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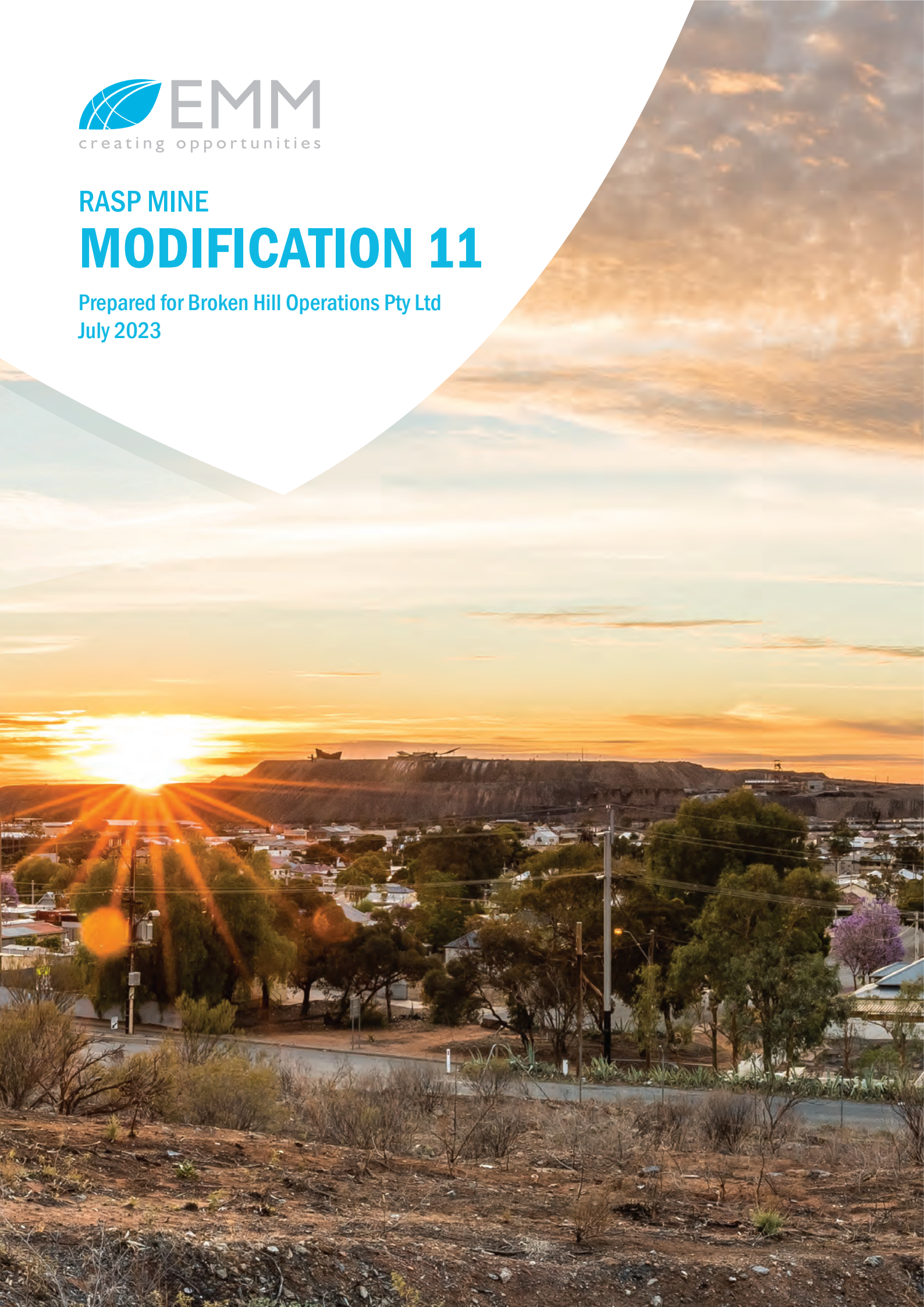
RASP MINE
MODIFICATION 11

Prepared for Broken Hill Operations Pty Ltd
July 2023



Rasp Mine

Modification 11

Broken Hill Operations Pty Ltd

E210999 RP1

July 2023

Version	Date	Prepared by	Approved by	Comments
1	21 July 2023	Natalie Devillers	Paul Freeman	Sent to BHOP for approval
2	27 June 2023	Natalie Devillers	Paul Freeman	Response to BHOP comments

Approved by

Paul Freeman
Associate Director
27 July 2023

Ground floor 20 Chandos Street
St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590

Executive Summary

ES1.1 Background

The Rasp Mine (Rasp) is an operating lead, zinc and silver mine which is located within the City of Broken Hill, in the far west of New South Wales (NSW). Rasp has operated since 1885. It is owned and operated by Broken Hill Operations Pty Limited (BHOP), which is a wholly owned subsidiary of CBH Resources. BHOP has owned Rasp since 2001.

Rasp is regulated under Project Approval 07_0018 pursuant to the *Environmental Planning and Assessment Act 1979* (EP&A Act). The approval allows ore mining, processing, ore concentrate transportation and waste emplacement operations. The project approval has been modified 10 times since it was granted in 2011.

ES1.2 Proposed modification

BHOP has made a modification request (07_0018 MOD 11) to the Minister for Planning and Public Spaces for approval under Section 4.55(1A) of the EP&A Act for a ventilation intake and an extension of development workings in Main Lode Blocks 13, 14 and 15. These activities are required to allow the continued access to future ore reserves and to augment the safety systems at the mine in accordance with relevant safety legislation and guidelines.

ES1.3 Consultation

BHOP has met with a number of NSW Government agencies and Broken Hill City Council to discuss the proposed modification. None of the stakeholders raised significant concerns about the proposal. Issues raised in consultation have been taken into consideration in the assessments undertaken for the proposal.

ES1.4 Assessment

A range of environmental impact assessments have been undertaken to support the modification application (see Appendices). The proposed modification activities are either located on already disturbed land or underground, and the surface effects of the modification will not be significant. The assessments show that for the project with the modification:

- noise impacts will meet relevant criteria at all private residential areas
- water impacts will be restricted and effectively managed by the on-site management systems
- air quality impacts will be managed in accordance with existing and approved procedures
- blasting impacts will not affect the integrity of surface features or underground mining domains and would remain within required limits at private residences
- geotechnical conditions are favourable for additional development workings and the ventilation intake
- visual impacts are unlikely to be any different to those currently experienced.

ES1.5 Conclusion

The proposed modification is minor and activities will be undertaken within the existing disturbed area. The proposal is justified to allow future development of the mine and augments the existing ventilation system. The proposed modification has merit and should be approved.

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1 Introduction

1.1 Overview

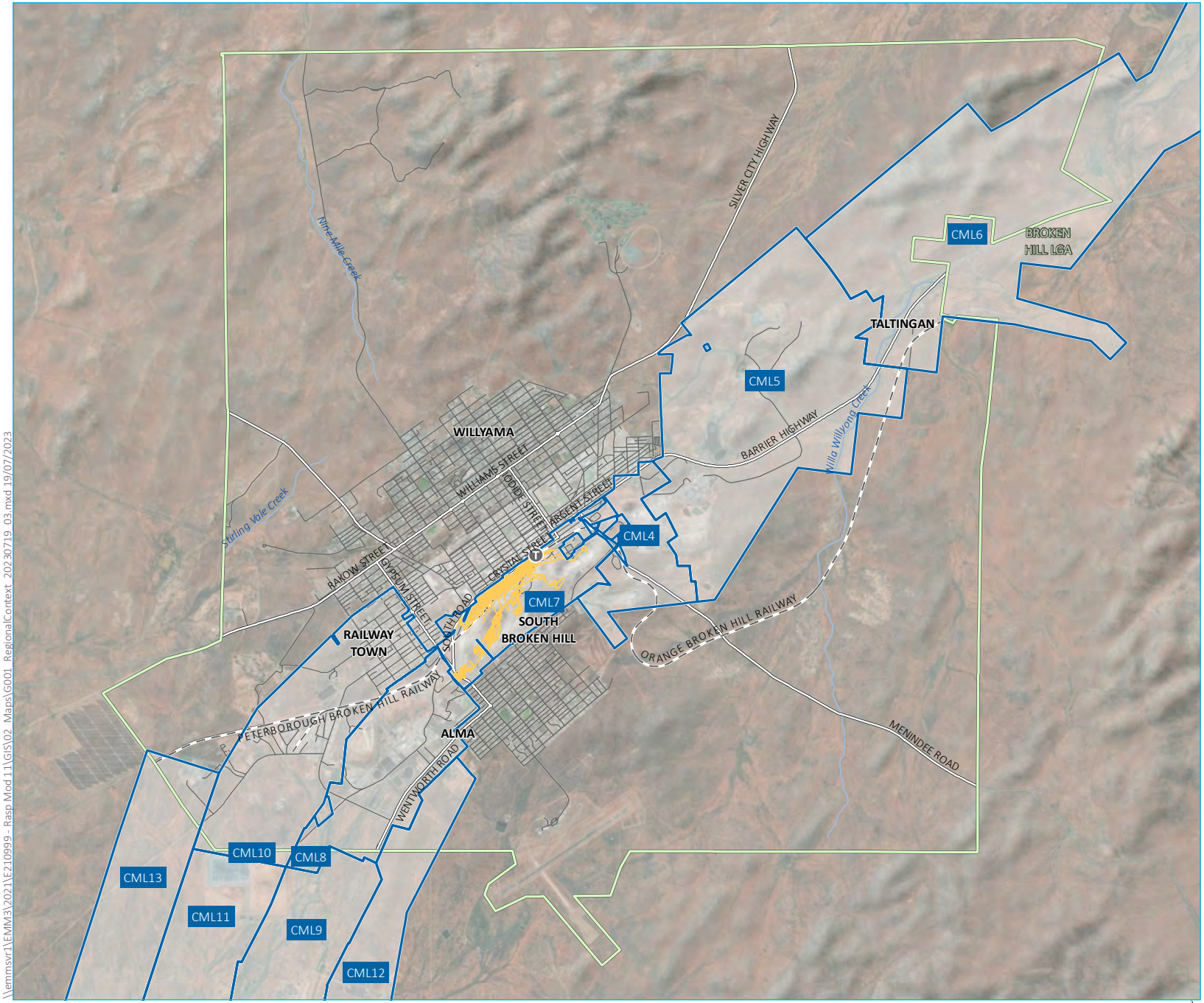
This modification report accompanies a modification request (07_0018 Mod 11) by Broken Hill Operations Pty Limited (BHOP) pursuant to Section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), for a ventilation intake and development extension works at Rasp Mine (Rasp) under Project Approval 07_0018.

This modification report has been prepared on behalf of BHOP by EMM Consulting Pty Ltd (EMM) in accordance with *State significant development guidelines – preparing a modification report* (Department of Planning Industry and Environment, 2021).

1.2 Rasp Mine

Rasp is an operating zinc, lead and silver mine which is located centrally within the City of Broken Hill, in the far west of New South Wales (NSW) (Figure 1.1). The mine has operated since 1885. Rasp has been owned and operated since 2011 by BHOP, which is a wholly owned subsidiary of CBH Resources. The mine produces zinc, lead and silver concentrates which are dispatched via rail to Port Pirie and Port Adelaide in South Australia (SA).

Rasp and its surrounding areas are dominated by mining infrastructure, including historic mining buildings and structures. The area surrounding the site has also been shaped by mining activities and includes a range of infrastructure, commercial, and residential developments immediately adjacent to the mine.



KEY

- Existing underground workings
- Mining lease
- Train station
- Rail line
- Major road
- Minor road
- Named watercourse
- Local government area

INSET KEY

- Major road
- NPWS reserve
- State forest

Source: EMM (2023); CBH (2021); DPE (2019); DFSI (2017); GA (2011); ASGC (2006)

0 1 2 km

GDA 1994 MGA Zone 54

N

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Regional setting

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Modification report
Figure 1.1

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The mine comprises:

- current and historic underground workings
- four open-cut voids, with one used to access the underground mine workings (Kintore Pit), one used as tailing storage facilities (TSF) (Blackwoods Pit TSF2), one used for ancillary mining activities (BHP Pit), and one used for waste rock emplacement and surface water runoff storage (Little Kintore Pit). BHOP is in the final stages of installing a new box cut for mine access which will then allow Kintore Pit to be established as TSF3 (as approved in MOD6).
- an ore processing plant
- ore concentrate rail load out area
- waste rock and tailings emplacements
- extensive non-active mining areas (free areas)
- ancillary mine infrastructure, including a water management system, workshops, offices and other facilities.

Rasp operates under Ministerial Project Approval 07_0018 which was granted in January 2011 and a mining lease (CML7). The approval has been modified 10 times since it was first granted. The key approved operating activities are summarised in Table 1.1. The project as approved is shown in Figure 1.2.

Table 1.1 Rasp approved activities

Activity	Details
Mine life	• To 31 December 2026.
Ore extraction	• 500,000 tonnes per annum (or up to 750,000 tpa with approval of the EPA). • Total of 8.5 million tonnes over the life of the mine.
Ore processing	• On-site ore processing.
Ore concentrate transport	• By rail to Port Pirie and Port Adelaide
Underground mine access	• Via Kintore Pit and a box-cut (under construction).
Tailing emplacement	Tailing stored in: • Tailing Storage Facility TSF1 • Blackwoods TSF (TSF2) • Kintore Pit (TSF3) • Underground voids.
Waste rock	• Mostly placed in underground voids and in surface storage (Little Kintore Pit). • Waste rock material with less than 0.5% lead content used for road repair, TSF2 embankment construction and bunding within the project area, and for rehabilitation of the site.

Table 1.1 Rasp approved activities

Activity	Details
Ancillary infrastructure	Ancillary infrastructure includes: • crushing and processing plants • tailing backfill plant • water management systems • rail siding facilities • internal roads • ventilation systems • administration offices • workshops • storage warehouse. • core shed

Source: EMM (2023); CBH (2021); DPE (2019); DFSI (2017)

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Approved project

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Figure 1.2

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The previous modifications to 07_0018 and the contextual changes to the project which resulted from the modifications are summarised in Table 1.2. The current proposed Mod 11 has been included in Table 1.2 for completeness.

Table 1.2 Modifications to 07_0018

Application	Determination date	Mine life	Mining rate and total production	Mining methods	Waste rock management	Processing rate	Processing methods	Concentrate production	Tailings disposal	Water supply	Employment numbers	Other
EA	31/01/2011	15 years from 2011 to 2026	750,000 tpa Total production over life of Project: 8,450,000 t	Underground mining using various methods including long hole, benching, modified Avoca, room and pillar or uphole retreat.	Underground: Backfill Surface: Inert material to be used for road repair and bunding and rehabilitation at closure. Permitted storage in Kintore Pit and BHP Pit.	250 tph crushing plant 93.8 tph grinding plant	Crushing, grinding, flotation, thickening and filtration at on-site processing facilities.	Lead: 44,000 tpa (concentrate 73% Pb and 985 g/t Ag) Zinc: 87,000 tpa (concentrate 50% Zn)	Fine tailings disposal (approximately 320,000 tpa): • TSF1 (10 m raise) • TSF2 Blackwood Pit • Coarse tailings disposal (approx. 320,000 tpa) as underground stope back fill.	Potable 9 ML/a Raw 139 ML/a Reclaimed/ Recycled 300 ML/a Extraction up to 370 ML/a	143	
PPR		No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	Relocation of processing plant with concentrate trucked to new Rail Loadout, Removed secondary and tertiary crushers and screens from the crushing circuit.
MOD1	16/03/2012	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	Relocation of ventilation shaft and installation of ventilation fans U/G.
MOD2	29/08/2014	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	Allow crusher to be operated at any time (24 hours per day 7 days per week).

Table 1.2 Modifications to 07_0018

Application	Determination date	Mine life	Mining rate and total production	Mining methods	Waste rock management	Processing rate	Processing methods	Concentrate production	Tailings disposal	Water supply	Employment numbers	Other
MOD3	17/03/2015	No change Replacement tonnes.	No change Replacement tonnes	No change	No change	No change	No change	No change	No change	No change	No change	Extension of underground mining to include Block 7 (also included the Zinc Lodes).
MOD4	06/09/2017	No change	No change	No change	Material <0.5% lead would be used in TSF2 embankment construction	No change	No change	No change	No change	No change	195 (updated 2 additional related to MOD4)	Cement silo, Concrete Batching Plant.
MOD5	02/11/2018	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	Cement silo, and warehouse extension

Table 1.2 Modifications to 07_0018

Application	Determination date	Mine life	Mining rate and total production	Mining methods	Waste rock management	Processing rate	Processing methods	Concentrate production	Tailings disposal	Water supply	Employment numbers	Other
MOD6	16/03/2022	No change	500,000 tonnes	No change	Excess waste rock to be: • Co-placed with tailings in TSF3. • Used for rehabilitation capping where material <0.5% lead. • Permanently stored in Little Kintore Pit and BHP Pit (all material from construction of the boxcut and new decline development from surface).	No change	No change	No change	Establish a tailings storage facility at Kintore Pit as TSF3 with an approximate 14 year life. Utilise the surface of TSF2 to nuturally dry tailings which would be harvested and transferred to TSF3.	Changes to • Potable/ treated water 10 ML/a. • Raw untreated water 324 ML/a. • Reclaim/ recycled water 525 ML/a.	No change	A new access portal and decline to the underground mine, to be located within a boxcut. Land disturbance in MOD6 activities is 40.2 Ha, increasing land disturbance (from Rasp Mine activities) to 70 Ha.
MOD7	29/07/2019	No change	No change	No change	Material <0.5% lead would be used in TSF2 embankment construction	No change	No change	No change	No change	No change	No change	Mobile crushing in BHP Pit for embankment construction.
MOD8	15/04/2021	No change	No change Tonnes swap with Perilya	No change.	No change	No change	No change	No change	No change	No change	No change	U/G mining extension (20x250 m) across Perilya Lease ML1249.

Table 1.2 Modifications to 07_0018

Application	Determination date	Mine life	Mining rate and total production	Mining methods	Waste rock management	Processing rate	Processing methods	Concentrate production	Tailings disposal	Water supply	Employment numbers	Other
MOD9	23/12/2021	No change	No change	No change.	No change	No change	No change	No change	No change	No change	No change	The establishment of two development drives and an emergency egress ladderway.
MOD10	13/12/2022	No change	No change	No change	No change	No change	No change	No change	Temporary storage of tailing in stockpile at TSF2	No change	No change	Temporarily emplace harvested tailing produced during interim period in a stockpile at the south-western end of TSF2, until TSF3 is operational.
MOD11	Yet to be determined	No change	No change	No change	No change	No change	No change	No change	No change	No change	No change	An extension of the development workings within blocks ML 13, ML 14 and ML 15 and the addition of a ventilation intake.

1.3 The proponent

The proponent for the proposed modification Mod 11 is BHOP. The relevant contact details for BHOP are:

Broken Hill Operations Pty Limited

130 Eyre Street

Broken Hill NSW 2880

2 Strategic context

2.1 Need for the proposed modification

Rasp is located centrally within the City of Broken Hill and is surrounded by transport infrastructure, areas of commercial and industrial development and some residential areas. The mine has and continues to be a strategic asset for Broken Hill and its community.

Mining has been undertaken at the Rasp site for over 137 years and the site contains several heritage buildings and structures associated with its rich mining history. Most of the site has been highly disturbed from mining activities with very little topsoil and native vegetation remaining onsite.

The proposed modification will not change the strategic context of the existing Rasp Mine. The proposed modification is minor in that it seeks to install a ventilation intake and extend underground development workings in Main Lode Blocks 13–15, which is within the existing disturbance area of the mine.

The Rasp mine will continue to support economic diversity in the Broken Hill Local Government Area. Rasp continues to provide significant local jobs, investment, purchase of goods and services and taxes to the local and regional economy. Compared to its physical impact, Rasp has a disproportionately large beneficial economic influence in the region.

2.2 Strategic planning

2.2.1 Far West Regional Plan 2036

The *Far West Regional Plan 2036* acknowledges and promotes a sustainable mining sector in Broken Hill, Cobar, Wentworth and Balranald. The plan recognises that the mining industry is the primary economic driver in Broken Hill, which generates direct employment and provides flow-on benefits to communities.

2.2.2 Broken Hill Community Strategic Plan 2040

The *Broken Hill Council Community Strategic Plan "Your Broken Hill 2040"* sets a vision for Broken Hill over the next two decades. The plan recognises Broken Hill as Australia's longest lived mining city, with mining greatly contributing to the local economy and employment. Rasp is integral to the delivery of the community strategic plan given its close links with Council and the local funding opportunities and partnerships it has with community organisations.

2.2.3 Broken Hill Local Strategic Planning Statement 2020-2040

The *Broken Hill Local Strategic Planning Statement 2020–2040* lists Broken Hill as one of the world's great "mineralogical rainforests," where mining revenues are vital to Broken Hill and the rest of Australia. The plan also acknowledges mining as a major employer and primary driver of the Broken Hill economy.

3 Proposed modifications

3.1 Overview

BHOP is currently approved to conduct mining activities up to Main Lode Block 12. MOD 9 allowed underground exploration/development drives into Main Lode Blocks 13, 14, and 15, which identified deposits further to the north of CML7 (Figure 3.1). A block is a historic mining lease which is now part of Consolidated Mining Lease (CML) 7.

BHOP is now seeking to extend mining development activities into the northern section of CML7 (Main Lode Blocks 13, 14 and 15). In order to develop the new mining blocks, BHOP must also install a new ventilation intake (Figure 3.1) to provide suitable ventilation to workers in the northern areas of the mine.

The proposed modification will not change the approved extraction rate, processing rate or other operating functions.

KEY

- Mining lease CML7
- Train station
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line

Ventilation intake locations

- Proposed
- Existing

Underground workings

- Proposed
- Existing

Source: EMM (2023); CBH (2021); DPE (2019); DFSI (2017)

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Proposed modification - new ventilation intake and extension into Blocks 13-15

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Figure 3.1

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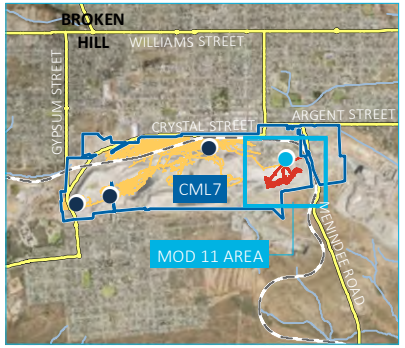

KEY

- Mining lease CML7
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- Major road
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Ventilation intake locations

- Proposed
- Existing

Underground workings

- Proposed
- Existing

Source: EMM (2023); CBH (2021); DPE (2019); DFSI (2017)

0 100 200 m

GDA 1994 MGA Zone 54

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Proposed modification - new ventilation intake and extension into Blocks 13-15

Rasp Mine Modification 11
Modification report
Figure 3.2

EMM creating opportunities

3.1.1 Installation of a ventilation intake

Four ventilation intakes to the underground mine workings are currently in operation. The four intakes are located in the southern areas of CML7 and comprise:

- no. 7 Shaft
- no. 6 airway
- Delprats shaft
- mine portal entry.

Two Howden 875 kW variable speed mixed flow axial fans located at the 10 level underground are utilised to provide mechanical ventilation by drawing air through the underground workings to the exhaust shaft (main vent shaft).

In order to provide ventilation to future mining activities in Blocks 13, 14, and 15, BHOP intends to install a ventilation intake. Prior to installation of the ventilation intake, a concrete pad will be constructed to provide a raiseborer with an appropriate, level platform which is necessary to operate safely and effectively.

A raise boring machine with a drill bit will be used to drill an approximate 230 mm pilot hole from the surface to the opening on the target level. Once the target level is reached, the drill bit will be replaced with a 4 m reamer head which will excavate a circular hole from the target level to the surface. The target level is 7 Level Far North underground, which is a vertical distance of approximately 178 m from the surface.

As the raiseborer excavates from the target level up, drill cuttings and dust will fall to the floor of the lower level and remain underground (Figure 3.3). Following excavation, a surface evase with an expected height of approximately 8m will be installed and secured into position over the circular hole (shown in Figure 3.4).

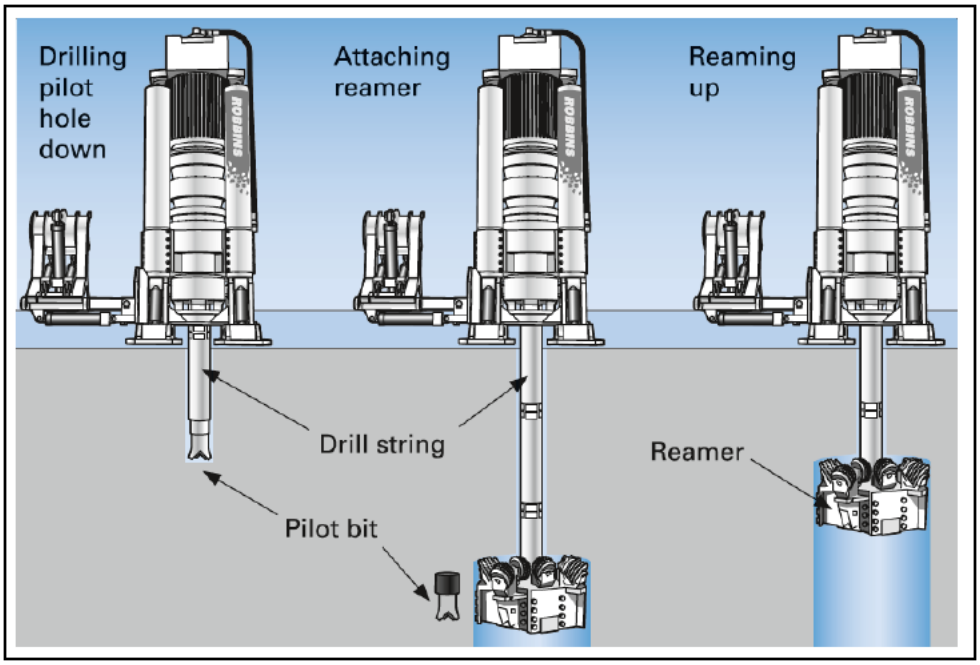

Figure 3.3 Overview of raisebore process

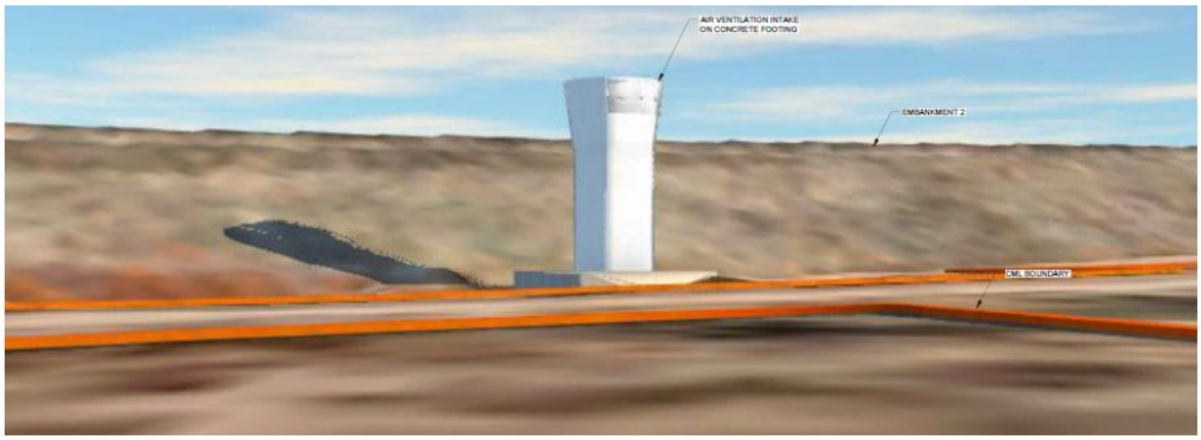

Figure 3.4 Impression of the surface ventilation evase

3.1.2 Extension of underground development workings

BHOP is seeking to extend mining development activities following the identification of deposits in the northern section of CML7. The extension of underground development workings in Main Lode Blocks 13, 14 and 15 requires a tunnel/drive with dimensions of approximately 5.0 x 5.8 m, which would be structurally supported in accordance with the site's current ground support installation standard (BHO-STD-MIN-003).

The proposed approximately 3.5 kilometres (km) of development would be a continuation of existing underground development workings and will not require surface disturbance. Any inert waste rock generated would be used for waste rock capping of free areas, suitable mineralised ore would be processed through the processing plant, and any remaining waste rock is to be placed in TSF3.

3.1.3 Hours of operation

Construction of the ventilation intake via raise boring would be carried out 24 hours a day. Concrete delivery and pouring would only take place during daylight standard construction hours (7:00 am–6:00 pm). The proposed development workings would be undertaken wholly underground and as they are not anticipated to result in any impacts at the surface, the workings would be carried out 24 hours a day.

Development blasting activities to be conducted in accordance with current Project Approval (PA) and Environmental Protection Licence (EPL).

3.1.4 Workforce

The proposed development workings would use existing personnel at the site with no additional workforce required to be employed. The following workforce will be required for the surface ventilation intake:

- concrete forming – approximately 4 personnel
- raisebore – approximately 9 personnel
- evase construction and installation – approximately 6 personnel.

3.1.5 Schedule

The approximate schedule and activities required for installation of the surface ventilation intake include:

- surface site preparation including concrete pad forming and pouring – approximately 5 days
- raise boring of 4 m diameter hole from the 7 Level to the surface:
  - pilot hole – approximately 15 days (24 hour operation)
  - reaming 4 m hole – approximately 60 days (24 hour operation)
- placement of surface evase and securing – approximately 7 days.

3.1.6 Modification justification and alternatives considered

A review of possible new ventilation intake locations was undertaken by BHOP, which determined the proposed location is the most suitable for the following reasons:

- it is located within CML7 and is not within any surface exclusion or heritage area.
- the ground in this location is stable (due to minimal overburden being in place on the surface)
- it allows a vertical link the ventilation intake to existing underground workings at a distance of 178 m

An alternative location for the ventilation intake was considered,70m SSE of the current location (see Appendix A). The location was 10 m west of Diamond drillhole (MLDD 4785), which crossed the path of the alternative raisebore around the midpoint of intake raise. This location was not selected due to the depth of overburden and proximity to residences. The preferred location selected for the ventilation intake is 10 m east of the MLDD4783 collar point which intersects the proposed ventilation intake at approximately midpoint. The installation of the ventilation intake and the extension of mining development are critical to the ongoing operations of the Rasp Mine. Without additional ventilation for the northern areas of the mine, identified and future mining deposits will not be able to be mined, which in turn will impact the viable operation of the mine.

4 Statutory context

4.1 Environmental Planning and Assessment Act 1979

4.1.1 Approval pathway

The project was originally approved under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Under clause 6 of Schedule 2 of the Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017, the project was transitioned to State significant development (SSD) by order, which took effect by publication in the NSW Government Gazette on 4 July 2018.

The MOD 11 modification application is considered to meet the classification under Section 4.55(1A) of the EP&A Act, as a modification involving minimal environmental impact, as:

- There would be no change to key aspects of the project, including annual and total ore extraction, ore processing and transportation systems.
- There would be no change to the way in which the mine is ventilated, and only introduces a minor piece of additional equipment to augment the existing ventilation system.
- The ventilation air intake would be located in an area which has already been disturbed for mining activities and no new land is required for its development.
- The proposed changes to operations are unlikely to change the approved impacts of the mine overall.

The proposed modification is therefore also considered to allow the project to remain substantially the same development as approved under the last modification prior to the project's transition to SSD.

4.1.2 Approval authority

The Minister for Planning (or delegate) is the approval authority for the proposed modification.

4.2 Planning instruments and policies

4.2.1 State Environment Planning Policies

The State Environment Protection Policy (Resources and Energy) 2021 (Resources and Energy SEPP) aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of NSW.

Part 2.3, Clauses 16 to 23 of the Resources and Energy SEPP require consideration to be given to the significance of the resource, the compatibility of projects with other surrounding land uses, including the existing and potential extraction of minerals, natural resource management and environmental management, resource recovery, transportation and rehabilitation. The information presented in this modification report addresses each of the matters for consideration prescribed in the abovementioned clauses, as applicable.

Clauses 16 and 20 of the Resources and Energy SEPP requires the consent authority to consider the compatibility of the Project with other nearby land uses and impacts on significant water resources, threatened species and greenhouse emissions. Existing and approved land uses in the vicinity of the proposed modification consist of:

- Delprats Shaft historic workings
- current mining infrastructure and operations of BHOP.

The proposed modification would not change these existing uses and would operate without impacting these users beyond the impacts currently approved. The Café and Line of Lode lookout and Miners Memorial are also located on CML7 beyond Delprats Shaft and would not be impacted by the proposed modification.

There would be no additional water usage requirements in addition to that already assessed and approved for the site.

4.2.2 Broken Hill Local Environmental Plan 2013

The majority of the mine, including the area proposed for Mod 11 activities, is within Special Purpose Zone 1 (SP1) Special Activities – Mining [BHCC Local Environment Plan (LEP), 2013]. Therefore, under the Broken Hill Local Environmental Plan 2013 the site is zoned for mining purposes and mining is permissible with consent.

4.2.3 Broken Hill Development Control Plan No 11 Management of Lead Contamination

Development Control Plan (DCP) 11 provides guidelines for the management of issues relating to lead contamination. Lead contamination is closely controlled under the approved management plans for the site. The activities would be mostly undertaken beneath the surface. Any minor surface preparation works required for the ventilation intake be within in a bunded area and closely controlled and monitored so that the currently approved levels of lead contamination would not change.

4.3 Changes to conditions

There are no conditions which are considered that require to be changed as a result of the proposed modification.

5 Stakeholder engagement

5.1 Overview of consultation

BHOP has undertaken a commensurate level of targeted consultation with Government agencies and Broken Hill City Council for the proposed modification, given the minor nature of the proposal. Consultation activities are summarised in Table 5.1.

Table 5.1 Consultation summary

Agency	Date	Comments
NSW Department of Planning and Environment (DPE)	22/02/2023	BHOP provided a presentation on the current mine operations and discussed the future modifications required including a new ventilation intake and mining development to the north of CML7 (MOD11). The presentation was followed by a surface and underground tour of the mine for the proposed ventilation intake and underground development extensions.
NSW Resources Regulator Safety (RRS)	20/06/2023	Following a presentation provided by BHOP, the Resources Regulator enquired about the design of intake evase, given its location adjacent to TSF2. BHOP explained that the majority of the dam is 'in pit' and only the approximately 7m above the 'pit rim' would be considered for a dam break. The surface evase was designed to withstand the rare event of a dam break or embankment failure. No further concerns were raised.
NSW Environment Protection Authority (EPA)	21/06/2023	BHOP provided a presentation to the EPA on the proposed modifications. The EPA enquired about general mitigation measures and whether a variation to the EPL would be required but were ultimately satisfied with the proposed drilling method. No further concerns were raised.
Broken Hill City Council (BHCC)	27/06/2023	BHOP provided a presentation to Council on the proposed modification. No major concerns were raised regarding the proposed works and support for the continuation of operations was provided.
NSW Resources Regulator Environment (RRE)	29/06/2023	BHOP provided a presentation to the Resources Regulator for the proposed modification. No major concerns regarding the proposed modification were raised.
NSW Mining, Exploration and Geoscience (MEG)	5/07/2023	BHOP made a presentation to MEG about the proposed modification. No major issues or concerns were raised. Clarification that this modification is a continuation of existing mining within current approved extraction rates was provided by BHOP.
Dam Safety NSW (DSNSW)	10/07/2023	Following a presentation to Dam Safety by BHOP, no major concerns regarding the proposed works were raised. The involvement of the TSF design engineer (from Golder WSP) was discussed and provided confidence that dam integrity would not be impacted. BHOP provided confirmation that the majority of the dam is 'in pit' and only the approximately 7 m above the 'pit rim' will be considered for a dam break. The surface evase was designed to withstand the rare event of a dam break or embankment failure. Following this, Dam Safety Reporting requirements were discussed. Regarding the development in Main Lodes, Dam Safety confirmed that an administrative update to the approved 'mining footprint' is required, particularly mining in the vicinity of the Declared Dam, which BHOP agreed and will progress.

6 Assessment of impacts

6.1 Noise impact assessment

A noise impact assessment for MOD 11 was conducted by EMM consulting on behalf of BHOP and is attached at Appendix B. The noise impact assessment focused on construction noise. Development works are undertaken underground, and the intake allows passive ventilation and is not mechanised, therefore if managed in accordance with current mitigation procedures, operational noise impacts are expected to be negligible.

6.1.1 Existing environment

The assessment locations adopted for this assessment are summarised in Table 6.1 and displayed in Figure 6.1. These locations are representative of nearest and/or most-affected residential receivers and are consistent with those adopted in previous noise assessments, listed in the approval and Environment Protection Licence 12559 (EPL).

Table 6.1 Assessment locations

Assessment location ID	Location	Coordinates (MGA94 Zone 54)	
		Easting	Northing
A1	Piper St North	544110	6462598
A2	Piper St Central	543763	6462312
A3	Eyre St North	543555	6462322
A4	Eyre St Central	543324	6462003
A5	Eyre St South	543140	6461859
A6	Bonanza and Gypsum Streets	542833	6462000
A7	Carbon St	542604	6462718
A8	South Rd	542923	6462744
A9	Crystal St	542926	6463052
A10	Garnet and Blende Streets	543158	6463633
A11	Crystal St	544210	6464144
A12	Crystal St	544761	6464527
A13	Eyre St North	544592	6463059
A14	Piper St North	544532	6462860

KEY

- Noise assessment location
- Mining lease CML7
- Train station
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line

Ventilation intake locations

- Proposed
- Existing

Underground workings

- Proposed
- Existing

Source: EMM (2023); CBH (2021); DPE (2019); DFSI (2017)

\\emmsvr1\EMM3\2021\E210999 - Rasp Mod 11\GIS\02 Maps\NIA001 NoiseAssessmentLocations 20230719 02.mxd 24/07/2023

New air intake location, underground workings and noise assessment locations

Rasp Mine Modification 11
Modification report
Figure 6.1

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The nearest assessment location is located approximately 340 m to the north of the proposed new ventilation intake, namely A12 (Crystal Street).

6.1.2 Methodology

The noise assessment was undertaken in accordance with The *Interim Construction Noise Guideline* (DECC 2009) (ICNG). Due to the type of construction works proposed and anticipated duration, this assessment has adopted a quantitative assessment approach. Quantitative modelling of construction and operational noise was completed using DGMR 'iNoise' noise prediction software.

The model incorporated factors such as the lateral and vertical location of plant and equipment, source-to-receiver distances, ground effects, atmospheric absorption, topography and meteorological conditions. Three-dimensional digitised ground contours of the site and surrounding land were incorporated to account for topographic effects.

A review of the proposed construction activities determined that concrete works (concrete pouring using concrete mixer trucks) during the surface site preparation will be the worst-case construction scenario during standard hours. During out-of-hours (OOH) periods, raise boring activities (24 hours) including pilot hole drilling (approximately 15 days in duration) and reaming (approximately 60 days in duration) will be the worst-case scenarios.

6.1.3 Impact assessment

i Construction – concrete works

Noise levels predicted for the concrete works during the ICNG standard hours were modelled. These were then combined with existing (approved) site noise and compared to the ICNG NML for standard hours as presented in Table 6.2.

Table 6.2 Predicted site noise levels during concrete works

Assessment location	Predicted concrete works + existing operation $L_{Aeq,15min}$, dB	ICNG NML $L_{Aeq,15min}$, dB	Exceedance, dB
	Standard hours	Standard hours	Standard hours
A1	40	45	Nil
A2	40	45	Nil
A3	44	49	Nil
A4	44	49	Nil
A5	44	49	Nil
A6	48	53	Nil
A7	45	50	Nil
A8	48	53	Nil
A9	46	51	Nil
A10	42	47	Nil
A11	46	51	Nil

Table 6.2 Predicted site noise levels during concrete works

Assessment location	Predicted concrete works + existing operation $L_{Aeq,15min}$, dB	ICNG NML $L_{Aeq,15min}$, dB	Exceedance, dB
	Standard hours	Standard hours	Standard hours
A12	48	51	Nil
A13	40	45	Nil
A14	40	45	Nil

Notes: 1. ICNG standard hours: Monday to Friday 7:00 am to 6:00 pm and Saturday 8:00 am to 1:00 pm. No work on Sundays or public holidays.

Modelling results show that predicted site noise levels during the proposed concrete works will satisfy the ICNG NML at assessment locations during standard hours. Site noise levels during the proposed concrete works are also predicted to satisfy the ICNG highly noise affected level.

ii Construction – raise boring

Noise levels predicted for the raise boring during the ICNG standard hours and OOH periods were modelled. These were then combined with existing (approved) site noise and compared to the ICNG NML for standard hours and OOH periods as presented Table 6.3. Predictions during the raise boring activities are shown for a generator with a sound power level of 106 dB(A).

Table 6.3 Predicted site noise levels during raise boring

Assessment location	Predicted raise boring + existing operation $L_{Aeq,15min}$, dB				ICNG NML $L_{Aeq,15min}$, dB				Exceedance, dB			
	Standard hours	Day OOH	Evening OOH	Night OOH	Standard hours	Day OOH	Evening OOH	Night OOH	Standard hours	Day OOH	Evening OOH	Night OOH
A1	38	38	32	32	45	40	37	35	Nil	Nil	Nil	Nil
A2	40	40	28	28	45	40	37	35	Nil	Nil	Nil	Nil
A3	44	44	29	29	49	44	41	39	Nil	Nil	Nil	Nil
A4	39	39	27	27	49	44	41	39	Nil	Nil	Nil	Nil
A5	35	35	25	25	49	44	41	39	Nil	Nil	Nil	Nil
A6	33	33	24	24	53	48	41	39	Nil	Nil	Nil	Nil
A7	36	36	27	27	50	45	42	36	Nil	Nil	Nil	Nil
A8	35	35	28	28	53	48	39	39	Nil	Nil	Nil	Nil
A9	36	36	30	30	51	46	39	39	Nil	Nil	Nil	Nil
A10	37	37	31	31	47	42	41	35	Nil	Nil	Nil	Nil
A11	42	42	35	35	51	46	39	39	Nil	Nil	Nil	Nil
A12	46	46	43	43	51	46	39	39	Nil	Nil	4	4

Table 6.3 Predicted site noise levels during raise boring

Assessment location	Predicted raise boring + existing operation $L_{Aeq,15min}$, dB				ICNG NML $L_{Aeq,15min}$, dB				Exceedance, dB			
	Standard hours	Day OOH	Evening OOH	Night OOH	Standard hours	Day OOH	Evening OOH	Night OOH	Standard hours	Day OOH	Evening OOH	Night OOH
A13	40	40	35	35	45	40	35	35	Nil	Nil	Nil	Nil
A14	39	39	33	33	45	40	35	35	Nil	Nil	Nil	Nil

Notes: 1. ICNG standard hours: Monday to Friday 7:00 am to 6:00 pm and Saturday 8:00 am to 1:00 pm. No work on Sundays or public holidays.

2. ICNG day OOH: Saturday 1:00 pm to 6:00 pm and Sundays or public holidays 7:00 am to 6:00 pm.

3. ICNG evening OOH: everyday 6:00 pm to 10:00 pm.

4. ICNG night OOH: Monday to Saturday 10:00 pm to 7:00 am and Sundays or public holidays 10:00 pm to 8:00 am.

Assuming a maximum sound power level of 106 dB(A) for the raise boring generator, modelling results show that predicted site noise levels during the raise boring activity will satisfy the ICNG NML at most assessment locations. The exception is at A12 (Crystal Street) where site noise levels (from existing approved operations and construction combined) during the raise boring activity are predicted to exceed by up to 4 dB the relevant ICNG NML during the evening and night OOH periods. Site noise levels during the proposed raise boring are predicted to satisfy the ICNG highly noise affected level.

6.1.4 Management and mitigation

Feasible and reasonable management and mitigation measures will be required to be implemented to reduce potential noise impacts from proposed raise boring activities (generator use) during the evening and night OOH periods. Options will be evaluated prior to the commencement of construction and the most effective mitigation measure or combination of mitigation measures will be implemented. The following options will be considered:

- A generator with a sound power level of 100 dB(A) would satisfy the ICNG NML at all locations.
- A temporary noise barrier targeting noise in the direction of assessment location A12 (and adjacent residences on Crystal Street) should be sufficient in reducing generator noise (by at least 5 dB) to satisfy the ICNG NML for the evening and night OOH periods. To achieve appropriate screening, the noise barrier should be positioned relatively close to the generator, be higher than the visible source-to-receiver line of sight and be approximately five times wider than its height.
- A temporary enclosure around the generator, which would provide maximum reduction at all surrounding residences.

Furthermore, standard construction management and mitigation measures currently implemented for construction works on-site (i.e. noise monitoring, operational strategies, source control strategies, noise barrier controls and community consultation) in accordance with the approved Rasp Mine Noise Management Plan (NMP) dated April 2023 continue to be implemented for the duration of the construction of the evase. The noise monitoring requirements in the NMP include:

- noise monitoring on an annual basis with results reported to the EPA for review
- permanent real time noise monitoring on site

- independent noise audit every three years.

6.1.5 Conclusion

Noise levels for the proposed new ventilation intake are not predicted to increase existing approved site operational noise levels at assessment locations above the current PA and EPL noise limits for the day, evening and night periods.

Noise levels during concrete works associated with the new ventilation intake construction during ICNG standard hours are predicted to satisfy the relevant NML at all assessment locations.

Noise levels during raise boring activities associated with the new ventilation intake construction during ICNG standard hours and OOH periods are predicted to satisfy the relevant NML at most assessment locations. The exception is at one assessment location (A12) where noise levels are predicted to exceed the relevant NML during the evening and night OOH periods.

Feasible and reasonable management and mitigation measures recommended by the assessment will be implemented by BHOP as a minimum to minimise potential noise impacts from proposed evening and night OOH construction activities. BHOP has established a hotline for enquiries about ongoing development work and construction activities, in addition to notifying residents that may be affected by the proposed modification.

6.2 Water assessment

A water assessment was conducted by EMM consulting on behalf of BHOP and is an appendix to the modification report (Appendix C).

6.2.1 Existing environment

The main uses for water on site are ore processing, and operation of underground machinery. Minor uses of water include dust suppression, fire water, contractor facilities, evaporation, and vehicle washing.

Fresh water is supplied to the site from the Broken Hill town water supply. Saline groundwater is intercepted by the underground workings and pumped to the surface. This water is then used on site for ore processing, and operation of underground machinery. Water used for the operation of underground machinery is collected in sumps, pumped to the surface, stored temporarily in ponds, and then pumped back underground for operation of underground machinery.

Rainfall runoff within the site boundaries is captured in storm water management ponds, or in unlined depressions as the mine site has no external surface water catchments. Typically, rainfall runoff evaporates, and it may be pumped into the mine water storage ponds if required.

6.2.2 Impact assessment

The water assessment identified the following risks that will need to be managed during construction activities:

- mobilisation of sediment laden water in stormwater runoff from the ventilation intake area during surface site preparation activities
- groundwater inflows to the ventilation intake and underground workings exceeding BHOP's groundwater entitlements
- inundation of the ventilation intake due to overland flows and flooding.

Construction of the ventilation intake would require site preparation activities over seven days and stormwater runoff from the ventilation intake construction area would drain to the existing dirty water management system. Construction of the air intake is estimated to require 19.7 ML of water which will be sourced from the Broken Hill town water supply. The ventilation intake disturbance area is a small portion of the overall mine footprint and would contribute an equally small portion of runoff to the water management system. Stormwater runoff from the ventilation intake construction area is not anticipated to result in any material changes to the water quality of the mine water management system.

Excavations for the ventilation intake and extension of underground workings have the potential to intercept groundwater. Initial geotechnical investigations completed by BHOP indicate significant volumes of groundwater are unlikely to be intercepted by the raise borer or extension of underground workings, which is in line with historical observations that groundwater inflows primarily occur when excavations intercept fractures in the rock which contain water.

The extension of underground workings is expected to intercept groundwater at around the historical rate of 0.5 ML per 1 kt of ore produced. It is estimated approximately 250 ML/year of groundwater will be intercepted if mining continues at the current approved rate of 500 kt ore per annum.

The ventilation intake is to be installed north of Blackwood's Tails Storage Facility (TSF2), adjacent to an existing embankment. The ventilation intake will not be at risk of inundation due to local drainage or flooding as:

- the ventilation intake is sited away from mapped watercourses and drainage lines
- the surface evase will act to divert local stormwater runoff away from the ventilation intake
- the ventilation intake opening will be raised several meters above the ground to prevent inundation of water from the immediate surrounding area.

6.2.3 Management and mitigation

The identified risks will be primarily mitigated through design and undertaking works in accordance with BHOP's existing water management plan.

BHOP has a water access licence (WAL 31065) to extract up to 370 ML/year of groundwater from the Adelaide Fold Belt MDB Groundwater Source. BHOP can also receive an additional carryover allocation each year of up to 10% of the water access licence volume, resulting in a total entitlement of 407 ML/year when this allocation is applied. Initial geotechnical investigations completed by BHOP indicate significant volumes of groundwater are unlikely to be intercepted by the raise borer or extension of underground workings. Should groundwater be intercepted during excavations, it is unlikely to result in a material increase in groundwater take above historical/expected values (260 ML/year).

BHOP's water access licence limit is approximately 120 ML greater than the estimated groundwater take volumes associated with Mod 11. Based on historical groundwater interception rates, it is unlikely the ventilation intake would intercept enough groundwater to exceed BHOP's water access licence limit of 370 ML/year (or 407 ML/year with carryover).

6.2.4 Conclusion

The water assessment (Appendix C) indicated that:

- Surface works associated with construction of the ventilation intake are expected to have negligible impact on the water quality of the water management system. The ventilation intake inlet is not expected to be inundated by flood waters or local overland flows or water associated with a dam break.

- The combined estimated groundwater take associated with the ventilation intake (4.5 ML) and extension of underground workings (250 ML/year) equates to a total groundwater take of 254.5 ML for the year in which the ventilation intake is constructed, which is well within BHOP's water access licence limit.
- Water supply and dewatering of the underground workings will be in accordance with BHOP's existing water management plan.

6.3 Other impacts

Table 6.4 contains a list of other potential impacts and mitigation measures associated with Mod 11.

Table 6.4 Summary of other impacts

Issue	Assessment
Air quality	An air quality impact due diligence has been undertaken for the proposed modification (Appendix D). The raised boring procedure reams from underground and therefore does not produce surface dust. Any dust created underground is controlled by water, water sprays and dust curtains. The concrete raised bore pad installation and the surface enlargement are minor surface construction tasks that will only take one to two days to complete. The following standard environmental management protocols must be in place: • pre-watering of dust generating material • keeping the distance between excavator buckets and emplacement areas to a minimum • not completing works when wind is blowing towards receptors at Proprietary Square • acting upon any short-term alerts/alarms from nearby particulate monitoring equipment. Mitigation measures already in place are a Tapered Element Oscillating Microbalance (TEOM) to measure changes to the particulate matter and an automated sprinkler system. Dust monitoring will continue at the Proprietary Square tennis court for the duration of the project. No further mitigation measures are considered necessary to manage the short-term construction of the ventilation intake.
Blasting and vibration	A blasting vibration impact assessment was completed for the proposed modification (Appendix E). The ventilation intake will be developed using mechanical raise boring methods and will not require blasting. Extension of development, such as inclines and sill drives will be carried out using conventional blasting methods already in use at Rasp Mine, with 45 mm diameter blastholes and approximate charge mass of 5 kg to 6 kg per hole and long period delay detonators. Peak vector ground vibration levels should remain well below the regulated or recommended limits at all identified sensitive receivers for the development blasting proposed in Mod 11. Based on the minimum distances from proposed development to identified sensitive receivers, blasting can be carried out in compliance with ground vibration limits specified by Dams Safety NSW. Blasting is also highly unlikely to exceed residential amenity limits as specified by Rasp Mine EPL conditions and ANZEC guidelines. Higher limits for closest non-residential infrastructure, suggested by Australian Standard AS2187, are unlikely to present compliance issues with respect to blasting requirements for this modification. Monitored data should be used to validate modelling assumptions and adjust blast design, as required. In the unlikely event of a non-compliance blast outcome, additional control methods are available and include: • the use of accurate electronic initiation to achieve sequential hole by hole firing. • the use of shorter round length to reduce charge mass per hole when blasting at the closest proximity to sensitive receivers.

Table 6.4 Summary of other impacts

Issue	Assessment
Geotechnical	A geotechnical review for the proposed modification was completed by BHOP (Appendix F). The new ventilation intake is located in an area that is not impacted by historical mining and is considered to be relatively stable, therefore significant impacts to geology and soil are not expected. Embankment 2, which is the TSF embankment closest to the proposed ventilation intake location, is located a sufficient distance (around 40 m) from the edge of the embankment so that it is unlikely to affect the integrity of the TSF. The embankment has been constructed on strong bedrock which would not be liable to fracturing as a result of the proposed raisebore drilling. The TSF is suitably lined to prevent seepage and the design has factored in earthquake magnitude seismic events to ensure its safety. Notwithstanding, the surface evase is being designed by qualified engineers and in consultation and agreement with the TSF Design Engineer from WSP. The evase is being designed and will be constructed to withstand the velocities and volumes of a very unlikely event of a dam wall break to prevent potential ingress into underground workings.
Traffic	The modification application will only require 40 concrete trucks. The trucks would come from the Mawsons Broken Hill Concrete & Landscaping Supply Center concrete batching plant located adjacent to the mine and would travel the short distance from the plant to the construction area on local roads. The route would include Holten Drive, Menindee Road, Crystal Street and Iodide Street. The truck movements would be undertaken over one day. The roads have limited traffic movements and the trucking campaign will not significantly impact local traffic. are not expected. BHOP will contact local residents ahead of the commencement of construction activities. Appropriate traffic control measures (signage and traffic controllers) will be used to minimise safety impacts
Heritage	Proposed Mod 11 is not expected to have impacts on any of the existing heritage building or items at the site. The project and this proposed modification respects known heritage values and it is anticipated that the modification will have minimal to no impact on these values. Field surveys for the EIS indicated that no indigenous archaeology exists in the project area.
Waste	All waste rock generated by the development workings that have 0.5% lead would be retained underground and stockpiled for use for backfilling in the future. Waste rock with less than 0.5% lead may be used on the surface for approved purposes and within allowable limits in accordance with PA07_0018. Existing strict protocols to manage emplacement of waste rock in underground workings will continue to apply for the proposed modification. If there is significant economic potential for the material, it may be stockpiled and processed.
Visual	The ventilation intake will be constructed using raiseboring methods and following construction completion the only remaining surface component would be an evase. The evase will have a height of 8 m and sit slightly above the embankment (as shown in Figure 3.4). The evase will be silver or grey coloured. Photograph 6.1 is a viewpoint from the nearby public road and Photograph 6.2 is a viewpoint from the nearest private residence. It appears that the evase is situated behind a raised embankment surrounding the mine site and will have some vegetation coverage. The works are to be undertaken in an existing open cut mine site that has been operating for over 137 years, located in a precinct that has been heavily dominated by mining development, as such it is anticipated that visual impacts of Mod 11 will be negligible.
Biodiversity	The ventilation intake and the development workings are within an area which has already been disturbed and cleared of all vegetation to allow for mining activities. The proposed modification does not require additional clearing to be undertaken. The proposed modification would not increase impact on biodiversity values and does not trigger the requirements for a Biodiversity Development Assessment Report under the *NSW Biodiversity Conservation Act 2016.*

Photograph 6.1 Viewpoint from public road (Corner of Crystal Street and Menindee Road)

Photograph 6.2 Viewpoint from 21 Proprietary Square, Broken Hill, NSW 2880

7 Justification of modified project

7.1 MOD 11 impact

Potential impacts that may result from the proposed modification have been examined in this report. The assessment of environmental issues has been multi-disciplinary and involved consultation with DPE and other agency stakeholders (including Dams Safety NSW, BHCC, Resources Regulator, and the EPA).

The proposed modification will not result in significant biophysical, social or economic impacts and this report has identified that any residual impacts can be appropriately managed in accordance with the existing conditions of approval. All activities will continue to be undertaken in accordance with the approved management plans for the mine.

7.2 MOD 11 benefits

The proposed modification is seeking to provide a ventilation intake for workers and extend existing development into Blocks 13, 14 and 15.

The proposed modification will allow BHOP meets its legislative requirements as outlined in the Work, Health and Safety (Mines and Petroleum sites) Regulations 2022 and will allow access future potential extractable resources. Therefore, the proposed modification is critical to the continued operation of the Rasp Mine in both legislative and operational contexts.

The ongoing development of the resource at Rasp will provide indirect social and economic benefits through increased job security for its employees, contractors and subsequent benefits to the local and regional economy through income and expenditure, and more widely in NSW through royalty payments. The proposed modification is an alteration with minimal environmental impact to an approved facility, which allows orderly and economic access to and use of a resource. All aspects relating to environmental management will continue in accordance with the project approval and the approved management plans for the mine.

7.3 Ecological sustainable development

Under Section 516A of the EPBC Act, Commonwealth organisations have a statutory requirement to report on their environmental performance and how they accord with, and advance, the principles of ESD.

Australia's National Strategy for Ecologically Sustainable Development (AGESDSC 1992), defines ESD as "using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased". The four principles of ESD (Clause 7(4) of Schedule 2 of the EP&A Regulation) are:

- Precautionary principle – the precautionary principle states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- Inter-generational equity – the principle of inter-generational equity is that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- Conservation of biological diversity and maintenance of ecological integrity – the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.
- Improved valuation and pricing of environmental resources – improved valuation, pricing and incentive mechanisms should be promoted.

The overall objectives of ESD are to use, conserve and enhance natural resources. This ensures that ecological processes are maintained facilitating improved quality of life, now and into the future. BHOP is committed to the principles of ESD and understands that biophysical, social and economic objectives are interdependent. BHOP acknowledges that a well-designed and effectively managed operation will avoid significant and/or costly environmental impacts or degradation.

The proposed modification has been designed to minimise impacts to a level which is as low as is reasonably practicable. The proposed modification does not change the approved functions of the mine and would not result in any new surface disturbance. No additional management measures are therefore required to mitigate residual impacts.

Consideration has also been given to appropriately identifying, avoiding, mitigating and managing environmental risks to demonstrate environmental due diligence and will provide for ongoing and adaptive monitoring and management of the operation in line with the principles of ESD.

7.4 Conclusion

BHOP has made a modification request (Mod 11) pursuant to Section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), for a ventilation intake and development extension works at Rasp under Project Approval 07_0018. These activities are required to allow continued access to develop future ore reserves and to safely ventilate the workings.

The proposed modification would result in negligible or minimal environmental impacts, and the proposed modification would be strictly controlled in accordance with current approved limits, using the existing strict site protocols and in accordance with approved management plans and relevant guidelines.

Overall, the proposed modification has merit and warrants granting of approval.

References

Australian Government Ecologically Sustainable Development Steering Committee (AGESDSC) 1992, *National Strategy for Ecologically Sustainable Development,* Ecologically Sustainable Steering Committee

Broken Hill City Council 2013, *Local Environmental Plan 2013*

Department of Planning, Industry and Environment 2021, *State Significant guidelines – preparing a modification Report*

Broken Hill Operations Pty Ltd (BHOP), 2021. *Rasp Mine Modification Report (MOD6) – Kintore Pit TSF3*, August 2021

EMM Consulting Pty Limited (EMM Consulting), 2021. *Rasp Mine Modification 9 - Modification Report*, prepared on behalf of BHOP, 24 August 2021

EMM Consulting, 2022. *Rasp Mine Modification 10 – Modification Report*, Prepared on behalf of BHOP, November 2022

BHOP, 2023. *Noise Management Plan (BHO-PLN-ENV-009) – Update in line with MOD10*, April 2023

Appendix A

Geotechnical Assessment – Location Review

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Blackwoods Fresh Air Shaft New Location Geotechnical Review

1. Introduction

The proposed location for the Blackwoods Fresh Air Shaft has been moved 70m to the NNE. As the original geotechnical review was based on information from 2 Diamond drillholes, MLDD4783 and MLDD4785 this is considered to make no changes to the findings, conclusions or recommendations in the original review from December 2022.

The original shaft location shown in yellow below was located 10m to the west of MLDD4785, which passed from south to north around the midpoint of the shaft.

The new location in red below is located 10m to the east of the MLDD4783 collar point which intersects the proposed shaft at approximately the midpoint of the shaft.

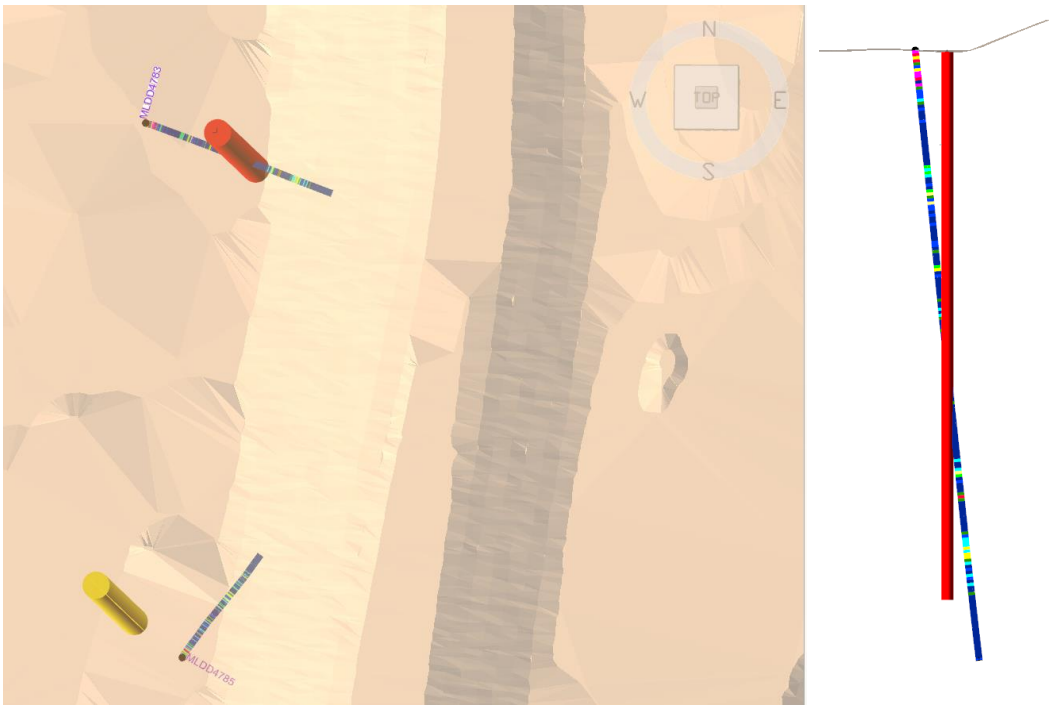

Figure 1: Old (yellow) and new (red) fresh air shaft location. With section looking NNE.

Appendix B
Noise Impact Assessment

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Ground floor 20 Chandos Street
St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590
02 9493 9500
www.emmconsulting.com.au

14 July 2023

Joel Sulicich
Health Safety Environment and Training Manager
Broken Hill Operations Pty Ltd
Eyre Street, Broken Hill NSW

Re: Rasp Mine Modification 11 - Noise impact assessment

Dear Joel,

1 Introduction

EMM Consulting Pty Limited (EMM) has been engaged by Broken Hill Operations Pty Ltd (BHOP) to prepare a noise impact assessment (NIA) for the proposed Modification 11 (Mod 11) of Project Approval PA 07_0018 (PA) for the Rasp Mine (the site) in Broken Hill, NSW.

BHOP was granted approval for Modification 10 (Mod 10) of its PA in December 2022 to allow for tailings harvesting and temporary stockpiling in TSF2 before emplacement into the new TSF3 once constructed.

BHOP is now seeking to modify its PA (Mod 11) to allow the following at the site:

- the installation of a new fresh air surface ventilation intake
- extension of underground mining development into Main Lode (ML) Blocks 13, 14 and 15.

The purpose of this letter is to provide the findings of our assessment of the proposed Mod 11 construction activities and operations, noise levels likely to be generated as a result and an assessment of potential noise impacts at surrounding residential receivers.

The proposed mining extension will be limited to underground and will not change currently approved surface mining operations (e.g. haul truck movements). Therefore, no noise impact is anticipated from construction activities and operations associated with the proposed underground mining extension. This assessment will focus primarily on the potential impacts associated with the installation of the new fresh air surface ventilation intake and its operation.

This assessment references the project approval, environment protection licence and relevant noise guideline as follows:

- NSW Department of Planning, Industry and Environment, Consolidated Project Approval PA 07_0018 Mod 10, December 2022

- NSW Department of Environment and Climate Change, Interim Construction Noise Guideline, 2009
- NSW Environment Protection Authority, Environment Protection Licence 12559, 28 March 2023
- NSW Environment Protection Authority, Noise Policy for Industry, 2017.

2 Proposed modification

2.1 Overview

The installation of a new fresh air surface ventilation intake (hereinafter referred to as air intake) will allow for the provision of suitable ventilation to workers in the northern underground areas of the site and to extend underground development workings in ML Blocks 13, 14 and 15.

The site currently operates four air intakes to the underground workings of the mine, including:

- No. 7 shaft
- No. 6 airway
- Delprats shaft
- the mine portal entry.

As underground development progresses further to the north, an additional air intake is required to ensure that adequate ventilation is provided for underground workers in the northern areas of the site. A review of possible locations for the new air intake was completed considering site conditions, the location of the underground development workings extension, ground stability and ability to link to existing underground workings.

The locations of the four existing and proposed new air intakes are shown in Figure 2.1.

The site currently utilises two Howden 875kW variable speed mixed-flow axial fans located at the 10 Level underground to provide mechanical ventilation throughout the underground workings. It should be noted that the new intake is a fresh air intake only, not an exhaust, and no additional mechanical ventilation (e.g. ventilation fans) is proposed as part of Mod 11. The existing surface exhaust for underground mine ventilation is part of existing (approved) site operations and no change is proposed as part of Mod 11.

In summary, the proposed Mod 11 will not:

- change the approved extraction rate, processing rate and transportation arrangements
- change the general operation of the Tailings Storage Facilities
- change the way in which the underground mine is ventilated (i.e. no additional fans or exhaust).

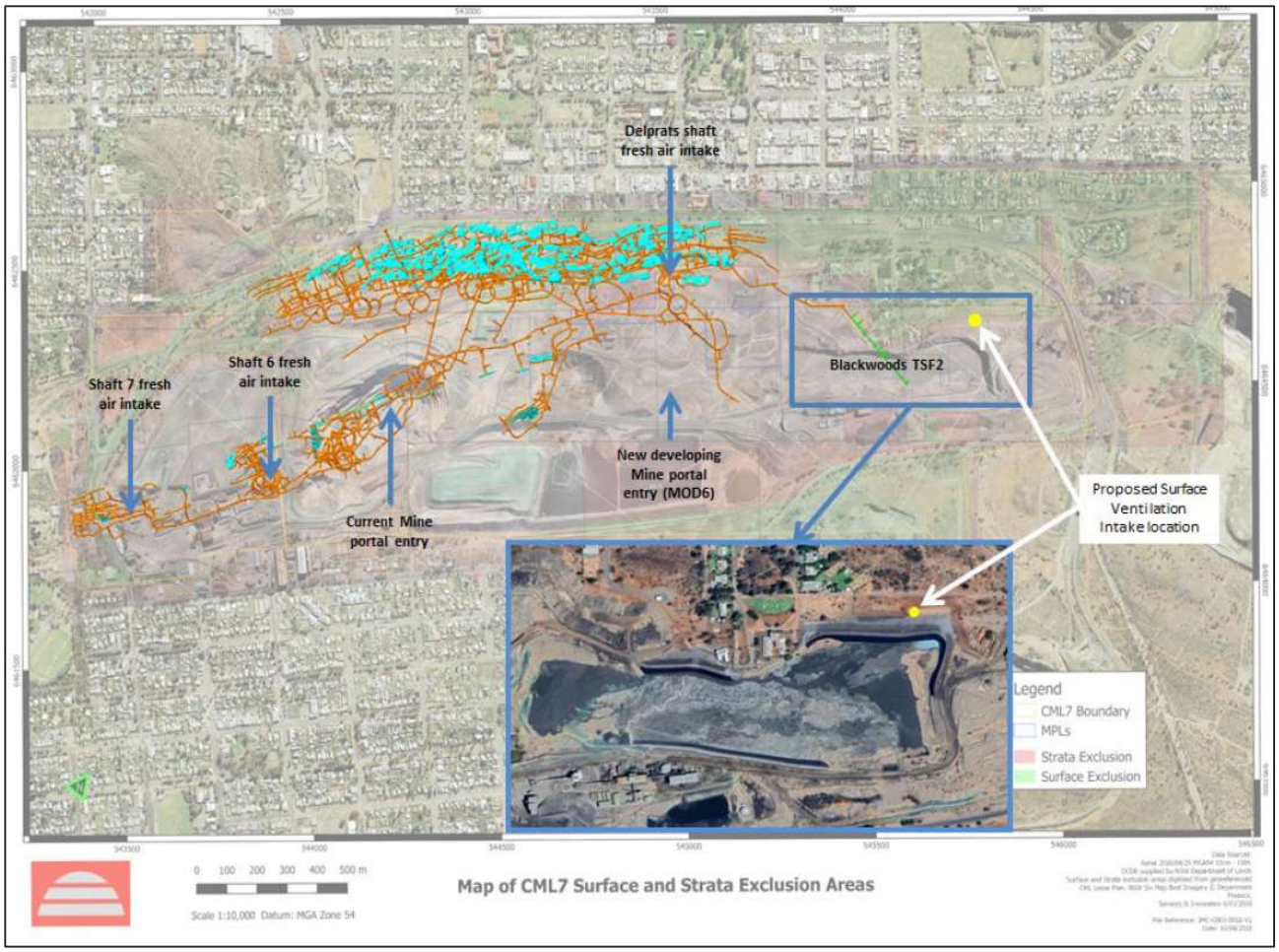

Figure 2.1 Existing and proposed new air intakes

2.2 Construction

The installation of the proposed new air intake will require the use of a raise boring machine (raise borer). A raise borer is generally used to excavate a circular hole between two levels of a mine without the use of explosives.

The raise borer will excavate a circular hole between the 7 level (underground) and the surface, a vertical distance of approximately 230 m. The raise borer will be set up on the surface on an evenly laid platform. A small-diameter hole (pilot hole) is drilled to the target level, the 7 level; the diameter of the pilot hole is typically 230-445 mm, large enough to accommodate the drill string. Once the drill has broken into the opening on the 7 level, the drill bit is removed, a reamer head (required diameter of 4 m) is attached to the raise borer string and raised back towards the surface. The boring cuttings from the reamer head fall to the floor of the lower level and will remain underground.

Other surface construction activities would be required including:

- installing a concrete raise bore pad and surface evase footing
- installation of the surface evase into position and securing.

Construction activities, schedule and duration associated with the proposed new air intake installation are as follows:

1. Surface site preparation including concrete pad forming and pouring – day period only for approximately five days.

2. Raise boring from the 7 level (underground) to the surface:

    a) Pilot hole drilling – 24-hours for approximately 15 days

    b) Reaming of 4 m diameter hole – 24-hours for approximately 60 days.

3. Installation of surface evase and securing – day period only for approximately seven days.

It is noted that construction activities associated with the new tailings storage facility (TSF3) is currently underway at the bottom of the Kintore Pit (i.e. portal plug works). However, given the depth of the Kintore Pit and its distant location from the proposed new air intake location, and as assessed in the Modification 6 (Mod 6) noise impact assessment (EMM 2021), TSF3 construction activities are not anticipated to contribute to noise levels from Mod 11 construction activities. Therefore, noise from TSF3 construction has not been considered further in this assessment.

2.3 Operation

The new intake is a fresh air intake only, not an exhaust, and no additional ventilation fans are proposed as part of Mod 11. This will extend the existing ventilation system and allow for the provision of suitable ventilation to workers in the northern underground areas. However, it will not change the way in which the underground mine is ventilated.

Based on existing approved site operations, noise limits and current acoustic environment at the nearest and most affected residential receivers (A11 and A12), the proposed new air intake operation will not cause additional noise impacts.

3 Existing environment and noise limits

3.1 Assessment locations

The assessment locations adopted for this assessment are summarised in Table 3.1. These are representative of nearest and/or most-affected residential receivers surrounding the site.

Furthermore, these locations are consistent with those adopted in previous noise assessments, listed in the PA and Environment Protection Licence 12559 (EPL).

Table 3.1 Assessment locations

Assessment location ID	Location	Coordinates (MGA56)	
		Easting	Northing
A1	Piper St North	544110	6462598
A2	Piper St Central	543763	6462312
A3	Eyre St North	543555	6462322
A4	Eyre St Central	543324	6462003

Table 3.1 Assessment locations

Assessment location ID	Location	Coordinates (MGA56)	
		Easting	Northing
A5	Eyre St South	543140	6461859
A6	Bonanza and Gypsum Streets	542833	6462000
A7	Carbon St	542604	6462718
A8	South Rd	542923	6462744
A9	Crystal St	542926	6463052
A10	Garnet and Blende Streets	543158	6463633
A11	Crystal St	544210	6464144
A12	Crystal St	544761	6464527
A13	Eyre St North	544592	6463059
A14	Piper St North	544532	6462860

The nearest assessment location is located approximately 340 m to the north of the proposed new fresh air intake, namely A12 (Crystal Street).

The proposed new air intake location and underground workings as well as noise assessment locations are shown in Figure 3.1.

KEY

- Noise assessment location
- Mining lease CML7
- Train station
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line

Ventilation intake locations

- Proposed
- Existing

Underground workings

- Proposed
- Existing

Source: EMM (2023); CBH (2021); DPE (2019); DFSI (2017)

\\emmsvr1\EMM3\2021\E210999 - Rasp Mod 11\GIS\02 Maps\NIA001 NoiseAssessmentLocations 20230719 02.mxd 24/07/2023

New air intake location, underground workings and noise assessment locations

Rasp Mine Modification 11
Noise impact assessment
Figure 3.1

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3.2 Noise limits

3.2.1 Operation

Condition 17 of Schedule 3 of the project approval (PA 07_0018), modified (Mod 10) and approved in December 2022, provides noise limits the site must meet during its operational phase. These are consistent with the noise limits provided in Condition L4 the EPL.

Site operational noise limits are based on project noise trigger levels (PNTL) adopted in the Mod 6 noise impact assessment completed for the site in 2021. The PNTL adopted in the 2021 noise impact assessment were derived based on measured or assumed minimum rating background levels (RBL) +5 dB for all assessment locations (residential), in accordance with the NSW Environment Protection Authority (EPA) Noise Policy for Industry (NPfI) (2017).

Current operational noise limits as per the PA and EPL are summarised in Table 3.2.

Table 3.2 Operational noise limits

Assessment location	PA/EPL operational noise limits, $L_{Aeq,15min}$, dB		
	Day[1]	Evening[2]	Night[3]
A1	40	37	35
A2	40	37	35
A3	44	41	39
A4	44	41	39
A5	44	41	39
A6	48	41	39
A7	45	42	36
A8	48	39	39
A9	46	39	39
A10	42	41	35
A11	46	39	39
A12	46	39	39
A13	40	35	35
A14	40	35	35

Notes: 1. Day period: Monday to Saturday: 7 am to 6 pm, on Sundays and public holidays: 8 am to 6 pm.
2. Evening period: Monday to Saturday: 6 pm to 10 pm, on Sundays and public holidays: 6 pm to 10 pm.
3. Night period: Monday to Saturday: 10 pm to 7 am, on Sundays and public holidays: 10 pm to 8 am.

3.2.2 Construction

Consistent with previous assessments and prior instructions from DPE, the assessment of noise from construction works has been completed using the NSW Department of Environment and Climate Change (DECC) Interim Construction Noise Guideline (ICNG) (2009). The ICNG provides two methods for the assessment of construction noise emissions:

- quantitative: suited to major construction projects with typical durations of more than three weeks; and
- qualitative: suited to short term infrastructure maintenance (3 weeks or less).

The method for a quantitative assessment requires a more complex approach, involving noise emission predictions from construction activities to the nearest sensitive receivers, whilst the qualitative assessment methodology is a more simplified approach that relies more on noise management strategies. Due to the type of construction works proposed for Mod 11 and anticipated duration, this assessment has adopted a quantitative assessment approach.

The ICNG recommends standard hours for normal construction work which are Monday to Friday from 7 am to 6 pm, Saturdays from 8 am to 1 pm, and no work on Sundays or public holidays. Most of the construction activities are proposed to be undertaken during the ICNG standard hours. However, raise boring is proposed to be undertaken outside standard hours, hereinafter referred to as out-of-hours (OOH) periods.

Where noise levels from construction works are predicted above the noise affected level during standard hours and/or OOH, all feasible and reasonable noise management and mitigation measures should be implemented.

i ICNG noise management levels

Table 2 of the ICNG provides guidance on establishing noise management levels (NML) for residential receivers during standard hours and OOH and has been reproduced in Table 3.3.

Table 3.3 ICNG residential NML

Time of day	NML $L_{Aeq,15min}$	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm; Saturday 8 am to 1 pm; No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: i) times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. ii) if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Table 3.3 ICNG residential NML

Time of day	NML $L_{Aeq,15min}$	How to apply
Outside recommended standard hours (OOH)	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements, see section 7.2.2 of the ICNG.

Source: ICNG (DECC 2009).

ii Mod 11 construction NML

Construction NML adopted for this assessment for standard hours and OOH were derived in accordance with the ICNG for all assessment locations and are presented in Table 3.4.

The Mod 11 construction NML for most residential assessment locations have been based on the RBL determined during previous noise assessments completed for the site and application of the NPfI.

The construction NML for standard hours are based on RBL + 10 dB.

The construction NML for OOH periods are based on RBL + 5 dB. For the evening and night OOH periods, the construction NML are consistent with the PA and EPL operational noise limits for those periods (refer to Table 3.2). Therefore, if construction noise levels (combined with existing approved operational noise) satisfy the NML for the evening and night OOH periods, the PA and EPL operational noise limits for the evening and night periods will also be satisfied.

Table 3.4 Mod 11 construction NML (as per ICNG)

Assessment location	RBL[1], dB(A)			NML, $L_{Aeq,15min}$, dB			
	Day[2]	Evening[2]	Night[2]	Standard hours[3] (RBL+10)	Day OOH[4] (RBL+5)	Evening OOH[5] (RBL+5)	Night OOH[6] (RBL+5)
A1	35	32	30	45	40	37	35
A2	35	32	30	45	40	37	35
A3	39	36	34	49	44	41	39
A4	39	36	34	49	44	41	39
A5	39	36	34	49	44	41	39
A6	43	36	34	53	48	41	39
A7	40	37	31	50	45	42	36
A8	43	34	34	53	48	39	39
A9	41	34	34	51	46	39	39
A10	37	36	30	47	42	41	35

Table 3.4 Mod 11 construction NML (as per ICNG)

Assessment location	RBL[1], dB(A)			NML, $L_{Aeq,15min}$, dB			
	Day[2]	Evening[2]	Night[2]	Standard hours[3] (RBL+10)	Day OOH[4] (RBL+5)	Evening OOH[5] (RBL+5)	Night OOH[6] (RBL+5)
A11	41	34	34	51	46	39	39
A12	41	34	34	51	46	39	39
A13	35	30	30	45	40	35	35
A14	35	30	30	45	40	35	35

Notes: 1. Referenced from previous assessments prepared for the site.
2. In accordance with the NPfI; Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: remaining periods.
3. ICNG standard hours: Monday to Friday 7 am to 6 pm and Saturday 8 am to 1 pm. No work on Sundays or public holidays.
4. ICNG day OOH: Saturday 1 pm to 6 pm and Sundays or public holidays 7 am to 6 pm.
5. ICNG evening OOH: Everyday 6 pm to 10 pm.
6. ICNG night OOH: Monday to Saturday 10 pm to 7 am and Sundays or public holidays 10 pm to 8 am.

4 Noise impact assessment

4.1 Modelling software and meteorological conditions

Quantitative modelling of construction and operational noise was completed using DGMR 'iNoise' noise prediction software. This software applies the EPA accepted ISO 9613 approach (including noise-enhancing meteorological effects) and calculates total noise levels at assessment locations from the concurrent operation of multiple noise sources.

The model incorporated factors such as the lateral and vertical location of plant and equipment, source-to-receiver distances, ground effects, atmospheric absorption, topography and meteorological conditions. Three-dimensional digitised ground contours of the site and surrounding land were incorporated to account for topographic effects.

4.2 Modelling methodology

The noise modelling of air intake construction activities (i.e. site preparation, raise boring and surface evase installation) and operation was based on information received from BHOP including the location and type of activities, the equipment required and approximate schedule (refer to Section 2.2). The noise model established by EMM for previous noise assessments completed for the site was used for the purpose of this assessment.

A review of the proposed construction activities determined that concrete works (concrete pouring using concrete mixer trucks) during the surface site preparation will be the worst-case construction scenario during standard hours. During OOH periods, raise boring activities (24-hours) including pilot hole drilling (approximately 15 days in duration) and reaming (approximately 60 days in duration) will be the worst-case scenarios. Therefore, for the purpose of this assessment, noise emissions from these construction activities were modelled at assessment locations.

4.2.1 Concrete works

Site preparation including concrete pad forming and pouring during the ICNG standard hours (day period) is expected to take approximately five days. However, pouring of concrete using concrete mixer trucks will only take one day to be completed.

Modelling of concrete works proposed to be undertaken at the proposed air intake location was undertaken to assess potential noise impacts from site preparation construction activities. A sound power level of 108 dB(A) was adopted for a concrete mixer truck (pouring) as referenced from Table 4 (reference number 20) of the UK Department for Environment, Food and Rural Affairs (DEFRA) 'Update of Noise Database for Prediction of Noise on Construction and Open Sites' (2005).

4.2.2 Raise boring

Minimal noise is expected from the raise borer machine on the surface. However, the raise borer will require a diesel generator (650 KVA or equivalent) on the surface for power supply. The literature for such equipment suggests that the sound power level for a 650 KVA diesel generator ranges between 95 and 106 dB(A). By adopting a sound power level of 106 dB(A) for the raise borer generator, preliminary noise modelling indicated that predicted noise levels would cause site noise levels to exceed the relevant ICNG NML during the evening and night OOH periods. Hence, a reverse-engineering modelling exercise was completed to determine the 'maximum' sound power level for the raise boring activities. The modelling showed that a sound power level of 100 dB(A) would not cause site noise levels (from existing approved operations and construction combined) to exceed the relevant ICNG NML during standard hours or any of the OOH periods.

Notwithstanding, to provide BHOP flexibility with the selection of a suitable generator for the raise boring activity, noise modelling was undertaken adopting a sound power level of 106 dB(A). Mitigation measures to reduce site noise levels to the relevant ICNG NML are provided where required.

4.3 Assessment results

4.3.1 Construction – concrete works

Noise levels predicted for the concrete works during the ICNG standard hours were modelled. These were then combined with existing (approved) site noise and compared to the ICNG NML for standard hours as presented in Table 4.1.

Table 4.1 Predicted site noise levels during concrete works

Assessment location	Predicted concrete works + existing operation $L_{Aeq,15min}$, dB Standard hours	ICNG NML $L_{Aeq,15min}$, dB Standard hours	Exceedance, dB Standard hours
A1	40	45	Nil
A2	40	45	Nil
A3	44	49	Nil
A4	44	49	Nil
A5	44	49	Nil
A6	48	53	Nil
A7	45	50	Nil
A8	48	53	Nil
A9	46	51	Nil
A10	42	47	Nil

A11	46	51	Nil
A12	48	51	Nil
A13	40	45	Nil
A14	40	45	Nil

Notes: 1. ICNG standard hours: Monday to Friday 7 am to 6 pm and Saturday 8 am to 1 pm. No work on Sundays or public holidays.

Modelling results show that predicted site noise levels during the proposed concrete works will satisfy the ICNG NML at assessment locations during standard hours. Site noise levels during the proposed concrete works are also predicted to satisfy the ICNG highly noise affected level.

4.3.2 Construction – raise boring

Noise levels predicted for the raise boring during the ICNG standard hours and OOH periods were modelled. These were then combined with existing (approved) site noise and compared to the ICNG NML for standard hours and OOH periods as presented in Table 4.2. Predictions during the raise boring activities are shown for a generator with a sound power level of 106 dB(A).

Table 4.2 Predicted site noise levels during raise boring

Assessment location	Predicted raise boring + existing operation $L_{Aeq,15min}$, dB				ICNG NML $L_{Aeq,15min}$, dB				Exceedance, dB			
	Standard hours	Day OOH	Evening OOH	Night OOH	Standard hours	Day OOH	Evening OOH	Night OOH	Standard hours	Day OOH	Evening OOH	Night OOH
A1	38	38	32	32	45	40	37	35	Nil	Nil	Nil	Nil
A2	40	40	28	28	45	40	37	35	Nil	Nil	Nil	Nil
A3	44	44	29	29	49	44	41	39	Nil	Nil	Nil	Nil
A4	39	39	27	27	49	44	41	39	Nil	Nil	Nil	Nil
A5	35	35	25	25	49	44	41	39	Nil	Nil	Nil	Nil
A6	33	33	24	24	53	48	41	39	Nil	Nil	Nil	Nil
A7	36	36	27	27	50	45	42	36	Nil	Nil	Nil	Nil
A8	35	35	28	28	53	48	39	39	Nil	Nil	Nil	Nil
A9	36	36	30	30	51	46	39	39	Nil	Nil	Nil	Nil
A10	37	37	31	31	47	42	41	35	Nil	Nil	Nil	Nil
A11	42	42	35	35	51	46	39	39	Nil	Nil	Nil	Nil
A12	46	46	43	43	51	46	39	39	Nil	Nil	4	4
A13	40	40	35	35	45	40	35	35	Nil	Nil	Nil	Nil
A14	39	39	33	33	45	40	35	35	Nil	Nil	Nil	Nil

Notes: 1. ICNG standard hours: Monday to Friday 7 am to 6 pm and Saturday 8 am to 1 pm. No work on Sundays or public holidays.
2. ICNG day OOH: Saturday 1 pm to 6 pm and Sundays or public holidays 7 am to 6 pm.
3. ICNG evening OOH: Everyday 6 pm to 10 pm.

4. ICNG night OOH: Monday to Saturday 10 pm to 7 am and Sundays or public holidays 10 pm to 8 am.

Assuming a maximum sound power level of 106 dB(A) for the raise boring generator, modelling results show that predicted site noise levels during the raise boring activity will satisfy the ICNG NML at most assessment locations. The exception is at A12 (Crystal Street) where site noise levels (from existing approved operations and construction combined) during the raise boring activity are predicted to exceed by up to 4 dB the relevant ICNG NML during the evening and night OOH periods.

Feasible and reasonable management and mitigation measures will be required to be implemented to reduce potential noise impacts from proposed raise boring activities (generator use) during the evening and night OOH periods. Approximate reductions than can be achieved by various forms of noise controls that could be implemented are provided in Table 4.3.

Table 4.3 Relative effectiveness of various noise controls

Noise control	Nominal noise reduction possible, dB(A)
Screening (e.g. noise barrier)[1]	Typically 5 dB to 10 dB, maximum 15 dB
Enclosure (e.g. shed/building)[1]	Typically 15 dB to 25 dB, maximum 50 dB
Reduce equipment operating times or turn off idling machinery[2]	Approximately 3 dB per halving of operating time

Notes: 1. Referenced from AS2436-2010.

2. Based on EMM measurement experience at construction and mining sites.

A temporary noise barrier targeting noise in the direction of assessment location A12 (and adjacent residences on Crystal Street) should be sufficient in reducing generator noise (by at least 5 dB) to satisfy the ICNG NML for the evening and night OOH periods. To achieve appropriate screening, the noise barrier should be positioned relatively close to the generator, be higher than the visible source-to-receiver line of sight and be approximately five times wider than its height. Optimum screening could also be achieved using a semi-enclosing (u-shaped) barrier positioned around the generator. Another option for optimal noise reduction would be to use a temporary enclosure around the generator, which would provide maximum reduction at all surrounding residences.

Furthermore, standard construction management and mitigation measures currently implemented for construction works on-site (i.e. noise monitoring, operational strategies, source control strategies, noise barrier controls and community consultation) in accordance with the approved Rasp Mine Noise Management Plan (NMP) dated April 2023 continue to be implemented for the duration of the Mod 11 construction.

It is noted that a generator with a sound power level of 100 dB(A) would satisfy the ICNG NML at all locations. Therefore, the aforementioned management and mitigation measures would not strictly be required if the raise borer generator selected had a sound power level of 100 dB(A) or lower.

Site noise levels during the proposed raise boring are predicted to satisfy the ICNG highly noise affected level.

5 Conclusion

Noise levels for the proposed new air intake are not predicted to increase existing approved site operational noise levels at assessment locations above the current PA and EPL noise limits for the day, evening and night periods.

Noise levels during concrete works associated with the new air intake construction during ICNG standard hours are predicted to satisfy the relevant NML at all assessment locations.

Noise levels during raise boring activities associated with the new air intake construction during ICNG standard hours and OOH periods are predicted to satisfy the relevant NML at most assessment locations. The exception is at one assessment location (A12) where noise levels are predicted to exceed the relevant NML during the evening and night OOH periods. Feasible and reasonable management and mitigation measures recommended herein will be implemented by BHOP as a minimum to reduce potential noise impacts from proposed evening and night OOH construction activities.

We trust the above is satisfactory and if you have any further questions please contact our office.

Yours sincerely

Teanuanua Villierme
Associate Acoustic Consultant
tvillierme@emmconsulting.com.au

Review: Najah Ishac on 14/7/23

Appendix C

Water Resources Impact Assessment

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6 July 2023

Joel Sulicich
Health Safety Environment and Training Manager
CBH Resources - Rasp Mine
130 Eyre St
Broken Hill NSW 2880

Re: J210999 - Rasp Mine Modification 11 water related risks and impacts

Dear Joel,

EMM Consulting Pty Limited (EMM) has been engaged by Broken Hill Operations Pty Ltd (BHOP) to assess the potential water related risks and impacts for Modification 11 (Mod 11) of Project Approval PA 07_0018 (PA) for the Rasp Mine (the mine) in Broken Hill, NSW.

This letter provides an assessment of the potential water related risks and impacts for Mod 11.

1 Modification description

1.1 Overview

BHOP is approved to conduct mining activities up to Main Lode Block 12. Modification 9 (Mod 9) allowed underground exploration/development drives into Main Lode Blocks 13, 14, and 15, which identified deposits north of CML7.

BHOP is seeking to modify (Mod 11) the PA to:

- install a new fresh air ventilation intake (hereinafter referred to as air intake) to provide suitable ventilation to workers in the northern underground areas of the mine
- extend underground development workings in Main Lode Blocks 13, 14, and 15.

No changes to the approved extraction rate, processing rate and water management approach are proposed as part of Mod 11.

1.2 Air intake

The installation of the new air intake will require the use of a raise boring machine (raise borer). A raise borer is generally used to excavate a circular hole between two levels of a mine without the use of explosives. The raise borer will develop a 4 metre (m) diameter shaft between the lower underground level (7) and the surface. The boring cuttings from the reamer head fall to the floor of the lower level and will remain underground.

Installing the air intake will require the following construction activities and timeframes:

- surface site preparation (7 days)
- installing a concrete raise bore pad and evase footing (1 day)
- installation of the surface evase into position and securing (7 days).

Construction of the air intake is estimated to require 19.7 ML of water which will be sourced from Broken Hill town water supply.

1.3 Extension of underground development workings in Main Lode Blocks 13, 14, and 15

The extension of underground development workings in Main Lode Blocks 13, 14 and 15 requires a tunnel/drive of approximately 5.0 x 5.8 m, which would be supported in accordance with the mine's current ground support installation standard (BHO-STD-MIN-003).

The proposed 3.5 kilometres (km) of development would be a continuation of existing underground workings and will not require surface disturbance. Any inert waste rock generated would be used for waste rock capping of free areas, suitable mineralized ore would be processed through the mill and any remaining waste rock can be placed in tailings storage facility 3 (TSF3).

Water supply and dewatering of the underground workings will be in accordance with BHOP's existing water management plan.

2 Existing mine water management

The mine is located within the township of Broken Hill, currently operating as an underground mine. Previous operations at the site included open cut mining, with pits now used for storing tails.

The main uses for water on site are ore processing, and operation of underground machinery. Minor uses of water include dust suppression, fire water, contractor facilities, evaporation, and vehicle washing.

Fresh water is supplied to the site from Broken Hill town water supply.

Saline groundwater is intercepted by the underground workings and pumped to the surface. This water is then used on site for ore processing, and operation of underground machinery.

Water is recycled on site. Notably, water used for the operation of underground machinery is collected in sumps, pumped to the surface, stored temporarily in ponds (primarily in 'Lochness', also known as pond S22), and then pumped back underground for operation of underground machinery.

The mine site has no external surface water catchments. Rainfall runoff within the site boundaries is captured in storm water management ponds, or in unlined depressions. Typically, rainfall runoff evaporates, but it may be pumped into the mine water storage ponds when quantities are significant.

Surface water and groundwater are managed in accordance with BHOP's existing water management plan.

3 Risk identification

The following water related risks have been identified for the Mod 11 works:

- mobilisation of sediment laden water in stormwater runoff from the air intake area during surface site preparation activities
- groundwater inflows to the air intake shaft and underground workings exceeding BHOP's groundwater entitlements
- inundation of the air intake due to overland flows and flooding.

The identified risks will be primarily mitigated through design and undertaking works in accordance with BHOP's existing water management plan. An assessment of each of the identified risks is provided in Section 5.

4 Water balance

4.1 Overview

EMM completed an independent review of the mine water balance as part of the Mod 9 approval (EMM 2021). This included the following:

- review of available management plans, processing data and flow meter records
- development of a conceptual water balance diagram (refer to Appendix A)
- development of a mine water balance (in Microsoft Excel) to quantify water inflows and outflows from the mine.

The water balance was used to estimate groundwater inflows to the existing underground workings and by extension the anticipated groundwater inflows resulting from the Mod 11 works (refer to Section 5.2). The outcomes of the independent water balance are described in the sections below.

4.2 Water balance summary

The site water balance was calculated from 2018 to 2020 using available metred data and observed records. The site water balance for 2020 is summarised in Table 4.1 and shown schematically in Appendix A.

Table 4.1 Mine water balance summary (2020)

Water stream	System component	Source	Volume (ML)
Inflows			
Raw water	Town water	Metered	98
Process water	Town water	Metered	224
	Groundwater	Calculated from water balance	260
	Rainfall – process ponds	Calculated from rainfall records	0
	Rainfall – tails	Calculated from rainfall records	16
Total inflows			**598**

Table 4.1 Mine water balance summary (2020)

Water stream	System component	Source	Volume (ML)
Outflows			
Raw (town) water	Vehicle workshops and vehicle wash	Calculated from water balance	96
	Site services	Assumed	2
Process water	Entrainment – product	Measured	5
	Seepage and entrainment – tails	Calculated from water balance	273
	Evaporation – process ponds	Calculated from climate records	5
	Evaporation – tails	Calculated from climate records	148
	Dust suppression	Calculated from truck movement records	69
Total outflows			**598**
Recycled			
Underground supply recycling	Pond S22 to underground and underground to pond S22	Metered	236

4.3 Groundwater take

Groundwater inflows to the existing workings occur when excavations intercept fractures in the rock which contain water. Groundwater take at the mine is estimated using the water balance as:

Groundwater take = dewatering – underground supply

Approximately half of the water removed from the underground workings via dewatering pumps is directly attributable to water taken underground for the purposes of operating underground machinery and ancillary uses such as fire water. This water is used in mining activities, collected in sumps within the excavated shafts and drives, and returned to the surface for settling in pond S22 before being recycled. The remainder of the water removed from the underground workings is attributed to groundwater inflows.

To allow the calculation of groundwater inflows, both the dewatering and underground supply pipes are metered.

The water balance model review indicated groundwater inflow rates are currently around 260 megalitres per year (ML/year) and have been trending down since 2018 in proportion to the mining rate. It was established that approximately 0.5 megalitres (ML) of groundwater is intercepted per 1 kilotonne (kt) of ore extracted.

5 Assessment of proposed activities

5.1 Construction of the air intake

Construction of the air intake would require site preparation activities including ground disturbance. Site preparation activities are estimated to span a period of seven days. Stormwater runoff from the construction area has the potential to mobilise sediment from disturbance areas.

Stormwater runoff from the air intake construction area would drain to the existing dirty water management system. The air intake disturbance area is a small portion of the overall mine footprint and would contribute an equally small portion of runoff to the water management system. Stormwater runoff from the air intake

construction area is not anticipated to result in any material changes to the water quality of the mine water management system.

Construction using raise bore is estimated to require 19.7 ML of water, which will be sourced from the town water supply in accordance with BHOP's existing water management plan.

5.2 Groundwater inflows to excavations

Excavations for the air intake shaft and extension of underground workings have the potential to intercept groundwater. Initial geotechnical investigations completed by BHOP indicate significant volumes of groundwater are unlikely to be intercepted by the raise borer or extension of underground workings as:

- No groundwater inflows are currently experienced along the 7 level drive development which forms the base of the raise and approximate middle of the new take off point for the underground extension. Minimal groundwater inflows are observed in the 1480 drive which is below the proposed underground extension.
- Groundwater was not detected during geotechnical drilling undertaken to determine the ground conditions associated with the proposed air intake raise.
- Groundwater was observed during geotechnical drilling into the historical voids above the extension of underground workings. However, flows rapidly dissipated becoming negligible 30 minutes after striking water. This indicates groundwater may be present in isolated fractures in the rock and is unlikely to be associated with a significant groundwater source.

The initial geotechnical investigations are in line with historical observations that groundwater inflows primarily occur when excavations intercept fractures in the rock which contain water. Should groundwater be intercepted during excavations of the air intake or extension of underground workings, it is unlikely to result in a material increase in groundwater take above historical/expected values (260 ML/year).

5.3 Inundation of the air intake

The air intake is to be installed north of Blackwood's Tails Storage Facility (TSF2), adjacent to an existing embankment. The air intake will not be at risk of inundation due to local drainage or flooding as:

- the air intake is sited away from mapped watercourses and drainage lines
- the surface evase will act to divert local stormwater runoff away from the air intake
- the air intake opening will be raised several meters above the ground to prevent inundation of water from the immediate surrounding area.

The air intake opening will be located above the TSF2 embankment wall height to mitigate risk of inundation during the unlikely occurrence of a dam break event.

6 Water licensing requirements

BHOP have a water access licence (WAL 31065) to extract up to 370 ML/year of groundwater from the Adelaide Fold Belt MDB Groundwater Source. BHOP can also receive an additional carryover allocation each year of up to 10% of the water access licence volume, resulting in a total entitlement of 407 ML/year when this allocation is applied.

Initial geotechnical investigations completed by BHOP indicate significant volumes of groundwater are unlikely to be intercepted by the raise borer or extension of underground workings. Should groundwater be intercepted

during excavations, it is unlikely to result in a material increase in groundwater take above historical/expected values (260 ML/year).

BHOP's water access licence limit is approximately 110 ML greater than the estimated groundwater take volumes associated with existing operations. This additional water entitlement will provide buffer to account for potential localised groundwater pockets that were not identified as part of the initial geotechnical investigations.

It is unlikely the Mod 11 excavations would intercept enough groundwater to exceed BHOP's water access licence limit of 370 ML/year (or 407 ML/year with carryover).

7 Conclusion

BHOP own and operate the Rasp Mine in Broken Hill, NSW. BHOP is seeking to modify (Mod 11) the project approval to:

- install a new fresh air ventilation intake to provide suitable ventilation to workers in the northern underground areas of the mine
- extend underground development workings in Main Lode Blocks 13, 14, and 15.

The assessment of water related risks and impacts for Mod 11 indicates:

- Surface works associated with construction of the air intake are expected to have negligible impact on the water quality of the water management system.
- Groundwater inflows associated with air intake shaft and extension of underground workings are not predicted to exceed BHOP's water access licence limit.
- The air intake inlet is not expected to be inundated by flood waters, local overland flows or water associated with a dam break.

Yours sincerely

Jarrah Muller
Associate Civil and Environmental Engineer
jmuller@emmconsulting.com.au

References

EMM. 2021. *J210513 - RASP Mine water balance.* Prepared for CBH Resources by EMM Consulting Pty Ltd.

Appendix A

Mine water balance schematic (EMM)

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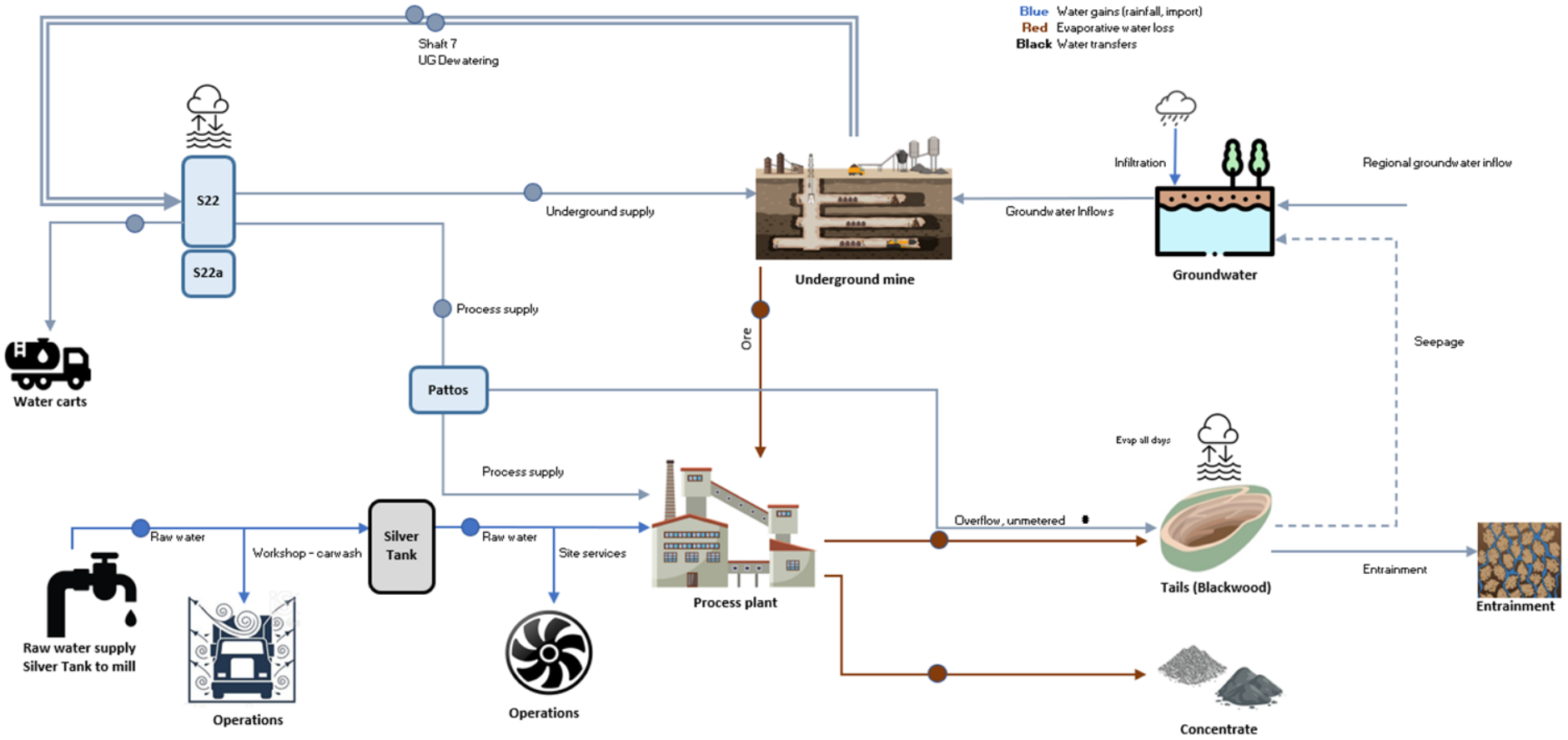
Blue Water gains (rainfall, import)
Red Evaporative water loss
Black Water transfers
Shaft 7
UG Dewatering
S22
S22a
Underground supply
Underground mine
Infiltration
Groundwater Inflows
Regional groundwater inflow
Groundwater
Water carts
Process supply
Ore
Pattos
Seepage
Process supply
Evap all days
Overflow, unmetered
Raw water
Workshop - carwash
Silver Tank
Raw water
Site services
Process plant
Tails (Blackwood)
Entrainment
Entrainment
Raw water supply
Silver Tank to mill
Operations
Operations
Concentrate

Appendix D
Air Quality Assessment

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Joel Sulicich
HSE and Training Manager
CBH Resources – Rasp Mine

29 June 2023

Sent via email to joelsulicich@cbhresources.com.au

RE: Rasp Mine – Ventilation Intake and Main Lode Development Extension – air quality impacts

1 Scope of Work

Broken Hill Operations Pty Ltd (BHOP) has requested that Zephyr Environmental Pty Ltd (Zephyr) provide commentary as to the potential of their proposed construction and operation of a new ventilation intake and Main Lode development extension to generate adverse offsite air quality impacts.

Zephyr personnel have a long history of assessing air quality impacts associated with the Rasp mine, as well as designing appropriate air quality mitigation and monitoring regimes to assist with operational dust management.

2 Background

BHOP owns and operates the Rasp Mine and is a wholly owned subsidiary of CBH Resources Limited (CBH). The Mine is located centrally within the City of Broken Hill on the Consolidated Mine Lease 7 (CML7). The Zinc and Lead concentrates that are produced at the mine are transported via rail to Port Pirie and Port Adelaide in South Australia.

The existing operations at the mine consist of underground mining, processing, rail siding for concentrate dispatch and other associated infrastructure. These operations are undertaken in accordance with Project Approval PA07_0018 (as modified) (PA). The current project approval allows:

- Mining operations at the Rasp mine until 31 December 2026
- Extraction of up to 500,000 tonnes of ore per annum
- Deposition of tailings into the Blackwood Pit tailings storage facility (TSF2) and the Kintore Pit (TSF3).

The Rasp mine currently utilises four fresh air intakes to the mine's underground workings, which are all situated in the southern regions of CML7. These four intakes are the No. 7 Shaft, No. 6 Airway, Delprats Shaft, and the current mine portal entry. BHOP is seeking to modify the project approval to ensure that underground workers in the northern areas of the mine have adequate ventilation, as the underground development moves further to the north of the mining lease.

3 Proposed activities

BHOP is seeking to modify PA07_0018 to:

- Allow for installation of a new fresh air ventilation intake to provide suitable ventilation to workers in the northern underground areas of the mine.
- Extend underground development workings in Main Lode (ML) Blocks 13, 14 and 15.

Considering the site conditions and underground mining areas, BHOP have determined that the most suitable location for the new fresh air ventilation intake is north of Blackwoods Tails Storage Facility

(Blackwoods TSF2) and adjacent of Embankment 2, as shown in Figure 1. This location is considered most suitable due to its:

- northern location
- location within CML7
- ground stability; and
- ability to link the intake to the existing underground workings at a vertical distance of 230 m.

Proprietary Square, containing Perilya (neighbouring Broken Hill mine) employee housing is approximately 240 m of the proposed ventilation works, however, there will not be any additional mechanical ventilation (e.g. fans at the surface) or operational emissions as the new intake is for fresh air (downcast) and not an exhaust (upcast).

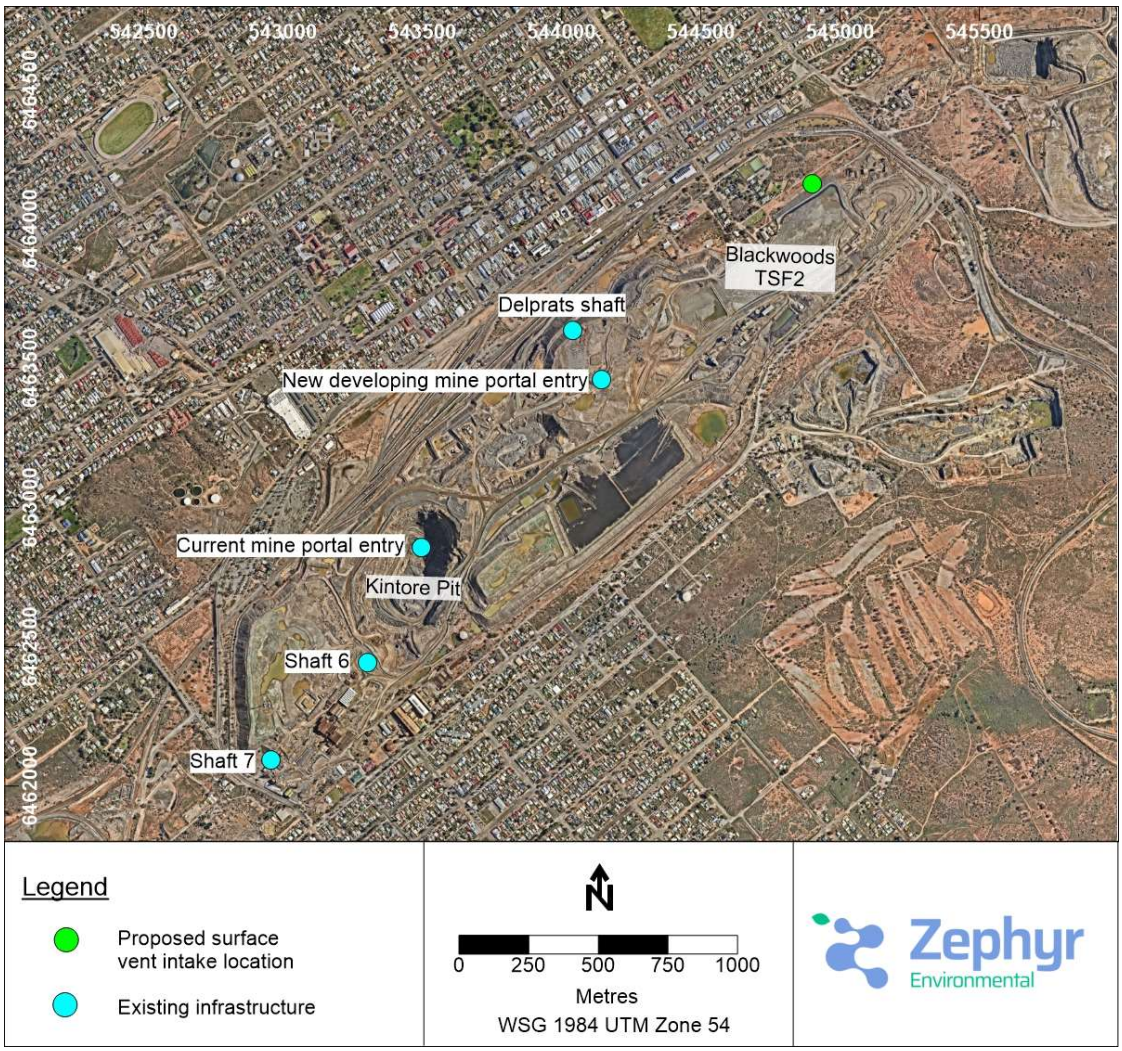

Figure 1: Proposed location of existing intakes and for new surface fresh air ventilation

4 Installation

A raiseborer machine will be utilised to construct the new surface fresh air ventilation intake. This is a piece of equipment that is frequently commissioned in mining (both above and below the surface) to excavate a circular opening between two levels of a mine without the use of explosives. Figure 2 shows a typical setup of the system.

The raiseborer will be positioned on the ground (surface level) of an evenly laid platform. The construction of the platform footing will most likely require 40 concrete delivery trucks, which will travel on sealed public routes.

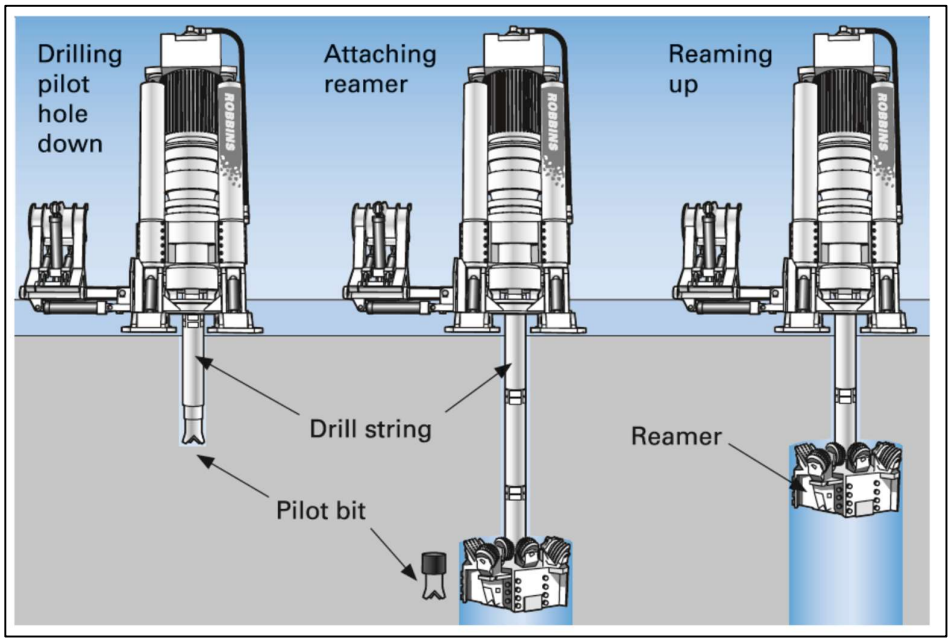

Figure 2: Raisebore process overview

5 Summary of air quality issues

Importantly, the raiseboring procedure does not produce surface dust, rather, it reams from underground, with any dust controlled using water, water sprays, and dust curtains.

The concrete raisebore pad installation, as well as the positioning and securing of the surface evase once installed, are the proposed minor surface construction tasks that would be required. It is estimated that the excavation surface works will only take about one to two days to complete, excavating a volume of approximately 8 m x 8 m x 3 m.

In view of the limited earthworks required, and their conventional nature (material excavation) it is considered that this activity may be completed without adverse off-site air quality impacts by following standard environmental management protocols in place at the mine, e.g.,

- pre-watering of dust generating material
- keeping the distance between excavator buckets and emplacement areas to a minimum
- not completing works when wind is blowing towards receptors at Proprietary Square
- acting upon any short-term alerts / alarms from nearby particulate monitoring equipment.

Existing particulate monitoring in the vicinity of Proprietary Square will enable real-time alerts and alarms to proactively manage particulate emissions before any exceedances of 24-hour air quality criteria occur off-site.

Further, as this is a fresh air intake, there will be no operational dust or fumes emitted from the air intake during mining.

Given the underground nature of the bulk of these works and the minimal surface disturbance, we do not anticipate there will be any associated air quality impacts.

Yours sincerely

Damon Roddis
Principal – Air Quality & Carbon
Zephyr Environmental
damon.roddis@zephyrenviro.com

Jane Barnett
Principal – Air Quality
Zephyr Environmental
jane.barnett@zephyrenviro.com

Appendix E
Blasting and Vibration Assessment

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TO: Eamonn Dare,
Technical Services Superintendent,
Broken Hill Operations Pty Ltd

FROM: Mike Humphreys,
Principal D&B Engineer, Fromble Corp Pty Ltd
Email: Mike.Humphreys@PrismMining.com.au

SUBJECT: BLAST VIBRATION ASSESSMENT – MOD11 DEVELOPMENT, JULY 2023

DATE: 10TH JULY 2023

BLAST VIBRATION IMPACT ASSESSMENT - PROPOSED MOD11 DEVELOPMENT

SUMMARY

New development is required as part of a modification to the project approval at Rasp Mine (Mod11) in order to install an additional ventilation intake and extend existing access drives for Main Lode Blocks 13, 14 and 15[1].

The ventilation intake will be developed using mechanical raise boring methods and will not require blasting. Extension of other development, such as inclines and sill drives (Figure 1a) will be carried out using conventional blasting methods already in use at Rasp Mine, with 45mm diameter blastholes, an approximate charge mass of 5kg to 6kg per hole, and long period delay detonators (Orica Exel LP). An example of a Rasp Mine development blast layout and initiation sequence is illustrated in Appendix 1.

This report confirms that, based on the minimum distances from proposed development to identified sensitive receivers (Figure 1b) and available site monitoring data, development blasting can be carried out in compliance with ground vibration limits specified by Dams Safety NSW[2] and suggested by Golder Associates Pty Ltd, for the TSF2 Tailings Facility[3].

Such blasting is also highly unlikely to exceed residential amenity limits at the closest residential locations, as specified by the Rasp Mine EPL conditions[4] and as suggested by the ANZEC guidelines for the minimisation of annoyance at sensitive residential locations[5].

Higher limits for the closest non-residential infrastructure, as suggested by Australian Standard AS2187[6], are similarly unlikely to present any compliance difficulties with respect to ground vibration from the proposed development blasting.

Mike Humphreys, Principal D&B Engineer, Fromble Corp Pty Ltd, July 2023

Figure 1a – Location of the proposed Mod11 development with respect to identified sensitive locations.

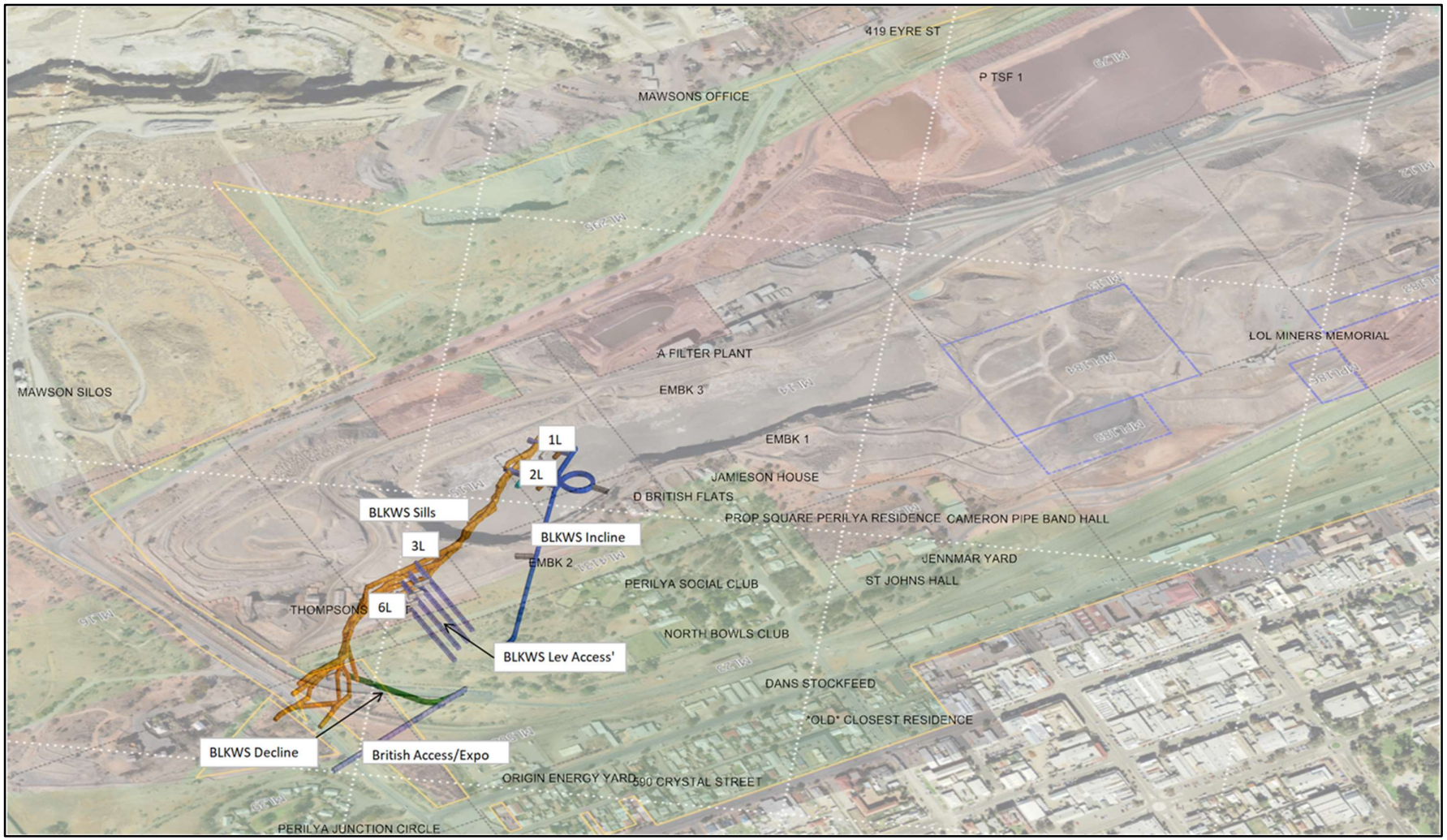
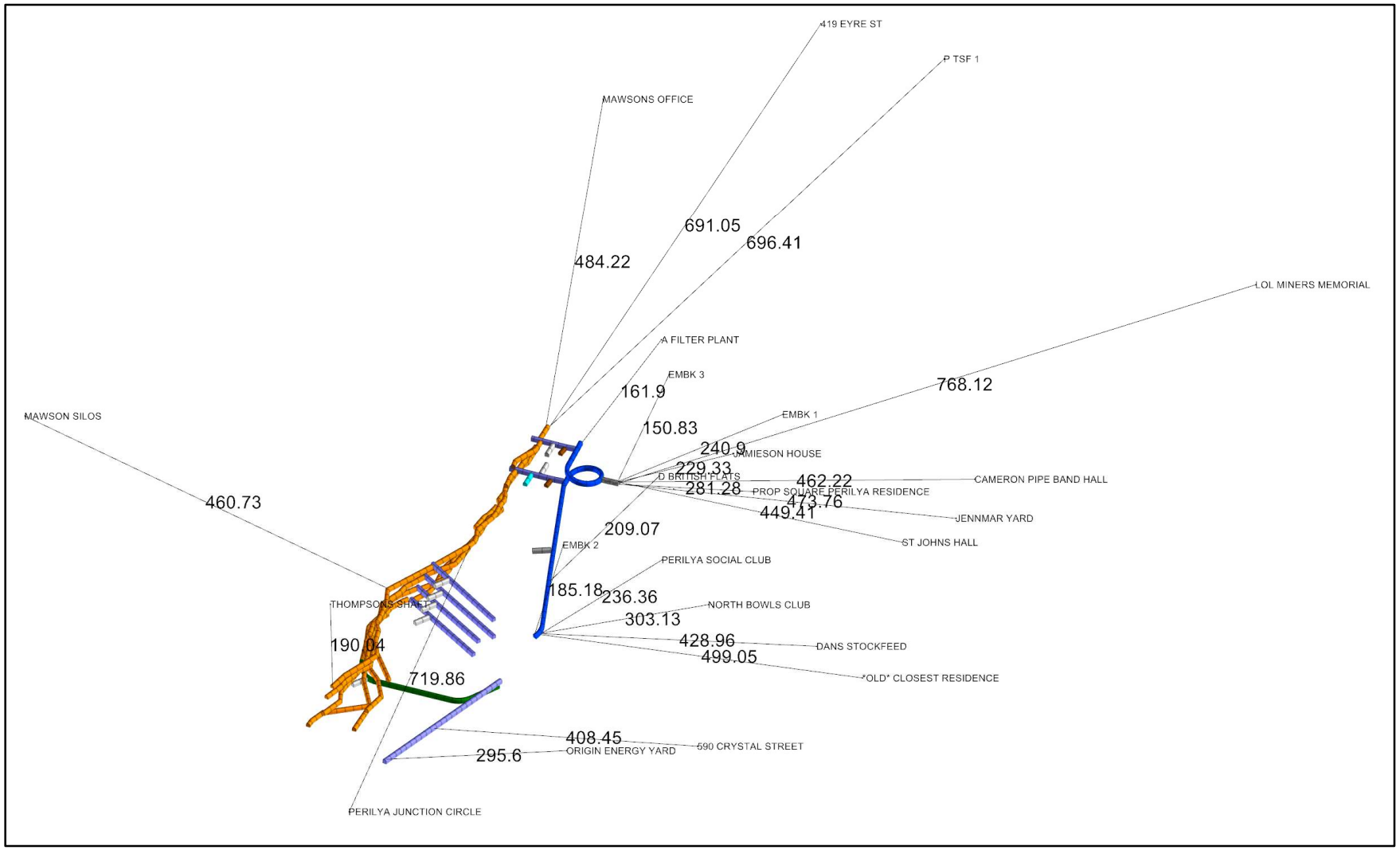


Figure 1b – Minimum distances from the proposed Mod11 development to identified sensitive locations.



GROUND VIBRATION ASSESSMENT METHODOLOGY AND LIMITS

A method for estimating the mean peak vector ground vibration (V mm/s), produced by a blast at a sensitive receiver, is provided in AS2187.2-2006[6] as:

$$V = K \times [\text{distance}/\sqrt{(\text{charge mass})}]^b$$

Distance is from the blast to the monitoring location (m) and charge mass is the maximum charge per hole (kg) for sequential firing, or fired within a specified timeframe for blasts where multiple blastholes fire together or reinforce each other relative to the direction of firing. The Australian Standard suggests site constants K=1140 and b=-1.6 for 'average' free face blasting conditions, with a vibration range of 0.4 to 4 times that suggested by these 'average' values, depending on ground conditions, blast geometry and other factors. The determination of site parameters must be validated for the blast site, based on the monitoring of actual blasts.

While development blasting is carried out at a high level of blasting intensity (high powder factor) and in confined conditions with limited relief, such blasting should be expected to generate relatively low ground vibration impacts at surface as they are of such small size, with a blasted volume up to 150m^3.

For this exercise, models utilising a 'maximum charge' can also be problematic, as the variability of timing with LP series detonators (high scatter) can significantly change the 'effective' MIC from blast to blast, for otherwise identical development rounds. Given that development blasts have very similar geometry and charging methodology, a simpler model that excludes charge mass has been used in this case, being:

$$V = K \times [\text{distance}]^b$$

In this case, K and b values have been derived from the most representative available site data, being development blasts monitored within 1000m.

Blast induced ground vibration at Rasp Mine is currently recorded at fixed monitoring locations (V1 to V6), all of which are to the south of the proposed Mod11 development area While ground vibration levels from development blasts have not presented compliance problems in the past, much of the historical data collected was considered unsuitable for this exercise due to the lack of close proximity monitoring and the fact that development blasts were not necessarily fired individually.

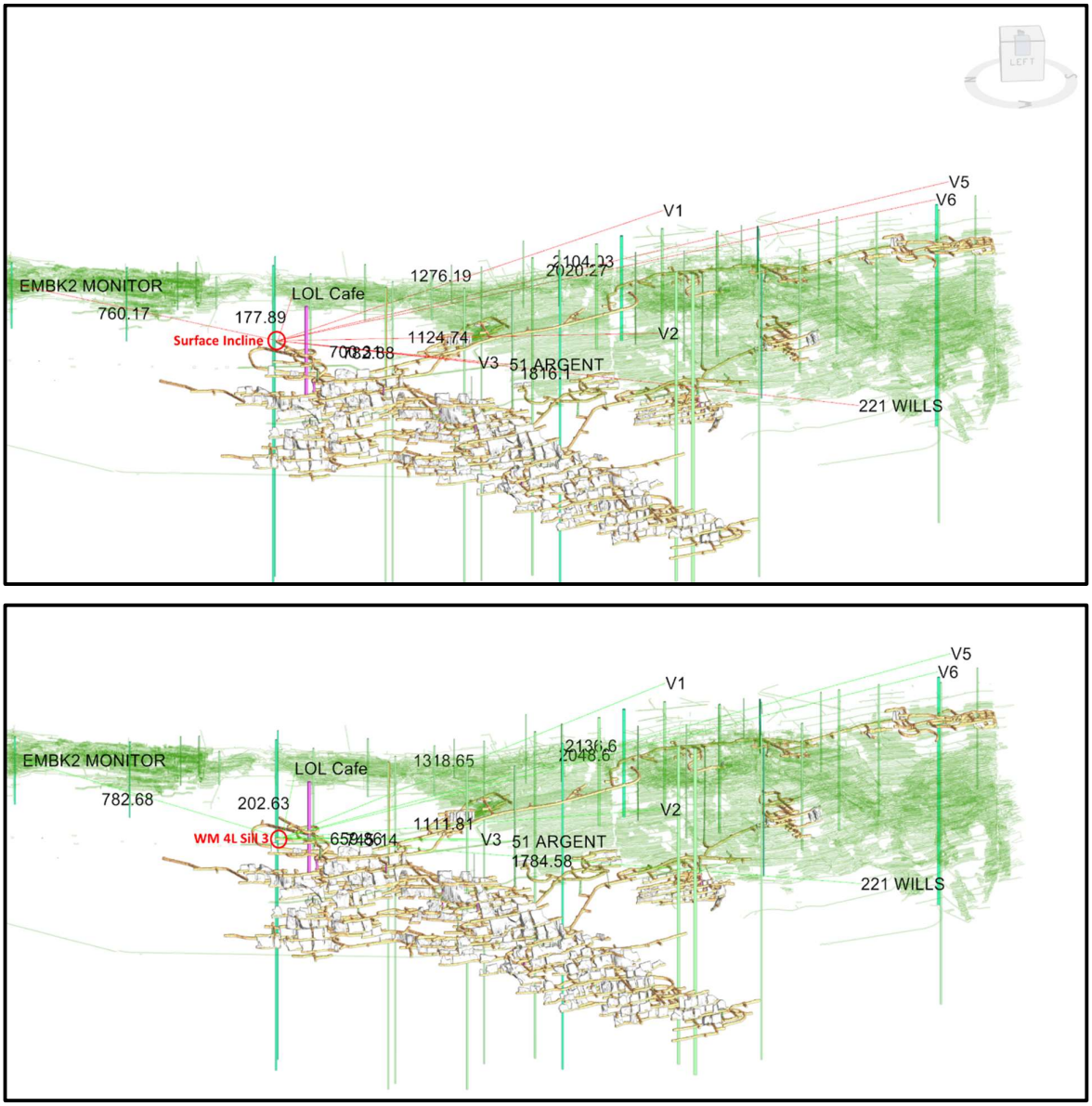
Data from two additional monitors was therefore collected in May and June of 2021 (LOL Café and Embankment 2 at TSF2), to specifically monitor close proximity ground vibration impacts for blasting at the Surface Incline and WM 4L Sill 3 areas. The locations of blast areas and monitoring points are shown in Figure 2.

Further ground vibration data was collected from October 2022 to March 2023, for development blasts close to Embankment 3 at TSF2, with additional monitors at Embankments 1 and 2 (TSF2) and at TSF1.

Dams Safety NSW (DSC) has imposed a peak particle vibration limit of 30mm/s (peak vector) at the TSF2 embankment structures[2] while Golder Associates had suggested a range of PPV limits for embankment foundations from 15mm/s (and higher), subject to ground conditions[3]. Given the potential for amplification of vibration from the foundations to the top of an

embankment, the 30mm/s DSC limit should comfortably allow for ground vibration levels at the foundations of 15mm/s, assuming a conservative amplification factor up to 2.

Figure 2 – Proximity of monitored development blasts to nearest sensitive receivers (Surface Incline, WM 4L Sill 3, May to June 2021).



For residential locations, peak vector ground vibration limits less than 5mm/s (95% of blasts) and 10mm/s (100% of blasts) are applicable under current EPL conditions[4], excluding underground blasting in Block 7, where a more restrictive 3mm/s limit applies. These limits are also reflected in the ANZECC guidelines[5].

For non-residential locations, a number of criteria are referenced in the applicable Australian Standard[6]. Ground vibration limits to avoid cosmetic damage to light commercial buildings are suggested by AS2187 as a peak component particle velocity of 15mm/s at 4Hz to 50mm/s at 40Hz. Ground vibration limits for occupied non-sensitive industrial sites are suggested as peak component particle velocities below 25mm/s unless agreement is reached with the asset owner for higher levels. Peak vector particle velocity limits of 15mm/s therefore provide conservative preliminary thresholds, when assessing impacts at non-residential locations and commercial/industrial sites respectively.

Estimated peak ground vibration impacts for the proposed Mod11 development blasts have been assessed at the closest distances to the TSF2 facilities, residential locations, and non-residential infrastructure, as 'worst-case' scenarios.

ASSESSMENT OF GROUND VIBRATION IMPACTS

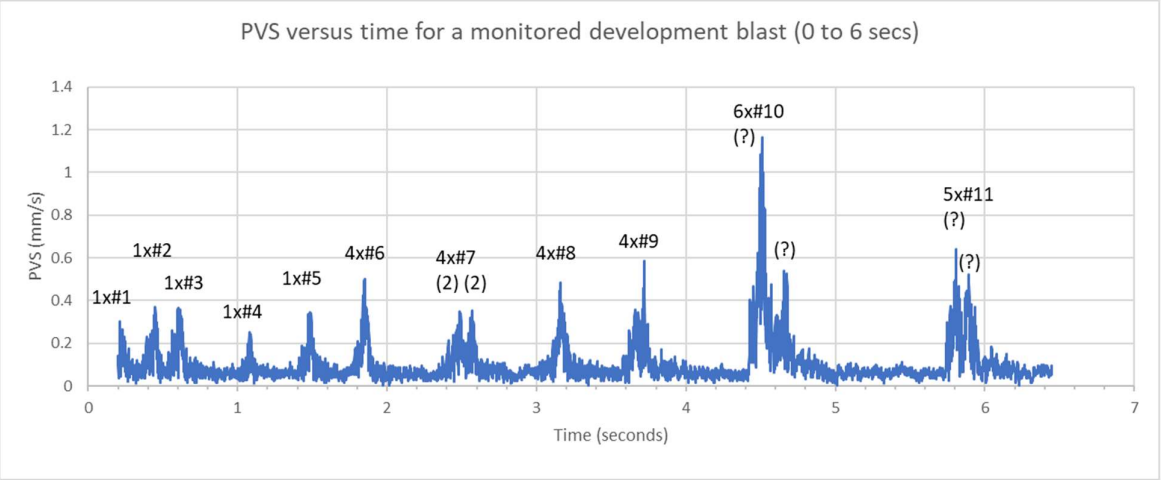
While the development round illustrated in Appendix 1 has 72 blastholes, with a specific timing sequence, the number of blastholes, charging methodology and timing sequence can vary at Rasp Mine, subject to operational constraints and ground conditions. The high degree of detonator scatter for long period (LP) delays also makes estimation of a maximum 'instantaneous' charge problematic.

This is illustrated in Figure 3, where an attempt has been made to identify the specific number of blastholes firing during a single blast, which contribute to the resultant waveform for that monitored event. In this case, the waveform was recorded at the closest monitor of interest (PVS of 1.16mm/s at the LOL Café on 24/06/2021). While the variable effect of firing time, charge mass and confinement, on vibration level, can be seen early in the waveform (single hole firing), this becomes harder as delay time and the number of holes per delay increases, due to overlap. Peak vibration generated by each development blast has therefore been plotted simply against distance, on the basis that these blasts are practically very similar, but difficult to define in terms of an applicable MIC.

Comparing monitored results between development blasts fired from May to June 2021, and more recent development blasts monitored between October 2022 and March 2023, trends can be approximated (low to high range), in order to estimate peak ground vibration impacts from Mod11 development blasts at the nearest sensitive receivers (see Figure 4 and Table 1). Note that some outliers in the 2022-23 data are off trend from their own data set, and also well outside the trends identified in 2021, so have been disregarded as suspected multi-blast firing events.

These estimates suggest that peak vector ground vibration levels at the TSF1 and TSF2 facilities, nearest residential locations, and nearest non-residential infrastructure will remain well below regulated or recommended limits at all identified sensitive receivers, for the development blasting proposed in Mod11. The estimates can be validated by monitoring ground vibration levels as blasting takes place, with design modifications made to ensure ongoing compliance with limits if required.

Figure 3 – Resultant (vector) waveform for a surface incline development blast, fired 24/06/21 and monitored at the LOL Café.



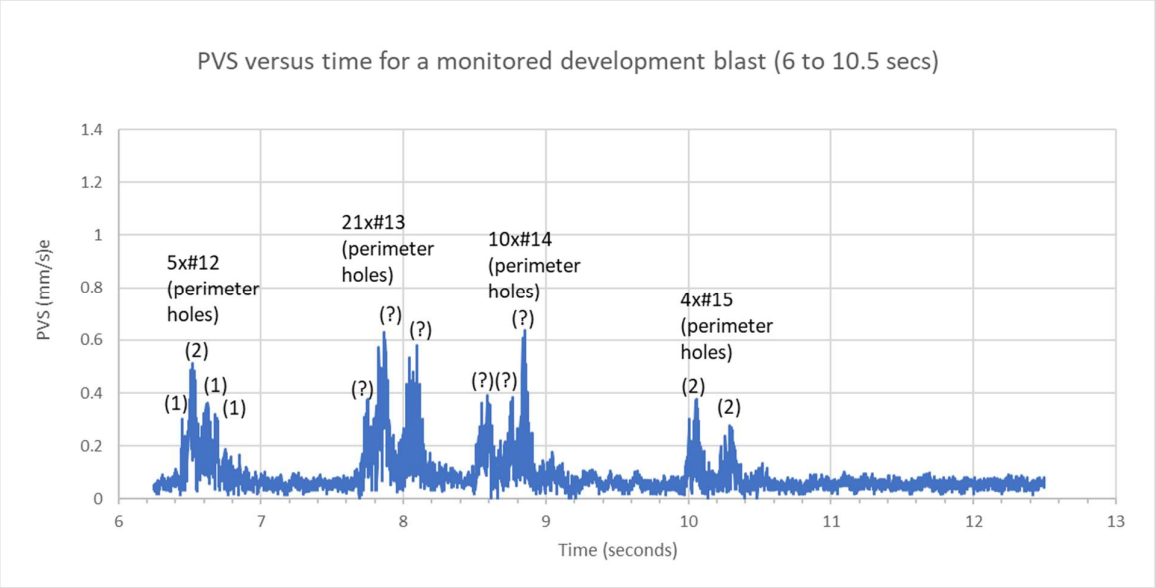


Figure 4 – PVS versus distance for monitored development blasts. Blasts shown by location and monitor (top) and with trends (bottom).

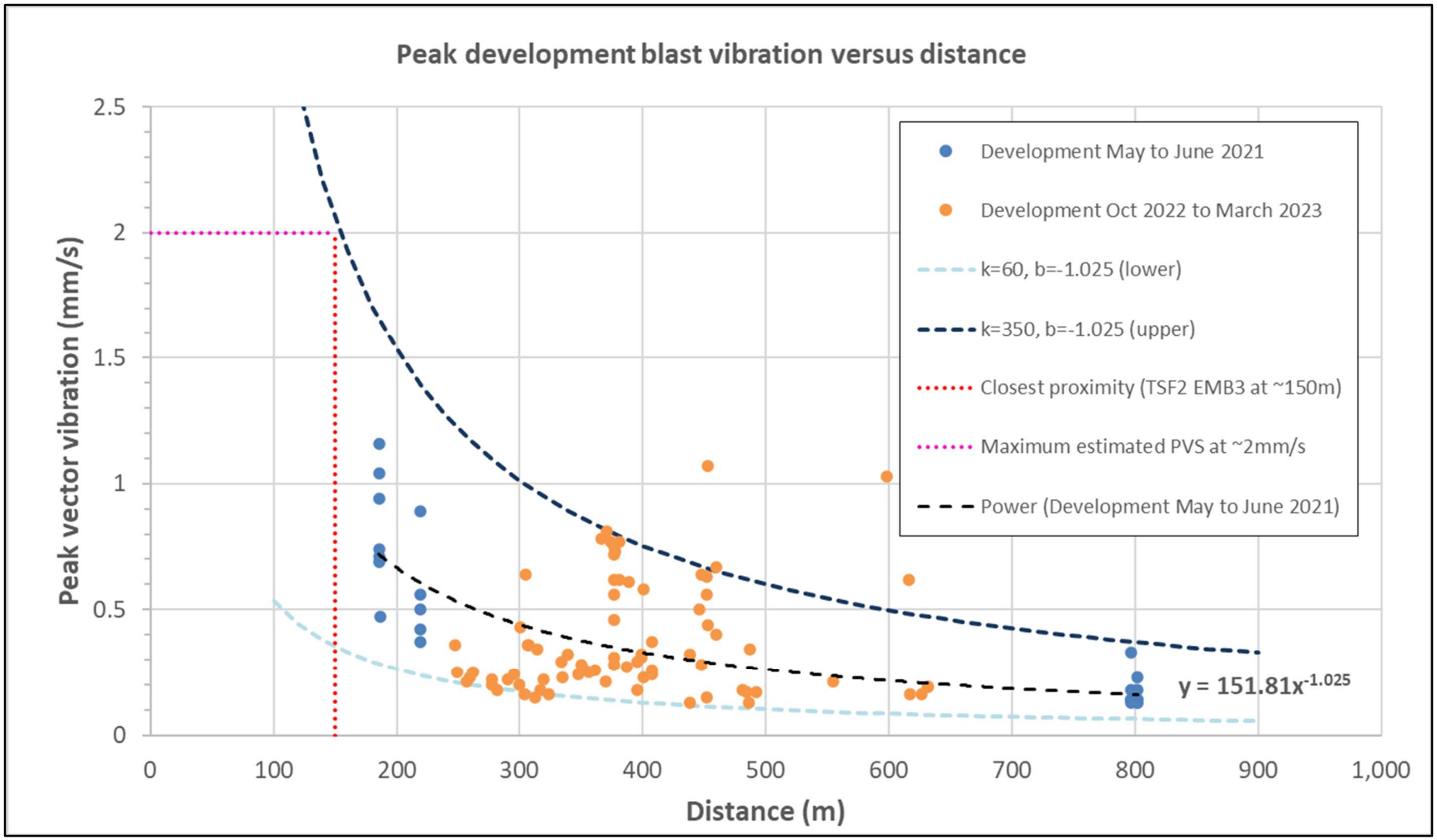


Table 1 – Estimated peak ground vibration impacts for proposed Mod11 development blasting at the closest sensitive receivers.

	Site factor, K	60	350			
	Exponent, b	-1.025	-1.025			
Closest Sensitive Locations	Minimum distance (m)	Peak vibration[1] (lower) (mm/s)	Peak vibration[1] (upper) (mm/s)	Minimum Target / Limit (mm/s)	Achieved (Yes/No)	Notes
TSF1 and TSF2 Facilities						
TSF1 Piezometer location	696	0.1	0.4	15 mm/s	Y	2
TSF2 Embankment 1	241	0.2	1.3	15 mm/s	Y	2
TSF2 Embankment 2	185	0.3	1.7	15 mm/s	Y	2
TSF2 Embankment 3	151	0.4	2.0	15 mm/s	Y	2
Residential						
British Flats	209	0.3	1.5	5 - 10mm/s	Y	3
Jamieson House (Crown property)	229	0.2	1.3	5 - 10mm/s	Y	3
Prop Square Perilya residence	281	0.2	1.1	5 - 10mm/s	Y	3
690 Crystal Street	408	0.1	0.7	5 - 10mm/s	Y	3
Old' closest residence	499	0.1	0.6	5 - 10mm/s	Y	3
419 Eyre Street	691	0.1	0.4	5 - 10mm/s		3
Perilya Junction Circle	720	0.1	0.4	5 - 10mm/s	Y	3
Non residential infrastructure						
Filter Plant	162	0.3	1.9	15mm/s	Y	4
Thompson's Shaft	190	0.3	1.6	15mm/s	Y	4
Perilya Social Club	236	0.2	1.3	15mm/s	Y	4
Origin Energy Yard	296	0.2	1.0	15mm/s	Y	4
North Bowls Club	303	0.2	1.0	15mm/s	Y	4
Dans Stockfeed	429	0.1	0.7	15mm/s	Y	4
St John's Hall	449	0.1	0.7	15mm/s	Y	4
Mawsons silos	461	0.1	0.7	15mm/s	Y	4
Cameron Pipe Band Hall	462	0.1	0.6	15mm/s	Y	4
Jenmar Yard	474	0.1	0.6	15mm/s	Y	4
Mawsons Office	484	0.1	0.6	15mm/s	Y	4
LOL Miners Memorial	768	0.1	0.4	15mm/s	Y	4
Notes						
1. PVS modelled against distance (NOT scaled dist using MIC) as a consistent max charge not achievable with LP detonators.						
2. Limit suggested by Golder Associates of 15mm/s for 'vibration sensitive' embankment foundations (dessicated tailings).						
3. Residential limits at closest private residences <5mm/s (95%), <10mm/s (100%). Target <5mm/s peak vector.						
4. Conservative commercial/industrial building limits of 15mm/s peak vector (refer AS2187).						

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are made, based on the assessment of currently available data and the assumption of good blast design, implementation and record keeping.

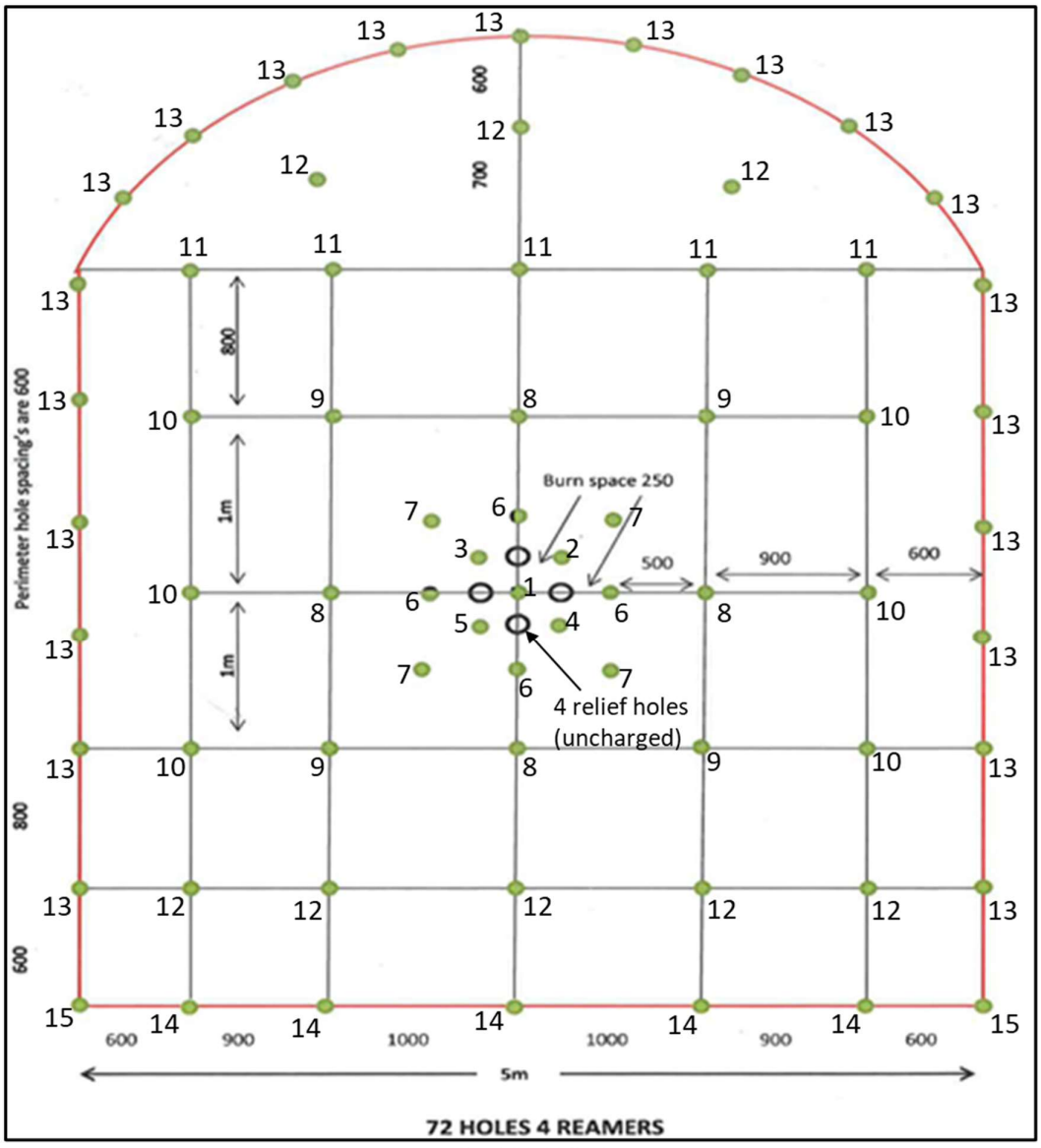
- **Peak vector ground vibration levels at the TSF1 and TSF2 facilities, nearest residential locations, and nearest non-residential infrastructure should remain well below the regulated or recommended limits suggested, at all identified sensitive receivers, for the development blasting proposed in Mod11, at the applicable minimum distances.**
- Monitored data should be used to validate modelled assumptions and adjust blast design parameters to maintain compliant blasting as development proceeds. Blast monitoring should include vibration monitors at the TSF2 embankments, including the closest point on the closest embankment, and the nearest commercial/industrial and residential locations.
- Compliant development blasting for Mod11 should be achievable using conventional tunnel development blasting methods. However, additional control methods are available in the event of non-compliant blasting outcomes include (i) the use of accurate electronic initiation to achieve sequential hole-by-hole firing, and (ii) the use of shorter round length to reduce charge mass per hole when blasting at the closest proximity to sensitive receivers.

For further clarification contact:

Mike Humphreys, Principal D&B Engineer, Fromble Corp Pty Ltd

Email: Mike.Humphreys@PrismMining.com.au

Appendix 1 – Development round example at Rasp Mine



Overall dimensions
Height 5.8m, Width 5m

Blastholes – 72 charged holes, 45mm diam, 4.5m length, with 4 uncharged relief holes.

Charging – 5kg to 6kg emulsion explosive, plus Orica Senatel primer with Exel LP detonator.

Available Delay Range

Delay #	**0**	**1**	**2**	**3**
Nominal Time (s)	0.025	0.2	0.4	0.6
Delay #	**4**	**5**	**6**	**7**
Nominal Time (s)	1.0	1.4	1.8	2.4
Delay #	**8**	**9**	**10**	**11**
Nominal Time (s)	3.0	3.5	4.5	5.5
Delay #	**12**	**13**	**14**	**15**
Nominal Time (s)	6.5	7.5	8.5	9.5

Firing sequence – Between 1 and 21 holes per delay. LP series scatter will result in fewer holes firing together, but will not be consistent from blast to blast.

Appendix 2 - References

The following references have been used in preparing this report.

1. Rasp Mine (PA07_0018) – Ventilation Intake and Main Lode Development Extension, Rasp Mine, June 2023
2. Annexure "D" Standard Mining Conditions, NSW Dams Safety Committee, October 2019.
3. Rasp Mine – Potential Impact of Blasting on Tailings Storage Facility, Technical Memorandum, October 2019, Golder Associates Pty Ltd.
4. Environment Protection Licence for Broken Hill Operations Pty Ltd, NSW EPA.
5. Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration, Australian and New Zealand Environment Council, September 1990.
6. Appendix J, Australian Standard for Explosives Storage and Use, AS2187.2-2006.

END OF DOCUMENT

Appendix F
Geotechnical Assessment

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Blackwoods Fresh Air Shaft Geotechnical Review

1. Introduction

The Surface to Blackwoods Fresh Air Shaft is planned to be a 4m diameter raisebored shaft providing fresh air to the Northern part of the mine. The shaft will be 179m in length and located to the west of TSF2 on surface. It is not currently planned to line the shaft.

Photos of the proposed site, drillcore photos and logs, nearby site investigations, along with geotechnical analysis can be found in Appendix 1 here: W:\TechServ\Geotech\17 Vertical development\BW RB\BW RB Geotech Assessment.pptx.

Figure 1: Planned location of shaft (yellow) with proposed Blackwoods development (white). MLDD 4783 in blue and 4785 in pink.

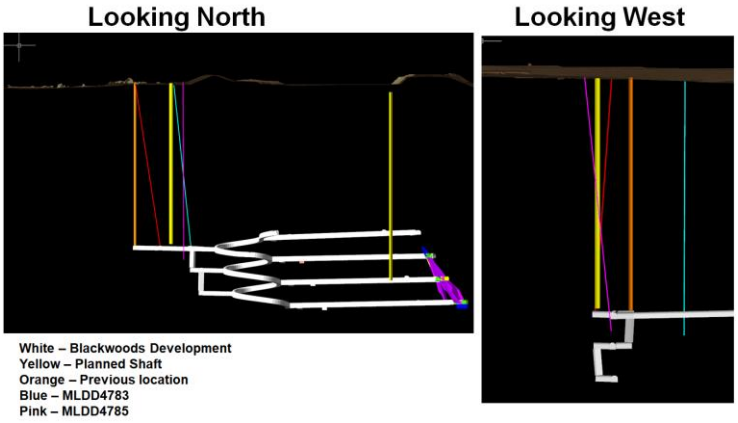

Figure 2: Sections through planned shaft.

2. Geotechnical Information

The planned shaft is located well away from current mining operations. 7L Blackwoods access is currently 210m to the south. The closest historic main lode workings are located 160m to the east. The 1,480'ft drive passes 70m to the WNW, but 240m below. The planned shaft lies in the historic ML413, in an area where no workings are thought to have occurred, apart from the historic Blackwoods Pit (max depth 65m) located approximately 95m to the east. A surface exclusion of 15.24m is recorded for the area.

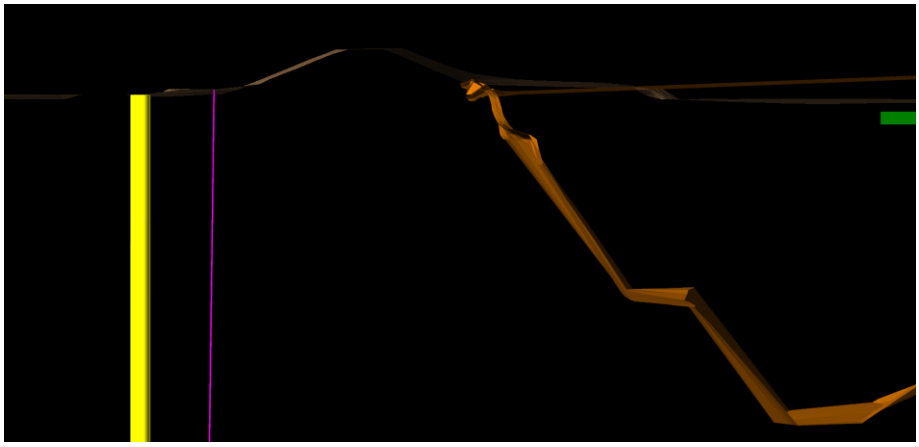

Figure 3: Section looking North through planned shaft with Blackwoods pit.

2.1 TD2 Site investigation August 2018

As part of the site investigation for the construction of TSF2 - Embankment 2 a number of trial pits were dug in the area (RASP Mine TSF Design 1896230-011-R, Golders 2018). Of the 11 Test pits TP1, 2 and 3 are the closest, however TP2 and 3 were excavated within an area of historic tailings and are not thought to be representative. TP1 found moderately weathered metasediments at a depth of 0.8m and was not able to be machine excavated deeper than 1.2m.

TP11 is also thought to have been excavated in a similar profile to the planned shaft with moderately weathered metasediments at a depth of 0.5m and refusal at 0.9m. Only limited laboratory testing was undertaken of Particle Size Distribution tests, thought to have limited applicability to the planned shaft.

2.2 Surface site inspection

A site inspection of the planned shaft location was undertaken on the 30/11/22, from within the site security fencing. The planned shaft location has been situated on an area of outcropping rock at the

toe of EMB2 which is part of TSF2, the current mine tailings storage facility in the historic Blackwood pit.

The area consists of level bare earth with a few scrubby plants (Salt Bush and Mulga). Rock was noted in the shallow drainage ditch at the toe of EMB2, the area was dry at the time of inspection.

The distance from the toe of the tailings dam to surface pad excavation, and the depth and design of that pad will need to be determined in consultation with the dam designers to avoid adversely affecting the stability of the dam.

The design of the surface Evase should consider the risk posed by tailings dam failure, to reduce the risk of the influx of tailings as much as possible in the unlikely case of tailings dam failure.

2.3 Diamond Drillholes

As the area of the planned shaft lies outside of the mineralised areas no diamond drill information was available on the rockmass through which the planned shaft will pass. Diamond drillholes MLDD4783 and 4785 were drilled to give further information on the rockmass.

The east dipping 4783 is located 69m north of the planned shaft, in a previous potential location. The north dipping MLDD4785 was drilled 10m to the east of the planned shaft, passing from south to north around the midpoint of the shaft.

Photos of the drillcore, geological logs and RQD values (per 1m interval) can be found in the Appendix.

The drillholes show approximately 1.5m of broken rock and soil before competent metasediments are intersected. These metasediments with occasional pegmatite intrusions continue for the depth of the holes.

Only one major structure was intersected between 49.8m and 50.7m (0.9m) in MLDD4785 and 52.1m and 52.3m (1.2m) in MLDD 4783. The similarity in depth suggests a flat dipping structure which is reinforced by a possible top contact structural reading of 6° dip to 186°.

Two areas of coreloss are noted in MLDD4783 between 6.5m and 9.6m (3.1m) the reason for this is not known, however it may be associated with the change from HQ to NQ at 7m. Another 0.7m of core loss is noted around 12.5m, however this may be a meterage marking error (see core) as it is not noted in the log for the hole. No areas of coreloss are located in the MLDD4785.

The metasediments intersected by the holes have been rated as Fair with the top 2m as Poor. The fault zone has been rated as extremely poor.

$$Q = \frac{RQD}{Jn} x \frac{Jr}{Ja} x \frac{Jw}{SRF}$$

Parameter	Rating	Reason
RQD	As logged **1**	Visual assessment (60 visual assessment) **Visual assessment**
Jn	6 **12**	2 joint sets + Random **3 + random**
Jr	1.5 **2**	Planar rough **Planar undulating**
Ja	1 (3) **3**	Surface stain (slightly altered top 2m) **Low friction coating <1mm**
Jw	1 **1**	Dry, or minor water flow
SRF	2.5 **2.5**	Low Stress, near surface

$$Q = \frac{60}{6} x \frac{1.5}{1\ (3)} x \frac{1}{2.5} = 6\ (2) = Good\ Rockmass$$

$$\boldsymbol{Q = \frac{1}{12} x \frac{2}{3} x \frac{1}{2.5} = 0.02 = Good\ Rockmass}$$

3. Geotechnical Assessment

3.1 Structural Analysis

293 structural readings were taken from the orientated core in the two diamond drillholes. While the pole plot of the readings shows little correlation.

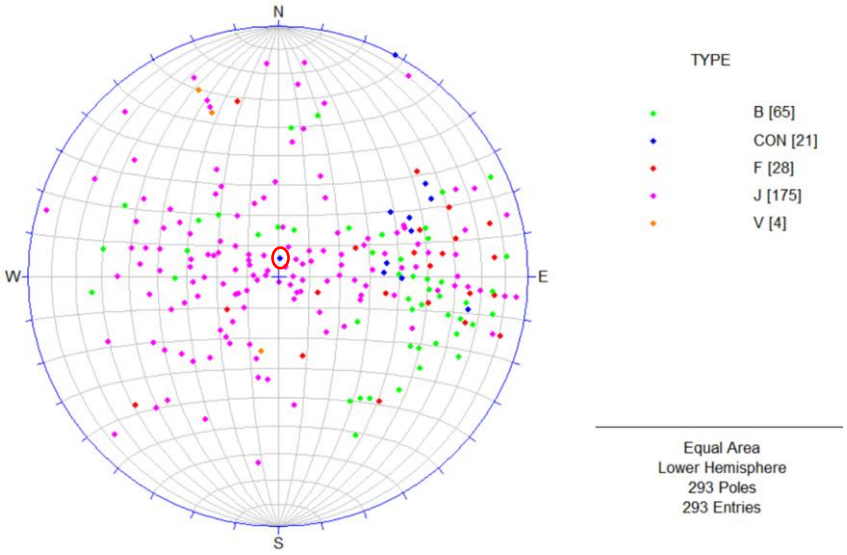

Figure 4: Pole plot of structural readings from MLDD 4783and 4785. Shear structure circled red.

The contour plot of those holes show a high correlation grouped at 49°/269°, thought to be bedding. A near horizontal, SSW dipping set (1m) which roughly correlates with the shear structure (11°/237°) and an east dipping set (34°/107°). Two other possible south dipping structure sets are shown 52°/190° and 64°/158° but these may be the same set.

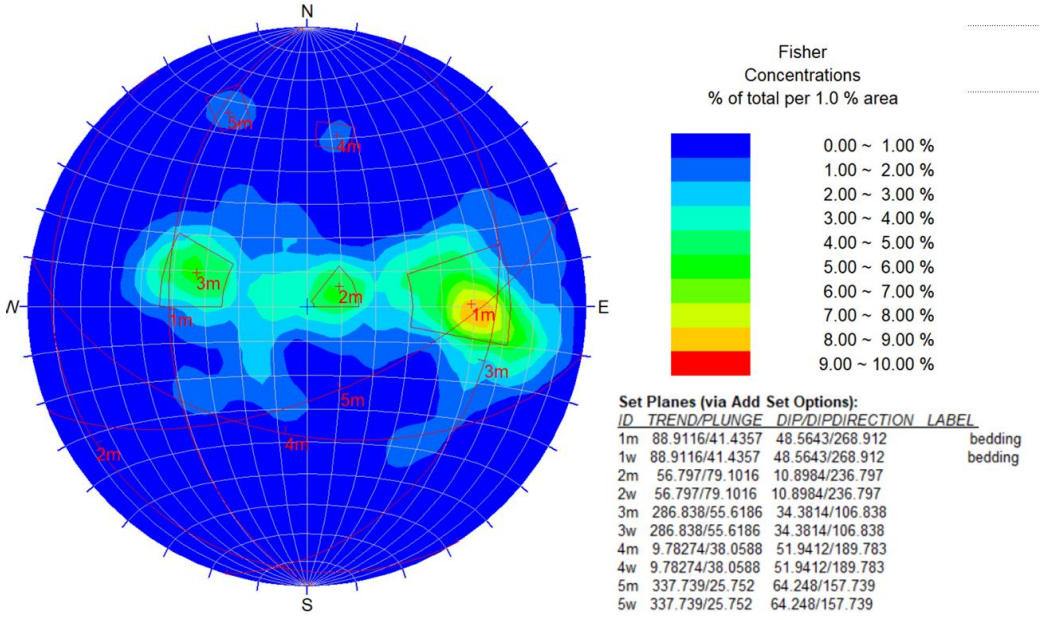

Figure 5: Contour plot of poles.

3.2 Kinematic Analysis

3 UnWedge analyse were undertaken using different combinations of the joint sets above and can be found in the appendix. No wedges of concern were noted in the walls or crown of the proposed shaft.

3.3 Numerical Analysis

No numerical analysis of the shaft was undertaken due to its location close to surface and lack of observed stress issues at the mine. The planned shaft is over 250m west of the planned Blackwoods stoping and no stoping related stress issues are expected, however this will be reviewed as development and stoping progresses in the area.

3.4 Maximum stable unsupported span

The MSUS was calculated according to the McCracken and Stacey method. For this method a number of adjustments are made to the Q value for:

- Wall adjustment to reflect importance of wall stability in raise. An adjustment of 2.5Q was used in the majority of the raise where Q>1. For the shear zone no adjustment was made.
- Orientation adjustment
    - Face orientation adjustment based on number of shallow dipping joint sets to reflect importance of face stability during raise boring. An adjustment of 0.85Q was applied throughout the raise for 1 flat joint set between 0° and 30°.
    - Wall orientation adjustment based on number of steep dipping joint sets for long term stability of raise. An adjustment of 0.9Q was applied throughout the raise for 1 steep joint set between 60° and 90°.
- Weathering adjustment. An adjustment of 0.9Q (slight weathering) was applied.

These adjustments are cumulative and applied to the original rating. A Raise Bore Stability Ratio or RSR (which is equivalent to the Excavation Support Ratio or ESR) of 2.5 was assigned for permanent mine opening/circular shaft.

Based on the above the lowest MSUS calculated for the walls and raisebore face of the raise was 1m for the shear zone at around 51m depth.

For the rest of the shaft MSUS of face and wall is well over 4m.

3.5 Lower Bound QR

The lower bound Q_R method allows comparison of raisebore stability across mine sites. It uses a rolling 3m average based on observations that zones of poor quality rockmass need to be greater than 3m in length to significantly impact raise wall stability. For zones smaller than this overbreak may be experienced but continual unravelling does not tend to occur.

A minimum Lower Bound Qr of 6 was calculated in the raise for the shear around 51m depth, which is stable for an RSR of 1.3 so would be stable at an RSR of 2.

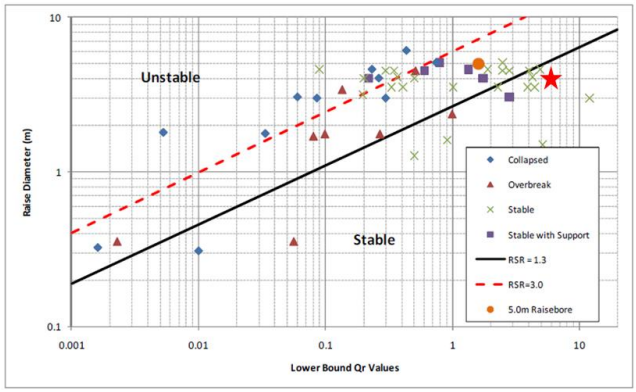

Figure 6: QR for raise (red star).

4. Conclusion and recommendations

Based on the limited information available the shaft is expected to be stable at a dimension of 4m. The shear zone at 51m is expected to cause localised deterioration in that area consisting of possible scat failure but should not affect the stability of the entire shaft. This is considered as suitable for the end use of the shaft as a fresh air raise with no personnel entry.

If the risk posed by the shear zone is not considered acceptable, shotcrete lining of the area can be considered.

A number of recommendations are made:

- Confirm in writing that the depth and location of surface pad to be determined from the dam designers to ensure stability of dam is not adversely affected.
- Further investigation of the fault would aid confidence – either another DDH to show orientation or by camera survey after raise boring. Shotcrete line area if required.
- Access to base of shaft to be maintained to allow monitoring for fallen material (added to critical infrastructure list in annual Geotechnical Drive Assessment, and bogging if required
- Surface Evase design to allow periodic camera surveys.
- The design of the surface Evase should consider the risk posed by tailings dam failure, to reduce the risk of the influx of tailings as much as possible in the unlikely case of tailings dam failure.
- Re-assess findings if end use of shaft is changed.
- Geotechnical inspection of surface pad excavation (should be included in permit to excavate).
- Monitor impact of development and stoping on shaft as Blackwoods extraction progresses.

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