Environmental Management Plan – Northern Quoll

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

Ministerial Statement 999

September 2022

RTIO-HSE-0356125

Mount Bruce Mining Pty Limited

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Disclaimer and Limitation

This Environmental Management Plan has been prepared by 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**
A*	Biota Environmental Sciences	Rio Tinto	June 2015	-	-
B*	Biota Environmental Sciences / Rio Tinto	Rio Tinto	August 2015	DPaW (now DBCA)	18 September 2015
v.1*	Biota Environmental Sciences / Rio Tinto	Rio Tinto	October 2015	OEPA (now EPA Services)	27 November 2015
v.1*	Biota Environmental Sciences / Rio Tinto	Rio Tinto	November 2015	DPaW (now DBCA)	01 December 2015
B.1*	Biota Environmental Sciences / Rio Tinto	Rio Tinto / Consultant	August 2018	EPA Services	31 August 2018
v.02*	Rio Tinto	Rio Tinto	November 2018	EPA Services	16 November 2018
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2	Stantec Australia / Rio Tinto	Rio Tinto	September 2022	DWER	23 September 2022

* Revision History relates to NQMP (RTIO-HSE-0325966) – a previous iteration of the current NQMP (RTIO-HSE-0356125)
^ RTIO-HSE-035612 was issued by RTIO in March of 2022 - erroneously showing the document still at Revision 1.

EXECUTIVE SUMMARY

This Environmental Management Plan (EMP) has been prepared by Stantec 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 - '*Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*' (EPA 2020a).

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: Northern Quoll (*Dasyurus hallucatus*).

Summary **Table 1** below presents the environmental outcomes and objectives for the environmental factor to be met through implementation of this EMP, 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

Proposal title		Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project
Proponent		Mount Bruce Mining Pty Limited
Purpose of this EMP		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 8 of MS 999 (WA) and Condition 2 of EPBC 2012/6422 (Commonwealth)
Terrestrial fauna – MNES fauna species and high value habitat **EPA Objective:** *to maintain representation, diversity, viability and ecological function at the species, population and assemblage level.*		
Objective-based Provisions	**Environmental Outcomes**	• The Proponent shall ensure that the Project is carried out in a manner that minimises the direct and indirect impacts to the Northern Quoll (MS 999: 8-2)
	Management Target	**1.** Management of feral predators within the Development Envelope
		2. Northern Quoll recorded within the MPA via camera and/or secondary signs and continue to have an ongoing presence
		3. No entry of unauthorised personnel into Gudai-Darri (Koodaideri) Spring Gorge EZ
		4. No unauthorised works within the Gudai-Darri (Koodaideri) Spring Gorge EZ
		5. No unauthorised clearing of mapped Northern Quoll high value habitat
		6. No direct Northern Quoll interactions (e.g., vehicle strike) per year resulting in mortality.

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 Northern Quoll Environmental Management Plan are true and correct.

Name: Heath Harnden **Signed:** 

Designation: GM, Gudai Darri Ops **Date:** 1st June 2023

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Abbreviations

ACAR	Annual Compliance Assessment Report
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
DotE	Department of the Environment
DWER	Department of Water and Environmental Regulation
EMP	Environmental Management Plan
EP Act	*Environmental Protection Act 1986*
EPA	Western Australian Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERD	Environmental Review Document
EZ	Exclusion Zone
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
Framework for EMPs	Rio Tinto Framework for development of EMPs as described in **Appendix 1**.
MNES	Matters of National Environmental Significance
MPA	Mine/Plant Area
MS	Ministerial Statement
Proponent	Mount Bruce Mining Pty Limited
Project	Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project
SIC	Southern Infrastructure Corridor
SPR	A '*causal pathway conceptual model*' (Pressure, Stressor, Receptor) approach for potential impacts due to project (refer to **Appendix 1**).
WRC	Western Rail Corridor

1. CONTEXT, SCOPE AND RATIONALE

This Environmental Management Plan (EMP) has been prepared by Stantec Australia (Stantec) on behalf Mount Bruce Mining Pty Limited (the Proponent) for the Gudai-Darri (Koodaideri)[1] 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) (RTIO-HSE-0325966). The revision of the EMP has been undertaken as prescribed in Condition 8-5 of Ministerial Statement (MS) 999 (EPA 2015).

This EMP was developed to fulfil the requirements of Condition 8 of 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 2021)*;
- *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans EPA (2020a)*;
- *Environmental Impact Assessment (Divisions 1 and 2) Procedures Manual* EPA (2020b);
- Department of the Environment DotE (2014) *Environmental Management Plan Guidelines*.
- DotE (2016a) Outcomes-based conditions policy; and
- DotE (2016b) 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 8-5, this EMP is subject to notice in writing from the CEO of DWER that the EMP satisfies the requirements of MS 999 Conditions 8-1, 8-2 and 8-3.

[1] 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 1-2**) 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 (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-pits 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 possible new/upgraded Royal Flying Doctor Service (RFDS) airstrip within the Development Envelope.
- Ore transport infrastructure providing the connection to Rio Tinto's railway network, comprising a railway from the MPA through the WRC to Lyre Siding; in the early stages only, ore may be hauled by truck to a railway load out (then phased out).
- Road infrastructure (mine access, internal road network, haul roads, infrastructure service roads).
- Power supply (step down to 66 kV off Rio Tinto's 220 kV distribution network supplying its Yandicoogina operation) 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 ultimately surplus water via a pipeline extending from Rio Tinto's Yandicoogina operation (during later operations stages); potable water from local bores within the MPA for both construction and operations.

One Exclusion Zone (EZ) for Northern Quolls is included as part of the Gudai-Darri (Koodaideri) Project (**Figure 1-3**) comprising:

- Gudai-Darri (Koodaideri) Spring Gorge EZ: approximately 55.4 ha, will be implemented at the Gudai-Darri (Koodaideri) Spring Gorge, to exclude mine excavation, blasting activities, and minimise indirect disturbance to Northern Quoll high value denning and foraging habitat.

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 8 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**.

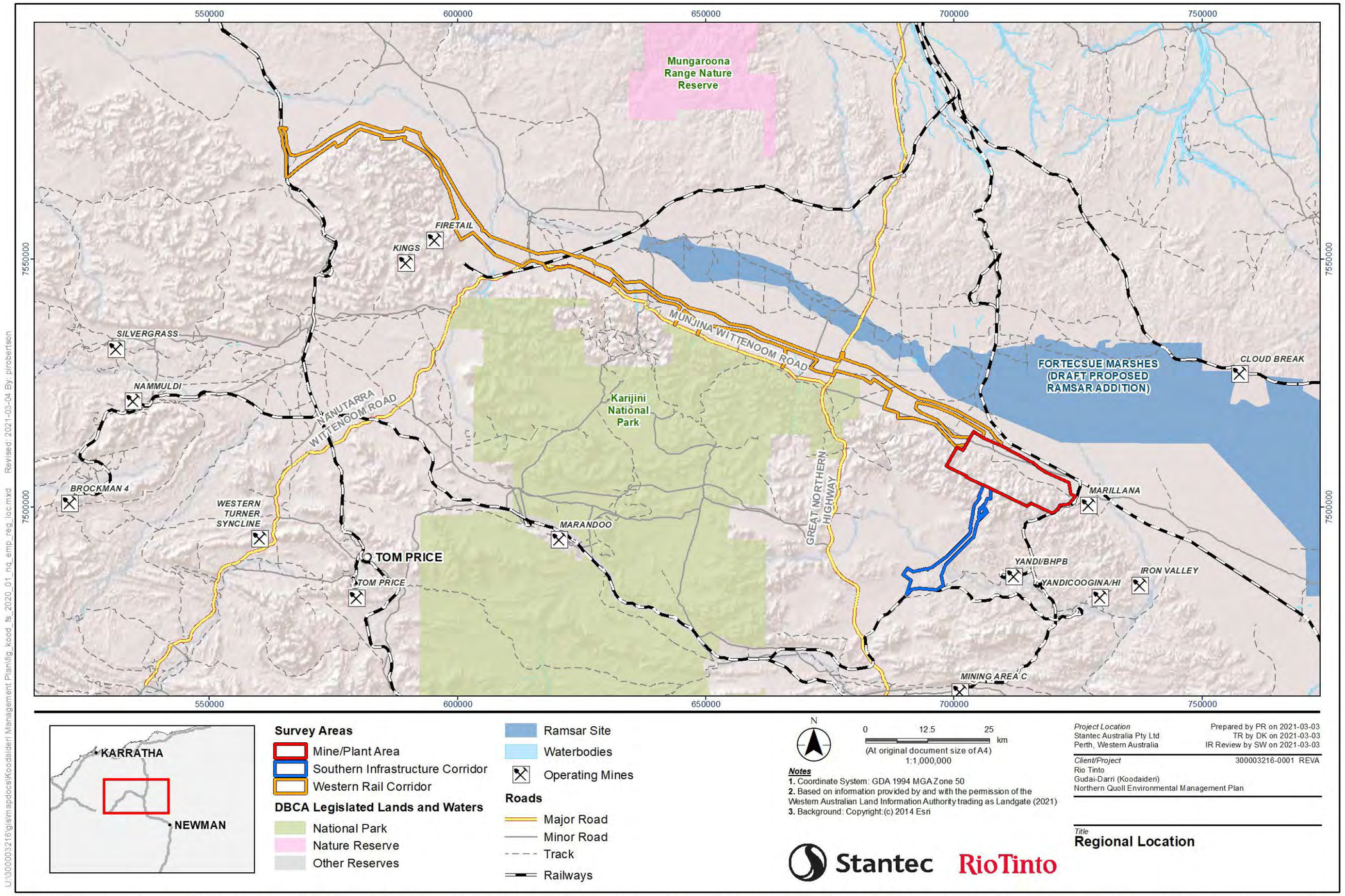

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Figure 1-1: Regional Location of the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project

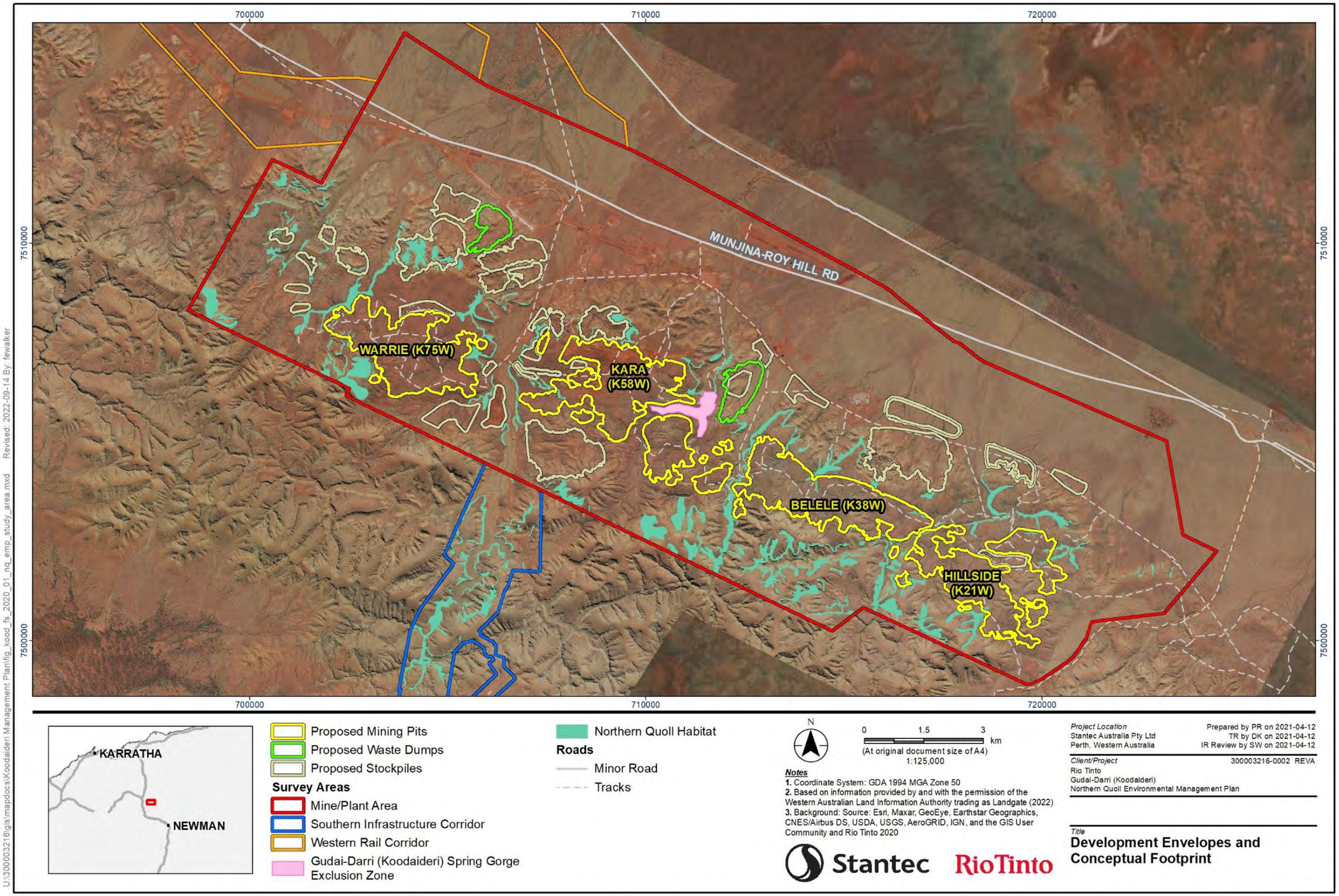

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Figure 1-2: Development Envelope and conceptual footprint of the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project

Table 1-1: Key environmental factors associated environmental values, and potential impacts from the Proposal as addressed in this EMP (as per the SPR model[2]).

Environmental value (receptor)	Predicted impacts		Potential impacts Not predicted to occur	
	Direct (stressor, pressure)	Indirect (stressor, pressure)	Direct (stressor, pressure)	Indirect (stressor, pressure)
	Conceptual footprint	**Development envelope**	**Development envelope**	**Development envelope**
Terrestrial fauna Tier 1: Northern Quoll (*Dasyurus hallucatus*) and high value habitat, including Gudai-Darri (Koodaideri) Spring Gorge	**Clearing** • Loss or modification of foraging and denning habitat • Fragmentation of habitat and intersection of foraging and denning habitat	**Other threatening processes (noise, dust, light, fauna interactions and feral animals)** • Changes to the environment from general activities may influence/change behaviour, and/or use of habitats within the Development Envelope • Vehicle strike • Altered fire regimes • Increase in feral animals **Gudai-Darri (Koodaideri) Spring** **Oher threatening processes (noise, dust, light and fauna interactions)** • Changes to the environment from general activities may influence/change behaviour, and/or use of habitats within the Development Envelope. • Increase in feral animals	**Fauna interactions/vehicle strike** • Fauna injury or death due to workforce presence, vehicle movements and/or infrastructure **Feral species** • Fauna injury or death due to feral predators **Altered fire regimes** • Loss of habitat and/or changes in the use of habitat • Altered/reduced prey availability	**Altered hydrogeology and hydrology** • Modification of high value foraging habitat **Construction and operation of mine** • Increase in weeds, changes in fire regime, increased fire risk, limiting quoll foraging/food availability **Altered fire regimes** • Greater potential for predation by feral species due to absence of cover

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

1.3 Condition Requirements

The Proposal 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 (EPA 2015) Condition 8.

Condition 2 of EPBC Decision Notice 2018/8299 (DotE 2015) also requires compliance with Conditions 8-1, 8-2, 8-3, 8-4, 8-5, and 8-6 of MS 999 (EPA 2015) for better protection of the Northern Quoll. The MS 999 conditions and the section/s of this EMP that addresses each condition are presented in **Table 1-2** below.

Table 1-2: MS 999 – Condition 8 Terrestrial Fauna – Northern Quoll

Condition	Condition Requirement	Section of EMP where addressed
8	**Terrestrial Fauna (Northern Quoll)**	
8-1	Prior to the commencement of ground-disturbing activities within 50 metres of Northern Quoll (*Dasyurus hallucatus*) foraging and denning habitat within the Mine/Plant Area Development Envelope, Southern Infrastructure Corridor Development Envelope and the Western Rail Corridor Development Envelope, the proponent shall prepare and submit a Northern Quoll Management Plan in consultation with the Department of Parks and Wildlife, to the requirements of the CEO to demonstrate that condition 8-2 has been met.	All (including Section 4 Stakeholder consultation
8-2	The objective of the Northern Quoll Management Plan is to ensure that the proposal is carried out in a manner that minimises the direct and indirect impacts to the Northern Quoll.	All
8-3	The Northern Quoll Management Plan shall include: 1) Census data for the Northern Quoll population within the Mine/Plant Area Development Envelope, Southern Infrastructure Corridor Development Envelope and the Western Rail Corridor Development Envelope, as delineated in Figure 1 of Schedule 1 and defined by the geographic coordinates in Schedule 2, based on available survey information;	Section 1.5 (Table 1-3)
	2) Spatial imagery detailing Northern Quoll foraging and denning habitat within the Mine / Plant Area Development Envelope, Southern Infrastructure Corridor Development Envelope and the Western Rail Corridor Development Envelope;	Section 1.3 (Figure 1-3)
	3) Detailed management measures to minimise direct and indirect loss of the habitat mapped pursuant to condition 8-3(2);	Section 2 (Table 2-1)
	4) Protocols and procedures to monitor Northern Quoll presence and abundance adjacent to the mine pit within the Mine/Plant Area Development Envelope identified by condition 8-3(2) during construction and operation; and	Section 2 (Table 2-1)
	5) Detailed contingency responses, including modified operational procedures or translocation of animals out of impact zones, if monitoring required by condition 8-2(4) show a decrease in Northern Quoll numbers attributable to the proposal, to ensure condition 8-2 is met.	Section 2 (Table 2-1)
8-4	Prior to commencement of ground-disturbing activities within 50 metres of the mapped Northern quoll foraging and denning habitat required by condition 8-3(2), unless otherwise agreed by the CEO, the proponent shall implement the approved plan required by condition 8-1.	Section 2 (Table 2-1)
8-5	Revisions to the Northern Quoll Management Plan may be approved by the CEO.	Section 3
8-6	The proponent shall implement approved revisions of the Northern Quoll Management Plan required by condition 8-5.	Section 3 Section 4

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 (**Figure 1-3**). 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 Proposal. 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 objective-based provisions, in order to achieve the environmental objectives of MS 999 Condition 8 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 objective and measurable criteria (EPA 2020a). Environmental criteria are defined to assess performance against the environmental outcome. These are:

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[3] 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 1-3**.

[3] In accordance with the Rio Tinto conceptual framework for development of EMPs (Appendix 1).

Table 1-3: Rationale for choice of provisions

Current knowledge and description of impacts	Key assumptions and uncertainties	Rationale for choice of provision
Environmental value: Terrestrial fauna – Northern Quoll (*Dasyurus hallucatus*) and high value habitat		
Level of Management[4] [Moderate]		
Key surveys and studies: (Biota 2012a, b, c, d, e, f, 2018, 2020) (How *et al.* 2009)		
Northern Quoll (*Dasyurus hallucatus*) **Population** Northern Quolls were recorded 63 times (50 from trapping, 13 from motion cameras) from within the Development Envelope during the 17 baseline surveys conducted between August 2010 and August 2016. Quolls were captured in low numbers (range = 1 – 6 captures) during seven of the 15 trapping surveys and no quolls were captured during the other eight surveys. This is consistent with a low-density population. • Northern Quoll population numbers can fluctuate substantially on both annual and inter-annual cycles. This variability is driven by both the reproductive biology of individuals and longer-term cycles in response to regional stochastic processes such as rainfall, fire, and related changes to prey populations. **High value habitat[5] (denning and foraging habitat)** Mapping of Northern Quoll primary habitat identified 1,114.05 ha of high value denning and foraging habitat within the Development Envelope (**Figure 1-3**). High value denning and foraging habitat is not recorded within the WRC or the southern portion of the SIC; **Figure 1-3** presents the full extent of mapped high value Northern Quoll habitat within the Projects Development Envelope. High value habitat comprises gorge/gully and breakaway habitats which provide suitable denning habitat. Adjacent plains and vegetated areas provide habitat suitable for foraging and dispersal of young but are considered to be of less important for the species' conservation. • The project currently has approval to clear 166 ha of high value habitat within the Development Envelope. High value habitat is present across the MPA and extending into the northern portion of the Southern Infrastructure Corridor • Vegetation clearing will be planned to avoid known areas of high-quality Northern Quoll habitat where possible. Baseline surveys indicate that the Northern Quoll routinely uses the Gudai-Darri (Koodaideri) Spring Gorge, however it is less clear if the species reliably occur in other areas within the Development Envelope. The Gudai-Darri (Koodaideri) Spring Gorge is the principal area of Northern Quoll habitat in the Development Envelope and will be protected by an EZ to: • Avoid direct disturbance; • Mitigate threatening processes, including light, noise, vibration dust and vehicle and machinery movements; and • Protect the integrity of the habitat values of the Spring Gorge.	**Assumptions:** • Protection of high value habitat will enable the persistence of the Northern Quoll within the Development Envelope **Uncertainties:** • Lack of a control trapping site and lack of quolls confirmed within the camera monitoring control site (Grand Canyon) makes it difficult to understand the long-term natural population variability, habitat use and movement of this species within the Development Envelope. • In addition, the Northern Quoll population at Gudai-Darri (Koodaideri) is consistent with being a low-density population that undergoes natural boom/bust cycles, which makes it difficult to consistently monitor and understand the long-term natural population variability, habitat use and movement of this species within the Development Envelope. • Limited data on the sensitivity of Northern Quoll to increases in dust, light, noise and vibration. • Limited data on the likely impact of climate change and drought on the Northern Quoll	A moderate management level has been assigned to manage impacts (direct and indirect) to the Northern Quoll and high value habitat within the Development Envelope. The overall management strategy for the Northern Quoll is to maintain the integrity of the high value habitat, which is achieved through the establishment of objective-based provisions. Given the moderate management level required for Northern Quolls, based on known presence, additional management measures proposed for this species are outlined below. All proposed provisions, including maintaining the Gudai-Darri (Koodaideri) Spring Gorge EZ, and feral predator control should have flow-on benefits to all species present. The targets and criteria presented in **Table 2-1** will be updated as required with consideration of baseline data and adaptive management (as described in **Section 3**). **Population** The following environmental objectives are in place; • Northern Quoll recorded within the MPA via camera, trapping and secondary signs continue to have an ongoing presence; and • No direct Northern Quoll interactions (e.g., vehicle strike) per year resulting in mortality. These environmental objectives aim to increase knowledge of Northern Quoll presence and maintain the population within the Development Envelope. Objective-based provisions have been developed with contingency response triggers to minimise direct and indirect impacts. Proliferation of feral predators due to vegetation clearing and poor waste management can increase access of feral predators to high value habitat and can result in increased predation causing injury or mortality to the Northern Quoll. • The Proponent shall manage and improve knowledge of feral predator presence and abundance within the Development Envelope. This environmental objective aims to increase knowledge of feral predator presence and abundance within the Development Envelope with the aim to manage and reduce impact to the Northern Quoll. **High value habitat (denning and foraging habitat)** The following environmental targets are in place: • Management of feral predators within the Development Envelope • Northern Quoll recorded within the MPA via camera, trapping and/or secondary signs and continue to have an ongoing presence • No entry of unauthorised personnel into Gudai-Darri (Koodaideri) Spring Gorge EZ • No unauthorised works within the Gudai-Darri (Koodaideri) Spring Gorge EZ • No unauthorised clearing of mapped Northern Quoll high value habitat • No direct Northern Quoll interactions (e.g., vehicle strike) per year resulting in mortality. Objective-based provision are considered suitable because there are management/administration controls in place. Northern Quolls present within the Development Envelope may also be vulnerable to injury or mortality from increased operational activity within the Development Envelope. Administrative tools have been included as supporting management parameters to mitigate these potential impacts. 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. Implementation of the Gudai-Darri (Koodaideri) Spring Gorge EZ and retention of high value habitat within the Development Envelope, is expected to mitigate other remaining threatening processes on Northern Quoll behaviour, including, dust, light, noise, vibration and vehicle and machinery movements.

[4] Summary of assessment for determination of required management zone provided in **Appendix 2**, as per the conceptual framework for development of Rio Tinto's EMPS (**Appendix 1**).

[5] 'High value habitat' denotes all suitable Northern Quoll habitat mapped within the development envelope - incorporating key habitats (Gorges/Gullies and Breakaways) but also buffers the surrounding areas allowing dispersal of the species across the site and ensuring biological function.

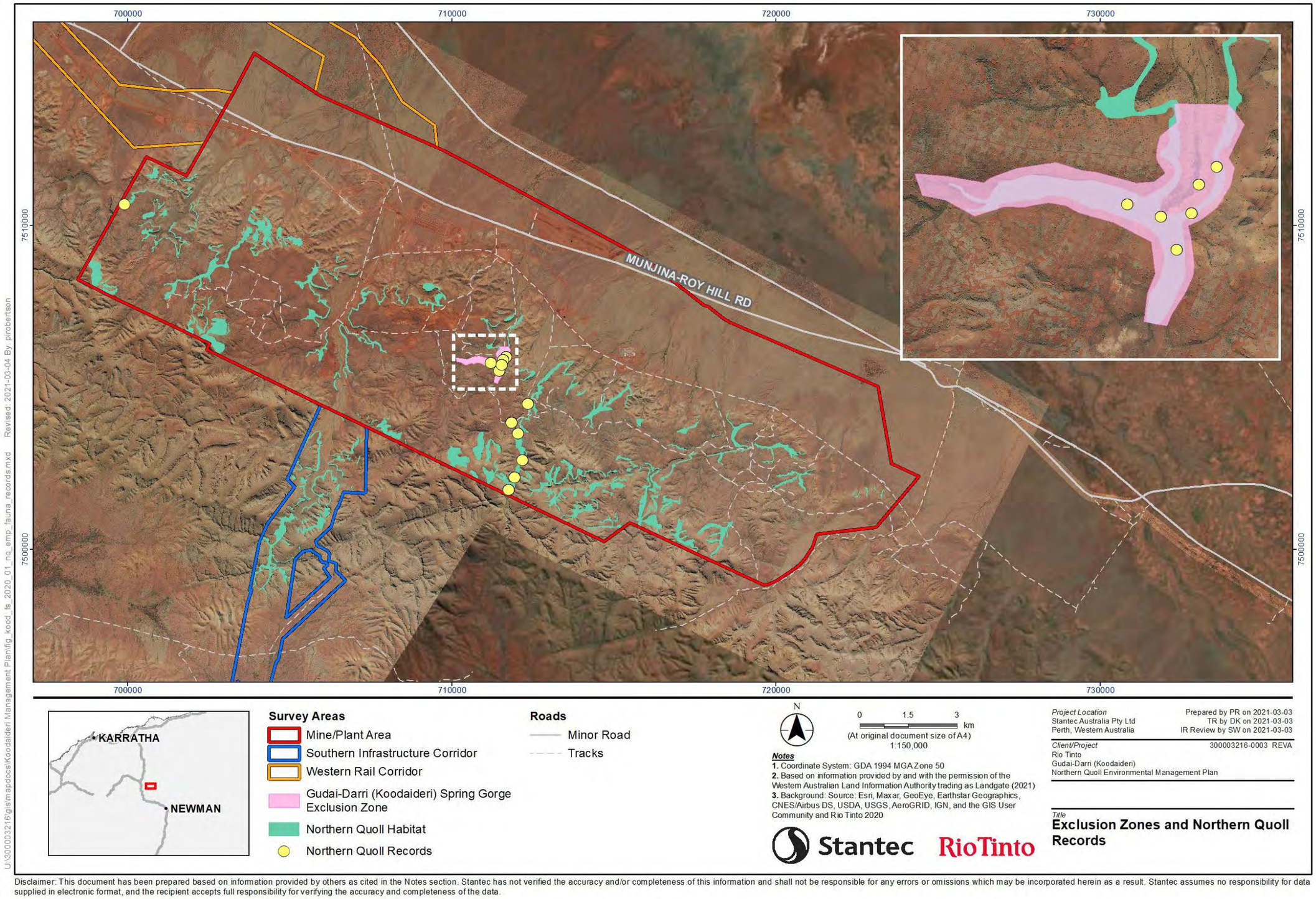

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Figure 1-3: Northern Quoll habitat, records and exclusion zones for the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project

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** 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 (Northern Quoll) and high value habitat (denning and foraging)

Rationale: To maintain the ecological function and viability of high value habitat through the implementation of monitoring protocols/procedures and mitigation measures to minimise direct and indirect impacts which have the potential to diminish the environmental quality of Northern Quoll foraging and denning habitat and corresponding presence and abundance.

EPA Factor: Terrestrial fauna

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

Objective: To ensure that the Project is carried out in a manner that minimizes the direct and indirect impacts to the Northern Quoll (MS999: 8-2)

Key environmental values: Northern Quoll (*Dasyurus hallucatus*) and high value habitat (denning and foraging)

Key impacts and risks: Potential loss of Northern Quoll population and potential loss or degradation of high value (denning and foraging) habitat as a result of implementation of the Project.

Objective-based provisions

Moderate Management Level

Indicators: Presence of feral predators within the Development Envelope	**Management Actions**	**Monitoring**	**Timing/Frequency**	**Responsible**	**Reporting**
Management target: **1.** Management of feral predators within the Development Envelope	• Record observations of feral predator animals opportunistically (foxes, wild dogs, feral cats) within operational areas, and record numbers removed in control programs. • Implementation of a feral cat control program within the Development Envelope. • Prohibiting feeding animals • Prohibiting keeping pets • Appropriate waste disposal for food scraps and other wastes as per Rio Tinto EMS waste management guideline and in accordance with the *Environmental Protection (Rural Landfill) Regulations 2002*	• Record opportunistic observations within the Development Envelope. • Number of feral animals removed through control programs. • Passive camera monitoring (as part of Northern Quoll camera monitoring program) to detect presence/absence of feral predators (**Figure 2-1**). • Inspections of waste disposal areas within the Development Envelope	• Annual program	• Operations • Environment Team	• The environmental objective will be reported against the management target for each calendar year by 30 April in the ACAR. • If the 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 the management actions is required.
MS999 (Page 8) Condition 8-3 (4): "*protocols and procedures to monitor Northern Quoll presence and abundance adjacent to the mine pit within the Mine/Plant Area Development Envelope identified by condition 8-3(2) during construction and operation*" **MS999 (Page 8) Condition 8-3 (5): "*detailed contingency responses, including modified operational procedures or translocation of animals out of impact zones, if monitoring required by condition 8-3(4) show a decrease in Northern Quoll numbers attributable to the proposal, to ensure condition 8-2 is met*"**					
Indicators: Presence of Northern Quoll within the Development Envelope	**Management Actions**	**Monitoring**	**Timing/Frequency**	**Responsible**	**Reporting**
Management target: **1.** Northern Quoll recorded within the MPA via camera and/or secondary signs and continue to have an ongoing presence	• Undertake on-going monitoring, during operation phase, for Northern Quoll, within high value habitat. • Annual review of Northern Quoll population persistence within the MPA. If non-achievement of management target is attributable to the Project, implement contingency actions: • Review project activities and mine plan; • Re-assess work procedures and training needs including but not limited to o Reduction of vehicle speeds o Increase of signage o Increase feral control programs • Review mine blast plan. • Develop and implement a protocol for any Northern Quoll individuals requiring translocation out of impact zones (in consultation with DBCA).	Annual monitoring program to determine ongoing presence of Northern Quoll during operation phase. • Camera monitoring[6] (**Appendix 3**) as per referral guidelines or in consultation with DBCA to determine ongoing presence of Northern Quolls (including identification of individuals to determine relative abundance) (**Figure 2-1**) at: • Four potential impact sites (Gudai-Darri (Koodaideri) Spring Gorge, Route 66, Red Dog and West Hillside **Figure 2-1**) • Four reference sites[7] (El Camino, Yosemite, Grand Canyon and Kingfisher (**Figure 2-1**)) • Opportunistic field observations to determine ongoing presence (including scat)	• Continuous (device dependant) with quarterly re-baiting and analysis	• Environment Team	• The environmental objective will be reported against the management target for each calendar year by 30 April in the ACAR. • If the 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 the management actions is required.
MS999 (Page 8) Condition 8-3 (3): "detailed management measures to minimise direct and indirect loss of the habitat mapped pursuant to condition 8-3(2)"					

[6] 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., Western Australian Department of Biodiversity, Conservation and Attractions [DBCA])

[7] El Camino, Yosemite, Kingfisher, Red Dog and West Hillside Monitoring sites have been identified as suitable sites, camera monitoring will be established on approval of this management plan.

EPA Factor: Terrestrial fauna

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

Objective: To ensure that the Project is carried out in a manner that minimizes the direct and indirect impacts to the Northern Quoll (MS999: 8-2)

Key environmental values: Northern Quoll (*Dasyurus hallucatus*) and high value habitat (denning and foraging)

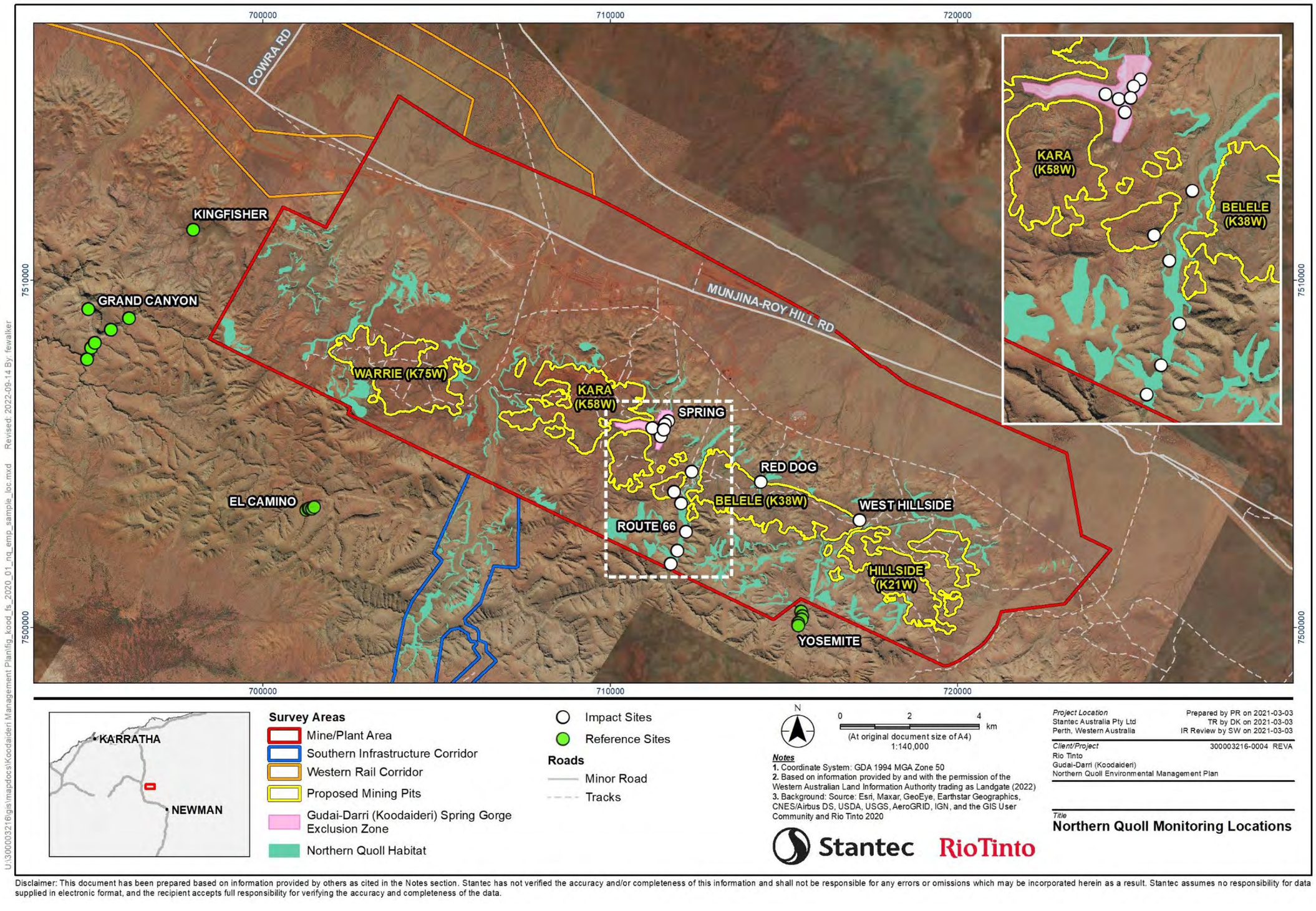
Key impacts and risks: Potential loss of Northern Quoll population and potential loss or degradation of high value (denning and foraging) habitat as a result of implementation of the Project.

Objective-based provisions

Moderate Management Level

Indicators: Direct disturbance to Northern Quoll high value habitat from Project-related activities, in excess of the authorised clearing area/value.	**Management Actions**	**Monitoring**	**Timing/Frequency**	**Responsible**	**Reporting**
Management targets **1.** No entry of unauthorised personnel into Gudai-Darri (Koodaideri) Spring Gorge EZ AND **2.** No unauthorised works within the Gudai-Darri (Koodaideri) Spring Gorge EZ AND **3.** No unauthorised clearing of mapped Northern Quoll high value habitat	• Install signage at all access points to Exclusion zones, including Gudai-Darri (Koodaideri) Spring Gorge • Enter Northern Quoll high value habitat areas and exclusion zones into RTIO GIS system • Include access limitations in site inductions - site induction material to include current information regarding the value of the EZ, and restrictions associated with entry. • Approvals Permit (and any conditions) is in place before ground disturbance. • Reporting incidents of unauthorised entry, works or clearing. • In-field inspections (UAV or visual);	• Regularly inspect signage to confirm it is intact and visible. • Audit by annual aerial imagery survey to assess whether any unauthorised clearing has occurred. • Periodic observation by Environmental personnel. • Land clearing reconciliation (against GIS avoidance layers and disturbance layers) to ensure the Mining Restrictions Zones are not impacted or entered without authorisation. • Aerial image capture (satellite or Remotely Piloted Aircraft).	• As triggered. • Annual audit. • Annual, or as triggered clearing reconciliation. • Annual imagery capture and analysis.	• Operations • Environment Team	• The environmental objective will be reported against the management target for each calendar year by 30 April in the ACAR. • If the 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 the management actions is required.
Indicators: Management of fauna interactions on site	**Management Actions**	**Monitoring**	**Timing/Frequency**	**Responsible**	**Reporting**

Management Target:
1. No direct Northern Quoll interactions (e.g., vehicle strike) per year resulting in mortality.
	Fauna interactions managed on site including:
	• All relevant site employees receive environmental induction, which covers information on Northern Quoll sightings and interactions, and vehicle speeds.
	• Personnel are to be informed of the Northern Quoll and high value habitat that may occur on site.
	• Northern Quoll encountered on site are to be recorded and records maintained. This will include locations, and animal status (alive/injured/dead).
	• If injured Northern Quolls are encountered and/or individuals required to be moved:
	  • Contact local DBCA Pilbara Regional Office for guidance on actions for treatment and release.
	  • handling of individuals will be completed by competent and licensed (where required) personnel only.
	• Feeding of native fauna, hunting, keeping of firearms or pets on site is prohibited.
	• Vehicles to remain on designated roads unless in the case of emergency or for undertaking necessary activities.
	• Limit vehicle speeds in operational areas.
		• Inspection of inductions, training, and awareness material.
		• Inspection of records, related to sightings, encounters and fauna removal.
			• As triggered	• Operations
				• Environment Team
					• Supporting parameters; review will provide additional information for interpretation of population monitoring data.
					• Any recorded Northern Quoll death attributable to the Project will be reported to the DWER and to DBCA (via email address: fauna@dbca.wa.gov.au)
					• Injured fauna may also be reported to DBCA via the Pilbara Regional Office (Ph: 9182 2000)



Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Figure 2-1: Indicative Northern Quoll monitoring locations at the Gudai-Darri (Koodaideri) Iron Ore Mine and Infrastructure Project

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 management targets in the Annual Compliance Assessment Report (ACAR) for the Proposal (**Table 4-1**).

In the event that 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 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 Management Targets contingency actions against environmental objectives, on an annual basis, to determine if any changes to the targets, 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.

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 Consultation table

Consultation Table			
Date	**Stakeholder/s**	**Issues / Comments Raised**	**Proponent Comment / Response**
Submitted by RTIO: March 2022 *Response received:* August 2022	**DWER** - Technical advice was sought from **DBCA**	1. Provide section of NQMP where census data for the NQ population and spatial imagery detailing foraging and denning habitat within the WRC and the south of the SIC Development Envelope have been included. If not recorded, confirm within NQMP. 2. Provide spatial imagery detailing NQ foraging and denning habitat within the WRC and SIC Development Envelope. If not recorded confirm within NQMP. 3. Provide stakeholder consultation undertaken to date. 4. General Comment - Previous DBCA advice not adequately addressed. Proposed monitoring program and management approach outlined in the Plan may not be adequate to meet the requirements of MS 999. Item No. 5 and 6 below highlighted by DBCA. 5. Monitoring Methodology - Based on condition 8-3(5) of MS 999, it is necessary that monitoring and analysis is capable of demonstrating "…a decrease in Northern Quoll numbers attributable to the proposal…". It is unclear how the proposed monitoring program will now be able to provide data on NQ populations to inform project attributable changes to their numbers…. Application of existing and additional impact and reference sites would assist in capturing adequate data to inform any causational changes in presence and abundance. 6. Monitoring Methodology - …it is unclear how the proposed cage trapping methodology is contributing to data collection and analysis for compliance with MS 999….Given the disparity of cage trapping effort between sites, it appears that the resources used to undertake cage trapping could be reallocated to a more comprehensive camera trapping program. This may include additional impact and reference sites.	1. Table 1-3 of the EMP revised to include a statement confirming no high value NQ denning and foraging habitat is recorded within the WRC of the southern portion of the SIC. 2. As above. Figure 1-3 presents the full extent of mapped high value NQ habitat within the Projects Development Envelope. 3. Document Status table and Table 4-1 (this table) amended to show revision history of EMP and detail consultation undertaken. 4. Addressed in line with Item No. 5 and Item No. 6 below. 5. Monitoring methods described within the NQMP have been revised as follows: a. 'Cage trapping' removed as a NQ monitoring method. b. Resources reallocated to more comprehensive camera trapping program. c. 4(No.) Impact sites and 4(No.) distinct Reference sites are now included in EMP. NQMP Table 2-1 (EMP Provisions – Threatened fauna (Northern Quoll) and high value habitat (denning and foraging)), Figure 2-1 (Indicative Northern Quoll monitoring locations at the Gudai-Darri Iron Ore Mine and Infrastructure Project) and Appendix 3 (Detailed Descriptions of Proposed monitoring Programs, Baseline Data and Proposed Analyses) updated to reflect the above changes to the monitoring methodology. Metric to inform project attributable changes in NQ population numbers added to Appendix 3 as follows: 'Where possible, Northern Quoll monitoring data will assess if there has been a statistically significant decrease in detections/numbers over a two-year period. However, it should be noted that historical monitoring suggests that data will not allow for statistically robust analyses due to the limited number of records characteristic of a low density population.' 6. As per Item No. 5 above.

Consultation Table			
Date	**Stakeholder/s**	**Issues / Comments Raised**	**Proponent Comment / Response**
Submitted by RTIO: October 2021 *Response received*: January 2022	**DWER** - Technical advice was sought from **DBCA** - **DAWE** declined to comment on the EMP	1. Include table identifying requirements of Condition 8 and the sections of the EMP that address same. 2. Monitoring methodology – that the monitoring program (i.e. design / methods) is undertaken consistently. 3. Monitoring Methodology – Recommendation 2 – that additional impact and reference monitoring sites are established as part of the monitoring program. 4. Monitoring Methodology – Recommendation 3 – that the locations of impact and reference monitoring sites are clearly defined with respect to the distance form project disturbances. 5. Feral predator control – Recommendation 4 – that a measurable management target is developed for feral predators in the EMP to demonstrate success of implemented feral predator management / contingency actions. 6. Census and spatial imagery information – Recommendation 5 – that northern quoll census data and spatial imagery detailing foraging and denning information is provided for the 'Gudai-Darri (Koodaideri) Development Envelope' in the EMP.	1. Table 1-2 added to section 1.3 of the EMP. 2. RTIO provided rationale for monitoring methodology – on the basis of NQ population in the Development Envelope being understood to be a low density population. 3. RTIO provided rationale for monitoring methodology and use of term 'monitoring sites' in place of specifying 'impact' and 'reference sites' – on the basis of change within EMP from outcome based (triggers and thresholds) to management-based provisions. Monitoring Sites El Camino and Yosemite were added to the monitoring program. 4. As per No.3 above. 5. RTIO noted a management target to have 'no increase' in presence of feral predators is difficult to meet given current population size is unknown. RTIO committed to feral cat control, passive monitoring techniques and application of adaptive management principles. 6. Footnote No. 5 added (following Table1-2) to clarify use of the term 'high-value' habitat.
Northern Quoll Management Plan (ref: RTIO-HSE-0325966)*****			
Submitted by RTIO: November 2015 *Approved: (by EPA Services)* November 2018	- **OEPA** (now EPA Services) - **DPaW** (now DBCA)	• A previous iteration of the Northern Quoll Management Plan (RTIO-HSE-0325966) was developed in 2015. Consultation occurred as shown in the Document Status Table above and summarised as follows: • Rev B submitted to DPaW in September 2015 • Rev v.1 submitted to OEPA (now EPA Services) in November 2015 – accompanied by RTIO letter (ref: RTIO-HSE-0271442) dated 27 November 2015. • Rev v.1 submitted to DPaW in December 2015 • Rev B.1 submitted to EPA Services in August 2018 • Rev v.02 submitted to EPA Services in November of 2018 • Rev 0 approved by EPA Services in November of 2018. Table 8-1 of NQMP (RTIO-HSE-0325966) shows stakeholder consultation with DBCA.	

***** Northern Quoll Management Plan (ref: RTIO-HSE-0325966) superseded by this current NQMP (RTIO-HSE-0356125).

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

Key environmental factors: Terrestrial fauna - Northern Quoll (*Dasyurus hallucatus*) and high value habitat (denning and foraging)	
Environmental outcomes and objectives with associated criteria and management targets.	**Reporting periods 1 January-31 December**
Management Targets	**Status report:** Management target achieved Management actions implemented Management target not achieved Management actions not implemented
1. Management of feral predators within the Development Envelope	
2. Northern Quoll recorded within the MPA via camera and/or secondary signs and continue to have an ongoing presence	
3. No entry of unauthorised personnel into Gudai-Darri (Koodaideri) Spring Gorge EZ	
4. No unauthorised works within the Gudai-Darri (Koodaideri) Spring Gorge EZ	
5. No unauthorised clearing of mapped Northern Quoll high value habitat	
6. No direct Northern Quoll interactions (e.g., vehicle strike) per year resulting in mortality.	

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

Complexity of Changes	**Minor Revisions** ☐	**Moderate Revisions** ☐	**Major Revisions** ☐	
Number of Key Environmental Factors	**One** ☐	**Two – Three** ☐	**> Three** ☐	
Date Revision submitted to EPA: DD/MM/YYYY				
Proponent's Operational Requirement Timeframe for approval of revision **Reason for Timeframe:**	**< One Month** ☐	**< Six Months** ☐	**> Six Months** ☐	**None** ☐

Item No.	EMP Section No.	EMP Page No.	Summary of Change	Reason for Change

5. REFERENCES

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Biota, Environmental Sciences. (2012b) *Koodaideri Northern Extension Fauna Survey.* Unpublished report prepared for Rio Tinto Pty Ltd.

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Biota, Environmental Sciences. (2012d) *Koodaideri Western Rail Corridor Fauna Survey.* Unpublished report prepared for Rio Tinto Pty Ltd.

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Biota, Environmental Sciences. (2012f) *Koodaideri Iron Ore Project Vertebrate Fauna Integration Report.* Unpublished report prepared for Rio Tinto Pty Ltd.

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Dunlop, J., Cook, A. and Morris, K. (2014) *Pilbara Northern Quoll project; Surveying and monitoring Dasyurus hallucatus in the Pilbara, Western Australia.* Department of Parks and Wildlife, Perth, Western Australia.

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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) 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

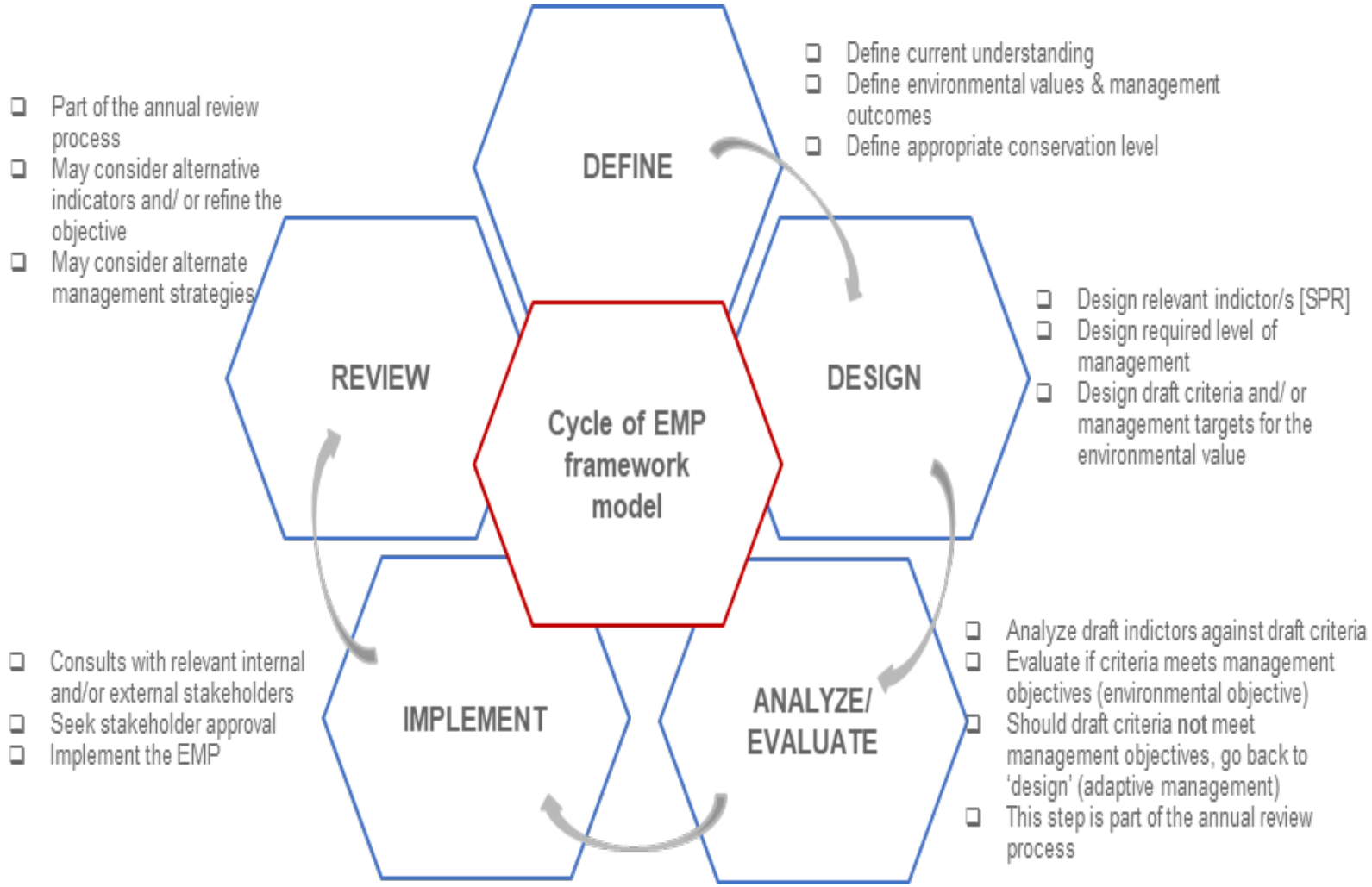

Figure A 1: Cycle of the conceptual Environmental Management Plan framework model

Table A 1: Description of Tiers and examples of environmental values for each[8]

Tier	Example of values included
1 Environmental Values directly protected under State or Commonwealth legislation (*Environmental Protection Act 1986, Biodiversity Conservation Act 2016, Environmental Protection and Biodiversity Conservation Act 1999*)	• Matters of National Environmental Significance • National Parks • Threatened flora and communities • Environmentally sensitive areas • Listed wetlands / aquatic Groundwater Dependent Ecosystems (GDE's)
2 Environmental Values recognised by State policy	• Priority species and communities • Subterranean fauna communities • Other wetlands / terrestrial GDE's
3 Environment Values with no formal recognition for conservation purposes	• Short Range Endemics • 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) • Other riparian habitats/ riparian communities / pools

Table A 2: Management level assessment matrix

Factor	Level of required management (increasing to right)				
Likelihood	Rare	Unlikely	Possible	Likely	Almost Certain
Consequence	No Tier	Tier 3	Tier 2	Tier 1	Tier 1 (potential severe consequence)
Extent	Immediate	Surrounds	Local	Catchment	Sub-regional
Duration	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.

[8] Note that the list of Tier values is not explicit and may be changed based on legislative and/ or guideline updates.

Appendix 2: Summary of assessment for required management level

Each environmental value, described in **Section 1.4**, was assigned a management level based on matrix level assessment (**Appendix 1**, Step 2). A summary of the assessment for the Proposal, which takes into account information provided in **Table 1-2** and **Table 1-3** is provided in the table below along with the resulting management level for each environmental value relevant to this EMP.

The assessment considers all impacts collectively (direct, indirect and including threatening processes) and assigns against the highest level of management.

Table A-3: Summary of assessment for assignment of management level.

Environmental Value	Predicted and Potential Impact/s	Assessment				Management Level
		Likelihood	Consequence	Extent	Duration	
Terrestrial Fauna						
Northern Quoll and high value habitat (denning and foraging)	• Direct • Indirect • Threatening processes	**Possible** The Development Envelope supports a low-density population of Northern Quolls that experiences natural population fluctuations due to environmental conditions (including rainfall and fire). An exclusion zone has been delineated around the Gudai-Darri (Koodaideri) Spring for the retention of high value habitat.	**Major** Tier 1 value: Northern Quolls and their habitats have statutory protection under the BC Act and the EPBC Act	**Immediate** The Project is not expected to cause a reduction in the area of occupancy, a decline in, or interfere with the recovery of MNES species. Therefore, potential impacts will be confined to the Development Envelope.	**Decades** The Project is not expected to cause a long-term decrease in the size of the Northern Quoll population as high value habitat (Gudai-Darri (Koodaideri) Spring Gorge) will be retained.	MODERATE

Appendix 3: Detailed Descriptions of Proposed Monitoring Programs, Baseline Data and Proposed Analyses.

3.1 Terrestrial Fauna - Northern Quoll (*Dasyurus hallucatus*) and high value habitat (denning and foraging) – Objective-based Provisions

Objective-based provisions have been proposed to increase understanding of Northern Quoll population size and habitat usage within the Development Envelope and ensure the environmental outcome is met including:

Northern Quoll Presence/Population

Monitoring of Northern Quoll populations was undertaken during baseline surveys via trapping and motion cameras (Biota 2018). However, improvements in camera technology and methods, now allow for identification of individuals and therefore gathering of adequate population data via camera to eliminate the need for trapping of Northern Quolls. Additionally, monitoring through motion cameras is achievable at remote and rugged sites where trapping is not. Monitoring of the Northern Quoll population will be undertaken using permanently deployed motion-sensing cameras during operational mine life, to determine ongoing presence of Northern Quoll within the MPA. All monitoring sites occur within suitable habitat (gorge/gully, breakaway) for Northern Quoll, and include:

- Four potential impact sites within the MPA; Spring, Route 66, Red Dog and West Hillside (**Figure 2-1**).
- Four reference sites, situated outside the Development Envelope; Grand Canyon, El Camino, Yosemite and Kingfisher (**Figure 2-1**).

A survey of 11 potential alternative monitoring sites (Stantec 2021) identified several sites that may be suitable as alternative monitoring site/s, based on the presence of suitable habitat and small numbers of quoll scats. However, it was also noted that no Northern Quolls were detected on camera at any of these sites during the survey. The two sites deemed most appropriate from this survey were El Camino and Yosemite. A third reference site (Kingfisher) was identified as an appropriate reference site in 2022.

Camera monitoring for Northern Quoll and other animals, including feral predators, will be conducted annually. Cameras will be deployed year round, recording continuously (device dependant), with data collected and analysed quarterly. Each site will consist of up to seven non-reward baited cameras, re-baited quarterly to continue effectiveness of lure Camera placement will include five downward facing cameras to allow for Northern Quoll spot recognition, and two outward (horizontal) facing cameras, with opened focal range, to allow greater detection of animals, including feral predators. The camera monitoring program has been designed in consultation with DBCA to be consistent with the latest DBCA Northern Quoll research (Dunlop *et al.* 2018), as far as practicable. Camera 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).

An annual review of Northern Quoll population persistence within the MPA will be conducted using data collected from potential impact and reference camera monitoring sites. Where possible, Northern Quoll monitoring data will assess if there has been a statistically significant decrease in detections/numbers over a two-year period. However, it should be noted that historical monitoring suggests that data is unlikely to allow for statistically robust analyses due to the limited number of records characteristic of a low density population.

In addition, opportunistic and covariate data that may provide contextual information to assist in interpreting any trends in Northern Quoll numbers within the MPA will be collected from monitoring sites, including:

- Opportunistic field observations and active searches to determine ongoing presence of Northern Quoll (including scat);
- Relative abundance of the Common Rock-rat (*Zyzomys argurus*), a known Northern Quoll prey species, at each site;
- Feral predator records (via motion camera);
- Motion camera observations of individuals where condition can be visually assessed, or reproductive activity inferred (i.e., by presence of juveniles); and
- Rainfall (preceding months to years to allow for lag in population response); and
  Fire history (years since last fire).

Population: Feral Predators

- Record opportunistic observations of feral predators within the Development Envelope.
- Record number of feral predators removed through control programs.
- Passive camera monitoring (as part of Northern Quoll camera monitoring program (see above)) to detect presence/absence and record relative abundance of feral predators.

High value habitat: Gudai-Darri (Koodaideri) Spring Gorge

- Signage will be regularly inspected to confirm it is intact and visible.
- Periodic observation by Environmental personnel will be conducted, along with an annual aerial imagery survey to assess whether any unauthorised clearing has occurred.

Annual or as triggered land clearing reconciliation using GIS disturbance layers will be undertaken to ensure the no unauthorised works or clearing within Exclusion Zones