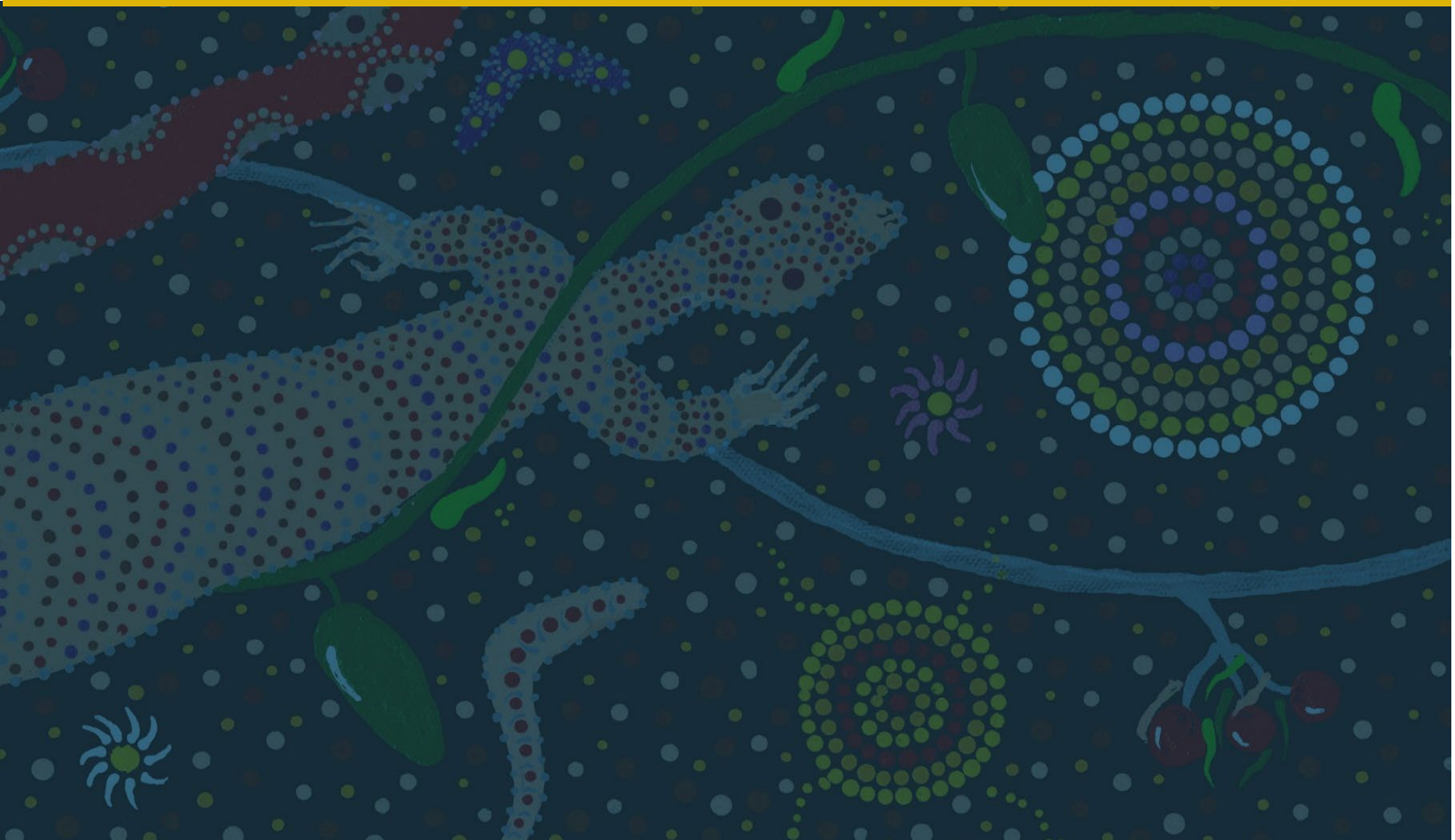


FIMISTON GOLD MINE OPERATIONS EXTENSION (STAGE 3) AND MINE CLOSURE PLANNING

REVISED PROPOSAL – FIMISTON SOUTH PROJECT

EPA Assessment Number 2354

11 March 2024



Document Control

Revision	Date issued	Reviewed by	Authorised by
0	22 August 2022	J. Cameron	 Nick Strong
1	13 October 2022	J. Cameron	 Nick Strong
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4	11 March 2024	J. Cameron	 Nick Strong

Invitation to make a submission

The Environmental Protection Authority (EPA) invites people to make a submission on the environmental review for this proposal.

Kalgoorlie Consolidated Gold Mines (the Proponent), a wholly owned subsidiary of Northern Star Resources Ltd., proposes to develop the Fimiston South Project and make changes to supporting infrastructure at Fimiston. KCGM is seeking approval under the *Environmental Protection Act 1986* (EP Act) to develop the Fimiston South Project. This Revised Proposal is considered a significant amendment under Section 40AA of the EP Act, which allows the conditions of previous Ministerial Statements to be reviewed during the assessment process. The conditions of Ministerial Statement 782 are proposed to be amended to reflect the future requirements. Changes proposed include a cutback to the Fimiston Open Pit, known as the Ivanhoe cutback, expansion of the Fimiston IIE TSF to include a third cell, a new Fimiston III Tailings Storage Facility, an extension to the Waste Rock Dump and additional supporting infrastructure.

The Environmental Review Document (ERD) has been prepared in accordance with the EPA's Administrative Procedures (Part IV Divisions 1 and 2). The ERD is the report by the Proponent on their environmental review which describes this Revised Proposal and its likely effects on the environment.

The ERD is available for a public review period of 4 weeks from 25 March 2024, closing on 24 April 2024.

Information on the Revised Proposal from the public may assist the EPA to prepare an assessment report in which it will make recommendations on the Revised Proposal to the Minister for Environment.

Why write a submission?

The EPA seeks information that will inform its consideration of the likely effect of the Revised Proposal, if implemented, on the environment. This may include relevant new information that is not in the ERD, such as alternative courses of action or approaches.

In preparing its assessment report for the Minister for Environment, the EPA will consider the information in submissions, the Proponent's responses, and other relevant information.

Submissions will be treated as public documents unless provided and received in confidence, subject to the requirements of the *Freedom of Information Act 1992*.

Why not join a group?

It may be worthwhile joining a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group. If you form a small group (up to ten people) please indicate the names of each participant. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on information in the ERD. When making comments on specific elements in the ERD:

- Clearly state your point of view and give reasons for your conclusions;
- Reference the source of your information, where applicable; and
- Suggest alternatives to improve environmental outcomes.

What to include in your submission

Include the following in your submission to make it easier for the EPA to consider your submission:

- Your name and address;
- Date of your submission;
- Whether you want your contact details to be confidential;
- A summary of your submission if it is long;
- A list of points so that issues raised are clear, preferably by environmental factor;
- Refer each point to the page, Section and if possible, paragraph of the ERD; and
- Attach any reference material, if applicable., ensuring your information is accurate.

The closing date for public submissions is DATE.

The EPA prefers submissions to be made electronically via the EPA's Consultation Hub at <https://consultation.epa.wa.gov.au>.

Alternatively, submissions can be:

- posted to: Chairman, Environmental Protection Authority, Locked Bag 10, Joondalup DC WA 6919, or
- delivered to: Environmental Protection Authority, Prime House, 8 Davidson Terrace, Joondalup 6027.

If you have any questions on how to make a submission, please contact EPA Services at the Department of Water and Environmental Regulation on (08) 6364 7000

TABLE OF CONTENTS

1.	Introduction.....	1
1.1	Background	1
1.2	Approvals History	3
1.3	Revised Proposal Purpose	4
1.4	Proponent Details	4
1.5	Other Approvals and Regulation.....	4
2.	Current Approved Project	6
2.1	Summary.....	6
2.2	Fimiston Open Pit (Current)	12
2.3	Environmental Noise Bund (Current)	12
2.4	Waste Rock Management (Current)	12
2.5	Fimiston Processing Plant (Current)	12
2.6	Tailings Storage Facilities (Current)	13
2.7	Managed Aquifer Recharge (Current).....	13
2.8	Mine Closure (Current)	14
3.	Revised Proposal.....	16
3.1	Revised Proposal Type.....	16
3.2	Location and Tenure	16
3.3	Revised Proposal Content.....	23
3.3.1	Summary	23
3.3.2	Revised Proposal Draft Ministerial Conditions	26
3.4	Revised Proposal Description.....	26
3.4.1	Summary	26
3.4.2	Fimiston Open Pit (Revised).....	26
3.4.3	Environmental Noise Bund (Revised)	28
3.4.4	Waste Rock Management (Revised)	28
3.4.5	Fimiston Processing Plant	29
3.4.6	Fimiston Tailings Storage Facilities (Revised)	29
3.4.7	Support Facilities	29
3.4.8	Mine Closure and Zone of Instability (Revised).....	29
3.5	Revised Proposal Justification and Alternatives	34
3.5.1	Mine	34
3.5.2	Tailings Storage Facilities.....	34
3.5.3	Waste Rock Dumps.....	35

4.	Legislative Context.....	36
4.1	Environmental Impact Assessment Process	36
4.2	Other Regulatory Approvals.....	37
5.	Stakeholder Engagement.....	39
5.1	Stakeholder Engagement Process.....	39
5.2	Key Stakeholders	39
5.2.1	Social Impact Assessment.....	41
5.2.2	Local Voices	43
5.3	Stakeholder Consultation Outcomes.....	44
5.3.1	Stakeholder Engagement for this Revised Proposal	44
5.3.2	Summary – Community Concerns Relating to the Revised Proposal.....	55
5.4	Aboriginal Heritage	58
5.4.1	Technical Guidance	58
5.4.2	Purpose	58
5.4.3	Technical Guidance Context.....	58
5.4.4	Heritage Engagements	59
5.4.5	Heritage Management	59
5.4.6	Heritage Management	60
5.4.7	Indigenous Procurement.....	60
6.	Environmental Factors and Objectives	61
6.1	Identification of Environmental Factors	61
6.2	Assessment Approach	62
6.3	Air Quality	63
6.3.1	EPA Objective	63
6.3.2	Policy and Guidance.....	63
6.3.3	Receiving Environment.....	63
6.3.4	Background Air Quality	65
6.3.5	Mercury	65
6.3.6	Potential Environmental Impacts	67
6.3.7	Assessment of Impacts.....	68
6.3.8	Mitigation	74
6.3.9	Improvement Initiatives.....	78
6.3.10	Predicted Outcomes	78
6.4	Social Surroundings	79
6.4.1	EPA Objective	79
6.4.2	Policy and Guidance.....	80

6.4.3	Receiving Environment.....	80
6.4.4	Potential Environmental Impacts	87
6.4.5	Assessment of Impacts.....	87
6.4.6	Cumulative Impacts	101
6.4.7	Mitigation.....	102
6.4.8	Predicted Outcome.....	106
6.5	Flora and Vegetation.....	107
6.5.1	EPA Objective	107
6.5.2	Policy and Guidance.....	107
6.5.3	Receiving Environment.....	107
6.5.4	Potential Environmental Impacts	117
6.5.5	Assessment of Impacts.....	117
6.5.6	Cumulative Impacts	120
6.5.7	Mitigation.....	122
6.5.8	Predicted Outcomes	125
6.6	Terrestrial Fauna.....	126
6.6.1	EPA Objective	126
6.6.2	Policy and Guidance.....	126
6.6.3	Receiving Environment.....	126
6.6.4	Potential Impacts on Terrestrial Fauna	141
6.6.5	Assessment of Impacts.....	144
6.6.6	Cumulative Impacts	145
6.6.7	Mitigation.....	146
6.6.8	Predicted Outcomes	148
7.	Other Environmental Factors or Matters.....	150
7.1	Inland Waters	150
7.1.1	EPA Objective	150
7.1.2	Policy and Guidance.....	150
7.1.3	Receiving Environment.....	150
7.1.4	Potential Impacts on Inland Waters	157
7.1.5	Cumulative Impacts	164
7.1.6	Assessment of Impacts.....	164
7.1.7	Mitigation.....	166
7.1.8	Predicted Outcomes	167
7.2	Subterranean Fauna.....	168
7.3	Landforms	169

7.4	Terrestrial Environmental Quality	170
7.5	Greenhouse Gas Emissions	172
7.6	Human Health	173
8.	Offsets	174
9.	Matters of National Environmental Significance	175
9.1	Policy and Guidance	175
9.2	MNES Relevant to the Revised Proposal.....	175
9.2.1	National Heritage Places	178
9.2.2	Threatened Species	178
9.2.3	Migratory Species.....	180
9.3	Potential Impacts	186
9.3.1	Malleefowl (Vulnerable)	186
9.3.2	Chuditch (Vulnerable).....	188
9.3.3	Fork-tailed Swift (Migratory).....	189
9.4	Cumulative Impacts	189
9.5	Mitigation and Management – Threatened Species	190
9.6	Predicted Outcome	190
10.	Holistic Impact Assessment	192
11.	Cumulative Environmental Impact Assessment.....	195
12.	Glossary	197
13.	References	199

TABLES

Table 1:	Proponent Details.....	4
Table 2:	Other Regulatory Approvals Required.....	4
Table 3:	General Project Content Description (current approval)	6
Table 4:	Project Content Elements (Current approval).....	7
Table 5:	Current management of Key Environmental Factors	8
Table 6:	Existing Tailings Storage Facilities	13
Table 7:	Tenement Summary.....	16
Table 8:	General Proposal Content Summary (Revised Proposal).....	23
Table 9:	Revised Proposal Content Elements (Revised Proposal)	23
Table 10:	Post-Mining Land Use for Fimiston Domains and Features	31
Table 11:	Standard Decommissioning and Rehabilitation Approach for Fimiston.....	32

Table 12:	Environmental Legislative Framework.....	37
Table 13:	Key Stakeholders for the Revised Proposal	39
Table 14:	Community and Stakeholder Consultation.....	44
Table 15:	Summary of Environmental Factors	61
Table 16:	Monitored PM ₁₀ Concentrations at Monitoring Locations for 2019 Operations	69
Table 17:	Difference in Predicted PM ₁₀ Concentrations (Proposed 2025 Minus Current KCGM Operations) at Monitoring Locations (µg/m ³)	70
Table 18	Summary of Mitigation and Management Measures for Air Quality (KCGM 2019).....	75
Table 19:	Archaeological and Ethnographic Sites in the KCGM Area	84
Table 20:	Allowable and Predicted Noise Levels (L _{a10} dB)	89
Table 21:	Summary of Mitigation and Management Measures for Noise and Vibration.....	102
Table 22:	Summary of Mitigation and Management Measures Flyrock	103
Table 23	Summary of Mitigation and Management Measures Heritage	105
Table 24	Vegetation and Flora Surveys	107
Table 25:	State-wide Extent of pre-European Vegetation Associations Present in the MDE	108
Table 26:	Introduced Flora Recorded in the Field Survey	111
Table 27:	Vegetation Types, Description, and Extent of Clearing.....	112
Table 28:	Vegetation Condition – Extent of Each Condition Rating in Study Area.....	115
Table 29:	Impacts on State-wide Extent of Pre-European Vegetation Associations Present in the Revised Proposal Area.....	117
Table 30:	Vegetation Condition – Extent of Each Condition Rating in Study Area.....	118
Table 31:	Impacts on State-wide Extent of Pre-European Vegetation Associations Present in the Revised Proposal Area.....	121
Table 32:	E. praecox cumulative clearing.....	122
Table 33:	Mitigation Measures for Flora and Vegetation	122
Table 34:	Fauna and SRE Surveys.....	128
Table 35:	Fauna Habitats Within the Study Area.....	129
Table 36:	Significant Vertebrate Fauna Identified in the Desktop Review.....	133
Table 37:	Details of Conservation Significant Vertebrate Fauna Recorded Outside of the Revised Proposal Area	134
Table 38:	Regional Habitat Mapping	145
Table 39:	Mitigation Measures for Fauna and SRE.....	147
Table 40:	Pre- and Post-development Flows at Bulong Road	160
Table 41:	Pre- and Post-development Flows at Mt Monger Road	160

Table 42:	Summary of Mitigation and Management Measures for Inland Waters	166
Table 43:	Assessment of Potential Impacts to Subterranean Fauna	168
Table 44:	Assessment of Potential Impacts to Landforms	169
Table 45:	Assessment of Potential Impacts to Terrestrial Environmental Quality	170
Table 46:	Assessment of Potential Impacts to Greenhouse Gas Emissions	172
Table 47:	Assessment of Potential Impacts to Human Health	173
Table 48:	Offsets Assessment	174
Table 49:	Protected Matters Search Results 2023	176
Table 50:	Listed Threatened Species from PMST Search	177
Table 51:	Listed Migratory Species from PMST Search	178
Table 52:	Threatened Species Identified in the PMST Search	181
Table 53:	Migratory Species Identified in the PMST Search	183
Table 54:	Malleefowl (VU) – Significant Impact Criteria	186
Table 55:	Chuditch (VU) – Significant Impact Criteria	188
Table 56:	Fork-Tailed Swift – Significant Impact Criteria	189
Table 57:	Mitigation Hierarchy	190
Table 58:	Glossary	197

FIGURES

Figure 1:	Regional Location	2
Figure 2:	Current Approved Layout	15
Figure 3:	Revised Proposal Site Layout	22
Figure 4:	Tenement Plan	25
Figure 5:	Expected total of material movement for Fimiston South project	27
Figure 6:	Waste Rock Haulage Routes	28
Figure 7:	Climate of the City of Kalgoorlie/Boulder	64
Figure 8:	Air Quality and Noise Monitoring Locations	66
Figure 9:	Predicted Difference in 24-hour Average Concentrations of PM ₁₀ (µg/m ³) – Proposed (2025) Minus Current KCGM Operations in Isolation	71
Figure 10:	Predicted Difference in Annual Average Concentrations of PM ₁₀ (µg/m ³) – Proposed (2025) Minus Current KCGM Operations in Isolation	72
Figure 11:	Days Where 24-Hour Average PM ₁₀ Concentration >50 µg/m ³ for Each Site and KCGM Identified as Significant Contributor	77

Figure 12:	Proposed Extension of Environmental Noise Bund	83
Figure 13:	Aboriginal Heritage.....	86
Figure 14:	Scenario 1 - Mining at -50 RL.....	90
Figure 15:	Scenario 2a - Mining at -60 RL (South)	91
Figure 16:	Scenario 2b - Mining at -60 RL (North).....	92
Figure 17:	Scenario 3a - Mining at -70 RL (South)	93
Figure 18:	Scenario 3b - Mining at -70 RL (North).....	94
Figure 19:	Scenario 4 - Mining at -80 RL.....	95
Figure 20:	Scenario 5 - Mining at -90 RL.....	96
Figure 21:	Vibration Monitoring Locations	99
Figure 22:	Conservation Significant Flora.....	113
Figure 23:	Vegetation Type.....	114
Figure 24:	Vegetation Condition.....	116
Figure 25:	Fauna Habitat	132
Figure 26:	Malleefowl Habitat.....	136
Figure 27:	Short Range Endemics	140
Figure 28:	Existing Hydrology	153
Figure 29:	Maximum Flood Depths, Pre-development 10% AEP, 12-hour Rainfall Event.....	154
Figure 30:	Maximum Flood Depths, Pre-development 1% AEP, 12-hour Rainfall Event.....	155
Figure 31:	Fimiston Diversion Channels.....	161
Figure 32:	Maximum Flood Depths, Post-development 5% AEP, 12-hour Rainfall Event.....	162
Figure 33:	Maximum Flood Depths, Post-development 1% AEP, 12-hour Rainfall Event.....	163
Figure 34:	Holistic Assessment of Environmental Factors and Impacts.....	192

APPENDICES

Appendix A	Social Impact Assessment
Appendix B	Letters of Support
Appendix C	CONFIDENTIAL Aboriginal Cultural Heritage Management Plan
Appendix D	Screening Health Risk Assessment
Appendix E	Air Quality Impact Assessment
Appendix F	Air Quality Management Plan
Appendix G	Green House Gas Management Plan

Appendix H	Revised Flora and Fauna Assessment
Appendix I	Revised Terrestrial Fauna Assessment
Appendix J	Malleefowl Activity and Habitat Assessment
Appendix K	CONFIDENTIAL Jalmenus aridus Impact Assessment
Appendix L	CONFIDENTIAL Significant Species Management Plan
Appendix M	Prediction of Blast- Induced Ground Vibration and Overpressure
Appendix N	Flyrock for Fimiston South Project
Appendix O	Fimiston Acoustic Impact Assessment
Appendix P	Noise and Vibration Monitoring Management Plan (Update) Noise and Vibration Monitoring Management Plan
Appendix Q	Hydrological Assessment of Eastern Floodway
Appendix R	Hydrogeological Review of the Fimiston I, Fimiston II, Fimiston IIE, and Fimiston III TSFs
Appendix S	Compliance Documents
Appendix T	Proposed Amended Conditions
Appendix U	Mine Closure Plan

Executive Summary

KCGM is located on the Golden Mile and is a world class gold resource. Mining and mineral processing has occurred in the vicinity of KCGM since gold was first discovered in 1893 by Paddy Hannan, Tom Flanagan and Dan Shea. By the mid-1980s all mining operations in Kalgoorlie-Boulder, from Mt Percy and Mt Charlotte at the northern end to Chaffers at the southern end, were effectively controlled by three companies. With a common goal of maximising the return on investment for their respective shareholders, these companies developed a loose relationship concerning the sharing of facilities and exchanging technical knowledge. This relationship was formalised on 29 March 1989 by the creation of a new management company, Kalgoorlie Consolidated Gold Mines Pty Ltd.

Kalgoorlie Consolidated Gold Mines (KCGM) Operations is located adjacent to the City of Kalgoorlie-Boulder approximately 600 kilometres east of Perth, Western Australia (Figure 3). In 2019, KCGM celebrated its 30th anniversary and poured its 50,000th bar of gold, bringing the total produced from the Golden Mile to over 60 million ounces in the 125 years since the first lease was pegged. On 12 February 2021, the KCGM Operations became controlled by a single entity, Northern Star Resources Limited (Northern Star).

The KCGM Operations include the Fimiston Operations, Mt Charlotte Underground Mine, Mt Percy Operational Area and Gidji Processing Plants. The Fimiston Operations consists of the Fimiston Open Pit, Fimiston processing plant, three tailings storage facilities, waste rock dumps (WRDs), run of mine pad, and supporting infrastructure. The operations are continuous, running 24 hours a day, 7 days a week throughout the year.

The Fimiston Open Pit is one of the largest open pit gold mines in Australia. The Fimiston processing plant was commissioned in 1989 and treats ore from Fimiston and Mt Charlotte. The processing plant has undergone two expansions to become one of the largest gold milling complexes in Australia. KCGM is supported by a total ore reserve of 11 million ounces and a total resource of 26 million ounces and produces up to 500,000 ounces of gold each year with a current mining life to 2034. The Fimiston South Project will sustain hundreds of local jobs in Kalgoorlie-Boulder over the next decade, which has been consistently welcomed by local stakeholders throughout KCGM engagement undertaken for the Revised Proposal. KCGM Operations' legacy as a predominately residential mine site is viewed by stakeholders as critical to KCGM's social license, providing a positive flow on effect for the local community and economy.

KCGM referred a Revised Proposal to the EPA under Section 38 of the *Environmental Protection Act 1986* (EP Act), seeking approval to develop the Fimiston South Project and make changes to supporting infrastructure at Fimiston.

The Fimiston South Project (FS Project) requires approximately 1,868 ha of clearing including 1,580 ha of native vegetation to accommodate the footprint of the Fimiston Open Pit extension, waste rock dump (WRD) extension, additional tailings storage facilities (TSFs) (Fimiston III TSF and a third cell on Fimiston IIE TSF) and associated supporting infrastructure, some of which overlays existing infrastructure within the existing approved Mine Development Envelope (MDE). Disturbed areas will be preferentially used for proposed infrastructure.

The MDE will increase from 5,841 ha to 7,795 ha to accommodate the Fimiston Open Pit, TSFs, WRD extension and supporting infrastructure.

This Revised Proposal is considered a significant amendment under Section 40AA of the EP Act, which allows the conditions of previous Ministerial Statements to be reviewed during the assessment process for

the mine expansion. The existing mine operations are approved under Ministerial Statement 782 (MS 782). The conditions of MS 782 are proposed to be amended to reflect the new design.

The Revised Proposal is described in Table ES1 and Table ES2.

Table ES1: Revised Proposal Content Description

Summary	
Revised Proposal title	Fimiston Gold Mine Operations Extension (Stage 3) and Mine Closure Planning Revised Proposal: Fimiston South Project
Proponent name	Kalgoorlie Consolidated Gold Mines
Short description	The Revised Proposal is to mine a cutback of the existing Fimiston Open Pit, with associated life of mine tailings deposition, waste capacity and associated infrastructure. The proposal includes, but is not limited to: • Increase in the Mine Development Envelope • Cutback of the Fimiston Open Pit • Additional tailings capacity • Additional waste rock dump capacity • Additional infrastructure areas (topsoil storage, roads, pipeline corridors) • Infrastructure to manage surface water.

Table ES2: Revised Proposal Content Elements

Element	Location/ description	Existing Proposal extent, capacity or range	Proposed amendment (content of s.38)	Combined extent, capacity or range
Physical Elements				
Mine Development Envelope, including: • Fimiston Open Pit • Environmental Noise Bund • WRDs including stockpiles) • Tailings Storage Facilities • Run of Mine (ROM) and processing plant • Infrastructure corridors and workshop area • Managed Aquifer Recharge (MAR) within existing Kaltails Supply Borefield.	Figure 3	Clearing of up to 3,973 ha within the Development Envelope of 5,914 ha.	Additional disturbance of 1,868 ha, of which 1,580 ha is clearing of native vegetation.	Clearing of up to a total of 5,841 ha within the Development Envelope of 7,795 ha.
Construction elements – not applicable				
Operational elements				
Fimiston Open Pit footprint spatial limit	Refer to Figure 4	Clearing up to 535 ha within Development Envelope	Additional clearing of 39 ha	Clearing up to 574 ha within Development Envelope
Environmental Noise Bund footprint spatial limit		Clearing up to 110 ha within	Reduction of 5 ha	Clearing up to 105 ha within

Element	Location/ description	Existing Proposal extent, capacity or range	Proposed amendment (content of s.38)	Combined extent, capacity or range
		Development Envelope		Development Envelope
Greenhouse gas emissions				
Operation				
Peak Annual Average Life (2024-2026)				
Scope 1	Mining and Processing Operations	Scope 1+2 Approximately 440,800 tonnes per year of carbon dioxide equivalent (CO ₂ - e)	Approximately 237,300 tonnes CO ₂ -e	Approximately 414,600 tonnes CO ₂ -e per annum
Scope 2	Electricity use		Approximately 177,3000 tonnes CO ₂ -e	
Annual average life of mine Scope 1 and Scope 2 (2024-2034)				
Scope 1	Mining and Processing Operations		Approximately 235,200 tonnes CO ₂ -e	Approximately 235,200 tonnes CO ₂ -e
Scope 2	Electricity use		Approximately 19,800 tonnes CO ₂ -e	Approximately 19,800 tonnes CO ₂ - e
Total (based on annual average Scope 1 and Scope 2) 11 years life of mine (2024-2034)				
Approximately 2,804,100 tonnes CO ₂ e			Approximately 2,804,100 tonnes CO ₂ e	Approximately 2,804,100 tonnes CO ₂ e
Commissioning – not applicable				
Not applicable. Fimiston is currently operational.				
Rehabilitation and closure				
Progressive rehabilitation will be undertaken over the life of mine. Areas disturbed through implementation of this proposal will be designed to be safe and non-polluting and will meet the closure objectives documented in the Mine Closure Plan (KCGM, 2022)				
Other elements which affect extent of effects on the environment			Existing Life of Mine	Proposed Life of Mine
Proposal time	Estimated project life		2027	2034

The mine development and modified MDE will result in the potential impacts outlined in Table ES3.

Table ES3: Potential Impacts

Key Environmental Factor – Flora and Vegetation	
Potential impacts	Potential environmental impacts from the Revised Proposal will result in additional 1,580 ha of clearing of native vegetation through modification of the MDE including 1,021 ha for tailings storage facilities, 94 ha for expansion of the WRD and 226 ha for closure stockpiles and other supporting infrastructure. All the vegetation communities proposed for clearing are well represented throughout the Goldfields region and no Threatened or Priority Ecological Communities will be impacted. One P2 species, <i>Eremophila praecox</i>, widespread in the Kalgoorlie-Boulder area (including being well represented in local Reserves), will be impacted with an additional 13 plants being removed.
Mitigation hierarchy	Avoid • Design TSFs, WRD expansion and stockpiles in an efficient manner to limit area to be cleared and minimise significant impacts. • Dust suppression will be implemented in active mining areas. • Suspending work if necessary. Minimise • The management of the proposed TSFs and WRD expansion will be consistent with existing operations and Management Plans will continue to be monitored and managed under Part V of the EP Act, in accordance with conditions of DWER Prescribed Premises Licence L6420/1988/14 and <i>Mining Act 1978</i> approvals. • Continue to manage groundwater mounding at TSFs to protect vegetation. Rehabilitate • Retain and utilise soil and mulch from cleared areas for TSF and WRD rehabilitation. • Rehabilitate landforms progressively and post closure to form a safe, stable landforms.
Residual impacts, including assessment of significance	• Permanent loss of 1,580 ha native remnant vegetation in an area of vegetation common to the local area. • Loss of 13 plants of the Priority 2 species <i>Eremophila praecox</i> bringing the total plants removed at Fimiston to 17, or 3.4% of the known population. These impacts are not considered to be of environmental significance.
Proposed environmental outcomes	Clearing will not have an impact on biological diversity or ecological integrity. Indirect impacts can be mitigated through implementation of relevant management plans. The EPA objective for flora and vegetation will be met. Offsets are not proposed for this factor.
Key Environmental Factor – Terrestrial Fauna	
Potential impacts	Potential environmental impacts from the Revised Proposal will result in additional 1,580 ha of clearing of native vegetation through modification of the MDE including 1,021 ha for TSFs, 94 ha for expansion of the WRD and by 226 ha for supporting infrastructure. The terrestrial fauna habitat proposed for clearing are well represented throughout the Goldfields region and no conservation significant vertebrate fauna species are known to be restricted to or reliant on the habitat within the modified MDE.
Mitigation hierarchy	Avoid • Design landforms in an efficient manner to limit area to be cleared. • A fauna spotter will be present during clearing.

	Minimise - Minimise the area cleared to that required for operational purposes including minimising clearing of breeding shrubs for the Priority 1 Inland Hairstreak Butterfly (<i>Jalmenus aridus</i>). - Mark boundaries of areas to be cleared with flagging tape to ensure boundaries are maintained. - Maintain existing reduced speed limits for TSFs and associated perimeter roads. Rehabilitate - Retain and utilise soil and mulch from cleared areas for closure and rehabilitation. - Rehabilitate TSFs and WRD progressively and post closure to form a safe, stable landforms.
Residual impacts, including assessment of significance	- Permanent loss of 1,580 ha of native vegetation as fauna habitat. - The Priority 1 butterfly species <i>Jalmenus aridus</i> has been found in the Revised Proposal area but its habitat and two of the eight breeding shrubs known at Fimiston will be removed. A further nine regional populations have been discovered that will not be disturbed by the project. - No evidence of recent Malleefowl activity has been found on site. These impacts are not considered to be environmentally significant.
Proposed environmental outcomes	Clearing of native vegetation for the construction and operation of the Revised Proposal will result in reduction of habitat. Other potential impacts can be mitigated through implementation of relevant management plans. The EPA objective for terrestrial fauna will be met. Offsets are not proposed for this factor.
Key Environmental Factor – Inland Waters	
Potential impacts	Without effective management measures in place, potential impacts on groundwater of the Revised Proposal include: - Groundwater mounding under TSFs causing localised vegetation decline. - Formation of a hypersaline pit lake after mine closure. Potential impacts on surface water of the Revised Proposal includes: - Landforms causing changes in surface water hydrology, potentially affecting significant species and communities. - Landforms changing local drainage patterns and increasing flood risk.
Mitigation hierarchy	Avoid - Drainage design to maintain hydrological flow regimes and control stormwater run-off to avoid impacts on conservation significant species. - Maintain TSF water levels to allow storage of the 0.1% Annual Exceedance Probability (AEP), 72-hour storm event. Minimise - Recovering seepage by means of production bores and seepage interception trenches to ensure a minimum depth to groundwater is maintained. - Minimising the normal operating supernatant pool area on the Fimiston TSFs. - Monitoring groundwater levels to ensure levels are kept within the licenced range to minimise impacts on plant root zone. - Increasing groundwater pumping when groundwater levels in accordance with licence targets and objectives. Rehabilitate

	- Retain and utilise topsoil and mulch from cleared areas for rehabilitation. - Rehabilitate landforms progressively and post closure to form safe, stable landforms.
Residual impacts, including assessment of significance	Small changes to the catchment boundaries and groundwater recovery are not anticipated to impact on overall hydrology of the site. These impacts are not considered to be environmentally significant.
Proposed environmental outcomes	Impacts on hydrological flows will be mitigated through construction of the diversion channels. Temporary impacts on groundwater and surface water during construction will be managed in accordance with groundwater licence conditions. Permanent change in groundwater regimes is considered unlikely to occur as a consequence of the Revised Proposal. Operation of the Revised Proposal is considered unlikely to significantly impact on surface water and groundwater quality. Based on the mitigation measures proposed, no significant residual impacts on inland waters are expected, and it is considered the Revised Proposal meets the EPA objective to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. Offsets are not proposed for this factor.
Key Environmental Factor – Air Quality	
Potential impacts	Potential direct impact to air quality may include reduced air quality in the broader Kalgoorlie-Boulder area from: - Increased dust emissions from the Revised Proposal footprint. - Greenhouse gas emissions from operation of vehicles and machinery. Potential indirect impacts that may result from changes to air quality include: - Reduced public health. - Reduced health or loss of vegetation or flora. - Displacement of fauna.
Mitigation hierarchy	Avoid - Implement dust suppression at key dust sources such as haul roads, as required. Minimise - Restricting operations as a function of wind direction to minimise dust, including: - Dumping of waste material. - Near surface mining activities (e.g., handling of oxide material and blasting). - Land clearing activities. - Mining near the surface during daytime only to allow elevated dust concentrations to be clearly visible, to provide for implementation of additional dust management measures as required. - Continued real time monitoring of PM₁₀ concentrations and implementation of the reactive dust control strategy, as required. - Continue to implement Fimiston Air Quality Management Plan (FAQMP).
Residual impacts, including assessment of significance	The Revised Proposal is not expected to result in a significant change to air quality in the Kalgoorlie area.

Proposed environmental outcomes	The air quality impacts can be managed effectively using the existing FAQMP (Ramboll, 2022). Dust emissions from the Revised Proposal are unlikely to result in a significant impact to vegetation and flora. It is considered that the EPA objective for Air Quality can be met. Offsets are not proposed for this factor.
Key Environmental Factor – Social Surroundings	
Potential impacts	Potential impacts to social surroundings from the proposed changes include: • Reduced visual amenity from mining landforms. • Reduced amenity from noise and vibration. • Reduced public health or damage to property from flyrock. • Reduced public amenity from dust emissions. • Land disturbance resulting in damage to cultural heritage sites.
Mitigation hierarchy	Avoid • No unnecessary blasting or ground vibration inducing activity to be conducted. • Restricted hours of operation: • Blasting only between 0700 hours and 1800 hours (as per current conditions). • Limiting surface mining activities to daytime and evenings only until a level of 20 m below the undisturbed surface level is reached. Minimise • Construction of the ENB along south-western boundary of Fimiston Open Pit. • Continuation of noise and vibration monitoring in accordance with the NVMMMP. • Continuation of undertaking independent noise modelling to evaluate any proposed changes to current or future Fimiston Operations. • Restricted hours of operation – for certain equipment or activity if there is a risk of attracting negative feedback from the community (restricted to daytime). • Designing blasts to minimise air blast and vibration: • Reducing blast size. • Reducing blasthole diameter. • Continue to undertake blast modelling to predict projected ground vibration and air-blast overpressure levels. • Utilisation of electronic detonation system (as required). • Ensuring the minimum stemming is loaded into each blasthole. • Continue taking into consideration atmospheric conditions prior to blasting (red or green winds). • Using additional noise barriers or temporary barriers where required or indicated by projected modelling (e.g., around exploration drilling). • Installation of broadband frequency noise (white sound) reversing alarms on mobile equipment. • Maintain consultation and engagement for matters of cultural heritage under the KCGM Aboriginal Cultural Heritage Management Plan (and agreements). Undertake consultation with TOs prior to disturbance in the vicinity of Aboriginal Heritage Site 1476.
Residual impacts, including assessment of significance	The Revised Proposal is unlikely to have a significant impact on social surroundings because: • Changes to the façade of mining landforms visible from the Kalgoorlie townsite will be minimised, as these landforms are behind the existing pit and noise bund. • Noise emissions will remain within the limits approved in the Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016 or subsequent further approvals. • Vibration will continue to be compliant with the ground vibration limits as set in condition 9-5 of MS 782. • KCGM continue to comply with the approved blasting procedures.

	No direct disturbance of Aboriginal heritage sites is proposed, and Cultural Heritage Monitors will be used to monitor the works in the vicinity of heritage sites.
Proposed environmental outcomes	The Revised Proposal is unlikely to have a significant impact on social surroundings because: • Changes to the visible façade of mining landforms is proposed to be located behind the pit and noise bund. • Noise emission levels will comply with the Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016 or subsequent further approvals. • Vibration will continue to be compliant with the ground vibration limits as set in condition 9-5 of MS 782. • KCGM continue to comply with the approved blasting procedures, as documented in the approved Noise and Vibration Monitoring Management Plan.

1. INTRODUCTION

1.1 Background

Kalgoorlie Consolidated Gold Mines (KCGM) Operations is located on the Golden Mile, a world class gold resource. Mining and mineral processing has occurred in the vicinity of KCGM since gold was first discovered in 1893 by Paddy Hannan, Tom Flanagan and Dan Shea. By the mid-1980s all mining operations in Kalgoorlie-Boulder, from Mt Percy and Mt Charlotte at the northern end to Chaffers at the southern end, were effectively controlled by three companies. With a common goal of maximising the return on investment for their respective shareholders, these companies developed a loose relationship concerning the sharing of facilities and exchanging technical knowledge. This relationship was formalised on 29 March 1989 by the creation of a new management company, Kalgoorlie Consolidated Gold Mines Pty Ltd.

KCGM Operations is located adjacent to the City of Kalgoorlie-Boulder approximately 600 kilometres east of Perth, Western Australia (Figure 1). The Golden Mile is one of the richest gold deposits in the world. In 2019 KCGM celebrated its 30th anniversary and poured its 50,000th bar of gold, bringing the total produced from the Golden Mile to over 60 million ounces in the 125 years since the first lease was pegged. On 12 February 2021, the KCGM Operations became controlled by a single entity, Northern Star Resources Limited (Northern Star).

The KCGM Operations include the Fimiston Operations, Mt Charlotte Underground Mine and the Fimiston and Gidji Processing Plants. The Fimiston Operations consists of the Fimiston Open Pit, Fimiston processing plant, three tailings storage facilities, waste rock dumps (WRDs), run of mine pad, and supporting infrastructure (Figure 2). The operations are continuous, running 24 hours a day, 7 days a week throughout the year.

The Fimiston Open Pit is one of the largest open pit gold mines in Australia. The Fimiston processing plant was commissioned in 1989 and treats ore from Fimiston and Mt Charlotte Operations. The processing plant has undergone two expansions to become one of the largest gold milling complexes in Australia. KCGM is supported by a total ore reserve of 11 million ounces and a total resource of 26 million ounces and produces up to 500,000 ounces of gold each year with a current mining life to 2027 and mineral processing life to 2034. The Fimiston South Project will sustain hundreds of local jobs in Kalgoorlie-Boulder over the next decade, which has been consistently welcomed by local stakeholders throughout KCGM engagement undertaken for the Revised Proposal. KCGM Operations' legacy as a predominately residential mine site is viewed by stakeholders as critical to KCGM's social license, providing a positive flow on effect for the local community and economy.

KCGM and government agencies recognise the unique situation of the Fimiston Operations being located close to the City of Kalgoorlie-Boulder, where mining has been part of the landscape for over 125 years. Due to the proximity to the city, it is imperative that KCGM manages environmental aspects to minimise any potential impacts to the community. KCGM is committed to operating in an environmentally and socially responsible manner, which contributes to the long-term social and economic value of the Kalgoorlie-Boulder region and protect the environment in which it operates.

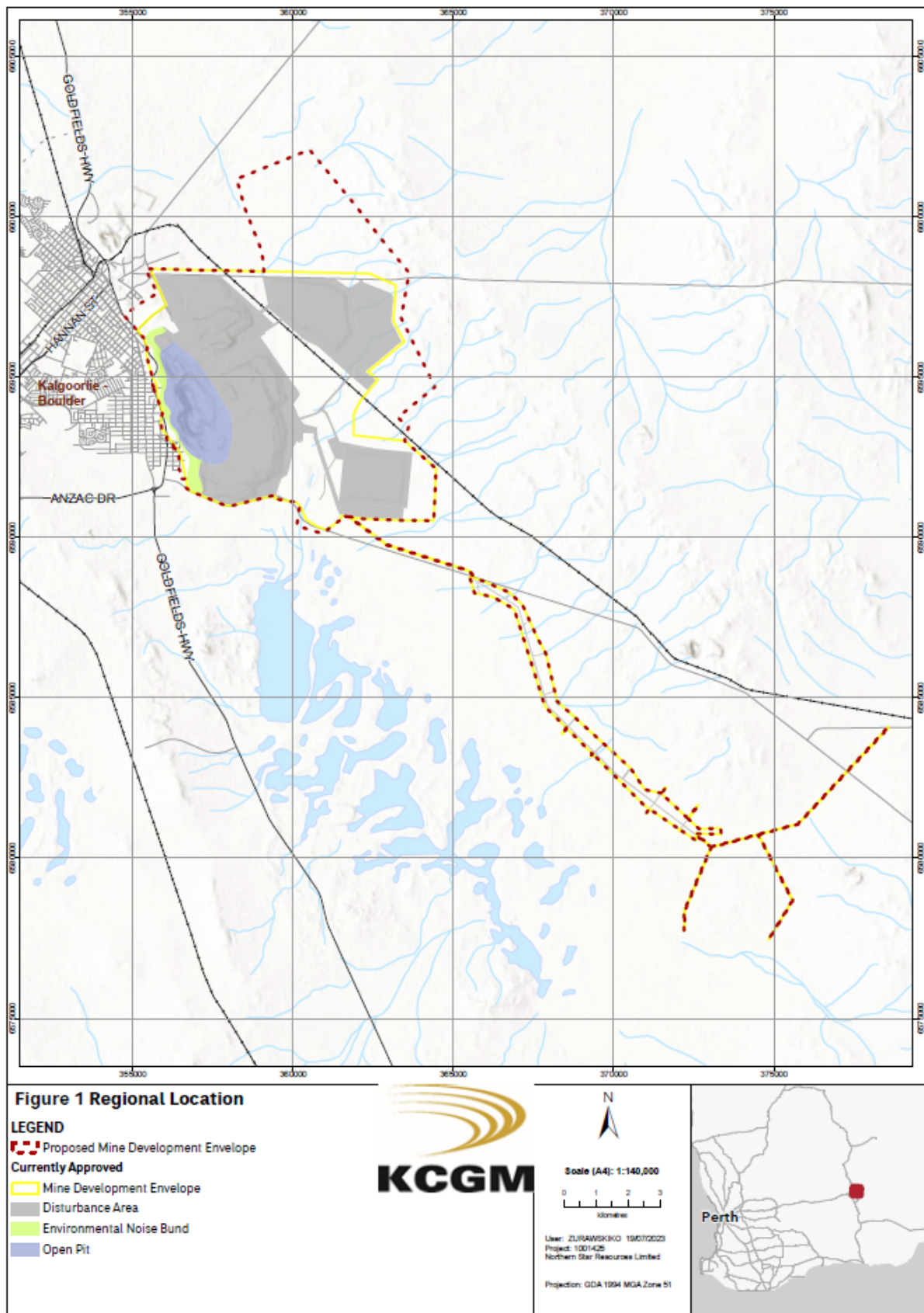


Figure 1: Regional Location

1.2 Approvals History

Prior to 1989, the Kalgoorlie Golden Mile area was mined by several companies, each with their own operations. In 1989 KCGM was created to combine the individual operations into a single operation. The original proposal to rationalise open-cut mining activities into a single operation was assessed by the Environmental Protection Authority (EPA) in 1991 (Bulletin 539). This involved a single open pit, placement of waste rock in WRDs to the east of the pit, and deposition of tailings in Fimiston I TSF. The proposal was approved in October 1991 under Ministerial Statement 188 (MS 188).

In September 2006, KCGM released a Public Environmental Review (PER) for the *Fimiston Gold Mine Operations Extension (Stage 3) and Mine Closure Planning* seeking approval to widen and deepen the Fimiston Open Pit by mining a cutback. This proposal included the Golden Pike Cutback located along the western edge of the pit, construction of additional WRDs north of the pit, and additional tailings storage capacity. Ministerial Approval was granted in January 2009 under MS 782 (which effectively superseded MS 188) and commenced implementation in March 2010.

MS 782 has been subject to seven amendments:

- 2010 – change to proposal approved under Section 45C of the EP Act (clearing for Kaltails TSF, contingency clearing for infrastructure post Kaltails re-commissioning, and inclusion of hydrogen peroxide dosing facility).
- 2013 – change to proposal approved under Section 46C of the EP Act (replacement of condition 11-3, associated with review of the Rehabilitation and Closure Management Plan (KCGM, 2022) every three years).
- 2015 – change to proposal approved under Section 45C of the EP Act (removal of different options for management of tailings, updating the description of the proposal and removal of elements that are not key proposal characteristics).
- 2017 – change to proposal approved under Section 45C of the EP Act (modification to the Fimiston Open Pit to allow the required remediation works on the western wall to be completed to reduce the occupational health and safety risk to KCGM's workforce).
- 2018 – change to proposal approved under Section 45C of the EP Act (modification to the Fimiston Open Pit to allow mining of Morrison and Brownhill extensions and clearing of 200 ha within the development envelope for infrastructure associated with rehabilitation of the Fimiston II and Kaltails TSFs).
- 2018 – Change to proposal approved under Section 45C on 10 October 2018. Revision of the proposal's Development Envelope to include the Kaltails Supply Borefield utilised as a water supply borefield in a defined development envelope (borefield formerly approved under a previous ministerial statement including establishment of a MAR system).
- 2020 – Change to proposal approved under Section 45C of the EP Act to expand the Fimiston II TSF and expand the Fimiston Open Pit to include the Great Boulder cutback.

The EPA has informed KCGM that any further changes to Fimiston Operations should be referred through Section 38 of the EP Act.

1.3 Revised Proposal Purpose

The purpose of this Revised Proposal is to seek approval under the *Environmental Protection Act 1986* (EP Act), Part IV (Section 38) to develop the Fimiston South Project (FS Project) and make changes to supporting infrastructure at Fimiston, here after called the Revised Proposal or FS Project.

This Revised Proposal is considered a significant amendment under Section 40AA of the EP Act, which allows the conditions of previous Ministerial Statements to be reviewed during the assessment process. The conditions of MS 782 are proposed to be amended to reflect the Revised Proposal. Suggested condition amendments are set out in (Appendix T). Managements plans will be revised to reflect any changes to conditions. Proposal justification is outlined in Section 3.5.

1.4 Proponent Details

KCGM is the Proponent for the Fimiston South Project (Table 1).

Table 1: Proponent Details

Proponent Information	Details
Company Name	Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM) (100% owned subsidiary of Northern Star Resources Ltd, the tenement owner).
ABN	97 009 377 619
ACN	009 377 619
Street Address	Black Street Kalgoorlie, Western Australia 6430
Postal Address	Private Mail Bag 27 Kalgoorlie, WA, 6433
Contact	Nickolas Strong, General Manager Growth or Janine Cameron, Approvals and Closure Specialist Ph: 08 9022 1272 Email: jcameron@nsrltd.com

1.5 Other Approvals and Regulation

Following primary environmental approval of the Revised Proposal under Part IV of the EP Act, additional regulatory approvals will be required to develop and operate the Revised Proposal. These approvals have been summarised in Table 2.

Table 2: Other Regulatory Approvals Required

Proposed Activities	Approval	Regulatory Agency	Regulating Legislation
Provision of hypersaline water for mining operations	Licence to take groundwater	Department of Water and Environmental Regulation (DWER)	<i>Rights in Water and Irrigation Act 1914</i> (RIWI Act)
Management of emissions from processing plant, tailings facilities, crushing facilities, commissioning and operations of TSFs.	EP Act (Part V) licenses	DWER	<i>EP Act 1986</i> and Regulations

Proposed Activities	Approval	Regulatory Agency	Regulating Legislation
Ground disturbance for mining, construction of WRD and TSFs and infrastructure. Mine Closure Plan to ensure the appropriate management of demolition, decommissioning and management of the post closure landscape.	Mining Proposal Mine Closure Plan	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	<i>Mining Act 1978</i>

2. CURRENT APPROVED PROJECT

2.1 Summary

KCGM's operations currently consist of the Fimiston Operations, Mt Charlotte Underground Mine, (approximately 2 km north of Fimiston), and the Gidji Processing Plant (approximately 20 km north of Kalgoorlie-Boulder). The active mining areas within the current Fimiston Open Pit are the Golden Pike, Oroya Brown Hill and the southern mining areas of Morrison and Great Boulder. The current Fimiston Open Pit footprint extends approximately 1.5 km in width, 3.4 km in length and to a depth of approximately 640 m. The Fimiston Open Pit hosts gold-bearing ores that are refractory in nature. The gold is associated with sulfides (mainly pyrite) and tellurides. Ore is processed through the Fimiston and Gidji Process Plants and includes crushing, milling, gravity separation, flotation, ultra-fine grinding (UFG) and cyanidation of the subsequent product streams.

Fimiston Operations, shown in Figure 2, include:

- the Fimiston Open Pit.
- the Environmental Noise Bund (ENB).
- Waste Rock Dumps (WRDs).
- Tailings Storage Facilities (TSFs).
- Supporting infrastructure.
- MAR activities within KCGM's Kaltails borefield.
- Supporting infrastructure, such as utilities, pipelines and roads (Figure 2).

The current approval is described in Table 3 and Table 4 below. Table 5 summarises the current management strategies for key environmental factors.

Table 3: General Project Content Description (current approval)

Proposal title	Fimiston Gold Mine Operations Extension (Stage 3) and Mine Closure Planning Revised Proposal: Fimiston South Project MS 782 (Attachment 7) approved 30 September 2020
Proponent name	Kalgoorlie Consolidated Gold Mines
Short description	The proposal is to mine a cutback of the existing Fimiston Open Pit, with associated life of mine tailings deposition, waste capacity and associated infrastructure. The proposal includes, but is not limited to: • Increase in the Mine Development Envelope • Cutback of the Fimiston Open Pit • Modifying the Environmental Noise Bund • Additional tailings capacity • Additional waste rock dump capacity • Additional infrastructure areas (topsoil storage, roads, and pipeline corridors) • Infrastructure to manage surface water

Table 4: Project Content Elements (Current approval)

Project element	Location / description	Existing Project extent, capacity or range
Approved Physical elements		
Mine Development Envelope, including: • Fimiston Open Pit • Environmental Noise Bund • Waste rock dumps (including stockpiles) • Tailings Storage Facilities • ROM and processing plant • Infrastructure corridors and workshop area • Managed Aquifer ReInjection (MAR) within existing Kaltails Supply Borefield	Figure 2	Clearing of up to 3,973 ha** within the Development Envelope of 5,914 ha.
Construction elements- not applicable		
Operational elements		
Fimiston Open Pit footprint spatial limit	Figure 2	Clearing up to 535 ha within Development Envelope
Environmental Noise Bund footprint spatial limit	Figure 2	Clearing up to 110 ha within Development Envelope
Greenhouse gas emissions		
Approximately 440,800 tonnes per year of carbon dioxide equivalent (CO ₂ -e)		
Commissioning – not applicable		
None specified		
Rehabilitation and closure		
None specified		
Other elements which affect extent of effects on the environment		
None specified		

Table 5: Current management of Key Environmental Factors

Key Environmental Factor – Flora and Vegetation	
EPA Objective: To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	
Potential Impacts:	Mine development and operational activities include clearing of up to 3,973 ha of native vegetation within a MDE of 5,914 ha. As approved under existing MS 782.
Mitigation Hierarchy:	Avoid: - When clearing activities are undertaken within approved footprints, ensure KCGMs internal Ground Disturbance Permit process is implemented. - Dust suppression techniques are used during periods dry conditions and if wind may transport dust towards town. Minimise: - Ensure the area to be cleared is kept to the minimum size required for effective construction and operational purposes. - Ensure areas to be cleared are surveyed and clearly delineated with flagging. - Ensure field team are briefed and understand the vegetation clearing approval limitations and consequences for off target clearing. Rehabilitate: - Retain and utilise any soil and mulch from cleared areas for rehabilitation. - Area is surveyed and data captured for the Annual Compliance Report (ACR) and Annual Environment Report (AER).
Residual Impacts; including assessment of significance	Permanent loss of vegetation types which are common to the local area and have been historically disturbed. These impacts are not considered to be of environmental significance under the current MS 782 assessment.
Proposed Environmental Outcomes:	Clearing of already approved construction footprints under MS 782 will not have an impact on biological diversity or ecological integrity of the region. Indirect impacts can be mitigated through implementation of relevant approved management plans. The EPA objective for flora and vegetation has been met.
Key Environmental Factor – Terrestrial Fauna	
Objective: To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	
Potential Impacts:	Terrestrial fauna habitats located within the currently approved clearing areas are well represented throughout the Goldfields region; the MDE contains no conservation significant vertebrate fauna or species known to be restricted to or solely reliant on the habitat within the proposed construction footprints.
Mitigation Hierarchy:	Avoid: - When clearing activities are undertaken within approved footprints, ensure KCGM's internal Ground Disturbance Permit process is implemented. - Redesign infrastructure or access routes if required. Minimise: - Ensure the area to be cleared is kept to the minimum size required for effective construction and operational purposes. - Ensure areas to be cleared are surveyed and clearly delineated with flagging. - Ensure field team are briefed and understand the vegetation clearing approval limitations and consequences for off target clearing. - Maintain existing reduced speed limits for TSFs and associated perimeter roads.

	Rehabilitate: • Retain and utilise soil and mulch from cleared areas for closure and rehabilitation. • Rehabilitate TSFs and WRD post-closure to form a modified ecosystem. • Area is surveyed and data captured for the Annual Compliance Report (ACR) and Annual Environment Report (AER).
Residual Impacts; including assessment of significance	Permanent loss of native vegetation that provides fauna habitat. These impacts are not considered to be environmentally significant.
Proposed environmental outcomes:	Clearing of native vegetation will result in the reduction of actual available terrestrial habitat at Fimiston within the defined MDE. Other potential impacts can be mitigated through implementation of relevant management plans. The EPA objective for terrestrial fauna has been met.
Key Environmental Factor – Inland Waters	
Objective: To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	
Potential Impacts:	Without effective management measures in place, potential impacts on groundwater from the current operation includes: • Groundwater mounding under TSFs leading to localised decline of vegetation. • Creation of a hypersaline pit lake after mine closure. Potential impacts on surface water of the current operation includes: • Infrastructure causing changes to surface water hydrology during storm events. • Built infrastructure or facilities changing local drainage patterns or increasing flood risk to downstream areas.
Mitigation Hierarchy:	Avoid: • Ensure where possible to avoid construction or mine development activities in or over identified significant surface waterlines or rivers. • Drainage design to maintain hydrological flow regimes where possible and control stormwater run-off (water and sediment) to avoid potential downstream impacts on the receiving environment and the workforce. • Maintain TSF supernatant liquor levels to ensure storage of the 0.1% Annual Exceedance Probability (AEP), 72-hour storm event can be safely contained. Minimise: • There are no identified water courses or permanent surface water bodies within operational areas of Fimiston. • Recovery of seepage by means of seepage recovery bores and/or interception trenches to ensure maximum seepage recovery. • Control surface flow from operational areas to collect or direct stormwater. • Minimising the size of operational supernatant liquor pond area on Fimiston TSFs. • Monitoring groundwater depth to ensure levels remain within the licenced range below ground level. • Increasing groundwater extraction to offset any rise of groundwater levels. Rehabilitate: • Retain and utilise topsoil and mulch from cleared areas for rehabilitation. • Rehabilitate areas of groundwater and surface water infrastructure following decommissioning after post closure requirements have been met.

	Areas are surveyed and data captured for the Annual Compliance Report (ACR) and Annual Environment Report (AER).
Residual Impacts; including assessment of significance	Groundwater extraction and reinjection is not anticipated to impact on the overall site hydrology. These impacts are not considered to be environmentally significant. Potential impacts can be mitigated through implementation of relevant management plans. Groundwater extraction licences currently held by KCGM include: - GWL66252(8) Eastern Borefield. - GWL63555(6) & GWL201828(1) Fimiston Open Pit dewatering. - GWL64266(9) abstraction and GWL201827(1) injection Kaltails. - GWL159860(6) Kaltails TSF Borefield. - GWL68592(6) Northern Borefield. - GWL63554(5) Southern Borefield.
Proposed Environmental Outcomes:	Temporary impacts on groundwater and surface water during operational phases will be managed in accordance with licence conditions. Permanent change in groundwater regimes is considered unlikely to occur as a result, of current activities. Stormwater runoff is to be intercepted and contained within drains, channels or sumps as part of maintaining a safe workplace. Based on the mitigation measures proposed, no significant residual impacts on inland waters are expected. The EPA objective for Inland Waters has been met.
Key Environmental Factor – Air Quality	
Objective: To maintain air quality and minimise emissions so that environmental values are protected.	
Potential Impacts:	Potential direct impact may include reduced air quality in the broader Kalgoorlie-Boulder area from: - Increased dust emissions from an expanded mining footprint. - Greenhouse gas emissions from operation of vehicles and machinery. Potential indirect impacts that may result from changes to air quality include: - Reduced public health (acute) or amenity of social surrounds (accumulative). - Reduced health or loss of vegetation or flora. - Displacement of fauna due to dust.
Mitigation Hierarchy:	Avoid: - Implement dust suppression at key dust sources such as haul roads and service corridors, as required. Minimise: - Restricting operational activities as a function of wind direction to minimise dust transportation, including: - Near surface mining activities (e.g., handling of oxide material and blasting). - Land clearing activities. - Continue to implement the approved Fimiston Air Quality Management Plan (FAQMP). Rehabilitate: - Rehabilitate any decommissioned monitoring location post closure, if not required for post closure monitoring commitments.
Residual Impacts; including assessment of significance	The continued activities will not result in a significant change to air quality in the Kalgoorlie area. Dust emissions from continued activities are unlikely to result in a significant impact.

Proposed Environmental Outcomes	Based on the mitigation measures proposed, no significant residual impacts to air quality are expected. It is considered that the EPA objective for Air Quality has been met.
Key Environmental Factor – Social Surroundings	
Objective: To protect social surroundings from significant harm.	
Potential Impacts:	Potential impacts to social surroundings from the proposed changes include: • Reduced visual amenity from mining landforms. • Reduced amenity from dust, noise and vibration. • Reduced public health or damage to property from flyrock. • Land disturbance resulting in damage to cultural heritage sites or vegetation.
Mitigation Hierarchy:	Avoid: • No unnecessary blasting. • Maintaining environmental noise bund along the western boundary of the operational lease. Minimise: • Noise and vibration monitoring in accordance with the approved NVMMP. • Noise modelling to evaluate any proposed changes from mining activities. • Designing blasts to minimise air blast and ground vibration. • Undertaking blast modelling to predict vibration and air blast levels and to design effective blasts. • Using an electronic detonation system, as required. • Taking into consideration atmospheric conditions prior to blasting (as required). Rehabilitate: • Rehabilitate any areas of WRD and TSF as per approved MCP.
Residual Impacts; including assessment of significance	The current operations are unlikely to have a significant impact on social surroundings due to the continuation of normal operations, implementation of controls and approved management plans. Significant impact on social surroundings is not expected.
Proposed Environmental Outcomes:	Based on the mitigation measures proposed, no significant residual impacts to social surroundings are expected. It is considered that the EPA objective for Air Quality has been met.

2.2 Fimiston Open Pit (Current)

The Fimiston Open Pit is mined using conventional open cut pit mining methods. This involves drill and blast activities followed by excavation with hydraulic shovels that load haul trucks that carry ore or waste rock. High grade ore is taken to the mill for processing and low-grade ore is stockpiled separately for later treatment, and waste rock is taken to various WRDs on site.

Drilling and blasting of the rock material is undertaken to break and loosen the material for extraction by the hydraulic shovels. The blast pattern depends on the type of material being mined, which comprises weathered rock (oxide) near the surface and fresh rock below the weathered zone. Blasting is limited to daylight hours. KCGM blasts at regular times to maintain consistency for the community and for visitors to be able to view blasts from the lookout.

If required, excess dewatering from the Fimiston Open Pit is reinjected at Kaltails Borefield using a MAR scheme. The Kaltails Borefield is located approximately 10 km southeast of the Fimiston processing plant. The MAR is implemented in accordance with a groundwater licence that is approved under Section 5C of the RIWI Act.

2.3 Environmental Noise Bund (Current)

The ENB is located between the residential areas of Kalgoorlie-Boulder and the western edge of Fimiston Open Pit and serves as one of the primary controls to minimise community exposure to noise from mining. The ENB, established in the early 1990's, has undergone various extensions and modifications in order to continue to minimise potential impacts to the community as the mine has developed. The most recent modification involved realigning the ENB to accommodate the extension of the Fimiston Open Pit in order to mine the Golden Pike resource (MS 782). It has an approved clearing area of 110 ha within the MDE.

2.4 Waste Rock Management (Current)

Waste rock is managed using a series of surface WRDs located south, east and north of the pit. Although there are some older designs, most of the WRD is now constructed as per a standardised design criteria to ensure that the WRD is aligned to the closure design requirements. The WRDs are all operational with in varying stages of construction and rehabilitation. The maximum height of the WRDs in the south and east of Fimiston operations has been restricted by Civil Aviation Safety Authority (CASA) regulations. The WRDs are well described in the Mine Closure Plan (MCP).

2.5 Fimiston Processing Plant (Current)

The Fimiston Processing Plant currently processes on average 13.4 Mtpa of ore through two separate mills known as Fimiston and Mt Charlotte. The Fimiston circuit comprises single stage crushing, semi-autogenous grinding (SAG) ball milling, gravity concentration and flotation circuit, with a utilization of 89%. The Mt Charlotte circuit comprises a three-stage crushing, SAG ball milling, gravity concentration and flotation circuit, with a utilisation of 90%. The two circuits combine post flotation for concentrate to be treated via Ultra-Fine Grinding (UFG) and high-cyanide leach, primarily at the Gidji plant site (which operates under a separate Ministerial Statement) located 20 km north of the FPP. The flotation tail is treated via a low-cyanide leach at Fimiston.

The ageing processing plant at Fimiston has successfully treated ore from Fimiston for the past 30 years. Planned improvements, through the Fimiston Processing Plant Revitalisation Project, to the Fimiston Processing Plant are expected to modernise the plant. This will enable an increase to throughput to well over 20 Mtpa. The project will upgrade aging infrastructure at Fimiston Processing Plant and streamline

the circuits for greater efficiency as well as increased throughput. A Mining Proposal and DWER Works Approval have been approved for these works.

2.6 Tailings Storage Facilities (Current)

Metallurgical processing of ore through the Fimiston Processing Plant results in the production of tailings, a direct waste product of the gold extraction process. The tailings geochemical characteristics are well understood; the tailings are potentially non-acid forming and stored in large, well-managed facilities primarily located on the eastern side of the operational area.

Three TSFs are currently operated / under construction at Fimiston Operational Area:

- Fimiston I – located north of the Fimiston Open Pit, this single cell TSF that covers an area of approximately 90 ha with an approved height of 60 m.
- Fimiston II – located north-east of the Fimiston Open Pit, this three cell TSF (AB Paddock, C Paddock and D Paddock) that covers an area of 230 ha with an approved height of 60 m.
- Kaltails – located south-east of the Fimiston Open Pit, this two cell TSF (East and West) has an operational area of 180 ha with an approved height of 60 m.
- Fimiston IIE (two cell) TSF is under construction in 2023.

Table 6: Existing Tailings Storage Facilities

TSF Name	Description	Approximate Area (ha) July 2022 data	Maximum Height
Fimiston I	Located north of the Fimiston Open Pit, this single cell TSF	112 ha disturbed land; 23 ha rehabilitated	60 m
Fimiston II	Located north-east of the Fimiston Open Pit, this three cell TSF (AB Paddock, C Paddock and D Paddock)	328 ha disturbed land; 50 ha rehabilitated	60 m
Kaltails	Located south-east of the Fimiston Open Pit, this two cell TSF (East and West)	216 ha 50 ha rehabilitated	60 m
Fimiston IIE	A two cell TSF (Cell E and F) under construction and yet to become operational.	270 ha under construction in 2023	60 m

KCGM completed all annual compliance and environmental reporting, as required by a prescribed premises. All reports were completed in March 2023 for the reporting year and have been submitted (includes DEMIRS, DWER and DBCA). These reports stated total tailings disposal as a “throughput of 12.49 Mt of dry tailings” (KCGM Annual Environment Report March 2023).

2.7 Managed Aquifer Recharge (Current)

A Managed Aquifer Recharge activity was approved by several agencies, including the EPA, in 2018. The activity occurs within the existing Kaltails Supply Borefield, in which abstraction activities also occur. When in operation, the MAR is implemented in accordance with a groundwater licences (GWL64266(9) abstraction and GWL201827(1) re-injection) that is approved under Section 5C of the RIWI Act. The MAR provides an opportunity to replenish the aquifer and store hypersaline water for future reuse.

2.8 Mine Closure (Current)

In accordance with the requirements of MS 782 and tenement conditions, KCGM is required to submit a Mine Closure Plan (MCP) every three years.

The MCP objective is to ensure at the end of mining activities, areas are rehabilitated and closed in a manner to make them physically safe to humans and animals, geotechnically stable, geo-chemically non-polluting/non-contaminating and capable of sustaining agreed post-mining land use.

This includes:

- Removal of infrastructure from the site where feasible, unless requested by a future land user
- Rehabilitation of TSFs, WRDs and the ENB where materials are available.
- Management of groundwater post closure
- Compliance with Contaminated Sites requirements post closure.
- Fimiston Open Pit becoming a saline pit lake.
- Construction of an abandonment bund around the site to prevent inadvertent access for safety reasons.

The most current version of the MCP was submitted to DEMIRS and DWER in October 2022. The 2018 MCP was approved by DEMIRS and was subsequently approved by the DWER. The 2021 MCP has not been assessed, and has been replaced by the current version, MCP 2022 v1, which has been updated to reflect the Revised Proposal and is provided in Appendix UAppendix A.

At KCGM, Mine Closure is integrated within mining and tailings design and operational activities to ensure the best outcomes. This includes ensuring WRD practices are implemented to ensure final closure designs can be implemented as effectively as possible. The MCP provides greater detail on these practices.

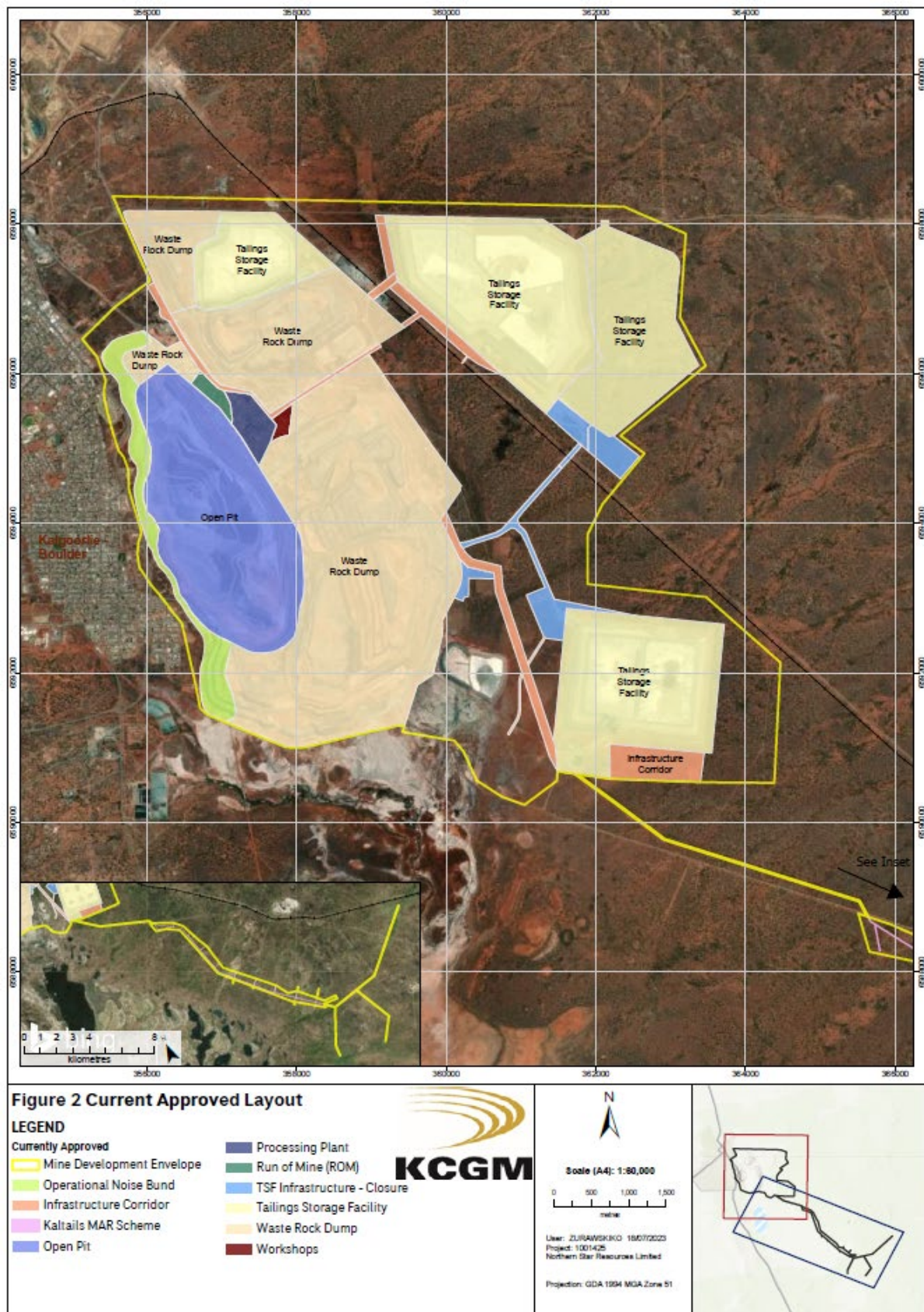


Figure 2: Current Approved Layout

3. REVISED PROPOSAL

3.1 Revised Proposal Type

This Revised Proposal represents a revision to the Fimiston operations approved under MS 782. Several amendments to MS 782 were previously approved under the EP Act.

KCGM is seeking approval under the EP Act, Part IV to develop the FS Project. This Revised Proposal is considered a significant amendment under Section 40AA of the EP Act, which allows the conditions of previous Ministerial Statements to be reviewed during the assessment process. The conditions of MS 782 are proposed to be amended to reflect the future requirements. Changes proposed include a cutback to the Fimiston Open Pit, known as the Ivanhoe cutback, expansion of the Fimiston IIE TSF to include a third cell, a new Fimiston III TSF, an extended WRD and additional supporting infrastructure. The Revised Proposal is shown in Figure 3.

3.2 Location and Tenure

Fimiston is located immediately east of the City of Kalgoorlie-Boulder approximately 600 km east of Perth, Western Australia (Figure 1).

Mining tenements relevant to the Revised Proposal are summarised in Table 7 and Figure 4. Tenements are jointly held by Northern Star (KLV) Pty Ltd and Northern Star (Saracen Kalgoorlie) Pty Ltd.

Table 7: Tenement Summary

Tenement ID	Area (ha)	Date Granted	End Date
G 26/100	9.942	6/10/2009	5/10/2030
G 26/101	9.303	6/10/2009	5/10/2030
G 26/102	9.698	6/10/2009	5/10/2030
G 26/103	9.989	6/10/2009	5/10/2030
G 26/104	9.985	6/10/2009	5/10/2030
G 26/105	9.995	6/10/2009	5/10/2030
G 26/106	9.999	6/10/2009	5/10/2030
G 26/107	10.000	6/10/2009	5/10/2030
G 26/108	11.880	24/08/2012	23/08/2033
G 26/109	12.085	24/08/2012	23/08/2033
G 26/110	8.687	24/08/2012	23/08/2033
G 26/111	5.868	24/08/2012	23/08/2033
G 26/112	10.410	24/08/2012	23/08/2033
G 26/129	9.997	24/08/2012	23/08/2033
G 26/130	9.999	24/08/2012	23/08/2033
G 26/131	9.997	24/08/2012	23/08/2033
G 26/132	9.999	24/08/2012	23/08/2033
G 26/133	9.989	24/08/2012	23/08/2033
G 26/134	9.979	24/08/2012	23/08/2033
G 26/135	9.691	24/08/2012	23/08/2033

Tenement ID	Area (ha)	Date Granted	End Date
G 26/136	9.997	24/08/2012	23/08/2033
G 26/137	9.993	24/08/2012	23/08/2033
G 26/138	9.992	7/10/2009	6/10/2030
G 26/139	9.981	7/10/2009	6/10/2030
G 26/14	2.025	5/03/1985	4/03/2027
G 26/140	10.000	7/10/2009	6/10/2030
G 26/141	9.999	7/10/2009	6/10/2030
G 26/142	9.998	7/10/2009	6/10/2030
G 26/143	9.999	7/10/2009	6/10/2030
G 26/144	9.998	7/10/2009	6/10/2030
G 26/145	9.980	7/10/2009	6/10/2030
G 26/146	9.413	7/10/2009	6/10/2030
G 26/147	9.433	7/10/2009	6/10/2030
G 26/148	9.545	7/10/2009	6/10/2030
G 26/149	9.988	7/10/2009	6/10/2030
G 26/15	24.900	14/02/1986	21/11/2025
G 26/150	8.395	7/10/2009	6/10/2030
G 26/159	4.045	24/08/2012	23/08/2033
G 26/160	2.621	24/08/2012	23/08/2033
G 26/165	33.875	5/11/2008	4/11/2029
G 26/166	453.400	5/11/2008	4/11/2029
G 26/17	37.850	29/07/1986	28/07/2028
G 26/170	127.100	31/12/2999	31/12/2999
G 26/171	82.900	31/12/2999	31/12/2999
G 26/175	28.000	31/12/2999	31/12/2999
G 26/31	1.006	7/07/1988	10/07/2030
G 26/42	9.033	12/09/1989	17/09/2031
G 26/44	9.900	10/04/1991	14/04/2033
G 26/45	9.900	10/04/1991	14/04/2033
G 26/46	9.900	10/04/1991	14/04/2033
G 26/47	6.080	10/04/1991	14/04/2033
G 26/48	9.900	10/04/1991	14/04/2033
G 26/49	9.900	10/04/1991	14/04/2033
G 26/50	9.900	10/04/1991	14/04/2033
G 26/51	9.900	10/04/1991	14/04/2033
G 26/52	9.900	10/04/1991	14/04/2033
G 26/53	9.900	10/04/1991	14/04/2033
G 26/54	9.900	10/04/1991	14/04/2033
G 26/55	9.900	10/04/1991	14/04/2033
G 26/56	9.900	10/04/1991	14/04/2033

Tenement ID	Area (ha)	Date Granted	End Date
G 26/57	9.900	10/04/1991	14/04/2033
G 26/58	9.900	10/04/1991	14/04/2033
G 26/59	9.900	10/04/1991	14/04/2033
G 26/60	9.900	10/04/1991	14/04/2033
G 26/61	9.900	10/04/1991	14/04/2033
G 26/62	9.900	10/04/1991	14/04/2033
G 26/63	9.900	10/04/1991	14/04/2033
G 26/64	7.007	10/04/1991	14/04/2033
G 26/65	6.231	10/04/1991	14/04/2033
G 26/66	9.138	10/04/1991	14/04/2033
G 26/67	9.900	10/04/1991	14/04/2033
G 26/68	4.078	10/04/1991	14/04/2033
G 26/69	8.298	10/04/1991	14/04/2033
G 26/70	7.607	10/04/1991	14/04/2033
G 26/71	7.025	10/04/1991	14/04/2033
G 26/72	9.900	10/04/1991	14/04/2033
G 26/73	9.900	10/04/1991	14/04/2033
G 26/74	9.900	10/04/1991	14/04/2033
G 26/75	9.826	10/04/1991	14/04/2033
G 26/76	9.900	10/04/1991	14/04/2033
G 26/77	9.900	10/04/1991	14/04/2033
G 26/78	9.900	10/04/1991	14/04/2033
G 26/8	128.450	11/03/1986	10/03/2028
G 26/82	7.468	4/03/1992	5/03/2034
G 26/83	5.674	4/03/1992	5/03/2034
G 26/84	4.499	4/03/1992	5/03/2034
G 26/85	9.250	4/03/1992	5/03/2034
G 26/86	4.628	4/03/1992	5/03/2034
G 26/88	8.094	16/10/2009	18/10/2030
G 26/9	99.875	11/03/1986	10/03/2028
G 26/99	3.996	6/10/2009	5/10/2030
L 26/100	0.700	26/07/1988	25/07/2023
L 26/101	0.400	26/07/1988	25/07/2023
L 26/102	0.200	26/07/1988	25/07/2023
L 26/104	0.600	26/07/1988	25/07/2023
L 26/107	0.900	26/07/1988	25/07/2023
L 26/114	2.000	26/07/1988	25/07/2023
L 26/115	2.000	26/07/1988	25/07/2023
L 26/116	2.000	26/07/1988	25/07/2023
L 26/117	2.000	26/07/1988	25/07/2023

Tenement ID	Area (ha)	Date Granted	End Date
L 26/118	2.000	26/07/1988	25/07/2023
L 26/125	3.000	25/10/1988	24/10/2023
L 26/126	0.810	29/11/1988	28/11/2023
L 26/127	7.000	27/09/1989	26/09/2024
L 26/130	2.200	5/04/1989	4/04/2024
L 26/131	2.100	5/04/1989	4/04/2024
L 26/132	2.500	5/04/1989	4/04/2024
L 26/133	2.100	5/04/1989	4/04/2024
L 26/134	1.800	5/04/1989	4/04/2024
L 26/135	2.100	5/04/1989	4/04/2024
L 26/140	0.300	26/09/1989	25/09/2024
L 26/149	0.280	30/03/1990	29/03/2025
L 26/151	34.000	10/12/1990	9/12/2025
L 26/172	2.756	18/09/1991	17/09/2026
L 26/180	21.810	5/02/1993	4/02/2023
L 26/181	1.699	21/11/1991	20/11/2026
L 26/182	2.700	3/04/1992	2/04/2027
L 26/184	10.000	1/05/1992	30/04/2027
L 26/193	1.200	5/02/1993	4/02/2023
L 26/205	2.000	28/07/1997	27/07/2022
L 26/216	13.000	20/08/2012	19/08/2033
L 26/217	54.000	20/08/2012	19/08/2033
L 26/233	54.600	22/11/2004	21/11/2025
L 26/254	1067.000	22/08/2012	21/08/2033
L 26/267	47.000	24/02/2014	23/02/2035
L 26/282	94.483	3/12/2018	2/12/2039
L 26/283	283.734	3/12/2018	2/12/2039
L 26/284	109.970	3/12/2018	2/12/2039
L 26/77	59.800	28/06/1988	27/06/2023
L 26/80	6.250	7/04/1988	6/04/2023
L 26/81	5.036	20/09/1988	19/09/2023
L 26/82	9.100	17/08/1988	16/08/2023
L 26/84	1.100	17/08/1988	16/08/2023
L 26/85	1.200	17/08/1988	16/08/2023
L 26/88	1.200	5/05/1988	4/05/2023
L 26/89	212.000	1/09/1988	31/08/2023
L 26/90	257.500	17/08/1988	16/08/2023
L 26/91	18.650	14/06/1989	13/06/2024
L 26/92	6.000	22/02/1989	21/02/2024
L 26/94	2.360	17/08/1988	16/08/2023

Tenement ID	Area (ha)	Date Granted	End Date
M 26/120	1.741	31/03/1989	30/03/2031
M 26/131	232.900	22/11/1990	27/11/2032
M 26/150	21.690	5/07/1989	10/07/2031
M 26/155	6.464	21/12/1987	30/12/2029
M 26/233	15.145	5/10/1989	9/10/2031
M 26/264	3.217	5/09/1989	6/09/2031
M 26/266	8.528	17/10/1990	22/10/2032
M 26/267	139.200	17/10/1990	22/10/2032
M 26/268	3.825	10/04/1990	18/04/2032
M 26/27	7.983	28/11/1983	20/12/2025
M 26/294	110.900	24/10/1989	25/10/2031
M 26/308	769.550	20/04/1989	23/04/2031
M 26/316	198.500	18/01/1990	21/01/2032
M 26/326	74.875	17/10/1990	22/10/2032
M 26/359	225.000	11/06/1993	14/06/2035
M 26/365	0.912	26/05/1992	28/05/2034
M 26/373	0.518	19/03/1993	22/03/2035
M 26/375	7.467	14/03/1995	14/03/2037
M 26/376	1.178	6/10/2009	5/10/2030
M 26/377	0.874	21/12/1991	5/01/2034
M 26/379	0.538	25/08/1993	30/08/2035
M 26/383	653.450	17/07/1992	16/07/2034
M 26/388	8.427	11/01/1993	10/01/2035
M 26/39	9.713	21/03/1986	2/04/2028
M 26/405	423.800	7/12/1992	7/12/2034
M 26/448	373.300	23/06/2015	22/06/2036
M 26/451	126.300	18/01/1995	19/01/2037
M 26/454	1.642	20/02/1995	20/02/2037
M 26/46	98.405	17/11/1983	21/11/2025
M 26/462	66.450	31/10/2016	30/10/2037
M 26/463	0.123	6/07/2015	5/07/2036
M 26/489	174.850	6/10/2009	5/10/2030
M 26/495	774.900	6/10/2009	5/10/2030
M 26/496	886.400	6/10/2009	5/10/2030
M 26/503	110.150	16/10/2009	15/10/2030
M 26/518	590.000	16/10/2009	15/10/2030
M 26/54	22.890	26/02/1985	25/02/2027
M 26/552	23.850	6/10/2009	5/10/2030
M 26/573	751.000	29/08/2012	28/08/2033
M 26/581	191.450	30/08/2012	29/08/2033

Tenement ID	Area (ha)	Date Granted	End Date
M 26/646	16.025	29/08/2012	28/08/2033
M 26/715	0.675	30/08/2012	29/08/2033
M 26/724	5.260	30/08/2012	29/08/2033
M 26/725	243.300	8/01/2013	7/01/2034
M 26/738	100.400	31/05/2001	30/05/2043
M 26/747	104.500	29/08/2012	28/08/2033
M 26/748	94.290	29/08/2012	28/08/2033
M 26/760	118.700	30/08/2012	29/08/2033
M 26/761	84.495	30/08/2012	29/08/2033
M 26/778	179.750	29/08/2012	28/08/2033
M 26/78	52.045	7/12/1984	17/12/2026
M 26/784	253.800	30/08/2012	29/08/2033
M 26/800	8.000	29/08/2012	28/08/2033
M 26/803	151.200	30/08/2012	29/08/2033
M 26/81	6.893	28/03/1985	27/03/2027
M 26/826	6.000	24/08/2012	23/08/2033
M 26/83	88.840	5/04/1987	7/04/2029
M 26/86	243.650	27/11/1985	26/11/2027
M 26/87	2.765	11/06/1986	10/06/2028
M 26/95	957.100	15/08/1988	17/08/2030
P 26/3779	128.000	20/08/2012	19/08/2020
P 26/3780	82.868	20/08/2012	19/08/2020
P 26/3976	27.600	7/04/2014	6/04/2022

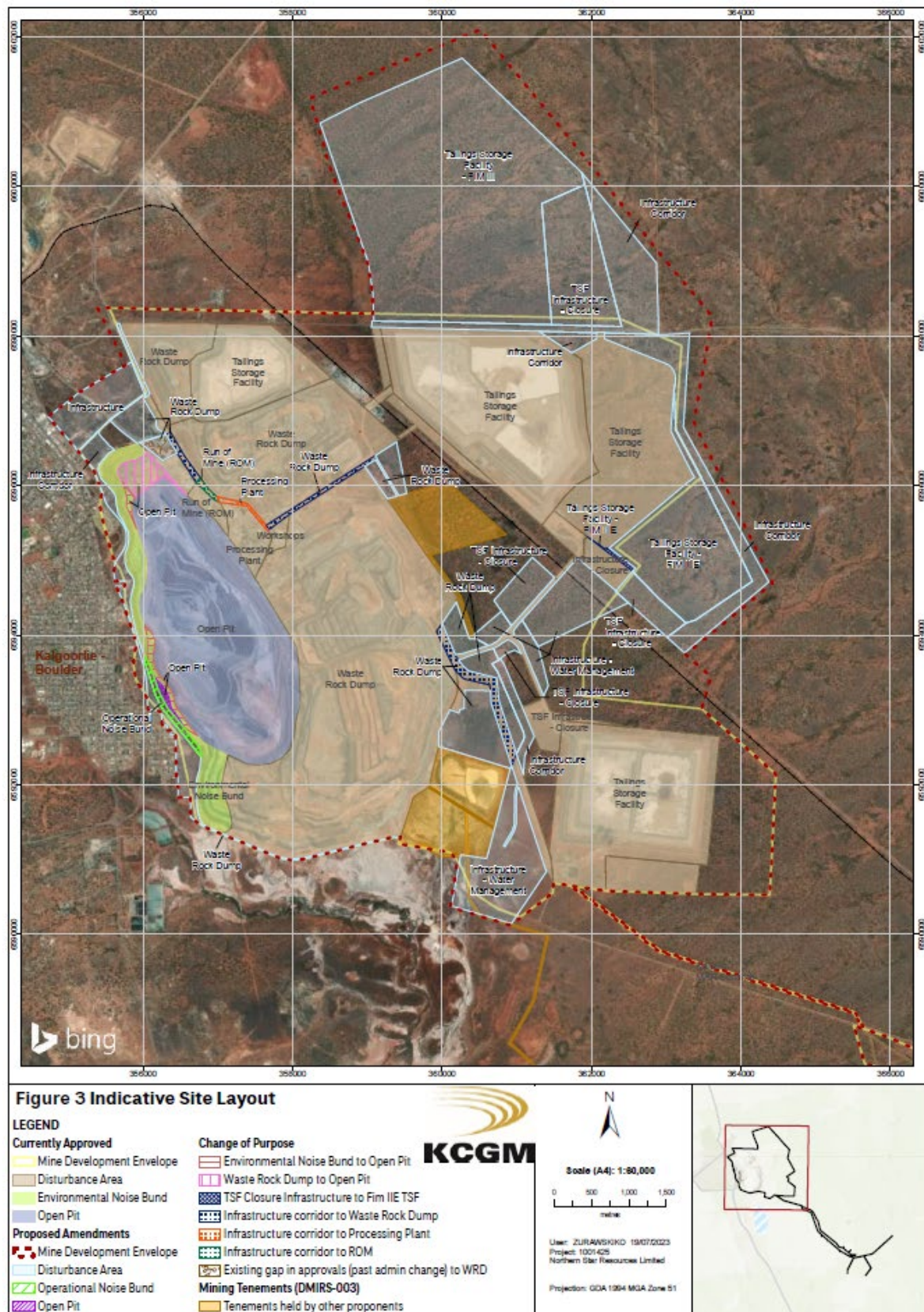


Figure 3: Revised Proposal Site Layout

3.3 Revised Proposal Content

3.3.1 Summary

Proposed changes to the Fimiston Operations include a cutback to the Fimiston Open Pit, addition of a 3rd cell to the Fimiston IIE TSF, construction of a new TSF (Fimiston III TSF) and associated infrastructure, as well as relocation of some supporting infrastructure including the ENB, roads, pipelines and transmission lines (Table 8, Table 9, and Figure 3).

Proposed changes will require expanding the MDE by 1,881 ha. An additional 1,868 ha land disturbance will be required, including clearing of 1,580 ha of native vegetation.

To minimise potential impacts on the Kalgoorlie-Boulder community, the ENB will be modified, with construction of a new operational noise bund (approximately 1.8 km in length) in the vicinity of the public lookout. Design requirements for these modifications have been informed by a series of studies that investigated potential changes to noise, fly rock, and air quality.

Table 8: General Proposal Content Summary (Revised Proposal)

Summary	
Revised Proposal title	Fimiston Gold Mine Operations Extension (Stage 3) and Mine Closure Planning Revised Proposal: Fimiston South Project
Proponent name	Kalgoorlie Consolidated Gold Mines
Short description	The Revised Proposal is to mine a cutback of the existing Fimiston Open Pit, with associated life of mine tailings deposition, waste capacity and associated infrastructure. The proposal includes, but is not limited to: • Increase in the Mine Development Envelope • Ivanhoe cutback of the Fimiston Open Pit • Modifying the Environmental Noise Bund (ENB) • Additional tailings capacity • Additional waste rock dump capacity • Additional infrastructure areas (topsoil storage, roads, pipeline corridors) • Minor infrastructure to manage surface water.

Table 9: Revised Proposal Content Elements (Revised Proposal)

Element	Location/ description	Existing Proposal extent, capacity or range	Proposed amendment (content of s.38)	Combined extent, capacity or range
Physical Elements				
Mine Development Envelope, including: • Fimiston Open Pit • Environmental Noise Bund • WRDs (including stockpiles) • Tailings Storage Facilities	Figure 4:	Clearing of up to 3,973 ha** within the Development Envelope of 5,914 ha.	Additional clearing of 1,868 ha, of which 1,580 ha is native vegetation.	Clearing of up to a total of 5,841 ha within the Development Envelope of 7,795 ha.

Element	Location/ description	Existing Proposal extent, capacity or range	Proposed amendment (content of s.38)	Combined extent, capacity or range
- Run of Mine (ROM) and processing plant - Infrastructure corridors and workshop area (Existing) Managed Aquifer Recharge (MAR) within existing Kaltails Supply Borefield.				
Construction elements – not applicable				
Operational elements				
Fimiston Open Pit footprint spatial limit	Figure 3Figure 4:	Clearing up to 535 ha within Development Envelope	Additional clearing of 39 ha	Clearing up to 574 ha within Development Envelope
Environmental Noise Bund footprint spatial limit	Figure 3	Clearing up to 110 ha within Development Envelope	Reduction of 5 ha	Clearing up to 105 ha within Development Envelope
Greenhouse gas emissions				
Operation				
Annual Average Life of Mine (2024-2034)				
Scope 1		Mining and Processing Operations	Approximately 235,200 tonnes CO ₂ -e	Approximately 235,200 tonnes CO ₂ -e
Scope 2		Electricity use	Approximately 19,800 tonnes CO ₂ -e	Approximately 19,800 tonnes CO ₂ -e
Total (based on annual average Scope 1 and Scope 2) 11 years life of mine (2024-2034)				
Approximately 2,784,380 tonnes CO ₂ -e			Approximately 2,784,380 tonnes CO ₂ -e	Approximately 2,784,380 tonnes CO ₂ -e
Commissioning – not applicable				
Not applicable. Fimiston is currently operational.				
Rehabilitation and closure				
Progressive rehabilitation will be undertaken over the life of mine. Areas disturbed through implementation of this proposal will be designed to be safe and non-polluting and will meet the closure objectives documented in the Mine Closure Plan				
Other elements which affect extent of effects on the environment			Existing Life of Mine	Proposed Life of Mine
Proposal time	Estimated project life		2027	2034

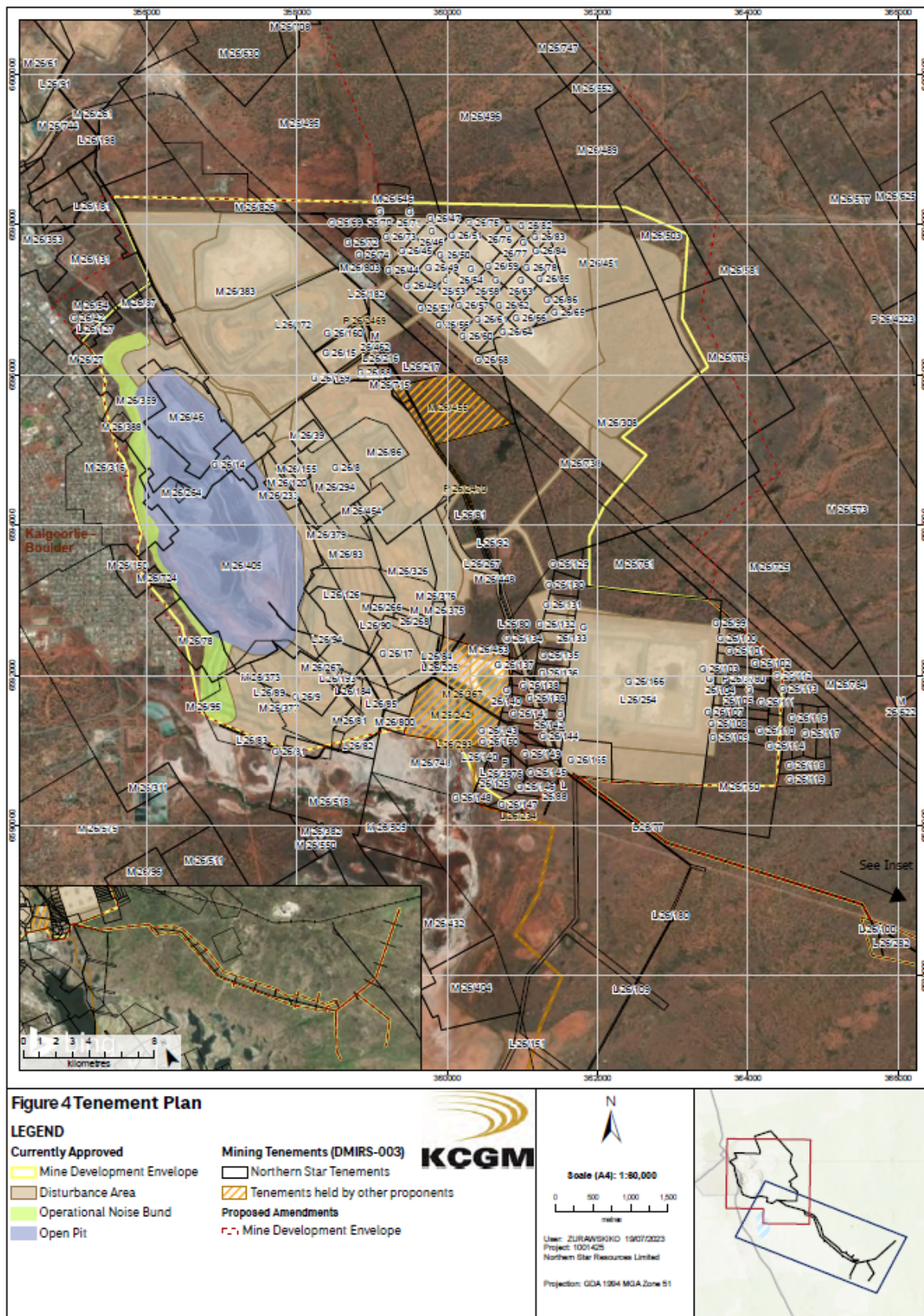


Figure 4: Tenement Plan

3.3.2 Revised Proposal Draft Ministerial Conditions

This Revised Proposal is considered a significant amendment under Section 40AA of the EP Act, which allows the conditions of previous Ministerial Statements to be reviewed during the assessment process. The conditions of MS 782 are proposed to be amended. A review of the existing conditions and Revised Proposal for amendment is presented in Appendix B.

3.4 Revised Proposal Description

3.4.1 Summary

Proposed changes include:

- Expansion of the existing Fimiston Open Pit footprint to allow for the Ivanhoe cutback.
- Expansion of the existing Fimiston IIE tailings storage facility (TSF), with the addition of a third cell.
- An additional TSF, the Fimiston III TSF.
- Eastward extension to the Southern WRD, the Far Eastern Waste Rock Dump (WRD); and
- Upgrade to all supporting civil, structural and electrical services.

These proposed changes will result in an increase to the overall depth and width of the existing Fimiston Open Pit and increase the operational development footprint by 1,868 ha with native vegetation clearing of 1,580 ha as a direct result of the implementation of the Revised Proposal, following approval.

A summary of all proposed changes provided in Table 8 and Table 9.

The proposed changes will require expanding the MDE by an additional 1,881 ha; of which 1,868 ha land disturbance will be required, including the clearing of 1,580 ha of rehabilitated native vegetation. A great majority of this land change occurs on the Eastern side of Fimiston for the development of TSF and WRD facilities. Clearing activities equating to ~40 ha on the western side of Fimiston is confined to the Ivanhoe cut back and relocation works associated with 1.8 km length of the existing ENB in an area of highly disturbed revegetation. In addition, some existing disturbance areas have a change of purpose, with no net increase in existing disturbance; these are clearly demarcated in Figure 3.

3.4.2 Fimiston Open Pit (Revised)

The FS Project includes the mining out of the Ivanhoe cutback, located in the south west sector of the pit. The footprint of Fimiston Open Pit will increase from 535 ha to 574 ha, which represents an increase by approximately 39 ha or 7%.

There will be no change to open pit mining methods currently used at the Fimiston Open Pit, which consist of conventional open pit mining using drilling, blasting, excavation utilising a shovel and haul truck fleet. The Revised Proposal is expected to extend the Life of Mine (LoM) of the Fimiston Open Pit by 7 years, allowing mining of the Fimiston Open Pit to continue until 2034. Existing environmental factor management and associated controls will be unchanged.

The proposed Ivanhoe cutback is located at the south western end of the existing Fimiston Open Pit and is an extension of the southern mineralization; it is consistent with previously mined ore bodies. The cutback and realignment of the noise bund will result in clearing of 3.61 ha of rehabilitation.

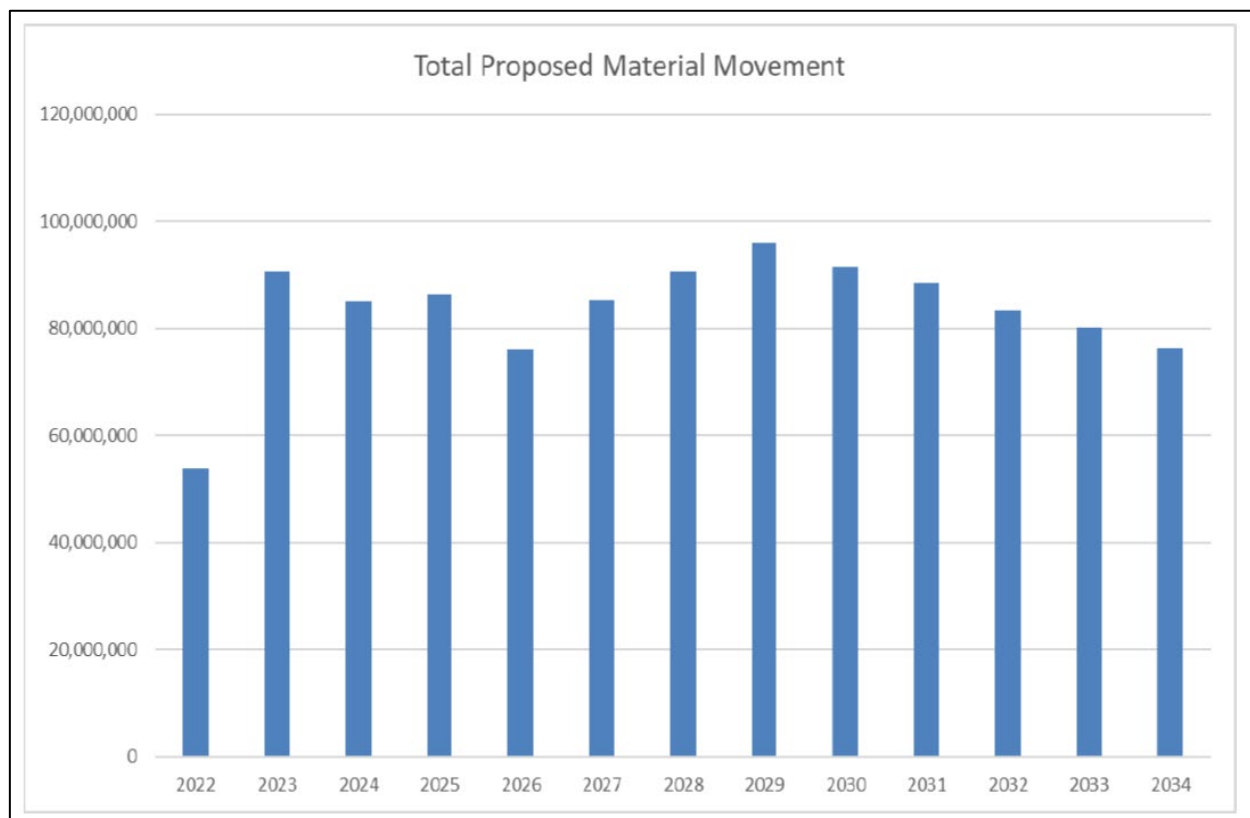


Figure 5: Expected total of material movement for Fimiston South project

As the proposed Fimiston South Project is a cutback of the existing mining area. From metallurgical studies the mineral and waste characteristics are expected to be consistent with the ore that has historically and is currently being mined and processed at the Fimiston and Gidji processing plants and alternate processing methods will not be required. The Fimiston South cutback is primarily in Golden Mile dolerite, with black flag beds (a mix of shale and porphyry) on the eastern extent (KCGM, 2019b). Similar geological units characterise the existing Fimiston Open Pit.

The maximum annual material movement will be approximately 96 Mt, with a graphical summary presented in Figure 5.

The Ivanhoe cutback will be mined in 10 m benches, with approximately ten benches mined in a given year. During the initial stage of the project, waste material will be hauled to the existing surface dumps. Upon completion of the existing Golden Pike cutback, waste dumping will transition to in-pit deposition (Figure 6). Up to 75% of the total waste material from the FS Project will be deposited in-pit. The proposed waste rock and mill haulage routes for the FS Project are shown in Figure 6. These changes over time will have a positive impact on dust and noise emissions.

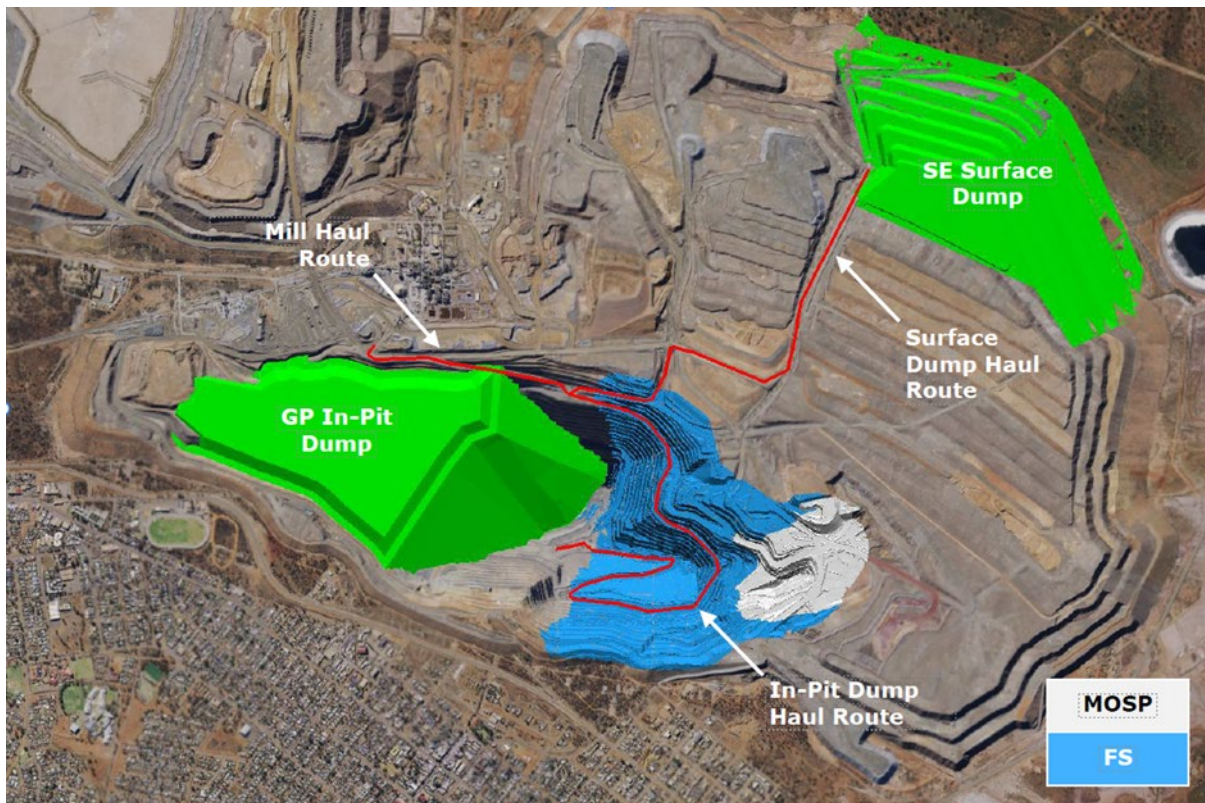


Figure 6: Waste Rock Haulage Routes

3.4.3 Environmental Noise Bund (Revised)

The ENB is located between the residential areas of Kalgoorlie-Boulder and the western edge of Fimiston Open Pit and serves as one of the primary controls to minimise community exposure to noise from mining. The majority of the ENB will remain unchanged by the Revised Proposal. A section approximately 1.8 km long in the vicinity of the proposed cutback will move westwards. The new section is called the Operational Noise Bund, and will be 15 m high. The height of the Operational Noise Bund is determined by noise management requirements, informed by extensive acoustic studies. The Operational Noise Bund will be approved under a Minor and Preliminary Works application, an approval for reversible construction activities. The new bund will occupy less footprint and reduce the overall ENB footprint 110 ha to 105 ha.

3.4.4 Waste Rock Management (Revised)

Waste rock is stored in WRDs located to the south, east and north of the Fimiston Open Pit. The WRDs are in various stages of construction, with progressive rehabilitation implemented on final faces. The maximum height of the WRDs in the south and east of Fimiston operations is restricted by Civil Aviation Safety Authority (CASA) regulations. WRDs are tipped to a design that considers the management of unsuitable materials, such as erodible oxide; the outer section of the WRD is completed with competent benign waste rock to ensure encapsulation of erodible materials.

The Revised Proposal will not introduce any new waste types with different geochemical or physical property to the current waste materials; consequently, no changes to waste rock management methods or WRD designs are proposed. A detailed study of the geochemical characterisation (refer to Appendix U) was undertaken of the fresh rock from the Fimiston Open Pit and it was determined that waste rock is comprised of three main identified lithologies – Golden Mile Dolerite (80%), Paringa Basalt (14%) and

Black Flag Shale (4.5%) (MBS, 2017). Samples were analysed for several parameters including; acid base accounting, acid and metalliferous drainage (AMD) potential and sulfur content.

Currently approved WRDs at Fimiston are expected to provide sufficient storage capacity for this expected volume in the short term. Long term, waste storage in the Fimiston Open Pit will be considered, but stockpile areas are expected to become available for waste rock storage. Waste generation due to open pit mining is expected to continue at current production rates and will generate approximately 1,200 Mt of additional waste rock.

3.4.5 Fimiston Processing Plant

Planned improvements to the Fimiston Processing Plant are expected to modernise the plant and increase the current throughput of approximately 13.4 Mtpa to well over 20 Mtpa. This will allow for processing of the low grade stockpiles concurrently with ore from Mining areas (open pit and underground). Processing of low grade stockpile areas will allow for re-use of the stockpile areas for waste rock material storage, without the need for new clearing.

3.4.6 Fimiston Tailings Storage Facilities (Revised)

The increased throughput at the Fimiston Processing Plant will result in an increase in tailings volumes, with an associated requirement for new TSFs. The Fimiston TSFs are aging facilities and reaching their final capacities. New TSFs will be required for the implementation of the FS Project. The new TSFs will be built to modern specifications, with improved underdrainage systems and other design features, based on local learnings as well as international improvements in tailings performance knowledge in recent years. The new designs are expected to reduce the seepage volumes and increase the Factor of Safety. To accommodate additional tailings produced, KCGM proposes to extend the Fimiston IIE TSF to include a third cell and construct a new Fimiston III TSF (Figure 3). Seepage from the new TSFs will be managed in the same way as currently – through the Prescribed Premises Licence and associated Seepage and Groundwater Management Plans (SGMPs). The TSFs will have sufficient underdrains and abstraction bores to effectively manage seepage and direct it for reuse as processing water.

Neither the Revised Proposal nor the modernisation of the Fimiston Processing Plant will introduce any new waste types with different geochemical or physical property to the current waste materials from Fimiston Open Pit and Mt Charlotte Underground Operations; consequently, no changes to tailings management methods is proposed.

Over recent years, a considerable amount of work has been undertaken on Factor of Safety, improved designs for underdrainage (reduction in total seepage compared to existing TSFs) and alignment of operational design with final closure design.

3.4.7 Support Facilities

Some changes to supporting facilities may be required to relocate or upgrade existing infrastructure. This is expected to be limited to roads, pipeline, and transmission lines.

Allowance has been made for a small amount of clearing in Infrastructure – Water Management areas in the Eastern Floodway. Due to past anthropological disturbance, minor modifications may be required to facilitate natural through flow to occur.

3.4.8 Mine Closure and Zone of Instability (Revised)

Closure designs and actions required for the proposed new FS Project landforms (within this Revised Proposal) have been included in the current MCP 2022 v1, contained in Appendix U.

The underlying strategies, design principles and completion criteria for closure remain unchanged for the Revised Proposal. These have been applied to the new landforms in the Revised Proposal. No new closure risks have been introduced as a result of the Revised Proposal:

- No material change in strategies or design is required.
- No new materials or material of concern which have significant differences in geochemistry, stability or other properties have introduced by the FS Project.
- Management of seepage from TSFs will improve as a result of new design changes planned for the TSFs, such as improved underdrainage.
- Significant geotechnical work has been undertaken for the Fimiston Open Pit walls, to ensure both operational and closure safety and stability.

Final land uses for KCGM will continue to be a combination of:

- Rehabilitated modified landscapes; and
- Zones of restricted access due to safety.

The general strategy has been to adopt post closure land use which aligned as far as practicably with the surrounds and provides the best possible visual amenity to the city residents, but does not preclude future mining in prospective areas, as agreed with key stakeholders, DEMIRS and DPLH. Mining areas (open pits, ore stockpiles) and TSFs will have access restricted for safety reasons.

Mining landforms will be rehabilitated to 'modified landscapes' as per discussions with DEMIRS Geological Survey Section, and DPLH in November 2019. Rehabilitation will aim to encourage vegetation growth where available and rehabilitation materials properties allow, as described in Table 10.

Under the current CKB Town Planning Scheme, the land area currently occupied by the Fimiston Operational area is currently zoned 'rural', with a special control area to protect mining activities at the 'Superpit'. Residential development is restricted in this area.

Table 10: Post-Mining Land Use for Fimiston Domains and Features

Domain	Feature	Proposed Post-Mining Land Use
Mining Infrastructure	Fimiston Open Pit and Sam Pearce Decline	Restricted access due to Safety Portal gate/seal at decline access
	ROM Pad, Crushing Facilities and Stockpiles	Modified landscape ^[1]
	Fuel Farm, Mining Maintenance Workshops	
	Infrastructure areas	Modified landscape
Waste Rock Dumps	All WRDs including encapsulated historic TSFs and Noise Bund	Modified landscape
	Tourist Lookout	Modified landscape
Mineral Processing Infrastructure	Fimiston Plant	Modified landscape
	Infrastructure areas	
Tailings Storage Facilities	Fimiston I, Fimiston II, Fimiston IIE, Fimiston III and Kaltails TSFs	Modified landscape Potentially fenced for Restricted access Excluding pastoral usage
	Tailings Infrastructure	Modified landscape
Water Abstraction and Containment Facilities	Seepage Management Systems Tailings Water Management Systems	Modified landscape
Rehabilitation Materials	Rehabilitation Material Stockpiles	Modified landscape

^[1] KCGM defines 'landscape' as the combination of abiotic (landform materials, surface water flow etc.) and biotic (vegetation and fauna) aspects of a rehabilitated area.

Table 11: Standard Decommissioning and Rehabilitation Approach for Fimiston

Feature	Approach	Proposed Post-Mining Land Use
Domain: Fimiston Mining Infrastructure		
Fimiston Open Pit and Sam Pearce Decline	- Decommission Fimiston Open Pit dewatering bore and salvage equipment. - Implement TSF seepage management water pipeline to the pit, ensuring that the discharge is at a geotechnically appropriate location and low down in the pit. - Update water management approvals as required. - Implement risk-based approach to prevention of inadvertent access in open pit areas, as required by <i>Work Health and Safety Act 2020</i> and <i>Work Health and Safety (Mines) Regulations 2022</i>. If not already completed, complete abandonment bunding and/or other measures. - Implement engineered seals for declines and portals, buttressed with mine waste. - Initially, limit pit access, but still allow geotechnical and water management access to the pit for inspections and monitoring. - Review geotechnical considerations and implement the post closure monitoring accordingly. - At final closure, paddock dump waste on upper pit access ramps to prevent vehicle access.	Restricted access due to Safety Seal decline and portals
Ore Stockpiles and ROM Pads	- Process or sell remaining ore stockpiles or rehabilitate <i>in situ</i>. - Scrape off upper 150mm of ROM pad and either process the material or bury. - Profile outer batters of ROM and stockpiles to less than 20-degree slope angles, to reduce long term erosion and promote stability. - Rip on the contour and seed with native species if the area is identified for revegetation.	Modified landscape
Crushing Facilities	- Dismantle/demolish all structures to below ground level unless specified otherwise. - Break up concrete and bury or dispose of. - Break up scrap metal and recycle where possible. - Reshape surface where required. - Cross rip and seed with native species if the area is identified for revegetation.	Modified landscape
Domain: Fimiston Waste Rock Dumps		
Southern (Trafalgar, Oroya, Eastern, Far Eastern) Northern, North Eastern (Central), Environmental Noise Bund	Implement the Visual Amenity Concept: - Encapsulation of historic TSFs and TSF footprints that are within the waste dump footprint. - Conduct progressive rehabilitation on available areas. For new rehabilitation: - Profile outer batters of landform to reduce long term erosion and promote stability. - Construction of robust crest bunds. - Where appropriate, profile upper surface for water control. - Cover outer surface with appropriate growth medium as per Visual amenity Concept or if available. - Cross rip to ensure correct rock cover on surface, and seed with native species. For the Fimiston South project operational noise bund:	Modified landscape

Feature	Approach	Proposed Post-Mining Land Use
	- Use material to construct the western portion of the abandonment bund, outside the zone of instability. - Remove excess material within Zone of Influence (ZOI). - Rehabilitate the portion (southern section) of the operational noise bund that is outside the ZOI. For existing rehabilitation: - Specifications in alignment with original approvals.	
Domain: Fimiston Mineral Processing Infrastructure		
Plant and Support Infrastructure	- Run down reagent inventory and hydrocarbons prior to closure date. - Salvage remaining gold from plant. - Remove buildings and other infrastructure. - Investigate potential contamination. - Dispose or remediate contaminated material as per Contaminated Sites requirements. - Cyanide decontamination of plant and equipment as per Cyanide Decommissioning Plan. - After decontamination and making safe (particularly electrical risks), implement demolition. - Dismantle/demolish all structures to below ground level unless specified otherwise by appropriate approvals. - Break up hard stand areas. - Break up concrete and other components that will hinder rehabilitation success, bury or remove as per DWER waste disposal requirements. - Break up scrap metal and recycle where possible. - Reshape surface where required. - Cross rip and seed with native species if the area is identified for revegetation. - Dispose of assets: offer to other sites or auction.	Modified landscape
Domain: Fimiston Tailings Storage Facilities		
Fimiston I, Fimiston II, Kaltails, Fimiston IIE, Fimiston III TSFs	- Remove piping, decant pumps and other infrastructure. - Allow sufficient drying time (estimated 2-3 years). - Profile outer embankments (except geotechnical buttresses) to reduce long term erosion and promote stability. - Cover outer slopes and surfaces with appropriate waste rock for erosion protection. - Upper surface of TSFs to be reshaped for water retention and capped with appropriate material for dust management. - Construction of robust crest bunds. - Cross rip and seed with native species if identified for revegetation. - Maintain fencing to restrict access to TSFs until relinquishment or no longer required. - Consider blocking ramps to restrict longer term access by vehicles, which could promote erosion. - Continue seepage and groundwater dewatering (and dispose of abstracted seepage within the Fimiston Open Pit) until monitoring confirms that active management is no longer required. - Backfill all seepage trenches and ponds when no longer required.	Modified landscape Potentially fenced for monitoring period to restrict access. Excluding pastoral usage.

3.5 Revised Proposal Justification and Alternatives

3.5.1 Mine

The City of Kalgoorlie-Boulder was founded to support gold mining operations in the Goldfields region. The mining industry, including KCGM operations, continues to be the cornerstone of the local economy and community today.

Through KCGM's continued engagement with stakeholders and the community, this Revised Proposal is considered to be of significant economic and social benefit to Kalgoorlie-Boulder and broader Goldfields region. This Revised Proposal was determined to be the most beneficial option for the next phase of mining at Fimiston following consideration of options and need to maintain the balance between socio-economic benefits and environmental outcomes.

The FS Project will sustain hundreds of local jobs in Kalgoorlie-Boulder over the next decade, which has been consistently welcomed by local stakeholders throughout KCGM's engagement for the Revised Proposal. KCGM Operations' legacy as a predominately residential mine site is viewed by stakeholders as critical to KCGM's social license to operate within the community, providing a positive flow on effect for the local community and economy.

Mining of the gold ore is necessary for the FS Project to continue and for KCGM to employ the existing Fimiston workforce of 1200 people, including residential employees and contractors. The mining of additional tonnes of ore means that the mine pit will be deeper and more waste will need to be removed to enable access to the ore. The mill will be modernised and upgraded to improve efficiency and to reduce electricity use. The additional mill throughput and resultant tailings will need to be stored in a safe and stable TSF.

Several flora, fauna and hydrology studies have been undertaken to refine the locations of the proposed infrastructure to minimise the impact on the environment. The pit location is restricted to the location of the ore. The options selected for this Revised Proposal were chosen because they have the smallest environmental impact in comparison to the other options.

3.5.2 Tailings Storage Facilities

KCGM commenced LoM TSF planning more than five years ago. Several candidate locations were identified for further consideration. The locations were risk ranked, considering safety, logistical/tenure constraints and high-level environmental considerations. The short list of three candidate locations were investigated further:

- The current location of Fimiston IIE TSF.
- A location North of the existing Kaltails TSF.
- The location of the proposed new Fimiston III TSF.

The location of Fimiston IIE TSF was determined to be the best location for the next TSF to be constructed as the existing active TSFs were reaching capacity. Initial biological and other studies were undertaken from 2014/ 2015 (Botanica) with no significant biological constraints identified. Follow up biological work was undertaken by Phoenix Environmental in 2019/2020, which identified the presence of Priority flora (Then P1) *E. Praecox*. Subsequent *E. Praecox* regional surveys were undertaken which have identified *E. Praecox* is well represented regionally. These studies improved the understanding of how to identify the plants outside of flowering season, which lead to confirmation and evidence that they are well represented in the greater region. The Priority rating of the plant was down-graded from P1 to P2 as a result of this work.

Permitting of the two cell Fimiston IIE TSF was completed in 2021, and construction of the two cells has commenced in 2023. Permitting for the third cell was postponed from the 2021 Section 45C to be included in this Revised Proposal, due to the presence of *E. praecox*.

Further tailings capacity was still required for the FS Project, and the other short listed candidate locations were investigated. For the Fimiston IIE TSF 3rd cell, detailed biological investigations of the footprint were undertaken and *E. praecox* was identified in the footprint. Two potential locations for future TSFs were discounted due to the presence of a P1 SRE species. Further raising the existing TSF cells is not geotechnically favourable.

The chosen TSF locations will require clearing of 13 *E. praecox* plants.

3.5.3 Waste Rock Dumps

Current WRDs dumps are highly constrained and are limited both laterally (by non KCGM tenure, townsite to the west, infrastructure to the south and north) and vertically by CASA tall structure requirements for the airport approach pathways (obstacle limitation of approach).

Future WRD capacity options were investigated, and the following possible options were identified:

- Vertical increase, dependent on protracted CASA / Airport applications and have an ultimate height 'ceiling' for public safety – this has been partially actioned, with continuing discussions with CASA for an additional height increase and lighting requirements.
- Expansion of the southern WRD to the east – the Far Eastern WRD – designed and optimised – see below for further information.
- Optimisation of internal footprints – expansion into areas with existing appropriate approvals that were being used for other activities e.g. former Fimiston workshop laydown area (approvals have been completed and relocation of other users is occurring).
- Reuse of the sub grade areas within the WRD for waste rock disposal – this has been actioned, but requires the low grade material to be dug off and processed prior to the area becoming available for waste rock storage. The modernisation of the Fimiston Processing Plant to allow for increased processing tonnes per annum will substantially facilitate this reuse of internal footprint areas.
- In pit dumping, which is constrained by timing to ensure that ore is not sterilised. This can only be actioned later in mine life.

While some of the options have already been actioned, the reality is that the site is quite constrained by the town to the east and other company tenements to the north and south. The original design footprint of the Far Eastern WRD was substantially larger than that included in this Revised Proposal, but has been reduced to maintain ecological flows through the eastern floodway to minimise indirect impacts on significant species. The current position of the WRD footprint has also been optimised to ensure stormwater will pass through the drainage channel effectively (suitable elevations of the drainage channel to ensure passive flow now and at closure) and will not cause unnecessary flooding and/or damage to the railway or more sensitive areas.

4. LEGISLATIVE CONTEXT

4.1 Environmental Impact Assessment Process

This Environmental Review Document (ERD) has been prepared in accordance with *EPA Instructions on how to prepare an Environmental Review Document*, Version 1.1 March 2022 (EPA 2022). In 2020 DWER/EPA advised KCGM that any additional amendments to MS 782 will need to be submitted under s38 of the EP Act. Following approval of the Revised Proposal, a new Ministerial Statement number will supersede MS 782. Full details of proposed changes to conditions are included in Appendix T.

In accordance with the EPAs *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2021* (EPA 2021) this ERD/Supporting Document aims to provide sufficient information to assist the Decision-Making Authorities to assess the proposed Revised Proposal as a significant amendment to MS 782.

This document and all supporting appendices, describe specific studies and impact assessment conducted by the KCGM prior to submitting this Revised Proposal in 2023.

The objectives of the reviews, additional studies and investigations are to:

- Ensure the full potential of environmental impacts resulting from the Revised Proposal are understood in their entirety by KCGM.
- Identify the potential or any critical issues to inform the development of risk mitigation and optimal management controls (such as redesign of landforms).
- Ensure baseline information is collected and analysed in line with the EPAs Statement of environmental principles, factors, objectives and aims of EIA, version 5.0 April 2023.
- Develop additional or revised management plans in line with the EPAs Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans, version 2.0 October 2021.
- Ensure the EPAs Instruction and Template - How to identify the content of a Proposal, version 1.0 October 2021 is incorporated into KCGM's significant amendment to identify the content of this Revised Proposal under Part IV of the EP Act 1986.
- Ensure preparation of the final Revised Proposal document (ERD/Supporting Document) is in line with EPA's Instruction: How to prepare an Environmental Review Document, version 1.1 March 2022.
- Understand the environmental effects of the proposed significant amendment.
- Understand the combined effects that implementation of the approved proposal and the significant amendment might have on the environment.
- The existing implementation conditions relating to the approved proposal and consideration of whether the existing implementation conditions are adequate to ensure the proposal's ongoing elements are consistent with the EPA's environmental factor objectives.
- Ensure all studies are undertaken and completed by suitably qualified and experienced professionals in their chosen field to ensure both transparency and integrity of information presented for assessment.
- Ongoing consultation between KCGM and the Decision-Making Authorities has included describing the Revised Proposal as well as determining steps to progress appropriate licences and secondary approvals also required to support the Revised Proposals subsequent approval under Part IV of the EP Act.

- KCGM has not undertaken consultation with the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) or referred the Revised Proposal to DCCEEW under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) as the desktop evaluation and field surveys conducted to understand the potential impacts to listed Matters of National Environmental Significance (MNES) concluded that the impacts are not significant impacts. Further described in Section 9.

4.2 Other Regulatory Approvals

The following State decision-making authorities have been identified for this Revised Proposal:

- Minister for the Environment.
- Department of Biodiversity, Conservation and Attractions (DBCAs)
- Department for Water, Environment and Regulation (DWER)
- Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
- Department of Planning, Lands and Heritage (DPLH)
- Department of Health (DoH).

Table 12: Environmental Legislative Framework

Relevant Legislation	Environmental Factor Regulated/Affected	Relevant Approval / Requirement and Status of Relevant Approval
<i>Aboriginal Heritage Act 1972</i> (DPLH)	Aboriginal heritage sites	Archaeological and ethnographic surveys have been conducted for the Mine Activity Areas. An Aboriginal Cultural Heritage Management Plan has been developed in consultation with the Traditional Owners to minimise impacts to cultural heritage.
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (DCCEEW)	Impacts to Matters of National Environmental Significance (MNES)	No MNES within the Mine Activity Areas. Referral under the EPBC Act is therefore not required. Field surveys found evidence of two Threatened vertebrate species, Malleefowl <i>Leipoa ocellata</i> and Chuditch <i>Dasyurus geoffroii</i> (both listed as vulnerable under the EPBC Act) was collected outside the study area. No recent (less than five years) evidence of Malleefowl on the site was identified.
<i>EP Act 1986</i> (Part IV) (EPA)	Key environmental factors regulated under Part IV: - Flora and vegetation - Terrestrial fauna - Terrestrial environmental quality - Inland waters - Social surroundings.	Fimiston operations are approved with conditions in MS 782. On 30 September 2020 a change to MS 782 was granted to approve development of the Fimiston South Project under Part IV of the EP Act. This approval is included in MS 782 Attachment 7. This Revised Proposal seeks approval for a mine extension.
<i>EP Act 1986</i> and EP Regulations 1987 (Part V) (DWER)	Pollution control for emissions and discharges to: - Land. - Surface water. - Ground water. - Air. - Noise.	Fimiston Operations are approved under Prescribed Premises Licence L6420/1988/14. A Works Approval / Licence Amendment will be required to commission the new TSFs.

Relevant Legislation	Environmental Factor Regulated/Affected	Relevant Approval / Requirement and Status of Relevant Approval
<i>Mines Safety and Inspection Act 1994 / WHS Act 2020</i> (DEMIRS)	Human Safety and Mine Abandonment / Closure	Relevant Regulations pertaining to mine closure and associated safety considerations.
<i>Mining Act 1978</i> (DEMIRS)	- Biodiversity, flora, fauna and ecosystem. - Water resources - Mine closure	A new Mining Revised Proposal will be prepared for this mine expansion. KCGM proposes to implement the Fimiston South Project under a revised Mining Proposal and MCP.
<i>RIWI Act (1914)</i>	Water Resources	5C licence to take water. 26D licence to construct or alter well. The Fimiston South Project is anticipated to require additional bores for dewater abstraction. KCGM will comply with approved licences and amend these licences if additional bores or groundwater allocation is required.
<i>Biodiversity and Conservation Act 2016</i>	Terrestrial Fauna	Fauna handling permits will not be required for this Revised Proposal.
<i>Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016</i> Environmental Protection (Noise) Regulations 1997	Noise and Vibration	<i>Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016</i> (2016 Approval) was gazetted to regulate noise and vibration from the Fimiston Operations. This Revised Proposal will comply with conditions in these regulations, including implementation of the approved Noise and Vibration Monitoring Management Plan. Whilst the 2016 Approval expired in March 2021 KCGM has applied for a further approval under regulation 17(1) and is working with the regulators to renew the approval. In accordance with Section 5 of the 2016 Approval, the 2016 Approval continues to have effect until the Minister grants, or refuses to grant, the further approval.
<i>Health Act 1911</i>	Dust	Endorsement of Fimiston Air Quality Management Plan.
City of Kalgoorlie-Boulder Local Planning Scheme	Encroachment of mining activities onto other designated land uses	Approvals will be obtained for encroachment of mining activities into local gazetted reserves and / or roads.
<i>Civil Aviation Safety Regulations 1998</i> (CASR) CASA	Air Space Management	WRD changes (tall structures)
<i>Land Act, 1933; Land Administration Act, 1997 (DPLH)</i>	Interface with urban land	Approvals are required for mining on townsite areas (primarily historic areas) or for degazetting road reserves (mainly historic roads)

5. STAKEHOLDER ENGAGEMENT

5.1 Stakeholder Engagement Process

KCGM is committed to developing and maintaining successful working relationships with stakeholders who are impacted directly and indirectly by mining operations. Specific and tailored communication and engagement is crucial to sustaining effective relationships and maintaining KCGM's social licence to operate within the Kalgoorlie-Boulder community.

KCGM's proximity to the City of Kalgoorlie-Boulder has necessitated the sustained delivery of considered stakeholder engagement. KCGM has an established stakeholder engagement network and utilises a range of mechanisms to facilitate consultation and capture input from the Kalgoorlie-Boulder community on an ongoing basis.

Community safety and concerns are at the forefront of KCGM's planning and ongoing operations, particularly given the proximity of KCGM's operations to the City of Kalgoorlie-Boulder. KCGM undertakes regular and ongoing consultation with the community, through means such as the Community Reference Group (CRG), Public Interaction Line (PIL), Social Impact Assessments (SIA) and Voconiq Local Voices.

5.2 Key Stakeholders

Key stakeholders for the Revised Proposal are summarised in Table 13.

Table 13: Key Stakeholders for the Revised Proposal

Stakeholder Sector	Organisation	Interest
Community Interest Groups	Kalgoorlie-Boulder Urban Landcare Group	Urban land rehabilitation
	KCGM Community Reference Group	KCGM current operations and future plans Impact to residents
Non-Government	Land Holders	Impacts to residents
	Chamber of Minerals and Energy	Interactions with mining industry regulation and policy
	Kalgoorlie-Boulder Chamber of Commerce and Industry	Local and regional development
	Goldfields Aboriginal Business Chamber	Local and regional Indigenous economic development
Indigenous Groups	Marlinyu Ghoorlie Native Title Claimant Group	Native Title Cultural heritage sites Cultural knowledge holders
	Maduwongga Native Title Claimant Group (Claim dismissed 28 April 2023)	Native Title Cultural heritage sites Cultural knowledge holders
Local Government	City of Kalgoorlie-Boulder	Kalgoorlie-Boulder Airport Land Access and property issues Strategic Town Planning Mine Closure Plan Standing invitation to the CRG monthly meetings

Stakeholder Sector	Organisation	Interest
State Government	Department of Planning, Lands and Heritage (DPLH)	Management of land and heritage in WA.
	Western Power / Synergy	Public electricity supply and street lighting
	Police	Public safety and law enforcement
	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Annual Environment Reports Mining Rehabilitation Fund Reports Closure and rehabilitation planning Environmental and Exploration Approvals Mining Proposals Mine Closure Plan
	Department of Water and Environmental Regulation	Prescribed Premises Licences Works Approvals Annual Environment Report Annual Audit Compliance Reporting Annual Inspection Fimiston Air Quality Management Plan Dust events above NEPM PM ₁₀ Standard Air Quality Data Noise Regulation 17 Noise and Vibration Monitoring Management Plan National Pollutant Inventory (NPI) Standing invitation to the CRG monthly meetings Groundwater Licensing Amendments to Ministerial Statements Annual Compliance Assessment Report Noise and Blast Quarterly Monitoring Reports Mine Closure Plan
	Department of Health (DoH)	Fimiston Air Quality Management Plan • Dust events above NEPM PM ₁₀ Standard
	Department of Fire and Emergency Services (DFES)	Fire management and emergency response
	Department of Biodiversity, Conservation and Attractions (DBCA)	Conservation – vegetation, flora and fauna
	Main Road WA (MRWA)	Permitting for haul truck transport on main roads Voids management Road Reserve information Road closures (specifically Goldfields Highway)
	Goldfields Esperance Development Commission	Local and regional development
	Water Corporation	Water management and licensing
	Western Power	Relocation of electrical powerlines (noise bund realignment)

Stakeholder Sector	Organisation	Interest
Commonwealth Government	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Matters of National Environmental Significance (NES)
	Civil Aviation Safety Authority	Kalgoorlie Airport (domestic/commercial)
	Australian Government initiative: Regional Development Australia Goldfields Esperance	Local and regional development

5.2.1 Social Impact Assessment

KCGM acknowledges the recommendations by the International Council on Mining and Metal's (ICMM) 'Mining Principle 9: Social Performance', and the related 'Performance Expectation 9.3: Conduct local stakeholder engagement', which requires companies to conduct stakeholder engagement based on an analysis of the local context.

Across select Northern Star sites, including KCGM, this is developed and analysed via an independently facilitated Social Impact Assessment (SIA), undertaken by an external party experienced in providing this service. The SIA process engages with key stakeholders to identify the social effects of a specific mining project, providing unbiased recommendations of how best to minimise any negative impacts, and maximise positive impacts.

Every five years a Social Impact Assessment (SIA) is commissioned by KCGM to identify what impacts it has, or is perceived to have, on neighbouring communities, and how to avoid, mitigate and manage these impacts (Appendix A). The SIA process engages with key stakeholders to identify the social effects of a specific mining project, providing unbiased recommendations on how best to minimise any negative impacts, and maximise positive impacts. In July 2020, a comprehensive SIA was undertaken for KCGM to understand the priority impacts resulting from mining activities at Fimiston on the community of Kalgoorlie-Boulder.

Conducted by KPMG Banarra, a specialist human rights and social impact advisory team, the SIA process was designed to:

- Understand how KCGM's operations impact on the surrounding community of Kalgoorlie-Boulder – considering social impacts as well as cumulative and human rights impacts, where identified.
- Develop and prioritise strategies to work with stakeholders within the community, with a focus on vulnerable stakeholders.
- Understand any social risks (risks to KCGM) that might influence KCGM's future mine planning and the conduct of its operations.
- Develop management strategies to support KCGM to enhance and support the positive social impacts of its presence and avoid, mitigate or manage negative social impacts.

The SIA revealed twelve priority impacts. In response, a broad Social Impact Management Plan for KCGM was developed to enhance positive impacts and mitigate potential negative impacts. As an addendum to the comprehensive 2020 SIA, an SIA specifically for the FS Project was completed in August 2021 (KPMG, 2021).

It identified nine combined social impacts resulting from the project. These are summarised below:

Positive Social Impacts:

- Increased certainty about future mining activities. Public awareness of FS Project has led to an increased sense of security that mining activities will continue into the future. Stakeholders are aware of the longer-term economic viability of the community due to an extended LoM.
- Support of local employment. The FS Project could provide more local employment opportunities, having a positive flow on effect for the local community and economy.
- Support for Aboriginal employment and procurement. KCGM have provided opportunities for Aboriginal participation through implementing trainee and apprenticeship programs targeted at Aboriginal populations. FS Project will extend the overall life of mine, meaning that these programs will potentially have a longer timeframe to achieve results and maximise involvement of local Aboriginal peoples.
- Support for tourism infrastructure. FS Project provides opportunity for KCGM to relocate and renovate the Super Pit Lookout. This coupled with KCGM's contribution to and partnership with Hannans North Tourist Mine communicates the Operations' long-term commitment to tourism infrastructure.
- Support for local industry. FS Project provides opportunity for KCGM to support local industry through maintaining and increasing procurement of local goods and services, which in turn support local employment and the local economy.
- Provision of local funding and grants. The FS Project will lead to an extension of funding and investment across the local community through funding and grants.

Negative Social Impacts:

- Environmental impacts reduce quality of life. The current effects of blasting, vibration, dust, and noise associated with mining activities is leading to worry that FS Project will further reduce amenity and related quality of life and wellbeing for near-mine residents.
- Fear of increasing FIFO employment. Worry that FS Project will result in an increased use of FIFO labour, leading to reduced residential employment and support to public services and businesses. Lack of a formal employment commitment indicates that current local employment will become less secure in the future.
- Perception that the FS Project blasting will contribute to property damage. Worry associated with perceptions that vibrations caused by the FS Project expansion will contribute to property damage and reduce property values for near-mine residents.
- The principal positive impacts relate to the support of a strong residential work force; the provision of funding and grants for local community groups and tourism infrastructure; and support of local suppliers of goods and services (KPMG, 2021). This overall positive assessment of the potential impact of the FS Project, however, should not detract from the fact that the project will bring mining operations slightly closer to the residents of Boulder. This has the potential to increase some social impacts, particularly during the period in which the ENB is being realigned (KPMG, 2021).
- Despite the numerous challenges identified above, the SIA found that there is a high level of community trust in KCGM. This is particularly valuable in light of the proposed FS Project because it means that if unintended environmental or social impacts emerge during the construction and operation of the Revised Proposal, it will be possible solely for the company to work with the community to find solutions to those impacts. It also makes it easier for the company to maximise the opportunities for a more strategic approach to social and economic development that come with an increase in the LoM (KPMG, 2021).

5.2.2 Local Voices

Voconiq is a data and community engagement company built on a platform of technology and social science developed over a decade in Australia's national science agency, CSIRO. Voconiq uses surveys conducted periodically to bring the unfiltered voice of community into the companies that work alongside them to support stronger, more productive relationships. This service is called Local Voices.

In 2019, KCGM engaged Voconiq to deploy the Local Voices service in Kalgoorlie-Boulder. Local Voices provides Kalgoorlie-Boulder residents and stakeholders opportunity to provide anonymous feedback about KCGM's operations, enabling the company to proactively respond to community concerns and sentiment.

Fundamental to the deployment of Local Voices is the arms-length nature of the relationship between Voconiq is a data and community engagement company built on a platform of technology and social science developed over a decade by Australia's national science agency, CSIRO. Voconiq uses surveys conducted periodically to bring the unfiltered voice of community into the companies that work alongside them to support stronger, more productive relationships.

In 2019, KCGM engaged Voconiq to deploy the Local Voices service throughout the Kalgoorlie-Boulder community. Part of the Local Voices service ensures Kalgoorlie-Boulder residents and stakeholders have an opportunity to provide anonymous feedback about KCGM's operations. This information once delivered back to KCGM enables the company to proactively respond to community concerns and sentiment proactively.

Fundamental to the deployment of Local Voices is the independent nature of the relationship between Voconiq and KCGM to derive social performance data and engage community directly. Since 2019 a total of 2,680 individual community surveys have been collected and included within the analysis of the relationship between KCGM and wider Kalgoorlie-Boulder community. A comprehensive baseline was survey conducted in September 2019, followed by seven quarterly Pulse surveys to track changes over time and allow KCGM to focus on specific issues of community interest as they emerge.

KCGM has used Local Voices to understand community sentiment towards the FS Project. Since December 2020, specific questions related to the FS Project have been included in Pulse surveys, providing multiple time points of data. The included questions related to the level of project awareness and acceptance, KCGM's responsiveness to community concerns, and perceived benefits and impacts related to the Revised Proposal. Community sentiment data collected through Local Voices during this time indicates that: Awareness of the project has increased, in particular from mid-2021.

- Awareness of the project has increased, in particular from mid-2021.
- Acceptance of the project has remained strong and stable over time in the community overall but has increased sharply among near neighbours to the mine since mid-2021.
- Perceived future benefits as a result of the project have increased over time among most community members surveyed. This is reflected in the latest Pulse results from March 2022, with participants agreeing that the FS Project will lead to more:
 - Community investment - 60% participants agreed.
 - Local employment - 67% of participants agreed.
 - Opportunities for local business - 66% of participants agreed.
- Ratings of acceptability of dust, noise and vibration impacts from the mine have either remained stable or declined slightly among community members since April 2020 in the context of increased site activity.

The results of each Pulse survey are publicly available online, promoting transparency and trust between KCGM and the Kalgoorlie-Boulder community. The Local Voices Kalgoorlie-Boulder website can be

accessed here: <https://voconiglocalvoices.com/kalgoorlie-boulder/>. Pulse results were reviewed by senior leadership at KCGM, exploring opportunities to improve operational practices and community engagement, particularly in relation to environmental impact management.

KCGM will continue to utilise Local Voices to engage with community into the future on growth activities and as the FS Project progresses, utilising program data to be responsive to community concerns and feedback in Kalgoorlie-Boulder.

5.3 Stakeholder Consultation Outcomes

Stakeholder engagement and consultation is a critical element to enable good planning process and outcomes. It leads to inclusive planning, informed decision-making and overall, greater confidence in the activity being proposed. KCGM have actively consulted with stakeholders and the surrounding community throughout the development of this Revised Proposal, as summarised below.

5.3.1 Stakeholder Engagement for this Revised Proposal

KCGM has employed a range of strategies to inform and engage with stakeholders and the community to gain an understanding of what the proposed works signify for groups, families, individuals and business owners. The feedback received has been collated and included below.

The consultation and engagement process included:

- Identifying key stakeholders and interests;
- Developing and implementing the consultation and engagement program; and
- Recording stakeholder feedback.

The consultation and engagement program is designed and implemented to present options of the Revised Proposal package and provide opportunities for community and stakeholder feedback to be captured.

Community safety and concerns are at the forefront of KCGM's ongoing planning and operations especially due to the proximity of the Fimiston Operations to the City of Kalgoorlie-Boulder. KCGM undertakes regular ongoing consultation with the community, through means such as the Community Reference Group (CRG), Public Interaction Line (PIL), Social Impact Assessments (SIA) and Local Voices. Table 14 summarises engagement with the community and key stakeholders, in relation to the proposed changes to the Fimiston Open Pit from October 2020 to July 2023. KCGM continues to undertake ongoing consultation with stakeholders in relation to the Revised Proposal.

Table 14: Community and Stakeholder Consultation

Stakeholder	Summary of Consultation	KCGM Response / Outcome
Kalgoorlie-Boulder Community 13 Oct 2020	Diggers and Dealers – Announcement – Approval of Fimiston South Stage 1 by WA Premier at 2020 Diggers and Dealers Forum.	Details of Project were circulated in local media, including the Kalgoorlie Miner and ABC Goldfields Esperance. KCGM to continue community engagement.
Kalgoorlie-Boulder regional business community 19 November 2020	Northern Star's Chief Operating Officer provided an overview of Fimiston South at the annual What's Down the Track	KCGM Operations extended LoM was well received by local stakeholders. KCGM to continue engagement with local businesses as

Stakeholder	Summary of Consultation	KCGM Response / Outcome
	Forum, attended by over 300 local businesses and stakeholders.	Fimiston South progresses to support sustainable development and local procurement outcomes.
Community Reference Group 15 Oct 2020	Presentation of EPA approval announced by Premier to CRG members, and closure planning considerations for KCGM Operations.	KCGM to continue engagement with CRG members as Revised Proposal progresses.
Kalgoorlie-Boulder Community January 2021	Local Voices Pulse Survey with 247 participants completed, exploring operational impacts and benefits.	Survey results released publicly, with a briefing provided to KCGM Operations site leaders and employees. KCGM to continue using Local Voices to understand and respond to community sentiment.
Marlinyu Ghoorlie Native Title Claimant Group 15 February 2021	Refer to KCGM AHCMP (Appendix C - Confidential)	
Community Reference Group March 2021	Overview of stage 1 (s45C design) and stage 2 (s38 design) of the Fimiston South Revised Proposal provided to CRG members, including environmental and approvals, stakeholder engagement plan, execution, and impacts.	KCGM to continue engagement with CRG members as Revised Proposal progresses.
Marlinyu Ghoorlie Native Title Claimant Group 22 March 2021	Refer to KCGM AHCMP (Appendix C - Confidential)	
Local Tourism stakeholders 22 April 2021	Stakeholder consultation workshop with local tourism providers, including Kalgoorlie-Boulder Visitors Centre, GEDC, Eastern Goldfields Historical Society, Hannans North Tourist Mine, to discuss relocation of the Super Pit Lookout as part of the Revised Proposal.	KCGM to ensure that new Lookout is accessible and continues to engage with local tourism stakeholders through the Lookout redevelopment process to enhance opportunities for regional tourism.
Kalgoorlie-Boulder Community April 2021	Local Voices Pulse Survey with 228 participants, exploring operational impacts and benefits related to Fimiston South. Questions included level of project awareness, acceptance, environmental impact management, and opportunities for local business.	Survey results released publicly, with a briefing provided to KCGM Operations site leaders and employees. KCGM to continue using Local Voices to understand and respond to community sentiment.
Community Reference Group June 2021	Presentation of Waste Dump expansion as part of Fimiston South Project to CRG members.	KCGM to continue engagement with CRG members as Revised Proposal progresses
Marlinyu Ghoorlie Native Title Claimant Group	Refer to KCGM AHCMP (Appendix C - Confidential)	

Stakeholder	Summary of Consultation	KCGM Response / Outcome
14 June 2021		
Maduwongga Native Title Claimant Group 28 June 2021	Refer to KCGM AHCMP (Appendix C - Confidential)	
Kalgoorlie-Boulder businesses 16 June 2021	Representatives from Northern Star's Corporate and KCGM Operations Procurement team attended the GE Business Register's 'Meet the Supplier' event, attended by over 300 local businesses. Conversations focused on procurement opportunities for local businesses through Fimiston South.	KCGM's support of the GE Business Register, connecting Goldfields' businesses to procurement opportunities in the region, was well received by local businesses. KCGM to continue engagement with Kalgoorlie-Boulder businesses to enhance local procurement outcomes throughout delivery of Fimiston South.
WA State Government 28 July 2021	Representatives from the WA State Labour Government participated in a site tour of KCGM Operations in July. Delegates were provided with an overview of the Revised Proposal, including KCGM's current activities and future plans across the Goldfields region.	KCGM Operations extended LoM was well received. Questions related to KCGM's employment, procurement, and social investment activities, as well as future planning. KCGM to continue engagement.
Kalgoorlie-Boulder Community July 2021	Local Voices Pulse Survey with 261 participants, exploring operational impacts and benefits related to Fimiston South. Questions included level of project awareness, acceptance, environmental impact management, and opportunities for local businesses.	Survey results released publicly, with a briefing provided to KCGM Operations site leaders and employees. KCGM to continue using Local Voices to understand and respond to community sentiment.
Western Power 4 August 2021	Meeting to discuss KCGM Operations proximity to Western Power assets, and considerations for the Revised Proposal, particularly in relation to open pit blasting and fly rock.	KCGM to continue engagement.
Marlinyu Ghoorlie Native Title Claimant Group 13 August 2021	Refer to KCGM AHCMP (Appendix C - Confidential)	
Regional Development Australia Goldfields Esperance & MLC 26 August 2021	Site tour of KCGM Operations facilitated for representatives from Regional Development Australia Goldfields Esperance (RDAGE) and MLC Mining and Pastoral Region, discussing the Fimiston South Revised Proposal and KCGM's current and future plans.	KCGM to continue engagement.
Community Reference Group August 2021	An update on the Fimiston South Project was shared with CRG members, with request from the CRG for continual	KCGM to continue engagement with CRG members as Revised Proposal progresses.

Stakeholder	Summary of Consultation	KCGM Response / Outcome
	updates on the project and KCGM's approach to impact management.	
Kalgoorlie-Boulder businesses 11 September 2021	Northern Star a key sponsor of the 2021 Goldfields Business Awards, celebrating the achievements of small businesses in the Goldfields Region. KCGM Commercial Manager addressed the audience, attended by over 300 local businesses.	KCGM to continue engagement with local businesses and stakeholders as the Revised Proposal progresses, enhancing sustainable development and local procurement outcomes.
Kalgoorlie-Boulder Community 10 October 2021	Community Information Stall about Fimiston South held by KCGM at the Lorna Mitchell Spring Festival, attended by over 9,000 community members. Discussions were held with approximately 150 people about the Revised Proposal during the event.	Community members overwhelmingly supportive of the project, providing certainty for the local economy and community. Questions related to relocation of the Super Pit Lookout, support of Hannans North Tourist Mine, Williamstown resident engagement, and environmental impact management, particularly in the Boulder area.
Kalgoorlie-Boulder Community November 2021	Local Voices Pulse Survey with 252 participants, exploring operational impacts and benefits related to Fimiston South. Questions included level of project awareness, acceptance, environmental impact management, and opportunities for local businesses.	Survey results released publicly, with a briefing provided to KCGM Operations site leaders and employees. KCGM to continue using Local Voices to understand and respond to community sentiment.
Kalgoorlie-Boulder businesses 16-17 November 2021	Northern Star major sponsor for the Sustainable Economic Growth in Regional Australia Conference (SEGRA). Support of SEGRA included a stakeholder site tour to KCGM Operations, sharing details of the Fimiston South Project and KCGM's current activities and future plans in the Goldfields region.	KCGM Operations extended LoM well received by stakeholders. Questions received through the site tour related to KCGM Operations, the Revised Proposal footprint, employment opportunities and KCGM's approach to social investment.
RDAGE, Assistant Minister for Regional Development 16 November 2021	Overview of Fimiston South Revised Proposal provided by KCGM Operations Open Pit Manager to representatives from RDAGE and Federal Assistant Minister for Regional Development.	Questions related to KCGM's operational practices, including current and future mining activities. The importance of KCGM Operations extended mine life, opportunities for local businesses and training and development opportunities for local people was acknowledged.
Kalgoorlie-Boulder businesses 24 November 2021	KCGM Operations General Manager presented at the Goldfields Esperance Business Register sundowner, providing and overview of the Revised Proposal and procurement opportunities available	Attended by over 200 businesses, questions largely related to how to become registered as a KCGM supplier, future works, and how to connect with site procurement representatives.

Stakeholder	Summary of Consultation	KCGM Response / Outcome
	with KCGM across the Kalgoorlie Production Centre.	
Kalgoorlie-Boulder Community 28 November 2021	Community Information Stall about Fimiston South held by KCGM at the City of Kalgoorlie-Boulder's Lighting of the Christmas Tree Street Party, attended by over 5,000 community members. KCGM representatives facilitated conversations with over 100 residents about the Revised Proposal.	KCGM Operations extended LoM well received by stakeholders. Questions related to relocation of the Super Pit Lookout, support for Hannans North Tourist mine, employment opportunities, the Revised Proposal footprint and anticipated operational impacts.
Kalgoorlie-Boulder Community 5 December 2021	KCGM is an active participant in the 2021 St Barbara's Parade. Details about KCGM's 'Karlkurla Truck' featured in the parade, a 793F CAT Haul Truck painted by Indigenous artist and Goldfields local Danielle Champion, shared in local media as part of KCGM Operations growth story.	The Karlkurla Truck was well received by local stakeholders, with positive media coverage in the Kalgoorlie Miner and on social media. The Karlkurla Truck was one of 39 new 793F CAT Haul Trucks arriving at KCGM Operations as part of Fimiston South, involving and connecting community to KCGM's future plans.
GEDC & WA Department of Transport 10 December 2021	Representatives from the Goldfields Esperance Development Commission (GEDC) and WA Department of Transport participated in a site tour of KCGM operations to better understand current and future operational plans, and their relationship to existing rail infrastructure.	KCGM to continue engagement. The Fimiston South Revised Proposal does not impact existing rail infrastructure.
City of Kalgoorlie-Boulder Airport Manager Jan 2021 – April 2022	Several meetings conducted with the Kalgoorlie-Boulder Airport Manager throughout January 2021 to April 2022, discussing the Fimiston South Revised Proposal and intersection with existing flight path into Kalgoorlie-Boulder.	KCGM to continue engagement as the Fimiston South Project progresses. No current impact on Kalgoorlie-Boulder flight path.
Boulder Traders Network 7 January 2022	Briefing by KCGM Operations General Manager to the Boulder Traders Network, attended by 20 businesses operating in the Boulder area. Briefing included an overview of the Revised Proposal, as well as KCGM's current operations and future plans in the Goldfields.	Questions largely related to relocation of the Super Pit Lookout and opportunities for local tourism providers through this process, environmental impact management, particularly dust, and local procurement. KCGM Operations extended LoM was well received by the group.
Western Power 8 February 2022	Meeting to discuss KCGM Operations proximity to Western Power assets, and considerations for the Revised Proposal, particularly in relation to open pit blasting and fly rock. KCGM accepting of low-level risk of fly rock damaging Western Power assets.	KCGM to continue engagement.

Stakeholder	Summary of Consultation	KCGM Response / Outcome
City & Regional Development Committee 9 February 2022	Update on Fimiston South Revised Proposal provided by KCGM representatives at the City and Regional Development Committee, attended by over 25 local stakeholders.	KCGM Operations extended LoM well received, as well as questions related to employment and procurement opportunities with the Company.
Kalgoorlie-Boulder Community 12 February 2022	Community Information Stall about Fimiston South held by KCGM at the KBCCI's Explore the Goldfields Community Expo, attended by over 10,000 community members. KCGM representatives facilitated conversations with over 50 residents about the Revised Proposal.	KCGM Operations extended LoM was well received, providing certainty to the local economy and community. KCGM's support of local community groups and organisations through donations and sponsorship is valued.
Marlinyu Ghoorlie Native Title Claimant Group 15 February 2022	Refer to KCGM AHCMP (Appendix C – Confidential)	
Kalgoorlie-Boulder Community 26 February 2022	Information Stall at Coles Kalgoorlie, increasing community awareness about the Revised Proposal and providing opportunity for public questions. KCGM representatives facilitated conversations with over 100 residents about the Revised Proposal.	Questions largely related to employment, and the importance of KCGM's residential workforce. There was awareness of the Revised Proposal amongst residents, and a general appreciation for KCGM's engagement activities around the Revised Proposal. Concerns were raised about dust, with impacts being more noticeable over the last 12 months.
Kalgoorlie-Boulder Community March 2022 – June 2022	Radio commercials, recorded by KCGM employees with details about Fimiston South, playing across local radio stations Goldfields Triple M and Hit FM. Commercials shared details about KCGM Operations extended life of mine, directing audiences to the Super Pit website for more information about the Revised Proposal.	Radio commercials well received by Kalgoorlie-Boulder community, connecting KCGM Operations to local residents.
Local Stakeholders 3 March 2022	Information session and site tour for community leaders and partners, including the City of Kalgoorlie-Boulder, Member for Kalgoorlie, GEDC, RDA, KBCCI, WASM, Goldfields Aboriginal Business Chamber, and East Kalgoorlie Primary School. KCGM Operations General Manager provided an overview of the Fimiston South Revised Proposal, providing opportunity for representatives to ask questions about KCGM's current operations and future plans.	KCGM Operations extended life of mine was well received, providing future certainty to the local economy and community. Questions related to availability of housing, employment opportunities, sustainable development opportunities through shared value investment projects, and Aboriginal participation and procurement. KCGM to continue engagement as project progresses.

Stakeholder	Summary of Consultation	KCGM Response / Outcome
City & Regional Development Committee 9 March 2022	Briefing by KCGM Operations General Manager to the KBCCI City and Regional Development Committee, attended by 40 stakeholders. Briefing included an overview of the Revised Proposal, as well as KCGM's current operations and future plans in the Goldfields.	Questions related to employment, procurement, and training opportunities for local people. KCGM Operations extended life of mine and residential employment was also viewed positively.
KBCCI Committee 9 March 2022	Briefing by KCGM Operations General Manager Nick Strong to the KBCCI Board and Executive on Fimiston South.	KCGM Operations' extended life of mine well received, providing certainty and opportunities for the local business community. Questions about KCGM's approach to stakeholder engagement, relocation of the Super Pit Lookout, and employment opportunities also raised.
Marlinyu Ghoorlie Native Title Claimant Group 12 March 2022	Refer to KCGM AHCMP (Appendix C – Confidential)	
Marlinyu Ghoorlie Native Title Claimant Group 18-12 March 2022	Refer to KCGM AHCMP (Appendix C – Confidential)	
Kalgoorlie-Boulder Community March 2022	Local Voices Pulse Survey with 265 participants, exploring operational impacts and benefits related to Fimiston South. Questions included level of project awareness, acceptance, environmental impact management, and opportunities.	Survey results released publicly, with a briefing provided to KCGM Operations site leaders and employees. KCGM to continue using Local Voices to understand and respond to community sentiment.
Kalgoorlie-Boulder Community 12 March 2022	Information Stall at Coles Kalgoorlie, increasing community awareness about the Revised Proposal and providing opportunity for public questions. KCGM representatives facilitated conversations with over 150 residents about the Revised Proposal.	Feedback largely related to job opportunities, Company recruitment processes, and the benefits to Kalgoorlie-Boulder through KCGM Operations extended LoM. Concerns around dust for near-mine residents, particularly in the Boulder area, and FIFO contract workers were also raised.
Boulder Community 15 March 2022	A letter and information sheet with key details about the Fimiston South Project was delivered on the 15 March 2022 to 120 residents and business owners within 400 metres of the proposed project footprint. This included details about the slight modification of the ENB near the South Boulder Industrial Area to accommodate future mining activities,	One enquiry from a South Boulder resident was received, relating to concerns around dust, particularly for properties in close proximity to the Fimiston Open Pit. Details about KCGM's dust monitoring and management process provided.

Stakeholder	Summary of Consultation	KCGM Response / Outcome
	with works scheduled to take place in late 2023, to early 2024.	
Prime Minister Australia 18 March 2022	Prime Minister of Australia and Member for O'Connor visited KCGM Operations in March, receiving an overview of the Fimiston South Revised Proposal and KCGM's current activities and future plans in the Goldfields region.	Questions related to employment opportunities, current operational challenges, and mining operations.
Kalgoorlie-Boulder Community 19 March 2022	Information Stall at Coles Kalgoorlie, increasing community awareness about the Revised Proposal and providing opportunity for public questions. KCGM representatives facilitated conversations with over 100 residents about the Revised Proposal.	Feedback related to Local Voices program, employment opportunities for local people, and the benefits of KCGM Operations extended LoM. Concerns around environmental impacts including dust and noise, were also raised.
City of Kalgoorlie-Boulder & GEDC 30 March 2022	Meeting with City of Kalgoorlie-Boulder and Goldfields Esperance Development Commission to discuss relocation of the Super Pit Lookout.	Considerations for relocation of the Super Pit Lookout were discussed, including accessibility requirements, access, and location. KCGM Operations' proximity to Boulder Camp was also discussed.
WA Premier & MLA Kalgoorlie 31 March 2022	WA Premier and MLA Kalgoorlie were provided with a briefing on Fimiston South and KCGM Operations in March 2022 at the Super Pit Lookout.	Questions related to current operational challenges, and local employment, procurement and social investment opportunities resulting from the Revised Proposal.
Community Reference Group 21 April 2022	KCGM Operations General Manager provided an overview of the Revised Proposal to the CRG members, including details on KCGM's current operations and future plans in the Goldfields region.	CRG members were highly interested in relocation of the Super Pit Lookout, and community engagement activities undertaken by KCGM for the Revised Proposal.
Boulder Community 5 April 2022	Community Information session about Fimiston South hosted at the Boulder Bowls Club by KCGM Operations' General Manager. Session provided an overview of the Revised Proposal stages, anticipated impacts, and opportunities for the Kalgoorlie-Boulder community resulting from the Fimiston South Project. Session was attended by 10 residents and businesses in the Boulder area.	Community concerns raised about the impact of dust from the Fimiston Open Pit on near mine residents, particularly those in the South Boulder area, and KCGM's environmental monitoring and management processes. Closure of the Goldfields Highway during the first 12 months of the Fimiston South Project for blast activities was also raised, with details of KCGM's plans to mitigate impacts on businesses and residents shared.
Marlinyu Ghoorlie Native Title Claimant Group 5-11 April 2022	Refer to KCGM AHCMP (Appendix C – Confidential)	

Stakeholder	Summary of Consultation	KCGM Response / Outcome
City of Kalgoorlie-Boulder Council 2 May 2022	KCGM Operations General Manager provided an overview of the Revised Proposal to the City of Kalgoorlie-Boulder Council, including details on KCGM's current operations and future plans in the Goldfields region.	Questions related to availability of housing, KCGM's workforce attraction and accommodation strategy, and environmental impact management, particularly dust and noise management strategies to mitigate impacts to Boulder residents. Williamstown relocation program well received, seen to proactively address community concerns towards mining impacts.
Golden Mile Milling 5 May 2022	KCGM Social Performance and Environment representatives met with the General Manager of Golden Mile Milling to provide an overview of the Fimiston South Project.	KCGM to continue engagement as the Fimiston South Project progresses.
EPA 11 May 2022	Meeting with WA EPA to provide an overview of the Revised Proposal prior to submission of the Section 38 Referral for Fimiston South in 2022.	Feedback from EPA, particularly in relation to the WA <i>Environmental Protection Act</i> requirements, incorporated into Fimiston South Section 38 Referral. KCGM to continue engagement.
KCGM Community Reference Group 20 May 2022	CRG members were provided with an update on the Fimiston South referral, including feedback received from key stakeholders about the Revised Proposal to date.	KCGM to continue engagement with the CRG as Fimiston South Project progresses, including facilitating opportunities to meet operational leaders.
Kalgoorlie-Boulder businesses 9 June 2022	Northern Star was the main sponsor of the inaugural Kalgoorlie Commodities Forum, attended by over 200 local businesses. The Forum included a site tour to KCGM to understand the Revised Proposal footprint and impact management strategies. KCGM also shared details about the Fimiston South Project and procurement opportunities with the company through forum presentations.	Local business representatives were interested to learn about opportunities to supply goods and services to KCGM. The company's support of local employment and procurement, as well as the KCGM's extended LoM, was well received by stakeholders. KCGM to continue engagement.
Marlinyu Ghoorlie Native Title Claimant Group 14 June 2022	Refer to KCGM AHCMP (Appendix C – Confidential)	
Goldfields Aboriginal Business Chamber (GABC) 7 July 2022	Northern Star was the main sponsor of the GABC's Aboriginal Business Forum and Trade Show, sharing details about the Revised Proposal and the company's commitment to spend at least \$20M pa with local Indigenous businesses by financial year (FY) 24.	KCGM to continue engagement with local Indigenous businesses, sharing details of upcoming procurement and contract opportunities with the company.

Stakeholder	Summary of Consultation	KCGM Response / Outcome
City of Kalgoorlie-Boulder Council 11 July 2022	KCGM Operations General Manager provided an additional briefing to the City of Kalgoorlie-Boulder Council on the Fimiston South Project, with a focus on workforce planning and accommodation considerations.	Questions related to KCGM's long-term workforce attraction and accommodation strategies, particularly in relation to the current shortages of rental accommodation in Kalgoorlie-Boulder. KCGM to continue to engage with the City to identify sustainable solutions for workforce accommodation.
Marlinyu Ghoorlie Native Title Claimant Group 18-20 July 2022	Refer to KCGM AHCMP (Appendix C – Confidential)	
DWER 21 July 2022	Briefing meeting to discuss the Fimiston South Project, specifically noise modelling for the Fimiston Open Pit, <i>Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016</i> and revised KCGM Noise and Vibration Monitoring and Management Plan (Provisional).	KCGM to continue engagement as Fimiston South Project progresses.
Marlinyu Ghoorlie Native Title Claimant Group 25-31 July 2022	Refer to KCGM AHCMP (Appendix C – Confidential)	
Boulder Traders Network 8 August 2022	Update on the Fimiston South Project was provided to 10 businesses and stakeholders operating in the Boulder area.	Questions largely related to relocation of the Super Pit Lookout and opportunities for local tourism providers in Burt Street. KCGM to continue engagement.
City of Kalgoorlie-Boulder 10 August 2022	KCGM representatives participated in consultation for the City of Kalgoorlie-Boulder's Airport Masterplan, discussing the Fimiston South Project and planning considerations for future developments at the Kalgoorlie-Boulder Airport.	KCGM to continue engagement.
Kalgoorlie-Boulder businesses 10 September 2022	Northern Star a key sponsor of the 2022 Goldfields Business Awards, celebrating the achievements of small businesses in the Goldfields Region. KCGM Commercial Manager addressed the audience, attended by over 300 local businesses.	KCGM to continue engagement with local businesses and stakeholders as the Revised Proposal progresses, enhancing sustainable development and local procurement outcomes.
Kalgoorlie-Boulder Community September 2022	Local Voices Pulse Survey with 273 participants, exploring KCGM's operational impacts and benefits, and the company's relationship with the Kalgoorlie-Boulder community.	Survey results released publicly, with a briefing provided to KCGM Operations site leaders and employees. KCGM to continue using Local Voices to understand and respond to community sentiment.

Stakeholder	Summary of Consultation	KCGM Response / Outcome
Kalgoorlie-Boulder businesses 17 November 2022	KCGM General Manager provided an update on the Revised Proposal at the annual <i>What's Down the Track Forum</i> , attended by over 300 local businesses and stakeholders.	KCGM to continue engagement with local businesses and stakeholders as the Revised Proposal progresses, enhancing sustainable development and local procurement outcome
City of Kalgoorlie-Boulder Boulder Community November 2022	KCGM applied to the City of Kalgoorlie-Boulder to have small sections of existing roads in the South Boulder Industrial Area permanently closed. As part of the road closure application, KCGM delivered a letter to 120 businesses and residences within 450m of the Fimiston Open Pit, advising them of the proposed noise bund realignment and intention to conduct further engagement and consultation in early 2023.	KCGM to continue to engagement with businesses and residences in the South Boulder Industrial Area as the Revised Proposal progresses.
Marlinyu Ghoorlie Native Title Claimant Group 31 January – 5 February 2023	Refer to KCGM AHCMP (Appendix C – Confidential)	
WA EPA February 2023	Application for Minor and Preliminary Works associated with the Revised Proposal lodged with the WA EPA, including a stakeholder engagement plan.	KCGM to continue engagement with the WA EPA and stakeholders identified for realignment of the environmental noise bund.
Kalgoorlie-Boulder Businesses & Stakeholders 16 February 2023	KCGM hosted <i>Business After Hours</i> at the West Australian School of Mines in partnership with the KBCCI, City of Kalgoorlie-Boulder and Royal Flying Doctor Service. The event was attended by 100 local businesses and stakeholders. KCGM General Manager presented at the event, providing an update on the Revised Proposal, specifically KCGM's plans for early and preliminary works.	KCGM to continue to engage with local businesses and stakeholders as the Revised Proposal progresses.
Federal Government – Prime Minister of Australia 20 February 2023	KCGM hosted Prime Minister of Australia, Federal Minister for Resources, and State Member for Kalgoorlie for a site tour, with senior leaders providing an overview of the Revised Proposal and anticipated benefits through the project for the Goldfields region and community.	KCGM to continue engagement with the Federal and State Government as the Revised Proposal progresses.
Kalgoorlie -Boulder Community March 2023	Local Voices Pulse Survey with 249 participants, exploring KCGM's operational impacts and benefits, and	Survey results released publicly, with a briefing provided to KCGM Operations site leaders and employees. KCGM to continue using

Stakeholder	Summary of Consultation	KCGM Response / Outcome
	the company's relationship with the Kalgoorlie-Boulder community.	Local Voices to understand and respond to community sentiment.
DEMIRS 27 March 2023	KCGM General Manager hosted the DEMIRS Executive Leadership Group at the Super Pit Lookout, providing the group with an overview of the Revised Proposal and associated early and preliminary works.	KCGM to continue engagement with DEMIRS as the Revised Proposal progresses.
Goldfields Aboriginal Business Chamber 5 April 2023	KCGM launched a three-year partnership with GABC to deliver the 'Stronger Business' program in the Goldfields. The 'Stronger Business' program aims to support the capacity and capabilities of Indigenous businesses in the region and connect them to long-term supply contracts at KCGM.	KCGM to continue engagement with local Indigenous businesses, sharing details of upcoming procurement and contract opportunities with the company.
Goldfields Aboriginal Business Chamber 3 May 2023	KCGM hosted a supplier briefing event in partnership with GABC, attended by over 50 representatives from local Indigenous businesses. KCGM General Manager provided an overview of the Revised Proposal, and upcoming opportunities for local Aboriginal businesses at KCGM.	KCGM to continue engagement with local Indigenous businesses, sharing details of upcoming procurement and contract opportunities with the company.
KCGM Community Reference Group 4 May 2023	Update on the Revised Proposal, specifically the Noise bund realignment provided to CRG members in May 2023.	KCGM to continue engagement with CRG members as proposal progresses.
Goldfields Aboriginal Business Chamber 6 July 2023	Northern Star was the main sponsor of the GABC's <i>Aboriginal Business Forum and Trade Show</i> , sharing details about the Revised Proposal and the company's commitment to the establishment of sustainable supply contracts to the value of \$20M pa with local Indigenous businesses by FY24.	KCGM to continue engagement with local Indigenous businesses, sharing details of upcoming procurement and contract opportunities with the company.

Letters of support for the Revised Proposal are presented in Appendix B.

5.3.2 Summary – Community Concerns Relating to the Revised Proposal

The presence of KCGM's current Fimiston Operations adjacent to light industrial areas and some residential properties, means that some residents experience blasting, ground vibration and dust associated with the day-to-day KCGM operational activities. This is reflected in Local Voices data, which reveals that ratings of acceptability of dust, noise, and ground vibration from KCGM Operations have either remained stable or declined slightly among these community members since April 2020 (even though there has been increased site activity during this time).

The Revised Proposal may heighten the experience of these potential impacts for those businesses or residents located near the project area, specifically in the initial stages of surface works of the project. KCGM has been transparent about the potential extent of environmental impacts resulting from the Revised Proposal being implemented throughout the entirety of community and stakeholder engagement. This includes closure of the Goldfields Highway for short periods of time to accommodate risk reduction activities for surface level open pit blasting during the first 6-12 months of implementing cutback activities (as required, not continually). This was also the case for the early period of the Golden Pike Cutback (current approval).

Environmental impact assessment studies and modelling for particulate matter, noise and ground vibration were undertaken to support the Revised Proposal, these have been included as Appendix E, Appendix M and Appendix O.

5.3.2.1 Particulate Matter (Dust)

KCGM is aware of community concerns, particularly amongst stakeholders positioned near-by in relation to the too perceived dust impacts from mining and processing activities. From the data collected through Local Voices and consultation opportunities from near-by residents, KCGM understands that residents within the Boulder and South Boulder areas may have experienced an increase in dust impacts over the last 12 months in the context of generally increased site-based activity.

The management of air quality (emissions, particulates or dust) is managed through the implementation of the approved Fimiston Air Quality Management Plan (Appendix F) as discussed in Section 6.3.

5.3.2.2 Blast Vibration

KCGM is aware of concerns amongst some near-by stakeholders associated with general perceptions that ground vibration resulting from blasting activities might contribute to property damage and/or potentially reduce property values of properties located near-by. Due to the Revised Proposal requiring surface blasting to initiate cutback activities, an independent impact assessment was completed to assist understanding the risk potential, this has been included as Appendix M.

Noise and vibration are managed through the implementation of the Noise and Vibration Monitoring Management Plan (Appendix P) discussed in Section 6.4.

5.3.2.3 Local Employment

The Revised Proposal and the continuation of the Fimiston Operation will sustain hundreds of local jobs in Kalgoorlie-Boulder area over the next decade, which has been consistently welcomed by local stakeholders throughout KCGM's engagement and consultation supporting the Revised Proposal.

KCGM's legacy as a predominately residential mine site is viewed by stakeholders as critical and provides opportunities for additional local employment; this is paramount to KCGM's social licence by providing continued positive flow on effects for the local community and economy.

However, at the time the Fimiston South SIA was conducted in August 2021, there were concerns that the proposed works would result in an increased use in FIFO labour. To alleviate stakeholder concerns and ensure there is strong community awareness and confidence, KCGM Operations will remain predominantly residential. KCGM leaders and company representatives have consistently stated that KCGM is committed to maintaining a residential workforce throughout all engagement for the Revised Proposal.

The FS Project will allow KCGM to continue to employ the existing Fimiston workforce of 1,200 people, including residential employees and contractors.

5.3.2.4 Local Procurement

Through engagement with local businesses and stakeholders, the importance of local procurement and supporting local businesses was routinely raised with KCGM. There is great confidence across stakeholders in KCGM's increased LoM through the FS Project, including the economic opportunities, will provide support to the long-term sustainability and viability of the local community and town.

KCGM consistently considers the positive impact of supporting local businesses when assessing procurement opportunities to ensure we maximise opportunities within our local supply chains. This was evident in 2021, with Northern Star spending over \$564 million in the Kalgoorlie Production Centre region, including KCGM, with suppliers and businesses based in Kalgoorlie-Boulder, Coolgardie, and Kambalda. This reflects 22.23% of Northern Star's total group spend.

Additionally, key multi-year partnerships with Goldfields Aboriginal Business Chamber (GABC) and Kalgoorlie Boulder Chamber of Commerce and Industry (KBCCI) further strengthen these relationships with local businesses and provide further engagement and procurement opportunities. A sustainable and culturally appropriate framework has also been developed to increase the number and value of Indigenous supply contracts at KCGM.

5.3.2.5 Social Investment

As revealed through the FS Project SIA (Appendix A), a key aspect of the Revised Proposal is that it supports the extension of KCGM Operations' LoM to 2034, allowing for both positive and negative impacts to occur over a longer period of time. While this requires a significant investment in resources to manage or enhance these impacts, it also provides KCGM the opportunity to thoroughly consider a longer-term approach to community engagement and relationships.

There is an expectation from stakeholders that KCGM continues to invest into the Kalgoorlie-Boulder community to create and support sustainable development outcomes that benefit the region in the long-term. Future contributions to the community in terms of funding and grants, and support for tourism infrastructure, were valued by stakeholders and demonstrated the Company's commitment support local.

5.3.2.6 Complaints Management

KCGM prioritises the minimisation of impacts on the Kalgoorlie-Boulder community. Where residents consider they have been impacted by KCGM Operations, the Social Performance team manages the concern as per KCGM's External Complaints Grievances and Concerns Procedure. This includes initial phone discussions via the KCGM Public Interaction Line (PIL) or face to face visits with the resident, with follow up discussions as required to reach a resolution.

5.3.2.7 Boulder Camp

Boulder Camp is a free camping and temporary accommodation facility predominately utilised by Aboriginal and Torres Strait Islander peoples visiting Kalgoorlie-Boulder from remote communities in the Goldfields region. Boulder Camp is maintained by the City of Kalgoorlie-Boulder, and in the 2021-2022 State Budget the WA Government committed \$510,000 to undertake upgrades at the facility. Boulder Camp is located off the Goldfields Highway, towards the southern end of the Fimiston Open Pit.

KCGM has engaged with the City of Kalgoorlie-Boulder, Goldfields Esperance Development Commission and Member for Kalgoorlie to discuss relocation of the Super Pit Lookout as part of the Fimiston South Project and considerations for Boulder Camp. KCGM does not anticipate that users of Boulder Camp will experience any change in impacts as a result of the FS Project and will continue to engage with the City and State Government as the project progresses.

5.3.2.8 Social Investment

As revealed through the FS Project SIA, a key aspect of the Revised Proposal is that it supports the extension of KCGM's life of mine to 2034, allowing for both positive and potential negative impacts to occur over a longer period of time. This provides KCGM the opportunity to thoroughly consider a longer-term approach to community engagement and Investment.

There is expectation from stakeholders that KCGM continues to invest in the Kalgoorlie-Boulder community to create sustainable social development outcomes that benefit the region long-term. Future contributions to the community in terms of funding and grants, and support for tourism infrastructure, were valued by stakeholders and demonstrated the Company's commitment to place.

A key example of this is KCGM's recent partnership 'Nguarra Nintipayi' with Boulder Primary School, formalised in July 2022. Nguarra Nintipayi will transform the school's aging library into a specialised Science Technology Engineering and Maths (STEM) learning hub, supporting engagement and educational outcomes for students and families in the Boulder area.

Boulder Primary's community is diverse and socially disadvantaged, placed in the bottom 10% of Australian schools according to the Community Social-Educational Advantage Index. The Revised Proposal aligns with the United Nations Sustainable Development Goals, addressing quality education, reduced inequalities, and providing future opportunities for decent work and economic growth.

Partnership with Nguarra Nintipayi will assist KCGM to build positive, long-term relationships with Boulder Primary School students, families, and the wider Boulder community. KCGM employees will be actively involved in delivery of the partnership, helping to support sustainable development and education outcomes for the Boulder community.

KCGM has also established or renewed partnerships with the East Kalgoorlie Primary School, Kalgoorlie-Boulder Urban Landcare Group, City of Kalgoorlie-Boulder, the Kalgoorlie-Boulder Chamber of Commerce and Industry, YMCA WA, and the Goldfields Aboriginal Business Chamber over the last 12 months. These partnerships are critical to KCGM's engagement with local communities.

5.4 Aboriginal Heritage

5.4.1 Technical Guidance

The EPA released , Technical Guidance – Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage (EPA, 2023c) under the environmental factor: social surrounds in November 2023 in response to the commencement of amendments to the *Aboriginal Heritage Act 1972* (AH Act) in 2023,.

5.4.2 Purpose

The Technical Guidance (EPA, 2023c) has been developed to outline the EPA's Environmental Impact Assessment (EIA) process in relation to Aboriginal cultural heritage and whether a proposal is likely to have a significant effect on the EPA Environmental Factor - Social Surrounding, as it relates to Aboriginal cultural heritage, and if it should be assessed by the EPA. It also outlines how the EPA may consider the statutory decision making processes outline in the AH Act. KCGM are proposing an amendment to the current MS 782 under Section 38 significant amendment under the EP Act, therefore this factor applies.

5.4.3 Technical Guidance Context

The EPA guidance (2023c) defines Aboriginal cultural heritage as "the tangible and intangible elements that are important to the Aboriginal people of the state, and are recognised through social, spiritual,

historical, scientific or aesthetic values, as part of Aboriginal tradition. It includes Aboriginal places, objects and cultural landscapes.” In summary, the knowledge or oral expression of Aboriginal traditional elements that are important to the Aboriginal people of the State, and are recognised through social, spiritual, historical, scientific or aesthetic values, as part of Aboriginal tradition.

“Aboriginal people have lived on this land for more than 65,000 years and in doing so have developed a living culture that is bound in tradition and manifested through, among other things, familial connections, languages, stories, songs, spiritual beliefs and practices, knowledge, art, sentiment and through the skilled adaptation of resources provided by the land and water” (EPA, 2023).

KCGM have applied the concepts to review if the guidelines trigger a review of assessments under this environmental factor (due diligence). This internal assessment has concluded that the context of the interim factor is captured and included within the Revised Proposal and Aboriginal Culture Heritage Management Plan (ACHMP) (KCGM, 2023c). This includes clear understanding of differences between:

- Proposal footprint as the area of direct disturbance under this environmental factor;
- Entire study or study area as the area directly linked to a study or assessment, which may cross other area boundaries;
- Development envelope (DE) a larger area to capture future development or operations; and
- Mine Development Envelope (MDE) includes all currently approved and future proposed activities.

5.4.4 Heritage Engagements

KCGM consider Indigenous peoples to be key stakeholders and recognise that to thrive as a business, we need to gain and maintain these enduring, trust-based relationships. This makes the engagement of Indigenous peoples critically important to KCGM.

KCGM’s engagement with Indigenous peoples is aligned with the ICMM Position Statement on Indigenous Peoples and Mining, and our further commitment to uphold the principles of Free, Prior and Informed Consent. This commitment includes the engagement of Indigenous peoples in relation to projects situated on their traditional lands. This allows us to understand any areas of concern, and factor that into our operational planning and priorities.

5.4.5 Heritage Management

Native title for the Kalgoorlie-Boulder region has not been determined. There is one native title claim over land KCGM Operations is located – Marlinyu Ghoorlie.

In preparation for the FS Project, the Marlinyu Ghoorlie Directors Group were invited to KCGM in March 2022. Whilst on-site, the group was able to gain a greater understanding of the MDE, as well as the mine’s current activities and future plans in the Goldfields region. The site tour was hosted by senior leaders within the business, including the KCGM and Kalgoorlie Operations General Managers.

Throughout planning and delivery of the FS Project, KCGM will continue to seek feedback from Traditional Owners on our proposed activities, reaching agreement on what mining or exploration activities can occur on the land, and how these activities will occur.

A Preliminary Advice Report was received from Terra Rosa Consulting on behalf of Marlinyu Ghoorlie on the 18 March 2022.

The Preliminary Advice Report outlined a number of recommendations for consideration by KCGM. This included that proposed works should not impact the physical or spiritual fabric of five cultural sites registered with DPLH which intersect with KCGM operations, and that cultural monitors are engaged throughout various stages of the FS Project.

KCGM has received Marlinyu Ghoorlie's heritage report which will contain the final heritage recommendations for the FS Project. This has been used to revise the Operation's ACHMP. KCGM will continue to seek guidance from Traditional Owners groups about planned activities.

5.4.6 Heritage Management

KCGM's Aboriginal Cultural Heritage Management Plan (ACHMP) is included as Appendix C - Confidential. This plan has been informed by cultural heritage surveys completed for KCGM Operations, including recent surveys encompassing the Revised Proposal area.

This ACHMP was prepared in accordance with the in consultation with the Marlinyu Ghoorlie Traditional Owners. The main objective of this ACHMP is to promote, protect and preserve Aboriginal Cultural Heritage, and to ensure that Aboriginal sites that lie within the vicinity of KCGM's operations are properly respected and protected..

KCGM is committed to revising and developing the ACHMP in accordance with statutory requirements, as well as engaging and consulting with the relevant Native Title Claimant Group and cultural knowledge holders on the ACHMP is plan in due course.

KCGM is committed to ensuring that its staff and procedures are and remain cognisant of KCGM's cultural heritage obligations, and to building the capacity of the relevant Traditional Owner groups to engage with KCGM on these issues.

5.4.7 Indigenous Procurement

Promoting and encouraging Aboriginal business through capacity building and direct procurement is a significant means of supporting the Traditional Owners on whose land we operate. In 2021, Northern Star committed to developing sustainable Indigenous supply contracts of at least \$20 million per annum spend by the end of FY24 across the Company's Australian Operations, including KCGM.

This commitment is intended to signal the importance of Indigenous procurement to the Board and assist to influence behaviours in relation to procurement decisions.

KCGM is currently working to develop a sustainable and culturally appropriate framework to increase the number and value of Indigenous supply contracts, including partnering with organisations such as the Goldfields Aboriginal Business Chamber and Waalitj Foundation, to assist the capacity and capability of indigenous businesses in the Goldfields.

6. ENVIRONMENTAL FACTORS AND OBJECTIVES

6.1 Identification of Environmental Factors

Environmental factors are those parts of the environment that may be impacted by an aspect of a Revised Proposal. The EPA has 14 environmental factors, organised into five themes: Sea, Land, Water, Air, and People (Table 15).

This Section identifies the environmental factors relevant to the Revised Proposal, outlines the overall assessment methodology presented in this document and the environmental impact assessment undertaken for each preliminary key environmental factor.

The relevance of each factor to the Revised Proposal is summarised in Table 15, an assessment of significant environmental factors that require further consideration is provided in this Section. Environmental factors relevant to the Revised Proposal, but unlikely to be significant are described in Section 7.

Table 15: Summary of Environmental Factors

Theme	Environmental Factor	Objective	Relevance to Revised Proposal	Significant Environmental Factor
Air	Air Quality	To maintain air quality and minimise emissions so that environmental values are protected.	Air emissions will be generated by the Revised Proposal. Potential to impact sensitive receptors including people and natural environment.	Yes
	Greenhouse Gas Emissions	To minimise the risk of environmental harm associated with climate change by reducing greenhouse emissions as far as practicable.	No new sources of greenhouse gas emissions.	No
People	Social Surroundings	To protect social surroundings from significant harm.	Potential to affect amenity in Kalgoorlie-Boulder via noise and vibration, flyrock and dust emissions. There are no heritage sites known within the proposed disturbance area.	Yes
	Human Health	To protect human health from significant harm.	No radiation emissions to be generated.	No
Land	Terrestrial Environmental Quality	To maintain the quality of land and soils so that environmental values are protected.	No new sources of potential contamination proposed. Tailings and waste rock will continue to be managed in accordance with existing management plans, DWER licence and DEMIRS approvals.	No
	Landforms	To maintain the variety and integrity of distinctive physical landforms so that	No significant natural landforms within the Revised Proposal	No

Theme	Environmental Factor	Objective	Relevance to Revised Proposal	Significant Environmental Factor
		environmental values are protected.	area, but extending manmade landforms to the east.	
	Flora and Vegetation	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	The Revised Proposal requires clearing of additional vegetation that is well represented in the region.	Yes
Land	Terrestrial Fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	The Revised Proposal requires clearing of additional fauna habitat that is well represented in the region.	Yes
	Subterranean Fauna	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	No suitable habitat present.	No
Water	Inland Waters	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	No new sources of surface water or groundwater contamination. Tailings and waste rock will continue to be managed in accordance with existing management plans.	No
Sea	Benthic Communities and Habitats	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.	No marine environments present. No impacts to benthic communities and habitat relevant.	No
	Coastal Processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.	No coastal environments present. No impacts to coastal processes relevant.	No
	Marine Environmental Quality	To maintain the quality of water, sediment and biota so that environmental values are protected.	No marine environments present. No impacts to marine environmental quality relevant.	No
	Marine Fauna	To protect marine fauna so that biological diversity and ecological integrity are maintained.	No marine environments present. No impacts to marine fauna relevant.	No

6.2 Assessment Approach

Assessment of the impacts of the FS Project was undertaken for each environmental factor following the same process:

- Identification of the EPA Objective for the factor and any relevant policy and guidance
- Characterisation of the receiving environment subject to potential environmental impacts
- Definition of the potential environmental impacts the proposal may cause
- Assessment of the likely impacts of the proposal on the receiving environment

- Mitigation measures that will be undertaken to minimise environmental impacts
- The predicted outcome to the receiving environment of the proposal taking into account the mitigation measures in place, including any predicted residual impacts.

As this Revised Proposal is an extension of the existing mining operations at the Kalgoorlie pit, the receiving environment includes current mining operations in a highly modified environment.

6.3 Air Quality

Air quality is defined for purposes of environmental impact assessment as, “The chemical, physical, biological and aesthetic characteristics of air”; whilst air “refers to all the air above the ground up to and including the stratosphere” (EPA, 2020a).

6.3.1 EPA Objective

The EPA applies the following objective in its assessment of Revised Proposals that may have a significant effect on air quality:

To maintain air quality and minimise emissions so that environmental values are protected.

6.3.2 Policy and Guidance

- Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2021 (EPA, 2021a).
- Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual 2021 (EPA, 2021b).
- Environmental Factor Guidelines ‘Air Quality’ (EPA, 2020a)
- NEPC. 2021. National Environment Protection (Ambient Air Quality) Measure (NEPM)

6.3.3 Receiving Environment

Air quality is a key environmental factor for the FS Project due to the proximity of the Fimiston Gold Mine Operations to the City of Kalgoorlie Boulder. Identification and management of contributing factors (aspects and risk analysis) or activities which may contribute to decreased air quality are paramount for large scale operations such as the Fimiston operations.

The region is semi-arid and relatively dry throughout the entire year. Evaporation is significantly larger than precipitation, together this creates a location with dry bare soils readily susceptible to wind erosion, and fugitive dust. Whilst the presence of dust within the ambient air is a natural occurrence in Australia, introduced activities within the townsite, from KCGM or from other industries may pose additional impact and change to the severity or frequency occurrences. Regional dust events are common and can result in significant ambient dust concentrations over a wide area.

6.3.3.1 Climate and Meteorological Conditions

The Kalgoorlie-Boulder area is subject to a semi-arid climate, with mild winters and hot summers. Precipitation is typically well below evapotranspiration rates, creating dry conditions. The closest Bureau of Meteorology (BoM) weather station is the Kalgoorlie-Boulder Airport (Station 012038). This station recorded temperature, rainfall, wind speed and direction and has data available dating back to 1939.

Temperatures range from a mean maximum of 33.7°C in summer and drop to a mean maximum of 16.8°C in winter (Figure 7). Mean minimum temperatures follow a similar trend and range from 18.3°C in summer to 5.1°C in winter.

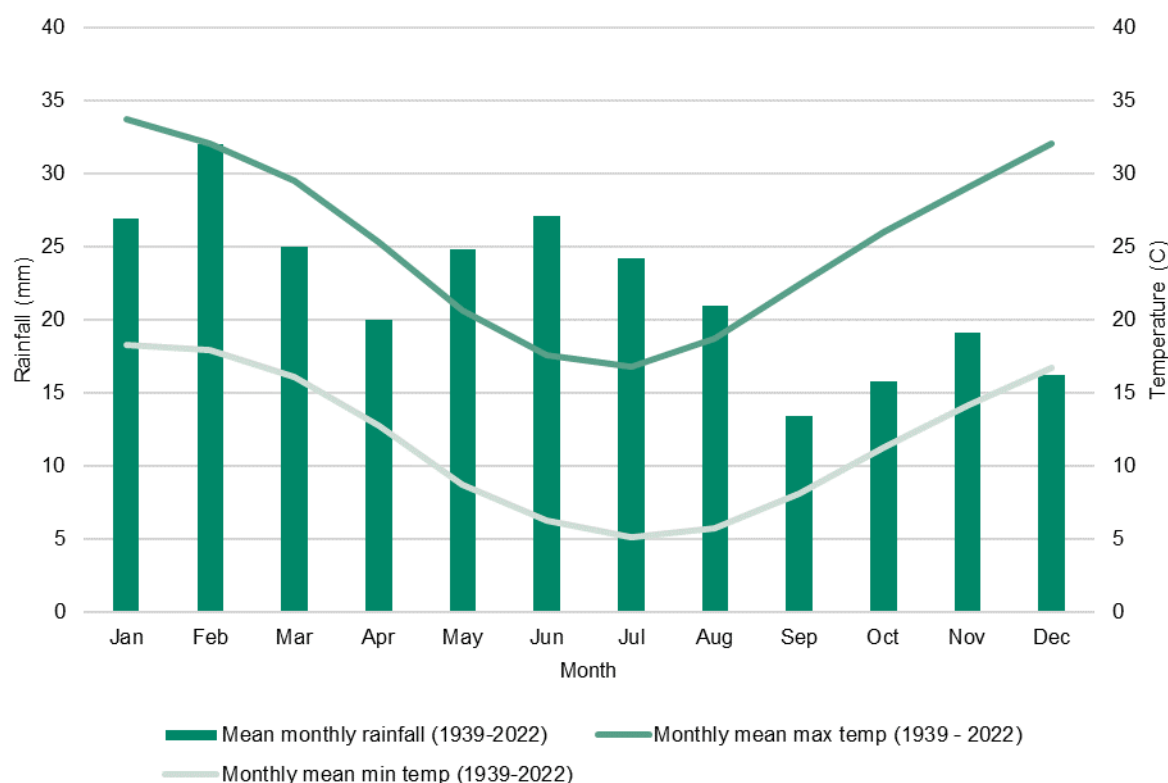


Figure 7: Climate of the City of Kalgoorlie/Boulder

Annual rainfall varies between 108 and 530 mm with an average of 266 mm (BoM, 2022). Rainfall occurs during all months of the year (Figure 7). The region is experiencing a distinctive long-term change in rainfall patterns characterised by reduced winter rainfall and a greater number of extreme rainfall events in summer. Climate studies by the CSIRO and BoM (2015) indicate that the decreasing winter rainfall trend will be continuing due to climate change with higher probabilities of extreme summer rainfall events.

Pan evaporation rates exceed average rainfall rates for every month of the year and the average annual pan evaporation is 2,646 mm, approximately 10 times the average annual rainfall. Average relative humidity is highest during the winter months (up to 74% at 9:00 am and up to 48% at 3:00 pm) and lowest during the summer (up to 57% at 9:00 am and up to 34% at 3:00 pm) (Ramboll, 2023).

Predominant wind direction and wind speeds for the Kalgoorlie-Boulder region from between 1939 and 2020 show an annual 9am wind speed of 15.0 km/h and a 3pm wind speed of 15.9 km/h. Summer and autumn are dominated by an easterly wind regime. The lowest recorded mean wind speeds for the period 1939-2020 generally occur in April to June (11.8-13.7 km/h). In winter the wind regime changes to a westerly, with the highest recorded mean wind speeds occurring between September and October (17.1-17.8 km/hr: BoM, 2020).

6.3.3.2 Previous Studies

KCGM has a long history of monitoring and analysis of air quality at Fimiston Operations. Numerous studies have been conducted to analyse air quality and identify potential emissions sources. Historic air quality studies include:

- CSIRO Australia (Mine Site Rehabilitation Research Program), Dust Generation from Tailings: Development of the Micro Wind Tunnel and preliminary investigations in tailings surfaces.

- CSIRO Dust Management System for Blasting.
- Coffey (1999) National Pollutants Inventory Kalgoorlie Mining Trial Aggregated Emission Study.
- DEP (1999) Kalgoorlie NPI Trial.
- SKM (2005) Airborne Contaminants or Emissions of Significance in the Kalgoorlie-Boulder, Coolgardie and Kambalda Area, Kalgoorlie Gap Emissions Study.
- ENVIRON (2006) Dust modelling study – Fimiston operations extension.
- RAMBOLL (2018) Review of PM₁₀ Monitoring Data and Assessment of the Potential Particulate Impacts of Proposed Project Changes at the Fimiston Operations.
- RAMBOLL (2022) Fimiston South Project Screening Health Risk Assessment.
- RAMBOLL (2023) Fimiston South Project Qualitative Air Quality Impact Assessment.

6.3.4 Background Air Quality

There are many natural and anthropogenic sources of air emissions in the Goldfields region.

A review of historical ambient PM₁₀ monitoring data has indicated that non-KCGM related dust sources are impacting the ambient PM₁₀ concentrations recorded at sites located within close proximity to the Fimiston Operations (i.e., BSY, HOP, CLY, and HEW) (Figure 8). These sources include smoke from wood heaters in winter, particulates from wind erosion of cleared areas, local non-KCGM earthworks, truck and car movement on sealed and unsealed roads and tracks, and motor cross bike generated dust from activity on nearby tracks.

Dust is generated as a result of the current approved Fimiston operations. Existing dust sources from Fimiston are consistent with typical mining operations and include:

- Mining operations – drilling and blasting, excavation of waste rock, and loading and unloading of haul trucks.
- Ore Processing – crushing and conveyor transfer points.
- Wheel generated dust – haul trucks and other vehicles travelling on unsealed roads.
- Wind-blown dust emission from exposed surface areas such as TSFs.

6.3.5 Mercury

In addition to dust emissions, there is a potential for mercury emissions to originate from Fimiston processing activities. Mercury is known to be contained within coloradoite, one of a suite of telluride minerals that are rare but widely distributed through the Golden Mile lodes. Mercury is tightly bound in the crystal lattice of telluride and requires roasting or ultrafine grind to liberate.

The percentage of mercury present in the ore processed through the Fimiston Process Plant circuit is typically less than 0.0001%. Some mercury joins the gold in the refining process, but most is retained in carbon and recovered. Mercury emissions will not be changed as a result of the Proposal.

The Fimiston Air Quality Management Plan (FAQMP) addresses key air quality issues arising from the Fimiston Operations, namely dust emissions from the site and mercury emissions from the Fimiston Processing Plant.



Figure 8: Air Quality and Noise Monitoring Locations

6.3.6 Potential Environmental Impacts

Specific aspects of the Revised Proposal, in addition to current site activities, may have the potential to impact from the implementation of continued mining activities and pose a risk to decreasing air quality (increased particulates), if not managed appropriately.

6.3.6.1 Direct Impacts

Potential direct impact to air quality may include reduced air quality from:

- Increased dust emissions from an expanded mining footprint and haulage of waste or ore and from initial clearing activities, harvesting of topsoil, increase of operationally exposed areas or dry tailings.
- Greenhouse gas emissions from additional resources and/or supplies being brought to the Fimiston operation to complete other supporting construction activities. (This element is addressed further in the Northern Star Greenhouse Gas Management Plan - Appendix G).
- Diesel particulate matter from internal combustion engines operating closer to the surface.

6.3.6.2 Indirect Impacts

Potential indirect impacts that may result from changes to air quality include:

- Reduced public health, higher levels of hay fever or asthma irritants present within the air.
- Reduced health or loss of vegetation or flora due to clearing or clearing outside surveyed areas.
- Reduced visual amenity during site preparation works (clearing, topsoil harvesting or construction contouring), by the visual recognition of willy willy phenomenon.
- Displacement of fauna species or increased fauna interactions occurring on public roads leading to road kills and odour (short term impact during pre-construction).

6.3.6.3 Sensitive Receptors

Human health is a key environment factor when considered in tandem with air quality and as an additional potential risk beyond social amenity. This human health factor has been interpreted and assessed as an additional step above personalising/individualising a direct risk aspect in addition to social surroundings which may otherwise be interpreted as in-personal/non-direct.

The human health factor is driven in part due to the location of the overall operational area, the semi-arid climatic region (natural) and the proximity of the proposed continued mining activities adjacent to the City of Kalgoorlie-Boulder; but, also supported by the fact that KCGM's employees, contractors, families and friends have the right to be safe whilst at work and whilst outside of the workplace. For the purposes of this FAQMP, the World Health Organization (WHO) defines human health as:

"a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (EPA, 2016b)."

KCGM's management approach is detailed in Section 2.9 of the FAQMP. Additional human health management is managed and implemented under the *Work Health and Safety Act 2020* and Work Health and Safety (General) Regulations 2022 by additional KCGM's Health and Safety team.

Potential risks to human health when incorporating an air quality element to the proposed implementation of the continuing mining activities might include:

- Reduced individual or public health (acute or chronic), including but not limited to sensitive receptors such as children and elderly through inhalation of air emissions over an extended amount of time (long term exposure).

- Reduced individual health, through inhalation of mobilised particulate emissions resulting in reactions similar to hay fever or asthma (acute short-term exposure).
- Uncontrolled release of harmful emissions into the air shed beyond regulated conditions.

Other aspects of the long-term mining activities which may pose a risk in the long term may include:

- Failure to modernise the Fimiston operation leading to excessive or unacceptable volumes of greenhouse gas emissions being released.
- Failure to maintain maintenance schedules or purchasing of suitable replacement parts or filters (sub grade materials)
- Failure to upgrade to newer technologies or improved methods if/when readily available.

Considerations of human health during the environmental impact assessment phase of the FS Project included:

- Careful consideration, planning and monitoring requirements of climatic conditions when undertaking mining activities.
- Designing an execution plan to, where possible, undertake near surface dust generating activities during the known cooler or wetter times of the year (land clearing).
- Identification of a group or singular high-risk task or activity which may require additional mitigation processes to be implemented to lower the proposed significance of impact (fugitive sources), prior to the task commencing.
- Ensure activities identified as potentially having a higher risk probability of mobilising particulates are identified early to enable the correct personal protective equipment to be selected and used (point source).
- Implement dust suppression activities (water cart) to minimise the potential for impacting on daily compliance particulate records (continuous monitors).
- Consider additional monitoring or training opportunities under the *Workplace Health & Safety Act 2022*, through discussions with KCGM health and hygiene teams.

Sensitive receptors are generally described as people or other organisms that may have an increased sensitivity or exposure to contaminants by virtue of their age and health (e.g. schools, day care centres, hospitals, nursing homes). Sensitive receptors that may be exposed to emissions from include the Kalgoorlie-Boulder community, vegetation and flora, and terrestrial fauna. KCGM have extensive pollution controls at point sources and implement management strategies to control fugitive emission associated with normal operations. The location of the Revised Proposal in relation to the Kalgoorlie-Boulder community is shown on Figure 3.

6.3.7 Assessment of Impacts

Ramboll was commissioned to conduct an air quality impact assessment supported by a health risk assessment (Appendix D) in 2022. This impact assessment was revised in 2023 (Appendix E). These impact assessments were completed to determine if the proposed activities included under the Revised Proposal would result in any significant impacts to air quality. Findings from these assessments have been utilised to review current KCGM mitigation measures being actively implemented through the approved FAQMP (Appendix F).

The results of the impact assessment are summarised in the sections below.

6.3.7.1 Increased Dust Emissions from the Mining Footprint Extension

Predictive air quality modelling conducted by Ramboll (2023) indicates the south western cutback of the Fimiston Open Pit is likely to have potential to impact ambient PM₁₀ concentrations in the Kalgoorlie-Boulder townsite. This will primarily be the case during construction works to align the ENB and when mining activity is close to the surface (oxide area), during the initial stages of the FS Project.

It is anticipated that in-pit dumping of waste rock material as operations progress will result in a reduction in wheel-generated dust emissions as the distances travelled by haul trucks will be reduced. However, as the height of the in-pit waste rock dumps increase and material handling activities occur closer to the surface, the potential for fugitive dust emissions from the northern aspect of the Fimiston Open Pit is likely to increase. Following commencement of cutback mining waste rock being placed within the Fimiston Open Pit void is likely to cause higher volumes of particulate matter within the open pit, however following predictive air dispersion modelling these additional emissions appear to remain within the footprint of Fimiston's Open Pit and not disperse to other areas.

The impacts of increased dust on fauna are discussed in Section 6.6.4.3.

Current Operations

Air dispersion modelling completed by Ramboll (2023), was based on 2019 data, to assess model performance using the monitored data and to provide the basis for a comparative analysis against the proposed future operations at the site. Data from 2019 was selected as this was the year where a dry year led to the highest ambient air quality concentrations recorded.

The maximum predicted 24-hour and annual average concentrations at the monitoring locations for particulate matter less than 10 microns in diameter (PM₁₀) in isolation are presented in Table 16. On an annual basis, when background influences (identified from the HGC monitor (background monitor)) are removed from the near mine data records, the predicted concentrations from KCGMs emissions show reasonable correlation. Analysis of these peak monitored concentrations indicate that that they were associated with very high wind speed events from a direction outside of the influence of KCGM operations and were likely associated with a regional dust events.

Overall, the results indicate that the model calibrated relatively well in characterising emissions from KCGM, and the modelling is suitable for use in this comparative assessment.

The results indicate that peak 24-hour average concentrations exceed the ambient air quality guidelines. Analysis of the results indicates that the peak concentrations were associated with wind erosion from exposed areas.

Table 16: Monitored PM₁₀ Concentrations at Monitoring Locations for 2019 Operations

	HGC	BSY	HEW	CLY	HOP	MEX
Max 24hr	77	103	93	91	95	91
Annual Average	14	19	23	23	25	20
Annual – HGC (Background) Removed		4	9	9	11	6

Future Operations

To assess the potential impacts from the Revised Proposal, predicted emissions for operations in 2025 (the year with the highest planned material movement) were compared to current operations (2019 results), indicating less than 0.1 $\mu\text{g}/\text{m}^3$ change in maximum 24-hour concentrations (Table 17). Changes in the 24-hour average and annual average PM_{10} concentrations between current and future operations are presented in Figure 9 and Figure 10.

Cumulative impacts were predicted by adding the predicted concentrations from current and proposed operations to the annual average results from 2019 above to obtain a modelled future air quality result. This methodology inherently takes into account all current non-KCGM particulate sources in the area.

Table 17: Difference in Predicted PM_{10} Concentrations (Proposed 2025 Minus Current KCGM Operations) at Monitoring Locations ($\mu\text{g}/\text{m}^3$)

	HGC	BSY	HEW	CLY	HOP	MEX
Max 24hr	0.6	<0.1	<0.1	1.2	<0.1	<0.1
Annual Average	0.1	1.1	2.3	2.4	0.8	1.3

Analysis of the 24-hour average results indicates that the minor change is due to the peak concentrations at these locations being associated with wind erosion of open areas during high wind speed events and that these did not change due to the proposed operations (Ramboll 2023).

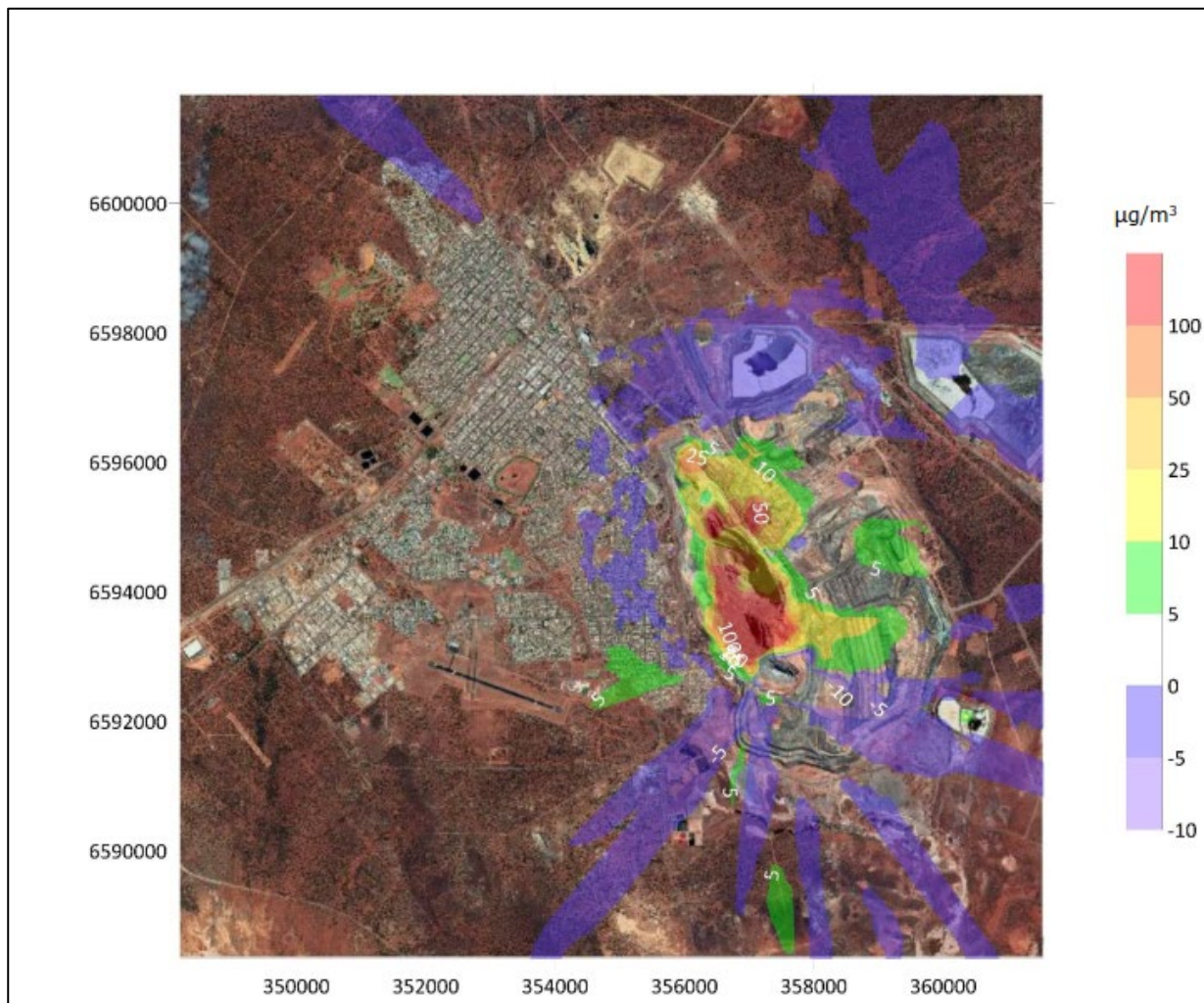


Figure 9: Predicted Difference in 24-hour Average Concentrations of PM₁₀ (µg/m³) – Proposed (2025) Minus Current KCGM Operations in Isolation

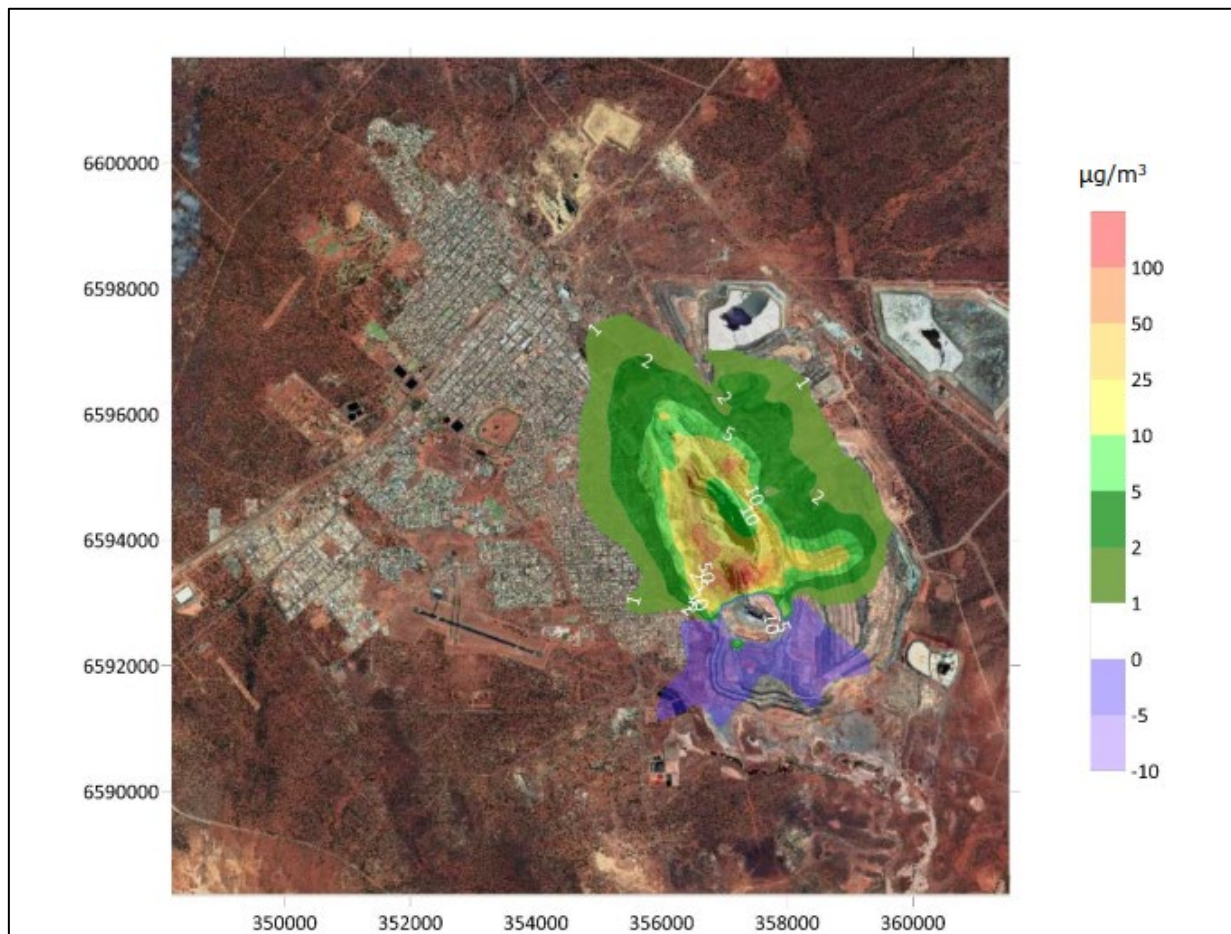


Figure 10: Predicted Difference in Annual Average Concentrations of PM₁₀ (µg/m³) – Proposed (2025) Minus Current KCGM Operations in Isolation

6.3.7.2 Reduced Air Quality from Blasting Emissions

Air quality can be impacted as a direct result of a blasting event. This is most noticeable through the visible explosive movement and relocation of particulate matter, gravel and rock and gaseous emissions being ejected from the shot. Visibility is greatly increased during near surface or on surface blasting events, although in pit and below ground blasts may also be visible when ejected material escapes underground areas through openings, portals or vents. This type of increased particulate loading is generally short lived and generally reasonably localised to the workplace.

Gaseous emissions caused as direct result of the explosive charge igniting and burning/consumption of available fuel sources are visible as yellow or orange clouds emitting from the blast zone following firing, a result of poor or incorrect blast design and charging methods. Whilst these emissions are highly visible, (if it occurs) is a very short lived and non-continuous event with emissions of known pollutants such as carbon dioxide (CO₂); nitrogen dioxide (NO₂) and sulfur dioxide (SO₂).

6.3.7.3 Greenhouse Gas Emissions

Greenhouse gases (GHG) are the emissions generated through the generation and consumption of energy or fuel sources to generate energy. GHG emissions are monitored and managed separately from all other air pollutants and emissions. The Revised Proposal will see an extended Life of Mine, which will see the production over a longer period of time of GHGs from continued use of existing and/or future energy

sources. This would result in extended potential for releases of the reportable GHGs; carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆) and specified kinds of hydro fluorocarbons and perfluorocarbons which are monitored under the *National Greenhouse Energy Reporting Act 2007*. Greenhouse gas emission sources associated with the Revised Proposal will be similar to those currently generated by Fimiston Operations and are therefore unlikely to result in significantly different impacts to the environment. Greenhouse gas emissions are discussed in Section 7.5 and Appendix G.

6.3.7.4 Emissions to Air Quality Resulting in Reduced Public Health

The main transport pathway for atmospheric dust emissions associated with the Revised Proposal is atmospheric dispersions and dust inhalation would be the most significant exposure route that could impact human health. Air dispersion modelling from carbon regeneration kilns to assess the potential health risks posed by mercury emissions has historically indicated that the levels being emitted from Fimiston are so low as to pose no risk to workers or the community.

Ramboll (2022) conducted a Screening Health Risk Assessment (HRA) to determine if the Revised Proposal has potential to result in unacceptable impacts to human health (Appendix HAppendix D).

The health risk assessment comprised a review of historic monitoring data and the existing health risk assessment criteria from the FAQMP. Historic metals analysis was compared to dust monitoring PM₁₀ data from 2010 and 2021, and protective guidelines were used to update the health risk assessment criteria for Fimiston. Quantitative risk indicators were developed for acute and chronic non-carcinogenic Hazard Indices (HIs) and Incremental Carcinogenic Risk (ICRs).

Results of the health risk assessment show the Revised Proposal is unlikely to result in significant impact to human health. HRA analysis indicated:

- Acute HIs were calculated to be between 0.5 and 2.6, and chronic HIs were well below one. Values below 10 generally do not represent cause for concern.
- Maximum ICRs from the estimated metals concentrations were above the target of 1E-05 (i.e., 0.00001). However, these estimates are considered highly conservative because they are calculated using the maximum recorded metal concentrations in any 24-hour period, rather than the average metals concentrations, which would be more representative of actual conditions.
- Once bioavailability factors from historical soils samples were accounted for, the ICRs were below 1E-05 (Ramboll 2022).

6.3.7.5 Mercury

In addition to dust emissions, very low levels of mercury emissions originate from Fimiston processing activities. Mineral processing activities at the Fimiston Operations can potentially result in point source emissions of mercury to the atmosphere from the carbon regeneration kilns and the gold room. Mercury is known to be contained within coloradoite, one of a suite of telluride minerals that are rare but widely distributed through the Golden Mile lodes. The percentage of mercury present in the ore processed through the Fimiston Process Plant circuit is typically less than 0.0001%. Some mercury joins the gold in the refining process, but most is retained in carbon and recovered.

KCGM has implemented a number of measures to reduce the point source emission of mercury from the processing plant. In 2015, KCGM implemented the Fimiston Emissions Reduction Project (Fimiston ERP), designed to reduce gaseous emissions of mercury from the Fimiston Processing Plant by more than 90%. The Fimiston ERP involves the installation of new emissions control equipment including a retort oven in the Gold Room, an off-gas scrubber, Regenerative Thermal Oxidiser and a sulphur impregnated carbon scrubber to capture mercury from the carbon regeneration kilns off-gas prior to release.

Extensive testing of controls and stack emissions were undertaken during commissioning of a new gold room scrubber system prior to grant of an updated Operating Licence (2023), which evidenced very low mercury levels in stack emissions.

The current ambient concentrations of mercury are considered to represent 'background' levels.

6.3.7.6 Dust Emissions Resulting in Reduced Health or Loss of Vegetation or Flora

Accumulation of dust particulates on leaf surfaces can occur as a result of exposure to dust, resulting in a reduced ability for plants to photosynthesise and transpire, causing decline in health and eventual plant death.

As the pit is expanded, the area of vegetation with potential for exposure to dust will be reduced slightly. Sources of dust emissions will be localised and indirect impacts to vegetation and flora are likely to be limited to areas that abut the Revised Proposal. Vegetation within these areas comprises vegetation communities that are well represented in the region. Most of this vegetation is degraded and modified by historical and nearby land uses, which include urban development, mining and pastoralism. Potential impacts are therefore not likely to have a significant impact on the representation of vegetation in the region.

Flora surveys conducted by Phoenix (2023c) indicate that 13 individuals of Priority 2 Flora species *Eremophila praecox* were found on the study area, including in a disturbed area and a rehabilitated area. However, indirect impacts from dust emissions are not likely to have a significant impact on the conservation status of this species because surveys undertaken over the years for the Fimiston Project have identified that there is broader distribution for the species than was previously known and the records support the notion that the species may in fact be widespread but infrequently recorded.

6.3.7.7 Dust Emissions Resulting in Displacement of Fauna

Excessive dust has potential to result in temporary displacement of local fauna populations. This can take place as fauna move to avoid inhalation of dust or relocate after vegetation providing habitat is damaged.

Results from recent fauna survey suggest that it is unlikely that there are any conservation significant fauna species that would be reliant on habitat abutting the mine. It is therefore unlikely that emissions to air would result in significant impacts to fauna associated with displacement of local populations of fauna.

6.3.8 Mitigation

Potential impacts to air quality are managed through implementation of the FAQMP. The FAQMP includes a series of sub-plans that comprise a Blasting Dust Management Plan, Dust Monitoring and Management Plan and Mercury Emissions Management Plan. Mitigation measures implemented as part of the FAQMP are summarised in Table 18.

Ramboll was commissioned to review the FAQMP to determine if the existing management approach is suitable for mitigating potential impacts to air quality from the Revised Proposal (Appendix G).

Results of the review indicated that potential impacts to air quality attributable to the Revised Proposal could be adequately managed through continued implementation of the FAQMP. Ramboll identified specific mitigation measures that should be applied during surface mining activities and relocation of the ENB, including:

- Restricting operations as function of wind direction to minimise dust, including:
 - Dumping material for the realignment of the ENB.
 - Near surface mining activities (e.g., handling of oxide material and blasting).

- Land clearing activities.
- Mining near the surface during daytime only to allow elevated dust concentrations to be clearly visible, to provide for implementation of additional dust management measures as required.
- Continued real time monitoring of PM₁₀ concentrations and implementation of the reactive dust control strategy, as required.
- Implement dust suppression at key dust sources such as haul roads and service corridors, as required.

It was noted that one of the dust monitoring stations will require relocation. However, this is not likely to change the overall effectiveness of implementation of the FAQMP.

Table 18 Summary of Mitigation and Management Measures for Air Quality (KCGM 2019)

Type	Controls
Avoid	• Blasting operations restricted based on wind conditions. • Suspending work in a particular area for a nominated activity as deemed necessary based on visual inspections, dust alarms, public feedback or prevailing wind conditions. • Using an alternative operational area if possible (e.g., use a different waste dump). • Progressively rehabilitating bare ground areas to minimise fugitive dust emissions from wind erosion.
Minimise	• Using water trucks and water cannons in areas that could produce dust such as service corridors and other active surfaces. • Watering down ore / waste rock material prior to load and haul activities as required. • Watering down the surface of the blast prior to firing as required. • Planning activities in high-risk areas (e.g., digging / loading) during day shift when fugitive dust can be seen and managed where practicable. • Using additional dust control measures (i.e., a dust binding agent or hyper saline water) where necessary. • Dust alarm system used to detect air quality exceedances. • Ensuring all contractors and staff undertake inductions which include raising awareness of the importance of dust control. • Ensuring dust monitoring is undertaken, that the data are assessed in real time, and the results of the monitoring are reviewed and reported on • Ongoing consultation with stakeholders to determine success of dust management measures.
Rehabilitate	• Progressively rehabilitating of bare ground areas to minimise fugitive dust emissions from wind erosion.
Offset	• Not applicable.

6.3.8.1 Dust Monitoring and Management Program

Dust emissions are targeted via the Dust Monitoring and Management Programme (DMMP), a component of the FAQMP. A key performance target of the DMMP is to manage KCGM's operations such that there are no more than five events above the National Environmental Protection Measure (NEPM) 24-hour PM₁₀ (particulate matter with an equivalent aerodynamic diameter of 10 microns or less) standard (i.e., 50 micrograms per cubic metre [µg/m³]) at any dust monitoring site per annum, where KCGM is a significant contributor. The background concentrations discussed below include the impact of the current approved Fimiston operations as monitored through the DMMP.

The DMMP utilises a network of seven ambient PM₁₀ monitoring stations, six of which are established in the residential and light industrial area near the Fimiston Operations. These comprise Boulder Shire Yard (BSY), Hewitt Street (HEW), Clancy Street (CLY), Hopkins Street (HOP), Mt Charlotte (MTC) and Metals

Exploration Yard (MEX) sites (Figure 8). The seventh monitor, Hannan's Golf Course (HGC), is located northwest of the Fimiston Operations and generally provides background PM₁₀ concentrations. Meteorological monitoring stations are located at the MEX site and the Cassidy Headframe (CAS).

Real time ambient PM₁₀ monitoring data are compared to Alert and Action levels at the individual monitoring sites. Alert levels are set at values that are indicative of the possibility of on-site activities contributing to ambient concentrations that may approach the NEPM standard and where reasonable and practicable management measures could be implemented to reduce this risk. Action levels are set at values that indicate it is likely that on-site activities are contributing to ambient concentrations that may result in an exceedance of the DMMP target concentration and where reasonable and practicable, immediate management measures should be implemented to reduce this potential.

For each day where a PM₁₀ concentration of greater than 50 µg/m³ is recorded, KCGM reviews the data to determine if the Fimiston Operations may have been a significant contributor, using the procedure in the FAQMP. In brief, the procedure involves a review of the 5-minute average PM₁₀ concentrations and meteorological monitoring data for the period in question to:

1. Determine the daily average concentration, if any, that was associated with wind directions that were within the arcs that align with KCGM's Fimiston Operations and use this value to calculate the ratio of the KCGM arc.
2. Based on an assessment of the winds that occurred, determine which ambient PM₁₀ monitoring station is most likely to represent the "background" monitoring site (usually the HGC site) and the daily average "background" concentration recorded at that site.
3. Calculate the difference between the recorded daily average exceedance concentration and the daily average background concentration and determine the ratio of this difference and the recorded daily average exceedance concentration.
4. If the ratios determined from steps 1 and 3 are both greater than 60% then KCGM is considered to be a potential significant contributor.

The number of days where a PM₁₀ concentration of greater than 50 µg/m³ is recorded and the Fimiston Operations are considered to be a potential significant contributor (based on the above procedure) is presented in Figure 11. It is not always possible to eliminate non-KCGM dust emission sources from the analysis particularly where the emissions may have occurred between the monitoring site and the Fimiston Operations (e.g., motor cross bikes, earth works). Where the contribution of these non-KCGM sources cannot be quantified (e.g., via photographic evidence), KCGM conservatively reports itself as a contributor. Therefore, the number of days presented in Figure 11 may be overstated.

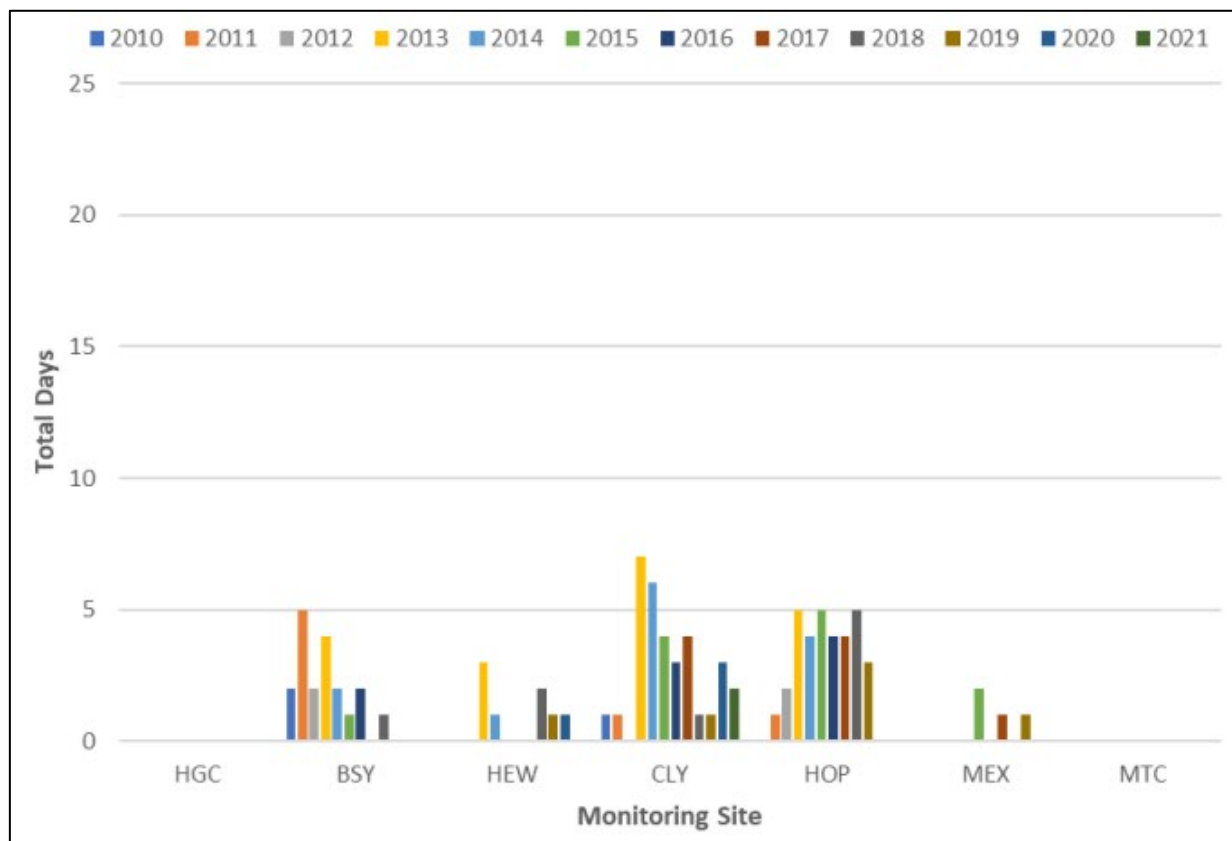


Figure 11 Days Where 24-Hour Average PM₁₀ Concentration >50 µg/m³ for Each Site and KCGM Identified as Significant Contributor

6.3.8.2 Mercury Emissions Management Program

KCGM implemented measures to reduce the point source emissions of mercury (Hg) from the processing plant in 2015. This was completed under the Fimiston Emissions Reduction Project.

The National Environment Protection Measure (National Pollutant Inventory) 1998 (as amended 2007); implemented as a mechanism under the *National Environment Protection Council Act 1994*, set out the reporting requirements for Hg and its compounds emitted through/resulting from anthropological activities. A variation to this measure was completed in 2007 (Variation to the National Environment Protection (National Pollutant Inventory) Measure 2007 (No. 1)) to separate out greenhouse gases and energy reporting which are now reported separately under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act). In Western Australia NPI is implemented through the Environment Protection (NEPM NPI) Regulations 1998, under the *Environmental Protection Act 1986* (NEPC, 2007).

The 2015 Fimiston Emissions Reduction Project was designed to greatly reduce gaseous emissions of Hg and its compounds from ore processing into the air by more than 90%. Results of successful implementation are publicly available through the DCCEEW website, along with the reported emissions from ~4000 other facilities.

KCGM's Revised Proposal is not expected to impact on current operational emission volumes of Hg and its compounds as both mining and processing throughputs are expected to continue at current rates.

6.3.8.3 Greenhouse Gas Management Program

The Revised Proposal includes utilisation of the current mining resources for a great majority of the activities; whilst a potential cost and time saving opportunity, this initiative also supports maintaining lower potential impacts to Greenhouse Gas Emissions (GHG) and reporting being incurred. The Fimiston reporting entity has a threshold as per MS 782 of approximately ~440,800 tCO₂-e (tonnes of carbon dioxide equivalent), no change is expected outside of normal operational fluctuations year to year which are directly connected to this proposal.

Northern Star Resources currently report GHG emissions annually (externally) under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) for all its operations as a single entity report which is available online <https://www.cleanenergyregulator.gov.au/NGER/corporate-emissions-2021-22>.

Monitoring of GHG is completed annually and is based in the preceding 12 months of operational usage of Scope 1 and Scope 2 emission sources. This process will continue without change under the Revised Proposal.

6.3.9 Improvement Initiatives

KCGM have proactively reduced emissions associated with ongoing operations and these reductions have been the direct result of business improvement initiatives, such as:

- Upgraded its fleet of 40 mechanical drive haul trucks from the 793C to the 793F model, resulting in direct decrease of associated emissions per tonne.
- Six underground vehicles with Tier 1 diesel engines will be replaced with vehicles with more efficient Tier 4 engines, also resulting in direct decrease of associated emissions per tonne.
- KCGM replaced 47 aging diesel mobile lighting towers, which were becoming more difficult to maintain. KCGM are in the process of replacing existing lighting plants with newer lighting plants which operate as LED to safely and practically implement both continuous improvement within the workplace and actively reduce emissions; and
- KCGM applied late in 2020 to DWER to amend Licence L6420/1988/14 following commissioning of the Fimiston Mercury Emissions Reduction Project, ambient mercury monitoring is no longer required given that the ambient mercury monitoring program produced results that were consistent with those expected, and below the ambient guidelines.
- That the Fimiston ERP has resulted in a significant reduction in the release of atmospheric emissions of mercury (>90%).
- That the approved FAQMP (and revised versions) supersedes the Mercury Emissions Reduction Program.

6.3.10 Predicted Outcomes

Results of the health risk assessment show the Revised Proposal is unlikely to result in significant impact to human health. Ramboll's 2022 HRA analysis indicated:

- The acute hazard indices (HIs) calculated based on 2010-2021 monitored PM₁₀ and historic metals data for the nominated receptors were below target risk level, when considering bioavailability of metals in PM₁₀ particles. This indicated that there was no cause for concern in terms of potential short-term acute health effects at any receptor locations.
- For comparative assessment of acute exposure risks, no material change in acute HIs have been noted from current (2019) to future operations (2025), with bioavailability adjusted HI values below target risk for all receptor locations under both scenarios. No change in acute (short-term) exposure

risks is expected when the FS project is operational, and acute exposure risks are expected to remain low and acceptable.

- The chronic non-carcinogenic HIs based on 2010-2021 monitored PM₁₀ and historic metals data, conservatively assuming 100% bioavailability for each metal, remain well below target risk at each of the monitoring locations, indicating no cause for concern in terms of potential long-term non-carcinogenic health effects.
- For comparative assessment of chronic non-carcinogenic exposure risks, no material change in chronic HIs have been noted from current (2019) to future operations (2025), with all values below target risk for all receptor locations under both scenarios. No change in chronic (long-term) exposure risks is expected when the FS project is operational, and chronic exposure risks are expected to remain low and acceptable.
- The maximum incremental carcinogenic risk (ICRs) calculated based on 2010-2021 monitored PM₁₀ and historic metals data is below the risk target for PM₁₀ particles with arsenic and nickel as the largest contributor towards the calculated ICRs. The ICR results indicated that there was no cause for concern in terms of potential carcinogenic health effects at any receptor locations from life-time exposures.
- For comparative assessment of carcinogenic exposure risks, no material change in ICR values have been noted from current (2019) to future operations (2025), with ICR values below the recommended risk target of 1E-05 for all receptor locations under both scenarios. No change in carcinogenic exposure risks is expected when the FS project is operational, and carcinogenic exposure risks are expected to remain low and acceptable.

Health risk indicators calculated by Ramboll (2022) indicated there would be no unacceptable acute or chronic non-carcinogenic or carcinogenic hazards. Therefore, the Revised Proposal is unlikely to result in changes to air quality that could cause significant impacts to human health.

The air quality impact assessment conducted by Ramboll (2022) indicated that dust can be managed effectively using the FAQMP. Analysis of the predicted changes based on the results of air dispersion modelling shows that most significant changes to air quality are expected to occur within the Fimiston Open Pit and that impacts at sensitive receptor locations these increases outside of the open pit are considered to be marginal. The predicted changes also indicate that wind erosion is the dominant source of elevated PM concentrations, as wind speeds did not change as a result of the proposed operations (Ramboll, 2023).

Dust emissions from the Revised Proposal are unlikely to result in a significant impact to vegetation and flora or fauna.

6.4 Social Surroundings

6.4.1 EPA Objective

In accordance with the EPA Factor Guideline for Social Surroundings, environmental impact assessments need to consider interactions between a Revised Proposal and the surrounding physical or biological environment, including potential for impacts to a person's aesthetic, cultural, economic or social surroundings.

The EPA applies the following objective in its assessment of Revised Proposals that may have a significant effect on social surroundings:

To protect social surroundings from significant harm.

6.4.2 Policy and Guidance

- Environmental Factor Guideline ‘Social Surroundings’ (EPA, June 2023); and
- Technical Guidance EIA of Social Surroundings – Aboriginal Cultural Heritage (EPA, November 2023).

6.4.2.1 Noise and Vibration

- *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016*
- Environment Protection (Noise) Regulations 1997 (Noise Regulations)
- Australian Standard 2187.2-2006 Explosives – Storage and use – Use of explosives.

6.4.2.2 Flyrock

- *Planning and Development Act 2005*
- City of Kalgoorlie-Boulder Local Planning Scheme No. 2
- *Work Health and Safety Act 2020*
- Work Health and Safety (Mines) Regulations 2022
- Guide to Blast Plan Preparation, Including Mining Operations (DMP, 2013).

6.4.2.3 Heritage

- *Aboriginal Heritage Act 1972*

6.4.3 Receiving Environment

Fimiston is in a unique situation where mining and ore processing activities have taken place immediately adjacent to urban areas for over 100 years. Consequently, Fimiston Operations have had to be developed in a manner that considers interactions with the local community, including residents and local businesses.

To minimise potential to impact the community, KCGM conducts ongoing consultation with key stakeholders in the region, including a community reference group. Feedback from the community is used to inform ongoing management of operations and future mine planning.

Key matters relating to social surroundings that require consideration, relate primarily to amenity and cultural heritage values. Amenity is a relatively broad term that is generally used to describe the characteristics of a place that make a positive contribution to quality of life (EPA, 2016a). This includes both visual amenity, and the ability for people live in a place without unreasonable interference with their health, welfare, convenience and comfort.

After over a century of mining, aspects of Fimiston most likely to impact amenity are well understood. Key aspects of mining that require consideration are noise and vibration, flyrock, dust emissions, and potential disturbance of cultural heritage sites. Key aspects of amenity associated with Fimiston Operations are described in the sections below.

6.4.3.1 Previous Studies

Studies and investigations relevant to this section include:

- Revised KCGM Aboriginal Cultural Heritage Management Plan (2023), archaeological, ethnographic, and ethnobotanical surveys completed;
- Revised Acoustic Assessment, Fimiston South Project (HSA, June 2023);
- Prediction of Blast-Induced Ground Vibration and Air Overpressure (GBC, 2022);
- Blasttechnology, 2022, Flyrock Control for Fimiston South Project, Stage 2 (Blasttechnology, 2022);
- Fimiston South Project Air Quality Impact Assessment (Ramboll, 2023); and

- Fimiston South Project Screening Health Risk Assessment (Ramboll, 2022).

6.4.3.2 Visual Amenity

Landforms visible from urban areas of Kalgoorlie-Boulder include the Environmental Noise Bunds (ENB) and WRDs. A public lookout exists within the southern area of the Fimiston Open Pit which provides a viewing point of operational mining activities for the public. The public lookout is a popular tourist attraction and an iconic draw card for Kalgoorlie-Boulder area. As part of the precursor works, this public lookout will be relocated to a similar, but more southerly location, with a new southern entrance road. Additional supporting works includes the realignment of a portion of the ENB closer towards Boulder Light Industrial Area, to become the Operational Noise Bund, to support the amended pit design. (Figure 12).

6.4.3.3 Noise

The existing Fimiston Operations operate under specific noise criteria where the allowable noise level is currently prescribed under the *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016*; which was been granted under regulation 17(7) of the Environmental Protection (Noise) Regulations 1997. The *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016* grants KCGM approval to emit noise from the Fimiston Operations provided the noise, received at specified locations, does not exceed the corresponding LA_{10} (noise level exceeded for 10% of a measurement period) and LA_{max} (maximum sound level reached during a measurement period) approval levels for that location and time of day.

The Revised Proposal includes amending part of the existing Environmental Noise Bund location, therefore there is a requirement to revise all acoustic modelling (against more stringent night-time thresholds) and submit a variation to the *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016* for assessment and approval, this process is required to enable assessment of this Revised Proposal.

The *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval* was originally granted in 2009 to assist the management of operational noise emitted from a 24/7 operation. This exemption is generally granted for a period of five years with a requirement to reapply or extend in the fourth year. A request to extend the current approval was lodged in December 2019, and KCGM met with DWER Noise Branch on 21 July 2022 to discuss the application for a further approval that would include proposed activities described within this Revised Proposal.

KCGM submitted a request for an amendment to vary their exemption under Regulation 17 of the Environmental Protection (Noise) Regulations 1997 in October 2023. The application considered the change in noise profile that had been modelled to be emitted from the Fimiston Operation, the infrastructure layout and the noise monitoring locations. This application for amendment is being processed in parallel with this Section 38 assessment.

6.4.3.4 Vibration

Ground vibration from blasting activities is influenced by a range of factors, not all of which are within the control of the shotfirer. These include the rock type, structure, topography, meteorological conditions, explosive type, blast design and geometry. Studies show that well designed and controlled blasts are unlikely to create ground vibrations of a magnitude that causes damage to structures.

Noise and vibration emissions are monitored and managed in accordance with a Noise and Vibration Monitoring Management Plan (Appendix P) prepared in accordance with MS 782 Conditions 8-1 to 9-9 and the 2016 Fimiston Noise Approval Conditions 9(1) and 9(2).

6.4.3.5 Flyrock

Flyrock refers to rock which has become airborne as the result of a blast event; such rock may be projected varying distances beyond the original blasting area. Variations in the distance that flyrock is ejected are a direct result of blast design, collar rock conditions and the loading practices of the blast. Poorly controlled blasting practices have the potential to generate flyrock that can be thrown great distances, these projectiles then have the potential to cause damage to equipment and property, or harm or injury to people.

A large majority of blasting activities occur within the defined open pit well below the surface, this removes the potential for flyrock impacting on surrounding public property. However, the Revised Proposal includes a surface cut back which will require blasting activities to occur for a short time near the surface adjacent to industrial areas.

6.4.3.6 Dust

The main sources of fugitive dust from the existing Fimiston operations are conventional mining practices that include drilling, blasting, digging, loading, hauling and dumping materials as part of mining operations; crushing and processing of ore and tailings storage facilities operations. Potential social impacts of dust on the community include:

- Loss of amenity due to high dust concentrations.
- Health risks associated with high dust concentrations (as discussed in Section 6.3.7.4).

Details on how dust is monitored and managed are provided in Section 6.3 which discusses the Revised Proposal in relation to the Air Quality Environmental Factor.

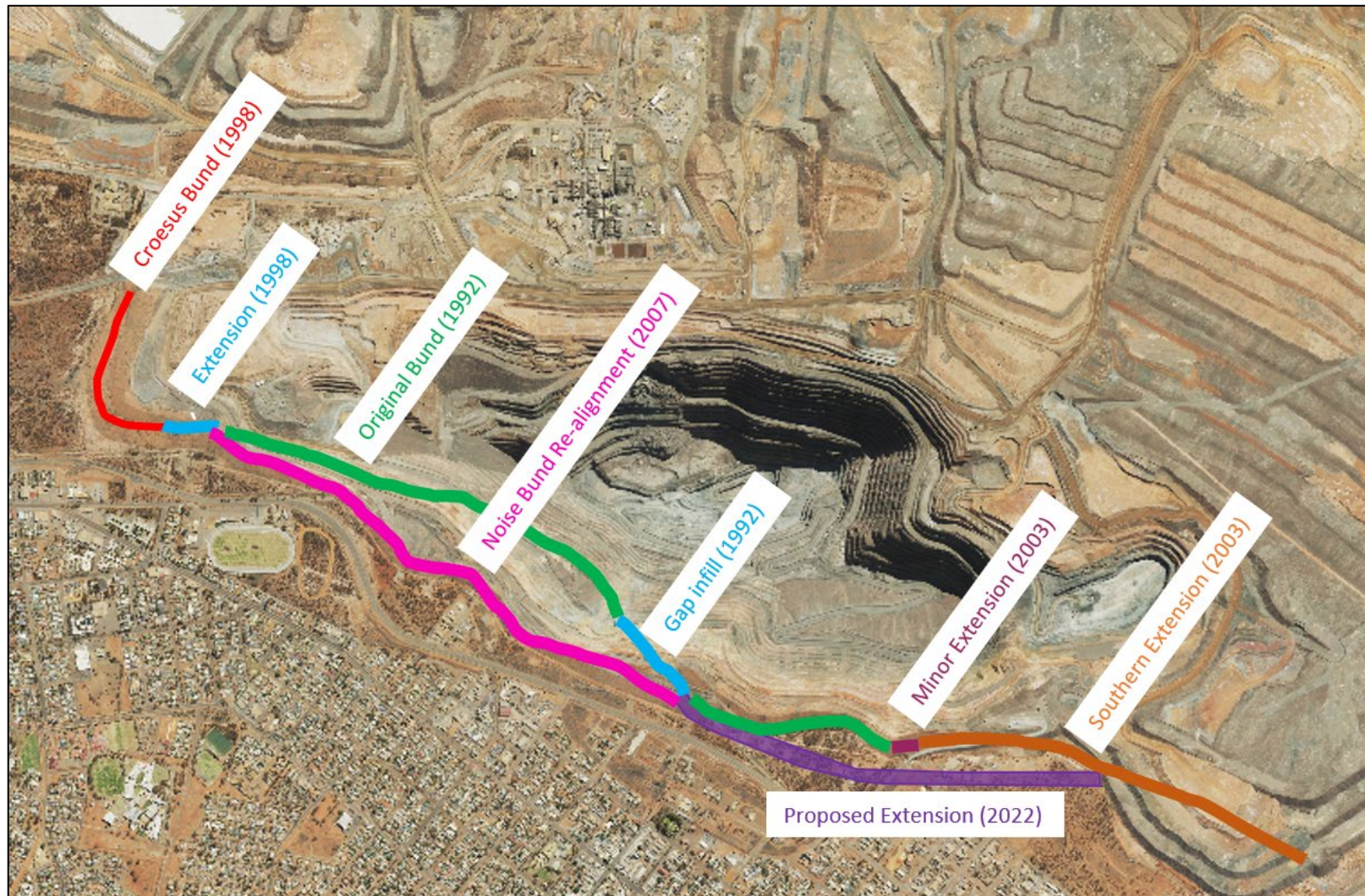


Figure 12: Proposed Extension of Environmental Noise Bund

6.4.3.7 Heritage

An ethnographic survey which encompassed the Fimiston operations was undertaken in 1989 in conjunction with an archaeological survey by O'Connor and Quartermaine (1989). Additional studies have been conducted by O'Connor in 2000, 2001 and 2004. Three archaeological sites were identified to the west and east of the Fimiston operation and ten ethnographic sites were identified to the north of the Fimiston operation. These sites are included in the DPLH Register of Aboriginal Sites (Table 19).

Table 19: Archaeological and Ethnographic Sites in the KCGM Area

Site ID	Access	Restriction	Site Name	Site Type	Site No.
Archaeological sites					
18572	Open	No restriction	Bulong Road KCGM Two	Artefacts/Scatter, Historical	-
18573	Open	No restriction	Bulong Road KCGM Two	Modified Tree	-
39486	To be determined	No restriction	Currently un-named	Artefacts/Scatter	Lodged
Ethnographic sites					
1541	Closed	No restriction	Nanny Goat Hill (Pilyurru)	Ceremonial, Mythological, Camp	W01662
1417	Closed	No restriction	Ninga Mia Hill	Mythological	W01753
1418	Closed	No restriction	Karkurla	Mythological, Water Source	W01754
1421	Closed	No restriction	Paddy Hannans Tree	Mythological	W01757
1422	Closed	No restriction	Quarry Rockhole	Mythological, Water Source	W01758
1425	Open	No restriction	Kalgoorlie Reserve	-	W01761
1476	Closed	No restriction	Muruntjarta	Mythological, Camp	W01760
1540	Closed	No restriction	Kalgoorlie Rockhole	Mythological, Water Source	W01661
1542	Closed	No restriction	Microwave Tower Hill	Mythological	W01663
3010	Closed	No restriction	Mt Charlotte	Mythological	W00120
36959	Closed	No restriction	Karkurla Tjurma Rockhole	-	Lodged

Source: Reports as above

Following the site tour in March, representatives from Marlinyu Ghoorlie commenced a Heritage Survey for the FS project areas over five days in March, with additional works completed over five days in April 2022. The heritage survey was conducted by six Marlinyu Ghoorlie representatives, two Terra Rosa consultants, and one KCGM representative.

KCGM and Marlinyu Ghoorlie have a signed agreement in place and an agreed protocol for survey activities. Heritage surveys currently occur monthly, and several site tours have also occurred.

An Aboriginal Cultural Heritage Management Plan (ACHMP) was developed by KCGM in 2009 and fully revised in 2023. The ACHMP includes protocols and procedures that will ensure the appropriate management of any Aboriginal sites or skeletal remains which may be identified during any mining-related activities (Appendix C - Confidential).

The ACHMP outlines the history of various indigenous groups in the regions, as well as describing the various surveys that have been undertaken previously in association with these cultural groups. It also includes recognition of heritage and cultural laws, and a summary of known Aboriginal heritage sites.

Sites 18572, 18753 and 39486 will not be affected (Figure 13). Site 1476 is located on the edge of the existing ENB and within the currently approved MDE area. The site has been demarcated and internal ground disturbance assessments exclude the sites from approved activity areas.

Site 18573 is a tree that is believed to have been modified by Aboriginal people. The tree is a gimlet gum (*Eucalyptus salubris*) with two sections of bark, one above the other, removed from the south side of the trunk. Quartermaine Consultants (2001) reported that the tree complies with the criteria for authentication and that while this tree has limited archaeological potential it is unique to the area and could be considered ethnographically important.

Site 18572 is a scatter of European debris which incorporates some flaked glass. Quartermaine Consultants (2001) reported that the area appears to have been a European settlement, or, at the very least, a dam and rubbish dump, that was visited by Aboriginal people. The assemblage included blue glass, clear glass, ale bottle bases and green glass. In the case of small glass bases, the natural shape of the base appears to have been retained and the artefact merely trimmed. The site is sparse with low stratigraphical potential, but it is a unique contact site that should be preserved and/or recorded.

Site 39486 (MG2209-01) is a low-density artefact scatter located immediately west of Fimiston Environmental Noise Bund, adjacent to the Goldfields Highway. KCGM will adhere to Marlinyu Ghoorlie Traditional Owners advice that the site will be demarcated and avoid this location until further archaeological recording has taken place.

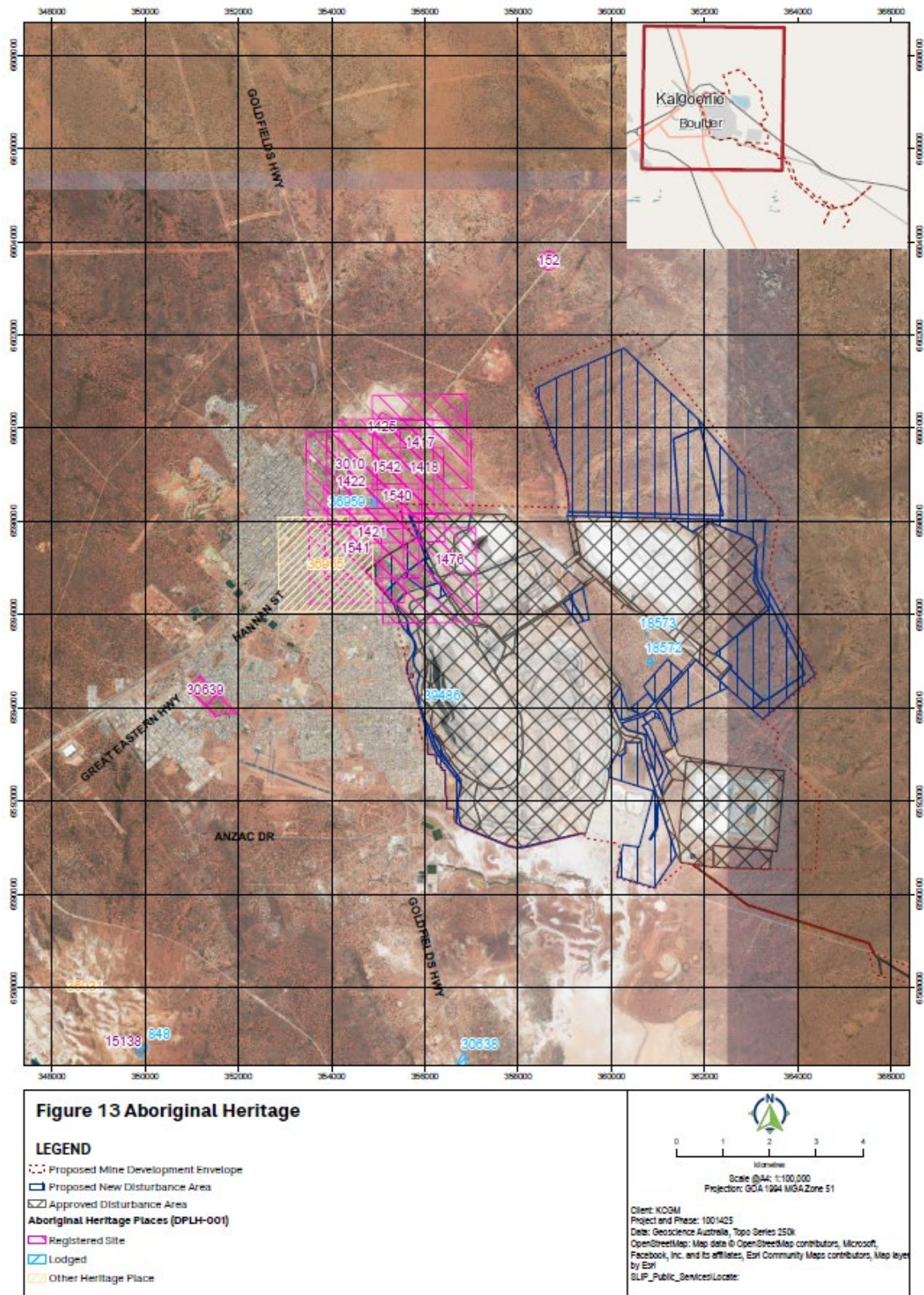


Figure 13: Aboriginal Heritage

6.4.4 Potential Environmental Impacts

Potential impacts to social surroundings from the proposed changes include:

- Reduced visual amenity from mining landforms.
- Reduced amenity from noise and vibration.
- Reduced public health or damage to property from flyrock.
- Reduced public amenity from dust emissions.
- Land disturbance resulting in damage to cultural heritage sites.

6.4.5 Assessment of Impacts

6.4.5.1 Reduced Visual Amenity

Fimiston is a unique situation, having mining operations established so close to an urban area. The proposed changes to mining operations represent extensions to the existing mining landforms and are not likely to result in significant changes to the façade of the existing mine.

Mining the larger pit is not expected to result in any significant changes to visual amenity due to the scale of changes proposed and the minimal changes to pit visibility. The cutback will increase the pit footprint from 535 ha to 574 ha, which represents an increase by approximately 39 ha or 7%. Most of the pit is concealed from line of sight by the 15m high ENB. The realignment of a 1.8km section of the existing ENB to form the ONB will not greatly amend the visual amenity aspect as activities are located to the south of the operation adjacent to industrial areas.

The FS Project will increase the overall disturbance footprint of other landforms such as TSFs and WRDs. However, the proposed amendments to these landforms will be located well away from any residential areas (to the east of the current open pit). Consequently, the proposed changes will result in no net change to the visual façade of mining landforms visible from urban areas of Kalgoorlie-Boulder. The changes to mining operations proposed are therefore considered unlikely to result in significant changes to visual amenity.

6.4.5.2 Reduced Amenity from Noise and Blast Vibration

6.4.5.3 Noise

To determine potential for impacts associated with changes to noise and vibration, KCGM commissioned Herring Storer Acoustics (2023a and 2023b) to update the Fimiston noise model to simulate the effects of the proposed operational amendments detailed within this Revised Proposal (Appendix O). The resulting model was then compared to noise criteria approved for Fimiston in the *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016* and defined in the NVMMP.

The noise assessment used noise levels at neighbouring residence and reference locations to inform predictive modelling using Soundplan. Seven operating scenarios were considered taking weather conditions into account:

1. Mining at -50 RL including existing noise bund
- 2a. Mining at -60 RL (South) including part of the existing noise bund
- 2b. Mining at -60 RL (North) including part of the existing noise bund
- 3a. Mining at -70 RL (South) including removal of southern part of the noise bund

- 3b. Mining at -70 RL (North) including removal of existing noise bund
- 4. Mining at -80 RL
- 5. Mining at -90 RL.

Noise modelling for each of these scenarios considered topography provided by KCGM and noise emissions (Sound Power Levels) previously assessed for the mining operations (HSA, 2023a). These noise sources were located throughout the mine at various locations, i.e. haul roads, pit floors etc. Scenario 1, the location of the sources was gained from the GPS location system, of which snapshots of equipment locations were taken (HSA, 2023). These snapshots were used to relocate equipment to worst case locations in regard to the proposed modification (HSA, 2023). Each scenario was run in the noise model for the same sources and weather conditions, monitoring noise at five locations as shown where approved noise levels are set under the *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016* (to be revised) and are shown in Figure 14 through to Figure 20.

Based on the assessable noise levels, there would be a potential change in noise levels at compliance noise monitoring locations. Analysis of the noise source contribution for these receivers shows that the haul truck location dominates the noise level with the variation being a result of the location of individual haul trucks. Provided operational areas are maintained for day and night mining operations, acoustically, the night-time variation of the Revised Proposal operations would be considered insignificant in either audibility or in assessable noise levels at the north and western receivers (HSA, 2023).

The Outram St location (OSB), which will require relocation due to the westward expansion of operational areas requires further investigation to support the identification of a suitable replacement location with detailed analysis shall be discussed in further detail in the revised Regulation 17 variation application (HSA, 2023).

Each scenario was run in the noise model for the same sources and weather conditions, monitoring noise at five locations as shown where approved noise levels are set under the *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016* (Figure 8). The noise levels noted in Table 20 are the based on the highest noise propagation from source to receiver, hence are directly comparable to the criteria with the maximum WIF added (HSA, 2023).

Table 20: Allowable and Predicted Noise Levels (L_{a10} dB)

Receiver	Maximum Allowable Noise Level		Scenario 1 - Mining Operations at - 50RL	Scenario 2a - Mining Operations at - 60RL (South)	Scenario 2b - Mining Operations at - 60RL (North)	Scenario 3a - Mining Operations at - 70RL (South)	Scenario 3b - Mining Operations at - 70RL (North)	Scenario 4 - Mining Operations at - 80RL	Scenario 5 - Mining Operations at - 90RL
	Daytime	Night-time							
BPS	56	51	50	50	49	52	54	51	49
BSW	54	49	45	45	46	46	46	46	45
KTS	56	51	49	49	50	49	50	49	49
OSB	57	54	54	52	52	50	57	52	51
OSB Alternate*	57*	54*	50	52	55	54	56	52	52
YSB	57	54	50	50	49	52	54	51	49

Exceedances shown in bold

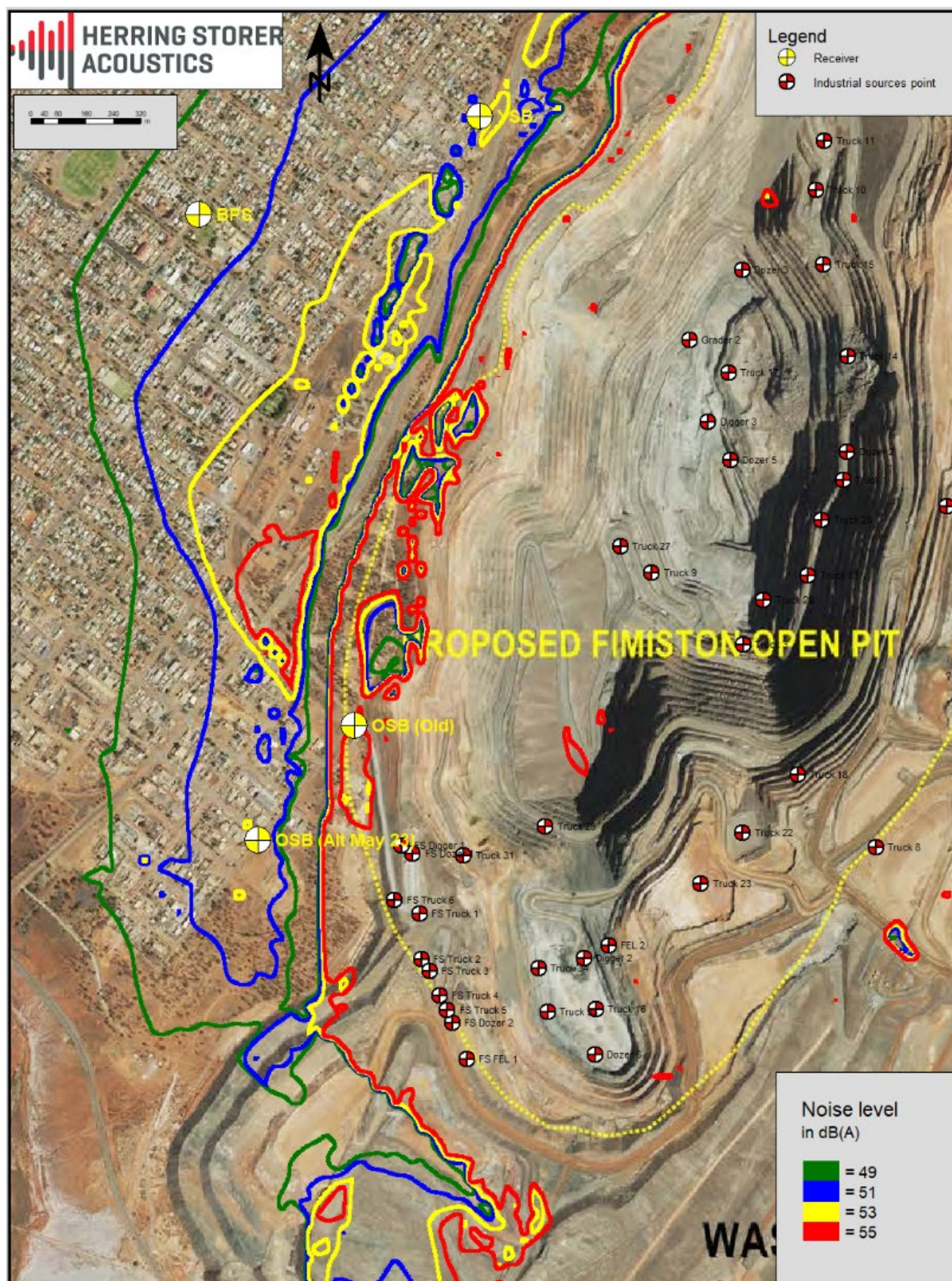


Figure 15: Scenario 2a - Mining at -60 RL (South)

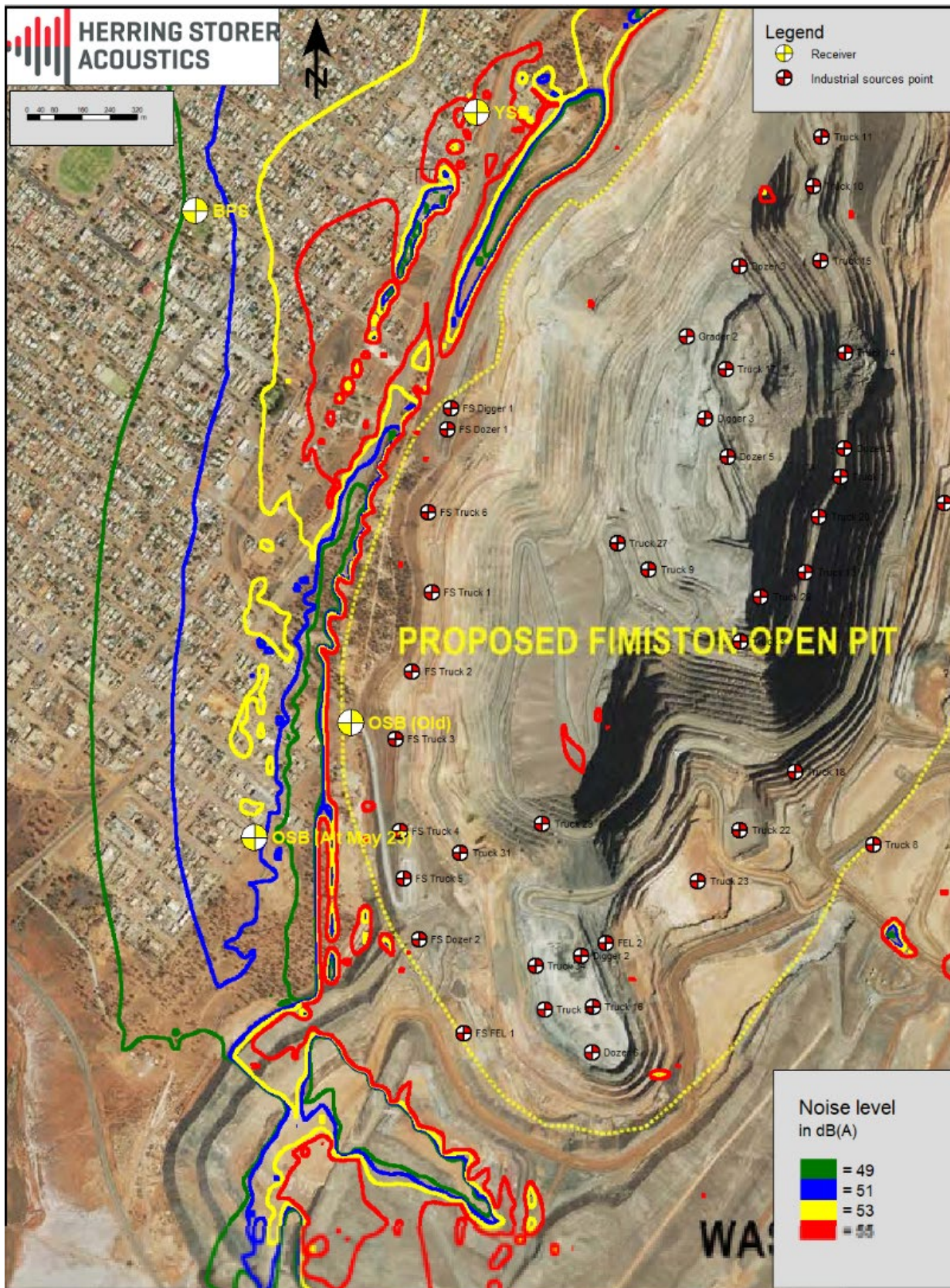


Figure 16: Scenario 2b - Mining at -60 RL (North)

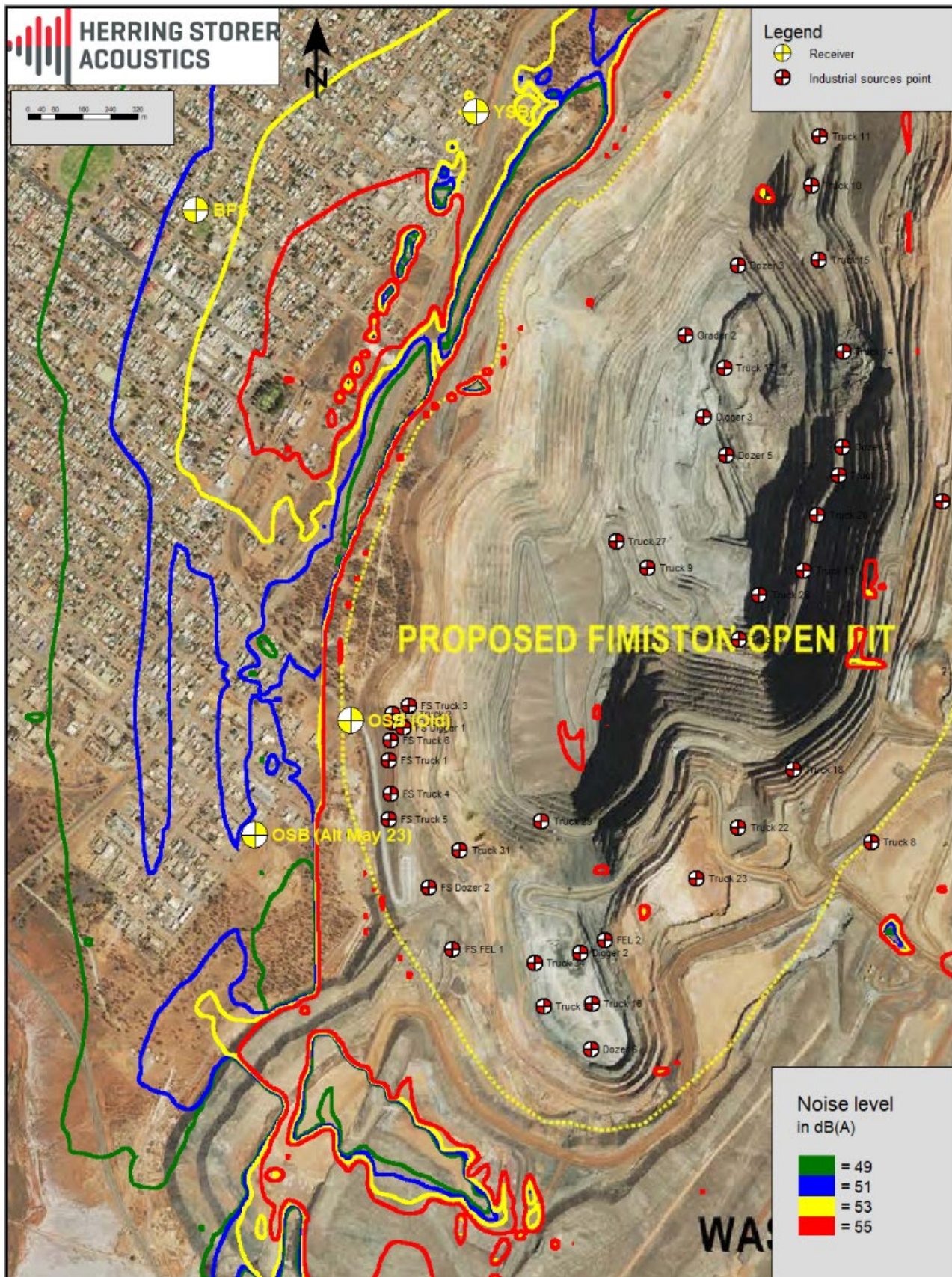


Figure 17: Scenario 3a - Mining at -70 RL (South)

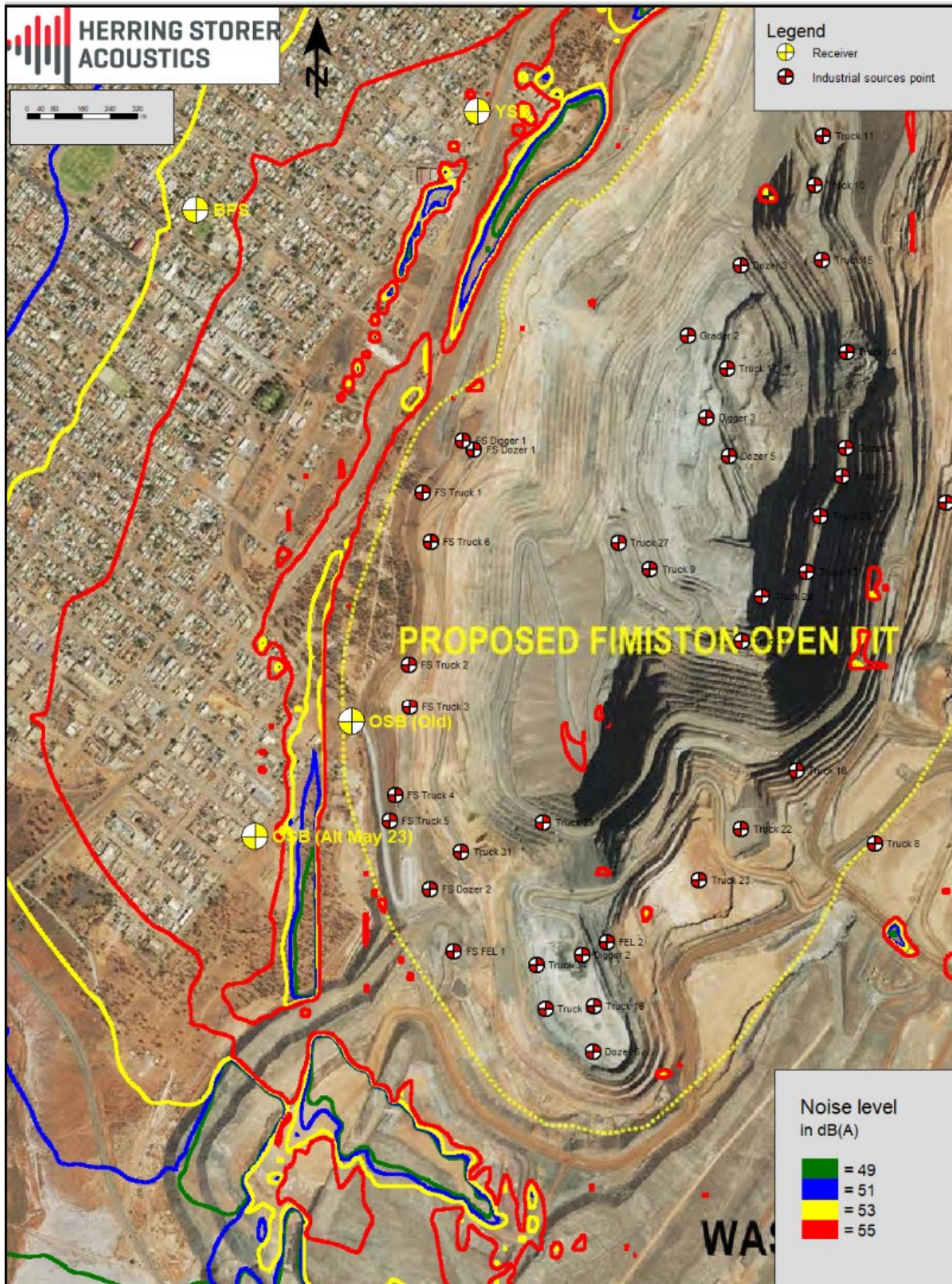


Figure 18: Scenario 3b - Mining at -70 RL (North)

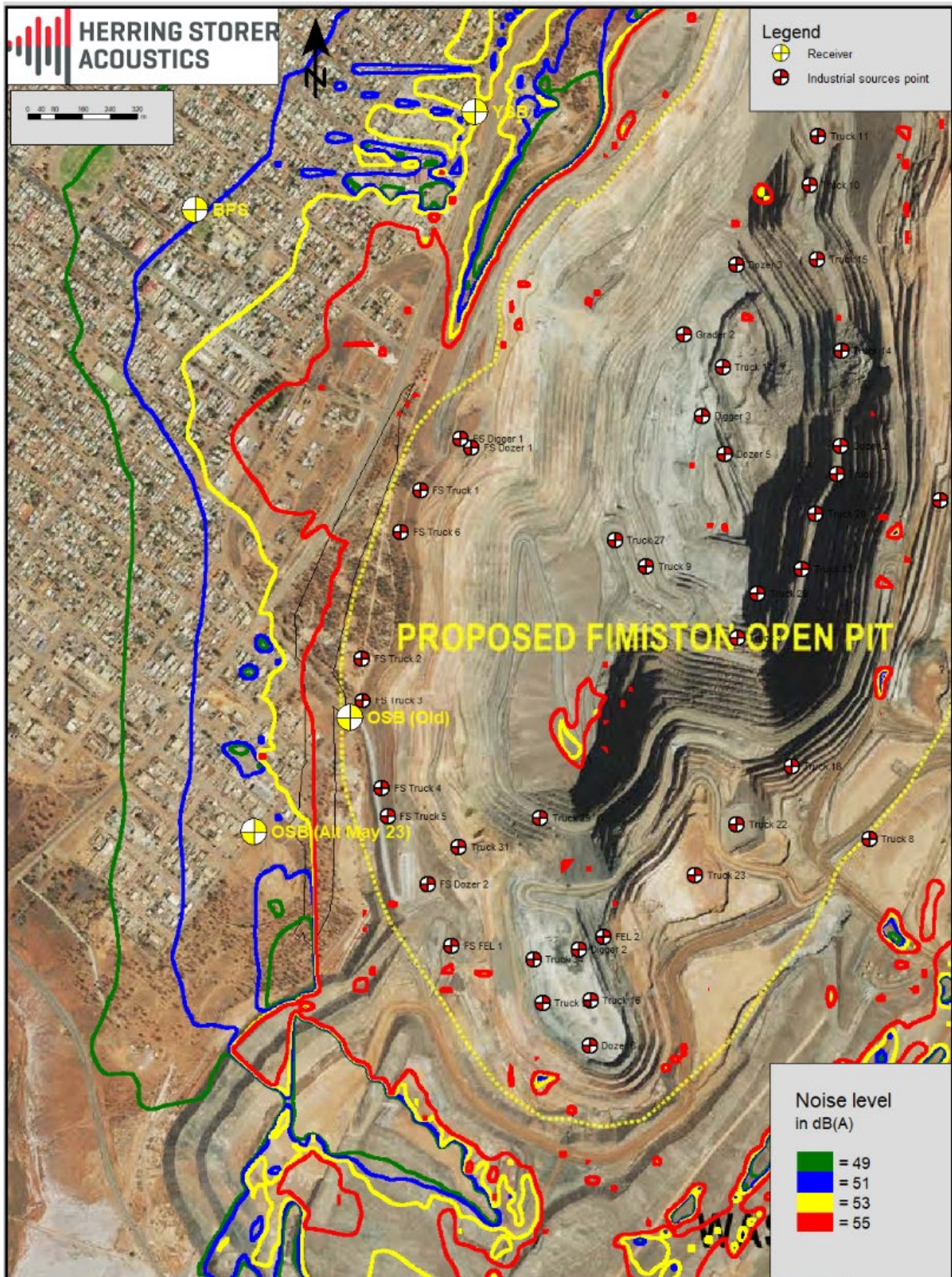


Figure 19: Scenario 4 - Mining at -80 RL

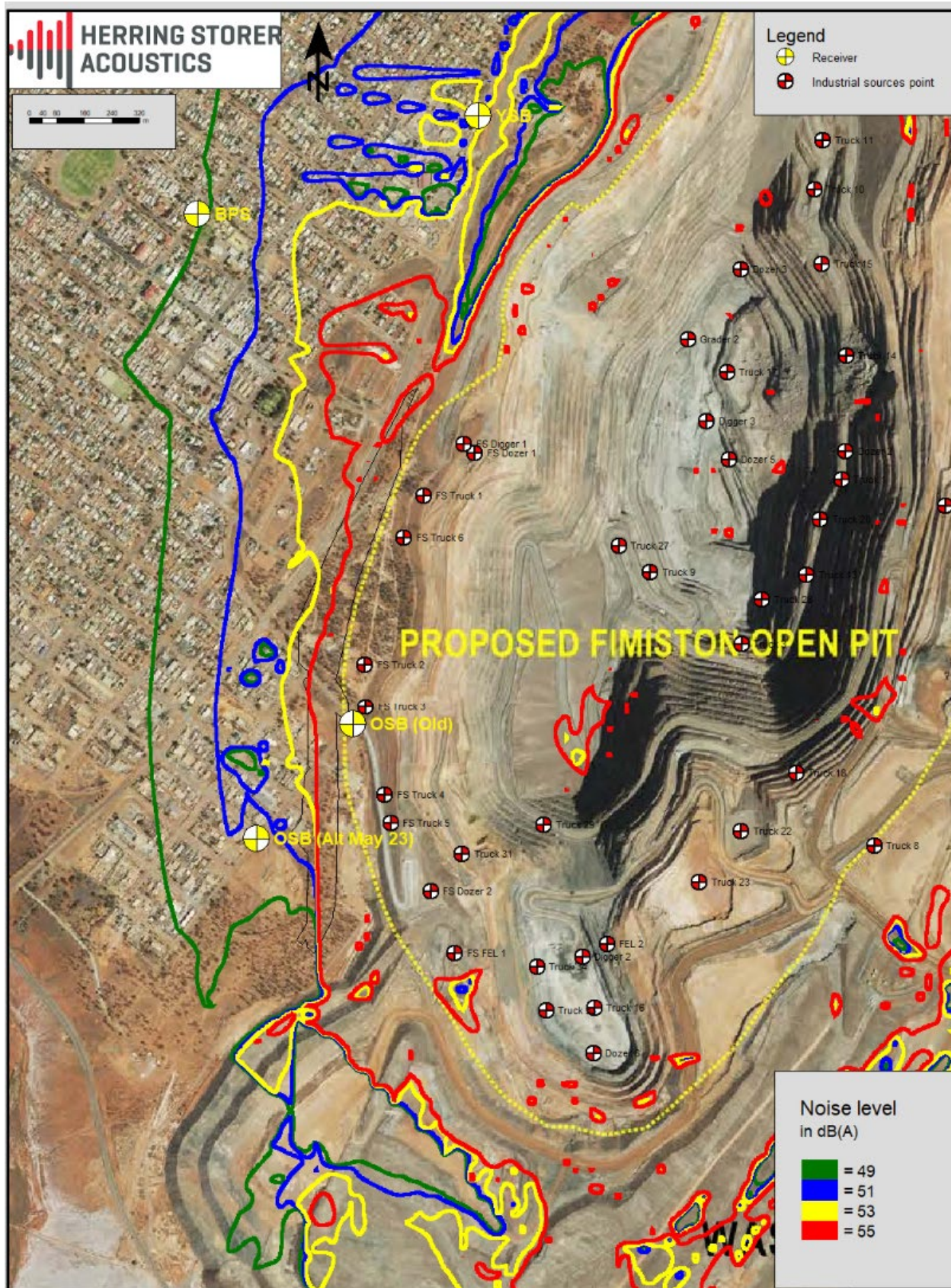


Figure 20: Scenario 5 - Mining at -90 RL

Noise levels at most reference sites were less than the approved noise criteria. The exceptions to this were Scenario 3a which exceeded the night-time noise criterion at the BPS monitoring site where the scenario was modelled to reach up to 52 L_{a10} dB against a night time maximum allowable noise level of 51 L_{a10} dB; and Scenario 3b at BPS which modelled 54 L_{a10} dB, OSB which modelled 27 L_{a10} dB (against a night time maximum allowable noise limit of 54 L_{a10} dB) and OSB Alternate which modelled 56 L_{a10} dB (against a night time maximum allowable noise limit of 54 L_{a10} dB) (Table 20). Noise levels should remain below the approved noise criteria if mining continues in accordance with the NVMMP. This requires KCGM to limit surface mining activities to allowable levels only until a level 20 m below the undisturbed ground surface level is reached. In this instance, 20 m below the undisturbed ground surface level is at -90 RL.

Acoustically the night time variation of the pit operations would not be significant in either audibility or in assessable noise levels and therefore the works associated with the proposed Fimiston Open Pit modification would be considered as having no impact on the noise levels either from a perception or from a regulatory assessment consideration.

Results of the noise assessment conducted for the Revised Proposal show that Fimiston Operations would maintain compliance with the approved noise level defined in the *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016* if KCGM continues to operate in accordance with the NVMMP. This modelling will be included with a revised Regulation 17 Application and revised NVMMP.

6.4.5.4 Vibration

Ground vibration and airblast produced from blasting, of sufficient magnitude or occurring over an extended period of time, can cause discomfort to sensitive receptors and potentially cause damage to structures, architectural elements and services. Structural damage is not always the result of vibration and can also be the result of natural deterioration of structures or ground or foundation movements due to the reactive clay environment (GBC 2022, M).

Best practice for blasting operations is defined within the Australia Standard AS2187.2 (2006). The compliance for ground vibration in Western Australia is usually specified in terms of 90% compliance as per MS 782 Condition 9-5 for the Fimiston Operations:

1. the peak velocity shall not exceed 5 mm/s for 90% of blasts per year
2. the peak particle velocity shall not exceed 10 mm/s for any blast
3. no more than one in ten consecutive blasts shall exceed 5mm/s peak particle velocity.

The analyses showed that blasting in the FS Project area will very probably achieve compliance with ground vibration limits as stipulated in Condition 9-5 of Ministerial Statement No. 782. This assessment is predicated upon the use of similar techniques to those previously applied to blasting at KCGM over the last 20 years and hence inherent to the vibration data gathered over that time (GBC 2022).

The FS Project cutback is adjacent to the South Boulder Light Industrial area which is predominantly made up of commercial and light industrial buildings/premises/land use which are not generally considered to be sensitive premises. Open pit blast monitoring is undertaken at six permanent blast monitoring locations (Alpha to Foxtrot) that are located between the Fimiston Open Pit and the City of Kalgoorlie-Boulder. The use of electric detonators does reduce the vibration and KCGM currently use these for specific purposes such as environmental control (GBC, 2022, Appendix J Appendix M).

The analyses showed that blasting in the Fimiston Open Pit will very probably continue to comply with ground vibration limits as stipulated in condition 9-5 of MS 782. The assessment is predicated upon the use of similar techniques to those previously applied to blasting at KCGM over the last 20 years and hence inherent to the vibration data gathered over that time.

Analysis of the air overpressure dataset did not assist in predicting air overpressure for the Revised Proposal. KCGM does have well established management techniques derived, refined, and proved over two decades of blasting operations and these techniques have proven to mitigate the risk of overpressure exceedance.

These techniques consider:

- Wind direction and velocity;
- Location of blast in reference to the pit shape and depth;
- Familiarity with the air pressure outputs of different types of blasts;
- Blast design to reduce air overpressure; and
- Avoidance of blasting where combinations of weather and blast design would result in elevated air overpressure.

The current operations comply with these criteria as will operations associated with the Revised Proposal.

The FS Project is adjacent to the South Boulder Light Industrial area which is predominantly made up of commercial and light industrial buildings/premises/land use; which are not generally considered to be sensitive premises (Figure 21).

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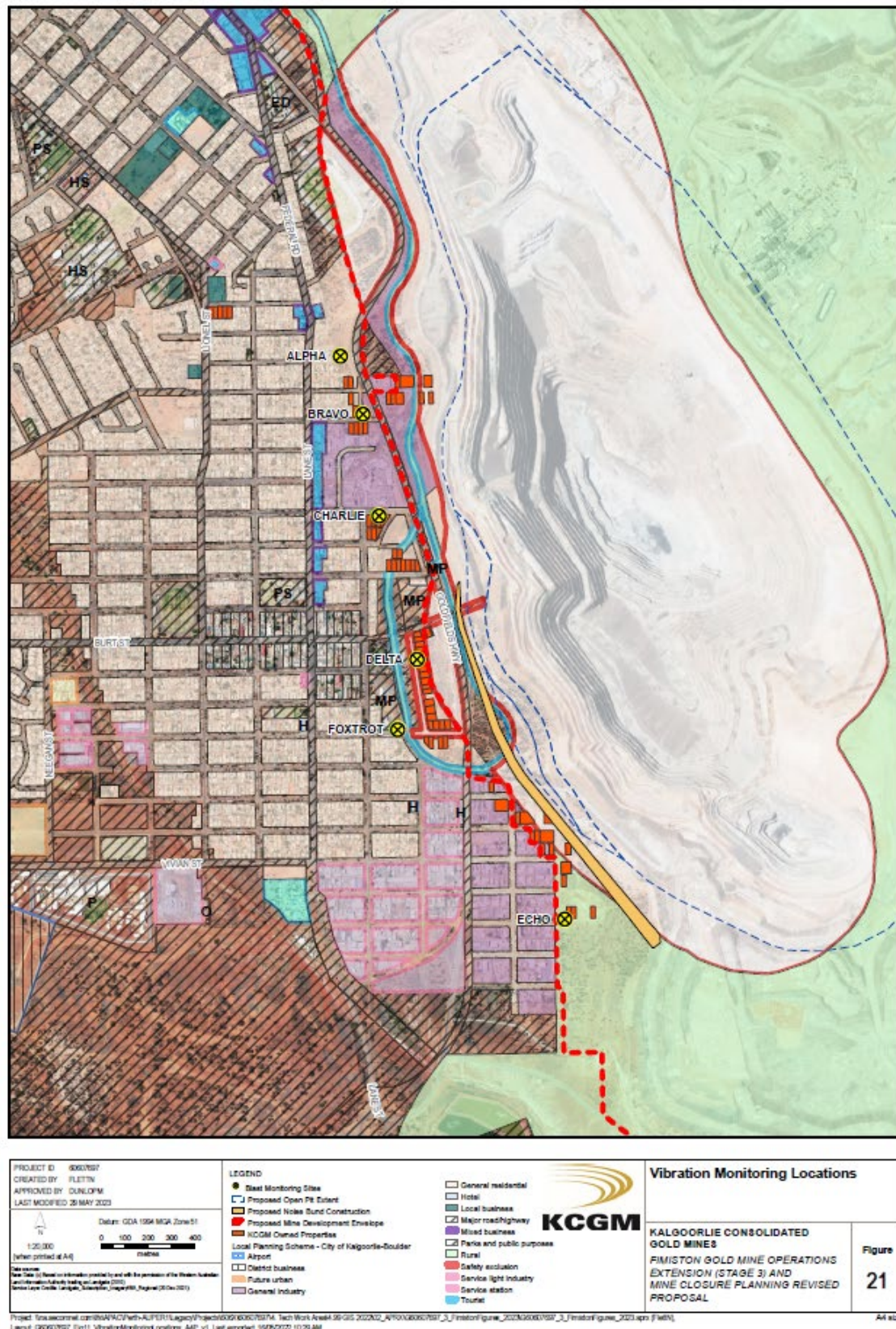


Figure 21: Vibration Monitoring Locations

6.4.5.5 Reduced Public Health or Damage to Property from Flyrock

Throughout development of the existing mine, flyrock modelling has been conducted to determine the level of risk flyrock may present to the community. Based on the results of flyrock assessments a blasting clearing area is implemented to reduce the risk of harm to personnel and the public from flyrock. Historically, since the commencement of the Golden Pike pushback, the blast clearance distance has been 200 metres from the nearest blasthole. While this distance is greater than the worst-case flyrock projection distance for holes charged to design specifications, 200m is considered a prudent distance.

Condition 10-1 of Ministerial Statement No 782 states “The proponent shall not undertake active mining operations within 400 metres of a property zoned Residential under the Town Planning Scheme without the written consent of the owner and occupier of that property.” The same document further defines “active mining” as “any method of working by which earth or any rock structure is disturbed...”, and is interpreted in this report to extend outwards by 400 metres from the top-of-pit footprint. During the assessment of the first approved pit shell for MS782, the fly rock risk zone was determined to be 200m.

In addition the current town planning scheme, Local Planning Scheme No. 2, contains a Special Control Area 3 (SCA3) which is slightly larger than the 200m zone, which severely restricts all residential construction within the area for safety purposes. In Local Planning Scheme No. 1, the potential interaction zone between the City of Kalgoorlie Boulder and KCGM was called the Safety Exclusion Zone. The naming conventions were updated to modern conventions in Scheme No. 2, with the Safety Exclusion zone renamed SCA 3.

The previous approval, Ministerial Statement 188 (MS188), had a Setback for Mining Activities (SMA), previously referred to as the Safety Exclusion Zone (SEZ) applied to the initial Fimiston Open Pit by the State Mining Engineer in 1992, and was set at 400 metres. KCGM was encouraged to purchase properties in the fly rock risk area.

The two Residential properties inside the 200m zone are owned by Northern Star and managed by KCGM. All KCGM managed properties (residential and commercial) have an Annexure to the tenancy agreement which requires the tenant to vacate the property on the request of KCGM if required. As a safety precaution, KCGM will ask the tenants of these properties or any other industrial land within 200m to vacate during initial blasting of upper benches. This process was used successfully used during the Golden Pike cutback early blasts, and may include the Goldfields Highway, which was closed for short periods for the Golden Pike cutback.

Results of modelling conducted for the existing FS Project (Blastech, 2022, Appendix F) suggested the risk of flyrock landing in the adjacent KGM owned industrial area was 0.04% but could be lower provided stemming length and related blast parameters are strictly controlled.

One KCGM owned commercial property is within the 200m zone, it is not permanently occupied, but used as a staff social club approximately twice a month, and will be vacated during the blast events. A small section of the Goldfields Highway (200 m long) also has a very low probability of around 0.0001%. Blastech (2024) noted various infrastructure near Fimiston South, including Western Power and KCGM powerlines and the Boulder Substation/ switch yard are likely to require short term vacation during blast events. The number of blasts fired at close distance to the identified infrastructure will be very small.

6.4.5.6 Reduced Public Amenity from Dust Emissions

An air quality impact assessment was conducted by Ramboll (2023), and the results indicate that emissions generated by the Revised Proposal can be adequately managed using the approved FAQMP (or as revised). It is therefore unlikely the Revised Proposal will result in significant impacts to public

amenity attributable to changes in air quality. Potential impacts to air quality are described in further detail in Section 6.3 of this referral.

In a screening health risk assessment (Ramboll, 2022; Appendix D) the comparative assessment of acute and chronic non-carcinogenic exposure risks resulted in no material change in acute or chronic non-carcinogenic HIs being noted from current (2019) model to future operations (2025 model), with bioavailability below target risk for all receptor locations. No change in acute (short-term) or chronic non-carcinogenic (long-term) exposure risks is expected from the Revised Proposal activities, and acute exposure risks are expected to remain low and acceptable (Ramboll, 2022).

Comparative assessment of carcinogenic exposure risks, no material change in ICR values have been noted from current (2019 model) to future operations (2025 model), with ICR values below the recommended risk target of 1E-05 at all receptor locations. No change in carcinogenic exposure risks is expected, and carcinogenic exposure risks are expected to remain low and acceptable (Ramboll, 2022).

The Revised Proposal will increase the size of the pit and therefore potentially expand the areas influenced by dust emissions. However, no new sources of emissions to air will be introduced, as the same mining fleet will be in use as currently and mined out sections of the pit will be inactive. Due to the nature and scale of the works proposed, the Revised Proposal is not expected to result in a significant increase in the amount of dust generated.

6.4.5.7 Land Disturbance Resulting in Damage to Aboriginal Heritage

The Revised Proposal has the potential to impact known Aboriginal sites. Consultation will be undertaken prior to works in the vicinity of Aboriginal Heritage Sites such as 1476, Muruntjarta.

KCGM will employ cultural heritage monitors from Native Title Claimant groups should works be implemented in the vicinity of an Aboriginal heritage sites. Monitoring teams will ensure that any isolated heritage materials can be immediately salvaged or relocated and assist the construction teams in undertaking a preliminary identification of any previously unknown heritage materials if unearthed.

The Aboriginal Heritage sites located within the vicinity of the Fimiston Operations are not located near the proposed Revised Proposal expanded operational footprints. KCGM mitigation strategies to protect and preserve Aboriginal Cultural Heritage have been included KCGM's Aboriginal Cultural Heritage Management Plan (Appendix C— Confidential).

If new sites are found during works, these will be managed in accordance with the ACHMP, which includes protocols for managing potential new sites if identified.

In the case of Muruntjarta, the site has been demarcated and works cannot be undertaken without an internal ground disturbance approval, which generally places a buffer around the site to avoid works impacting it.

6.4.6 Cumulative Impacts

The scale of mining at the Fimiston Operations is not expected to change under the Revised Proposal. Predictive modelling includes some potential increases in mill processing to account for worst case noise and dust emission scenarios and the potential impact on the local community. The number of blasts from the Fimiston Open Pit will not increase. Blasting from Mt Charlotte is not anticipated to increase. As a consequence, the cumulative impact of blasting from Fimiston Open Pit and Mt Charlotte is not anticipated to increase.

The cumulative impacts from the aspects listed below are not expected to change from current operations:

- Visual Amenity
- Noise
- Ground Vibration
- Flyrock
- Particulate Matter
- Heritage

6.4.7 Mitigation

6.4.7.1 Visual Amenity

KCGM makes efforts to minimise significant changes to the landscape and any additional landforms developed aim to minimise changes to the façade.

6.4.7.2 Noise and Vibration

Condition 9 of MS 782 requires KCGM to undertake mining operations in accordance with an approved Noise and Vibration Monitoring and Management Plan (NVMMMP) (KCGM, 2023). The 2016 KCGM NVMMMP has been revised in conjunction with the Regulation 17 renewal process and to incorporate the acoustic recommendations from revised modelling (HSA, 2023).

In accordance with MS 782 Condition 8(1) KCGM implements continuous environmental noise monitoring at Metal Exploration Premises (MEP) and Boulder Primary School (BPS); as detailed below:

- Continuous noise monitoring is undertaken at BPS and MEP using Bruel and Kjaer 2250 Sound Level Meter (SLM) equipment, which are NATA calibrated every two years.
- Noise data at BPS is recorded in decibels as L_{10} , L_{50} , and L_{90} .
- Noise data at MEP is recorded in decibels as L_{eq} .

Due to the change to the Fimiston Open Pit footprint, the Outram St monitoring location (OSB), will require relocation. Confirmation of replacement location requires further investigation to support the identification of a suitable replacement location with detailed analysis contained within the revised Regulation 17 application (HSA, 2023). Results of the vibration and air pressure assessment also conclude that the vibrations in the pit extended to the south and east would remain compliance with existing Ministerial Conditions of MS 782 provided management and techniques are consistent with the revised NVMMMP (Appendix P).

Mitigation measures implemented as part of the NVMMMP are summarised in Table 21.

Table 21: Summary of Mitigation and Management Measures for Noise and Vibration

Type	Controls
Avoid	• No unnecessary blasting or ground vibration inducing activity to be conducted. • Restricted hours of operation: ○ Blasting only between 0700 hours and 1800 hours (as per current conditions). ○ Limiting surface mining activities to daytime and evenings only until a level of 20 m below the undisturbed surface level is reached.
Minimise	• Construction of the ONB along south-western boundary of Fimiston Open Pit. • Continuation of noise and vibration monitoring in accordance with the NVMMMP. • Continuation of undertaking independent noise modelling to evaluate any proposed changes to current or future Fimiston Operations. • Restricted hours of operation – for certain equipment or activity if there is a risk of attracting negative feedback from the community (restricted to daytime).

Type	Controls
	- Designing blasts to minimise air blast and vibration: - Reducing blast size. - Reducing blasthole diameter. - Continue to undertake blast modelling to predict projected ground vibration and air-blast overpressure levels. - Utilisation of electronic detonation system (as required). - Ensuring the minimum stemming is loaded into each blasthole. - Continue taking into consideration atmospheric conditions prior to blasting (red or green winds). - Using additional noise barriers or temporary barriers where required or indicated by projected modelling (e.g. around exploration drilling). - Installation of broadband frequency noise (white sound) reversing alarms on mobile equipment. - Maintain consultation and engagement for matters of cultural heritage under the KCGM Aboriginal Cultural Heritage Management Plan (and agreements).
Rehabilitate	Not applicable.
Offset	Not applicable.

6.4.7.3 Flyrock

KCGM mitigates impacts from flyrock through implementation of a Set Back for Mining Activity (within the Kalgoorlie Boulder town planning scheme) and Blast Management Plan. Key mitigation and management measures are summarised in Table 22.

Table 22: Summary of Mitigation and Management Measures Flyrock

Type	Controls
Avoid	Blasting will maintain a minimum blast clearance of 200 m
Minimise	- Traffic management implemented where required for blasts near major roads - Consultation with key stakeholders including the City of Kalgoorlie-Boulder and Main Roads WA. - Training for all personnel participating in blasting. 'Free-dig' techniques will be used to avoid blasting where possible - Electronic detonators (or similar alternative technology) will be used where applicable rather than traditional detonators for greater precision reduced airblast and ground vibration. - Quality Assurance data to be transferred to blast design software for accurate kilogram per hole quantities. - No hole quantity to exceed design parameters sent to the Mobile Mixing Unit. - Mechanical methods used where practicable for secondary breaking. - Quality Assurance Procedures regarding charge mass per unit length of blast hole and minimum stemming lengths will be used and recorded. - Specified blasting design and loading procedures will be used to reduce flyrock where secondary blasting is required. - Acquisition of close proximity properties by KCGM.
Rehabilitate	Not applicable.
Offset	Not applicable.

To protect the community from flyrock, all blasting is managed using a Blast Management Plan. Additionally, in accordance with conditions in MS 782, no blasting is conducted within 400 m of a property zoned residential under the Town Planning Scheme without written consent of the owner and occupier of

that property. On occasion when blasting is nearer the surface, some council roads can be closed as a precaution.

Currently all properties zoned residential within 400 m of the active mining operations are owned by Northern Star and managed by KCGM. All KCGM managed properties (residential and commercial) have an Annexure to the tenancy agreement which requires the tenant to vacate the property on the request of KCGM if required. As a safety precaution, KCGM will ask the tenants of these properties or any other industrial land within 200m to vacate during initial blasting of upper benches. This process was used successfully during the Golden Pike cutback early blasts, and may include the Goldfields Highway, which was closed for short periods for the Golden Pike cutback. Blastotechnology (2024) concluded that:

- A rigorous programme of quality control and assurance is maintained during charging.
- All design charge configurations are checked for compliance with maximum projection distances using an approved flyrock model.
- Personnel involved in design and implementation of blasting are kept aware of the need for tight control of flyrock and undertake review of blast performance.
- All flyrock incidents are fully reviewed and records are maintained, including separation distance and actual charge configurations.

KCGM will continue to operate with a minimum 200m clearance zone during blasting. The 200m clearance distance provides an appropriate buffer to compensate for potential charging errors. The KCGM mining lease and other KCGM infrastructure on the eastern side of the highway are bounded by a security fence to reduce the chance of inadvertent access and to assist in maintaining the clearance zone.

Dust

Potential impacts to air quality are managed through implementation of the FAQMP. Ramboll was commissioned to review the FAQMP to determine if the existing management approach is suitable for mitigating potential impacts to air quality from the Revised Proposal Appendix G (Appendix F). Results of the review indicated that potential impacts to air quality attributable to the Revised Proposal could be adequately managed through continued implementation of the FAQMP. The current FAQMP has been updated to include predictive modelling which captures the proposed changes. This revised version of the FAQMP is being submitted for review and approval as per currently required under MS 782. Management and monitoring processes as per the revised FAQMP have been adjusted for the continuation of Fimiston Operations proposed under the Revised Proposal.

Mitigation measures implemented to manage air quality are described in Section 6.3.8. Key management measures are outlined in Table 18.

6.4.7.4 Aboriginal Cultural Heritage

The Registrar of Aboriginal Sites (formerly Department of Aboriginal Affairs, now part of DPLH); require KCGM to ensure the long-term management of vegetation significant to adjacent ethnographic sites (KCGM 2022 (MCP, Vol1)). This action was completed to the satisfaction of the Registrar in 2015, after an audit of site vegetation status was completed. Most sites with vegetation associations are in locations accessible to the public.

A revised KCGM Aboriginal Cultural Heritage Management Plan (ACHMP) is included as Appendix C; which was prepared in consultation with the Marliny Ghoorlie Traditional Owners. The ACHMP is the key process for delivery of early engagement, initiation archaeological and ethnographic surveys and to ensure that Aboriginal Cultural Heritage within the vicinity of KCGM's operations is properly respected and protected.

The development and implementation of an ACHMP is an agreed obligation as part of project stakeholder and regulatory consultation for KCGM. The ACHMP sets in place a formal mechanism for the management of cultural heritage within the Fimiston Operational areas. The ACHMP also ensures project participants are aware of obligations under Commonwealth and State legislation, to avoid and minimise impacts on Aboriginal Cultural Heritage (Appendix C – Confidential).

Heritage items or locations positioned outside the proposed amended operational or/and closure footprints will not be disturbed by implementation of the Revised Proposal. Activities of machinery and equipment will be confined within the approved footprint. Some known heritage locations at Fimiston are fenced to prevent disturbance; small artifacts were salvaged during heritage survey activities by the Native Title holder. Mitigation efforts for new or previously unknown instances of heritage are discovered the current ACHMP outlines the following mitigation:

- KCGM will employ cultural monitors from the Native Title Claimant Group during all initial ground disturbance activities; and
- If new discoveries can be relocated or salvaged.

If a previously unidentified Aboriginal site is found (for example, artefacts are uncovered) at KCGM, the following actions will be taken as per KCGM ACHMP (2023):

- Ground disturbing activity in the area will be stopped.
- The site will be barricaded to prevent further inadvertent access or disturbance.
- A heritage survey will be conducted by a suitably qualified consultant.
 - If the heritage survey determines that the area is an Aboriginal site, a report will be prepared and submitted to the DPLH.
- The site is recorded and placed on the Register of Aboriginal Sites.

Potential impacts to heritage are managed through implementation of the ACHMP. Mitigation measures implemented as part of the ACHMP are summarised in Table 23.

Table 23 Summary of Mitigation and Management Measures Heritage

Type	Controls
Avoid	• No known Aboriginal sites within the Revised Proposal disturbance footprint • Work is not conducted at Aboriginal sites without prior approved from DPLH and TOs
Minimise	• Aboriginal sites are identified through ethnographic and archaeological surveys. • Department of Planning, Lands and Heritage (DPLH) informed of identified sites for inclusion in the Register for Aboriginal Sites • Coordinate of identified sites are recorded in the Northern Star / KCGM GIS database. • Clearance must be obtained from KCGM relevant officers if any activity is going to take place outside the boundary of the operations. • Traditional Owner observers will be involved in clearing of any new areas • Location of Aboriginal sites is considered during preparation of the Revised Proposal and other approvals. • Information on items of cultural significance provided as part of the general induction. • All employees are required to take part in Cross Cultural training. • Aboriginal Heritage Management Plans are developed for specific sites where necessary. Plans are to be developed in consultation with relevant Aboriginal groups.

Type	Controls
	If an Aboriginal cultural heritage site must be disturbed, approval will need to be sought under the <i>Aboriginal Heritage Act 1972</i>. Work cannot commence in the identified area until approval is received.
Rehabilitate	Prior to work commencing consultation is undertaken with DPLH and Traditional Owners and a rehabilitation Revised Proposal is prepared.
Offset	Not applicable.

6.4.8 Predicted Outcome

The increase in the use of trucks on the eastern waste dumps as a result of proposed extension of the Fimiston Open Pit will potentially increase the local noise levels in the eastern part of the site, which is away from the city. The ENB between the city and the Fimiston Open Pit will continue to attenuate noise from the Fimiston Operations. KCGM aims to operate within the limits specified in the revised Regulation 17 Approval through continued management of noise emissions as per the site NVMMMP.

Due to the realignment of a 1.8 km section of the current ENB and relocation of the public lookout, KCGM consider the changes to visual amenity to be minimal with the unlikelihood of any significant impact to be visible from residential areas; KCGM pose that the relocation and reestablishment of the public lookout may in increase tourist interest for the area.

Following review of the risk assessment of flyrock occurring from the Revised Proposal activities, KCGM consider the potential for negative impact to the public, residential or commercial properties to be very low. However, best practice methods will include temporary closure of up to a 700m section of the Goldfields Highway (Blastotechnology, 2022) during surface blasting events (as previously implemented during past cut back activities).

Results of the air quality (particulate matter) and health risk assessment concluded the activities proposed within the Revised Proposal are unlikely to result in significant impact to human health or change to current air quality conditions (Ramboll 2022).

Implementation of the Revised Proposal is unlikely to result in significant impact to items or locations of heritage due to early engagement with both determined and non-determined groups and completed surveys across areas identified within the proposed amended operational or/and closure footprints and other areas across the Fimiston Operations.

The Revised Proposal is unlikely to have a significant impact on social surroundings because:

- Changes to the façade of mining landforms visible from the Kalgoorlie townsite will be minimised, as these landforms are behind the existing pit and realigned noise bund.
- Noise emissions will remain within the limits approved in the revised application to be submitted to update *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016*.
- Vibration will continue to be compliant with the ground vibration limits as set in condition 9-5 of MS 782.
- KCGM continue to comply with the approved blasting procedures.
- No direct disturbance of Aboriginal heritage sites is proposed, and Cultural Heritage Monitors will be used to monitor the works in the vicinity of heritage sites.

6.5 Flora and Vegetation

6.5.1 EPA Objective

The EPA's objective for flora and vegetation is 'to protect flora and vegetation so that biological diversity and ecological integrity are maintained' (EPA, 2023).

6.5.2 Policy and Guidance

- Technical Guidance 'Flora and Vegetation Surveys for Environmental Impact Assessment' (EPA, 2016b)
- 'Environmental Factor Guideline 'Flora and Vegetation' (EPA, 2016c)
- Protection of Naturally Vegetated Areas Through Planning and Development, Environmental Protection Bulletin No. 20' (EPA, 2013)
- Guidance Statement No. 6 — Rehabilitation of Terrestrial Ecosystems (EPA, 2006).
- Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans (EPA, 2021c).

6.5.3 Receiving Environment

6.5.3.1 Flora and Vegetation Studies

The results from ecological surveys have been used to support the assessment of potential impacts of the Revised Proposal on flora and vegetation. The most recent flora and vegetation assessment report (Phoenix Environmental Sciences, 2023c) includes a discussion on the combined vegetation and flora studies completed in recent years. Reports that document regional fauna, flora and vegetation within the surrounds of the MDE were also reviewed as outlined in Table 24.

In September 2021, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned to undertake a biological desktop review and reconnaissance survey for the Revised Proposal to identify potential terrestrial biological values and inform further baseline survey requirements.

Table 24 Vegetation and Flora Surveys

Report	Survey Description	Survey Dates
Revised Flora and Vegetation Assessments for the Fimiston Gold Mine Operations, Phoenix Environmental Sciences 2023c, (Appendix MAppendix H)	Investigation of proposed infrastructure areas in the floodway and south of the Fimiston II TSF and Kaltails TSF.	6-8 September and 11-12 November 2017
	Targeted <i>Eremophila praecox</i> and general short range endemic (SRE) survey for the Fimiston II Cell E TSF Project.	13-14 November 2018
	Survey for the State listed Priority 1 flora species <i>Eremophila praecox</i> in the broader Kalgoorlie region.	9-15 August 2019
	Gap analysis of botanical values at the Fimiston Operational Area and botanical survey in areas where survey was insufficient, including the Floodway North and Floodway South areas, Fimiston II Cell E TSF, Cell G and Fimiston III TSF study areas.	Floodway North and Floodway South – 19-21 May 2021 Fimiston IIE TSF and Cell G – 4-8 October 2021 Reconnaissance survey for Fimiston III TSF – 13-16 December 2021

6.5.3.2 Regional Vegetation Context

The Revised Proposal area is within the Interim Biogeographic Regionalisation of Australia (IBRA) Eastern Goldfields subregion (COO3) of the Coolgardie bioregion. A small section of the MDE occurs in the Eastern Murchison (MUR1) subregion of Murchison bioregion.

The Eastern Goldfields subregion is characterised by (Cowan 2001a) as having:

- gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite
- tertiary soils dominated by calcareous earths overlay eroded gneisses and granites
- vegetation consisting of mallees, *Acacia* thickets and shrub-heaths on sandplains and dwarf shrublands of samphire persisting on salt lakes, surrounded by diverse *Eucalyptus* woodlands, which also occur on ranges and in valleys
- in the western half, a series of large playa lakes indicate the remnants of ancient major drainage lines.

The Eastern Murchison subregion is characterised by Cowan (2001b) as having:

- many internal drainages
- extensive areas of elevated red desert and plains with minimal dune development
- salt lake systems associated with the occluded Palaeodrainage system.
- broad plains of red-brown soils and breakaway complexes as well as red sandplains
- vegetation dominated by Mulga woodlands, often rich in ephemerals; hummock grasslands, saltbush shrublands and *Halosarcia* shrublands.

6.5.3.3 Vegetation Associations

Regional scale pre-European vegetation mapping for Western Australia (Beard et. al. 2013) identifies three vegetation associations in the MDE (Table 25). The remaining extent of the vegetation associations at the State-wide scale exceeds 98% and they are therefore considered of Least Concern.

Table 25: State-wide Extent of pre-European Vegetation Associations Present in the MDE

Vegetation Association	Pre-European Extent (ha)	Current Extent (ha)	Remaining (%)	Current Extent in DBCA Lands (%)	% of MDE
20	1,295,103.39	1,292,474.58	99.80	19.42	10.61
468	592,022.32	583,902.76	98.63	23.15	88.67
1294	6,295.54	6,047.45	96.05	1.9	0.72

The woodland vegetation types of the MDE are representative of the Shepherd et al. (2002, after Beard) vegetation association 468 mapped as medium woodland; salmon gum (*Eucalyptus salmonophloia*) & Goldfields blackbutt (*Eucalyptus lesouefii*) that has more than 98% pre-European extent remaining and covers a broad area (total 583,903 ha) (Government of Western Australia, 2019). Other vegetation types are vegetation association 20 (Low woodland, mulga mixed with *Allocasuarina cristata* and *Eucalyptus* species) and vegetation association 1294 (medium woodland: coral gum), both of which have over 95% remaining at a State level.

6.5.3.4 Flora Diversity

Several studies have been undertaken to survey the flora and vegetation for the MDE and surrounds. Botanica Consulting surveyed and mapped the flora and vegetation of the TSF expansion areas in 2015. As this was done prior to the release of the technical guidance for flora and vegetation surveys (EPA, 2016b), Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by KCGM in 2018 to undertake a gap analysis of previous studies to ensure previous surveys met the technical guidance document (Phoenix, 2023c). In September 2021, Phoenix was commissioned by KCGM to undertake flora and vegetation assessments, with work areas defined as Floodway North, Floodway South, Fimiston IIE TSF (3rd cell) and Fimiston III TSF study areas.

Desktop review identified records of a total of 248 flora taxa have been recorded in the study area, representing 39 families and 98 genera of which 234 have been identified to species level. This included 223 native and 25 introduced flora. The most prominent families were the Chenopodiaceae (51 taxa), Fabaceae (35 taxa), Scrophulariaceae (28 taxa), Myrtaceae (26 taxa) and Asteraceae (21 taxa) (Phoenix, 2023c).

Field survey data from previous surveys was consolidated with data collected in the field surveys undertaken by Phoenix in May, October and December 2021, to produce a comprehensive database of botanical values for the Fimiston Operational Area to inform future developments (Phoenix, 2023c).

Taking the results of the current and previous surveys into account, a total of 270 flora species have been recorded in the MDE, representing 42 families and 108 genera (Phoenix 2023c). The most common families are the Chenopodiaceae (53 taxa), Fabaceae (35 taxa), Scrophulariaceae (31 taxa), Myrtaceae (28 taxa) and Asteraceae (25 taxa) (Phoenix 2023c).

6.5.3.5 Conservation Significant Flora

No Commonwealth or State listed Threatened flora were recorded in the MDE during the 2018 survey (Phoenix 2023c).

Of the 23 significant flora identified in the desktop review, one species of Priority flora, *Eremophila praecox* (P2), was recorded in the 2018 and 2021 Phoenix field surveys (Phoenix 2023c).

The 2021 survey established that the species has a greater distribution than that currently recorded on FloraBase (WA Herbarium 1998-) or NatureMap (DBCA 2021). The species is most frequently recorded in clay loam soils in *Eucalyptus* and/or *Allocasuarina* woodland with a variable understorey, frequently with *Acacia* and *Eremophila* species. *Eremophila praecox* has previously been recorded in conservation reserves including the Karrawang Nature Reserve (WA Herbarium 1998-) and Bullock Holes Timber Reserve (Phoenix 2023c).

Phoenix (2020c) recorded a total of 340 *E. praecox* plants in the study area (broader area including the MDE in which surveys have been taken) noting that some records of the species were not visited during the survey as they were not accessible and subsequently the total population size of the species would exceed this figure. Further populations have since been recorded comprising of:

- Six plants at three locations.
- A single plant
- Five plants at four locations
- 90 plants at Fimiston (Phoenix 2023c).
- An additional 10 plants identified on KCGM tenure outside the study area (Figure 22)
- An additional 30 further plants identified in recent nearby surveys, after this project and not shown in Figure 22.

Subsequently the total population size for the species now exceeds 482 plants, as the population size of records remains unknown, but of those known there are 482 plants (Phoenix 2023c; Phoenix pers comm). Recent surveys (Phoenix 2018b, 2019, 2020, 2021b) have identified that the species has a broad distribution, is frequently recorded and may be expected to have a higher population due to the substantial area of suitable habitat for the species across the recorded distribution. The number of populations recorded during regional studies “may support application to a Priority 3 status” (Phoenix 2023c).

Eremophila praecox is known from 59 populations with over a quarter of known plants in conservation reserves. Populations were delineated by proximity of records to other records. Plants located more than 500 m apart were assigned to different populations. Some exceptions were applied to occasional isolated records that were slightly further apart from a population cluster (up to 700 m) where they were considered likely to be connected to the population. Some consideration was also given to barriers, i.e. drainage lines (*E. praecox* rarely occurs in drainage areas) and roads.

The mapped distribution for *E. praecox* spreads roughly from 140km north-south and 110 km east-west has substantially more suitable habitat for the species and likely suitable habitat beyond the current distribution. There is now a record for the species in South Australia according to FloraBase. When conducting regional searches for the species the success rate of locating the species in suitable habitat was extremely high even though typically populations are sparse. It is likely that with further survey effort of some of the populations in the Fimiston area could be joined by locating further individuals to reduce distance apart to below 500m.

6.5.3.6 Introduced Flora

The desktop review identified records for 75 introduced flora (weeds) within 40 km of the study area, Nine introduced flora species have been recorded in the study area (of which three are a weed of national significance (WoNS) or Declared Pest as shown in Table 26, Phoenix 2023c).

Table 26: Introduced Flora Recorded in the Field Survey

Family	Species	Declared Pest	WoNS
Asteraceae	* <i>Centaurea melitensis</i>		
Asteraceae	* <i>Oligocarpus calendulaceus</i>		
Asteraceae	* <i>Sonchus oleraceus</i>		
Boraginaceae	* <i>Echium plantagineum</i>	x	
Brassicaceae	* <i>Carrichtera annua</i>		
Cactaceae	* <i>Opuntia elata</i>	x	
Lamiaceae	* <i>Salvia verbenaca</i>		
Solanaceae	* <i>Datura ferox</i>		
Solanaceae	* <i>Lycium ferocissimum</i>		x

6.5.3.7 Vegetation Communities

Based on previous vegetation mapping, the study area contains 12 remnant vegetation types as well as disturbed areas (cleared of vegetation) and areas of rehabilitation (Table 27, Figure 23). The native remnant vegetation comprises nine woodlands and three shrubland communities (Phoenix 2023c). Woodlands comprised the majority of the areas covered by the vegetation and flora surveys (81.3%). There are 10 vegetation types in the project footprint (eight woodland and two shrubland) (Table 27).

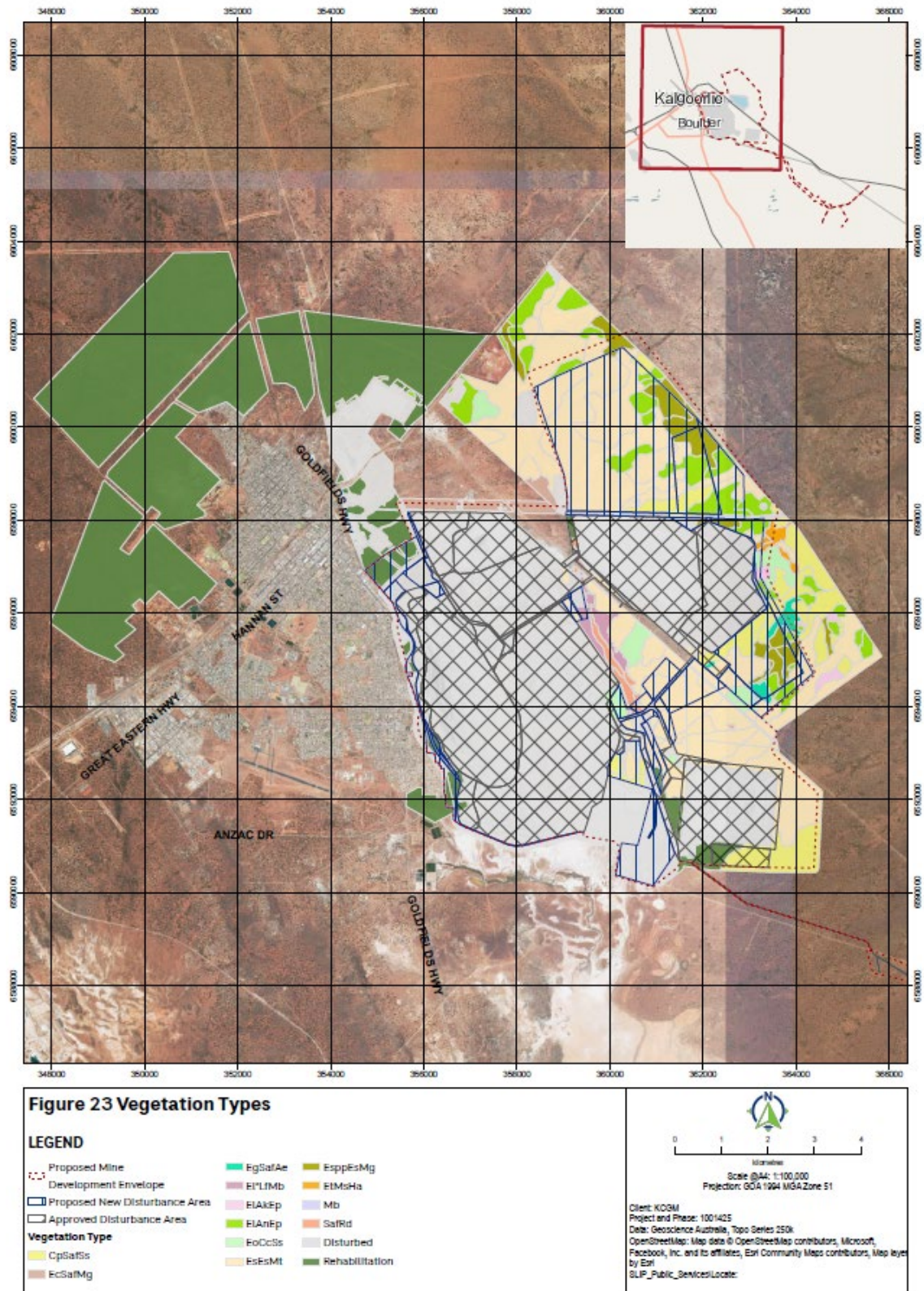
The woodlands of the study area comprise mostly mixed *Eucalyptus* spp. over *Eremophila*, *Acacia*, *Senna* and chenopod species. *Casuarina* woodland over *Acacia* and *Eremophila* species, sometimes with emerging *Eucalyptus salmonophloia* over low shrubland of mixed species, is also present. The shrublands are dominated by *Acacia*, *Eremophila* and *Senna* species over mixed chenopod species.

The most dominant vegetation type is Mid-open woodland to woodland of *Eucalyptus salmonophloia*, over mid-open shrubland of *Eremophila scoparia*, *Acacia hemiteles*, and *Senna artemisioides* subsp. *filifolia*, over a low sparse chenopod shrubland of *Maireana triptera*, *Maireana georgei*, and *Atriplex vesicaria*. (Table 27) which makes up 19% of the study area. A total of 41% of the MDE was rehabilitated or disturbed. In infrastructure corridors and water infrastructure areas, clearing of the whole area is not anticipated to be required for implementation of the Revised Proposal. As a consequence, areas and percentages of each vegetation type to be cleared are maximum areas, assuming a 'worst case' clearing outcome for that vegetation type.

Table 27: Vegetation Types, Description, and Extent of Clearing

Vegetation Type	Vegetation Description	Proposed Maximum Clearing (ha)	Maximum % to be Cleared of study area	Total Extent Study Area (ha)
CpSafSs	Low woodland of <i>Casuarina pauper</i>	151.97	33.52	453.4
EgSafAe	Mid open woodland of <i>Eucalyptus griffithsii</i>	24.95	21.0	118.65
El*LfMb	Tall sparse to open shrubland of <i>Eremophila longifolia</i>	4.66	7.1	65.63
EIAkEp	Low woodland of <i>Eucalyptus lesouefii</i>	4.16	14.4	28.87
EIAAnEp	Low woodland of <i>Eucalyptus lesouefii</i>	239.71	47.69	502.61
EoCcSs	Mid open woodland of <i>Eucalyptus oleosa</i> , and/or <i>Eucalyptus lesouefii</i>	37.07	26.09	142.08
EsEsMt	Mid open woodland to woodland of <i>Eucalyptus salmonophloia</i>	919.23	42.29	2173.48
EsppEsMg	Mid open woodland variable composed of <i>E. celastroides</i> , <i>E. lesouefii</i> , and/or <i>E. salubris</i>	186.77	68.7	271.87
EtMsHa	Mid open woodland of <i>Eucalyptus transcontinentalis</i> and <i>E. lesouefii</i>	3.32	10.15	32.70
SafRd	Mid sparse to open shrubland of <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Eremophila scoparia</i> , and <i>Acacia hemiteles</i>	6.14	12.91	47.57
Other		2		
Total native vegetation		1580	40.9	3859
Disturbed	Areas cleared of vegetation	176	4.3	4099
Rehabilitation	Mosaic of native and non-local species	98	3	3216
Total area		1,852	16.6	11,174





DISCLAIMER: CDM Smith has endeavored to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.
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Figure 23: Vegetation Type

6.5.3.8 Vegetation Condition

The consolidated data set from flora and vegetation assessments undertaken in 2021 and updated in 2024 (Phoenix, 2024), shows that the vegetation condition of the study area ranges from Completely Degraded (cleared areas) to Excellent condition (Table 28). Just under half of remnant vegetation within the study area (44.4%) was mapped as Completely Degraded condition (Table 28), with just under a quarter (23.4%) mapped as Very Good or Excellent condition.

Table 28: Vegetation Condition – Extent of Each Condition Rating in Study Area

Condition Rating	Within Study Area (ha)	% of Study Area
Excellent	1062	8.8
Very Good	1752.6	14.6
Good	2861.5	23.8
Degraded	1005.2	8.4
Completely Degraded	5344.6	44.4

The majority of the bushland areas around Kalgoorlie are in a good or degraded condition due to historical clearing and disturbance to vegetation structure caused by frequent fires, the presence of aggressive weeds, partial clearing, and grazing. (Phoenix 2023c).

6.5.3.9 Conservation Significant Vegetation

None of the vegetation types mapped within the MDE are considered regionally significant or represent a listed Threatened or Priority Ecological Community.

The MDE is considered unlikely to contain any highly restricted vegetation types that would be considered locally significant (Phoenix 2023c).

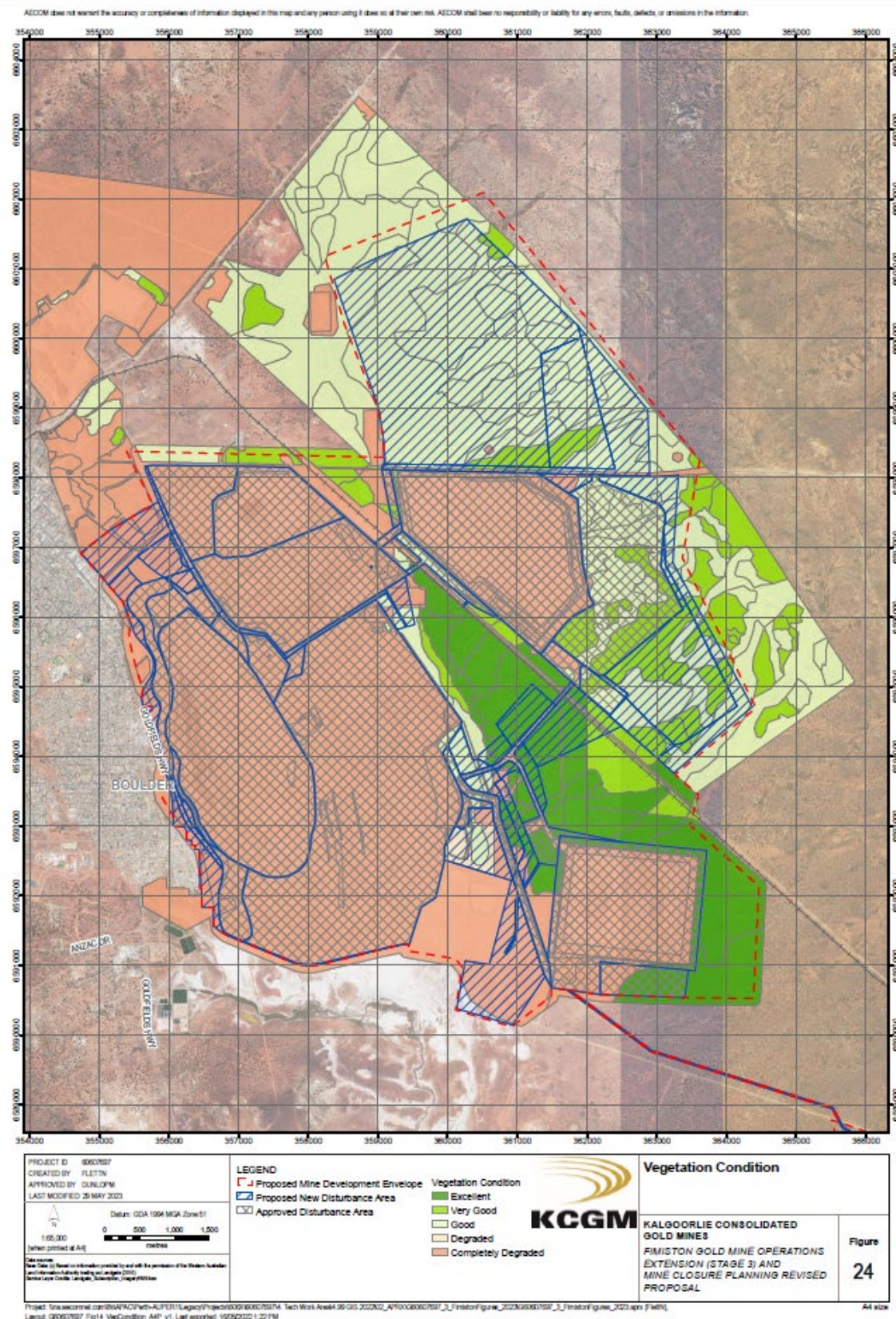


Figure 24: Vegetation Condition

6.5.4 Potential Environmental Impacts

There could be a number of direct and indirect impacts on flora and vegetation as a result of this Revised Proposal. Direct impacts are considered those within the Indicative Footprint as a result of native vegetation clearing. Indirect impacts are considered those within 50 m of the MDE, as potential impacts from dust, spills and altered fire regimes or surface water could occur within this distance. The 50 m distance is based on the DWER Clearing Regulation Fact Sheet 24: Environmentally Sensitive Areas (August 2014), whereby a declared environmentally sensitive area is considered the area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located. In addition, a 50 m distance is considered sufficient to minimise any potential indirect impacts (for example, dust).

Specific impacts on flora and vegetation potentially resulting from the Revised Proposal are:

- direct loss of flora and native vegetation due to clearing
- indirect impacts on flora and vegetation from construction and operation of expanded pit, new TSFs and WRD expansion including:
 - changes to vegetation structure and composition through altered surface drainage flow patterns and spread of weeds.
 - alteration of groundwater regimes due to clearing, and water from the TSFs entering groundwater invasion of introduced flora.
 - dust deposition on vegetation
 - impact to flora and vegetation from water used for dust suppression.
 - alteration of fire regimes leading to loss of vegetation.

6.5.5 Assessment of Impacts

6.5.5.1 Clearing of Regional Vegetation Association Impacts

The Revised Proposal will result in up to 1,580 ha of additional clearing of native vegetation in a disturbance footprint of 1,868 ha. All the vegetation communities proposed for clearing are well represented throughout the Goldfields region and no Threatened or Priority Ecological Communities will be impacted.

None of the vegetation types to be cleared for the Revised Proposal are considered regionally significant as they do not represent habitat for Commonwealth or State listed Threatened Flora or are representative of vegetation with less than 30% Pre-European extent remaining. It is therefore unlikely that there will be any significant impacts on regional vegetation (Table 29).

Table 29: Impacts on State-wide Extent of Pre-European Vegetation Associations Present in the Revised Proposal Area

Vegetation Association	Pre-European extent (ha)	Current Extent (ha)	Remaining (%)	Extent in MDE (ha)	% of Disturbance area
20	1,295,103	1,292,475	99.80%	47	2.3%
468	592,022	583,903	98.63%	1530	83%
1294	6,296	6,047	96.05%	3	0.2%

6.5.5.2 Clearing of Vegetation Communities

Native vegetation covers approximately 4,452 ha (36%) of the area surveyed, with woodlands and forests being the dominant vegetation types (Phoenix, 2023c). Proposed clearing will impact on 10 of the 12 vegetation types mapped. The estimated impact of clearing on the mapped extent of vegetation types within the study area is detailed in Table 27.

Clearing of some rehabilitated mining areas and planted vegetation will also occur within the MDE.

The proposed clearing of native vegetation is not considered to represent a significant impact to flora and vegetation on the basis that:

- Clearing of local vegetation type EsppEsMg is greater than 50% (68.7%) of the local mapped extent, but 85 ha will not be disturbed. The EsppEsMg vegetation type is comprised of very common species that have a broad distribution and it is highly likely this vegetation type exists in the broader landscape;
- Vegetation types to be cleared are well represented at a regional and local scale and are not considered to be regionally or locally significant; and
- No Threatened or Priority ecological communities occur within the MDE or surrounding mining leases.

The impacts to local vegetation types are presented in Table 27 and Figure 23.

The vegetation proposed to be cleared is mostly in good, very good or completely degraded condition (Table 30, Figure 24). Within the proposed footprint the majority is in Good condition (68.5%) with almost 15% in Very Good (11.3%) or Excellent (3.6%) condition and almost 16% in Degraded (1.8%) or Completely Degraded (14.8%) condition.

Table 30: Vegetation Condition – Extent of Each Condition Rating in Study Area

Condition Rating	Area to be Cleared (ha)	% of Area to be Cleared
Excellent	66.5	3.6
Very Good	2.9.6	11.3
Good	1269.2	68.5
Degraded	32.67	1.8
Completely Degraded	273.4	14.8
Total	1851.2	100
Total excluding completely degraded	1580	85

6.5.5.3 Conservation Significant Flora

One Priority 2 species *Eremophila praecox* is present in the MDE, and 13 plants are proposed to be impacted by clearing (Figure 22). The total known population size for the species is 494 plants (Phoenix 2023c) within 100km of Fimiston. Of these there are 125 individuals protected within Nature Reserves. The Revised Proposal involves the clearing of 13 plants or 2.6% of the total population. This is in addition to the four plants in the existing clearing envelope, bringing the total plants removed at Fimiston to 17, or 3.4% of the known population of 494. *Eremophila praecox* is known from 59 populations with over a quarter of known plants in conservation reserves.

The species is most frequently recorded in clay loam soils in Eucalyptus and/or Allocasuarina woodland with a variable understorey, frequently with Acacia and Eremophila species. *Eremophila praecox* has a broad distribution and has previously been recorded in conservation reserves (125 individuals) including

the Karrawang Nature Reserve (WA Herbarium 1998-) and Bullock Holes Timber Reserve (Phoenix 2020c). This indicates that the species is likely more common than is currently known and is present in reserved areas. As a consequence, the removal of 13 plants is not anticipated to significantly impact upon the population.

The distribution mapped for *E. praecox* spreads roughly from 140km north-south and 110km east-west there is substantially more suitable habitat for the species and likely suitable habitat beyond the current distribution. There is now also a record for the species in South Australia according to FloraBase.

6.5.5.4 Increase in Weed Infestation

There is a potential to spread introduced flora as a result of vehicle or heavy equipment movement through the site, land clearing, or movement of soil and plant materials. Introduced flora can also potentially be carried to downstream areas through surface water flow. Introduced flora may have an impact on the surrounding flora and vegetation if management or mitigation measures are not put in place, particularly weeds classified as declared pests and WoNS. *Opuntia elata* is a C3 restricted Declared Pest which is an “Organism that should have some form of management applied that will alleviate the harmful impact of the organism, reduce the numbers or distribution of the organism or prevent or contain the spread of the organism”. *Echium plantagineum* is an Exempt Declared Pest, no management requirements are provided for the species. Appropriate hygiene measures will be undertaken to ensure development does not result in the spread of either of these species, or other weeds.

6.5.5.5 Changes to Surface Hydrology

The construction of large structures such as TSFs and WRDs can result in the alteration of surface water flow paths, which can result changes to in drying or wetting of areas, altering the vegetation types that may grow there. Flow paths are to be directed around TSFs and WRDs to avoid these impacts occurring.

As discussed in Section 6.6, the Fimiston IIE TSF third cell is estimated to reduce the catchment feeding the vegetation northwest of the Kaltails TSF. The upstream area is reduced by approximately 170 ha as approximately 70 ha of catchment area is lost to the third cell of Fimiston IIE TSF landform and approximately 100 ha intersected by the Southern WRD Diversion Channel (Figure 31). The Fimiston IIE Primary Diversion Channel is directed to the channel outlet west of the proposed Fimiston IIE TSF (to ensure water is returned to the Eastern Floodway as close as possible to the predevelopment scenario. Hydraulic modelling indicates that both the contributing catchment area and total runoff volumes reporting to this sub-catchment are reduced by approximately 20%. The addition of the Fimiston II E Secondary Diversion Channel will improve the volume of water to the sub-catchment, with a resultant 14% reduction in flow volumes during sheet flow events. The majority of water supply supporting vegetation within the Eastern Floodway is likely to be sourced from more frequent incident rainfall rather than the 10% AEP sheet flow runoff events as discussed in Section 7.1.4.4.

6.5.5.6 Alteration of Groundwater Regimes due to Clearing, Excavations, Changing of the Landscape and Mounding from the TSFs

Changes to saline groundwater levels due to continued mining activities from groundwater extraction, and the operation of active and non-active TSF (unlined) may potentially impact on groundwater levels. This impact could include increase or decrease in standing water levels, both actions resulting in a change to the level of salinity in relation to vegetation root zones and therefore risks associated with vegetation dieback. Groundwater levels are monitored and managed to maintain levels below plant root zones.

6.5.5.7 Dust Deposition on Vegetation

Accumulation of dust particulates on leaf surfaces may occur as a result of exposure to excessive particulates being mobilised and settling on the surface of vegetation. This may result in a reduced ability for plants to photosynthesise and transpire, leading to a decline in plant health, if the situation is prolonged.

Dust generation is most likely to occur during development of new TSF cells and relocation of supporting infrastructure including the ENB, and the upper benches of the Ivanhoe cutback, which can result in accumulation of dust particulates on leaf surfaces.

6.5.5.8 Indirect Impacts from Altered Fire Regimes

The area within and surrounding the MDE has been highly modified by historic mining, historic farming (in Eastern Floodway), pastoral and urbanisation activities. This includes extensive alteration of the ground surface through disturbance such as construction of roads and mining exploration, revegetation programmes and recreational activities. Disruption or complete removal of natural vegetation from the area has resulted from these actions. It is therefore unlikely that there will be any indirect impacts from altered fire regimes as a result of the Revised Proposal.

6.5.6 Cumulative Impacts

6.5.6.1 Regional Vegetation Association Impacts

The reported pre-European vegetation extent in the Kalgoorlie-Boulder area has over 90% of the pre-European vegetation remaining. The cumulative impacts of Fimiston Operations have consequently been considered as a whole for the Kalgoorlie-Boulder area. The proposed works will not result in the percentage of pre-European vegetation remaining dropping below 90% (Table 31).

None of the vegetation types to be cleared are considered regionally significant as they do not represent habitat for Federal or State listed Threatened Flora or are representative of vegetation with less than 30% Pre-European extent remaining. It is therefore unlikely that there will be any impacts on regional vegetation.

Table 31: Impacts on State-wide Extent of Pre-European Vegetation Associations Present in the Revised Proposal Area

Vegetation Association	Pre-European Extent (ha)	Current Extent (Ha)	Remaining (%)	Extent in Proposed Clearing (ha) ¹	Extent in Approved Fimiston Clearing (ha)	Extent at Mt Percy (ha)	Extent at Gidji (ha)	Extent at Mt Charlotte (ha)	Cumulative Clearing (ha)	Percentage Remaining after KCGM Operations (%)
20	1,295,103	1,292,475	99.80%	47	0	0	0	0	47	99.79%
468	592,022	583,903	98.63%	1530	497	91	76	19	2213	98.26%
1294	6,296	6,047	96.05%	3	0	174	0	20	197	92.96%

¹ Includes clearing to date

6.5.6.2 Impacts on Conservation Significant Flora

No Commonwealth or State listed Threatened flora were recorded in the MDE during the 2018 survey or any subsequent surveys (Phoenix 2023c).

One Priority 2 species *Eremophila praecox* is present in the MDE, and 13 plants of an existing 494 are proposed to be impacted by clearing.

E. praecox was also found at the Lynas Yarri rare earths processing facility site (Fig 5-4 of Lynas ERD) with seven plants located at six locations within the study area. None of these will be impacted by the project. A further seven plants were located outside the project area. Because no other proposals were found to have an impact on the species the cumulative impacts for this species are based on Northern Star's impact only.

Cumulatively Northern Star has an approved clearing permit CPS 10242/1 which includes the clearing of 11 plants and another pending clearing permit (CPS 10290/1) where an additional 11 plants would be cleared.

Table 32: E. praecox cumulative clearing

<i>E. praecox</i> population	Number of individuals
Current known population	494
CPS 10242/1 – 11 plants	483
CPS10290/1 – 11 plants	472
This proposal - 13	459
Proportion of remaining <i>E. praecox</i> removed for this proposal 13/472	2.7%
Cumulative clearing for all projects	7%

6.5.7 Mitigation

A summary of key management measures is provided in Table 33. The management measures are applicable to the maintenance and protection of flora and vegetation and associated biodiversity within the MDE.

Where direct impacts are unavoidable, measures intended to minimise direct loss have been proposed. Potential indirect impacts will be minimised to the maximum extent practicable with best management practices to suppress dust and minimise introduced species. A specific management plan for *E. praecox* is presented in Appendix NAppendix L – Confidential.

All weeds identified in the 2021/2 studies were sprayed in June 2022.

Table 33: Mitigation Measures for Flora and Vegetation

Type	Controls
Avoid	- Minimise clearing to the maximum extent practicable through implementation of internal clearing permit procedures, which include: - Prior and post construction inspections - Use of spatial data of significant flora and vegetation location in planning areas. - Design TSFs and stockpiles in an efficient manner to limit area to be cleared.

Type	Controls
Minimise	• Survey and peg areas required to be cleared as per the vegetation clearing guideline (KCGM, 2021). • Delay clearing until area is required. • Install diversion channels to minimise changes to surface water regimes. • Use of additional dust control measures where practical, such as application of saline water on an as-needs basis dust suppression. • Monitor current and forecast weather conditions to plan work activities. • Implement good hygiene practices when vehicles and mine equipment enter or depart the site. • Maintain GIS records of infestation of introduced species. • Reduce the numbers or distribution of <i>*Opuntia elata</i> or prevent or contain the spread. • Ensure development in the study areas does not result in the spread of <i>*Echium plantagineum</i>. • Maintain implementation of Fimiston Weed Management Procedure (KCGM,2021), with spraying or other suitable action when weed species are identified on KCGM leases or in rehabilitation areas. • Ensure a fire management and emergency response plan is available at key locations. • Ensure firefighting equipment is readily available on all vehicles and all facilities. • Ensure water carts are full and always readily on hand. • Provide all employees with an induction on fire risk and what to do in the event of a fire. • Inspect rehabilitation for emerging weeds, and action as per Fimiston Weed Management Procedure (KCGM, 2021).
Rehabilitate	• Stockpile vegetation cleared / mulched vegetation for use in rehabilitation to improve the nutrient value of the soil. • Retain and utilise soil from cleared areas for TSF rehabilitation. • Rehabilitate TSF post-closure.

KCGM have well established process for managing vegetated areas of land to be cleared to enable operational areas to be developed. This process includes the vegetation clearing and rehabilitation material stripping guideline which was developed to advise on the activities that must occur prior to, during and after vegetation clearing activities. This process includes forward planning for external and internal approvals, project budgets or operational budgeting and the requirement for an internal ground disturbance approval is completed to ensure KCGMs legal and other commitments are being upheld regarding disturbance and clearing.

This information is funnelled into additional supporting processes including Mine Closure Plan revisions and assessment of progress on closure goals, progressive rehabilitation works being implemented during LoM and the collection of graded topsoil closure stockpiles data to assist annual disturbance reporting requirements.

Implementation of clearing activities require the following:

- Areas to be cleared must be surveyed and marked up prior to clearing begins.
- Activities may be 'wind dependant' or limited by wind conditions to reduce dust generation into City of Kalgoorlie-Boulder.
- Any identified weeds must be removed and disposed of appropriately.
- Topsoil is to be stripped to depths guided by the soil investigation analysis.

- Machinery used in clearing should be clean and inspected for any vegetative material prior to entering site.
- Only potable water can be used for dust suppression on materials to be used or stored in topsoil stockpiles for rehabilitation.
- Clearing and vehicle movements must only occur within defined area/footprint; and
- Clearing large areas should be conducted in a staged manner to minimise dust generation.

Dust impacts will be managed by implementation of the Fimiston Air Quality Management Plan (KCGM, 2023) which has been developed in accordance with Conditions 7-1 to 7-7 of Ministerial Statement 782 which includes use of water trucks to reduce dust generation and watering down ore and waste rock prior to loading it onto trucks as well as dust management on the TSF walls.

For activities involving topsoil, vegetation clearance or rehabilitation activities potable water is used as per the KCGM Water Management Plan and supported through application of the vegetation clearing and rehabilitation material stripping guideline. This ensures that the health of valuable topsoil is captured and will remain viable for use in rehabilitation activities.

KCGM have an established procedure for managing weeds on KCGM leases which outlines the introduced flora/weed control processes employed as a long-term approach to weed management at KCGM. Controls include using varied control methods, such as biological, physical and chemical. By using several techniques, the chance of weed species adapting is reduced (KCGM, 2021).

Flood modelling has been used to design appropriate stormwater infrastructure around the new infrastructure to maintain ecological flows in the Eastern Floodway and to minimise changes to the likelihood of flooding. KCGM has procedures in place to ensure the systems and processes utilised for the management of surface water supplies:

- Operate within the legal and other obligations required by DWER and the DEMIRS.
- Compliance with design standards: stormwater structures will be designed to withstand a minimum of a 1 in 100 year, 24 hour rainfall event.
- Investigate all failures in surface water management systems or structures so that root causes are identified, and preventive/corrective actions applied; and
- Conduct regular inspections/technical reviews to assess the effectiveness of the surface water supply and delivery systems and identify opportunities for improvement.

As the tailings water and local groundwater is saline, a compliance limit for groundwater depth from natural surface has been developed as a management option, to ensure that groundwater does not rise into vegetation root zone downgradient of the TSFs. This limit is set through the Part V licence for the TSFs and documented in the TSF Seepage and Groundwater Management Plans. A large number of production and monitoring bores (Eastern Borefield), as well as a series of trenches have been constructed and operated to maintain compliance with this limit. Groundwater monitoring is undertaken around the Eastern Borefield to ensure that saline water does not enter the root zone. Water abstracted from the Eastern Borefield is used as process water for the mine.

KCGM currently do not currently implement seasonal back burning or cool cultural burns at the Fimiston Operations, within the current or proposed MDE. A Fire Management Plan and hot work permits are in place, with fire ban days implemented across the site to maintain workplace health and safety.

6.5.8 Predicted Outcomes

Direct impacts will include the permanent loss of 1,580 ha of native remnant vegetation within the MDE, including 3.4% of the population of *E. praecox*. Apart from providing habitat for priority species *E. praecox*, the vegetation proposed to be cleared, the vegetation is not considered to have any conservation significance.

Clearing will not have an impact on biological diversity or ecological integrity.

Indirect impacts can be mitigated through implementation of relevant management plans during construction and operations.

KCGM considers offsets are not required for this factor.

6.6 Terrestrial Fauna

Terrestrial fauna is defined for purposes of environmental impact assessment as the “terrestrial fauna are defined as animals living on land or using land (including aquatic systems) for all or part of their lives. Terrestrial fauna includes vertebrate (birds, mammals including bats, reptiles, amphibians, and freshwater fish) and invertebrate (arachnids, crustaceans, insects, molluscs and worms) groups.

“Fauna habitat is defined as the natural environment of an animal or assemblage of animals, including biotic and abiotic elements, that provides a suitable place for them to live (e.g. breed, forage, roost or seek refuge). The scale at which fauna habitat is defined will depend on the ecological requirements of the species considered.” (EPA, 2016d)

6.6.1 EPA Objective

Terrestrial fauna is an identified environmental factor within the current EPA “Statement of environmental principles, factors, objectives and aims of EIA” (EPA, April 2023); this factors objective is:

“To protect terrestrial fauna so that biological diversity and ecological integrity are maintained”.

6.6.2 Policy and Guidance

- Environmental Factor Guideline ‘Terrestrial Fauna’ (EPA, 2016d)
- Technical Guidance – ‘Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment’ (EPA, 2020b)
- Technical Guidance ‘Sampling of Short Range Endemic Invertebrate Fauna’ (EPA, 2016e)
- EPA Technical Guidance: Sampling methods for terrestrial vertebrate fauna (EPA, 2020b)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Biodiversity Conservation Act 2016* (BC Act)
- *Environmental Protection Act 1986* (EP Act).

6.6.3 Receiving Environment

The dominant land use within the Eastern Goldfields subregion is Unallocated Crown Land and Crown reserves. This accounts for the vast majority of land use in the subregion with grazing on native pastures, freehold, conservation and mining making up the remainder (Cowan 2001; Phoenix, 2023).

The proposed extended MDE and supporting expanded Operational disturbance footprint are located in proximity to urban areas and numerous historical and current mining operations. For the purposes of the Revised Proposal with fauna surveys covering up to 100km from the Fimiston Operations, “located predominantly approximately 6 km east of Kalgoorlie-Boulder” (Phoenix, 2023).

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia’s landscapes into large ‘bioregions’ and ‘subregions’ based on climate, geology, landform, native vegetation and species information (DoEE 2016). The basic fauna study area is located near the eastern boundary of the Eastern Goldfields subregion (COO3) of the Coolgardie bioregion which is characterised as (Cowan 2001a):

“Coolgardie 3 lies on the Yilgarn Craton’s ‘Eastern Goldfields Terrains’. The relief is subdued and comprises of gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying geology is of gneisses and granites eroded into a flat plane covered with tertiary soils and with scattered exposures of bedrock. Calcareous earths are the dominant soil group and cover much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line.

The vegetation consists of mallees, *Acacia* thickets and shrubheaths on sandplains. Diverse *Eucalyptus* woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. Woodlands and *Dodonaea* shrubland occur on basic granulite's of the Fraser Range. The area is rich in endemic *Acacias*. The climate is arid to semi-arid with 200-300 mm of rainfall, sometimes in summer but usually in winter." (Cowan 2001; Phoenix, 2023).

Some of the regional targeted SRE sites are located in the Eastern Murchison subregion (MUR01) of the Murchison bioregion (Figure 27) which is characterised as (Cowan 2001c).

"Characterised by its internal drainage, and extensive areas of elevated red desert sandplains with minimal dune development. Salt Lake systems associated with the occluded Palaeodrainage system. Broad plains of red-brown soils and breakaway complexes as well as red sandplains. Vegetation is dominated by Mulga Woodlands often rich in ephemerals; hummock grasslands, saltbush shrublands and *Halosarcia* shrublands. Arid climate, with mainly winter rainfall (200 mm)." (Cowan 2001, Phoenix, 2023).

6.6.3.1 Fauna Surveys

The diverse nature of terrestrial fauna assemblages and supporting habitats requires the adoption of many specialist methods or techniques to be applied to capture representative presence and/or absence of individual or groups of vertebrate and/or invertebrate species (and assess their health and abundance). Broadly KCGM initiate surveys annual spring surveys and rehabilitation areas assessments. In addition, other more targeted surveys are initiated through future projects pre-feasibility studies.

Fauna habitat mapping was based on flora and vegetation mapping undertaken in 2017 (Phoenix 2023) and an approximately 160 ha section in the southwest of the study area was based on mapping undertaken in 2015 (Botanica Consulting 2015). Active searches primarily targeted diurnal herpetofauna and mammals from direct sightings and secondary evidence.

Malleefowl habitat was assessed at each basic fauna site throughout the study area (15 sites, identified prior to site mobilisation) using a set of environmental variables based on features of critical Malleefowl habitat in Western and Central Australia, as described in the National Recovery Plan (Benshemesh 2007). Individual sites were then assessed with a numerical score system, as a basis for mapping areas of suitable habitat. The score used is an unweighted sum of binary values (0 absent, one present) for the following attributes:

- Sandy substrate.
- Canopy cover.
- Litter (leaf litter forming distinct patches under vegetation, or continuous).
- Level ground.
- Mallee present (presence of any mallee-form *Eucalyptus* sp.).
- *Melaleuca* present (presence of any *Melaleuca* sp.).
- Mulga present (presence of any *Acacia* sp. of subgenus *Juliflorae*); and
- *Triodia* present (presence of any *Triodia* sp.).

Assessment scores of four or greater (meaning a site contained at least 50% of features that comprise critical Malleefowl habitat) were considered to represent potential Malleefowl habitat. The higher the score, the higher quality the habitat is for Malleefowl (AHA, 2023).

Malleefowl and Malleefowl habitat assessment has been included as Appendix J.

Twenty-minute avifauna surveys were undertaken at all basic fauna sites. Avifauna surveys were confined to the habitat type (up to 2 ha), represented by each site to collect assemblage data for each habitat. Avifauna surveys were undertaken throughout the day with a focus on periods of higher activity around sunrise and sunset. Surveys consisted of bird recordings from visual sightings and call recognition. A total of 12.9 person hours of avifauna census was undertaken during the field survey (Phoenix, 2023). Additional avifauna observations were also recorded opportunistically whilst other field work was being undertaken and completed, including observations made during travel and active searches.

A listed threatened species under the EPBC Act, the Night Parrot (*Pezoporus occidentalis*) which is assessed through identification of suitable supporting habitat was completed. The assessment concluded that habitat suitability assessed from aerial imagery and through field searches, resulted that there was no suitable spinifex habitat identified therefore no Song Meter recording devices were deployed (Phoenix, 2023).

Wildlife Acoustics SM2+ Bat Detector, bat call recordings were taken by Harewood in 2015. The detector was deployed at nine locations, four in the first phase and five in the second phase of the level 2 fauna survey, for one night at each site.

Targeted SRE active foraging for the mygalomorph spiders *Conothele* 'MYG554' ('*kalgoorlie*'), *Idiosoma* '*kalgoorlie*' and *Idiommatia* '*kalgoorlie*' were conducted at regional sites outside proposed disturbance areas, but within proximity to and in habitat matching previous records of the species. Eleven sites were searched with a total search effort of 23.9 hours and 32 mygalomorph spider burrows excavated.

Records from all site and regional vertebrate historical and current sampling efforts and are now presented as supporting information for this Revised Proposal have been consolidated into a single KCGM consolidated fauna assessment (Appendix I).

The surveys were undertaken in accordance with the standards set out in Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020b), Technical Guidance – Sampling of Short Range Endemic Invertebrate Fauna (EPA, 2016e) and Environmental Factor Guideline: Terrestrial Fauna (EPA, 2016d). Previous reports that document regional fauna within the surrounds of the Revised Proposal is outlined in Table 34.

Table 34: Fauna and SRE Surveys

Report	Survey Description	Date of Survey
Summarised in Phoenix (2023) <i>Terrestrial Fauna assessment for the Fimiston Gold Mine Operations (Revised)</i> (Appendix M)	Level 2 fauna survey of the Fimiston IIE TSF, G cell and Fimiston III TSF area (Harewood 2015).	24/11/2014 – 2/12/2014 and 9/04/2015 – 17/04/2015
	Phoenix data currency review and gap biological review and gap biological survey for the broader Fimiston Operations in spring 2017	6/09/2017 – 8/09/2017 and 11/11/2017 – 12/11/2017
	Short Range Endemic (SRE) survey for the FIM IIE Project	7/11/2018 and 13-14/12/2018
	Basic terrestrial fauna and SRE survey and targeted SRE survey	13-20/09/2021
	A targeted survey in the Fimiston area for ant species <i>Camponotus</i> sp. nr. <i>terebrans</i> , host of the Critically Endangered Arid Bronze Azure Butterfly (ABAB, <i>Ogyris subterrestris petrina</i>)	16/08/2021 – 20/08/2021

Report	Survey Description	Date of Survey
Phoenix 2023a. <i>Records of Jalmenus aridus at Fimiston</i> (Appendix PAppendix K – Confidential).	Targeted surveys for the P1 <i>Jalmenus</i> butterfly	14-15/10/2021, 26/10/2021, 29/10/2021 14-17/09/2022, 14, 17, 26 and 29/10/2022.
Alexander Holm and Associates 2023, <i>Assessment of Malleefowl Activity and Habitat for the Fimiston South Project</i> (Appendix TAppendix J)	Targeted assessment for Malleefowl activity and habitat.	6/03/2023-15/03/2023

6.6.3.2 Fauna Habitat

In the Phoenix 2023a survey, three broad fauna habitat types were identified in the study area, comprising of Open woodland, Shrubland and Rehabilitation (Figure 25 and Table 35). An additional habitat, Shrubland in Drainage Lines, has been designated for SREs to distinguish microhabitat along ephemeral drainage lines; this habitat is titled ‘shrubland along drainage line’ and is only present in the infrastructure corridor through the centre of the Revised Proposal area.

Initial habitat characterisation was completed by utilising various remote geographical tools, including aerial photography, land system maps and topographic maps. Habitats with the potential to support significant terrestrial fauna species were then identified based on known habitats of such species, within the Coolgardie bioregion. Fauna habitat mapping was based on flora and vegetation mapping undertaken in 2017 (Phoenix 2023), with approximately 160 ha section in the southwest of the Fimiston area based on mapping undertaken in 2015 by Botanica Consulting (Phoenix 2023). Active searches primarily targeted diurnal herpetofauna and mammals from direct sightings and or secondary level evidence collected or observed.

Searches were undertaken in any observable microhabitats considered likely to support mammals, reptiles and amphibians. Techniques included: raking leaf and bark litter, overturning logs, searching beneath the bark of trees, investigating dead trees and logs, investigating burrows, investigating infrastructure ruins or disused building materials such as tin piles and identifying any secondary evidence including tracks, diggings, scats, fur or sloughs (shed skins), predation or feeding sites, and fauna constructed structures such as nests. Varying amounts of time were spent active searching at each site, depending on the richness and complexity of habitat, for a total of 49.1 hours over the duration of the basic fauna field survey.

Table 35: Fauna Habitats Within the Study Area

Habitat	Extent Within the Study Area (ha)	Significant Species Habitat
Open woodland – Mid to tall open eucalypt woodland of gimlet and Salmon Gum with scattered <i>Brachychiton</i> over mixed shrub understorey of <i>Eremophila</i> , <i>Senna</i> , <i>Acacia exocarpus</i> and <i>Santalum</i> on red-brown clay	3,683	Potential foraging habitat for Chuditch.
Shrubland – Tall open <i>Eremophila scoparia</i> shrubland over mid open <i>Acacia nyssophylla</i> and	193.7	Potential foraging habitat for Chuditch.

<i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low open <i>Eremophila caperata</i> , <i>Rhagodia drummondii</i> and <i>Scaevola spinescens</i> shrubland.		
Shrubland in Drainage Lines	77.0	Potential foraging habitat for Chuditch. SRE Microhabitat
Rehabilitation – Previously cleared areas that are now revegetated.	3,158.4	Low value dispersal/foraging habitat for fauna occupying adjacent vegetated areas.
Cleared – Cleared for infrastructure or historic purposes	923.4	Not considered significant habitat

Both open woodland and shrubland are regionally widespread with no restricted habitat isolates present. The woodland and shrubland habitats represent foraging habitat and marginal breeding habitat for conservation significant vertebrate fauna species Chuditch. The rehabilitated areas may provide value as foraging or dispersal habitat for vertebrate fauna species.

Malleefowl habitat was assessed at each basic fauna site throughout the study area (15 sites) using a set of environmental variables based on features of critical Malleefowl habitat in Western and Central Australia, as described in the National Recovery Plan (Benshemesh 2007). Individual sites were assessed with a numerical score as a basis for mapping areas of suitable habitat in the study area. The score used is an unweighted sum of binary values (0 absent, one present) for the following attributes:

1. sandy substrate
2. canopy cover
3. litter (leaf litter forming distinct patches under vegetation, or continuous)
4. level ground
5. mallee present (presence of any mallee-form *Eucalyptus* sp.)
6. *Melaleuca* present (presence of any *Melaleuca* sp.)
7. mulga present (presence of any *Acacia* sp. of subgenus *Juliflorae*)
8. *Triodia* present (presence of any *Triodia* sp.)

Scores of four or greater (meaning a site contained at least 50% of features that comprise critical Malleefowl habitat) were considered to represent potential Malleefowl habitat. Generally speaking, the higher the score, the higher quality the habitat is for Malleefowl. Sites that attained a value of four or greater were applied to vegetation type polygons and the entire polygon (usually) assigned as potential Malleefowl habitat. Where two or more sites were assessed within a single polygon, the higher score was applied unless features of the lower-scored site(s) were more representative. Where no site occurred within a polygon, polygons were classified based on scores for similar vegetation nearby and inspection of relative vegetation density.

A total of four SRE habitats are present within the current and proposed MDE, these include Open woodland, Shrubland, Shrubland along drainage line, and Rehabilitation. These SRE habitats occupy a total of 80.9% of the area.

- The Shrubland along drainage line habitat occupies 4.3% of the area and comprises of low shrubland species along the Eastern Floodway. This habitat is comparatively dense and has the potential to retain moisture and may provide marginally better quality habitat for SRE invertebrate species.
- The Open woodland, Shrubland, and Rehabilitation habitats were classified as Low potential SRE habitat and collectively occupy 76.6% of the area.

The Open woodland is widespread within and externally of the current and proposed MDE area with the Shrubland extending to the north and north-west Fimiston. The Shrubland located along the Eastern Floodway drainage line habitat is limited to within the Current Fimiston Operational areas due to existing active mining activities (Table 40). Total area covered by these SRE Invertebrate habitat extends across ~1099 ha (Phoenix, 2023).

6.6.3.3 Fauna Diversity

The desktop review from Phoenix (2023a) identified records of 254 vertebrate taxa within the desktop search extent. Previous surveys within the KCGM area recorded a total of 120 vertebrate fauna species; three frogs, 29 reptiles (all native), 64 birds (63 native or migratory and one introduced) and 24 mammals (17 native and seven introduced). The Basic fauna survey undertaken by Phoenix (2018b) recorded a total of 57 vertebrate species.

Taking the results of the current and previous surveys into account, a total of 131 vertebrate fauna species have been recorded in the MDE, representing 75 families. The most common group was birds (138 taxa), followed by reptiles (74 taxa), mammals (37) and amphibians (5 taxa).

Nineteen significant vertebrate species were identified in the desktop review, comprising seven species listed as Threatened, Conservation Dependent or Specially Protected under the EPBC Act and/or BC Act. Ten avifauna species are listed as Migratory under the EPBC Act and BC Act (Table 36). The Curlew Sandpiper is listed as both Threatened and Migratory under the EPBC Act and BC Act (CR, VU). Two species are listed as Priority by DBCA (Phoenix, 2023a).

No conservation significant species have been recorded within the study area in previous surveys, but four species have been recorded within 5 km of the study area: Western Rosella (inland) (*Platycercus icterotis xanthogenys*; P4), Malleefowl (*Leipoa ocellata*; VU), Wood Sandpiper (*Tringa glareola*; Mig), and Numbat (*Myrmecobius fasciatus*; VU/EN).

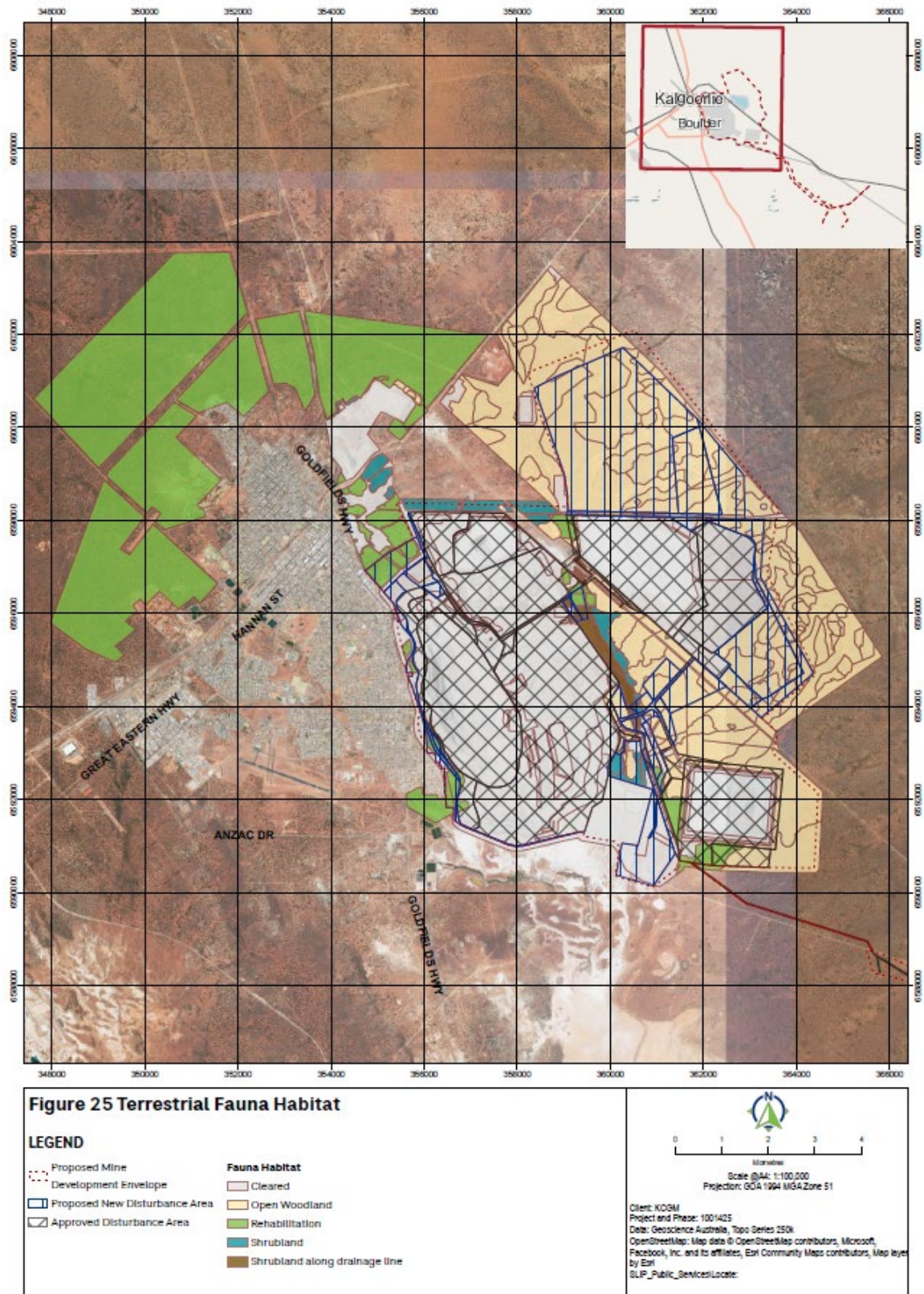


Table 36: Significant Vertebrate Fauna Identified in the Desktop Review

Scientific Name	Common Name	Conservation Status			Recorded Within 5 km of MDE	Recorded from Study Area
		EPBC Act	BC Act	DBCA		
Reptiles						
<i>Egernia stokesii badia</i>	Western Spiny-tailed Skink	EN	VU		No	No
Birds						
<i>Actitis hypoleucos</i>	Common Sandpiper	Mig	Mig		No	No
<i>Apus pacificus</i>	Fork-tailed Swift	Mig	Mig		No	No
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mig	Mig		No	No
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR/ Mig	VU/ Mig		No	No
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mig	Mig		No	No
<i>Calidris ruficollis</i>	Red-necked Stint	Mig	Mig		No	No
<i>Falco peregrinus</i>	Peregrine Falcon		SP		No	No
<i>Leipoa ocellata</i>	Malleefowl	VU	VU		Yes	No
<i>Motacilla cinerea</i>	Grey Wagtail	Mig	Mig		No	No
<i>Pezoporus occidentalis</i>	Night Parrot	EN	CR		No	No
<i>Platycercus icterotis xanthogenys</i>	Western Rosella			P4	No	No
<i>Plegadis falcinellus</i>	Glossy Ibis		Mig		No	No
<i>Thinornis ribricollis</i>	Hooded Plover			P4	No	No
<i>Tringa glareola</i>	Wood Sandpiper	Mig	Mig		Yes	No
<i>Tringa nebularia</i>	Common Greenshank	Mig	Mig		No	No
Mammals						
<i>Dasyurus geoffroii</i>	Chuditch or Western Quoll	VU	VU		No	No
<i>Macrotis lagotis</i>	Greater Bilby	VU	VU		No	No
<i>Myrmecobius fasciatus</i>	Numbat	VU	EN		Yes	No

CR = Critically endangered, EN = endangered, VU= vulnerable, SP = specially listed, Mig = migratory

6.6.3.4 Conservation Significant Fauna

No conservation significant vertebrate fauna has been recorded inside the Fimiston Operation Area to date. Five significant fauna species considered likely to occur in the study area include Fork-tailed Swift (Mig.; EPBC & BC Acts), Peregrine Falcon (OS; BC Act), Malleefowl (VU; EPBC & BC Acts), Western Rosella (inland ssp), and Chuditch (VU; EPBC & BC Acts) (Phoenix 2023a). The Western Rosella was recorded at two locations close to the study area, one approximately 40 m and one approximately 700 m east of the study area. The Numbat record is historic and outside the current range for the species. In 2023, an abandoned Malleefowl mound was recorded within the Fim IIE TSF, G- Cell area (Alexander Holm & Associates 2023).

Evidence of two Threatened vertebrate species (Table 37), Malleefowl *Leipoa ocellata* and Chuditch *Dasyurus geoffroii* (both VU) was collected outside the study area. Both species were initially inferred to potentially use parts of the study area for dispersal and foraging but are unlikely to be dependent on the area for breeding purposes.

Table 37: Details of Conservation Significant Vertebrate Fauna Recorded Outside of the Revised Proposal Area

Species	Status	Distribution and Ecology	Survey Records
<i>Leipoa ocellata</i> (Malleefowl)	VU (EPBC & BC Acts)	The Malleefowl is found across the southern half of the Australian continent and is the only <i>Megapodiidae</i> in the South-west Region. In Western Australia, the majority of the population is found south of a line from Shark Bay to the Nullarbor Plain. In the extreme south-west of WA, the species displays a patchy distribution. Malleefowl are typically found in mallee woodlands but also in Eucalyptus woodlands and shrublands.	Tracks at site Myg04, approx. 5 km NE of the Fimiston study area.
<i>Dasyurus geoffroii</i> (Chuditch)	VU (EPBC & BC Acts)	The Chuditch is now confined to south-western Australia, occurring in only 5% of its former range. Prior to European settlement the species occupied approximately 70% of continental Australia (Smith et al. 2004; Van Dyck & Strahan 2008). They are now mostly found in woodland, heath and mallee habitats.	Scat at site Myg02, approximately 7 km ENE of the Fimiston study area.

Malleefowl habitat was found to be marginally suitable to support the species in nine of the 15 (60%) sites assessed in the most recent fauna survey (Phoenix 2023a). Based on this result, a further study by Alexander Holm and Associates (AHA) (2023) was undertaken in accordance with *Survey Guidelines for Australia's Threatened Birds* (Commonwealth of Australia 2010) and the *National Malleefowl Monitoring Manual* (National Malleefowl Recovery Team (2020) including a controlled foot traverse on a 500 m spacing. The AHA study determined that:

- None of the MDE contained critical or marginal habitat for breeding and survival.
- 451 ha of the low hillocks and footslopes in the east of the MDE provides suitable habitat for foraging and dispersal.
- Only one potential Malleefowl mound, more than 10 years old, was identified in the Study Area. Mounds of this age are unlikely to be reused.

The closest recent evidence of Malleefowl is approximately 5 km NE of the Fimiston Study Area. The MDE is lacking in sandy soils, a criterion for construction of mounds and thus breeding (AHA 2023). A key feature of Malleefowl breeding habitat is thick, vision obscuring vegetation that provides plentiful leaf litter for building the mounds. The areas with the thickest vegetation cover in the study area are mostly part of

the floodway and associated drainage lines which are not suitable for mound building as they contain clayey soils and may flood during rain which also prevents leaf litter from accumulating. As a consequence, the MDE is not considered to represent significant habitat for Malleefowl (Figure 26).

The total area of Chuditch habitat mapped is 1515.9 ha (Phoenix 2023a). Chuditch was recorded from one scat outside the Fimiston MDE, approximately 7 km east north-east. Chuditch records in the area are sparse with the closest known desktop records over 40 km to the south at Kambalda, north-west of Lake Lefroy. Open woodland habitat within the MDE may be suitable foraging and dispersal habitat. The Fimiston Operational area and surrounding KCGM tenements has been regularly surveyed for fauna since 2012 without obtaining positive evidence of Chuditch, indicating that the species is not likely to be present in large numbers in the Revised Proposal area.

Fork-tailed Swifts are summer migrants to Australia and may be found over any habitat type, where they forage in the airspace above. The species may infrequently occur in the MDE to forage; however, as they are almost exclusively aerial, they are unlikely to land or nest in the MDE.

Peregrine Falcons have large foraging ranges and are considered likely to occasionally forage within and in the vicinity of the MDE and may also nest in Open woodland habitat where suitable tall trees are present.

The Western Rosella is endemic to south-western Western Australia. The inland form is known from arid areas including the Wheatbelt and Goldfields regions. Primary habitat for this species is eucalypt and casuarina woodlands which is abundant within and outside the MDE.



6.6.3.5 Short Range Endemics

Sampling for SRE invertebrates was conducted at 24 sites in areas identified as suitable habitat for SREs. Potential SRE habitat was rated as follows:

- Low - Vegetation is widespread, does not contain landforms, soils or vegetation likely to give rise to short-range endemism in the terrestrial invertebrate assemblage, may or may not have recorded Potential or Confirmed SRE taxa.
- High – vegetation is locally restricted or regionally significant, contains landforms, soils or vegetation that acts to hold water in the landscape or is associated with surface water, likely to have recorded numerous Confirmed SRE taxa.
- Sampling comprised the following methods:
 - wet pit trapping
 - active foraging
 - litter/soil sieving.

A total of four SRE habitats are present within the study area, Open woodland, Shrubland, Shrubland along drainage line, and Rehabilitation. These occupy a total of 80.9% of the study area. A further 19.1% of the study area is cleared. One of the SRE habitats has High potential for SRE invertebrates (Shrubland along drainage line). The Shrubland along drainage line occupies 4.3% of the study area and comprises of low shrubland species along a drainage line. This habitat is comparatively dense and has the potential to retain moisture and may provide better quality habitat for SRE invertebrate species. The Open woodland, Shrubland, and Rehabilitation habitats were classified as Low potential SRE habitat and collectively occupy 76.6% of the study area. The Open woodland is widespread within and outside of the study area and the Shrubland extends to the north and north-west of the study area. The Shrubland along drainage line habitat is limited within the study area, however it extends between the northern and southern portions of the Eastern Floodway and to the north of the study area. A total of 272 specimens from 37 SRE taxa were collected within the study area (Phoenix 2023a). They were comprised of 16 taxa of mygalomorph spiders, 12 taxa of pseudoscorpions, two taxa of scorpions, five taxa of isopods, and one species each of snail and butterfly (Figure 27).

Of these, one is a Confirmed SRE (*Missulena harewoodi* – a mygalomorph spider), 21 (55%) are Potential SRE species, and one is a P1 species. The remaining 15 taxa are widespread or uncertain SREs.

A total of 26 taxa from SRE groups were collected from the regional targeted mygalomorph survey, including 15 taxa of mygalomorph spiders. Of these, one is a Confirmed species (*Missulena harewoodi*), nine are Potential SRE species, three are widespread species and one is of uncertain SRE status due to unresolved taxonomy.

Of the three target species currently known only from the Fimiston Operational Area (*Conothele* 'MYG554' ('kalgoorlie'), *Idiosoma* 'Kalgoorlie 1', and *Idiommata* 'kalgoorlie'), two were re-collected during the regional survey. The Pseudoscorpion *Austrohorus* 'sp. Fi01' is not located in the disturbance footprint.

Arid Bronze Azure Butterfly

The Arid Bronze Azure Butterfly (ABAB, *Ogyris subterrestris petrina*) is listed as Critically Endangered under the BC Act and EPBC Act. The ABAB was returned in the desktop review for the assessment based on a now extinct sub-population near Kalgoorlie and at the time of reporting, the only known extant population was at Barbalin Nature Reserve in the northern Avon Wheatbelt (Gamblin et al., 2009), over 300 km west of the study area (Phoenix, 2023a). Recent high level guidance from DBCA (2020) identifies a potentially extensive distribution for ABAB.

Targeted surveys for ABAB host ants, *Camponotus* sp. nr. *terebrans*, were undertaken in the Fimiston area in mid-August and mid-September 2021. The targeted *C. sp. nr. terebrans* survey of the FS Project study area, conducted by entomologists familiar with the ant species at several other colonies and following the appropriate methods described in the survey guidelines, and did not detect any nests of this species. The study area has been adequately searched; it is concluded that it does not contain any significant colony of the host ant (most likely completely absent), and consequently no part of the study area represents habitat for the ABAB (Phoenix 2023a).

Jalmenus aridus

Until recently, *J. aridus* was only known from its type locality at Lake Douglas approximately 12 km SW of Kalgoorlie. It was discovered in November 1983 breeding on a single *Acacia tetragonophylla*, but soon after its discovery the shrub started to die, and the butterflies disappeared. The last sighting of *J. aridus* at Lake Douglas was in 1999 (Phoenix 2023b).

At a regional scale, KCGM and Phoenix undertook a survey of the broader Kalgoorlie area to use the knowledge gained from the survey process at Fimiston Operations, to identify other populations of the butterfly (Phoenix 2023b). A total of 15 sites were visited including national parks and timber reserves within 100 km of the MDE. Timing of surveys coincided with the known flight times of *J. aridus* at Fimiston. Populations have been identified at 10 locations, including Fimiston, spanning an area of 120 km north to south and 40 km from east to west, with a range of approximately 277,645 ha (Phoenix 2023b). Of the ten locations, two locations occur on DBCA managed lands. Within the population at Fimiston, 8 breeding shrubs have been identified, with the majority clumped in relatively close proximity.

As a consequence of this survey work, the species can now be described as known from a few locations, some on conservation lands; and known from a few but widespread locations with significant remaining areas of apparently suitable habitat available.

Details of the surveys and locations where the species has been found are confidential to prevent butterfly poaching. The survey reports are provided in Appendix P.

Other Short Range Endemics

A Confirmed SRE species, a mygalomorph spider, *Missulena harewoodi* was collected from three surveys (Harewood 2015; Phoenix 2019a), and Phoenix 2023a). One of these records is from within the Fimiston Operation area and two records are outside (Figure 27). Notably, the female of this species was excavated from a burrow outside of the study area, indicating breeding habitat is present outside of the MDE.

Of the Potential SRE taxa, three are only known only from within the Fimiston Operation area (*Austrohorus* 'sp. Fi01', *Nesidiochernes* 'sp. Fi01' and *Spherillo* 'sp. indet. A1'). All three are morpho-species from genera that have such poor taxonomic resolution that comparisons to other specimens by experienced taxonomists is not generally undertaken. There is currently very limited literature available outlining physical characters which may be reliably used to identify species. The pseudoscorpion and isopod morpho-species codes are a reflection of the number of different species recorded from the survey rather than new species.

Nesidiochernes 'sp. Fi01' was recorded from two sites, Rehabilitation and Open woodland, thus is highly likely to be more widespread and occur outside of the Fimiston Operations area (Figure 27). Similarly, *Spherillo* 'sp. indet. A1' was recorded from rehabilitation site and is consequently also highly likely to be more widespread and occur outside of the Fimiston Operations area. As these species occur in rehabilitation (post-mining) areas, they are likely to be resilient to the impacts of mining and rehabilitation.

Austrohorus 'sp. Fi01' was collected in the Shrubland along Drainage line habitat which is High potential SRE habitat (Figure 27), but is located outside the disturbance footprint. This habitat type also extends between the northern and southern portion of the Eastern Floodway and to the north-east of the study area. The genus *Austrohorus* is widespread throughout arid Australia and is commonly collected from arid areas, however, currently includes only a single described species, *A. exsul* (Harvey 2011) from the Wheatbelt. It is uncertain whether the regional records of *Austrohorus* sp. *indet.* are the same or many different species, however, given the genus is well known from arid areas, it is also likely to be well-adapted to arid environments thus more widely distributed.

An additional seven species from SRE groups were collected from the Shrubland along drainage line habitat, of which six are widespread and one is a Potential SRE (*Buddelundia frontosa*) (Figure 27). *B. frontosa* has a known distribution of about 10,000 km² but is only known from three populations in the Goldfields.

Further details regarding the survey methodology and identification of SRE at Fimiston is provided in Appendix P.

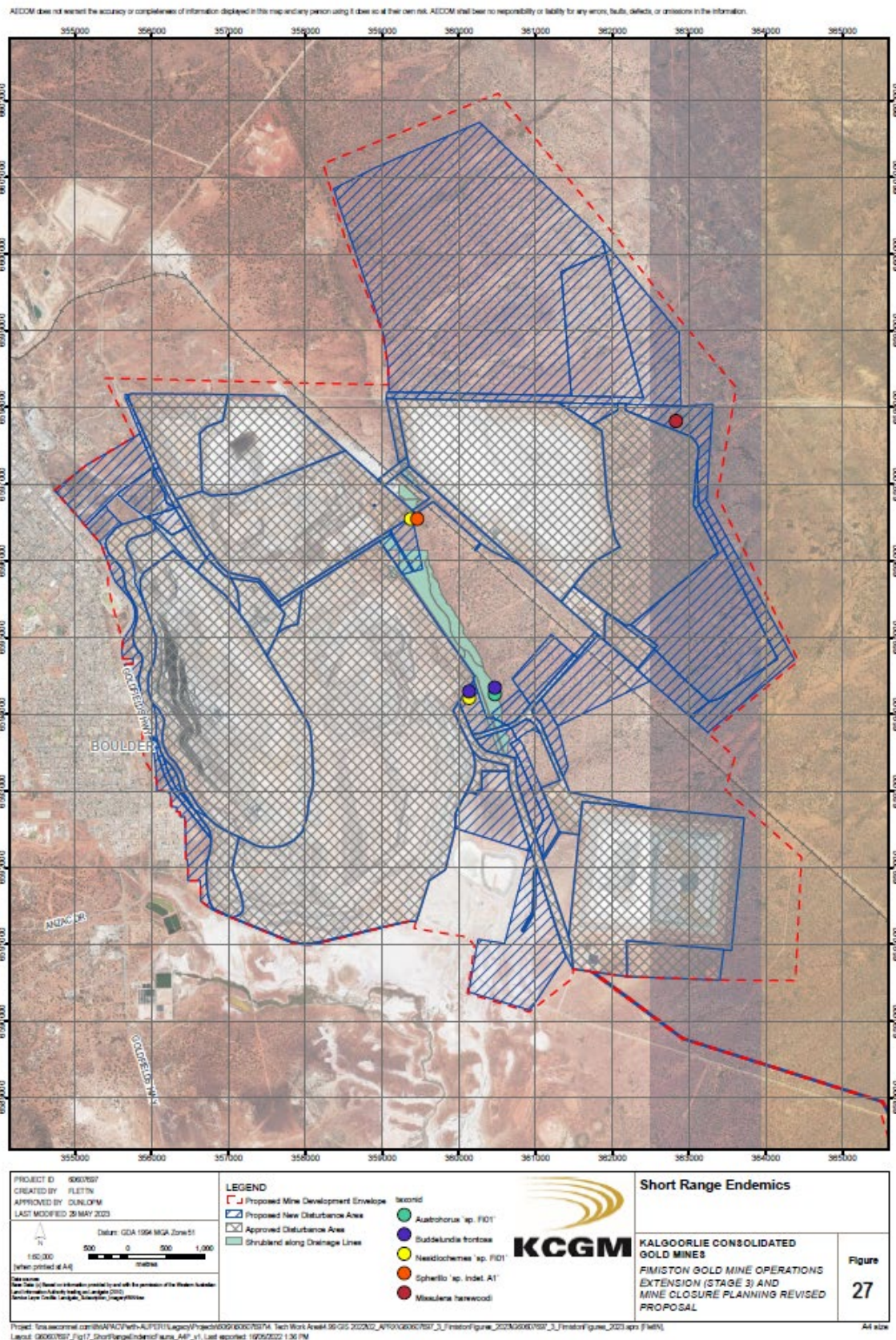


Figure 27: Short Range Endemics

6.6.4 Potential Impacts on Terrestrial Fauna

The Revised Proposal will result in direct impacts on terrestrial fauna through the loss of fauna habitat as a result of clearing 1,580 ha of native vegetation comprising 1,533 ha of open woodland and 47 ha of shrubland. Potential impacts on terrestrial fauna include:

Direct impacts:

- Loss of habitat and habitat fragmentation due to native vegetation clearing.
- Vehicle strike causing injury or death.
- Fauna entrapment leading to injury or death.

Indirect impacts:

- Dust generation, noise and vibration causing temporary displacement of fauna.
- Altered fire regimes.
- Increase in pest species impacting native fauna due to predation and competition.
- Altered hydrological regimes impacting on vegetation health.

6.6.4.1 Fauna Habitat Loss and Fragmentation

The Revised Proposal will result in 1,580 ha of additional clearing of native vegetation through modification of the development footprint for the additional TSFs, WRDs and infrastructure corridors. The terrestrial fauna habitats proposed for clearing are well represented throughout the Goldfields region and no conservation significant vertebrate fauna species are known to be restricted to or reliant on the habitat within the modified MDE.

Whilst it is possible for the Malleefowl to be present in the area given that 451 ha of suitable foraging and dispersal habitat is present in the MDE, the Revised Proposal is unlikely to have an impact on this species as there are much larger areas of better quality habitat available in the surrounding region. There is no direct evidence of Malleefowl such as sightings or mounds and in the MDE, and thus the site is not considered to be habitat critical to the species.

It is unlikely that there will be any impact on the Chuditch as the species has not been recorded in the study area in any of the previous surveys. The habitat within the site represents foraging and marginal breeding habitat and unaffected areas of similar habitat are known to occur nearby.

No vertebrate fauna species of conservation significance have the potential to be significantly affected by the proposed WRD expansion and additional TSFs. This is due to the evidence that most conservation significant species appear to be absent due to local/regional extinction or lack of suitable habitat, having broad ranging distributions (migratory) or will persist in adjoining unaffected areas of similar habitat that are known to exist nearby.

The area where the *J. aridus* has been located is surrounded on three sides by existing infrastructure. New infrastructure in the area has been designed to minimise impact on the species. Two of the eight known breeding shrubs at Fimiston Operation are located within the FS Project proposed disturbance footprint and will require removal. The species appears to show high breeding shrub fidelity and has continued to flourish in the vicinity of mining; hence the remaining population is anticipated to be retained.

At the time of the initial survey in 2021, the Fimiston study area supported the only known extant population of *J. aridus*. Currently, *J. aridus* is now known from a total of 10 populations spanning an area 120 km north to south and 40 km from east to west, with a range of approximately 277,645 ha (Eastwood 2022; Phoenix 2022b, 2024; Williams 2022). Of the 10 locations, 2 locations are in DBCA managed lands,

Karrawang Nature Reserve and Goongarrie National Park, located approximately 100 km north and 20 km west of the Fimiston population respectively.

Care has been taken to design drainage infrastructure to maintain the current surface water flow and flooding regime, although key shrubs favoured by the population are not located directly within drainage lines. A detailed confidential discussion of the potential impacts to *J. aridus* based on the known locations has been provided to the EPA and DBCA for their assessment.

KCGM will endeavour to protect the breeding sites from significant changes to hydrology; air, water and ground pollution; introduced plant species; and unauthorised entry, especially from hobbyist entomologists, some of whom may decimate local insect populations without regard to the rarity or conservation status of the species. Details of the location of the site will not be publicly available.

The majority of the area of potential SRE habitat that was rated as 'High' lies outside of the proposed disturbance footprint. This area is described as 'Shrubland along Drainage Line'. The total area of the 'High' rated habitat comprises of 0.9% (18 ha) of the study area for SREs (Phoenix, 2024). This is unlikely to cause any fragmentation of the habitat type, but will reduce its total area.

Whilst Northern Star are the tenement holders for the majority of the tenements within the proposed Mine Development Envelope, there are two tenements over the area that has been identified as "High" potential SRE habitat. These are Mining Lease M 26/455 (covering an area of 86.43 ha) and Prospecting Licence P26/2470 (covering an area of 8.08 ha), and are not held by Northern Star Resources.. The areas of 'High' potential SRE habitat within the tenements held by Northern Star will be avoided to ensure that there are no direct impacts from Project activities.

6.6.4.2 Vehicle Strike and Fauna Entrapment

Fauna within the clearing footprint are at risk of death, injury or displacement due to interaction with heavy and light vehicles undertaking vegetation clearing, transportation or mining activity associated with the Revised Proposal. Fauna may also potentially become entrapped within mining infrastructure such as water storages or excavations. This impact is not new as mining activity is already occurring within the area and has been for over 100 years. The likelihood of the impact occurring is not expected to increase as a result of the expansion as there will not be an increase in the number of mining vehicles and equipment operating on the site and clearing of native vegetation (fauna habitat) is required in discrete areas prior to the construction of the TSF cells.

Appropriate management measures during clearing will reduce the likelihood of fauna death or injury occurring as a result of this activity.

J. aridus appear to be tolerant of the local disturbances, including roads, which is evident at the other locations which are also near roads (Phoenix 2023b). *J. aridus* is thought to remain in close proximity to the breeding and cleared areas are not considered a threat (Phoenix 2023b).

The existing project area is an active mining area adjacent to an urban area, means that fauna tend to avoid this area, also reducing the likelihood of impacts.

6.6.4.3 Indirect Impacts from Dust, Noise, and Vibration

Potential impacts to native fauna due to disruption or disturbance to fauna as a result of noise, vibrations, light and dust emissions are managed to minimise any impacts.

The Revised Proposal will increase the size of the pit and therefore expand the areas affected by dust emissions. Excessive dust has potential to result in temporary displacement of local fauna populations. This can take place as fauna move to avoid inhalation of dust, relocate after vegetation providing habitat is damaged. Results from recent fauna survey suggest that it is unlikely that there are any conservation significant vertebrate fauna species that would be reliant on habitat abutting the mine. It is therefore unlikely that emissions to air would result in significant impacts to vertebrate fauna associated with displacement of local populations of vertebrate fauna.

The P1 butterfly, *J. aridus*, occurs in an area surrounded by the current mining operations. The butterfly is known to feed on two plant species and has a mutualistic association with the small dolichoderine ant *Froggattella kirbii*. The colony appears healthy and does not appear to be affected by the mining operations, including dust. Dust deposition would be a concern if it killed the host plants or individual butterflies of the species. Additional monitoring of the population is proposed as part of a Significant Species Management Plan (Appendix NAppendix L – Confidential).

Results of the noise assessment conducted for the Revised Proposal show that Fimiston Operations would maintain compliance with the approved noise level defined in the Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016, if KCGM continues to operate in accordance with the Noise and Vibration Monitoring and Management Plan (NVMMP). KCGM is submitting a revised Regulation 17 application for the changes made for the Revised Proposal and the NVMMP will be revised accordingly. The NVMMP includes control measures and operational strategies that contribute to reducing the noise and vibration emissions produced by the site. These measures include the following:

- Completion of noise modelling in relation to any proposed changes in mining activities.
- Designing blasts to minimise noise and vibration.
- Using additional noise barriers where required.
- Installation of broadband frequency sound (white noise) reversing alarms on mobile equipment.

KCGM has a Blast Management Plan for blasting at the current cutback. This plan is designed to control dust, airblast overpressure, vibration and fly rock from blasting. Blasting is monitored through a series of five vibration monitoring stations to ensure it meets acceptable criteria.

6.6.4.4 Indirect Impacts from Altered Fire Regimes

The area within and surrounding the proposed MDE has been highly modified by historic mining, pastoral and urbanisation activities. This includes extensive alteration of the ground surface through disturbances as construction of roads and mining exploration, revegetation programmes and recreational activities. Disruption or complete removal of natural fauna habitats from the area has resulted from these actions. It is therefore unlikely that there will be any indirect impacts from altered fire regimes.

6.6.4.5 Indirect Impacts from Predation and Competition due to Introduced Species

Three introduced species were observed during surveys of the Fimiston Operations, including *Bos taurus* (European cattle), *Felis catus* (cat) and *Oryctolagus cuniculus* (rabbit). Impacts of introduced species can impact on native fauna by increasing competition or predation. They can also contribute to the spread of disease. The Chuditch is known to eat mammals the size of rabbits so indirectly, the rabbits may provide a large food source for the species.

These feral species have been established in the area for the last 100 years. The cattle are encouraged to be present in the surrounding pastoral leases and rabbits are common. Feral cats are successful hunters

and may have been drawn from the City of Kalgoorlie Boulder. The new development will not alter the number of feral animals within the MDE or surrounding areas.

6.6.4.6 Indirect Impacts from Altered Hydrological Regimes

The Eastern Floodway is a highly ephemeral water course and stormwater runoff typically occurs throughout the catchment as shallow sheet flow. A large total rainfall depth or high rainfall intensity is required to generate surface water runoff within the catchment due to the high infiltration losses associated with the local soil. Under dry antecedent catchment conditions, it is estimated that a flood event around 10% AEP or rarer is required to result in sufficient stormwater runoff to hydraulically connect the upper and lower sub-catchments of the Eastern Floodway catchment. During such significant flood events under existing conditions, it is estimated that total runoff volumes reporting to sub-catchments downslope of the proposed landforms are being impacted as incident rainfall is retained upslope of the TSFs and WRDs landforms.

Model results indicate the proposed stormwater diversions improve stormwater conveyance around the proposed TSF and WRD landforms allowing upslope catchments to drain freely to downslope catchments. Modelled flows through the Eastern Floodway at the Bulong Road floodway are largely unchanged by the upslope Fimiston III landform. Modelled flow volumes through the Eastern Floodway north of Mt Monger Road are largely unchanged; however, the peak flows are estimated to increase during more frequent floods and decrease during rarer floods in due to the proposed developments within the Eastern Floodway catchment (WSP 2023).

6.6.5 Assessment of Impacts

Considerations for terrestrial fauna within EIA assessments at the State level include significance of values present, the current state of knowledge of those values, potential impacts and the scale at which the impacts are assessed (EPA, 2016d). Within the wider Fimiston Operational Area, impacts to conservation significant vertebrate fauna with the potential to occur in the study area are considered negligible. No conservation significant vertebrate fauna species has been recorded inside the current or proposed MDE. The two Threatened vertebrate species, Malleefowl *Leipoa ocellata* and Chuditch *Dasyurus geoffroii* (both VU), may potentially use parts of the study area intermittently for dispersal and foraging, but are not likely to be breeding residents. Any significant species with potential to occur would not be restricted to the MDE.

Fauna habitat mapping in Table 38 indicates that there is 282 ha of Malleefowl foraging and dispersal and an additional 3,412 ha of extrapolated foraging and dispersal habitat surrounding and including the proposed disturbance footprint. Of the 282 ha 68 ha (24%) is proposed to be disturbed and of the 3,412 ha, 1,477 ha (43%) will be disturbed. No sightings of Malleefowl or active breeding mounds were found in the targeted Malleefowl survey (Alexander Holm & Associates 2023).

Two breeding shrubs for the *J. aridus*, will be removed as a result of the FS Project. The remaining six breeding shrubs are considered adequate to support a population of the species. The *J. aridus* population at Fimiston represents 11% of the currently known *J. aridus* populations. An impact to a fraction of 10% of the populations is not anticipated to negatively impact upon the survival of the species.

Table 38: Regional Habitat Mapping

Habitat	Extent Within the Study Area (ha)	Extent in the Proposal Area (ha)
Open woodland – Mid to tall open eucalypt woodland of gimlet and Salmon Gum with scattered <i>Brachychiton</i> over mixed shrub understorey of <i>Eremophila</i> , <i>Senna</i> , <i>Acacia exocarpos</i> and <i>Santalum</i> on red-brown clay	3,683	1,523.5
Shrubland – Tall open <i>Eremophila scoparia</i> shrubland over mid open <i>Acacia nyssophylla</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> shrubland over low open <i>Eremophila caperata</i> , <i>Rhagodia drummondii</i> and <i>Scaevola spinescens</i> shrubland.	193.7	35.4
Shrubland in Drainage Lines	77.0	18.2
Rehabilitation – Previously cleared areas that are now revegetated.	3,158.4	106.6
Cleared – Cleared for infrastructure or historic purposes	923.4	167.4
Malleefowl suitable for foraging and dispersal	282.2	68
Malleefowl extrapolated foraging and dispersal habitat	3,412	1,477

6.6.6 Cumulative Impacts

KCGM is a large mining operation in the Kalgoorlie-Boulder Area, covering the Fimiston, Mt Charlotte, Mt Percy and Gidji operations. The Kalgoorlie-Boulder area has over 90% of the pre-European vegetation remaining. The cumulative impacts of the KCGM Star operations have consequently been considered as a whole for the Kalgoorlie-Boulder area. The proposed works will not result in the percentage of pre-European vegetation remaining dropping below 90% (Table 31).

The removal of 68 ha of marginal and 1,477 ha of extrapolated marginal habitat is unlikely to have a direct, indirect or cumulative impact on the species even through it will reduce marginal Malleefowl foraging and dispersal habitat in the area. As the Malleefowl has not been recorded in the area it is unlikely that a local population or individual would be impacted. The area around Kalgoorlie has been extensively disturbed for mining and urban activities and is unlikely to have the litter cover required to provide good habitat as noted in the Malleefowl Recovery Plan (Benshemesh, J. 2007). Habitat ranges across the arid zones across WA, NSW, SA and Victoria.

The likelihood of direct, indirect or cumulative impact on the Arid Bronze Azure Butterfly is low to negligible. The Arid Bronze Azure Butterfly (*Ogyris subterrestris petrina*) is a Threatened species that is listed as Critically Endangered under the EPBC Act and the BC Act. The most critical factor for habitat occupancy by the butterfly is the presence of large colonies of the host ant. A targeted survey undertaken in 2021 (Phoenix, 2021) found no evidence of suitable colonies for the host sugar ant (*Camponotus sp. nr. terebrans*) at any of the sites.

Similarly the likelihood of direct, indirect or cumulative impact on the *J. aridus* population is low to negligible. Until recently, *J. aridus* was only known from its type locality at Lake Douglas approximately 12 km South West of Kalgoorlie, Western Australia. It was discovered in November 1983 breeding on a single *Acacia tetragonophylla*. While several new populations have recently been discovered north of Kalgoorlie by Dr Rod Eastwood (unpublished) and by A.A.E. Williams (DBCA; pers. comm. 2021) there is no information in other referrals about potential impacts from other projects. Further research will be conducted by KCGM's consultants to make sure there is no impact upon the species populations as

recently discovered. It is unlikely that quantification of cumulative impacts on this species can be determined at this stage of knowledge of the species. What we do know is that there are at least 10 populations and there are likely to be more.

It is therefore unlikely that there will be any cumulative impacts on the availability of significant species fauna habitat or on significant species populations.

6.6.7 Mitigation

A summary of key management measures to minimise impacts on fauna are provided in Table 39. The management measures are applicable to the maintenance and protection of fauna and SREs and associated biodiversity within the MDE.

A Significant Species Management Plan (KCGM, 2023) has been developed to monitor species health and assess potential impacts to *J. aridus* (Appendix L– Confidential).

Where direct impacts are unavoidable, measures intended to minimise direct loss have been proposed. Potential indirect impacts will be minimised to the maximum extent practicable with best management practices to suppress dust and minimise introduced species.

Table 39: Mitigation Measures for Fauna and SRE

Type	Controls
Avoid	- Design surface hydrology to avoid changes in hydrology to sensitive areas. - Maximise the use of existing cleared areas for roads and infrastructure corridors. - Clearing along one front to allow fauna to escape. - A fauna spotter/s to transect the area prior to clearing activities begin each day. - For clearing activities approved under a Ministerial Statement, ensure KCGMs internal disturbance approval considers all aspects and implications of the proposed clearing. - Suspending work if necessary or if classified as a total fire ban day. - No clearing of 'High' potential SRE habitat outside of the approved disturbance envelope
Minimise	- Minimise clearing in the <i>J. aridus</i> area to the extent possible - Minimise clearing to the maximum extent practicable through implementation of internal clearing permit procedure (KCGM, 2021), which includes: - Prior and post construction inspections - Use of spatial data of significant flora and vegetation location in planning - Surveying and demarcation of clearing areas - Maintain traffic management rules to minimise the likelihood of fauna injury or mortality. These rules include prohibition of off-road driving unless authorised and reduced speed limits on internal roads. - Remove roadkill from roads to reduce scavenging; - Minimise the attraction of feral and native fauna to the proposal by ensuring proper food storage and disposal; - Direct light sources towards proposal activities to illuminate operational areas rather than surrounding areas; - Maintain existing fauna exclusion management including the fencing of the TSFs to prevent fauna entering and management of trenches to allow fauna to escape. - Minimise dust generation from mining and road use that could cause temporary disturbance to fauna. - Maintain existing procedures for feral animals (KCGM, 2023), including cat trapping when numbers are identified as increasing (usually spring). - Clearing activities will not be undertaken when the Fire Danger Rating is severe or higher.
Rehabilitate	- Progressive rehabilitation of bare ground areas to achieve habitat values. - Retain and utilise topsoil and mulch from cleared areas for closure and rehabilitation. - Area is surveyed/ mapped and data captured for the Annual Compliance Report (ACR) and Annual Environment Report (AER). - Rehabilitate TSFs and WRDs to agreed MCP post-closure form, a modified ecosystem.

All clearing activities at the Fimiston Operations are implemented in-line with the Vegetation Clearing and Rehabilitation Material Stripping Guide. Within this guide any regulatory approval conditions relating to the clearing of vegetation and soils must be considered, including any actions/recommendations arising from fauna surveys (KCGM 2023). Additional practical risk mitigation measures include:

- A fauna spotter/s to transect the area prior to clearing activities begin each day.
- For clearing activities approved under a Ministerial Statement, ensure KCGMs internal disturbance approval considers all aspects and implications of the proposed clearing; or
- Suspending work if necessary or if classified as a total fire ban day.

Prior to any fauna habitat being disturbed numerous checks have been completed by KCGMs internal disturbance approval. In addition to the Vegetation Clearing and Rehabilitation Material Stripping Guide, KCGM implement internal disturbance approval.

The actioning and crosschecking initiated through the internal PCWAC permitting system allows the site environmental compliance team to keep abreast of site activities and ensure they are included within the Annual Environmental Report (AER). Due to a potential time lag between clearing approval and implementation of actual clearing activities, a DPF (ground disturbance form) internal permitting process supports the responsible implementation of clearing activities at the Fimiston Operations.

Mitigation and management of particulate matter originating from any Fimiston Operational activities is implemented through the delivery of the approved Fimiston Air Quality Management Plan (FAQMP) as required under Conditions 7-1 to 7-7 of MS 782.

Due to the proximity of KCGM operations to the City of Kalgoorlie-Boulder, the incidence of stray pets, declared feral and pest animals is not uncommon. Management and mitigation measures are actively implemented at Fimiston through the multi-faceted KCGM Managing Native Stray Feral and Pest Animals procedure developed for multiple scenarios in which KCGM employees may come into proximity to animals during normal operations.

KCGM do not implement seasonal back burning or cool cultural burns within or externally to the current Fimiston Operational areas or MDE. The regional climate is semi-arid with low rainfall considered the norm. This setting supports vegetative growth and formation of fauna habitat. However, the volume and rate of increase is not considered rapid with volumes increasing slowly in direct response to received rainfall (or drought/below rainfall conditions).

6.6.8 Predicted Outcomes

The proposed expansion of the Mine will directly impact terrestrial fauna primarily as a result of habitat loss. The Revised Proposal will result in the direct loss of up to 1,580 ha of Open Woodland and Shrubland habitat. This will result in a reduction in the extent of available fauna habitat at a local scale. However, the habitats present within the MDE are considered to be well represented in the surrounding region. The loss of fauna habitat is therefore unlikely to have a significant impact on the extent of fauna habitat, or density of fauna species at a regional scale. In addition, KCGM conducts a progressive rehabilitation program for closure which will result in replacement of the cleared habitat in the long term.

Clearing of native vegetation for the construction and operation of the Revised Proposal will not result in permanent loss of fauna habitat for the potentially restricted species of pseudoscorpion *Austrohorus* 'sp. Fi01'. Impacts to confirmed SRE invertebrates within the Eastern Floodway is considered low, with species assemblages represented outside of the current and proposed MDE and extended Fimiston Operational disturbance footprints. The Eastern Floodway area has not been included for development therefore disruption to SRE and invertebrates is unlikely.

The habitat supporting conservation significant fauna *Jalmenus aridus*, Inland Hairstreak butterfly (P1), will largely be protected. This habitat represents 10% of the known populations. Recent surveys from 2021 to 2023 by Phoenix Environmental Services and globally recognised entomologists have significantly increased knowledge of known populations and the species. This includes increased identification from a single population to nine confirmed populations within 100 km. This growth in knowledge indicates the species is more common and widespread than previously reported. Current and historic disturbances consistent with mining activities already exist within proximity to known populations, indicating some degree of resilience is present (Phoenix, 2023). As a consequence, the mine expansion is not likely to have a significant impact on the species.

Secondary or indirect impacts associated with noise, dust and vibration in relation to the existing mining operation are not considered significant as they are not new, therefore fauna in the local area have adapted to these. Similarly, fauna injury or death due to interaction with the mining activities is not expected to have a significant occurrence as fauna are accustomed to the mining operation. This impact can be minimised through appropriate traffic controls and through checks of proposed clearing areas prior to commencing activity.

There are no current plans to begin season fuel reduction burns or cool cultural heritage burns within the current or proposed MDE. The regional climate is semi-arid with low rainfall considered the norm and rehabilitation rates are delivered to replicate the surrounding densities. The Revised Proposal is not expected to impact or change natural fire regimes.

The Revised Proposal is not expected provide suitable amended landforms which feral fauna species may find appealing and therefore not supporting an increased diversity or population. Feral animal management is actively undertaken by KCGM through trapping under controlled conditions. The Revised Proposal is not expected to encourage or support breeding opportunities for known and listed feral species, therefore no significant impact is expected.

With the exception of habitat loss, residual impacts to terrestrial fauna are considered to be equivalent to those resulting from the existing Mine. KCGM considers that the Revised Proposal is able to meet the EPA's objective to protect terrestrial fauna so that biological diversity and ecological integrity are maintained through adequate management practices. KCGM considers offsets are not required for this factor.

7. OTHER ENVIRONMENTAL FACTORS OR MATTERS

7.1 Inland Waters

7.1.1 EPA Objective

The EPA's objective for inland waters is 'to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.' (EPA, 2023).

7.1.2 Policy and Guidance

Policy and Guidance on Inland Waters includes:

- EPA – Statement of Environmental Principles, Factors and Objectives (EPA, 2023a).
- Environmental Factor Guideline 'Inland Waters' (EPA, 2018a).
- Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2021 (EPA, 2021a).
- Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual 2021 (EPA, 2021b).
- *Rights in Water and Irrigation Act 1914.*
- *Country Areas Water Supply Act 1947.*
- Western Australia Water in Mining Guideline (DWER, 2013).

7.1.3 Receiving Environment

The climate of Kalgoorlie is discussed in Section 6.3.3.

7.1.3.1 Studies and Investigations

Studies undertaken for this Revised Proposal include:

- Hydrological Assessment of Eastern Floodway – WSP 2023.
- Hydrological Review of the Fimiston I, Fimiston II and Fimiston III TSFs – Big Dog Hydrogeology 2022.

7.1.3.2 Surface Hydrology

The MDE is located in the Salt Lake hydrogeological region that comprises numerous drainage systems flowing to terminal salt lake systems, clay pans and other natural surface depressions. The MDE is located in an elevated area which forms a topographic divide between two drainage systems.

A drainage line transects the MDE, with Fimiston Open Pit and the WRDs on the western side and TSFs generally on the eastern side. The drainage line is locally referred to as the Eastern Floodway (or Central Drainage).

The Eastern Floodway is part of the Hannan Catchment drains an area of about 230 km² with runoff flowing to the Hannan Lake to the south of the MDE (GRM and MBS, 2021). The Hannan catchment associated with the Yindalooda South palaeochannel system.

The Eastern Floodway only flows after heavy rainfall events that occur on a frequency of less than once per year. Heavy rains associated with tropical depressions in 1992, 1995 and 1999 caused extensive

flooding in the Kalgoorlie area, and on these occasions floodwaters in the Eastern Floodway spread laterally over several hundred metres (BDH, 2019). Flooding in the catchment also occurred in response to above average rainfall in March 2013 and January 2014. The direction of natural surface water drainage is to the south towards Hannan Lake; however, floodwaters can accumulate and stand for long periods, controlled by man-made structures such as crossings along Mt Monger Road and the Trans Australian Railway (BDH, 2019) – refer Figure 28.

Flow conveyance along the Eastern Floodway is controlled by floodways (low-lying road sections designed to overtop during flood events) across Bulong Road, the TSF Haul Road connecting Kaltails and Fimiston II TSFs to the Fimiston WRDs, and Mt Monger road. The temporary stockpile and the GMM TSF landform within the Eastern Floodway watercourse also partially impede the flow conveyance during flooding. Stormwater flow through the Eastern Floodway tributary network is controlled by several sets of culverts beneath Bulong Road, the raised TAR embankment, and the Kaltails Haul Road at several locations (WSP, 2023).

The majority of the floodway has relatively flat topography which reflects the underlying soils and geology (Golder, 2017). As a result, surface runoff responses are largely expressed as shallow sheet flow across a wide topographic section (between 100 to 500 m) (Golder, 2017), with poor definition of flow pathways. Rainfall of 60 to 75 mm is required before surface runoff flow paths, particularly occurs (WSP Golder 2022a). This is equivalent to approximately the 5-10% Annual Exceedance Probability (AEP), 12-hour rainfall event (WSP Golder 2022a, Appendix Q). Flood depth mapping for the 10% and 1% AEP 12-hour events are presented in Figure 29 and Figure 30.

Hydrology of the *J. aridus* habitat has also been reviewed in Appendix Q.

Anecdotal evidence based on KCGM site personnel indicates that the Eastern Floodway begins to flow when daily rainfall totals exceed approximately 60 mm. Additionally, daily rainfalls that exceed approximately 80 mm typically result in full connection of the floodway between Bulong Road in the north to Mt Monger Road in the South. Based on pre-development modelling, it is estimated it will take at least a 12-hour 10% Annual Exceedance Probability (AEP)² event for the Eastern Floodway to flow. For the more frequent storm events (50% and 20% AEP) the critical duration is longer, and the runoff volumes are estimated to be low or cease to flow in some cases.

Due to the ephemeral hydrological conditions and low frequency of these sheet flow events it is estimated the vegetation located near to minor drainage lines is watered by predominantly incident rainfall.

7.1.3.3 Hydrogeology

There are three major active groundwater systems in the KCGM area namely:

- Ferricrete and alluvial sedimentary system; sand, gravel and fractured ferricrete within clay deposits between 5 to 40 m below ground level. These deposits are present in the lower elevation areas at the centre of the surface water catchments. The Eastern Borefield predominantly draws groundwater from this system, and this is the groundwater system through which seepage from the Fimiston TSFs travel.
- Paleochannel systems; a localised but extensive network of alluvial sands at around 60 m depth. This system is well defined and is the primary source of process water by KCGM and by other mining operations.

²An event having a likelihood of 10% of being exceeded in any given year. Equivalent to the 1 in 10 year average return interval event.

- Fractured bedrock system where groundwater flow occurs in fractured and weathered zones within the basement rocks at depth. The Fimiston Pit is entirely situated within the fractured bedrock zone (GRM and MBS 2021). Regional investigations undertaken by KCGM and other mining companies in the Eastern Goldfields Region suggest these formations typically have a very low primary permeability and are not expected to store or transmit large quantities of groundwater except through major secondary structures. Some portions of the Eastern Borefield may extract small amounts of groundwater from the upper weathered portion of the bedrock but flows from this unit are generally low (BDH, 2019).

In general, groundwater at KCGM is naturally saline with TDS (total dissolved solids) concentrations ranging between 25,000 and 170,000 mg/L with higher TDS concentrations observed in monitoring bores near the TSFs and paleochannels. Groundwater pH is neutral to slightly alkaline in the paleochannel and fractured bedrock groundwater systems. The ferricrete and alluvial groundwater system has a naturally low pH, with an observed range between 2.8 to 4 (GRM and MBS 2021). Because of the high salinity and sometimes low pH, the groundwater is not considered to have any environmentally or socially beneficial uses except for as process water in mining.

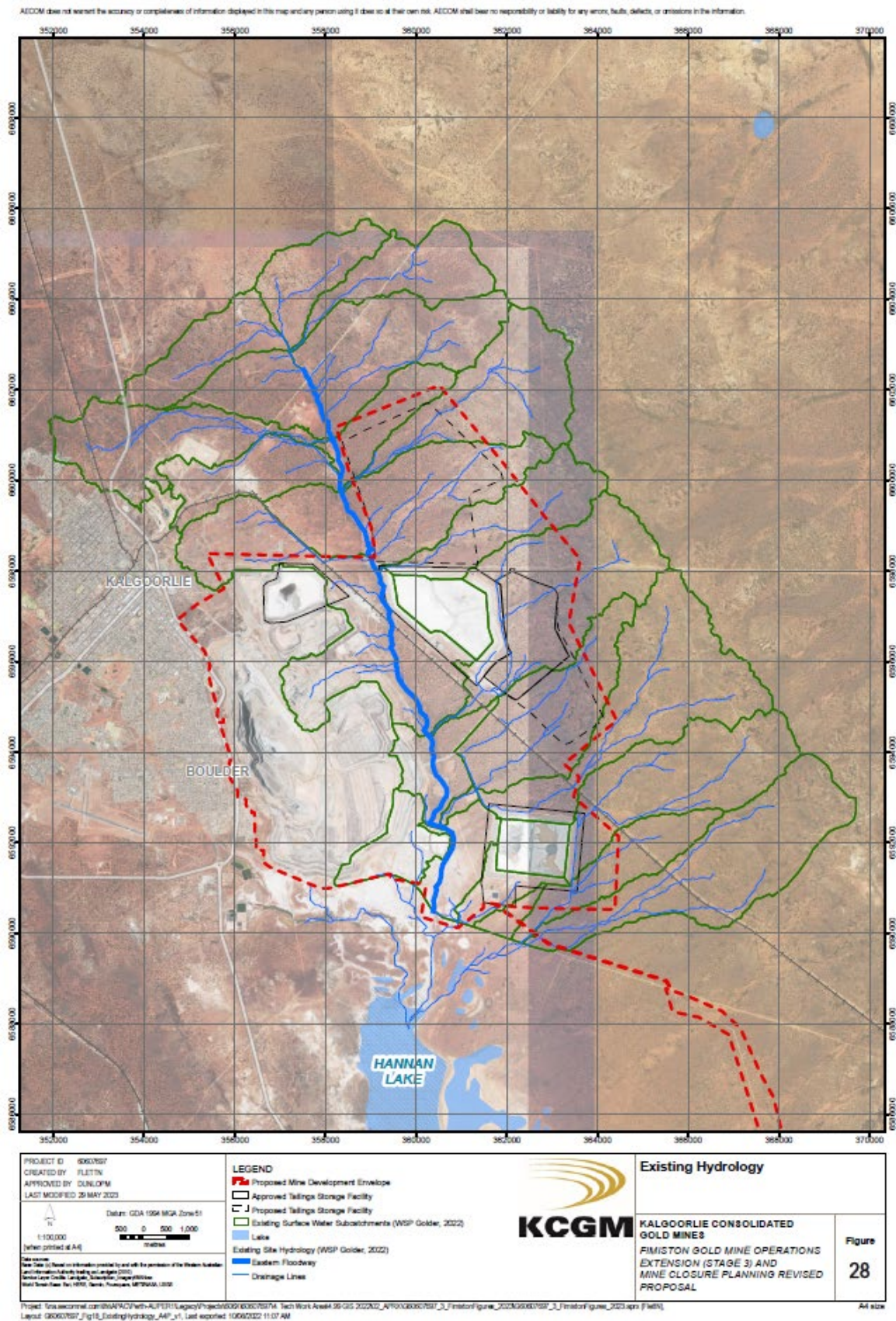


Figure 28: Existing Hydrology

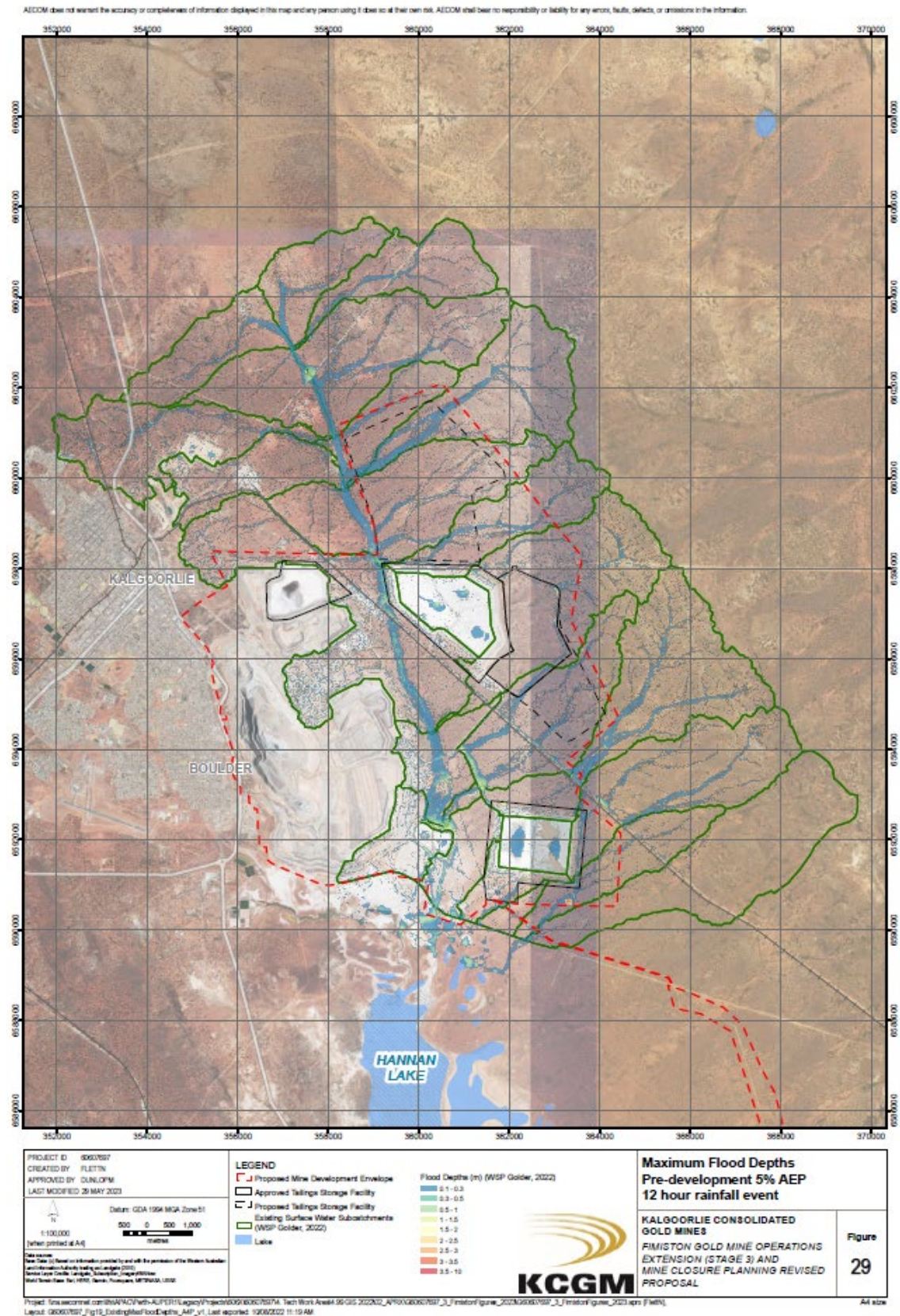


Figure 29: Maximum Flood Depths, Pre-development 10% AEP, 12-hour Rainfall Event

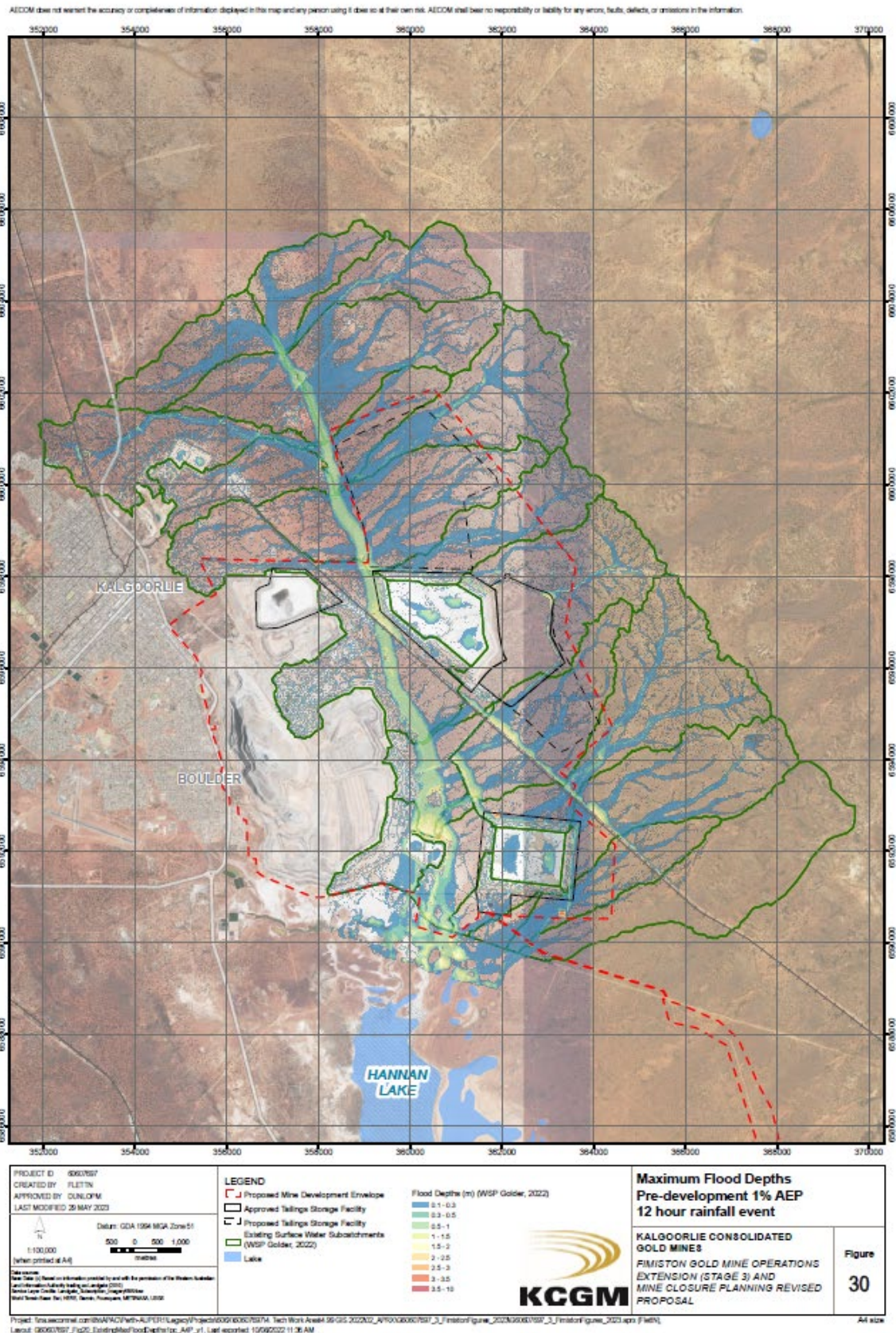


Figure 30: Maximum Flood Depths, Pre-development 1% AEP, 12-hour Rainfall Event

7.1.3.4 Dewatering

Dewatering of the mines along the Golden Mile has occurred for a considerable period of time, probably since mining commenced in the late 1890s. Prior to 1992, the underground mines were dewatered by pumping from various shafts on the Golden Mile, with water levels in the late 1980s appearing to have been held at around 800 m below ground level (mbgl). Production of groundwater by the Chaffers Shaft pumping station maintained water levels in the old underground workings of the Golden Mile between 720 m and 820 m below ground level between 1994 and January 2004. Groundwater levels recovered by around 130 m between January 2004 (when pumping temporarily ceased) and September 2005 (when pumping recommenced).

Currently dewatering of the Fimiston Open Pit is achieved by pumping from two angled dewatering bores located west of the pit which intersect the historical underground workings below the pit. The groundwater level is maintained at around 700 mbgl, which provides dry conditions during mining at the base of the pit. Dewatering will continue while the Fimiston Open Pit is operational and will result in the groundwater level being held at around 900 mbgl by the end of mining. Monitoring of groundwater conditions in the pit slopes is achieved via standpipe monitoring bores and Vibrating Wire Piezometer (VWP) sensors.

The monitoring identifies that the position of the groundwater surface is strongly controlled by the underground workings and rises very steeply within the open pit slopes. As a result, the cone of depression in the basement groundwater system surrounding the Fimiston Open Pit is very limited and extends a maximum of 200 m from the edge of the Fimiston Open Pit.

Groundwater produced by the Fimiston Open Pit dewatering operations is a blend of groundwater inflow, water stored in the underground mining voids below the pit, and runoff and direct precipitation which is captured within the pit and subsequently infiltrates the underlying workings. Total dissolved salts concentrations range between 45,000 and 80,000 mg/L, with the pH consistently above 7.5. The water quality is dominated by sodium and chloride (GRM and MBS, 2021). Mining is the only identified beneficial use for this saline groundwater system and there are no potable water supplies in the vicinity of Kalgoorlie-Boulder that could be influenced by the Fimiston Open Pit dewatering operations. The nearest borefields are hypersaline seepage recovery borefields, in the ferricrete and alluvial sediment groundwater system, located several kilometres from the Fimiston Open Pit surrounding the TSFs and paleochannel supply borefields. There is no evidence of any hydrogeological linkage between these aquifers.

7.1.3.5 Tailings Storage Facilities

All TSFs at Fimiston are currently unlined and are used to deposit tailings generated from the processing of ore in the Fimiston Processing Plant. Tailings have been discharged to the TSFs as a slurry containing around 50% by weight of finely ground rock particles. The liquid portion of the slurry comprises hypersaline water derived from remote water supply borefields and includes residual chemicals from ore processing, including lime and low levels of cyanide (BDH, 2019).

Excess water within the tailings cells (decant water) including collected precipitation is removed from the TSF paddocks to minimise the extent of the decant ponds and is returned to the mine water management circuit. Tailings have been deposited to the three cells on a rotational basis, with each cell being used for several months at a time, before being left for the tailings to consolidate and dry out. The rotational tailings deposition schedule includes cells in the Fimiston I TSF, Fimiston II TSF and the Kaltails TSF, located as marked in Figure 4. Each of the cells have been progressively lifted, by raising the embankment using compacted coarse tailings sourced from the margin of the deposition cell.

Currently it is anticipated that based on the maximum allowable heights of the Fimiston I, Fimiston II and Kaltails TSFs, an additional facility will be required to store the total tailings to be deposited over the remaining life of mine.

7.1.4 Potential Impacts on Inland Waters

Potential impacts to groundwater of the Fimiston Operation expansion includes:

- Groundwater mounding under TSFs causing localised vegetation decline.
- Creation of hypersaline pit lake after mine closure.

Potential impacts on surface water of the Fimiston Operations expansion includes:

- Infrastructure causing changes in surface water hydrology, potentially affecting significant species and communities.
- Infrastructure changing local drainage patterns and increasing flood risk.

7.1.4.1 Groundwater Mounding around Tailings Storage Facilities

Because the TSFs are unlined, there is movement of water from the tailings cells to groundwater. This movement is reduced by the presence of underdrainage on the new TSFs. As the tailings water is hypersaline, compliance limits for groundwater depth have been set in the DWER Operating Licence to ensure that naturally saline groundwater does not rise into the potential root zone for vegetation downgradient of the TSFs. An existing system of seepage bores and trenches have been constructed and operated to maintain compliance with detailed in the TSF Seepage and Groundwater Management Plans (SGMPs), required by the DWER Operating Licence. Groundwater monitoring is undertaken to ensure that saline water does not rise above target water levels and in doing so enter the root zone. These levels are rigorously monitored and reported on, as part of the SGMPs. They have been in place for more than 10 years at existing TSFs and proven very effective in controlling groundwater levels. The Water abstracted from these production borefields is used as process water for the mine.

For new TSFs, during the active operational period, SGMPs will be used to manage seepage. Post closure, during the drain down period, SGMPs will continue to be used, although the targets will require more regular review as water levels decline and reach equilibrium.

Tailings deposition is expected to mostly cease on Fimiston I and Fimiston II TSFs during the operational period, though the TSFs might be used occasionally as a top up option until closure. Post closure all TSFs will be closure and systems will be decommissioned once no longer required. Intercepted seepage will be pumped to the Fimiston Pit (GSM and MBS, 2021).

A hydrogeological investigation into the seepage from the current and proposed TSFs was undertaken by BDH (2023) (Appendix R). The investigation concluded that:

1. The current average groundwater production rate is approximately 70 L/s, which reflects current tailings production. Designs for the Fimiston IIE TSF and Fimiston III TSF with the use of internal toe drains and underdrain recovery will reduce rates of seepage to groundwater compared to the existing TSFs. This abstracted groundwater is recycled for use in the processing plant.
2. A monitoring program of ten new monitoring bores is recommended for the two new TSFs. An additional six Stage 1 (initial) production bores will be required for Fimiston IIE to meet the current requirement of groundwater remaining at least 4 m below the natural surface level. An additional ten to 35 production bores will be installed in a responsive manner at locations to be determined based on monitoring data.

3. Monitoring of the decant ponds at the existing TSFs indicates that seepage from the TSFs is likely to have a neutral to alkaline pH, TDS greater than 100,000 mg/L, total cyanide approximately 30 mg/L and weakly acid dissociable cyanide approximately 20 mg/L. Free cyanide concentrations are around 2 mg/L. The salinity and pH are similar to local groundwater (Section 7.1.4.1). Total cyanide in groundwater is typically at or below the detection limit of 0.04 mg/L. The impacts from the proposed operations are not anticipated to be significantly different from those of the current operations.

Further information regarding the TSFs and hydrogeology is provided in Appendix R.

7.1.4.2 Stockpiled Soil and Groundwater Rise

In situations where groundwater is close to the surface, groundwater can rise into stockpiles of soil or other material. As groundwater at Fimiston is saline, such groundwater rise could result in soils stockpiled for future rehabilitation use at Fimiston becoming saline. This is considered unlikely because:

1. Groundwater at the current TSF perimeters is currently greater than 10 mbgl (i.e. too deep to rise into stockpiles).
2. Any groundwater mounding driven by TSF seepage will be managed through the installation and operation of groundwater production bores.
3. DWER licences for the current (and likely future) TSFs require that groundwater production bores are operated to maintain groundwater at least 4 mbgl (BDH, 2022).

7.1.4.3 Post Closure Pit Lake

The Fimiston Open Pit is actively dewatered to allow for mining activities and will be dewatered until the end of open pit mining, with the associated cone of depression being limited in extent to within about 200 m of the pit rim. Groundwater seepage from pit walls is very low, with the majority of 'groundwater' present in old mining voids below the pit floor. This water has accumulated over a long period of time from rainfall incident on the pit and associated ramps (Appendix R).

The Fimiston Open Pit will be a groundwater sink and develop a hypersaline pit lake post closure.

For closure three possible impacts were considered:

- Potential impact on beneficial users of the groundwater aquifer adjacent to the pit.
- Potential for ecological impacts; and
- Potential for overtopping of the pit lake.

The Fimiston Open Pit lake model was updated in 2020 and again in 2022. The model predicts that the pit lake elevation will recover when dewatering ceases, stabilising at between 485 m and 505 m below the pit rim after around 300 years and will not rise any further due to the large amount of water lost by evaporation from the lake surface. The water level will never rise high enough for the lake to discharge from the pit. The lake level will remain substantially below the groundwater elevation within the surrounding basement rocks, ensuring the pit will act as a groundwater sink. The lake level will also remain below the base of oxidation in the pit area and in all locations the lake will be in contact with competent bedrock.

The model predicts that although the lake may initially stratify, it will subsequently become fully mixed and within 200 years the lake will become hypersaline (100,000 mg/L TDS). TDS concentrations will continue to gradually increase until NaCl solubility limits are reached (the maximum possible TDS concentration will be less than 300,000 mg/L). The water quality will reflect natural trace concentrations of metals associated with the Fimiston ore body, including the presence of Sb, B, Cd, Cu, Mo, Ni and Se. Concentrations of these metals will increase with time due to evapo-concentration, with the exception of Se which is sourced

from TSF seepage which will only be pumped to the pit lake for a short period. Total cyanide concentrations are predicted to be less than 0.6 mg/L in the pit lake.

Post-closure water impacts are addressed through the Mine Closure Plan (Appendix A).

7.1.4.4 Changes in Surface Water Hydrology

Hydraulic modelling was undertaken for three model scenarios including the base case, post-development excluding any stormwater mitigation infrastructure, and the post-development including the proposed stormwater mitigation infrastructure (WSP 2023). Changes to surface water hydrology as the result of construction of TSFs and WRDs can result in:

- Decreases in surface water flows due to infiltration of water into TSFs or WRDs
- Diversion of flow away around TSFs and WRDs away from the pre-existing flow paths, causing decreases in surface flows and potential drying out of vegetation forming a water shadow
- Diversion of flows around TSFs and WRDs towards other, new, flow paths causing increases in surface water flows and potential flooding and inundation of vegetation.

Two approved Fimiston IIE TSF cells are under construction in 2023. They are located to the east and southeast of the existing Fimiston II TSF adjacent to the Trans Australian Railway (Railway). The construction includes a stormwater diversion running in a southeast direction along the northeast flank of the expansion to divert upstream flows along the TSF to discharge to the Eastern Floodway catchment upstream of the Railway.

A Fimiston IIE TSF 3rd cell forms part of this proposal. Sub-catchments upslope of the Railway drain in a south-westerly direction through culverts towards the Eastern Floodway. The proposed 3rd cell intersects several of these sub-catchment drainage lines potentially restricting the flow from reaching the Railway culverts and downstream sub-catchments. A diversion drain will feed this water around the southern edge of the TSF and introduce the stormwater back into the Eastern Floodway as high up in the catchment as possible to minimise change to flows in the Eastern Floodway.

The proposed Fimiston III TSF to be located north of the existing Fimiston II TSF on the north side of Bulong Road. Sub-catchment drainage lines flow in a south-westerly direction discharging into the Eastern Floodway where flows subsequently discharge further south via the Bulong Road floodway. The proposed Fimiston III TSF landform intersects several of these drainage lines partially restricting flows from reaching the Eastern Floodway. The proposed Fimiston III TSF footprint was updated based on the latest conceptual designs undertaken by WSP (WSP, 2023).

An extension of the Southern WRD is proposed, which pushes eastwards into the Eastern Floodway. Without an engineered diversion, the landform would restrict significant storm event flows being conveyed to Hannan Lake with significant ponding expected to occur along the north side of the expansion landform within the Eastern Floodway.

To assist in maintaining pre-development flows, KCGM will construct a series of diversion channels around Fimiston IIE and Fimiston III TSFs and the Southern WRD (Figure 31). These channels are referred to as the:

- Fimiston IIE Primary Diversion Channel – a diversion channels to collect flows from all eastern drainage lines intersected by the Fimiston IIE TSF to be reintegrated into the Eastern Floodway as far north as possible, to minimise any reduction in water to the Eastern Floodway catchment and to direct stormwater through the largest of the ARTC rail line (which have design capacity for the stormwater volumes). A second Division channel has been designed if this proves in sufficient, which will increase the volumes reporting to the Eastern Floodway in significant storm events.

- Fimiston IIE TSF Secondary Diversion Channel – to maintain flows to Eastern Floodway sub catchment area to the north of the Kaltails TSF.
- Fimiston III TSF Diversion Channels - proposed to collect flows and feed it around the north and south sides of the proposed TSF, to be reintegrated into the Eastern Floodway
- Southern WRD Diversion Channel – to ensure that passive flow can be achieved around the eastern WRD toe, feeding the Eastern Floodway water towards Hannans Lake Golder 2019, WSP Golder 2022a, b).

The objective of these channels is to maintain stormwater flows within the operational area and into the Eastern Floodway towards Mt Monger Road and ultimately Lake Hannan. Some minor water infrastructure works may be required to ensure that these flows are able to occur passively, due to historical anthropological disturbance in the floodway. Several water infrastructure areas allow for these minor works.

7.1.4.1 Changes to Flows to Eastern Floodway

Impacts to peak and cumulative flows were modelled at Bulong Road and Mt Monger Road for the base case and the post-development scenario with the diversion channels for the critical 12-hour event (WSP Golder 2022a, refer Figure 32, Figure 33, and Appendix Q) for the 10%, 5%, 2% and 1% AEP. The post development peak flow rates in the 12-hour event are comparable to the base case scenario during the 5%, 2% and 1% AEP scenarios (Table 40 and Table 41).

Table 40: Pre- and Post-development Flows at Bulong Road

Event	Peak Flow (m3/s) – Base Case	Peak Flow (m3/s) – Post Development	Cumulative Flow (m3) – Base Case	Cumulative Flow (m3) – Post Development
10% AEP	0.83	1.30	18,334	24,122
5% AEP	16.6	17.4	331,009	315,273
2% AEP	84.6	79.5	1,360,658	1,270,377
1% AEP	214.6	205.9	2,559,209	2,384,071

Table 41: Pre- and Post-development Flows at Mt Monger Road

Event	Peak Flow (m3/s) – Base Case	Peak Flow (m3/s) – Post Development	Cumulative Flow (m3) – Base Case	Cumulative Flow (m3) – Post Development
10% AEP	0.15	0.25	1,537	5,501
5% AEP	12.2	16.1	335,677	355,790
2% AEP	73.6	95.0	1,533,266	1,751,499
1% AEP	190.0	226.3	3,000,823	3,493,673

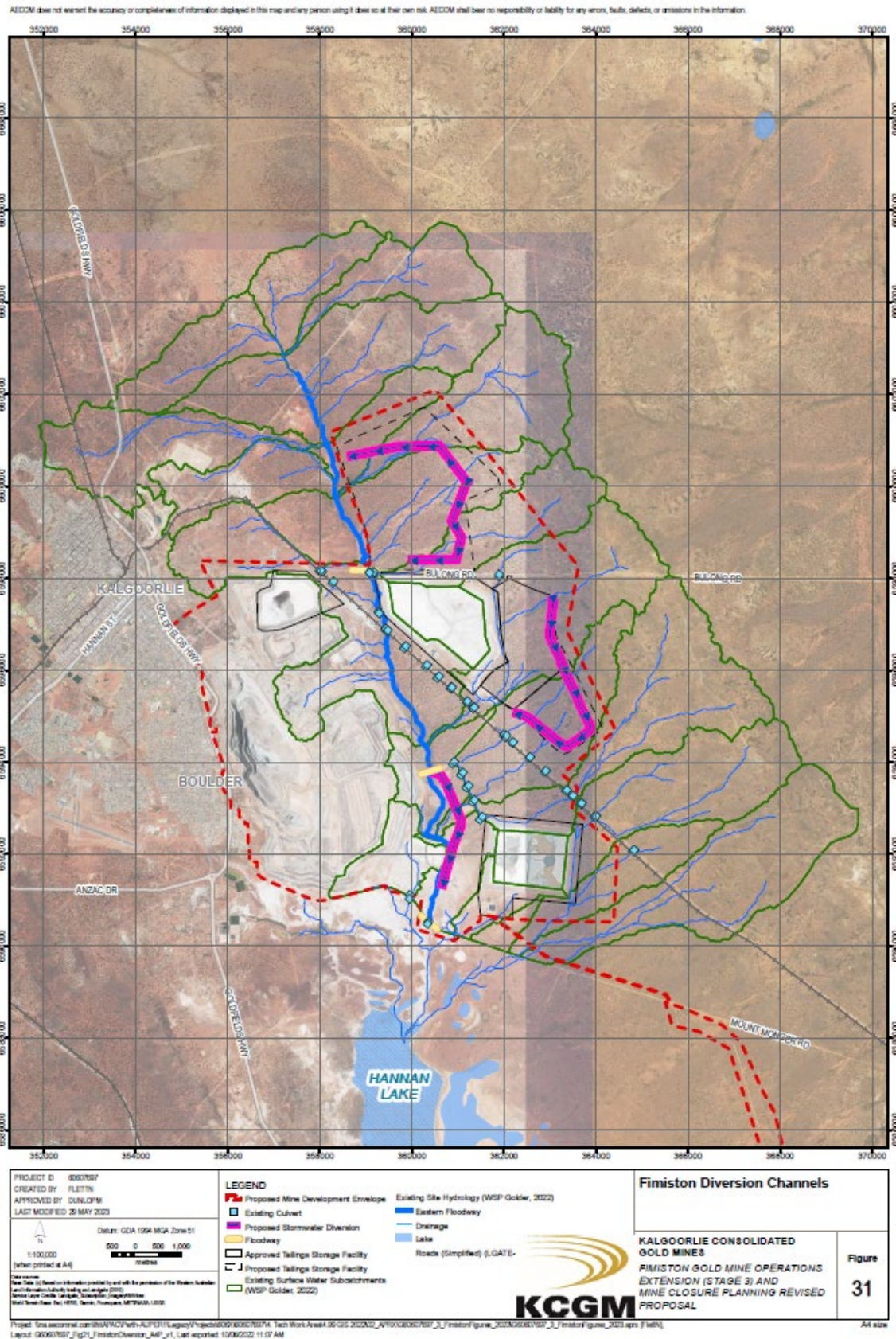


Figure 31: Fimiston Diversion Channels

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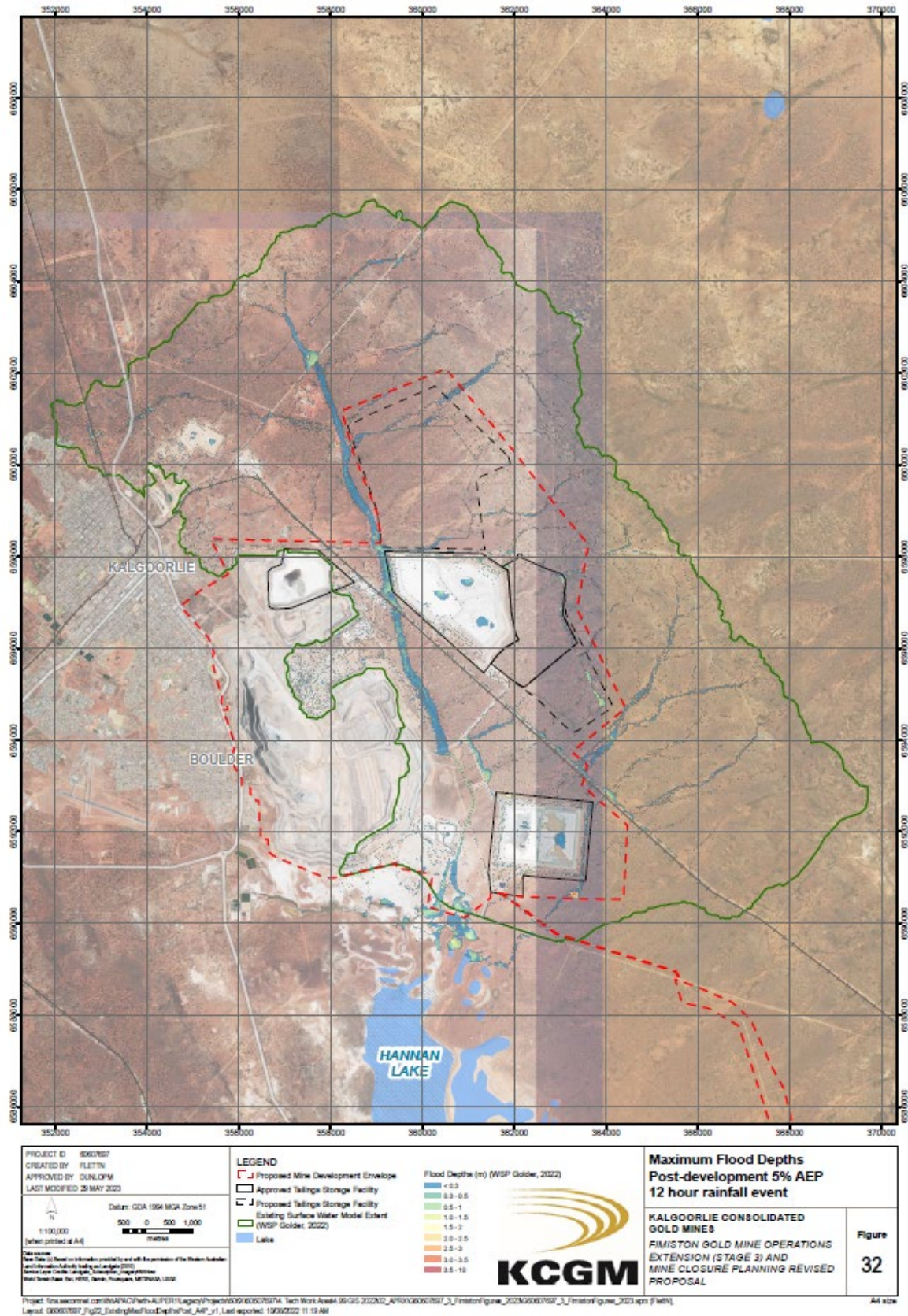


Figure 32: Maximum Flood Depths, Post-development 5% AEP, 12-hour Rainfall Event

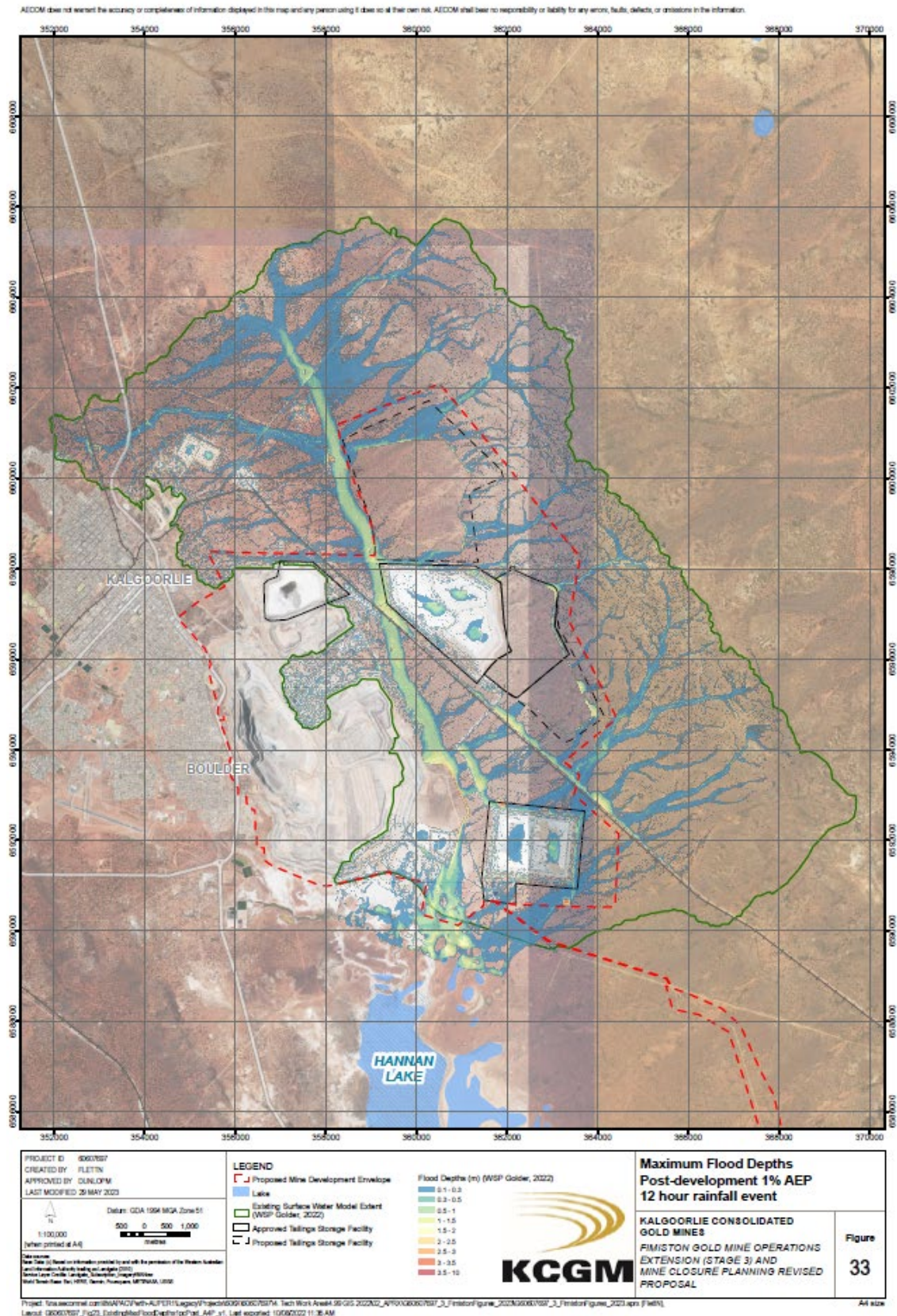


Figure 33: Maximum Flood Depths, Post-development 1% AEP, 12-hour Rainfall Event

7.1.5 Cumulative Impacts

Seepage into the naturally saline groundwater is actively managed to maintain a depth below the vegetation root zone to prevent impacts on vegetation health, and this activity is permitted under the existing DWER Operating Licence. Additional extraction bores will be constructed for the new TSF cells, and these will be licenced in the same way, including with SGMPs, to prevent cumulative impacts on groundwater from TSF seepage.

The Fimiston Open Pit will be a 'groundwater sinks' in perpetuity, and as such does not pose a significant environmental risk to groundwater resources, as local groundwater flow is from the groundwater systems into the pit lakes. Environmental risks to the community or wildlife are assessed to be low due to the final depth of the pit lakes being significantly below the pit crests, as well as the saline nature of the water.

Surface water diversion channels are being constructed to minimise changes the surface flows in the Eastern Floodway. Flood hydrographs show the estimated impacts to the peak flows and total runoff volumes through the Eastern Floodway watercourse due to the proposed infrastructure and stormwater diversions. At the Bulong Road floodway, the change in peak flows and total runoff volumes as a result of the Fimiston III TSF development are estimated to be less than 10% and are considered comparable to the Base Case scenario. During the 10% AEP flood event a small increase in peak flow is estimated (8.8%) and for the 5%, 2%, and 1% AEP flood event small decreases in peak flow are estimated (7.2% – 9.4%) under the post-development conditions.

Upstream of Mt Monger Road, the total stormwater volumes are estimated to reduce by between 2.5% and 9% for all post development conditions and are considered to be comparable to the Base Case scenario. The Southern WRD diversion channel will divert stormwater to the east of the GMM TSF, providing flood control for a TSF which located within the floodway. However, results indicate an increase in peak flows for more frequent floods and a decrease in peak flows during higher flow flood events.

Therefore, cumulative impacts of the new and the existing infrastructure show similar peak flows during large and small flood events.

7.1.6 Assessment of Impacts

7.1.6.1 Surface water Hydrology

To assess the impacts associated with the proposed mine landforms and stormwater diversions on the hydrological regime within the Eastern Floodway catchment, flow hydrographs have been assessed at two locations within the Eastern Floodway watercourse, namely:

- At the floodway conveying flow across Bulong Road approximately midway along the Eastern Floodway catchment; and
- Upstream of Mt Monger Road and immediately downstream of the discharge location for the Southern WRD diversion channel.

Under Base Case conditions the 10% AEP flood event, flooding is estimated within the Eastern Floodway water course and flows are connected between Bulong Road and Mt Monger Road. The floodway at Bulong Road is estimated to overtop with maximum flood depths over the road crest in the order of 0.3 m. For the 10%, 5%, 2%, and 1% AEP flood events, widespread flooding is anticipated across the entire Eastern Floodway catchment. The Eastern Floodway watercourse is estimated to flow as a connected system between Bulong Road and Mt Monger Road with maximum flood extents varying between 150 – 500 m. Maximum flow depths across the flood plain of the Eastern Floodway are estimated to be between

0.2-0.4 m for the 10% AEP event, 0.4-0.6 m for the 5% AEP event, 0.6-0.8 m for the 2% AEP event, and 0.8-1.2 m for the 1% AEP flood event.

- At the Bulong Road floodway, the change in peak flows and total runoff volumes as a result of the Fimiston III TSF development are estimated to be less than 10% and are considered comparable to the Base Case scenario; and
- Upstream of Mt Monger Road, the total stormwater volumes are estimated to reduce by between 2.5% and 9% for all post development conditions and are considered to be comparable to the Base Case scenario.

During Post Development conditions the proposed Southern WRD extension restricts flows from passing around the western flank of the GMM TSF landform. The Southern WRD diversion allows upslope flows to drain around both the Southern WRD extension and the GMM facility, however, results in an increase in peak flows for more frequent floods and a decrease in peak flows during rarer flood events. Flood level results indicate that flood levels reduce in areas directly downslope of the proposed landforms and increase upslope of mine landforms, within the designed stormwater diversion channels and in locations to which stormwater has been diverted.

The Eastern Floodway is a highly ephemeral water course and stormwater runoff typically occurs throughout the catchment as shallow sheet flow. A large total rainfall depth or high rainfall intensity is required to generate surface water runoff within the catchment due to the high infiltration losses associated with the local soil. Under dry antecedent catchment conditions, it is estimated that a flood event around 10% AEP or rarer is required to result in sufficient stormwater runoff to hydraulically connect the upper and lower sub-catchments of the Eastern Floodway catchment. During such significant flood events under existing conditions, it is estimated that total runoff volumes reporting to sub-catchments downslope of the proposed landforms are being impacted as incident rainfall is retained upslope of the TSFs and WRDs landforms.

Model results indicate the proposed stormwater diversions improve stormwater conveyance around the proposed TSF and WRD landforms allowing upslope catchments to drain freely to downslope catchments. Modelled flows through the Eastern Floodway at the Bulong Road floodway are largely unchanged by the upslope Fimiston III landform. Modelled flow volumes through the Eastern Floodway north of Mt Monger Road are largely unchanged; however, the peak flows are estimated to increase during more frequent floods and decrease during rarer floods in due to the proposed developments within the Eastern Floodway catchment (WSP 2023).

7.1.6.2 Groundwater

The review of monitoring data from the existing TSFs has confirmed that monitoring bores in the Eastern Borefield display trends in depth to groundwater in the ferricrete and alluvial sediment groundwater system which respond to a combination of TSF seepage influences, natural recharge associated with precipitation events, and groundwater production in the local area. Groundwater depths respond rapidly to seepage influences and respond in advance of any changes in groundwater chemistry. TDS concentrations in groundwater provide an indication of the extent of seepage influences in groundwater, however the distribution is complicated by natural background variations and by the influence of other active or decommissioned TSFs. Monitoring of pH and cyanide concentrations in groundwater do not define seepage influences, as the background groundwater is highly buffered with a naturally low pH, and cyanide concentrations are strongly attenuated during flow through the groundwater system.

Groundwater depth is the key parameter for managing potential seepage influences, as regardless of any changes in groundwater chemistry, the naturally hypersaline groundwater must be prevented from rising

into the potential root zone for downgradient vegetation. The current average total groundwater production rate is around 70 L/s, which reflects a reduction in pumping over recent years due to tailings deposition being reduced to account for the operation of the Kaltails TSF, and due to deposition being temporarily suspended in some paddocks of the Fimiston TSFs.

The installed infrastructure has been demonstrated to have the capacity to operate at 110 L/s if groundwater elevations rise at the production bores and the saturated thickness of the ferricrete and alluvial sediment groundwater system increases. The system around the existing TSFs is therefore concluded to be sufficient to manage groundwater depths if tailings deposition schedules and decant pond sizes continue to be managed in a similar manner to the operations over the last ten years, subject to achieving higher groundwater production rates to the northwest of the Fimiston I TSF as is planned by KCGM (BDH 2023; Appendix R).

7.1.6.3 Pit Lake

The hypersalinity of the lake is unlikely to pose a threat to the surrounding environment since; the lake is expected to remain a terminal groundwater sink, the pit void exists in association with saline groundwater, and the lake surface will be far below ground level, hence plant roots will not interact with the water. These factors also limit the environmental significance of elevated concentrations of some metals and metalloids.

Access to the lake for terrestrial fauna is likely to be extremely limited due to the steep gradients from ground level and substantial freeboard, given that ramps and roads will be rendered inaccessible at closure. Whilst flying fauna (e.g. birds and bats) may be able to access the lake surface, the water is unlikely to remain palatable for more than 50 years due to increasing salinity, particularly sulfate salinity which is purgative. Furthermore, consumption of the brackish water is unlikely to be substantial where more attractive freshwater sources are available to avifauna.

There are no operating borefields in the vicinity of the Fimiston Open Pit that could be influenced by the Pit dewatering operations. The nearest operating borefields are associated with seepage recovery at the KCGM TSFs, and are located in the ferricrete and alluvial sediment groundwater system, located several kilometres from the Fimiston Open Pit, with no hydrogeological linkage between these aquifers. As a result, there is effectively no risk of environmental harm associated with the pit lake, or as a result of indirect interactions with the groundwater system.

Due to the existing groundwater controls in place, which would be expanded to include new TSFs, it is considered very unlikely that mounding will cause impacts on vegetation or groundwater resources.

7.1.7 Mitigation

KCGM have applied the mitigation hierarchy to an assessment of current and proposed activities at Fimiston Operations for the Environmental Factor – inland waters (Table 42).

Table 42: Summary of Mitigation and Management Measures for Inland Waters

Type	Controls
Avoid	Maintain the 4 m separation between ground surface and groundwater to prevent groundwater and seepage entering the root zone of vegetation, consistent with the Part V licence.
Minimise	- Actively manage seepage and groundwater, by implementing the following controls: - Recovering seepage by means of production bores and seepage interception trenches. - Minimising the normal operating supernatant pool area on the Fimiston TSFs. - Monitoring groundwater levels in accordance with licence conditions to minimise impacts on plant roots.

Type	Controls
	• Increase groundwater pumping when groundwater levels are close to the separation criteria.
Rehabilitate	• Long-term management of ground and surface water systems affected by KCGM's mining operations has been identified as a key closure aspect within KCGM's Mine Closure Plan (MCP). It is envisioned that post closure criteria for groundwater levels surrounding the Fimiston TSFs will be managed through a post closure version of the SGMP, which will prevent impact to vegetation as a consequence of rising groundwater levels due to seepage from the Fimiston TSFs while groundwater equilibrium is being met.
Offset	• Not applicable.

The SGMP requires that groundwater does not rise to within the licenced separation distance (typically 4 m) of the natural surface. This 4 m level represents a safe distance below the root zone of the local vegetation, ensuring that saline water does not impact vegetation health. This condition is intended to be retained for the licence for the proposed new TSFs (Fimiston IIE third cell and Fimiston III). The proposed TSFs will have underdrainage to facilitate seepage collection. As a result, seepage to groundwater bores is expected to be reduced.

7.1.8 Predicted Outcomes

The Revised Proposal will result in the construction of additional TSFs that will add to the seepage already occurring in the mine area due to existing operational TSFs. Pumping will be used to minimise impacts on groundwater mounding to maintain approved groundwater levels in the local vicinity of the TSFs. As the current TSFs come offline (end of asset life or reduced usage), ground water mounding will reduce, while the proposed TSFs, with comprehensive underdrainage systems will come online. As there is normally a lag time prior to mounding occurring, the net impacts are not predicted to be significantly different to those already approved.

Peak and cumulative flow rates at Bulong Road and Mt Monger Road are not anticipated to be significantly different from the pre-development flows in events up to the 1% AEP.

A pit lake will remain in the long-term after the mine has been abandoned. Water levels in this lake will never rise high enough for the pit to overtop and cause damage to the local residents. The pit lake surface is also well below the oxide zone, so there is no risk of wave action undercutting the oxide, which could create a localised geotechnical risk. The groundwater in this part of the Goldfields is hypersaline and the water in the pit lake will also be hypersaline, making it unpalatable and unlikely to be used by wildlife.

7.2 Subterranean Fauna

KCGM have applied the mitigation hierarchy outlined within the EPA's How to prepare EP Act Part IV Environmental Management Plans (2021, v2.0) whilst completing an assessment of potential impacts for the environmental factor - subterranean fauna (Table 43).

Table 43: Assessment of Potential Impacts to Subterranean Fauna

Aspect	Description
EPA Objective	The EPA's objective for subterranean fauna is 'to protect subterranean fauna so that biological diversity and ecological integrity are maintained.' (EPA, 2023).
Guidance and Policy	- Environmental Factor Guideline 'Subterranean Fauna' (EPA, 2016f) - Technical Guidance 'Sampling Methods for Subterranean Fauna' (EPA, 2016g). - Studies and Reports - Likelihood of Stygofauna to occur in the Yindarlgooda South Palaeochannel (Phoenix 2016)
Receiving Environment	The Yindarlgooda South Palaeochannel, south of Kalgoorlie-Boulder is formed by the confluence of the Hannan and Wollubar Palaeochannels, to Lake Yindarlgooda. The groundwater in the Wollubar Sandstone is saline or hypersaline having accumulated over at least a few hundred thousand years. In the Hannan Palaeochannel just south of City of Kalgoorlie-Boulder, the salinity was measured at 146,000 mg/L TDS and decreases to 116,000 mg/L TDS halfway to the confluence with the Wollubar Palaeochannel. The Yindarlgooda South Palaeochannel measures more than 89,000 mg/L TDS with a maximum of almost 200,000 mg/L TDS near Lake Yindarlgooda. Independent of all other factors, salinity appears to be the principal limiting factor for the occurrence of stygofauna in the palaeodrainage system of the reference area. The majority of non-marine stygofauna are intolerant to salinity. Most are found in freshwater (<3,000 mg/L TDS) but some will tolerate water with salinities above this level. Stygofauna have been collected in saline waters (3,000–70,000 mg/L TDS) in calcrete formations in the Yilgarn and Nullarbor regions of WA (Phoenix, 2016).
Potential Impacts	With groundwater salinities generally well over 90,000 mg/L TDS throughout the palaeochannel system of the reference area, it is extremely unlikely that stygofauna are present. This is consistent with a number of assessments conducted for mining operations in the Goldfields, all of which concluded that stygofauna are unlikely to occur in the Roe and Lefroy Palaeodrainage Systems.
Proposed Mitigation and Management Actions	As there is unlikely to be Stygofauna present in the area, mitigation and management is unlikely to be required.
Predicted Outcome	It is likely that the EPA's objective for subterranean fauna will be met.

7.3 Landforms

KCGM have applied the mitigation hierarchy outlined within the EPA's How to prepare EP Act Part IV Environmental Management Plans (2021, v2.0) whilst completing an assessment of potential impacts for the environmental factor - landforms (Table 44).

Table 44: Assessment of Potential Impacts to Landforms

Aspect	Description
EPA Objective	The EPA's objective for landforms is 'to maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.' (EPA, 2023).
Guidance and Policy	Environmental Factor Guideline 'Landforms' (EPA, 2018b).
Receiving Environment	Hard rock mining has been undertaken in the Kalgoorlie-Boulder area for over 100 years. Landforms such as the Fimiston Open Pit, WRDs and TSFs are present throughout the landscape and provide much of the character of the area, attracting tourists for their historical aspects. As the mine located closest to the town, KCGM is critically aware of the impacts the mine has on the local community, both positive and negative. Natural landforms in the area include: • Areas of native vegetation • Rocky outcrops • Breakaway areas • Salt lakes.
Potential Impacts	• Permanent changes within the MDE through construction of WRD, TSFs and extension of the Fimiston Open Pit to the south. • Permanent changes to surface drainage through the MDE due to the placement of the Fimiston IIE third cell. • Medium term, reversible changes to landform due to construction of Revised Proposal infrastructure such as roads/access tracks. • Medium term, reversible changes to landform within the MDE for construction of Revised Proposal infrastructure. • Increased erosion within disturbed areas.
Proposed Mitigation and Management Actions	• Revised Proposal design has considered optimising the footprint and height of the landform to balance competing requirements. • Clearing activities will be managed to ensure clearing is strictly limited to that necessary for the operations. • Disturbed areas will be rehabilitated as they become available. • The Mine Closure Plan (2022) has been updated to include the new Revised Proposal impacts and implemented. Closure criteria will consider EPA objectives for this factor. • Consultation will be undertaken with stakeholders regarding the future use of the Fimiston Operations Site.
Predicted Outcome	• Final landform design criteria for the FS Project are the same as for existing Fimiston WRDs. The main objective is the creation of a safe, stable, non-polluting landform. • KCGM believe on this basis that the EPA Objective for this factor can be met.

7.4 Terrestrial Environmental Quality

KCGM have applied the mitigation hierarchy outlined within the EPA's How to prepare EP Act Part IV Environmental Management Plans (2021, v2.0) whilst completing an assessment of potential impacts for the environmental factor – terrestrial environmental quality (Table 45).

Table 45: Assessment of Potential Impacts to Terrestrial Environmental Quality

Aspect	Description
EPA Objective	The EPA's objective for terrestrial environmental quality is 'to maintain the quality of land and soils so that environmental values are protected.' (EPA, 2023).
Guidance and Policy	- Environmental Factor Guideline 'Terrestrial Environmental Quality' (EPA, 2016h). <i>Environmental Protection Act 1986</i> (Part V – Works Approvals and Licensing). <i>Contaminated Sites Act 2003</i>.
Receiving Environment	The Eastern Goldfields subregion is characterised by Cowan (2001a) as: "gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite tertiary soils dominated by calcareous earths overlay eroded gneisses and granites vegetation consisting of mallees, Acacia thickets and shrub-heaths on sandplains and dwarf shrublands of samphire persisting on salt lakes, surrounded by diverse Eucalyptus woodlands, which also occur on ranges and in valleys in the western half, a series of large playa lakes indicate the remnants of ancient major drainage lines arid to semi-arid climate with 200–300 mm of mostly summer rainfall." No new waste materials are expected for Fimiston South project, however the ratios of waste types vary over time. In the early stages of Fimiston South project, there will be increase volumes of oxide material. KCGM's existing waste rock design criteria and internal waste dump design approval processes have sufficient flexibility to allow for these changes. Detailed information regarding this has already been assessed and approved by DEMIRS in the Fimiston WRD Mining Proposal, which remains valid for the life of KCGM. KCGM continue to encapsulate less favourable materials, such as oxides, to manage outer slope rehabilitation success. Ore grade Black Flag material continues to be stockpiled in a defined location with a closure capping cover design. This location has more than required capacity for the forecast volumes. Black Flag waste material is co-disposed with Golden Mile Dolerite waste, which has acid neutralising capacity. Studies have shown that these strategies are robust for the types of waste at KCGM. KCGM has a comprehensive cross functional waste rock design process which accounts for geotechnical, environmental, waste capacity and other requirements. Further details on WRD designs can be found in the Appendices of the MCP (Appendix U of the ERD). The groundwater in the Wollubar Sandstone is hypersaline having accumulated over at least a few hundred thousand years.
Potential Impacts	- Contamination of soils through spillage of reagents, chemicals, hydrocarbons or saline water. - Increased erosion following rainfall events. - Impact of permanent TSFs and WRDs on the local environment.
Proposed Mitigation and Management Actions	- Saline and process pipelines will continue to be located within bunds to prevent uncontrolled discharge of saline or process water to the environment. - The existing and new pipelines will continue to have a leak detection system and regular inspections allows early detection of pipe leaks or failure. - Reagents and hydrocarbons will continue to be stored within bunded areas. - Spill kits will be located at strategic locations throughout the FS Project area and employees trained in their use. - Appropriate drainage design to manage runoff and surface flow to prevent erosion.

Aspect	Description
	• Groundwater will continue to be managed to prevent seepage up into the root zone of the local vegetation to avoid impacting on native vegetation surrounding the TSFs. • Existing WRD design and internal processes continue to be flexible and appropriate for the life of the project. The waste materials are expected to remain the same, but the ratios vary over life of the project. • Existing TSF design and management practices continue to be appropriate for the tailings characteristics, which are expected to remain the same •
Predicted Outcome	Impacts on terrestrial environmental quality are expected to be minimal due to location of the majority of Revised Proposal disturbance being within the existing MDE. Implementation of standard industry practices for transport, storage and handling of hydrocarbons, reagents and WWTP effluent will ensure adverse impacts to terrestrial environmental quality are prevented or minimised. The EPA objective for terrestrial environmental quality is expected to be met by the Revised Proposal.

7.5 Greenhouse Gas Emissions

KCGM have applied the mitigation hierarchy outlined within the EPA's How to prepare EP Act Part IV Environmental Management Plans (2021, v2.0) whilst completing an assessment of potential impacts for the environmental factor - subterranean fauna (Table 46).

Table 46: Assessment of Potential Impacts to Greenhouse Gas Emissions

Aspect	Description
EPA Objective	The EPA's objective for greenhouse gas emissions is 'to minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable.' (EPA, 2023).
Guidance and Policy	• Australian Government 2011, <i>Clean Energy Regulations</i>, Schedule 1 Part 4, 2011 • Australian Government 2019, <i>National Greenhouse Accounts Factors</i>, August 2019 • Environmental Factor Guideline 'Greenhouse Gas Emissions' (EPA, 2023b). Reports and studies • KPMG International, 2021. KCGM Assessment of Emissions • KCGM Greenhouse Gas Management Plan, 2022.
Receiving Environment	Greenhouse gases are generated by mining activities such as: • Mining operations – drilling and blasting, excavation of waste rock, and movement of haul trucks and other earthmoving equipment. • Ore Processing – crushing and conveyor transfer points. • Haulage – haul trucks and other vehicles travelling on unsealed roads. • Emissions will be managed under the overarching Northern Star Greenhouse Gas Management Plan (KCGM, 2023, Appendix S) and the Northern Star Sustainability Report (2022).
Potential Impacts	In 2021, KCGM undertook an assessment of their greenhouse gas emissions for their existing operations including the Mt Charlotte underground mine as well as the Fimiston Operations. KCGM has undertaken a review of the future emissions of the Fimiston Operations, which is documented in the KCGM Greenhouse Gas Management Plan. Scope 1 emissions mainly arise from consumption of diesel for mobile equipment including haul trucks, excavators, dozers and ancillary vehicles. Diesel is also a component of bulk explosives. Minor quantities of diesel and gasoline are used in road-registered vehicles. The current annual Scope 1 emissions of the Fimiston Operations are estimated at 194,892 tCO₂-e. Scope 2 emissions are mainly electricity consumed in the crushing, grinding and processing operations. The current annual Scope 2 emissions of the Fimiston Operations are estimated at 265,000 tCO₂-e (KCGM, 2023). KCGM's parent company, Northern Star has set a Net Zero ambition for Scope 1 and 2 greenhouse gas emissions by 2050.
Proposed Mitigation and Management Actions	Greenhouse gas emissions from implementing the Revised Proposal predominantly come from the mining operations and use of machinery to build and operate the mine. Emissions will be managed under the KCGM Greenhouse Gas Management Plan (KCGM, 2023) and the Northern Star Sustainability Report (2022). Northern Star is also proposing to use renewable energy generation, including grid and behind the meter wind and/or solar at Fimiston starting in 2025. The largest source of emissions at KCGM is the mining vehicles. Electrification would be a viable alternative to the current diesel fleet if the average cost of electricity can be lowered. Northern Star's intent is to strive towards zero net emissions and improve efficiencies wherever practicable. Through implementation of these policies, annual average emissions under the Revised Proposal are anticipated to be 237,277 tCO₂-e for Scope 1 and 177,325 tCO₂-e for Scope 2 –

Aspect	Description
	i.e. a net reduction from the currently approved Proposal. Annual Scope 3 emissions are estimated at 71,984 tCO ₂ -e. Further information on these numbers is provided in Appendix S.
Predicted Outcome	The implementation of the Revised Proposal and the use of renewable energy generation will reduce net greenhouse gas emissions from the current levels (Appendix S) (Appendix G) The EPA objective for greenhouse gas emissions is expected to be met by the Revised Proposal.

7.6 Human Health

KCGM have applied the mitigation hierarchy outlined within the EPA's How to prepare EP Act Part IV Environmental Management Plans (2021, v2.0) whilst completing an assessment of potential impacts for the environmental factor – human health (Table 47).

Table 47: Assessment of Potential Impacts to Human Health

Aspect	Description
EPA Objective	The EPA's objective for landforms is 'to maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.' (EPA, 2023).
Guidance and Policy	- Environmental Factor Guideline 'Human Health' (EPA, 2016i). <i>Environmental Protection Act 1986</i> (Part V – Works Approvals and Licensing). - National Environmental Protection (Ambient Air Quality) Measures (NEPM 2003).
Receiving Environment	- The Fimiston Operations are located adjacent to the City of Kalgoorlie-Boulder. - Products including all waste products are non-radioactive and do not pose a risk to human health.
Potential Impacts	Potential impacts on the human health relevant to the EP Act include: - Noise and vibration - Flyrock - Air quality (particulates and odour) - Chemical exposure (mercury). - Noise, vibration, and flyrock are transient in nature and associated with blasting activities. The materials are not classified as radioactive materials, so radiation is not a consideration for this Revised Proposal.
Proposed Mitigation and Management Actions	Noise, vibration and other emissions will continue to be regulated as part of the DWER Prescribed Premises Licence L6420/1988/14, including implementation of the Fimiston Air Quality Management Plan. Noise from FS Project construction and operation activities can be managed through the construction provisions of the Environmental Protection (Noise) Regulations 1997, the <i>Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016</i> and the NVMMP. Dust and mercury emissions will be managed in line with the current operations, which minimise the risk to human health (Section 6.3). Noise and vibration at Fimiston are managed to prevent impact to the community as described in Section 6.4. No radioactive substances are used or concentrated at Fimiston.
Predicted Outcome	The proposed operation will not impact upon the health of staff or surrounding residents and land users. Noise, vibration and air quality at Fimiston are managed to prevent impact to workers. No radioactive substances are used or concentrated at Fimiston. The EPA objective for human health is expected to be met by the Revised Proposal.

8. OFFSETS

The EPA has developed the WA Environmental Offsets Guidelines (Government of WA, 2014) and associated Offsets Template to assess the potential requirement for offsets to be applied to proposed projects. Environmental offsets are actions that provide environmental benefits which counterbalance the Significant Residual Environmental Impacts or risks of a Revised Proposal. In accordance with the WA Environmental Offsets Policy, EPBC Act Environmental Offsets Policy, Western Australian Government's Environmental Offsets Guideline (Government of Western Australia 2014) and EPBC Act Offsets Assessment Guide for use in determining offsets under the EPBC Act, (October 2012), offsets may be applied after other mitigation measures have been considered, as per the following hierarchy:

- Avoid
- Minimise
- Rehabilitate
- Offset.

As noted in WA Environmental Offsets Guidelines, "Environmental offsets address significant environmental impacts that remain after on-site avoidance and mitigation measures have been undertaken. Environmental offsets will only be considered after strategies to avoid and mitigate significant environmental impacts have been applied." As such, all reasonable and feasible actions under the mitigation hierarchy should be considered to address residual impacts prior to considering offsets.

Offsets are typically considered for factors such as Flora and Vegetation and Terrestrial Fauna where significant impacts may be ameliorated by actions at another location (e.g. rehabilitation at an offsite location to improve fauna habitat). KCGM considers that there are no significant residual impacts from the project, as identified in the factor offsets section above. An offsets table has been completed as part of the assessment of this Revised Proposal (Table 48) to demonstrate this point.

Table 48: Offsets Assessment

Existing Environment/ Impact	Mitigation			Significant Residual Impact
	Avoid and Minimise	Rehabilitation Type	Likely Rehab Success	
Clearing of vegetation and flora	Avoid Priority flora, minimise area cleared. No significant residual impact anticipated.	Post-closure TSF and WRD rehabilitation to stable landform.	KCGM is familiar with rehabilitation protocol. A detailed Mine Closure Plan exists for this site.	Not anticipated. Offset not required.
Clearing of fauna habitat	Minimise area cleared.	Post-closure TSF and WRD rehabilitation to stable landform.	KCGM is familiar with rehabilitation protocol. A detailed Mine Closure Plan exists for this site.	Not anticipated. Offset not required.
Impacts on Matters of National Environmental Significance	Minimise area cleared.	Post-closure TSF rehabilitation to stable landform, soil stockpiles rehabilitated to native vegetation.	KCGM is familiar with rehabilitation protocol. A detailed Mine Closure Plan exists for this site.	Not anticipated. Offset not required.

9. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Matters of National Environmental Significant (MNES) are protected under the EPBC Act and include World Heritage Properties, National Heritage Properties, Wetlands of International Importance, Great Barrier Reef Marine Park, Commonwealth Marine Areas, Listed Threatened Ecological Communities, Listed Threatened Species and Listed Migratory Species. A Revised Proposal with potential to significantly impact any MNES trigger a referral to DCCEEW for assessment.

9.1 Policy and Guidance

- *Environment Protection and Biodiversity Conservation Act 1999.*
- Environment Protection and Biodiversity Conservation Regulations 2000
- Significant Impact Guidelines (No. 1.1): Matters of National Environmental Significance (DotE, 2013)
- Survey guidelines for Australia's threatened birds (DEWHA, 2017);
- National Malleefowl Recovery Team – National Malleefowl Monitoring Manual: Edition: 2019; and
- Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA June 2020).

The Fimiston Gold Mine has not been previously referred to DCCEEW as no potential impacts to MNES have been identified through previous EPA assessments. An assessment for the Revised Proposal was undertaken to determine the potential impact (if any) significance of the Project on MNES. This has been assessed in accordance with the EPBC Act Significant Impact Guidelines 1.1 (DotE, 2013).

9.2 MNES Relevant to the Revised Proposal

Results from a desktop search through the Protected Matters Search Tool (PMST) highlighted a number of MNES within ~40 kms of Fimiston Open Pit (updated 18/07/2023, 30°46'35"S; 121°30'12"E). This search identified three potential MNES categories which required further investigation to identify if a significant impact may result from implementing the proposed activities under this Revised Proposal (Table 49, Table 50 and Table 51).

KCGM completed targeted species and supporting habitat surveys in response to the possibility that listed threatened flora and fauna species had potential to be located within Fimiston's current and proposed MDE. These additional investigations included:

- Site and Regional surveys for Arid Bronze Azure Butterfly *Ogyris subterrestris petrina* (ABAB).
- Site surveys for Malleefowl *Leipoa ocellata*; and
- Review and consolidation of all historical flora and fauna species recorded at Fimiston.

Investigations for *Ogyris subterrestris petrina* concluded (Phoenix 2023, Appendix I):

- A regional reconnaissance habitat survey was conducted in 2022 (Phoenix) (ABAB, *Ogyris subterrestris petrina*) which concluded, additional populations of ABAB may occur within the 100 km radius of the survey (outside of Fimiston current and proposed MDE).

Investigations for *Leipoa ocellata* concluded (AHA 2023, Appendix J):

- None of the proposed impact areas contain critical or marginal habitat for Malleefowl breeding and survival.
- The low rolling hillocks and footslopes of land unit 1f occupying 451ha within Fimiston II/III are rated as suitable habitat for Malleefowl foraging and dispersal.
- Fimiston Eastern Floodway North and Western proposed impact areas are not suitable for Malleefowl.
- No evidence of recent Malleefowl use, no Malleefowl footprints and no litter disturbance indicative of foraging activity was found during March 2023; and
- There were no active or recent nesting mounds, only one definite Malleefowl nesting mound was found within the 2303 ha search area; believed to be >50 years since last use.

Further investigations for *Dasyurus geoffroii* were not undertaken due to recent data consolidation and review identified that Chuditch (*Dasyurus geoffroii*) record was from an indirect observation of which verification cannot be confirmed. The record was located outside of the current and proposed MDE footprint, and no field survey has recorded the species being present at Fimiston or nearby (Appendix I).

Consolidation of data records and analyses found two Threatened vertebrate species, Malleefowl *Leipoa ocellata* and Chuditch *Dasyurus geoffroii* (both VU), may potentially (low) use parts of the study area intermittently for dispersal and foraging (marginal), but not as breeding residents. Any significant species with potential to occur or transverse would not be restricted to the study area (Phoenix, 2023).

Table 49: Protected Matters Search Results 2023

MNES	Count	Description	Significantly Impacted by KCGM Proposal?
World Heritage Properties	None	N/A	No
National Heritage Places	1	Refer to section 9.2.1 <i>Goldfields Water Supply Scheme</i>	No
Wetlands of International Importance	None	N/A	No
Threatened Ecological Communities	None	N/A	No
Great Barrier Reef Marine Park	None	N/A	No
Commonwealth Marine Areas	None	N/A	No
Threatened Communities	None	N/A	No
Threatened Species	11	Refer to Table 54	No (<i>Following completion of EIA's</i>)
Migratory Species	7	Refer to Table 55	No (<i>Following completion of EIA's</i>)

Table 50: Listed Threatened Species from PMST Search

Scientific Name	Common Name	Class	Presence	Threatened Category	Migratory Status
<i>Calidris ferruginea</i>	Curlew Sandpiper	Bird	Likely	Critically Endangered	Migratory
<i>Ogyris subterrestris petrina</i>	Arid Bronze Azure Butterfly	Insect	May	Critically Endangered	
<i>Pezoporus occidentalis</i>	Night Parrot	Bird	May	Endangered	
<i>Gastrolobium graniticum</i>	Granite Poison	Plant	May	Endangered	
<i>Thelymitra stellata</i>	Star Sun-orchid	Plant	May	Endangered	
<i>Polytelis alexandrae</i>	Princess Parrot, Alexandra's Parrot	Bird	May	Vulnerable	
<i>Tecticornia flabelliformis</i>	Bead Glasswort, Bead Samphire	Plant	Known	Vulnerable	
<i>Aphelocephala leucopsis</i>	Southern Whiteface	Bird	Known	Vulnerable	
<i>Falco hypoleucos</i>	Grey Falcon	Bird	May	Vulnerable	
<i>Leipoa ocellata</i>	Malleefowl	Bird	Known	Vulnerable	
<i>Dasyurus geoffroii</i>	Chuditch, Western Quoll	Mammal	May	Vulnerable	

Table 51: Listed Migratory Species from PMST Search

Scientific Name	Common Name	Class	Presence	Threatened Category	Migratory Status	Other Listings
<i>Apus pacificus</i>	Fork-tailed Swift	Bird	Likely		Migratory	CAMBA, JAMBA, ROKAMBA IUCN: Least Concern
<i>Calidris ferruginea</i>	Curlew Sandpiper	Bird	Likely	Critically Endangered	Migratory	EPBC Act, Bonn, CAMBA, JAMBA, ROKAMBA IUCN: Listed as Near Threatened NGO: Listed as Endangered
<i>Tringa nebularia</i>	Common Greenshank, Greenshank	Bird	Likely		Migratory	Bonn, CAMBA, JAMBA, ROKAMBA IUCN: Listed as Least Concern NGO: Listed as Vulnerable
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Bird	Known		Migratory	Bonn, CAMBA, JAMBA, ROKAMBA IUCN: Listed as Vulnerable NGO: Listed as Vulnerable
<i>Calidris melanotos</i>	Pectoral Sandpiper	Bird	May		Migratory	Bonn, JAMBA, ROKAMBA IUCN: Listed as Least Concern
<i>Actitis hypoleucos</i>	Common Sandpiper	Bird	May		Migratory	CAMBA, JAMBA, ROKAMBA IUCN: Least Concern
<i>Motacilla cinerea</i>	Grey Wagtail	Bird	May		Migratory	CAMBA, JAMBA, ROKAMBA IUCN: Listed as Least Concern

Refer to Section 6.5 Flora and vegetation and supporting Appendix H; Section 6.6 Terrestrial fauna and supporting Appendix I and Appendix J for individual species, habitat requirements descriptions and occurrence records.

9.2.1 National Heritage Places

The only National Heritage Place within 20 km of the Revised Proposal is the Goldfields Water Supply Scheme, Western Australia. This comprising infrastructure associated with the water pipeline between Perth and Kalgoorlie. This is located outside the MDE and will not be impacted by the Revised Proposal

9.2.2 Threatened Species

The eleven Threatened species identified in the PMST search were limited to seven highly mobile fauna species, three flora species and the ABAB (Table 52). Most of these species are unlikely to occur in the MDE because there is no suitable habitat, or the Revised Proposal is located outside their known distribution. Some species such as avifauna may opportunistically visit the area but are unlikely to be

restricted to or reliant on habitat present because similar and better quality habitat is common and widespread in the region. ABAB habitat confirmed to not exist in MDE.

Following extensive flora and fauna targeted surveys the closest confirmed record of these species has been included below:

- *Aphelocephala leucopsis* Vulnerable (EPBC Act) known be present within the regional WA, however no confirmed sightings in field surveys in or near the current or proposed MDE have been recorded. One record from Harewood (2015) is from a desktop data search (Phoenix 2023 consolidated fauna assessment).
- *Calidris ferruginea* CR, Migratory, (EPBC & BC Acts) Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from current and proposed MDE.
- *Dasyurus geoffroyi* Vulnerable (EPBC & BC Acts) Suitable woodland habitat present. No evidence of Chuditch presence recorded within current and proposed MDE areas in the current or previous surveys. Species previously recorded 45 km south near Kambalda and Chuditch scat was found during the field survey at a regional targeted SRE site approximately, 7 km ENE of the current and proposed MDE (Phoenix, 2023).
- *Falco hypoleucos* Migratory species (EPBC & BC Acts) not recorded within current or proposed MDE. Suitable habitat is absent. Possible visitor to salt lakes situated 5 -20 km from Fimiston Operations.
- *Gastrobium graniticum* Endangered (EPBC Act) May be present in desktop data searches, no confirmed record of species within site or regional surveys encompassing current and proposed MDE footprint.
- *Leipoa ocellata* Vulnerable (EPBC & BC Acts) Suitable forage habitat along eastern boundary. No evidence of recent presence has been recorded March 2023 targeted (Appendix J) survey or previous surveys. Previously the species has been recorded approximately 10 km north and east of MDE. Suitable foraging and nesting habitat was recorded in the study area in Open woodland and Shrubland habitat. However, the health and suitability of this habitat has been assessed under the National Malleefowl Monitoring Program guidance as marginally suitable for transient foraging and unsuitable for breeding/nesting.
- *Ogyris subterrestris petrina*: (ABAB) (BC Act) CR (WA); Critically Endangered (EPBC Act) is located 12km SW Kalgoorlie (believed extinct population); also Barbalin Nature Research (Avon Wheatbelt region); a targeted survey in the Fimiston MDE for ant species *Camponotus sp. nr. Terebrans* (2021), the host ant of the ABAB. Findings concluded that no records of *Ogyris subterrestris petrina* at Fimiston's current or proposed MDE due to lack of suitable habitat (ant nests).
- *Pezoporus occidentalis* CR (BC Act); EN (EPBC Act). No records of suitable supporting habitat exist with the current or proposed MDE footprint. No confirmed sightings of the night parrot have ever been recorded at Fimiston.
- *Polytelis alexandrae* Vulnerable (EPBC Act) species identified on data bases as may be present within region. No confirmed records of the species in desktop or field surveys appear in the (2023 consolidated fauna assessment, Appendix I) of the current and proposed MDE. These records include historical and current desktop and field observations by qualified specialists.

- *Tecticornia flabelliformis*: P1 (WA); VU (EPBC) is located 27.8 km east of Fimiston, preferred habitat - low samphire shrubland in red-brown clayey sand on saline flats (DBCA 2017), habitat not recorded within the current and proposed MDE footprint.

Thelymitra stellata Vulnerable (EPBC Act) species identified on data bases as may be present within region. No confirmed records of the species in desktop or field surveys of the current and proposed MDE. No records located during consolidation of all historical and current desktop and field observations (2023 consolidated flora and vegetation assessment, Appendix H).

Consolidation of desktop and field observations (included the collection of samples for laboratory analysis or identification through the Western Australian Museum and Herbarium) was completed by Phoenix in May 2023. The revised data bases of flora and vegetation and fauna within the MDE and regionally up to 100 kms from Fimiston Operations provides KCGM with a sound baseline of occurrences and the status of flora and fauna. The Revised Proposal is unlikely to have significant impact on any listed threatened species.

9.2.3 Migratory Species

The seven Migratory species identified in the PMST search were limited to highly mobile fauna species (Table 53). These species are unlikely to be restricted to or reliant on habitat present because similar and better quality habitat is common and widespread in the region. Migratory species are unlikely to require the resources within the current or proposed MDE footprint as suitable habits are located externally to the Fimiston Operations. Extensive localised, targeted and regional fauna surveys concluded that no confirmed records *Calidris ferruginea* near to the current or proposed MDE; as suitable habitat is absent. The species might be considered a possible visitor to salt lakes located 5 -20 km from the current and proposed MDE. However, occurrence might be fleeting due to the migratory nature of the species and no known breeding grounds nearby. Therefore, KCGM consider the Revised Proposal is unlikely to have significant impact on any listed migratory species.

Table 52: Threatened Species Identified in the PMST Search

Species	Conservation Status		Description	Likelihood of Occurrence
	WA	EPBC		
<i>Calidris ferruginea</i> Curlew Sandpiper	Critically Endangered	Critically Endangered	The Curlew Sandpiper is a small, slim wader weighing 57 g. In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. In Western Australia, they are widespread around coastal and sub coastal plains from Cape Arid to the south-west Kimberley. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (Higgins & Davies, 1996).	Unlikely – Species was returned in the PMST report (April 2022). No suitable habitat present and no nearby DBCA records (Phoenix, 2023a).
<i>Falco hypoleucos</i> Grey Falcon	Vulnerable	Vulnerable	The Grey Falcon is sparsely distributed across semi-arid and arid Australia. In Western Australia the species only inhabits north of latitude 26°S. The species prefers timbered lowland plains and tree lines watercourses, with rare records in tussock grassland and open woodland (TSSC, 2020).	Unlikely – The Grey Falcon was returned in the PMST report (April 2022). Suitable habitat may be present for hunting. However, species is rarely recorded south of the latitude 26°S and no DBCA records occur within the vicinity of the MDE (Phoenix, 2023a).
<i>Leipoa ocellata</i> Malleefowl	Vulnerable	Vulnerable	The Malleefowl is a large, ground-dwelling bird with strong feet and a short bill. It is found principally in the semi-arid to arid zone in shrublands and low woodlands dominated by mallee and associated habitats such as such as Broombush (<i>Melaleuca uncinata</i>) and Scrub Pine (<i>Callitris verrucosa</i>). In WA, Malleefowl distribution was associated with landscapes that had lower rainfall, greater amounts of mallee and shrubland that occur as large remnants, and lighter soil surface textures (Benshemesh, 2007). At a finer scale, Malleefowl occurrence was associated with mallee/shrubland and thicket vegetation with woodland representing poor habitat for the species.	Unlikely–Malleefowl (<i>Leipoa ocellata</i>) has been recorded from indirect observations outside the MDE. Intensive survey for Malleefowl has identified that while 451 ha of the site is suitable for Malleefowl foraging and dispersal, none of the MDE contains critical or marginal habitat for Malleefowl breeding and survival (AHA 2023). No evidence of recent Malleefowl use was found. No active or recent nesting mounds, no Malleefowl footprints and no litter disturbance indicative of foraging activity were found in the MDE (AHA 2023)
<i>Pezoporus occidentalis</i> Night Parrot	Critically Endangered	Endangered	The Night Parrot is a medium-sized, highly elusive, nocturnal, ground-feeding parrot (DotEE, 2019). Adults are mostly bright-green with extensive black and yellow markings, including streaks, spots and bars and a yellow belly (Higgins, 1999). The current distribution of the night parrot is not known. The Night Parrot was thought to be extinct but in 2013 it was rediscovered in Queensland (Pullen Reserve), with other recent records in the Wiluna district of central Western Australia, and the Lake Gregory area of northern Western Australia (Burbidge, 2018). It is possible that the Night Parrot may continue to occur throughout much of its historic range, with most habitat records are in spinifex grasslands and/or chenopod shrublands (Garnett et al., 2011).	Unlikely – MDE does not contain the preferred habitat for this species.
<i>Ogyris subterrestris petrina</i> Arid Bronze Azure Butterfly	Critically Endangered	Critically Endangered	A rare butterfly known from two locations in Western Australia one at the Barbalin Reserve (~300 km from MDE) and an undisclosed location in the Wheatbelt (Phoenix, 2023a, DBCA 2020). Additionally, In December 2020, Zootopia Environmental Services photographed an individual ABAB in during a Malleefowl Survey between Menzies and Kalgoorlie (undisclosed location) (Phoenix, 2022). The DBCA (2020b) survey guidelines describes the preferred habitat for the species as red-brown loam soils, with mixed <i>Eucalyptus salubris</i> and <i>E. salmonophloia</i> woodlands over open understory. Other smooth-barked Eucalypts with sugar ant (<i>Camponotus</i> sp. nr. <i>terebrans</i>) colonies may also provide suitable habitat. The ABAB larvae are known to live exclusively within sugar ant nests. Large sugar ant colonies provide essential for ABAB species.	Unlikely – The ABAB was returned in the desktop review (PMST) report due to a sub-population located near Kalgoorlie. This sub-population is locally extinct with no new records since 1993 (DBCA, 2020b). The MDE does not contain any <i>Camponotus</i> sp. nr. <i>terebrans</i> colonies and therefore is unable to support ABAB species (Phoenix, 2023a).
<i>Dasyurus geoffroii</i> Chuditch	Vulnerable	Vulnerable	At maturity the Chuditch is the size of a small domestic cat with white spotted brown pelage, large, rounded ears, pointed muzzle, large dark eyes and non-hopping gait. The Chuditch requires adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows where they mostly rest during the day) and sufficient prey biomass (large invertebrates, reptiles and small mammals) to survive. It primarily forages on the ground at night, although can be active during the day during the breeding season or during bad weather. It may eat any animal smaller than a rabbit and they can climb trees when hunting or escaping predators. The Chuditch previously occurred throughout arid and semi-arid Australia but is now restricted to south-west Western Australia. It currently only occurs in areas dominated by sclerophyll forest or drier woodland, heath and mallee shrubland (Van Dyck & Strahan, 2008).	Possible – The Phoenix (2023a) survey recorded indirect evidence of Chuditch (scats) approximately 3.5 km from the MDE (east of the TSF 3rd Cell). The open woodland habitat may be suitable for foraging. However, species records in this area are sparse (Phoenix, 2023a) and the MDE is outside of species current known distribution. The species is also considered regionally extinct in this locality (Van Dyck and Strahan 2008). As such the site is considered unlikely to be habitat critical to the species.

Species	Conservation Status		Description	Likelihood of Occurrence
	WA	EPBC		
<i>Gastrolobium graniticum</i> Granite Poison		Endangered	May be present. No records in Phoenix regional data 2023 - flora	
<i>Thelymitra stellata</i> Star Sun-orchid		Endangered	May be present. No records in Phoenix regional data 2023 – flora	
<i>Polytelis alexandrae</i> Princess Parrot, Alexandra's Parrot		Vulnerable	May be present. No records in Phoenix regional data 2023 – fauna	
<i>Tecticornia flabelliformis</i> Bead Glasswort, Bead Samphire	P1	Vulnerable	Phoenix regional data 2023 – flora Status - P1(WA); VU (EPBC) Nearest record - 27.8 km east Source - DBCA database search Habitat - Low samphire shrubland in red-brown clayey sand on saline flats (DBCA 2017a).	
<i>Aphelocephala leucopsis</i> Southern Whiteface		Vulnerable	Phoenix consolidated data base of historical studies found only one record from 2015, is located in their appendix 3 Vertebrate species records from desktop review and this survey of the 2023 consolidated report. ONLY DESKTOP no field verified. Record Harewood (2015)- desktop search- no other records	

Table 53: Migratory Species Identified in the PMST Search

Species	Conservation Status		Description	Likelihood of Occurrence
	WA	EPBC		
<i>Apus pacificus</i> Fork-tailed Swift	Migratory	Migratory	The Fork-tailed Swift is a widespread migratory species that overwinters in Australia. It can be found across most of WA and is uncommon to moderately common in the north-west. They are mostly found over inland plains and along foothills, coastal areas and over settlements. They occur in a wide range of dry or open habitats, including riparian woodlands, tea-tree swamps, low scrub, heathland, saltmarsh, grassland and spinifex sandplains, open farmland and inland and coastal sand-dunes. Fork-tailed Swifts are often found in areas that experience updraughts around cliffs and normally forage several hundred metres above ground level (Phoenix, 2023a). The Fork-tailed Swift is likely to occur occasionally within the broader Kalgoorlie area (Phoenix, 2023a). The nearest record of the species is located over 100 km southwest of the broader Kalgoorlie area (Phoenix, 2019a). The species can occur within a wide range of habitats, including those found in the study area. The species is likely to forage, though it is unlikely it will land or nest within the Fimiston Operations area.	Possible The species is unlikely to be dependent on the habitat of the study area as it is primarily a long-range aerial species (Phoenix, 2023a).
<i>Motacilla cinerea</i> Grey Wagtail	Migratory	Marine; Migratory	The Grey Wagtail is a scarce but regular visitor to northern Australia, typically arriving in October and leaving in March. The species is most commonly associated with water and are found across a wide variety of wetlands, watercourses and on the banks of lakes and marshes (DotEE, 2019).	Unlikely Suitable habitat for this species is not present in the MDE and no DBCA records within 10km of MDE.
<i>Actitis hypoleucos</i> Common Sandpiper	Migratory	Marine; Migratory	The Common Sandpiper is widespread in small numbers throughout Australia, found along all coastlines and in many inland areas (DAWE, 2021). They visit Australia during the non-breeding season. The population when in Australia is concentrated in northern and western Australia (Higgins & Davies, 1996). Areas of national importance within Western Australia include Nuytsland Nature Reserve and Roebuck Bay (Watkins, 1993). The species utilises a wide range of coastal wetlands and some inland wetlands and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools,	Unlikely Suitable habitat for this species is not present in the MDE and no DBCA records within 10km of MDE.

Species	Conservation Status		Description	Likelihood of Occurrence
	WA	EPBC		
			billabongs, reservoirs, dams and claypans, and occasionally piers and jetties (DAWE, 2021).	
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	Migratory	Marine; Migratory	The Sharp-tailed Sandpiper spends the non-breeding season in Australia. In Western Australia (WA), scattered records occur along the Nullarbor Plain and the southern areas of the Great Victoria Desert. They are widespread across Australia, and in Australasia they prefer muddy edges of shallow coastal or inland wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. They also occur in saltworks, sewage farms, flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves (DAWE, 2021).	Unlikely One known DBCA record occurs within 10 km of the MDE, however no suitable habitat occurs within the MDE.
<i>Calidris ferruginea</i> Curlew Sandpiper	Critically Endangered	Critically Endangered, Marine, Migratory	Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. In Western Australia, they are widespread around coastal and sub coastal plains from Cape Arid to the south-west Kimberley. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (Higgins & Davies, 1996).	Unlikely Suitable wetland habitat for this species is not found in the MDE and one known DBCA record occurs within 10 km of the MDE.
<i>Calidris melanotos</i> Pectoral Sandpiper	Migratory	Migratory	The Pectoral Sandpiper occupies shallow, fresh waters often containing low grass or other small herbs. It is also observed in swamp margins, flooded pastures and saltmarshes. This species breeds in the northern hemisphere and is a regular though uncommon summer visitor to Australia (Pizzey & Knight, 2007). Rarely recorded in Western Australia (DAWE, 2021).	Unlikely Suitable wetland habitat for this species is not found in the MDE and no DBCA records within 10 km of MDE.
<i>Tringa nebularia</i> Common Greenshank	Migratory	Migratory, Marine	The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia (Higgins & Davies, 1996). The species is found in inland wetlands and sheltered coastal habitats (DotE 2015). The Common Greenshank is generally absent from the Western Deserts although there are a few records from the Great Sandy Desert and the Nullarbor Plain (DAWE, 2021). It occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west. In the Kimberleys, it is recorded in the	Unlikely Suitable wetland habitat for this species is not found in the MDE and scattered DBCA records within 10 km of the MDE, however no suitable habitat present.

Species	Conservation Status		Description	Likelihood of Occurrence
	WA	EPBC		
			south-west and the north-east, with isolated records from the Bonaparte Archipelago (Higgins & Davies, 1996). The species is known to forage at edges of wetlands, in soft mud on mudflats, in channels, or in shallows around the edges of water often among pneumatophores of mangroves or other sparse, emergent or fringing vegetation, such as sedges or saltmarsh (DAWE, 2021).	

9.3 Potential Impacts

The Revised Proposal is unlikely to impact on any MNES. The MNES with potential to utilise the MDE include two Threatened fauna species, Chuditch (VU) and Malleefowl (VU), and one Migratory species, the Fork-tailed Swift (MI). All three species are not restricted to or reliant on habitat within the MDE.

The potential impacts of the Revised Proposal on the MNES were considered against the significant impact criteria as defined in the Significant Impact Guidelines 1.1 for Matters of National Environmental Significance (DotE, 2013).

Results of the assessment indicate the only MNES with potential to occur within the Revised Proposal area are mobile fauna. No MNES have been recorded within the Revised Proposal area (Table 50). None of these species would be restricted to or reliant on habitat within the Revised Proposal area. These species more likely to be incidental visitors to the area.

9.3.1 Malleefowl (Vulnerable)

The potential impact of the Revised Proposal on Malleefowl was evaluated against the significant impact criteria for Threatened species listed as Vulnerable in Table 54 below.

Table 54: Malleefowl (VU) – Significant Impact Criteria

Criteria (DotE, 2013)	Assessment
Lead to a long-term decrease in the size of an important population of a species.	No direct or indirect observations of Malleefowl have been recorded within the MDE despite extensive searching consistent with the relevant guidance for Malleefowl surveys (Commonwealth of Australia, 2010, National Malleefowl Recovery Team, 2019). No active or recent nesting mounds, no Malleefowl footprints and no litter disturbance indicative of foraging activity have been identified (Phoenix, 2023, AHA, 2023). The Revised Proposal will not impact on any known populations of Malleefowl.
Reduce the area of occupancy of an important population.	Malleefowl has not been recorded within the MDE. The Revised Proposal will not reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations.	Malleefowl has not been recorded within the MDE. Tracks were recorded at a site 5 km NE of the Revised Proposal. One long-unused (greater than 5-10 years) mound has been found in the MDE (AHA, 2023). The Revised Proposal will not fragment an existing population.
Adversely affect habitat critical to the survival of a species.	451 ha of potential Malleefowl foraging and dispersal habitat is mapped within the MDE. This habitat is not considered suitable for breeding and is consequently not considered critical for the survival of the species or any Malleefowl populations.
Disrupt the breeding cycle of an important population.	No recent Malleefowl mounds have been recorded in the MDE (AHA, 2023). The Revised Proposal will not disrupt the breeding cycle of Malleefowl.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to	A total of 451 ha of suitable foraging and dispersal habitat may be cleared. This area is not considered critical or marginal habitat for the species (AHA, 2023).

Criteria (DotE, 2013)	Assessment
the extent that the species is likely to decline	Clearing of 1,580 ha of vegetation including 451 ha of suitable foraging and dispersal habitat within the MDE will not have a significant impact on the availability or quality of Malleefowl habitat.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The Revised Proposal is an expansion of the existing Fimiston Gold Mine Operations. The Revised Proposal is unlikely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
Introduce disease that may cause the species to decline.	The Revised Proposal is an expansion of the existing Fimiston Gold Mine Operations. Construction will be implemented under a construction management plan, with appropriate hygiene measures where necessary. The Revised Proposal is unlikely to introduce disease that would cause decline of Malleefowl populations.
Interfere substantially with the recovery of the species.	The threats listed in the Malleefowl Recovery Plan (Benshemesh, 2007) include: • land clearing, particularly mallee in the Wheatbelt region • fragmentation and isolation • grazing from agricultural animals (sheep), and feral (rabbits, goats) • predation (fox, cats) • fire (wildfire and intentional burns) • disease, inbreeding and chemical exposure • climate change. The Revised Proposal will clear up to 451 ha of suitable foraging habitat for Malleefowl. The habitat is not locally significant and is not important to the survival of Malleefowl species. The Revised Proposal is an extension of the existing Fimiston Gold Mine and will not fragment any Malleefowl populations or habitats. The expansion is not expected to increase Greenhouse Gas (GHG) emissions to have a significant impact on climate change from the existing mine site. The Revised Proposal is not expected to increase the number of feral animals or cause accidental mortality to Malleefowl. Feral animal management is undertaken by Fimiston through trapping under controlled conditions. The Revised Proposal is also not likely to increase the risk of fire or disease. The Revised Proposal is not expected to interfere with the recovery of the Malleefowl species.

9.3.2 Chuditch (Vulnerable)

The potential impact of the Revised Proposal on Chuditch was evaluated against the significant impact criteria for Threatened species listed as Vulnerable in Table 55 below.

Table 55: Chuditch (VU) – Significant Impact Criteria

Criteria (DotE, 2013)	Assessment
Lead to a long-term decrease in the size of an important population of a species.	No direct or indirect observations of Chuditch have been recorded within the MDE (Phoenix, 2023a). The Revised Proposal will not impact on any known populations of Chuditch.
Reduce the area of occupancy of an important population.	Chuditch has not been recorded within the MDE. The Revised Proposal will not reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations.	Chuditch has not been recorded within the MDE. The closest DBCA record is 40 km south. The Revised Proposal will not fragment an existing population.
Adversely affect habitat critical to the survival of a species.	Potential foraging habitat may be cleared. Chuditch are known to occupy various habitats, including woodlands, mallee, dry sclerophyll forests, riparian vegetation, beaches and deserts. The vegetation of the MDE is typical of the surrounding bioregion, and no Chuditch observations have been recorded in the MDE. As such, this habitat is not considered critical to the survival of the species.
Disrupt the breeding cycle of an important population.	No evidence of Chuditch presence or breeding has been recorded within the MDE. The Revised Proposal will not disrupt the breeding cycle of Chuditch.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Potential foraging habitat may be cleared. Chuditch are known to occupy various habitats, including woodlands, mallee, dry sclerophyll forests, riparian vegetation, beaches and deserts. The proposed clearing of 1,515.9 ha of poor quality habitat within the MDE will not have a significant impact on the availability or quality of Chuditch habitat.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	The Revised Proposal is an expansion of the existing Fimiston Gold Mine Operations. The Revised Proposal is unlikely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
Introduce disease that may cause the species to decline.	The Revised Proposal is an expansion of the existing Fimiston Gold Mine Operations. Construction will be implemented under a construction management plan, with appropriate hygiene measures where necessary. The Revised Proposal is unlikely to introduce disease that would cause decline on Chuditch populations.
Interfere substantially with the recovery of the species.	The major threats to Chuditch as defined in the National Recovery Plan (DEC, 2007) include:

Criteria (DotE, 2013)	Assessment
	- Land clearing, particularly of riparian vegetation, and the removal of suitable den logs and den sites from Chuditch habitat - Predation by, and competition from, foxes and feral cats; and - Deliberate and accidental mortality from poisoning, trapping, illegal shooting, and road kills. No vegetation or habitat within the MDE has been mapped as riparian vegetation (Phoenix 2023a). The Revised Proposal is not expected to increase the number of feral animals or cause accidental mortality to Chuditch. Feral animal management is undertaken by Fimiston through trapping under controlled conditions. The Revised Proposal is not expected to interfere with the recovery of the Chuditch species.

9.3.3 Fork-tailed Swift (Migratory)

The Revised Proposal's potential impact assessment on the Fork-tailed Swift was evaluated against the significant impact criteria for listed Migratory species in Table 56 below.

Table 56: Fork-Tailed Swift – Significant Impact Criteria

Criteria (DotE, 2013)	Assessment
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The Fork-tailed Swift may fly over the proposed MDE, but observations of the species have not been recorded previously. The species is almost exclusively aerial and is unlikely to nest or land within the MDE. The habitat within the MDE is not important to the species. The Revised Proposal will not substantially modify or destroy any habitat that is important to the Fork-tailed Swift.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The Revised Proposal is an expansion of the existing Fimiston Gold Mine Operations. The Revised Proposal is unlikely to result in invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The Fork-tailed Swift may fly over or briefly visit the MDE. The species is a rare, non-breeding visitor to inland areas in Western Australia. The Revised Proposal is not likely to have any impact on life cycle of the species.

9.4 Cumulative Impacts

Following in-depth survey efforts both site based and regionally, KCGM have concluded that the Revised Proposal is not anticipated to have a significant impact on any MNES, therefore an assessment of cumulative impacts on MNES is not required.

9.5 Mitigation and Management – Threatened Species

KCGM has undertaken surveys for both flora & vegetation and terrestrial fauna as supporting data collation and baseline strengthening. These surveys include site and regional study areas; are generalised or species specific. KCGM will continue to undertake pre-disturbance surveys and monitoring surveys throughout the life of mine and through the mine closure commitments. Early identification of what species within the MDE provides greater planning and avoidance opportunities. Considerable additional resources were used to identify with certainty whether an MNES concerns existing in the assessment and development of the Revised Proposal.

By implementing scheduled flora and fauna monitoring KCGM, together with other Northern Star operations, manage an evolving regional database, and through implementing new reconnaissance surveys (mitigation) for flora and fauna (including SREs) has proved to be an effective measure of guiding future operations of any potential or significant concerns well in advance to any clearing or project mobilisation occurs. The mitigation hierarchy for Threatened Species is described in Table 57.

Table 57: Mitigation Hierarchy

Type	Controls
Avoid	- Undertake threatened species surveys to identify areas to avoid during project design - Design surface hydrology to avoid changes in hydrology to sensitive areas. - Maximise the use of existing cleared areas for roads and infrastructure corridors. - Clearing along one front to allow fauna to escape.
Minimise	- Minimise clearing in the <i>J. aridus</i> area to the extent possible - Implement detailed measures in the Significant Species Management Plan. - Minimise clearing to the maximum extent practicable through implementation of internal clearing permit procedures, which include: - Prior and post construction inspections - Use of spatial data of significant flora and vegetation location in planning - Surveying and demarcation of clearing areas - Maintain traffic management rules to minimise the likelihood of fauna injury or mortality. These rules include prohibition of off-road driving unless authorised and reduced speed limits on internal roads. - Maintain existing fauna exclusion management including the fencing of the TSFs to prevent fauna entering and management of trenches to allow fauna to escape. - Minimise dust generation from mining and road use that could cause temporary disturbance to fauna. - Maintain existing procedures for feral animals, including cat trapping when numbers are identified as increasing (usually spring). Clearing activities will not be undertaken when the Fire Danger Rating is severe or higher.
Rehabilitate	Progressive rehabilitation of bare ground areas to achieve habitat values.

9.6 Predicted Outcome

The proposed amendments to the current MDE through the Revised Proposal which is inclusive of an extended operational footprint and continued mine life, are not expected to have a negative impact on MNES (places or individual species).

Whilst a generalised Protected Matters Search mapping layer indicates some threatened listed MNES species might inhabit, visit or transvers the current and proposed MDE areas, no evidence of these species has been recorded through general and species specific (targeted) surveys by qualified ecological specialists.

KCGM therefore consider the Revised Proposal will not have a significant impact on MNES.

10. HOLISTIC IMPACT ASSESSMENT

It is important to recognise that the Revised Proposal will not affect relevant environmental factors in isolation, and that there are many connections and interactions between parts of the environment (environmental factors). This section of the ERD considers the connections and interactions between the preliminary key environmental factors (Section 6) relevant to the Revised Proposal:

- Flora and Vegetation
- Terrestrial Fauna
- Inland waters
- Air Quality
- Social Surroundings.

Each of these environmental factors is addressed separately in previous chapters. A summary of how the Revised Proposal addresses the principles outlined in the EP Act is provided in Environmental Factors and Objectives. Inland Waters, Greenhouse Gas Emissions, Air Quality and Human Health are addressed in Other Environmental Factors or Matters (Section 7).

KCGM acknowledges the connections and interactions between environmental factors and those interdependencies requiring consideration and management to achieve good environmental outcomes (Figure 34). From the early stages of project planning, KCGM has considered relevant environmental factors, and has integrated these into its design process. This has allowed a holistic view of design responses to avoid or minimise impacts on those environmental factors while still achieving overall objectives.

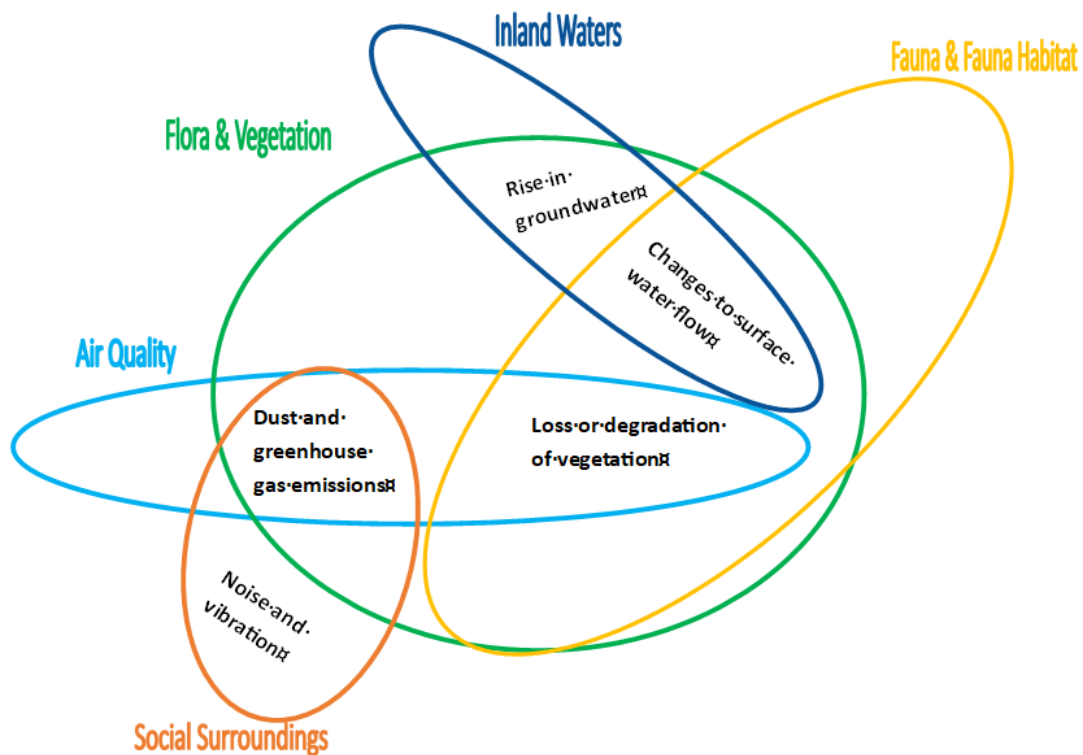


Figure 34: Holistic Assessment of Environmental Factors and Impacts

This section summarises key connections and interactions between environmental factors (grouped by the relevant EPA theme) and the most significant mitigation and management measures to minimise impacts across environmental factors. Of these, KCGM considers the following to be the most relevant holistic impacts:

- Vegetation clearing and loss of habitat, particularly habitat for the Priority 2 flora species, *Eremophila praecox* and Priority 1 fauna species *J. aridus*.
- Potential for particulate matter generation and mobilisation
- Potential for ground vibration, or air-blast overpressure to impact on the community and/or the receiving environment.

The vegetation types present on site are well represented in the surrounding area and are not unique.

Impacts on individual environmental factors and the connections and interactions between them have been subject to concerted avoidance and minimisation efforts. The assessment of the holistic impacts and the predicted outcomes has been considered in relation to each of the principles of environmental management in Section 4A of the EP Act and the EPA's environmental objectives for each key environmental factor. The impact assessment and development of mitigation measures is discussed in detail within each environmental factor chapter. From the impact assessment, the Revised Proposal's predicted outcomes have been considered in relation to the environmental principles (see Section 6) and the EPA's environmental objectives for each key environmental factor.

KCGM has adopted the precautionary principle to ensure that the design of the Revised Proposal minimises significant residual impacts to all relevant environmental factors.

Environmental studies were undertaken to gain a detailed understanding of the environmental values within the MDE and its surrounds, and informed the mitigation measures to avoid, minimise and/or rehabilitate the impacts identified across the Revised Proposal. The studies, impact assessment, and mitigation measures, have been developed with regard to the principle of the conservation of biological diversity and ecological integrity, ensuring that the conservation of biological diversity and ecological integrity is a fundamental consideration. The mitigation measures, in conjunction with the implementation of environmental offsets, has allowed for the EPA objective for flora and vegetation, terrestrial fauna, inland waters, air quality and social surrounds to be met.

The new MDE will result in the following potential impacts on environmental factors:

- Vegetation and Flora – potential environmental impacts from the Revised Proposal will result in 1,580 ha of additional clearing of native vegetation. All the vegetation communities proposed for clearing are well represented throughout the Goldfields region and no Threatened or Priority Ecological Communities will be impacted. This includes removal of 13 plants of the P2 species *E. praecox*.
- Terrestrial Fauna – potential environmental impacts will result in 1,580 ha of additional clearing of native vegetation through expansion of the MDE. The terrestrial fauna habitat proposed for clearing are well represented throughout the Goldfields region and no conservation significant vertebrate fauna species are known to be restricted to or reliant on the habitat within the modified MDE. A total of two of the eight known breeding shrubs will be removed. Given the shrub fidelity of the species, the subpopulation is anticipated to continue.
- Inland Waters – the Revised Proposal will result in the construction of an additional Fimiston III TSF and Fimiston IIE TSF 3rd cell, that will add to the seepage already occurring in the local vicinity of the TSFs due to Fimiston II TSF. More extensive underdrainage and implementation of a SGMP pumping strategy will be used to maintain suitable groundwater levels in the vicinity of the TSFs. Impacts are not predicted to be significantly different to those already approved. New TSFs will

change groundwater flows, but modelling and planning will minimise the impact on existing infrastructure, including the Trans-Australian Railway, and impacts on conservation significant species habitat. Changes to surface water flows are not anticipated to be significant. A pit lake will remain in the long-term after the mine has been closed. Water levels in this lake will never rise high enough for the pit to overtop and cause damage to the local environment or residents. The groundwater in this part of the goldfields is hypersaline and the water in the pit lake will also be hypersaline.

- Air quality will be managed in accordance with the Fimiston Air Quality Management Plan which controls PM₁₀ and health risks from the Revised Proposal. Studies of dust impacts to date indicate that dust generation does not have a significant impact on *E. praecox* or conservation significant fauna.
- Blast impacts will be managed in accordance with the Revised *Environmental Protection (Fimiston Gold Mine Noise Emissions) Approval 2016* and NVMMP that address site noise. Flyrock and blasts will continue to be conducted in accordance with the Blast Management Plan.

None of these additional effects are likely to have a significant residual impact on the environment greater than the existing, operating mine.

11. CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT

The implementation of the Revised Proposal will contribute to cumulative impacts on flora and vegetation and fauna in the Kalgoorlie area. Kalgoorlie is a city of 30,000 people with a predominantly mining economy. The area surrounding Kalgoorlie is a mixture of mines and mining related industries (such as mineral processing) and native vegetation. The surrounding area is largely vegetated with approximately 99.83% of the Pre-European Vegetation remaining within the 9,543,244 ha Local Government Area (LGA, Government of Western Australia 2019).

Recent EPA assessed projects in the Kalgoorlie area are:

- Binduli North (Norton Gold Fields) – 908.9 ha of clearing (Talis Consultants 2020).
- Lynas Rare Earths – 217.3 ha of clearing (KASA Consulting 2021).

This is in addition to the 3,973 ha of already approved clearing for Fimiston and 540 ha for the other KCGM projects of Mt Charlotte and Gidji (Section 6.5), giving a total of 5,639 ha of clearing approved for all the recent projects excluding the Revised Proposal, or 0.06% of the total area of native vegetation in the LGA.

The addition of 1,580 ha of native vegetation clearing for the Revised Proposal will increase this to 7,228 ha or 0.08% of the total area of native vegetation in the Shire. As 99.7% of the LGA will remain vegetated, the cumulative impacts of this clearing on flora, vegetation and fauna in Kalgoorlie-Boulder are not anticipated to be significant. KCGM have taken steps to include existing disturbed areas where possible under MS 782 preference to remnant or more mature stands of vegetation and/or fauna habitat. Importantly clearing activities are not proposed to occur suddenly, rather over an extended period of time as the Fimiston Operations requires these additional areas.

No conservation reserves, environmentally sensitive areas (ESAs), geographically restricted species or critical breeding habitat are present within or intersect the current or proposed extended MDE. No other threatened listed flora, vertebrate, invertebrate or SRE species have been recorded within or known to occur within the extended project footprint. Whilst Priority flora, invertebrate and confirmed SRE species have been recorded within the currently approved MDE, the risks to these species has been reduced through changes to the proposed landform design and completion of numerous targeted regional surveys. These surveys concluded that Priority listed species under DBCA Act are present and more widely distributed than previously recorded.

KCGM have completed both desktop and ground truthing surveys (2015, 2018, 2021, 2022 and 2023) for MNES and have concluded that the likelihood of a EPBC act listed threatened vertebrate (seven) and invertebrate (one) species foraging and breeding presence as highly unlikely. Due to the absence of either foraging or critical breeding habitat, three listed threatened flora species do not occur within the current or proposed MDE.

Similarly, EPBC Act listed threatened migratory species are unlikely to be restricted to or completely reliant on habitat present within the current or proposed MDE due to similar and better-quality habitat or widespread in the region, or available habitat not of significance for breeding, or seasonal rest spots or feeding locations as part of their annual migratory pathways.

Noise and dust emissions consider the existing noise and dust environment in Kalgoorlie and are cumulative emissions for the project. Following approval, implementation of the proposed area of clearing at first poses a high potential of impacting on particulate concentrations at Fimiston and within the local

region including the City of Kalgoorlie-Boulder. However, the proposed clearing activities are scheduled activities with implementation over time; not a broad acre clearing campaign. Through sequenced implementation of clearing activities and conclusions from air quality and human health impact assessments, cumulative impacts on a regional scale are manageable through implementation of ongoing successful mitigation measures. In addition, cumulative blasting impacts with Mt Charlotte are not anticipated to increase from the current scenario, as the frequency of blasting at Fimiston is not anticipated to increase.

The Fimiston mining and processing operations are KCGM's largest source of greenhouse gas emissions. KCGM owners, Northern Star Resources, intends to strive towards zero net emissions and improve efficiencies wherever possible. Northern Star have reviewed the future GHG emissions for Fimiston, including investigating commissioning renewable energy options for the Fimiston Operations. The largest source of emissions at KCGM is the mining fleet. Electrification would be a viable alternative to the current diesel fleet if the average cost of electricity can be lowered.

KCGM consider a greater majority of existing obligations and commitments prescribed under a range of regulatory instruments and decision-making processes, including DEMIRS tenement conditions, DWER licence conditions, DWER water licence conditions, KCGM Environmental Management Plans (externally approved under MS 782) and KCGM Monitoring Procedures, are appropriate to manage potential cumulative impacts associated with this Revised Proposal. Where instances of difference occur, for example requirement to relocate monitoring equipment, this has been highlighted within the Revised Proposal under the appropriate environmental factor and supported by revised environmental management plans to support and guide the change (as per conditions of MS 782).

Mining and mineral processing activities have been undertaken at the Fimiston location for approximately 130 years. KCGM have a solid environmental reporting and compliance records are shown within Appendix S Compliance documents which includes copies the last 5 years of Annual Environment Reports, Compliance Annual Reports and Annual Audit Compliance Report Forms (from 2018 to 2022).

12. GLOSSARY

Table 58: Glossary

Term	Definition
ACHMP	Aboriginal Cultural Heritage Management Plan
AH Act	<i>Aboriginal Heritage Act 1972</i>
BMP	Blast Management Plan
BSY	Boulder Shire Yard (dust and noise monitoring location)
CKB	City of Kalgoorlie – Boulder
CLY	Clancy Street (dust and noise monitoring location)
CO ₂ -e	Carbon dioxide equivalents
CRG	Community Reference Group
dB	Decibels
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water (formerly Department of Agriculture, Water and Environment)
DEMIRS	Department of Energy, Mines, Industry and Resources Safety (State)
DMMP	Dust Monitoring and Management Programme
DPLH	Department of Planning, Lands and Heritage (State)
DWER	Department of Water and Environmental Regulation (State)
EIA	Environmental Impact Assessment
ENB	Environmental Noise Bund
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act (WA) 1986</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act (Commonwealth) 1999</i>
ERP	Emissions Reduction Project
FAQMP	Fimiston Air Quality Management Plan
FS	Fimiston South
FY	Financial Year
GABC	Goldfields Aboriginal Business Chamber
GEDC	Goldfields Esperance Development Commission
GIS	Geographic Information Systems
GPS	Global Positioning System
HEW	Hewitt Street (dust and noise monitoring location)
Hg	Mercury
HGC	Hannans Golf Course (dust and noise monitoring location)
HI	Hazard Indices
HOP	Hopkins Street (dust and noise monitoring location)
HRA	Health Risk Assessment
ICMM	International Council on Mining and Metals
ICR	Incremental Carcinogenic Risk
KBCCI	Kalgoorlie Boulder Chamber of Commerce and Industry

Term	Definition
KCGM	Kalgoorlie Consolidated Gold Mines (a subsidiary of Northern Star)
KPI	Key Performance Indicator
kWh	Kilowatt hours
LA10	Noise level exceeded for 10% of a measurement period
L _{Amax}	Maximum sound level reached during a measurement period
LoM	Life of Mine
MAR	Managed Aquifer Recharge
MDE	Mine Disturbance Envelope
MEX	Metals Exploration Yard (dust and noise monitoring location)
MNES	Matters of National Environmental Significance
MS 782	Ministerial Statement 782
MTC	Mt Charlotte (dust and noise monitoring location)
NGER	National Greenhouse Energy Reporting
NVMMP	Noise and Vibration Monitoring and Management Plan
RL	Relative Level
SEGRA	Sustainable Economic Growth in Regional Australia Conference
SIA	Social Impact Assessment
SGMP	Seepage and Groundwater Management Plan
SMA	Setback to Mining Activities; a Special Control Area under Town Planning Scheme No 2
SRE	Short Range Endemic
SWIS	South West Interconnected System
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
WRD	Waste Rock Dump
ZOI	Zone of Influence

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APPENDIX A SOCIAL IMPACT ASSESSMENT

APPENDIX B LETTERS OF SUPPORT

APPENDIX C CONFIDENTIAL ABORIGINAL CULTURAL HERITAGE MANAGEMENT PLAN

APPENDIX D SCREENING HEALTH RISK ASSESSMENT

APPENDIX E AIR QUALITY IMPACT ASSESSMENT

APPENDIX F AIR QUALITY MANAGEMENT PLAN

APPENDIX G GREEN HOUSE GAS MANAGEMENT PLAN

APPENDIX H REVISED FLORA AND FAUNA ASSESSMENT

APPENDIX I REVISED TERRESTRIAL FAUNA ASSESSMENT

APPENDIX J MALLEEFOWL ACTIVITY AND HABITAT ASSESSMENT

APPENDIX K CONFIDENTIAL JALMENUS ARIDUS IMPACT ASSESSMENT

APPENDIX L CONFIDENTIAL SIGNIFICANT SPECIES MANAGEMENT PLAN

APPENDIX M PREDICTION OF BLAST- INDUCED GROUND VIBRATION AND OVERPRESSURE

APPENDIX N FLYROCK FOR FIMISTON SOUTH PROJECT

APPENDIX O FIMISTON ACOUSTIC IMPACT ASSESSMENT

APPENDIX P NOISE AND VIBRATION MONITORING MANAGEMENT PLAN (UPDATE) NOISE AND VIBRATION MONITORING MANAGEMENT PLAN

APPENDIX Q HYDROLOGICAL ASSESSMENT OF EASTERN FLOODWAY

APPENDIX R HYDROGEOLOGICAL REVIEW OF THE FIMISTON I, FIMISTON II, FIMISTON IIE, AND FIMISTON III TSFS

APPENDIX S COMPLIANCE DOCUMENTS

APPENDIX T PROPOSED AMENDED CONDITIONS

APPENDIX U MINE CLOSURE PLAN