

Proposed Changes to Ravensthorpe Nickel Operations

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ABBREVIATIONS, ACRONYMS AND DEFINITIONS

Term/Abbreviation	Definition/Title
CCA	Community Conservation Area – an area established for the conservation of conservation significant species.
DER	Department of Environment Regulation
Development Envelope	The boundary of the Proposal
DMP	Department of Mines and Petroleum
DoW	Department of Water
DPaW	Department of Parks and Wildlife
FQM	First Quantum Minerals Nickel Australia Pty Ltd
EAG	Environmental Assessment Guideline
EIA	Environmental Impact Assessment
EP Act	Environmental Protection Act 1986
EPA	Environmental Protection Authority
OEPA	Office of the Environmental Protection Authority
PEC	Priority Ecological Community
TEC	Threatened Ecological Community
RNO	Ravensthorpe Nickel Operations



1 PROPONENT AND KEY PROPOSAL CHARACTERISTICS

1.1 Proposal Overview

FQM Australia Nickel Pty Ltd (FQM) proposes changes at the Ravensthorpe Nickel Operations (RNO) for an expansion of mining operations on the Hale-Bopp ore body, a revised alignment of the infrastructure corridor to the Shoemaker-Levy ore body and adding neutralised tailings to the reject rocks used to backfill mine pits and re-establish hill topographies (Figures 1 and 2).

Mining operations in the proposed Hale-Bopp pit will utilise the same processes as the existing operations of drill and blast for open pit mining. Ore from this pit will be transported via existing access roads to the same processing facility. The revised corridor will be used to transport ore from Shoemaker-Levy initially via road, then later by conveyor, to the existing ore processing site.

This document provides supporting information to the Environmental Protection Authority (EPA) to determine the Level of Assessment. A Referral Form (Appendix A) has been prepared for the proposal in accordance with Section 38(1) of the EP Act.

1.2 The Proponent

The Proponent for the Proposal is:

FQM Australia Nickel Pty Ltd (FQM) ACN: 135 761 465 Lot 1269 South Coast Highway Ravensthorpe WA 6346

The key contact for this Proposal is:

Tony Petersen Manager, Health, Safety & Environment Phone: 08 9838 2601 Email: <u>tony.petersen@fqml.com</u>

1.3 Key Proposal Characteristics

FQM Australia Nickel Pty Ltd (FQM) proposes changes at the Ravensthorpe Nickel Operations (RNO) for an expansion of mining operations on the Hale-Bopp ore body and a revised alignment of the infrastructure corridor to the Shoemaker-Levy ore body and adding neutralised tailings to the reject rocks used to backfill mine pits and re-establish hill topographies.

A summary of the key characteristics (Tables 1 and 2) have been prepared in accordance with Environmental Assessment Guideline (EAG) No. 1 *Environmental Assessment Guideline for Defining the Key Characteristics of a Proposal Environmental Protection Act 1986* (EPA 2012).



Table 1: Proposal Summary

Proposal Title	Changes to Ravensthorpe Nickel Operations
Proponent Name	FQM Australia Nickel Pty Ltd
Short Description	The Proposal is comprised of a proposed expansion of open pit mining operations on Hale-Bopp and a revised alignment of the infrastructure corridor to the Shoemaker-Levy ore body and adding neutralised tailings to the reject rocks used to backfill mine pits and re-establish hill topographies.
	The new corridor will include a saltwater pipeline, haul road, conveyor and powerline.

Table 2: Physical Elements

Element	Location	Proposed Extent
Mine and Associated Infrastructure Corridor	Figure 2	Clearing of up to 113 ha within a 252 ha Development Envelope. A total of 48 ha in the southern portion of the proposed corridor is existing clearing.

Table 3: Operational Elements

Element	Location	Proposed Extent
Mine pit	Development Envelope	Clearing of up to 29 ha within a 30 ha Development Envelope.
Associated Infrastructure Corridor and other disturbance	Development Envelope	Clearing of up to 110 ha within a 222 ha Development Envelope.
Tailings disposal		Neutralised tailings mine backfill approximately 5 Mt capacity



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Author: Denise True Location map (Regional) WEC Ref: FQM16-22-01 Filename: FQM16-22-01-f01.mxd Figure WOODMAN ENVIRONMENTAL Scale: 1:210,000 (A4) Projection: GDA 1994 MGA Zone 51 Revision: 0 - 25 July 2016

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 RNO Showing Development Envelope
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 Image: FQM16-22-01

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2 GENERAL DESCRIPTION OF PROPOSAL

2.1 Proposal Description

FQM Australia Nickel Pty Ltd (FQM) proposes changes at the Ravensthorpe Nickel Operations (RNO) that includes an expansion of mining operations at the Hale-Bopp ore body, a revised alignment of the infrastructure corridor to the Shoemaker-Levy ore body and adding neutralised tailings to the reject rocks used to backfill mine pits and re-establish hill topographies. The infrastructure corridor will include a saltwater pipeline, haul road, conveyor and powerline.

The Project is an expansion of the existing mining and processing operations at RNO. Ore reserves include three nickel laterite deposits, Halleys, Hale-Bopp and Shoemaker-Levy, with mining by conventional open cut methods. The nickel content in the ore is upgraded through a beneficiation process and followed by a series of treatments utilising pressure and atmospheric acid leach technology and solution purification techniques. RNO produces a mixed nickel-cobalt hydroxide product. The mixed hydroxide product is packaged and transported by road to the Port of Esperance if being shipped for further processing. Project infrastructure such as the processing plant, tailings storage facilities and evaporation ponds are located on cleared farmland adjacent to the mine.

2.2 Proposal Tenure

The Proposal is located within the Mineral LeasesM74/108, M74/115, M74/144, M74/168, M74/171, M74/235, L74/21 and L74/32.

The proposed corridor will cross the South Coast Highway and intersect the road reserve. Consultation with Main Roads WA (MRWA) on the nature of the crossing and traffic management during construction has commenced.

2.3 Other Approvals

2.3.1 Part IV Approvals

Ravensthorpe Nickel Operations is the subject of Ministerial Statement 633 with the most recent approval for changes to the proposal under section 45C of the EP Act obtained in 2014 (Appendix B).

2.3.2 Part V Approvals

Ravensthorpe Nickel Operations is the subject of a Licence under the EP Act (L8008/2004/3) for activities conducted on the premises.

2.3.3 Native Title

Native Title Agreements exist with Southern Noongar / Wagyl Kaip people and the Esperance Nyungar people.



3 STAKEHOLDER CONSULTATION

Stakeholder engagement, community consultation and participation in the planning, development, construction and operation phases of RNO have been extensive. The Government approvals process involved significant community engagement, and subsequent regulatory approvals require on-going consultation.

FQM is committed to community engagement as documented in the Company's Social Policy which states –

First Quantum Minerals Ltd. (the "Company") believes it makes sound, strategic business sense to involve local communities and other relevant stakeholders in our business. We engage with them to build and maintain effective, long-term and mutually beneficial relationships, and conduct business in a way that provides long term economic opportunity and supports social well-being.

RNO's primary stakeholder engagement is through:

- Quarterly meetings of the Jerdacuttup RNO Working Group (JRWG), the group of key fence line neighbours.
- Ongoing dialogue with the Wagyl-Kaip/Southern Noongar (WKSN) native title parties, including quarterly meetings of the RNO-WKSN Relationship Committee.
- Ongoing dialogue with the Shire of Ravensthorpe and the Shire of Esperance.
- Annual regulatory-required audits and reports with the Department of Mines and Petroleum and the Department of Environment Regulation.
- Direct consultation and engagement on specific closure issues with local stakeholders and experts (such as environment rehabilitation planning).
- Direct communications and briefings on key issues, as they arise.

As an active mine area, a number of heritage surveys have been conducted to date. Native Title Agreements exist with Southern Noongar/Wagyl Kaip people and the Esperance Nyungar people.

FQM has identified stakeholders with interest in the Proposal and has commenced consultation with regulators and government agencies; Office of the Environmental Protection Authority, EPA, and Department of Parks and Wildlife (DPAW). Further consultation with stakeholders will be conducted and will include but not be limited to Department of Mines and Petroleum (DMP), Conservation Council, Wildflower Society, Ravensthorpe Wildflower Society, Shire of Ravensthorpe, Ravensthorpe Chamber of Commerce and Hopetoun Progress Association (Table 4).



Stakeholder	Date	Topic/issue raised	Proponent Response/Outcome
Office of the Environmental Protection Authority	November 2015	Presentation of the preliminary RNO expansion of Hale-Bopp mining operations into the <i>Kunzea similis</i> ssp. <i>mediterranea</i> Community Conservation Area.	The OEPA advised that the project needs to ensure that the conservation status of the Threatened species is not changed by the proposal.
	18 May 2016	Discussion of the proposed alternative Shoemaker Levy access corridor.	The OEPA advised that the proposed changes of the access corridor and the Hale-Bopp mine expansion would require referral under section 38 of the EP Act. It was also advised that the most likely level of assessment would be a Public Environment Review (PER).
	10 June 2016	 Details of the proposal were discussed, in particular the: discussions held with the Department of Parks and Wildlife (DPaW) regarding threatened flora; approach to the referral; and key factors for the Proposal, including approach to <i>Kunzea similis</i> subsp. <i>mediterranea.</i> 	The OEPA advised that the PER process will allow that with approval of the proposed project, a single Ministerial Statement will be issued to include all of the previous approval (MS633) along with the new mining and corridor areas. As the proposal comprises Matters of National Environmental Significance (MNES) and maybe a controlled action, the referral to the Commonwealth on a separate form should be done simultaneously.
Department of Parks and Wildlife	November 2015	Presentation of the preliminary RNO expansion of Hale-Bopp mining operations into the <i>Kunzea similis</i> ssp. <i>mediterranea</i> Community Conservation Area.	DPaW advised that they considered that the clearing of the population of the <i>Kunzea similis</i> ssp. <i>mediterranea</i> Community Conservation Area constituted a significant environmental impact and would be referred.

Table 4: Stakeholder Consultation and Identified Stakeholders



4 ENVIRONMENTAL STUDIES AND SURVEY EFFORT

Table 5 details the relevant studies, surveys and investigations that have been conducted to date, the study area covered and the applicable guidelines and limitations of each study.



Table 5: Environmental Studies and Survey effort

Factor	Consultant	Survey/Report Name	Study Area, Type and Timing	Study Standard/Guidance and Limitations
Flora and Vegetation	Woodman Environmental (2015a) Appendix C	Shoemaker-Levy Access Corridor Flora and Vegetation Assessment	Spring survey for flora and vegetation 2 km wide and 11 km long study area for access corridor (flora sampling, conservation significant survey and mapping of vegetation types).	Level 2 Detailed Survey Guidance Statement No. 51 (EPA 2004). Technical Guide - Flora and Vegetation Surveys for EIA (EPA 2015b).
			200m wide potential development envelope (Project Area) (conservation significant flora search and census).	Specific searching for significant flora taxa will be undertaken in Spring 2016.
	Woodman Environmental (2015b)	Kunzea similis subsp. mediterranea Community Conservation Area - Significant Flora	Kunzea Community Conservation Area incorporating proposed northern extension to Hale- Bopp pit.	Guidance Statement No. 51 (EPA 2004). Technical Guide - Flora and Vegetation Surveys for EIA (EPA 2015b).
	Appendix D	Assessment	Census and mapping of <i>Kunzea similis</i> subsp. <i>mediterranea</i> and other known Priority flora Spring Survey Period.	Conservation significant <i>Lepidosperma</i> taxa was delineated by Dr. Russell Barrett after the survey was conducted. Further searching for a population census will be conducted.
	Woodman Environmental (2015c) Appendix E	Kunzea similis <i>subsp.</i> mediterranea (<i>Threatened</i>) – <i>Regional</i> <i>Search</i> 2015	Further regional searching for additional populations of <i>K. similis</i> subsp. <i>mediterranea</i> during 2015.	Guidance Statement No. 51 (EPA 2004). Technical Guide - Flora and Vegetation Surveys for EIA (EPA 2015a).
	Woodman Environmental (2015d) Appendix F	Kunzea similis subsp. mediterranea <i>Health</i> <i>Monitoring Program 2014</i>	New monitoring regime for <i>Kunzea similis</i> subsp. <i>mediterranea</i> within the Kunzea CCA and 2014 monitoring results (baseline sampling) for the program.	Methodology agreed with the OEPA.
	Woodman Environmental (2016)	Proposal to Impact Kunzea similis subsp. mediterranea (Threatened) -	Kunzea Community Conservation Area incorporating proposed northern extension to Hale- Bopp pit	IUCN Red List Criteria.
	Appendix G	Assessment of Conservation Status Against IUCN Red List	Assessment of Impact of the proposed Hale-Bopp north extension on the conservation status of <i>Kunzea similis</i> subsp. <i>mediterranea.</i>	



Factor	Consultant	Survey/Report Name	Study Area, Type and Timing	Study Standard/Guidance and Limitations
		Criteria		
	Glevan (2014) Ra Appendix H Op Ph Oc	Ravensthorpe Nickel Operations - Phytophthora Dieback Occurrence Assessment	RNO tenements and associated infrastructure	CALM. (2003). <i>Phytophthora cinnamomi</i> and disease caused by it. Volume 1 - Management Guidelines. Unpublished
				O'Gara, E., Howard, K., Wilson, B., & Hardy, G. (2005). Management of <i>Phytophthora cinnamomi</i> for Biodiversity Conservation in Australia: Part 2 - National Best Practice Guidelines. CPSM. Department of Environment and Heritage.
				An assessment will be conducted in 2016 which will include the proposed access corridor.
Terrestrial Fauna	Terrestrial Ecosystems (2015)	Potential impact of vegetation clearing and the development of a conveyor belt on fauna at	200m wide study area covering the proposed access corridor (11km long)	Terrestrial Biological Surveys as an Element of Biodiversity Protection: Position Statement No. 3 (EPA 2002).
	Appendix I	the Ravensthorpe Nickel Operations		Guidance for the Assessment of Environmental Factors. Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia No. 56 (EPA 2004).
				Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment. EPA and Department of Environment and Conservation 2010.
				Further vertebrate field surveys including a targeted Black Cockatoo survey will be conducted in 2016 for the proposed Hale-Bopp North West Pit and access corridor.
	Terrestrial Ecosystems (2015)	Conservation Significant Vertebrate Fauna Monitoring for Ravensthorpe Nickel	Long term monitoring program for Heath Rat, Western Mouse, Southern Brown Bandicoot, Chuditch and Western Whipbird.	Terrestrial Biological Surveys as an Element of Biodiversity Protection: Position Statement No. 3 (EPA 2002).
	Appendix J	Operations, Ravensthorpe		Guidance for the Assessment of Environmental Factors. Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia No. 56 (EPA 2004).



Factor	Consultant	Survey/Report Name	Study Area, Type and Timing	Study Standard/Guidance and Limitations
				Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment. EPA and Department of Environment and Conservation 2010.
Hydrological processes	RNO (2006) Appendix K	Surface Water Management Plan	This OEPA 2007 Approved Management Plan documents the procedures and strategies to be implemented at the RNO to provide protection of surface water flows and quality.	This Management Plan will form the basis for the protection of surface waters in response to the proposed Hale-Bopp North West Pit and the Access Corridor. It will be updated to include site-specific management strategies that are adopted for the proposal.
Inland Waters Environmental Quality	FQM Australia Nickel Pty Ltd (2016) Appendix L	Ravensthorpe Nickel Operations Pty Ltd Mineral Field 74 Mine Closure Plan	Prepared for submission to the Department of Mines and Petroleum (DMP) as part of Ravensthorpe Nickel Operations Pty Ltd (RNO) commitments to operating requirements under the <i>Mining Act 1978</i> and EP Act 1986 Ministerial Statement 633 (September 2003).	Approved Mine Closure Plan following the <i>Guidelines for the Preparation of a Mine Closure Plan.</i> Department of Mines and Petroleum and Environmental Protection Authority 2015. This MCP will be updated to include the proposed Hale-Bopp North West Pit and the Access Corridor.



5 ASSESSMENT OF PRELIMINARY KEY FACTORS

5.1 Assessment of Preliminary Key Factors

Key environmental factors were identified during the assessment process undertaken for Ministerial Statement 633 (Section 46) and the Amendment under Section 45C. The potential key environmental factors, as defined in EAG No. 8 (EPA 2015b) were determined and include the key environmental factors as detailed in Table 6 and Figures 3 and 4. Other factors which were considered in relation to this assessment but are not considered key factors are discussed in Section 6.

Factor	Proposal Aspect	Potential Impact and Risks
Terrestrial Environmental Quality	Mine pit excavation Access corridor dust management	Contamination and impacts to soil quality Incorporation of tailings materials into soil profile Utilisation of saline waters in dust suppression on access corridor.
Flora and Vegetation	Mine pit excavation Access corridor clearing Modification of surface and subsurface water flows	 Clearing of native vegetation in good or better condition. Clearing of conservation significant species (Figure3): <i>Kunzea similis</i> ssp. <i>mediterranea</i> (Threatened) <i>Conostylis lepidospermoides</i> (Threatened); <i>Drosera grievei</i> (P1); <i>Lepidosperma</i> sp. Mt Chester (S. Kern et al. LCH 16596) (P1); <i>Tricostularia</i> sp. Lake King (A.M. Coates 2298) (P2); <i>Micromyrtus navicularis</i> (P3); <i>Synaphea platyphylla</i> (P3); <i>Thysanotus parviflorus</i> (P4); <i>Goodenia phillipsiae</i> (P4) <i>Stachystemon vinosus</i> (P4) Clearing of part of the Community Conservation Area for <i>Kunzea similis</i> ssp. <i>mediterranea</i> (Threatened). Clearing of the EPBC listed Endangered TEC 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia' (Figure 4). Spread/introduction of weeds Increased disease risk (<i>Phytophthora</i>)
Terrestrial Fauna	Mine pit excavation Access corridor clearing	Clearing of foraging habitat for the EPBC listed species, Carnaby's Cockatoo, and habitat for Malleefowl, Heath Mouse, Western Quoll, and Rainbow bee-eater. Clearing of habitat for Threatened and priority fauna

Table 6: Preliminary Environmental Factors



Factor	Proposal Aspect	Potential Impact and Risks
		species Western Whipbird, Western Brush Wallaby.
Hydrological processes	Dissection of minor drainage lines	Change in surface/subsurface water flows, erosion and sediment controls.
	Altered hydrological regimes from mining and mining-related activities Interaction of floodwaters on mining and mine-infrastructure Rehabilitation and Mine Closure Environmental quality	Alteration of the natural water balance and surface water drainage patterns due to diversion of surface water flows around, and collection of surface water within the development envelope. Alteration of hydrology of creeks from linear mine infrastructure. Increased erosion, sediment and runoff from post-mine landforms.
Inland Waters Environmental Quality	Mine pit excavation Construction and operation of Access corridor Mining, stockpiling and handling of overburden and ore In-pit tailings deposition Mining related activities (dust suppression) Environmental quality	Interruption of creeks and impacts to Jerdacuttup River. Impacts to environmental quality from metalliferous drainage from waste rock landforms, tailings backfill and stockpiled overburden and ore. Contamination of surface water as a result of loss of containment of mine related processes including ore, tailings seepage, dust suppression, and spillage of fuels or reagents. Increased erosion, sediment and solute transport from stockpile materials and post-mine landforms.
(integrating Factor)	Access corridor clearing	 Clearing of native vegetation in good of better condition. Clearing of conservation significant flora species including both State and EPBC listed flora. Clearing of the EPBC listed Endangered TEC. Clearing of the State listed Priority 1 PEC. Clearing of habitat for EPBC listed and state conservation significant fauna species.
Rehabilitation and Decommissioning (integrating factor)	Land and vegetation clearing for site works Mine and mining infrastructure Alteration or change of natural ecosystem processes	Permanent impacts to landforms. Landform stability and increased erosion. Residual soil or water contamination. Unsuccessful rehabilitation of flora and vegetation in cleared and disturbed areas. Impediment to rehabilitation success due to the spread of weeds.



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Significant Flora Taxa

- Allocasuarina ?hystricosa (P4) A?hy
- Acrotriche orbicularis (Threatened) Aor
- Beyeria villosa (P4) Bvi
- Conostylis lepidospermoides (T) Cle
- Drosera grievei (P1) Dgr
- Dampiera sp. Ravensthorpe (G.F. Craig 8277) (P3) DspR
- Egl Eremophila glabra s. lat. (potentially undescribed)
- Gta Grevillea fastigiata (P4)

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- Goodenia phillipsiae (P4) Gphi
- LspFT Lepidosperma sp. 'Fitzgerald Tuberculate' (potentially undescribed)
- LspMC Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596) (P1)
- Micromyrtus navicularis (P3) Mna
- Pultenaea calycina subsp. proxena (P4) Pcap
- Synaphea aff. petiolaris (potentially undescribed) Sap
- Synaphea platyphylla (P3) Spl
- Thysanotus parviflorus (P4) Tpar
- TspLK Tricostularia sp. Lake King (A.M. Coates 2298) (P2)



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	Threatened Flora comprised of Kunzea	Author: Denise True	Figure
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S ENVIRONMENTAL N	Priority and Conservation Significant Flora	Filename: FQM16-22-01-f03-1.mxd	3.1
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- Development Envelope
- EPBC listed TEC/State Listed Priority 3 PEC '*Proteaceae* Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia'
- State listed Priority 3 PEC 'Swamp Yate (*Eucalyptus occidentalis*) woodlands in seasonally inundated clay basins (South Coast)'
- Priority Ecological Community Buffer
- *Eucalyptus purpurata* woodlands (Bandalup Hill) (Priority 1)
- Heath on Komatiite of the Ravensthorpe area (Priority 3)

Vegetation Types

- 1 *Eucalyptus pleurocarpa* woodland over Kwongan shrubland on sandy soils with some laterite Mid mallee woodland or shrubland dominated by *Eucalyptus pleurocarpa* over mid sparse to open shrubland dominated by *Banksia lemanniana*, *Banksia media* and
 - Hakea pandanicarpa subsp. pandanicarpa over low shrubland of mixed taxa dominated by Banksia cirsioides, Banksia obovata, Allocasuarina humilis, Beaufortia micrantha var. micrantha and Melaleuca tuberculata var. macrophylla on grey-brown sandy loams, usually with lateritic gravel, on undulating plains
- 3 Eucalyptus pleurocarpa woodland over Kwongan shrubland on sandy soils Mid mallee woodland or shrubland dominated by Eucalyptus pleurocarpa over mid sparse to open shrubland dominated by Hakea pandanicarpa subsp. pandanicarpa



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and Hakea corymbosa over low shrubland and sedgeland of mixed taxa dominated by Allocasuarina humilis, Beaufortia micrantha var. micrantha, Melaleuca carrii, Calothamnus gracilis and Mesomelaena stygia subsp. stygia on grey or grey-brown sandy loams on undulating plains

4 Kwongan shrubland on sandy soils

Mid isolated mallees of *Eucalyptus pleurocarpa* over mid sparse shrubland dominated by *Adenanthos cuneatus, Jacksonia elongata* and *Hakea obliqua* subsp. *parvifolia* over low shrubland and sedgeland of mixed taxa dominated by *Allocasuarina acuaria, Banksia violacea, Calothamnus gracilis, Taxandria spathulata* and *Caustis dioica* on grey-brown or yellow-brown sandy loams on undulating plains

8 *Eucalyptus occidentalis* woodlands on clay soils in basins

Mid woodland to open forest of *Eucalyptus occidentalis* over tall to mid sparse shrubland of mixed taxa including *Acacia cyclops*, *Acacia saligna* subsp. *lindleyi* ms, *Hakea nitida* and *Melaleuca thapsina* over low open to sparse sedgeland and shrubland of mixed taxa dominated by *Schoenus subfascicularis* and *Thomasia angustifolia* on grey-brown sandy loam or sandy clay in basins



252500	255000	257500	260000
	Threatened Ecological Community	Author: Denise True	Figure
WOODMAN	Compiled of Vegetation Mapping	WEC Ref: FQM16-22-01	
ENVIRONMENTAL N	Units 1, 3, 4 and 8	Filename: FQM16-22-01-f04.mxd	4
This map should only be used in conjunction with WEC report FQM16-22-01	Revision: A - 04 July 2016 Scale: 1:35,000 (A3)	Projection: GDA 1994 MGA Zone 51	



5.2 Application of Significance Framework

FQM has applied the significance framework as per Environmental Assessment Guideline No. 9 *Application of a significance framework in the environmental impact assessment process* (EPA 2015a). The framework has been applied to manage the residual impacts following the consideration of the mitigation hierarchy and proposed management actions.



Table 7: Assessment of Key Factors – Terrestrial Environmental Quality

Terrestrial Environmental Quality - To maintain the quality of land and soils so that the environmental values, both ecological and social, are protected			
Inherent impact and aspects that may cause a significant impact	Mitigation actions to address residual impacts	Proposed regulatory mechanisms for ensuring mitigation	Outcome to demonstrate the Proposal meets EPA objective
 Contamination and impacts to soil quality Incorporation of tailings materials into soil Utilisation of saline waters in dust suppression Dust suppression on haul road and Access Corridor using saline water 	profile ssion on access corridor. <i>Avoid</i> – dust suppression activities using saline water will be restricted to	Updated Dust Management Plan.	Impacts will be confined to disturbance envelope.
	constructed haul roads and the Access Corridor and overspray outside of these areas will be avoided. <i>Minimise</i> – the use of saline water for dust suppression will be minimised as far as practicable to reduce the potential exceedance of implemented surface drainage control features. <i>Rehabilitate</i> – following cessation of operations, all soil contaminated by saline water, will be excavated and deposited at depth in a mine pit, and the area rehabilitated to agreed completion criteria.	A Soil Management Plan will be developed. Updated Vegetation and Flora Management Plan. Updated Mine Closure Plan.	Contaminated soils will be ameliorated or buried at depth in mine pits. FQM considers that it will meet the EPA objective for this factor within the Proposal Area.
Backfilling of the mine pit with co-disposed tailings.	Avoid – backfilling of the mine pit using tailings slurry will be avoided, and only dried tailings will be used in the backfilling process.	A Tailings Backfill Management Plan will be developed. A Soil Management Plan will be developed.	No detrimental impact on rehabilitation performance and downstream surface water and groundwater quality. FQM considers that it will meet the EPA



Terrestrial Environmental Quality - To maintain the quality of land and soils so that the environmental values, both ecological and social, are protected				
Inherent impact and aspects that may	Mitigation actions to address	Proposed regulatory mechanisms	Outcome to demonstrate the Proposal	
cause a significant impact	residual impacts	for ensuring mitigation	meets EPA objective	
	<i>Minimise</i> – the elevation that the backfilled tailings will be deposited into the mine pit will be controlled so as to minimise the interaction between the root zone of the proposed revegetation species and the tailings material.	The Flora and Vegetation Management Plan and Surface Water Management Plan will be updated.	objective for this factor within the Proposal Area.	
	<i>Rehabilitate</i> – the mine pit will be rehabilitated to re-establish the geomorphic and pedogenic processes of the landform, which will effectively isolate the backfilled tailings materials and reduce any potential impact on the environment.			



Table 8: Assessment of Key Environmental Factors - Flora and Vegetation

Flo	Flora and Vegetation - To maintain representation, diversity, viability and ecological function at the species, population and community level.				
Inh ca	nerent impact and aspects that may use a significant impact	Mitigation actions to address residual impacts	Proposed regulatory mechanisms for ensuring mitigation	Outcome to demonstrate the Proposal meets EPA objective	
•	 Two Threatened Flora species pursuant subsection (2) of the Wildlife Conservation Act 1950 (WC Act) were recorded from the Development Envelope. One of these species is listed under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act): Kunzea similis ssp. mediterranea (Threatened (WC Act)); and Conostylis lepidospermoides (Threatened (WC Act); Endangered (EPBC Act)). 				
•	Expansion of the Hale-Bopp orebody w This portion comprises 10.33 ha of the p	ill entail the removal of a large portion (2 population of <i>Kunzea similis</i> ssp. <i>meditern</i>	9 ha) of the <i>Kunzea similis</i> ssp. <i>mediterrane</i> anea.	ea Community Conservation Area (74.75 ha).	
•	Prior to the survey of the corridor (Wood more than 2129 individuals and it is esti that further populations of this taxon will	Iman 2015), it was estimated that only 67 imated that 1351 of these would be impa be located in areas that will not be impac	0 individuals of <i>Conostylis lepidospermoides</i> acted by the corridor representing a high loca acted.	were known. The Woodman survey recorded al impact and species scale impact. It is likely	
•	 Six Priority Flora species as listed by the DPaW have been recorded within the Development Envelope: Drosera grievei (P1); Lepidosperma sp. Mt Chester (S. Kern et al. LCH 16596) (P1); Tricostularia sp. Lake King (A.M. Coates 2298) (P2); Micromyrtus navicularis (P3); Synaphea platyphylla (P3); Thysanotus parviflorus (P4); 				
•	 Clearing of the EPBC listed Endangered TEC 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia' Spread/introduction of weeds 				
•	 Increased disease risk (<i>Phytophthora</i>) Sixteen introduced flora species were recorded in the vicinity of the proposed corridor. One of these <i>Eragrostis curvula</i> is considered the most serious weed. 				
Cle cor	earing of vegetation in Good or better ndition	Avoid – reduction of clearing required as much as possible.	A <i>Kunzea similis</i> ssp. <i>mediterranea</i> Interim Recovery Plan will be developed.	Conservation status of Threatened Flora will not be worsened.	
		<i>Minimise</i> – infrastructure will be contained within as small a corridor as possible.	Updated Vegetation and Flora Management Plan.	FQM considers that it will meet the EPA objective for this factor within the Proposal	



Flora and Vegetation - To maintain representation, diversity, viability and ecological function at the species, population and community level.					
Inherent impact and aspects that may cause a significant impact	Mitigation actions to address residual impacts	Proposed regulatory mechanisms for ensuring mitigation	Outcome to demonstrate the Proposal meets EPA objective		
Clearing of Threatened and/or Endangered	Rehabilitate – laydown and similar areas required for construction will be rehabilitated. Offsets – will be assessed for those areas to be cleared that cannot be avoided or minimised.	WA Permit to Take under the WC Act. WA and Commonwealth Offsets Policy and Guidelines.	Area.		
Flora	 Avoid – The Development Envelope of the proposed pit has been modified to avoid some of the known locations of the <i>Kunzea similis</i> ssp. <i>mediterranea</i> and ensure that the conservation status of the species is not changed as a result of the proposal. Avoid – The Development Envelope of the proposed infrastructure corridor will be managed to avoid as many of the known locations of the <i>Conostylis</i> <i>lepidospermoides</i> as practicable. Avoid – Known locations of Threatened flora where no ground disturbance is required will be avoided where practicable. Minimise – Access corridor and pit designs will minimise the clearing of threatened flora. Minimise – Vegetation Management 	Interim Recovery Plan will be developed. Updated Vegetation and Flora Management Plan. WA Permit to Take under the WC Act. WA and Commonwealth Offsets Policy and Guidelines.			



Flora and Vegetation - To maintain representation, diversity, viability and ecological function at the species, population and community level.					
Inherent impact and aspects that may cause a significant impact	Mitigation actions to address residual impacts	Proposed regulatory mechanisms for ensuring mitigation	Outcome to demonstrate the Proposal meets EPA objective		
	Plans will be in place prior to any clearing of rare flora to minimise potential impacts through unauthorised clearing. <i>Rehabilitate</i> – progressive rehabilitation will be implemented which will include the use of <i>Kunzea</i> <i>similis</i> ssp. <i>mediterranea</i> and <i>Conostylis lepidospermoides</i> material where practicable. <i>Offsets</i> –will be assessed for those individuals to be cleared that cannot be avoided or minimised.				
Clearing of Priority Listed flora	Avoid – known locations of Priority flora where no ground disturbance is required will be avoided where practicable. Minimise – Access corridor and pit designs will minimise the clearing of Priority flora to ensure viable populations. Minimise – Vegetation Environmental Management Plans will be in place prior to any clearing of Priority flora to minimise impacts through unauthorised clearing.	Updated Vegetation and Flora Management Plan. WA Permit to Take under the WC Act. WA Offsets Policy and Guidelines.			



Flora and Vegetation - To maintain representation, diversity, viability and ecological function at the species, population and community level.					
Inherent impact and aspects that may cause a significant impact	Mitigation actions to address residual impacts	Proposed regulatory mechanisms for ensuring mitigation	Outcome to demonstrate the Proposal meets EPA objective		
Clearing of the EPBC listed Endangered	Rehabilitate – progressive rehabilitation will be implemented which will include the use of Priority flora material where practicable. Avoid – reduction of clearing of TEC	Management of vegetation will be	_		
TEC 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia'	as much as possible. Where no ground disturbance is required TEC will be avoided where practicable. <i>Minimise</i> – Access corridor and pit designs will minimise the clearing of TEC to ensure viable communities. <i>Minimise</i> – Vegetation Management Plans will be in place prior to any clearing of TEC to minimise impacts through unauthorised clearing. <i>Rehabilitate</i> – progressive rehabilitation will be implemented which will include the use of indigenous proteaceous material. <i>Offsets</i> – will be assessed for the areas of the TEC to be cleared that cannot be avoided or minimised.	 undertaken under the Vegetation and Flora Management Plan that will contain obligations for the mitigation, rehabilitation and management of vegetation. FQM will also commit to developing offsets to counterbalance any significant residual impacts from clearing of native vegetation. WA and Commonwealth Offsets Policy and Guidelines. 			
Spread/introduction of weeds	Avoid – weed hygiene inspections of ground disturbance equipment will be conducted prior to arriving on site. Minimise – periodic weed surveys will	A Biosecurity Management Plan will be developed updating the Hygiene Management Plan.			



Flora and Vegetation - To maintain representation, diversity, viability and ecological function at the species, population and community level.					
Inherent impact and aspects that may cause a significant impact	Mitigation actions to address residual impacts	Proposed regulatory mechanisms for ensuring mitigation	Outcome to demonstrate the Proposal meets EPA objective		
	be conducted including species identification and mapping.				
	<i>Minimise</i> – Weed management controls will be implemented for areas adjacent to native vegetation as required.				
Increased disease risk (Phytophthora)	Avoid – dieback hygiene inspections of ground disturbance equipment will be conducted prior to arriving on site.	A Biosecurity Management Plan will be developed updating the existing Hygiene Management Plan.			
	<i>Avoid</i> - All equipment will use the washdown bay prior to going to and departing from entering native vegetation.				
	<i>Minimise</i> – annual dieback surveys currently conducted will be extended to include additional RNO areas of this proposal.				
	<i>Minimise</i> – Dieback management controls will be implemented for areas adjacent to native vegetation through a hygiene management plan.				



Table 9: Assessment of Key Environmental Factors - Terrestrial Fauna

Terrestrial Fauna - To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.			
Inherent impact and aspects that may	Mitigation actions to address	Proposed regulatory mechanisms for	Outcome to demonstrate the Proposal
cause a significant impact	residual impacts	ensuring mitigation	meets EPA objective
Fourteen Conservation significant fauna sp	becies have been recorded from RNU	tenements and surrounding areas:	
Australian Busiard (Ardeolins aus	(18/18) (DPAVV PHONLy 4)	EDBC Act Endengered	
Crosted Bellbird (Orogics gutture	lice authuralis) (DRAM Priority 4)	, EFBC Act Endangered)	
Heath Mouse (Pseudomys shortr	idaei) (MC Act Schedule 1: EPBC A	ct Vulnerable)	
 Malleefowl (Leinoa ocellata) (WC 	Act Schedule 1: EPBC Act Vulnerable		
 Rainbow bee-eater (Merops orna 	tus) (WC Act Schedule 3: EPBC Act N	/igratory)	
 Rufous Fieldwren (Calamanthus of States) 	campestris) (DPaW Priority 4)		
 Shy Heathwren (Hylacola cauta v 	vhitlocki) (DPAW Priority 4)		
 Southern Brown Bandicoot (Isood) 	lon obesulus) (DPAW Priority 5)		
o Tammar Wallaby (Macropus euge	enii) (DPAW Priority 5)		
 Western Brush Wallaby (DPAW F 	Priority 4)		
 Western Mouse (Pseudomys occ 	identalis) (DPAW Priority 4)		
 Western Quoll (Dasyurus geoffrom 	i)(WC Act Schedule 1; EPBC Act Vul	nerable)	
 Western Whipbird (Psophodes night) 	grogularis oberon) (DPAW Priority 4)		
 Foraging habitat for the EPBC listed species Carnaby's Cockatoo (Endangered) was recorded within the Development Envelope. The EPBC listed Rainbow Bee-eater (Migratory) and Malleefowl (WC Act Schedule 1; EPBC Act Vulnerable) and Western Quoll (<i>Dasyurus geoffroii</i>)(WC Act Schedule 1; EPBC Act Vulnerable) were recorded within or nearby the Development Envelope. The DPAW Priority 4 listed Western Brush Wallaby was recorded within the Development Envelope. Seven vertebrate habitats were mapped within the Development Envelope those within the Access Corridor envelope are considered widespread and typical of the region. There are no unique fauna habitats and thus fauna species assemblages in the access corridor (Terrestrial Ecosystems 2015). 			
Clearing of foraging habitat for the EPBC	Avoid – reduction of required	Updated Fauna Management Plan.	No change in conservation status of fauna.
listed species, Carnaby's Cockatoo.	clearing of foraging habitat as		
	much as possible.	vvA and Commonwealth Offsets Policy	FQM considers it will meet the EPA
	Minimise – infrastructure will be		area.



Terrestrial Fauna - To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.			
Inherent impact and aspects that may cause a significant impact	Mitigation actions to address residual impacts	Proposed regulatory mechanisms for ensuring mitigation	Outcome to demonstrate the Proposal meets EPA objective
	contained within as small a corridor as possible.		
	Vegetation Management Plans will be in place prior to any clearing of conservation significant fauna species to minimise impacts through unauthorised clearing.		
	<i>Rehabilitate -</i> areas required for construction will be rehabilitated with foraging species where appropriate.		
	Offsets –will be assessed for those foraging habitat areas to be cleared that cannot be avoided or minimised.		
Clearing and alteration of habitat for Threatened and priority fauna species.	Avoid – reduction of required clearing as much as possible.	Updated Fauna Management Plan.	
	<i>Minimise</i> – infrastructure will be contained within as small a corridor as possible.	and Guidelines.	
	<i>Offsets</i> –will be assessed for habitat for threatened fauna species to be cleared that cannot be avoided or minimised.		



Table 10: Assessment of Key Environmental Factors - Hydrological Processes

Hydrological Processes - To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.			
Inherent impact and aspects that may	Mitigation actions to address	Proposed regulatory mechanisms	Outcome to demonstrate the Proposal
cause a significant impact	residual impacts	for ensuring mitigation	meets EPA objective

The land surface within the local Bandalup Hill and broader Ravensthorpe Range is characterised as gently undulating with subdued ridgelines, gentle slopes (e.g. <5% grade or $<3^\circ$) and defined drainage lines dissecting the range. The relief varies from 135m RL within the central drainage lines on the western side of the range to 220m RL along the ridge line. Whilst the majority of the slopes of the range are relatively gentle, slopes of up to 10% grade or 6° do occur in the immediate vicinity of the drainage lines.

The surface drainage system is geologically controlled, with the streams and river systems having preferentially etched into the underlying in situ regolith and bedrock along lines of structural weakness and discontinuity. The surface of the range is armoured (resistant to erosion) by a surficial lateritic caprock, which is typical of Tertiary weathered landscapes of Western Australia. Whilst local-scale surface water flows occur off the exposed lateritic caprock, the potential for surface water flows from the ridge to reach the drainage channels is low due to the undulating upper surface of the caprock and its highly fractured or structured nature; the lateritised upper slopes and ridgeline can therefore be considered as zones of infiltration and deep recharge, which has facilitated the supergene formation of the nickel orebody. With distance downslope, the lateritic caprock thins-out and is replaced by surface sands overlying the in situ saprolitic regolith. These surface sands feed the drainage system, and thus the actual catchment for the stream channels is considered to be restricted to the vicinity around the drainage line.

- Changes to the downstream vegetation health from alteration of surface flows
- Change in surface/subsurface water flows, erosion and sediment controls.
- Alteration of the natural water balance and surface water drainage patterns due to diversion of surface water flows around, and collection of surface water within the development envelope.
- Alteration of hydrology of creeks from linear mine infrastructure.
- Increased erosion, sediment and runoff from post-mine landforms.

Altered hydrological regimes from mining and mining-related activities	Avoid – the proposed mine pit does not intersect groundwater and mining-related infrastructure will be located to avoid impact on hydrological processes. <i>Minimise</i> –disturbance to key recharge areas will be minimised as much as practicable. <i>Minimise</i> – mine and mining-related infrastructure will be rehabilitated so as to re-establish hydrological processes.	Updated Surface Water Management Plan. Updated Groundwater Management Plan.	No detrimental impacts to hydrological processes or uses or downstream vegetation. FQM considers it will meet the EPA objective for this factor within the Proposal area.
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Table 11: Assessment of Key Environmental Factors - Inland waters environmental quality

Inland waters environmental quality – To ma ecological and social, are protected.	Inland waters environmental quality – To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.			
Inherent impact and aspects that may cause a significant impact	Mitigation actions to address residual impacts	Proposed regulatory mechanisms for ensuring mitigation	Outcome to demonstrate the Proposal meets EPA objective	
 Mining of the Hale-Bopp Expansion Pit and confrom disturbance areas. Whilst the proposed Hawater flows (i.e. it occurs in the upper catchmer There is a potential that surface water runoff an sediment loads. This will need to be managed by design that can be supported by the site-specifi from surface runoff from cleared areas, in additi Potential impacts on groundwater quality are like the Access Corridor. Aspects of the proposal that may cause a signif Increased salt input into the environment from Increased turbidity through uncontrolled surf Mine pit excavation Construction and operation of Access corrid Dissection of minor drainage lines and imparts Impacts to environmental quality from metal Contamination of surface water as a result or reagents. Increased erosion, sediment and solute transition and solute	struction and operation of the Access ale-Bopp Expansion Pit occurs along it position), it is proposed to backfill th d excessive erosion from the re-estal by ensuring appropriate materials are c materials. The Access Corridor has on to contaminant transport following ely to be restricted to potential metall icant impact on inland waters environ m dust suppression measures face water runoff or cts to Jerdacuttup River liferous drainage from waste rock land of loss of containment of mine related sport from stockpile materials and po	Corridor may have an impact on surface wat the ridgeline/upper slopes of Bandalup Hill, and the mine pit and reconstruct the land surface s oblished land surface may result in contaminate used on the reconstructed land surface and the a potential to impact on surface water quality dust suppression and ore transfer along the iferous drainage from backfilled mine pit and s mental quality therefore include:	er quality as a result of contaminated runoff nd therefore is unlikely to impact on surface o that it resembles the pre-mine topography. ed surface water flows, mainly from increased hrough implementation of a stable landform r in response to increased sediment yields corridor. seepage of contaminated surface soils along burden and ore. Ist suppression, and spillage of fuels or	
Impacts to environmental quality from metalliferous drainage from post-mine landforms, backfilled tailings and stockpiled overburden and ore.	Avoid – as the proposed expansion pit occurs above the water table, the likelihood of intersection with problematic	Updated Surface Water Management Plan. Updated Groundwater Management Plan.	No detrimental impacts to hydrological processes or uses or downstream vegetation.	
	materials is significantly reduced. <i>Minimise</i> – the volume of identified problematic material		objective for this factor within the Proposal area.	



Inland waters environmental quality – To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.			
Inherent impact and aspects that may	Mitigation actions to address	Proposed regulatory mechanisms for	Outcome to demonstrate the Proposal
cause a significant impact	residual impacts	ensuring mitigation	meets EPA objective
	(i.e. AMD, dispersive and saline soils) disturbed during mining will be minimised during mining and backfilling operations.		
	<i>Rehabilitate</i> – disturbance areas will be rehabilitated to reinstate the pre-mine hydraulic processes and thus minimise the potential for continued metalliferous drainage.		
	Offsets – backfilling of the mine pit and effective encapsulation of any problematic materials will ensure no significant residual environment impacts occur in response to this proposal.		
Excessive erosion and sediment transport from disturbance and rehabilitated areas	Avoid – the utilisation of identified problematic materials in the near surface soils horizons will be avoided in the proposal.		
	<i>Minimise</i> – the potential for excessive erosion and sediment loss to occur as a result of this proposal will be minimised through the utilisation of appropriate stable materials and erosion and landform modelling to		



Inland waters environmental quality – To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.			
Inherent impact and aspects that may	Mitigation actions to address	Proposed regulatory mechanisms for	Outcome to demonstrate the Proposal
cause a significant impact	residual impacts	ensuring mitigation	meets EPA objective
	establish optimal landform		
	designs that restrict surface water		
	interactions with the surrounding		
	environment.		
	Rehabilitate – disturbance areas		
	will be repebilitated to rejected		
	the pro-mine hydroylic processes		
	the pre-mine hydraulic processes		
	and thus minimise the potential		
	for continued metalliferous		
	drainage.		
	Offsets – through the application		
	of the above mitigation hierarchy,		
	it is unlikely that the proposal will		
	have a significant residual impact		
	on the environment.		



Table 12: Assessment of Key Environmental Factors - Offsets

Offsets - To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets.

The proposal is seeking to clear vegetation and will likely have residual impacts on Threatened flora, habitat for Threatened fauna, Priority Ecological Communities and a Threatened Ecological Community.

Inherent import and concerts that many	Mitigation options to address	Drepend regulatory most or	Outcome to demonstrate the Dremond
innerent impact and aspects that may	Mitigation actions to address	Proposed regulatory mechanisms	Outcome to demonstrate the Proposal
cause a significant impact		for ensuring mitigation	
	Avoid – use of existing infrastructure and facilities to reduce the clearing required. Avoid – infrastructure will be aligned to avoid Threatened flora, fauna habitat and ecological communities as much as is practicable. Minimise - reduce the clearing required for tailings and overburden storage through disposal within mine pits. Rehabilitate - areas required for construction will be rehabilitated with foraging species for Carnaby's cockatoos where appropriate. Rehabilitate - rehabilitation will include Threatened flora and species that constitute Threatened Ecological Communities where practicable.	WA and Commonwealth Offsets Policy and Guidelines.	Agreed offsets implemented. FQM considers it will meet the EPA objective for this factor within the Proposal area.



Table 13: Assessment of Key Environmental Factors - Rehabilitation and decommissioning

Rehabilitation and Decommissioning - To ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner.

• Approximately 113 ha of additional ground disturbance will require progressive rehabilitation.

• Acid and Metalliferous Drainage (AMD) and impacts on groundwater, surface water and soil quality in the immediate area of the pit void and waste rock are unlikely to have an impact on the regional groundwater quality.

• Proposal is likely to have low impact on the local and regional setting.

Inherent impact and aspects that may cause a significant impact	Mitigation actions to address residual impacts	Proposed regulatory mechanisms for ensuring mitigation	Outcome to demonstrate the Proposal meets EPA objective
Clearing of native vegetation	<i>Minimise</i> - clearing of vegetation will be minimised. <i>Rehabilitate-</i> progressive rehabilitation will be implemented.	Updated RNO Mine Closure Plan (2016).	Stable, non-polluting landforms post closure. FQM considers it will meet the EPA objective for this factor within the Proposal area
Potential impacts to surface water and soil quality.	Minimise – Backfill depleted mine pitswith inert waste material, wherepracticable and required to reduceresidual risk.Minimise – Revise and implement theRNO Mine Closure Plan to minimiselegacy issues associated with pit voidsfollowing cessation of active mining.		
Landform stability and visual impacts.	Minimise – Reduce the requirement for ex-pit overburden storage areas through disposal of waste rock in-pit where practicable, as described in the RNO Mine Closure Plan.Minimise – Implement the closure strategies outlined in the RNO Closure Plan to minimise post-closure risks associated with pit voids and associated mine infrastructure.		



6 OTHER ENVIRONMENTAL FACTORS

An assessment of the environmental factors not considered to be key for this Proposal is provided in Table 14. These other environmental factors for the proposal include:

- landforms;
- subterranean fauna;
- terrestrial environmental quality;
- terrestrial fauna (short-range endemic invertebrates);
- air quality and atmospheric gases;
- amenity;
- heritage; and
- human health.

Table 14: Other Environmental Factors

Aspects and potential impacts	Mitigation actions to address residual impacts	Proposed mechanism for ensuring mitigation	
Landforms - To maintain the vari landforms.	ety, integrity, ecological functions	and environmental values of	
Change to landforms from creation of pit, overburden storage areas and overland infrastructure corridor.	Overburden management and tailings management.	Landforms will be managed by the implementation of the RNO Mine Closure Plan (2015). FQM considers it will meet the EPA	
		objective for this factor.	
Subterranean fauna - To maintain species, population and assemble	n representation, diversity, viabilit lage level.	y and ecological function at the	
The geology of the area to be impacted is not known to support subterranean fauna (EAG 12). Studies (SKM 2001) found no evidence of stygofauna in the	There are no residual impacts which require mitigation.	No mitigation or regulatory mechanism is proposed as Subterranean fauna are not considered to constrain the proposed pit area or corridor.	
Proposal area.		FQM considers it will meet the EPA objective for this factor.	
Terrestrial Fauna (short-range en and ecological function at the sp	demic invertebrates) - To maintai ecies, population and assemblage	n representation, diversity, viability e level.	
Previous surveys indicate that there are no invertebrate species considered to be short range endemic invertebrates known to occur in the area (Terrestrial Ecosystems 2015).	There are no residual impacts which require mitigation.	No mitigation or regulatory mechanism is proposed as short range endemic invertebrates are not considered to constrain the proposed pit area or corridor.	
		FQM considers it will meet the EPA objective for this factor.	
Air Quality and Atmospheric Gases - To maintain air quality for the protection of the environment and human health and amenity, and to minimise the emission of greenhouse and other atmospheric gases through the application of best practice			
The proposal is predicted to contribute to minimal impact from dust emissions to current baseline conditions in the region.	Expand standard dust controls across operations to minimise dust emissions to reduce impacts at nearby receptors.	Air quality and atmospheric gases will be managed by Part V of the EP Act (Environmental Licence to Operate), the <i>Clean Energy Act 2011</i> (Cwth) and the <i>National Greenhouse and Energy</i> <i>Reporting Act 2007</i> (Cwth). FQM considers it will meet the EPA	



Aspects and potential impacts	Mitigation actions to address residual impacts	Proposed mechanism for ensuring mitigation
		objective for this factor.
Amenity - To ensure that impact	s to amenity are reduced as low as	s reasonably practicable.
Modification of landforms and the infrastructure corridor crossing the South Coast Highway have the potential to reduce visual amenity. A tunnel is proposed to enable the crossing of the South Coast Highway by the infrastructure corridor thus reducing the visual amenity of the crossing.	There are no residual impacts which require mitigation.	No mitigation or regulatory mechanism is proposed as visual amenity is not considered to constrain the proposed corridor. FQM considers it will meet the EPA objective for this factor.
Heritage - To ensure that historic affected.	cal and cultural associations and r	natural heritage are not adversely
The proposal will require land disturbance which has the potential to impact on known archaeological or ethnographical sites. Native Title Agreements exist with Southern Noongar / Wagyl Kaip people and the Esperance Nyungar people. Surveys have been conducted and sites have been identified within the Proposal area and surrounds (Goode 2012).	A desktop Aboriginal heritage survey to review and collate previous heritage information and make assessments of previously recorded sites of significance as defined by section 5 of the <i>Aboriginal Heritage Act 1972</i> (AHA) that impact upon the RNO tenements has been conducted. There are no known sites of significance in the proposal area.	FQM works to avoid and mitigate impacts to heritage sites in implementing the <i>Aboriginal Heritage</i> <i>Act 1972.</i> FQM considers it will meet the EPA objective for this factor.
Human Health - To ensure that h	uman health is not adversely affec	cted.
Creation of noise emissions that may have the potential to impact human health (hearing).	The nearest receptor is more than 10 km from the conveyor and is unlikely to receive noise levels above acceptable levels.	A noise study will be commissioned to determine if there are any impacts to human health by the operation of the conveyor. Consultation with adjacent landholders and other stakeholders will be conducted to provide adequate consultation. Human health will be managed in accordance with the <i>Environmental Protection (Noise)</i> <i>Regulations 1997</i> (EPA). FQM considers it will meet the EPA objective for this factor.



7 PRINCIPLES OF THE ENVIRONMENTAL PROTECTION ACT

The objectives of the EP Act and the principles of Environmental Impact Assessment have been addressed and the Proposal meets the criteria for a Public Environmental Review (PER) as described in the *Environmental Impact Assessment (Part IV Divisions 1 and 2)* Administrative Procedures 2012 (EPA 2012b). FQM proposes that the proposal is consistent with the criteria outlined within Section 10.2.1 of the Administrative Procedures. Table 15 provides a summary of the consideration of this proposal against the criteria for PER within this Referral documentation.

PE	R criteria	Consideration within this proposal	Referral Section
(a)	The proposal is of regional and/or State-wide significance.	Yes; the proposal is situated in a biodiversity hotspot (Fitzgerald – Ravensthorpe) and will impact Threatened flora, fauna and ecological communities.	Section 5.1
(b)	The proposal has several key environmental factors or issues, some of which are complex or of a strategic nature.	Yes; five key factors have been proposed (Terrestrial Environmental Quality, Flora and Vegetation, Terrestrial Fauna, Hydrological Processes and Inland Waters Environmental Quality).	Section 5.2
		Impacts to Threatened flora are potentially significant and require consideration.	
		Two integrating factors Rehabilitation and Decommissioning and Offsets are also considered.	
(c)	substantial and detailed assessment of the proposal is required to determine whether, and if so, how the environmental issues could be managed; or	Further biological and hydrological studies are required to be undertaken to determine and manage impacts.	Section 4
(d)	the level of public concern about the likely effect of the proposal, if implemented on the environment, warrants a public review period.	Stakeholders with local and state interests will likely wish to be consulted and provide input to the management of the proposal.	Section 3

Table 15: Consideration of Administrative Procedures

The principles of Ecologically Sustainable Development are incorporated into the *Environmental Protection Act 1986* and EAG No. 8 (EPA 2015b). These principles are:

- the precautionary principle;
- the principle of intergenerational equity;
- the principle of the conservation of biological diversity and ecological integrity;
- principles in relation to improved valuation, pricing and incentive mechanisms; and
- the principle of waste minimisation.

Table 16 provides a summary of how FQM has considered the principles of Ecologically Sustainable Development for the Proposal.



Table 16: Consideration of the Principles of the Environmental Protection Act 1986

EPA Act Principle	Consideration within this proposal
 Precautionary Principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by: careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and an assessment of the risk-weighted consequences of various options. 	Some baseline biological surveys and have been conducted. Some specialist technical environmental impact assessments, such as impact assessment on Threatened flora, have been carried out to assess potential impacts and propose potential management strategies. Further studies and technical modelling (including noise and water) have been highlighted to be conducted to finalise the impacts of the proposal. Once these are conducted, the mitigation hierarchy can be applied more thoroughly.
2. Intergenerational Equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	Some technical studies and modelling have been carried out to inform this Referral Document. Further studies are required as part of the assessment process to determine the impacts.
3. Conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Some baseline biological surveys and have been conducted. Some specialist technical environmental impact assessments, such as impact assessment on Threatened flora, have been carried out to assess potential impacts and propose potential management strategies. Management strategies will be identified and developed in the process of impact assessment.
 4. Improved valuation, pricing and incentive mechanisms Environmental factors should be included in the valuation of assets and services. The polluter pays principle - those who generate pollution and waste should bear the cost of containment, avoidance or abatement. The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems. 	Environmental factors have been considered throughout the development of this Referral Document. Specialist technical studies have been conducted to inform detailed impact or identified as required for evaluation and management measures to minimise pollution and waste.
5. Waste minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	Standard waste management measures are a key element for the implementation of this Proposal. FQM applies the waste management hierarchy to RNO and this will be the case in relation to this Proposal, for example (i.e. avoidance, reuse, recycling, recovery of energy, treatment, containment and disposal).



8 CONCLUSION

The Proposal will expand mining operations on the Hale-Bopp ore body and provide a revised alignment of the infrastructure corridor to the Shoemaker-Levy ore body and adding neutralised tailings to the reject rocks used to backfill mine pits and re-establish hill topographies.

This Referral Document provides supporting information to the EPA in order to undertake an assessment of the Proposal to determine the Level of Assessment.

Biological and technical surveys have been conducted for the proposal. Further surveys have been identified as required to complete the environmental impact assessment. The summary of the key findings and supporting information is provided for the environmental factors in order to assess impacts associated with the proposed development at the existing RNO. The document includes a draft framework summary to implement relevant environmental management components.

FQM proposes that the environmental factors can be adequately managed to meet the EPA's objectives for each factor, provided the proposed management measures continue to be implemented at RNO.



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