <li>Land clearing reconciliation (against GIS avoidance layers and disturbance layers) to ensure the Adit/cave System Protection Zone, Gudai-Darri (Koodaideri) Spring Gorge EZ and PLNB EZ are not impacted without authorisation.</li> </ul>	<ul style="list-style-type: none"> <li>Continuous (device dependant) monitoring, with bi-monthly<sup>17</sup> analysis</li> <li>Annual, or as triggered during clearing reconciliation</li> </ul>	<ul style="list-style-type: none"> <li>Operations Environment team</li> </ul>	<ul style="list-style-type: none"> <li>The environmental objective will be reported against the management target for each calendar year by 30 April in the ACAR.</li> <li>If any management target was not met during the reporting period, the annual report will include discussion of the effectiveness of the management actions and whether revision of management actions is required.</li> </ul>
<p><b>MS999 (Page 6) Condition 7-6 (5): “specific management protocols to enable the Pilbara Leaf-nosed Bat to adapt to impacts of construction and operation including a schedule of clearing of bat foraging habitat within the Kara (K58W) mine pit and Warrie (K75W) mine pit taking into account the requirements of conditions 7-6(1), 7-6(2), 7-6(3) and 7-6(4)”</b></p>					
<p><b>Indicators:</b></p> <p>Presence of PLNB within the Development Envelope</p>	<p><b>Management Actions</b></p>	<p><b>Monitoring</b></p>	<p><b>Timing/Frequency</b></p>	<p><b>Responsible</b></p>	<p><b>Reporting</b></p>
<p><b>Management target:</b></p> <p>1. Allow PLNB to adapt to impacts of construction and operation within the Kara (K58W) and Warrie (K75W) mine pits.</p>	<ul style="list-style-type: none"> <li>Implement staged mine pit development, commencing at Kara (K58W) then Warrie (K75W) and then Belele (K38W).</li> <li>Implement Gudai-Darri (Koodaideri) Blast Management Plan</li> <li>Apply precautionary mining approach to provide additional protection from potential indirect impacts for future Warrie (K75W) development, including but not limited to: <ul style="list-style-type: none"> <li>Warrie pit mining to start away from the Adit/Cave System.</li> <li>Strategic mine scheduling of building landforms i.e. waste dumps.</li> <li>Blast designed to limit vibration outside of the monitoring zone.</li> </ul> </li> <li>Implement clearing schedule of PLNB foraging habitat within the Kara (K58W), Warrie (K75W) and Belele (K38W) mine pits.</li> <li>Clearing of main development infrastructure to occur in parallel with the initial mine pit development.</li> <li>Monitoring and mitigation of light, noise/vibration or dust.</li> </ul>	<ul style="list-style-type: none"> <li>Inspection (on-ground or UAV) of mine pit development against mine plan</li> <li>Review of mine plan</li> <li>Inspection of lighting controls</li> </ul>	<ul style="list-style-type: none"> <li>Annual, or as triggered</li> </ul>	<ul style="list-style-type: none"> <li>Operations Environment team</li> </ul>	<ul style="list-style-type: none"> <li>The environmental objective will be reported against the management target for each calendar year by 30 April in the ACAR.</li> <li>If any management target was not met during the reporting period, the annual report will include discussion of the effectiveness of the management actions and whether revision of management actions is required.</li> </ul>
<p><b>Low Management Level</b></p>					
<p><b>Management target:</b></p> <p>1. Minimise direct project-related interactions (e.g. vehicle strike) resulting in PLNB injury or mortality.</p>	<ul style="list-style-type: none"> <li>Personnel are to be informed of EPBC Act listed threatened species (PLNB) that may occur on site.</li> <li>Any PLNB encountered on site are to be recorded and records maintained. This will include locations, and animal status (alive/injured/dead).</li> <li>Vehicles to remain on designated roads unless in the case of emergency or for undertaking necessary activities.</li> <li>If PLNB are required to be moved, handling of individuals will be completed by competent and licensed (where required) personnel only, following Rio Tinto’s Wildlife Interaction Guidelines (our ref: RTIO-HSE-0013116).</li> <li>Feeding of native fauna, hunting, keeping of firearms<sup>25</sup> or pets on site is prohibited.</li> </ul>	<ul style="list-style-type: none"> <li>Inspection of inductions, training, and awareness material</li> <li>Inspection of records, related to sighting, records, encounters and fauna removal.</li> </ul>	<ul style="list-style-type: none"> <li>Construction and operations, monitoring data to be reviewed annually</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>As triggered</li> </ul>	<ul style="list-style-type: none"> <li>Operations Environment team</li> </ul>	<ul style="list-style-type: none"> <li>The environmental objective will be reported against the management target for each calendar year by 30 April in the ACAR.</li> <li>If any management target was not met during the reporting period, the annual report will include discussion of the effectiveness of the management actions and whether revision of management actions is required.</li> </ul>
<p><b>Supporting management parameters for management target<sup>26</sup></b></p>					

<sup>25</sup> Excluding firearms for use in pastoral station activities

<sup>26</sup> Supporting parameters will also manage potential impacts to PLNB, and review of data will provide additional information for interpretation of criteria (trigger and threshold) in **Table 2-1**

<p><b>EPA Factor:</b> Terrestrial Fauna</p> <p><b>EPA objective:</b> To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.</p> <p><b>Objective:</b> The Proponent shall ensure that the bat colony continues to use the important foraging locations of Gudai-Darri (Koodaideri) Spring Gorge and the gorge containing the KBH12 site (MS 999: 7-5(1)). The Proponent shall ensure that the population of the Pilbara Leaf-nosed Bat colony remains in the Warrie (K75W) Adit/cave System (MS 999: 7-5(2))</p> <p><b>Key environmental values:</b> MNES species, Pilbara Leaf-nosed Bat (<i>Rhinonictoris aurantia</i>)</p> <p><b>Key impacts and risks:</b> Potential loss or degradation of high value habitat (roost and important foraging sites), potential loss of species from the Development Envelope, as a result of implementation of the Project</p>					
Management of Gudai-Darri (Koodaideri) Spring Gorge water levels and vegetation.	<ul style="list-style-type: none"> <li>Detailed management actions are presented in the separate Gudai-Darri (Koodaideri) Spring Gorge Environmental Management Plan<sup>27</sup></li> </ul>				<ul style="list-style-type: none"> <li>Supporting parameters; review will provide additional information for interpretation of colony monitoring data.</li> <li>Reporting in accordance with the Gudai-Darri (Koodaideri) Spring Gorge EMP</li> </ul>
Management of horizontal ground displacement <sup>28</sup>	<p>Horizontal ground displacement management from PSM study (FINAL Structural Report PSM4481-003R REV1) includes:</p> <ul style="list-style-type: none"> <li>Pit crest and ground surface monitoring using prisms and automated total stations to be implemented prior to commencement of mining to establish baseline readings and continued through mining of Warrie.</li> <li>Horizontal displacement/deformations due to mining, limited to 6 mm towards pit slope for rock mass with adverse beddings at the Warrie (K75W) pit stand-off distance of 130 m.</li> <li>Horizontal displacement/deformations due to mining are up to 10 mm towards pit slope for rock mass with adverse beddings at 50 m behind the Warrie (K75W) pit crest.</li> <li>Monitoring will be conducted as per RTIO-HSE-0128560_Prism Monitoring Guidance Notes.</li> </ul>	<ul style="list-style-type: none"> <li>Monitor Warrie (K75W) pit crest and ground surface using prisms, and automated total stations</li> </ul>	<ul style="list-style-type: none"> <li>Daily for live and weekly for manual.</li> </ul>	<ul style="list-style-type: none"> <li>Mine Technical Services - Geotech team</li> </ul>	<ul style="list-style-type: none"> <li>Supporting parameters; review will provide additional information for interpretation of colony monitoring data and geotechnical stability of the Warrie Adit/ Cave system.</li> <li>Outcomes will be reported against the management target for each calendar year by 30 April in the ACAR.</li> </ul>
Management of feral animals on site.	<p>Feral animal presence managed on site including:</p> <ul style="list-style-type: none"> <li>Prohibiting feeding animals.</li> <li>Prohibiting keeping pets.</li> <li>Appropriate waste disposal for food scraps and other wastes as per Rio Tinto EMS waste management guideline and in accordance with the <i>Environmental Protection (Rural Landfill) Regulations 2002</i>.</li> <li>All bins storing putrescible waste to have tightly secured lids to avoid fauna attraction and/or entry.</li> <li>Feral animal control program.</li> </ul>	<ul style="list-style-type: none"> <li>Inspection of waste disposal areas at Gudai-Darri (Koodaideri) Village and administration blocks.</li> <li>Report feral animal sightings.</li> </ul>	<ul style="list-style-type: none"> <li>Annual or as triggered</li> </ul>	<ul style="list-style-type: none"> <li>Operations Environment team</li> </ul>	<ul style="list-style-type: none"> <li>Reporting in accordance with the Gudai-Darri (Koodaideri) Northern Quoll EMP</li> </ul>
Management of blasting activities	<ul style="list-style-type: none"> <li>Management of blasting activity as detailed in the Gudai-Darri (Koodaideri) Blast Management Plan</li> </ul>			<ul style="list-style-type: none"> <li>Mine Technical Services – Drill and Blast team</li> </ul>	<ul style="list-style-type: none"> <li>Supporting parameters; review will provide additional information for interpretation of colony monitoring data.</li> <li>Reporting in accordance with the Gudai-Darri (Koodaideri) Blast Management Plan</li> </ul>

<sup>27</sup> The revised Gudai-Darri Spring Gorge Environment Management Plan was submitted to DWER on the 01 October 2021 and is awaiting approval.

<sup>28</sup> This is currently not in place and will be set up and a baseline recorded prior to mining within the revised 400m monitoring zone, there will be a lag between manual load and live load so frequency will change between the two types of data loads.

## 2.1 Reporting

For each calendar year, during the operational phase (refer to Section 2), the environmental outcomes and objectives will be reported against their associated trigger and threshold criteria and management targets in the Annual Compliance Assessment Report (ACAR) for the Proposal (**Table 4-2**).

In the event that trigger, and threshold criteria are exceeded, or management targets are not met during the reporting period, the ACAR will include a description of the effectiveness of any management contingency actions that have been implemented to manage the impact. A stand-alone report will also be produced for the DWER within 21 days of any reporting against exceedance of the threshold criteria, or non-achievement of a management target. A follow up report detailing the adequacy of the response actions will also be submitted to the DWER within 12 months of the initial notification or within the ACAR.

## 3. ADAPTIVE MANAGEMENT AND REVIEW OF THIS EMP

The conceptual framework for the development of Rio Tinto EMPs provides details of the review and adaptive management process (**Appendix 1**). The approach will include evaluation of:

- Monitoring data and comparison to baseline and reference site data on a regular basis to verify responses to potential impacts.
- The effectiveness and relevance of trigger and threshold contingency actions against environmental objectives, on an annual basis, to determine if any changes to the criteria, monitoring or response actions are required.
- The effectiveness and relevance of management actions and targets against environmental objectives, on an annual basis, to determine if any changes to actions, targets or monitoring are required.

Based on the results of the review process the Proponent will update and adjust the management measures and strategies in consultation with DWER (**Table 4-3**).

## 4. STAKEHOLDER CONSULTATION

Consistent with the DAWE and DWER expectations for this EMP to align with the principles of EIA, the Proponent will consult with stakeholders, including but not limited to the Department of Biodiversity, Conservation and Attraction - Park and Wildlife Service, the DWER EPA Services and Compliance and Reporting and DAWE during the environmental impact assessment of the Proposal (**Table 4-1**).

**Table 4-1: Consultation table**

Consultation Table			
Date	Stakeholder	Issues / Comments Raised	Proponent Comment / Response
<p><i>Submitted by RTIO:</i> November 2015</p> <p><i>Approved (by EPA Services)</i> October 2018</p>	<ul style="list-style-type: none"> <li>- <b>OEPA</b> / EPA Services</li> <li>- <b>DPaW</b> (now DBCA)</li> </ul>	<p>The Pilbara Leaf-nosed Bat Environmental Management Plan (PLNB EMP) (RTIO-HSE-0325714) was developed in 2015. Consultation occurred as shown in the Document Status Table above and summarised as follows:</p> <ul style="list-style-type: none"> <li>• <i>Draft</i> submitted to DPaW in August 2015.</li> <li>• Revision 1 submitted to OEPA (now EPA Services) in November 2015 accompanied by RTIO letter (ref: RTIO-HSE-0270141); DPaW comments received and proponent responses contained in Appendix 3 of submitted EMP.</li> <li>• Revision 2 submitted to OEPA in October 2016 accompanied by RTIO Letter (ref: RTIO-HSE-0311230); EMP updated with recent monitoring undertaken and re-formatted to comply with the EPA Environmental Assessment Guideline 17.</li> <li>• Revision 3 submitted to EPA Services in July 2018 accompanied by RTIO letter (ref: RTIO-HSE-0327791); addressing comments provided by EPA Services in June 2017 (that incorporated DPaW comments). Consolidated comments and proponent responses were updated within Appendix 3 of submitted EMP.</li> <li>• Revision 0 submitted to EPA Services in September 2018; addressing comments and editorial amendments as noted in EPA Services correspondence (ref: DWERA 001181, dated 13 September 2018).             <ul style="list-style-type: none"> <li>○ Notification from EPA Services (DWER) of approval of PLNB EMP received 03 October 2018.</li> </ul> </li> </ul>	

**Table 4-2: Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project PLNB Environmental Management Plan Reporting Table**

Key environmental factors: Threatened Fauna – (Pilbara Leaf-nosed Bat ( <i>Rhinonictis aurantia</i> ) and high value habitat (roosts and important foraging sites))	
Environmental outcomes and objectives with associated criteria and management targets.	Reporting periods 1 January-31 December
<b><u>Trigger Criteria</u></b>	<b>Status report:</b> Trigger criteria not exceeded Trigger criteria exceeded
1. Direct disturbance moves within the 400 m monitoring zone, but outside the Adit/Cave System Protection Zone, attributable to the Project.	
2. Vibration levels recorded between 8 - 10 mm/s <sup>-1</sup> peak particle velocity at the Warrie (K75W) Adit /cave System, attributable to the Project.	
3. Total nightly calls at the Warrie (K75W) Adit/cave System remains below wet-season LCL (25) OR dry-season LCL (236) for between five and 14 consecutive nights during the respective season.	
4. Total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge site during the dry-season, remain below 5 for 5 consecutive nights.	
5. Total nightly calls at the gorge containing the KBH12 site during the dry-season, remain below 5 for 5 consecutive nights.	
<b><u>Threshold criteria:</u></b>	<b>Status report:</b> Threshold criteria not exceeded Threshold criteria exceeded
1. Direct disturbance occurs within the Adit/cave System Protection Zone, attributable to the Project.	
2. Vibration levels exceed 10 mm/s <sup>-1</sup> peak particle velocity at the Warrie (K75W) Adit/cave System, attributable to the Project.	
3. Total nightly calls as the Warrie (K75W) Adit/cave System remain below wet-season LCL (25) OR dry-season LCL (236) ≥15 consecutive nights during the respective season.	
4. Total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge, are 0 during the dry-season for 5 consecutive nights.	
5. Total nightly calls at the gorge containing the KBH12 site, are 0 during the dry-season, for 5 consecutive nights.	

**Key environmental factors:** Threatened Fauna – (Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) and high value habitat (roosts and important foraging sites))

<p><b><u>Management Targets</u></b></p>	<p><b>Status report:</b>                      Management target achieved                      Management actions implemented                      Management target not achieved                      Management actions not implemented</p>
<p>1. The long-term persistence of a viable PLNB colony at the Warrie (K75W) Roost.</p>	
<p>2. The Gudai-Darri (Koodaideri) Spring Gorge remains an important foraging location for the PLNB colony during construction and operation of the Kara (K58W) pit.</p>	
<p>3. Allow PLNB to adapt to impacts of construction and operation within the Kara (K58W) and Warrie (K75W) mine pits</p>	
<p>4. Minimise direct project-related interactions (e.g. vehicle strike) resulting in PLNB injury or mortality</p>	

**Table 4-3: Changes to the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project PLNB EMP**

<b>Complexity of Changes</b>				
Minor Revisions <input type="checkbox"/>		Moderate Revisions <input type="checkbox"/>		Major Revisions <input type="checkbox"/>
<b>Number of Key Environmental Factors</b>				
One <input type="checkbox"/>		Two – Three <input type="checkbox"/>		> Three <input type="checkbox"/>
Date Revision submitted to EPA: DD/MM/YYYY				
Proponent’s Operational Requirement Timeframe for approval of revision				
< One Month <input type="checkbox"/>		< Six Months <input type="checkbox"/>		> Six Months <input type="checkbox"/>
None <input type="checkbox"/>				
Reason for Timeframe:				
Item No.	EMP Section No.	EMP Page No.	Summary of Change	Reason for Change

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## **6. APPENDICES**

## Appendix 1 Conceptual Framework for the Development of Rio Tinto Environmental Management Plans

For the development of Environmental Management Plans (EMPs), a conceptual framework model has been applied (**Figure A-1**). The framework ensures linkages between current understanding, potential impacts, outcomes, adaptive management, and consistent monitoring and management practices. The framework is a stepwise process that considers the environmental values as identified in the Proposal's Environmental Impact Assessment Documents, in order to implement appropriate management measures and actions to ensure the environmental objective can be achieved.

The first step of the framework examines in detail the current knowledge of the environmental value(s) associated with the Proposal. This is compiled from information provided in the EIA documents, any additional environmental surveys and examined with input from internal experts. Environmental values associated with the Proposal are evaluated based on their conservation status at local, state and regional levels.

The second step of the framework is to define relevant indicators, level of management and type of provisions (outcome vs objective-based) and associated criteria and/or targets.

A source-pathway receptor (SPR) conceptual modelling approach is used to inform the selection of indicators, as recommended by national and international guidance (DIIS 2016). The SPR conceptual model sets out the collective knowledge, experience and perspective on the environmental value (system of interest) and illustrates assumptions about how the value (system) functions and what is believed to be the important or dominant processes and their linkages. This includes factors that are perceived to be driving changes in the value (system) and the consequences of changes in these factors. The conceptual model also includes factors such as spatial boundaries as well as temporal and seasonal variations.

The number and type of indicators selected to monitor and measure changes in individual environmental values will depend on several factors including; the conservation status of the environmental value; the level of management required; the environmental outcome or objectives; location; and the types of pressures and stressors identified.

The required level of management (Low, Moderate or High; **Table A-1**) is determined using a matrix assessment with four factors relating to predicted impacts from the Proposal including: likelihood; consequence; spatial extent; and temporal duration (**Table A-2**). The higher the level of management, the more lines of evidence may be deemed necessary to meet the environmental outcome or objective (that is more indicators and / or more frequent monitoring schedules).

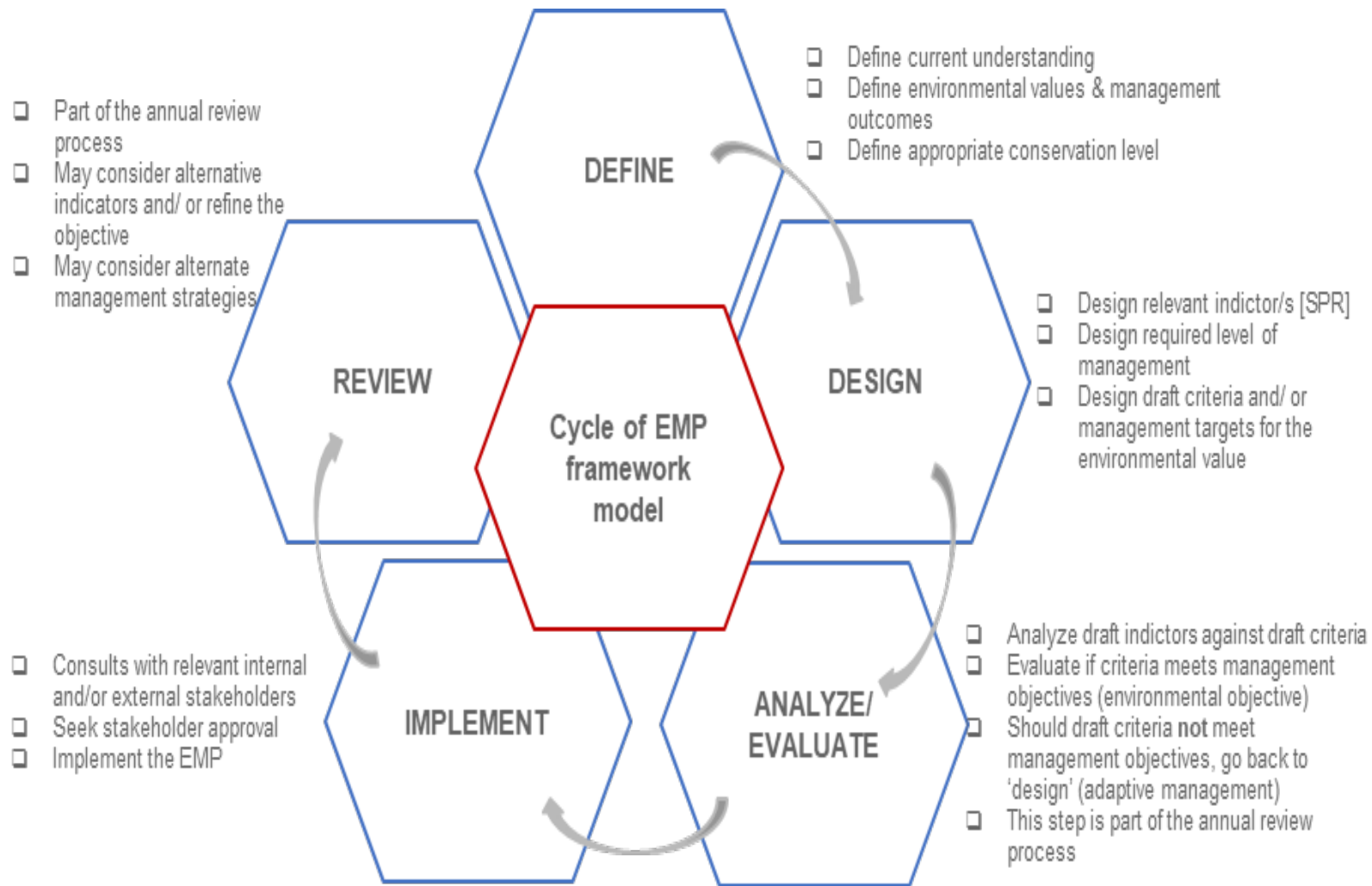
Draft (interim) trigger and threshold criteria and/or draft management targets will be determined for each environmental value. Early response criteria (if appropriate) may be defined for indicators for the environmental value (e.g. groundwater depth) or the environmental value itself (e.g. vegetation status). Trigger and threshold criteria will directly relate to the environmental value and objective itself.

The number of trigger criteria, and the sensitivity of both trigger and threshold criteria, will be determined by the associated management level for the environmental value.

The third step of the framework is to undertake an evaluation of the baseline and/ or current data to assess against criteria and determine whether the environmental outcome or objectives are likely to be met with existing proposed indicators. This step should also occur as part of reporting requirements when criteria are exceeded. Where criteria are not being met the adaptive management process should be implemented.

The fourth step of the framework is to implement the EMP. To ensure successful implementation, relevant internal and external (regulatory) stakeholders are consulted to ensure the EMP meets management expectations and can be implemented for the associated Proposal.

The fifth, final step of the framework considers a revision of or alternatives of management objectives, indicators and/ or criteria. This step is considered where monitoring and assessment indicates objectives are not being met. Where data suggests that objectives cannot be met using current associated indicators and criteria, repeat the second to fifth step of the framework, with consideration of the additional information gained through monitoring



**Figure A 1: Cycle of the conceptual Environmental Management Plan framework model**

**Table A-1: Description of Tiers and examples of environmental values for each<sup>29</sup>**

Tier	Example of values included
<b>1</b> Environmental Values directly protected under State or Commonwealth legislation ( <i>Environmental Protection Act 1986, Biodiversity Conservation Act 2016, Environmental Protection and Biodiversity Conservation Act 1999</i> )	<ul style="list-style-type: none"> <li>• Matters of National Environmental Significance</li> <li>• National Parks</li> <li>• Threatened flora and communities</li> <li>• Environmentally sensitive areas</li> <li>• Listed wetlands / aquatic Groundwater Dependent Ecosystems (GDE's)</li> </ul>
<b>2</b> Environmental Values recognised by State policy	<ul style="list-style-type: none"> <li>• Priority species and communities</li> <li>• Subterranean fauna communities</li> <li>• Other wetlands / terrestrial GDE's</li> </ul>
<b>3</b> Environment Values with no formal recognition for conservation purposes	<ul style="list-style-type: none"> <li>• Short Range Endemics</li> <li>• Other values of interest (e.g. unique or range restricted, high interest, high quality representation, potential new taxa, high value to Rio Tinto or regulators)</li> <li>• Other riparian habitats/ riparian communities / pools</li> </ul>

**Table A-2: Management level assessment matrix**

Factor	Level of required management (increasing to right)				
<b>Likelihood</b>	Rare	Unlikely	Possible	Likely	Almost Certain
<b>Consequence</b>	No Tier	Tier 3	Tier 2	Tier 1	Tier 1 (potential severe consequence)
<b>Extent</b>	Immediate	Surrounds	Local	Catchment	Sub-regional
<b>Duration</b>	Days	Months	Years	Decades	Centuries

- The factors act independently of one another, and an increased risk of one factor will not necessarily result in other factors with higher risk.
- Level/s of management gives an indication of potential importance, however important to note that regulatory focus, cumulative impact and heritage values may impact the way the environmental values are treated/ managed.

**Reference**

DIIS (2016). Leading Practice Sustainable Development Program for the Mining Industry - Preventing Acid and Metalliferous Drainage Handbook Department of Industry, Innovation and Science (DIIS), Canberra, Australia.

<sup>29</sup> Note that the list of Tier values is not explicit and may be changed based on legislative and/ or guideline updates.

## **Appendix 2: Detailed Descriptions of Proposed Monitoring Programs, Baseline Data and Proposed Analyses.**

A Monitoring Program has been developed to align with the assignment of management level (**Table 1-2**). The Monitoring Program follows a Before-After-Control-Impact (BACI) design and includes a primary focus on relative PLNB activity both within and outside the Projects Development Envelope. The Monitoring Program has been developed to achieve the following objectives:

- Monitor the success of mitigation and management measures in the EMP and detect potential impacts to PLNB and high value habitat;
- Evaluate potential impacts against trigger, threshold, and management targets;
- Report exceedances against environmental criteria and implement corrective actions (where required); and
- Assess the effectiveness of the environmental criteria to inform adaptive management and revision where required.

**Table A-3: Summary of PLNB monitoring at the Gudai-Darri (Koodaideri) Project.**

Monitoring Method	Provisions Category		Monitoring Sites	Frequency	Timing	Reporting
	Outcomes-based criteria (Table 2-1)	Objective-based criteria (Table 2-2)				
Echolocation monitoring (activity)	<ul style="list-style-type: none"> <li>Total nightly calls at the Warrie (K75W) Adit/cave System remains below wet-season LCL (25) OR dry-season LCL (236) between 5 and 14 consecutive nights during the respective season</li> <li>Total nightly calls as the Warrie (K75W) Adit/cave System remain below wet-season LCL (25) OR dry-season LCL (236) <math>\geq 15</math> consecutive nights during the respective season</li> </ul>	<ul style="list-style-type: none"> <li>The long-term persistence of a viable PLNB colony at the Warrie (K75W) Roost.</li> </ul>	<ul style="list-style-type: none"> <li>Warrie (K75W) Roost</li> </ul>	Bi-monthly, or as triggered	Continuous (device dependent) for duration of Project	Annual PLNB Monitoring Technical Report (by suitably qualified consultants)
	<ul style="list-style-type: none"> <li>Total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge site during the dry-season, remain below 5 for 5 consecutive nights, when PLNB are roosting at the Warrie (K75W) Roost</li> <li>Total nightly calls at the gorge containing the KBH12 site, remain below 5 during the dry-season, for 5 consecutive nights, when PLNB are roosting at the Warrie (K75W) Roost</li> <li>Total nightly calls at the Gudai-Darri (Koodaideri) Spring Gorge, are 0 during the dry-season for 5 consecutive nights.</li> <li>Total nightly calls at the gorge containing the KBH12 site, are 0 during the dry-season, for 5 consecutive nights.</li> </ul>	<ul style="list-style-type: none"> <li>The Gudai-Darri (Koodaideri) Spring Gorge remains an important foraging location for the PLNB colony during construction and operation of the Kara (K58W) pit.</li> </ul>	<ul style="list-style-type: none"> <li>Spring Gorge</li> <li>KBH12</li> <li>KBH25</li> </ul>	Bi-monthly, or as triggered	Continuous (device dependent) for duration of Project	
	N/A	<ul style="list-style-type: none"> <li>The long-term persistence of a viable PLNB colony at the Warrie (K75W) Roost.</li> </ul>	<ul style="list-style-type: none"> <li>KOOD0018</li> </ul>	bi-monthly, or as triggered (e.g. when Project activities move within monitoring zone, 400 m of the Adit/cave System Protection Zone)	Event based, all blasts within the monitoring zone, 400 m of the Adit/cave System Protection Zone.	
Warrie (K75W) Roost census	N/A	<ul style="list-style-type: none"> <li>The long-term persistence of a viable PLNB colony at the Warrie (K75W) Roost.</li> </ul>	<ul style="list-style-type: none"> <li>Warrie (K75W) Roost</li> </ul>	Annual	May - October	
Infra-red camera complementary monitoring	<ul style="list-style-type: none"> <li>Total nightly calls at the Warrie (K75W) Adit/cave System remains below wet-season LCL (25) OR dry-season LCL (236) between 5 and 14 consecutive nights during the respective season</li> <li>Total nightly calls as the Warrie (K75W) Adit/cave System remain below wet-season LCL (25) OR dry-season LCL (236) <math>\geq 15</math> consecutive nights during the respective season</li> </ul>	<ul style="list-style-type: none"> <li>The long-term persistence of a viable PLNB colony at the Warrie (K75W) Roost.</li> </ul>	<ul style="list-style-type: none"> <li>Warrie (K75W) Roost</li> </ul>	Quarterly <sup>30</sup> , or as triggered	Continuous (device dependent) for duration of Project	
Temperature and Humidity monitoring	<ul style="list-style-type: none"> <li>Direct disturbance occurs within the Adit/cave System Protection Zone, attributable to the Project.</li> </ul>	<ul style="list-style-type: none"> <li>The long-term persistence of a viable PLNB colony at the Warrie (K75W) Roost.</li> </ul>	<ul style="list-style-type: none"> <li>Warrie (K75W) Adit/cave System</li> </ul>	Ongoing with bi-monthly, or as triggered (e.g. after blasts within 400 m of Adit/cave System Protection Zone) analysis.	Continuous (device dependent) for duration of Project	
Blast vibration monitoring	<ul style="list-style-type: none"> <li>Vibration levels recorded between 8 - 10 mm/s-1 peak particle velocity at the Warrie (K75W) Adit /cave System, attributable to the Project.</li> <li>Vibration levels exceed 10 mm/s-1 peak particle velocity at the Warrie (K75W) Adit/cave System, attributable to the Project.</li> </ul>	<ul style="list-style-type: none"> <li>The long-term persistence of a viable PLNB colony at the Warrie (K75W) Roost.</li> </ul>	<ul style="list-style-type: none"> <li>Warrie (K75W) Adit/cave System</li> </ul>	Event based, all blasts within the monitoring zone, 400 m of the Warrie (K75W) Adit/cave System Protection Zone	Continuous during Warrie (K75W) pit development and operation	

<sup>30</sup> In line with a new moon when bat calls are expected to be higher

## 2.1 PLNB Echolocation Monitoring Program (Activity Monitoring)

### Background

PLNB Echolocation monitoring will be undertaken to assess if there are any potential impacts from Project related activities and inform corrective actions, if required. Monitoring will allow for assessment against triggers, thresholds and targets to ensure environmental outcomes within the EMP are met.

Activity level and number of bats present at roosts monitored in the Pilbara, varies in both a seasonal and year to year manner. PLNB activity and population varies seasonally as PLNB contract back to maternal roosts and aggregate for breeding in the dry-season (May - November), then range nomadically from maternal roosts in the wet-season (December - April) when conditions allow individuals to move to other roosts, caves and/or crevices (**Appendix 3**) (Armstrong 2001). Additionally, PLNB call activity is known to negatively correlate with rainfall, as such rainfall or lack thereof can result in variation of recorded call activity. PLNB populations and call activity may vary year to year due to the success of the previous breeding season. Reproduction represents the most energy demanding period for female bats (Churchill 2008), during this period an adequate food supply is needed to survive. Therefore, rainfall recorded during the preceding wet-season is likely to influence the survivorship of newly weaned young and lactating females, and is a major contributing factor in variation of the population/colony size year to year.

### Monitoring Sites

On-going echolocation monitoring (device dependant), will be conducted at the locations described in **Table A-5 (Figure 1-4)**. Regional PLNB roosts from other Rio Tinto sites may be used to provide context for the observations made at the Warrie (K75W) Roost.

**Table A-5: PLNB Echolocation monitoring locations at the Gudai-Darri (Koodaideri) Project**

Site Name	Reference/ Impact	Site Type	Coordinates (50K)		Data Collection and Analysis
			Easting (mE)	Northing (mE)	
Warrie (K75W) Roost	Impact	Maternal roost	705630	7507125	Bi-monthly, or as triggered
Spring Gorge	Impact	Permanent water source	711571	7505944	Bi-monthly, or as triggered
KBH12	Impact	Semi-permanent water source	703070	7508714	Bi-monthly, or as triggered
KBH25	Reference	Semi-permanent water source	695011	7512300	Bi-monthly, or as triggered
KOOD0018*	Impact	Drill hole intersecting natural cavern of the Warrie (K75W) Roost	705535	7506920	Bi-monthly, or as triggered (e.g. after blasts within 400 m of Adit/cave System Protection Zone)

\* monitored only when Project activities move within 400 m of the Adit/cave System Protection Zone.

### Methods and Data Analysis

Multi-year collection of data representing undisturbed activity at and in the vicinity of the Project has been undertaken (Biota 2018). At each monitoring site (**Table A-4**); a solar powered echolocation recorder, with protection from the elements, will be left out permanently for continuous (device dependant) nightly recording throughout the life of the Project. The echolocation unit comprises a full spectrum recorder equipped with adequate storage capacity (e.g. 256 -512 GB SD cards) for long-term deployment. The units are set to automatically activate 30 minutes before sunset and return to standby

mode 30 minutes after sunrise. Monitoring methods will be updated to align with current methodologies in consultation with internal/external experts and/or regulators (i.e. DBCA).

PLNB echolocation data will be collected bi-monthly and analysed bi-monthly, or as triggered (**Table A-4**). PLNB echolocation data analysis will be undertaken by a suitably qualified consultant/zoologist.

An infra-red video camera in place at the Warrie (K75W) Adit/cave System entrance will allow for manual counts of the number of bats entering or exiting the Warrie (K75W) Adit/cave System from video footage, undertaken as complementary monitoring. An associated time synchronised ultrasonic recorder is in place to corroborate video results. The infra-red video camera is remotely turned on for quarterly monitoring nights.

A weather station on site will monitor local climatic variables, including temperature, rainfall, humidity, and wind direction.

## **2.2 Warrie (K75W) Colony Census (Colony Monitoring)**

### **Background**

Baseline census data from the Warrie (K75W) Colony estimated a size of approximately 400 PLNB individuals. Baseline monitoring indicates a highly fluctuating and cyclical colony, potentially influenced by recruitment, previous years rainfall, season (aggregations for breeding), among other factors.

### **Methods and Data Analysis**

An annual census of the PLNB colony at the Warrie (K75W) Adit/cave System will be undertaken (between May and October) to monitor colony size and ensure the colony is maintained within natural variation. The PLNB colony size will be assessed against baseline colony size to ensure the environmental outcomes are met.

Annual census is to be conducted by a suitably qualified consultant/ecologist using:

- A tripod mounted high-definition video camera equipped with nightshot and infra-red (IR) lighting. The camera should be deployed to give a full-frame view of the adit. Bats passing out of the roost and re-entering are counted manually from the video to confirm minimum colony size.
- A full spectrum ultrasonic bat detector is to be placed beside the camera to record calls made by bats present and to confirm that the bats counted were PLNB.

Census methods will be updated to align with current methodologies in consultation with internal/external experts and/or regulators (i.e. DBCA).

## **2.3 Temperature and Humidity Monitoring**

### **Background**

All permanent diurnal PLNB roosts are governed by a strict temperature (28 – 32°C) and humidity (85 – 100%) requirements. The Warrie (K75W) Adit/cave System maintains a temperature of approximately 31°C, and 98 – 100% relative humidity. Temperature and humidity monitoring will be used to verify that blasting and Warrie (K75W) pit development within 400 m of the Adit/cave System Protection Zone, does not inadvertently generate new openings at the back of the Adit/cave System, which may change the microclimate.

## Methods and Data Analysis

Temperature and humidity will be monitored on a continuous basis (device dependant) and calibrated with ambient temperature and humidity. Data is accessed remotely via a data management system. Temperature (°C) and humidity (%) data will be collected and analysed quarterly, or as triggered. Data will be compared to baseline data, and against the strict requirements to support a permanent PLNB roost (see above).

## 2.4 Blast Vibration Monitoring

### Background

The design of the Warrie (K75W) pit avoids direct impact on the Warrie (K75W) Adit/cave System and the Warrie (K75W) Roost residing within it (**Figure 1-2**). However, given the proximity of both to the Warrie (K75W) mine pit, there is a risk that indirect disturbance from blasting (in particular vibration), could affect the PLNB colony. A threshold of 10mm/s<sup>-1</sup> peak particle velocity (PPV) is in place, based on available standards for humans, literature in relation to bat colonies and the PLNB blasting disturbance trial conducted at the Warrie (K75W) Adit/cave System (Biota 2013a).

### Methods and Data Analysis

Blast vibration shall be monitored using a 'scaled distance' blast vibration model for every blast within 400 m of the Warrie (K75W) Adit/cave System Protection Zone. Ensuring vibration levels remain below the peak particle velocity determined, reduces the risk that vibrations compromise the structural integrity of the Warrie (K75W) Adit/cave System. Additionally, it reduces the risk of vibrations altering the behaviour of the Warrie (K75W) Colony.

A permanent blast vibration monitoring station (geophone) is installed above the natural cavern of the Warrie (K75W) Adit/cave System. The monitoring station is set to record for all blast events and data is collected after blasts with an email notification sent if blast vibration criteria is exceeded. The data is analysed bi-monthly against trigger and threshold criteria.

### Reporting

A technical report is prepared for each reporting period during the life of the PLNB Monitoring Program and should include, but not be limited to:

- Methods, results, discussion and recommendations sections.
- Results of PLNB Echolocation (see **Section 3.1**) and Warrie (K75W) Roost (see **Section 3.2**) monitoring.
- Results of temperature and humidity monitoring (see **Section 3.3**), and blast vibration monitoring (see **Section 3.4**).
- Determination of statistical differences between current reporting period and baseline conditions, as well as reporting against preliminary triggers and or thresholds within the EMP.
- Key plots and statistics that support the survey results.

### Review

The PLNB Monitoring program will be reviewed biennially. However, the Proponent reserves the right to align with current methodologies as appropriate, and in consultation with external experts and/or regulators (i.e. DBCA).

### **Appendix 3: Development of Seasonal Environmental Criteria for Gudai-Darri PLNB.**

To: Amee Butler  
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 Perth, 6000,  
 Western Australia

From: Steph Williams  
 Stantec Australia  
 226 Adelaide Terrace,  
 Perth, 6000,  
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 Date: 23 January 2024

**Reference: Development of Seasonal Environmental Criteria for Gudai-Darri PLNB**

**Identifying Pilbara Leaf-nosed Bat (PLNB) call seasonality:**

Long term monitoring of PLNBs at the Warrie (K75W) Adit/cave system (Adit Roost) shows that bat activity is highly seasonal, with higher calling activity over the dry season, and lower activity during the wet season. PLNB are known to aggregate in the dry season (winter months) for mating, then range nomadically from roosts in the wet season (summer months) when conditions allow individuals to move to other caves and/or crevices (Armstrong 2001). Recent studies have also shown that during dry/late dry season, when prey availability is low and reproductive pressure is higher, bats (particularly females) have shorter but more frequent foraging bouts away from the roost (Bullen and Reiffer 2020). This is likely to influence call activity, as individuals will call as they enter/exit the roost. Additionally, during April and May PLNB have been detected over 30 km from a known permanent roost, corresponding to the period in which young adult bats might be dispersing across the landscape (Bat Call 2021). Stantec classified the different seasons (wet vs dry) by investigating the average nightly calls by month over time during the baseline period (2013-2018) and then compared monthly calls to the annual average nightly calls for the same period. Stantec defined the wet/low season as the months below the annual average calling activity and the dry/peak season as the months with above annual average calling activity (**Figure 1**).

The low calling season (Wet Season) at the Adit Roost was from December to April, with average nightly calls of 642.3 (SD ± 610.1). The peak calling season (Dry Season) was from May to November, with an average of 1077.9 (SD ± 803.0) nightly calls.

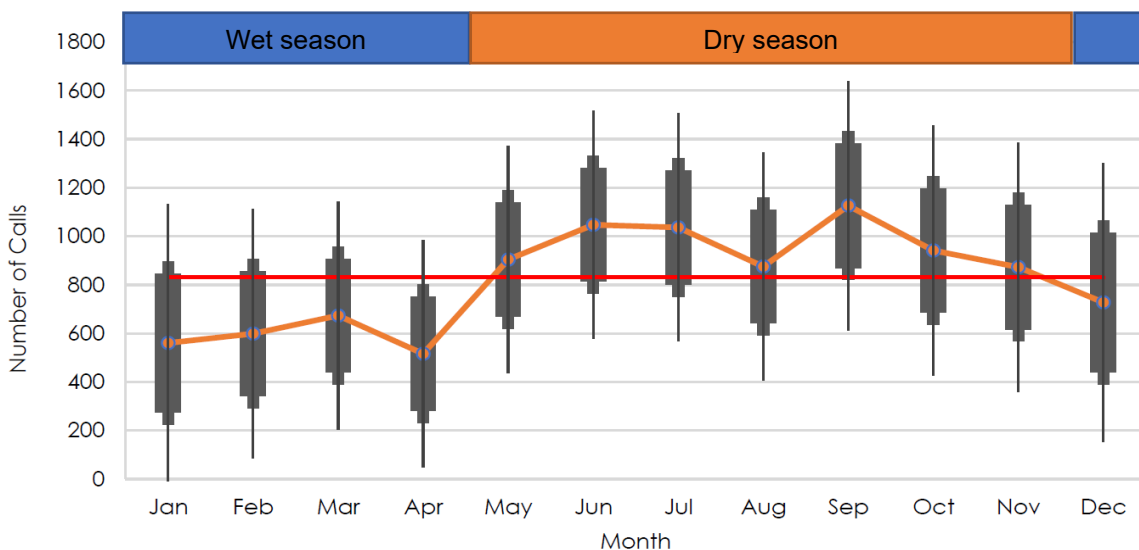


Figure 1: Total nightly calls by months during the baseline period (2013-2018) at the Adit Roost. Box plots indicate the upper 95% percentile, mean and lower 95% percentile of each month. Orange line represents the monthly mean of calls. Red line represents the overall average annual calls.

**Reference: Development of Seasonal Environmental Criteria for the Adit Roost**

Environmental criteria calculations were based on Bat Call (2020) note on threshold and trigger protocols for significant PLNB roosts. In brief, the method involves summarising the nightly call counts at a site for greater than 12 months (including both wet and dry seasons) to get a baseline long term average. Then an upper call limit (UCL) and lower call limit (LCL) can be calculated as the baseline long-term average plus and minus one standard deviation respectively.

Three levels of response to environmental criteria have been defined based on the LCL and other environmental data and include:

- Early response, when calls are recorded below the LCL between 1 and 4 nights;
- Trigger, when calls are recorded below the LCL for 5 to 14 nights; and,
- Threshold, when calls are recorded below the LCL for more than 15 nights.

**Adit Roost Lower Call Limit (LCL) calculations:**

Given the high variability in the Adit Roost bat call data, and gaps in the data (e.g. equipment faults and/or damage from environmental conditions) (**Table 2**), all the available baseline data from 2013 to 2018 was used to calculate the initial LCLs. However, we excluded data that was collected from 1 April to 14 August 2015, as Biota (2018) identified a technical fault during this period resulting in a substantial drop in the number of calls recorded. Based on the recommendation from Bob Bullen (Bat Call WA) all call data, collected during 2019, was included to calculate a revised LCL. Whilst 2019 was technically a non-baseline year, it was rationalised that there was minimal disturbance activity during 2019 (RTIO, pers. comm. 2022) and allowed for the inclusion of a drier than average year in the LCL calculations, as the baseline years were typically wetter than average. Therefore, the 2013-2019 period captured more of the boom-and-bust cycle of calling activity (Bullen, pers. comm. 2022).

The Wet Season LCL was calculated using call data from December to April (2013-2019), and the Dry Season LCL was calculated using call data from May to November (2013-2019). An Annual (non-seasonal) LCL was also calculated for comparison, using data from all months of the year (**Table 1**).

**Table 1: Lower Call Limit (LCL) calculations for Seasonal or Annual periods, based on the 2013-2019 timeframe\*.**

Criteria Period	Mean calls	Standard Deviation	UCL	LCL
<b>Wet Season (Dec-Apr)</b>	628.1	603.1	1231	<b>25</b>
<b>Dry Season (May-Nov)</b>	1010.6	774.9	1786	<b>236</b>
<b>Annual (Jan-Dec)</b>	870.6	740.0	1611	<b>131</b>

\*excluding data during potential technical fault (1 April – 14 August 2015).

**Table 2: Gaps in PLNB call data at the Adit Roost over time. ND denotes No Data**

Month	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	Baseline						Construction	Operation			
Jan	Not established		ND				ND				
Feb	3 days ND		ND	ND			ND				
Mar				17 days ND			ND				
Apr							ND				
May			Identified faulty unit				20 days ND				
Jun											
Jul					5 days ND						
Aug		ND	14 days faulty unit								
Sept		ND									N/A
Oct	6 days ND	ND									N/A
Nov		ND				23 days ND		25 days ND			N/A
Dec		ND				ND		ND			N/A

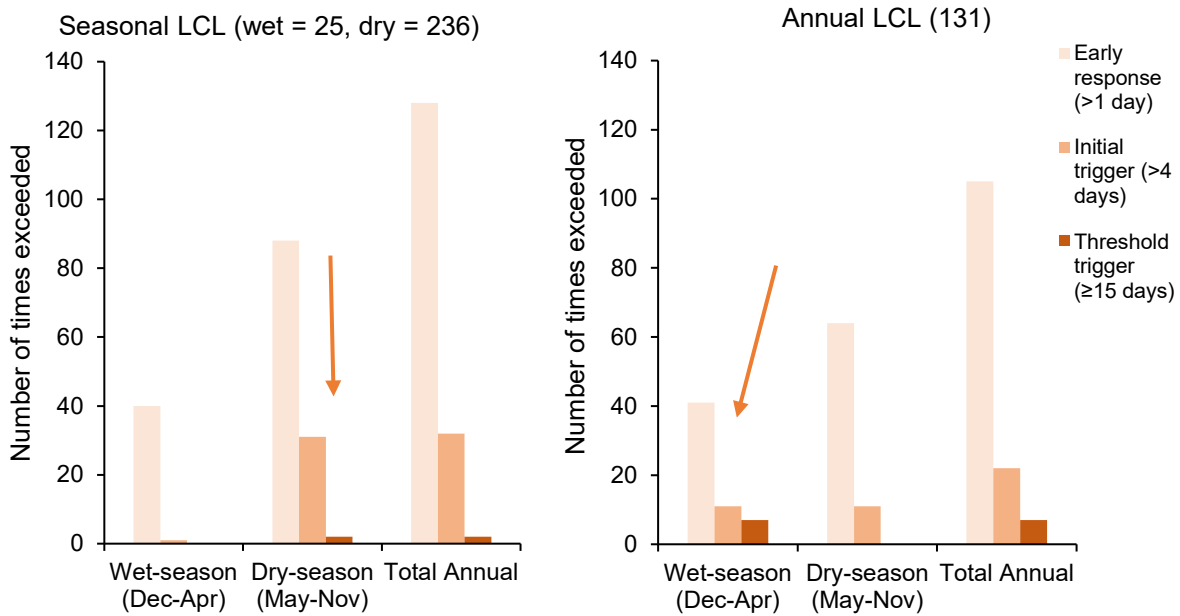
Reference: Development of Seasonal Environmental Criteria for the Adit Roost

**Rationale for using seasonal LCL criteria:**

By calculating separate LCL criteria for each season, this allows for a more conservative (higher) LCL criteria in the dry season (when call activity is typically higher), and a lower less conservative LCL criteria in the wet season (when bat call activity is typically lower).

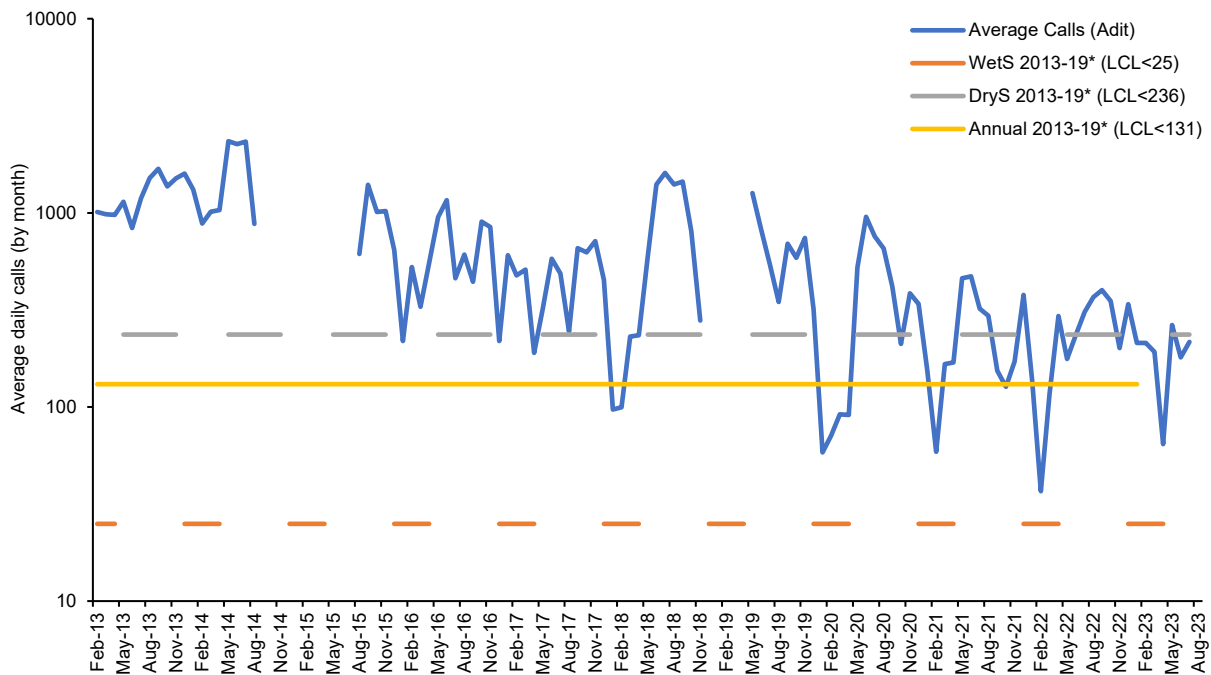
**Validation of seasonal versus annual LCL criteria:**

To compare the use of Seasonal and Annual LCL criteria we modelled how often each LCL criteria would have hypothetically been exceeded (over all data years). The modelling hindcast a similar number of Early Response occurrences between seasonal LCLs and an annual LCL (**Figure 2**). However, using seasonal LCLs resulted in fewer hindcast exceedances of trigger and threshold criteria, where exceedances were hindcast to have occurred, almost all were during the active/peak dry season. Conversely, the annual LCL resulted in the majority of hindcast trigger and threshold exceedances occurring during the less active wet season, which is likely to be less informative of actual population/activity changes. Therefore, using separate LCLs by season is a more conservative approach, as there are fewer non-target exceedances in the wet season, and a more conservative criteria (a higher LCL) during the peak-season (**Figure 3**).



**Figure 2: Modelled (hindcast) number of environmental criteria exceedances across wet- and dry-seasons and annually (between Feb 2013 - June 2023\*) when using seasonal LCLs (left) or an annual LCL (right) based on 2013-19\* data. \*Excluding data during potential technical fault from 1 April to 14 August 2015. Arrows highlight which season majority of modelled trigger and threshold exceedances occurred.**

**Reference: Development of Seasonal Environmental Criteria for the Adit Roost**



**Figure 3: Average daily bat calls (by month) and Annual and Seasonal Lower Call Limits (based on 2013-2023 data\*).** \*Excluding data during potential technical fault from 1 April to 14 August 2015, additionally excluding data from 21<sup>st</sup>, 28<sup>th</sup> and 29<sup>th</sup> July 2022 and 18<sup>th</sup> August 2022, when PLNB trapping was being undertaken. Note: Bat calls displayed on log scale.

**Adit Roost length of criteria exceedance review:**

There were no modelled threshold exceedances during the baseline period in either the wet or dry season (**Table 3**). In the absence of site-specific baseline data that demonstrates an average length (number of days) of an exceedance well above 15, it is appropriate to use the recommended length (number of days) as per Bat Call WA (2020) for early warning (1-4 days), trigger (5-14 days), and threshold ( $\geq 15$ ) criteria for the Adit Roost.

There were two modelled threshold exceedances, both occurring in the impact period (**Table 3**). These modelled exceedances suggest that the length (number of days) set for the threshold criteria is appropriate given the modelled increase in threshold exceedances from zero, post baseline conditions. Based on current available data it is recommended that the criteria in Bat Call WA (2020) sets a threshold with an acceptable level of impact. Additional long-term monitoring data would be required to further evaluate the threshold criteria.

**Table 3: Modelled (hindcast) number of environmental criteria exceedances across wet- and dry-seasons at the Adit Roost.**

Wet Season (Dec-Apr) LCL = 25											
# days	Baseline							Impact			
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
>1			1	2	1	4	4	12	4	7	5
$\geq 5$								1			
$\geq 15$											
Dry (Peak) Season (May-Nov) LCL = 236											
# days	Baseline							Impact			
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
>1			1	7	9	8	10	17	8	19	9
$\geq 5$				3	4		1	2	9	8	4
$\geq 15$								1	1		

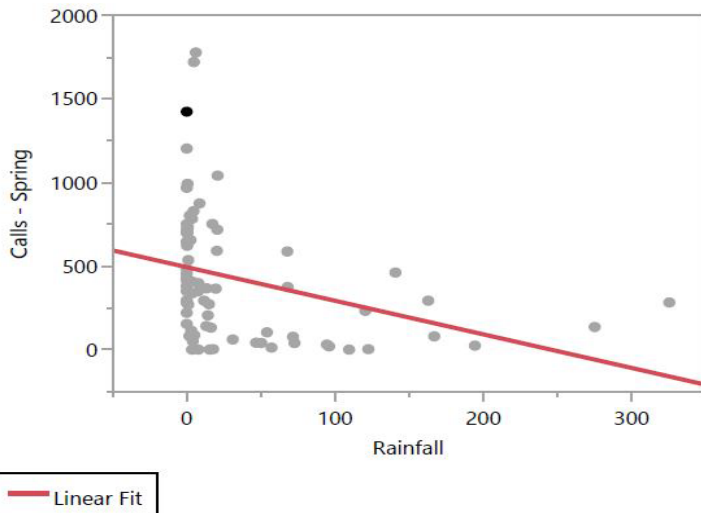
Reference: Development of Seasonal Environmental Criteria for the Adit Roost

**Seasonal LCL criteria for foraging sites:**

Subsequent to the development of seasonal LCL criteria for the Adit Roost, we tested if this method could be used for the other (foraging) monitoring sites in the vicinity of Gudai-Darri. The total nightly calls at the foraging sites (Spring Gorge and the gorge containing KBH12) were even more variable than that of the Adit Roost, this resulted in Standard Deviations of call activity data so large that the LCLs end up negative. A negative LCL is not useful and thus this method was deemed not appropriate for the foraging sites in the vicinity of Gudai-Darri. Expert opinion from BatCall WA deemed more valuable to determine criteria.

**Spring Gorge criteria development:**

It has previously been demonstrated that rainfall has a negative correlation with call activity at the Spring Gorge site (Biota 2018). An ANOVA of Spring Gorge total nightly calls against rainfall (mm), demonstrated that PLNB call activity significantly ( $p = 0.0041$ ; **Table 4**) decreases as rainfall increases (**Figure 4**). The increased rainfall during the wet season results in water pooling across the landscape, creating alternative water sources for the PLNB to utilise, reducing the reliance on the Spring Gorge permanent water source. As a result, developing criteria based on the wet season is not deemed suitable and an alternative criterion was recommended based on the dry-season data.



**Figure 4: Spring Gorge total nightly calls plotted against rainfall (mm).**

**Table 4: Spring Gorge total nightly calls against rainfall (mm) ANOVA results. Significant values ( $p < 0.05$ ) are indicated in red.**

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Model	1	1206524	1206524	8.7742	0.0041
Error	75	10313088	137508		
C. Total	76	11519613			

Bat Call WA supported the recommendation to use a nominal ‘5 calls’ in place of the LCL for the foraging sites criteria. Under this guidance the criteria would be as follows:

- Trigger: total nightly calls recorded are below 5, for between 5 to 14 nights, in the dry season.
- Threshold: total nightly calls recorded are below 5, for 15 or more nights, in the dry season.

Average length (# of days) total nightly calls dropped below 5 in the dry season at the Spring Gorge during the baseline period (2013-2019) was 1.2 days. In comparison, the average length total nightly calls dropped below 5 in the dry season during the impact period is 2.6 days. In both cases the average length is well below the suggested trigger criteria (5 to 14 nights) and threshold criteria ( $\geq 15$  nights). This suggests a more conservative trigger and threshold criteria could be adopted for the Spring Gorge.

Utilizing the information above Stantec developed alternative trigger and threshold criteria for the Spring Gorge as follow:

**Reference: Development of Seasonal Environmental Criteria for the Adit Roost**

- Alternative Trigger: total nightly calls recorded are below 5, for 5 or more consecutive nights, in the dry season.
- Alternative Threshold: total nightly calls recorded are 0, for 5 or more consecutive nights, in the dry season.

Hindcast modelling of the criteria recommended by Bat Call WA (2020) guidance and Stantec alternative criteria is presented in (Table 5). The modelling revealed two occasions where the alternative trigger criteria would have been exceeded, both occurring in the impact period (Table 5). One instance was for 15 consecutive nights, however coincided with a period where the majority of PLNB were not roosting at the Adit Roost in April/May 2020 and were instead thought to be roosting at a satellite roost. This instance in particular, accounts for the modelled exceedance of the guidance threshold (Table 5). The second modelled instance of the alternative trigger exceedance occurred in May 2022 which coincided with a late season rainfall event (as Figure 4 shows, increased rainfall, has a negative correlation on call activity).

**Table 5: Modelled (hindcast) number of criteria exceedances across wet- and dry-seasons at the Spring Gorge.**

Criteria	Baseline (2013-2019)		Impact (2020-current)	
	Wet-season (Dec-Apr)	Dry-season (May-Nov)	Wet-season (Dec-Apr)	Dry-season (May-Nov)
Guidance Trigger (calls <5 for 4-14 consecutive nights)	0	0	7	1
Alternative Trigger (calls <5 for ≥5 consecutive nights)	0	0	9	2
Guidance Threshold (calls <5 for ≥15 consecutive nights)	0	0	3	1
Alternative Threshold (calls = 0 for 5≥ consecutive nights)	0	0	3	0

Based on the information above, Stantec recommend that the existing criteria based on the wet season is not appropriate and may eventuate in a trigger and threshold criteria exceedance that does not reflect a meaningful change and instead are due to natural variation in call activity associated with the PLNB’s lower reliance on the Spring Gorge, given the wider availability of water pooling in the landscape following rainfall. Alternative environmental criteria that is focused around the dry season is therefore recommended, where PLNB call activity is at its peak around important permanent water sources. Proposed alternative criteria for the Spring Gorge are “calls recorded are below 5, for 5 or more consecutive nights in the dry season” (Trigger) and “calls recorded are 0, for 5 or more consecutive nights, in the dry season” (Threshold). These criteria are considered an appropriately conservative and supported by SME (Bat Call WA).

**KBH12 criteria development:**

The gorge containing the KBH12 site was identified as an important foraging and drinking site for the Adit Roost PLNB’s based on 5 nights of sampling in the dry-season in 2015 (mean calls = 164.8). Subsequent baseline monitoring that included wet-season sampling, observed means of 92.0, 66.5 and 8.9 in 2017, 2018, and 2019 respectively. Call activity is highly variable at the gorge containing KBH12 and can be influenced by; season (rainfall), water presence at the site, location of the echolocation recorder and PLNB movements between the Adit Roost and KBH25 (KBH12 lies directly between these two important locations).

The gorge containing KBH12 mirrors the Spring Gorge in exhibiting a negative correlation in call activity with rainfall. As a result, developing criteria based on the wet season is not deemed suitable and criteria was focused around the dry-season. In the same manner as the Spring Gorge, LCL’s are not deemed appropriate, and criteria were developed around the nominal ‘5 calls’ as endorsed by Bat Call WA.

It is noted that the gorge containing KBH12 contains semi-permanent water, available at varying times throughout the year, whereas the Spring Gorge is a permanent water source and is heavily relied upon in the dry season by PLNB’s. Average length (# of days) total nightly calls dropped below 5 in the dry season at KBH12 during the baseline period (2013-2019) was 7.2 days. In comparison, the average length total nightly calls dropped below 5 in the dry season during the impact period is 4.7 days. The increase in the length of call activity being below 5 calls (compared to the Spring Gorge), may be influenced by the high variability in call activity observed at KBH12, and the fact it is not a permanent water source. Despite the differences, Stantec suggest using the same trigger and threshold criteria as the Spring Gorge, for the KBH12 site.

Reference: Development of Seasonal Environmental Criteria for the Adit Roost

### Summary and recommendations:

- As there is considerable variation in annual bat call activity and data gaps across baseline years, it is recommended that environmental criteria for the Adit Roost be assessed on all pre-determined baseline years (2013-2018- wetter than average rainfall), as well as the inclusion of 2019 (drier than average rainfall) data. This accounts for the natural fluctuation in annual average rainfall events, therefore capturing the typical boom-and-bust activity typically observed with PLNB call activity (Bullen, pers. comm. 2022).
- Using Seasonal LCLs is an informative approach to help deal with the considerable variation in the PLNB call data that occurs in relation to seasonal activity periods. With an annual environmental criterion, the standard deviation of the call activity is so large that the LCL is very low (due to so much variation). Therefore, it is likely to result in exceedances of the criteria during times that may be less accurate to identify a meaningful change in population or activity changes to PLNB to inform adaptive management (i.e. exceedances occurring during the wet season where sudden decreases in call activity around important water pools etc. are expected).
- Using seasonal LCLs may be more beneficial to inform management than the annual method, in that the seasonal LCLs criteria trigger exceedances are more likely to occur during the active/peak dry season of the PLNB, which may be more reflective of an actual change to the PLNB population and/ or activity. Conversely, using an annual LCL will likely result in the majority of triggers occurring during the wet season, which may be less informative of actual population or activity changes, given the typically lower call activity rate and natural behavioural response of the PLNB associated with more readily available water sources.
- The proposed seasonal LCL criteria addresses some of the limitations of the 2018 EMP (RTIO 2018) environmental criteria (Rio Tinto 2018). The 2018 environmental criteria did not consider the high variability in call activity (annual and seasonal), the speed at which call activity changes (i.e. sudden decreases after rainfall) and assumed slow declines in call activity as opposed to the dynamic boom-and-bust cycle changes typically observed.
- An evaluation of trigger and threshold criteria for foraging sites (Spring Gorge and KBH12) resulted in LCL's based criteria being deemed unsuitable. When LCL's were calculated, the highly variable call activity observed, resulted in negative LCL's. Subsequently, trigger and threshold criteria were developed by reviewing Spring Gorge and KBH12 monitoring data and in consultation with Subject Matter Experts (Bat Call WA).

Best regards,

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**Reference: Development of Seasonal Environmental Criteria for the Adit Roost**

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