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Re: Addendum to MOD6 noise impact assessment - TSF2 tailings harvesting haul road update

Dear Gwen,

1 Introduction

EMM Consulting Pty Limited (EMM) has been engaged by Broken Hill Operations Pty Ltd (BHOP) to review potential noise impacts associated with the proposed new TSF2 tailings harvesting haul road for the proposed Modification 6 (MOD6) of Project Approval PA 07_0018 (PA) for the Rasp Mine, Broken Hill, NSW.

2 MOD6 project updates

2.1 Overview

This report provides an addendum to the *Rasp Mine Modification 6 – Kintore Pit TSF3 – Noise impact assessment* report (MOD6 NIA) prepared by EMM in May 2021 for MOD6 following recent minor changes to the project description. These changes relate to the location and alignment of the tailings harvesting haul road between TSF2 and TSF3. Tailings harvesting haulage was outlined in the MOD6 project brief (September 2020) utilising the current mine ore haul road.

As TSF2 Embankment 3 (Modification 4) was being completed, it was identified that the space for the roadway between the embankment and the processing plant was insufficient for safe access and passage. This was a section of the tailings harvesting haulage route assessed for MOD6. A new tailings harvesting haulage route is therefore proposed to avoid this part of the site. The new tailings harvesting haul road (referred to as the 'new haul road' hereafter) has now been incorporated into the design of the boxcut and will dissect the upper benches of the boxcut footprint. The new haul road will commence on the western slope of TSF2 entering the northern corner of the boxcut and exiting at its western corner before arriving at the current mine ore haul road on the other side of the portal.

In addition to avoiding the roadway between the embankment and the processing plant, the new haul road will remove the interaction of trucks hauling ore from those hauling tailings. Other minor alterations to the mine ore haul road are also proposed to improve road intersections for visibility. No changes are proposed to other parts of the tailings harvesting haul route between the new haul road (starting near the boxcut) and TSF3.

The current mine haul roads (as assessed in the MOD6 NIA) and proposed new tailings harvesting haul road are shown in Figure 2.1.

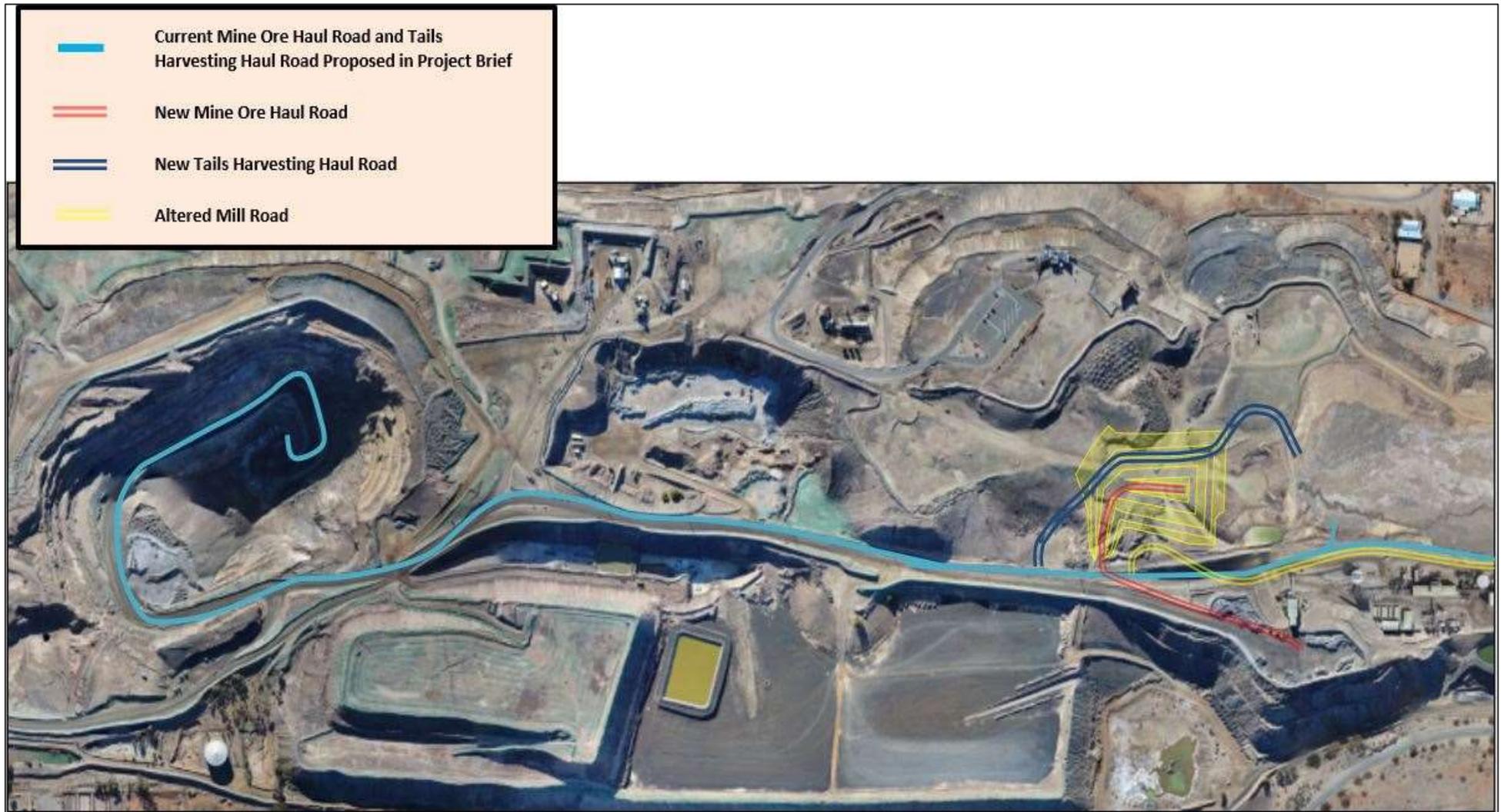


Figure 2.1 Current mine haul roads and proposed new tailings harvesting haul road

The new haul road will result in additional projected material movement during the construction phase in the vicinity of the boxcut as well as a change to the tailings harvesting haulage route during the operational phase. An assessment of noise impacts from the new haul road for the construction and operation stages has been undertaken and noise predictions from the proposed changes have been compared to those presented in the MOD6 NIA.

2.2 Construction activities update

The new haul road construction will be completed in several stages and comprise the following activities:

- Earthworks and road capping for new haul road – areas A, B and C;
- Road capping and pavement (concrete) for new haul road – area D;
- Boxcut ramp to portal road capping – area E;
- Mill access road intersection re-alignment and road capping – area F;
- Light vehicle access road capping – area G;
- Boxcut parking area road capping – area H; and
- Hardstand and heavy vehicle go line road capping – area I.

The new haul road construction areas are shown in Figure 2.2.

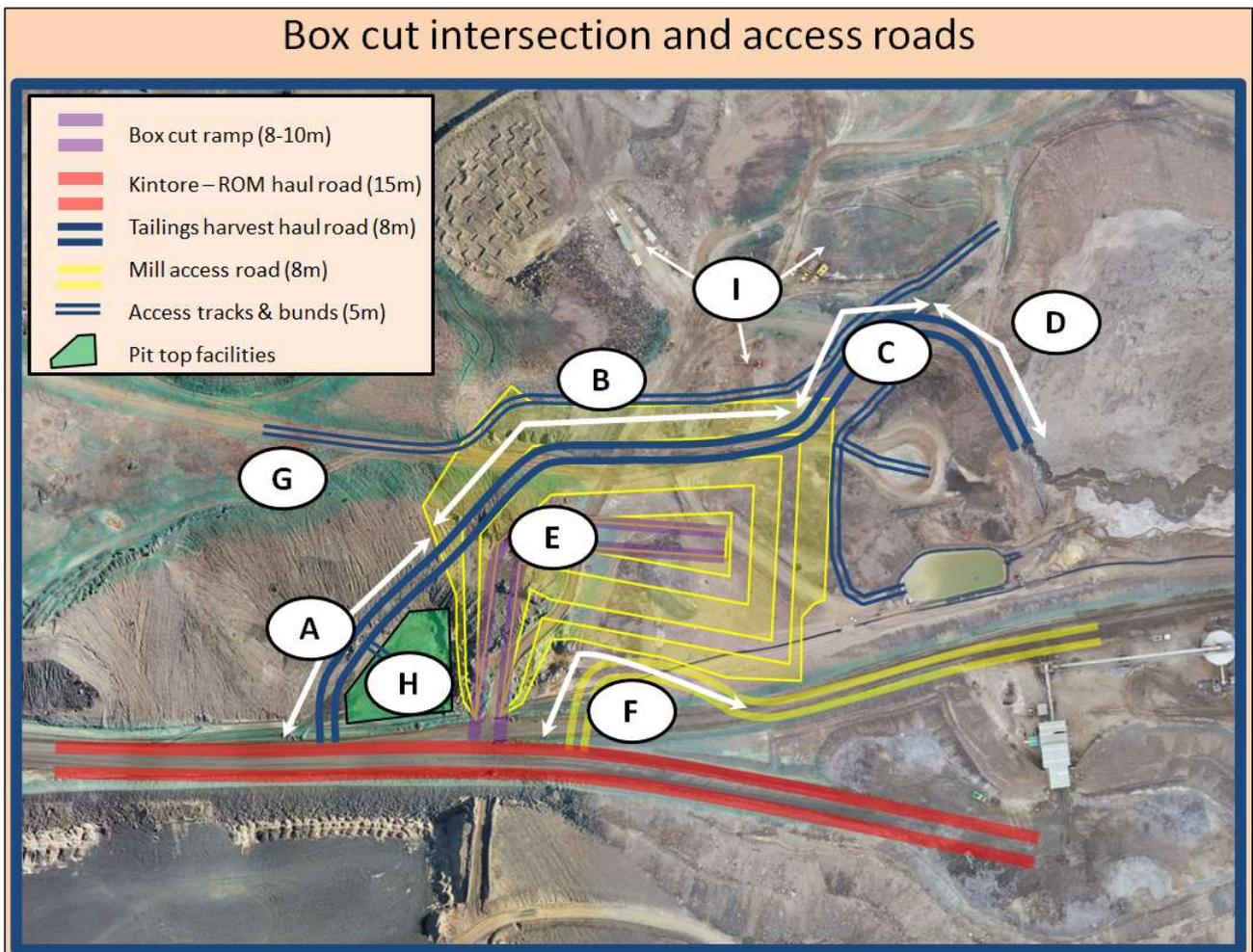


Figure 2.2 Proposed TSF2 tailings harvesting haul road construction

The majority of the construction activities associated with the new haul road will occur during the boxcut construction. The exception will be for the construction activities associated with the pavement (concrete) of the new haul road ramp in area D, which is anticipated to occur during the initial stage of the new decline surface works (surface trucking), after completion of the boxcut construction. The pavement (concrete) of the new haul road ramp in area D is anticipated to take up to four weeks to complete. Each of the other construction activities associated with the new haul road will be relatively short in duration, less than one day for most but potentially up to four days for area B. Therefore, it is anticipated that the construction schedule as assessed in the MOD6 NIA will not be significantly affected as a result.

Activities associated with the new haul road construction will generally occur during the Interim Construction Noise Guideline (ICNG) standard hours between 7 am and 6 pm Monday to Friday, 8 am to 1 pm on Saturdays, and no work on Sundays or public holidays. Some activities will also occur outside the ICNG's recommended standard hours (ie during out-of-hours (OOH)), for one hour (7 am to 8 am) and five hours (1 pm to 6 pm) on Saturdays and will remain within the day period. The proposed new haul road construction hours are consistent with those of the boxcut construction and new decline surface works as assessed in the MOD6 NIA.

2.3 TSF2 tailings harvesting operation update

The operational changes associated with the new haul road only relate to the location and alignment of this section of the tailings harvesting haul route, that is between the boxcut and TSF2 (refer to Figure 2.2). No changes are proposed to other parts of the tailings harvesting haul route between the new haul road section and TSF3 or other future site operations. Tailings harvesting activities during the operational phase (during the day period only) other than truck movements on the new haul road section will remain the same (eg harvesting activities within TSF2), as assessed in the MOD6 NIA.

An assessment of noise impacts during the day period from the new haul road section during the operational stage (after completion of all MOD6 construction) has been undertaken. The noise model developed for MOD6 as detailed in the MOD6 NIA was updated as per the changes described in this report. Daytime noise predictions from the proposed changes and site operations as a whole have been compared to those presented in the MOD6 NIA and assessed against the relevant PNTLs.

3 Assessment locations and day criteria

The assessment locations and day criteria adopted for this assessment are consistent with those in the MOD6 NIA and are summarised in the following sections.

3.1 Construction

Construction noise management levels (NMLs) adopted for this assessment for standard hours and day OOH were derived in accordance with the Interim Construction Noise Guideline (ICNG) for all assessment locations and are presented in Table 3.1. The construction NMLs for standard hours are based on RBL + 10 dB. The construction NMLs for day OOH period are based on RBL + 5 dB.

The existing PA noise limit of 65 dB $L_{Aeq,day}$ for approved construction noise at the site has also been presented for all MOD6 construction activities proposed to occur during the day period (ICNG standard hours and day OOH). A 65 dB $L_{Aeq,day}$ is equivalent to 68 dB $L_{Aeq,15min}$ as per the NPfl, and hence has been adopted as the existing PA noise limit for the purpose of this assessment. This is also shown in Table 3.1.

Table 3.1 Site specific construction NMLs (as per ICNG) and PA noise limit

Residential assessment location	Description	RBLs ¹ , dB(A) Day	NMLs, L _{Aeq,15min} , dB		PA limit ² , L _{Aeq,15min} , dB Standard hours/day OOH
			Standard hours (RBL+10)	Day OOH (RBL+5)	
A1	Piper St North	35 ³	45	40	68
A2	Piper St Central	35 ³	45	40	68
A3	Eyre St North	39	49	44	68
A4	Eyre St Central	39	49	44	68
A5	Eyre St South	39	49	44	68
A6	Bonanza & Gypsum Sts	43	53	48	68
A7	Carbon St	40 ⁴	50	45	68
A8	South Rd	43	53	48	68
A9	Crystal St	41	51	46	68
A10	Garnet & Blende Sts	37	47	42	68
A11	Crystal St	41	51	46	68
A12	Crystal St	41	51	46	68
A13	419 Eyre St	35 ³	45	40	68
A14	Piper St North	35 ³	45	40	68

- Notes:
1. Referenced from EMM report *Rasp Mine Modification 4 – Concrete batching plant and TSF2 (Blackwood Pit) extension – Noise impact assessment (2017)* unless noted otherwise.
 2. Existing PA noise limit for construction activities approved at the site (MOD4, MOD5 and MOD7) has also been adopted for all MOD6 construction activities proposed to occur during the day period. A 65 dB L_{Aeq,day} noise level is equivalent to a 68 dB L_{Aeq,15min} noise level as per the NPfl.
 3. Based on the NPfl minimum day period RBL of 35 dB, in accordance with the ICNG.
 4. Determined from the ambient noise monitoring completed in June 2019 (refer to the MOD6 NIA).
 5. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays. ICNG standard hours: 7 am to 6 pm Monday to Friday and 8 am to 1 pm on Saturdays. ICNG day OOH: 7 am to 8 am and 1 pm to 6 pm on Saturdays.

3.2 Operation

The adopted PNTLs are largely unchanged from the existing PA and EPL limits applicable to site currently. The only changes are for the less sensitive daytime period due to NSW EPA policy changes (for assessment locations A1, A2, A13 and A14) and updated RBLs for assessment location A7. Consistent with the MOD6 NIA, it is recommended that site noise limits (in the PA and EPL) be adjusted in accordance with the findings of the MOD6 NIA, this addendum assessment and the NPfl.

The existing site limits (PA and EPL) and PNTLs adopted for the day period for this assessment are shown in Table 3.2 for comparison, with changes in the PNTLs shown in bold font.

Table 3.2 Existing PA/EPL operational noise limits and adopted PNTLs

Residential assessment location	Description	PA/EPL operational noise limits	Adopted PNTLs
		L _{Aeq,15min} , dB Day ¹	L _{Aeq,15min} , dB Day ¹
A1	Piper St North	38	40²
A2	Piper St Central	38	40²
A3	Eyre St North	44	44
A4	Eyre St Central	44	44
A5	Eyre St South	44	44

Table 3.2 Existing PA/EPL operational noise limits and adopted PNTLs

Residential assessment location	Description	PA/EPL operational noise limits	Adopted PNTLs
		L _{Aeq,15min} , dB Day ¹	L _{Aeq,15min} , dB Day ¹
A6	Bonanza & Gypsum Sts	48	48
A7	Carbon St	35	45³
A8	South Rd	48	48
A9	Crystal St	46	46
A10	Garnet & Blende Sts	42	42
A11	Crystal St	46	46
A12	Crystal St	46	46
A13	419 Eyre St	38	40²
A14	Piper St North	35	40²

Notes: 1. Day period: Monday to Saturday: 7 am to 6 pm, on Sundays and public holidays: 8 am to 6 pm.
 2. Based on the NPfl minimum day period RBL of 35 dB.
 3. Updated based on ambient noise monitoring completed in June 2019 (refer to the MOD6 NIA).

4 Updated noise assessment

4.1 Noise modelling software and meteorological conditions

Quantitative modelling of construction and operational noise was completed using DGMR iNoise noise prediction software (from the developers of the long standing Predictor product). This software applies the EPA accepted ISO 9613 approach and calculates total noise levels at assessment locations from the concurrent operation of multiple noise sources. Three-dimensional digitised ground contours of the site and surrounding land were incorporated to model topographic effects. Equipment was modelled at locations and heights representative of proposed construction activities and future operations. This is consistent with the methodology adopted in the MOD6 NIA.

4.2 Construction noise

4.2.1 Modelled construction scenarios

The construction noise modelling for the new haul road was based on information received from BHOP including the location and type of activities, the equipment required and approximate schedule.

To determine the worst-case scenarios for this assessment, activities associated with the new haul road construction were carefully reviewed to identify those that would result in worst-case noise at offsite locations, considering construction activities previously assessed in the MOD6 NIA that may occur concurrently. Activities associated with the new haul road construction will occur during the boxcut construction (stage 1, stage 2 and/or stage 3) or new decline surface works (surface trucking). No additional equipment will be required to be brought on-site for the new haul road construction as the same equipment used for these other construction activities (as assessed in the MOD6 NIA) will be utilised. The exception will be for the pavement (concrete) works for new haul road ramp (area D) which will require the use of concrete agitator trucks from an offsite contractor.

Based on this review, the following new haul road construction activities were identified as worst-case and were modelled for the purpose of this assessment:

1. Earthworks for new haul road in area A, during stage 2 of the boxcut construction;
2. Pavement (concrete) for new haul road in area D, during the new decline surface works (surface trucking); and
3. Mill access road intersection re-alignment in area F, during stage 1 of the boxcut construction.
4. Mill access road intersection re-alignment in area F, during stage 2 of the boxcut construction.

Based on this review, it can also be said that noise levels likely to be generated by other construction activities associated with the new haul road and construction activities previously assessed in the MOD6 NIA (combined) are unlikely to be above those presented in this addendum assessment.

To assess the worst-case noise from the new haul road construction, noise levels predicted for each construction activity were added to noise levels from existing site operations. The overarching approach is to model worst-case construction activities together with existing site operations as relevant and is consistent with the approach adopted in the MOD6 NIA.

4.2.2 Construction noise results

i Updated construction noise results

Predicted site noise levels for each worst-case construction scenarios (refer to Section 4.2.1) during noise-enhancing weather conditions (consistent with the MOD6 NIA) for the ICNG daytime assessment periods (standard hours and day OOH Saturday) are shown in Table 4.1. Noise levels predicted to be above the day OOH NMLs are indicated in bold and noise levels predicted to be above the standard hours NMLs are indicated by bold font and grey shading.

Table 4.1 Predicted new haul road construction noise levels

Residential assessment location	Predicted new haul road construction noise levels ¹ , L _{Aeq,15min} , dB				ICNG NMLs, L _{Aeq,15min} , dB		PA limit ⁷ , L _{Aeq,15min} , dB
	Standard hours/day OOH Saturday ISO 9613 ²				Standard hours	Day OOH Saturday	Standard hours/day OOH
	Scenario 1 ³	Scenario 2 ⁴	Scenario 3 ⁵	Scenario 4 ⁶			
A1	43	<35	43	42	45	40	68
A2	40	36	44	45	45	40	68
A3	42	40	46	47	49	44	68
A4	43	43	44	44	49	44	68
A5	36	<35	38	37	49	44	68
A6	<35	<35	36	35	53	48	68
A7	<35	<35	36	35	50	45	68
A8	<35	<35	36	35	53	48	68
A9	<35	<35	39	37	51	46	68
A10	35	<35	38	36	47	42	68
A11	36	<35	42	36	51	46	68

Table 4.1 Predicted new haul road construction noise levels

Residential assessment location	Predicted new haul road construction noise levels ¹ , L _{Aeq,15min} , dB				ICNG NMLs, L _{Aeq,15min} , dB		PA limit ⁷ , L _{Aeq,15min} , dB
	Standard hours/day OOH Saturday				Standard hours	Day OOH Saturday	Standard hours/day OOH
	ISO 9613 ²						
	Scenario 1 ³	Scenario 2 ⁴	Scenario 3 ⁵	Scenario 4 ⁶			
A12	40	37	41	39	51	46	68
A13	47	35	48	43	45	40	68
A14	47	35	46	44	45	40	68

Notes: 1. Combined with noise levels from existing site operations.
 2. Downwind conditions in accordance with ISO 9613 algorithm (Sections 5 and 8 of ISO 9613-2:1996).
 3. Scenario 1 – Earthworks for new haul road in area A, during stage 2 of the boxcut construction.
 4. Scenario 2 – Pavement (concrete) for new haul road in area D, during the new decline surface works (surface trucking).
 5. Scenario 3 – Mill access road intersection re-alignment in area F, during stage 1 of the boxcut construction.
 6. Scenario 4 – Mill access road intersection re-alignment in area F, during stage 2 of the boxcut construction.
 7. A 65 dB L_{Aeq,day} noise level is equivalent to a 68 dB L_{Aeq,15min} noise level as per the NPfI.
 8. ICNG standard hours: 7 am to 6 pm Monday to Friday and 8 am to 1 pm on Saturdays. ICNG day OOH: 7 am to 8 am and 1 pm to 6 pm on Saturdays.

During standard hours and day OOH on Saturday, modelling results show that noise levels from the new haul road construction and existing operations (combined) are predicted to satisfy the adopted 68 dB L_{Aeq,15min} noise limit as per the PA (Condition 17B(c)) at all assessment locations.

Noise levels from the new haul road construction and existing operations (combined) were also compared to the ICNG NMLs for standard hours and day OOH on Saturday.

Noise levels during the earthworks in area A (scenario 1; less than half a day in duration) are predicted to exceed the relevant NMLs during:

- standard hours at assessment locations A13 (2 dB) and A14 (2 dB).
- day OOH on Saturday at assessment locations A1 (3 dB), A13 (7 dB) and A14 (7 dB).

Noise levels during the pavement (concrete) works in area D (scenario 2; less than one day of activities over a four-week period) are predicted to satisfy the relevant NMLs at all assessment locations.

Noise levels during the mill access road intersection re-alignment works in area F (scenario 3 – during stage 1 of the boxcut construction; half a day in duration) are predicted to exceed the relevant NMLs during:

- standard hours at assessment locations A14 (1 dB) and A13 (3 dB).
- day OOH on Saturday at assessment locations A1 (3 dB), A3 (2 dB), A2 (4 dB), A14 (6 dB) and A13 (8 dB).

Noise levels during the mill access road intersection re-alignment works in area F (scenario 4 – during stage 2 of the boxcut construction; half a day in duration) are predicted to exceed the relevant NMLs during:

- day OOH on Saturday at assessment locations A1 (2 dB), A3 (3 dB), A2 (5 dB), A13 (3 dB) and A14 (4 dB).

ii Comparison to MOD6 NIA construction noise results

To understand the potential noise impacts from the new haul road construction, the noise levels predicted during the new haul road construction (Table 4.1) and the noise levels predicted without the new haul road construction as assessed in the MOD6 NIA (for the relevant construction scenarios) are compared in Table 4.2. Noise levels predicted to be above the day OOH NMLs are indicated in bold and noise levels predicted to be above the standard hours NMLs are indicated by bold font and grey shading.

Table 4.2 Predicted MOD6 NIA vs new haul road construction noise levels

Residential assessment location	Predicted MOD6 NIA construction noise levels ¹ , L _{Aeq,15min} , dB			Predicted new haul road construction noise levels ² , L _{Aeq,15min} , dB			
	Standard hours/day OOH Saturday			Standard hours/day OOH Saturday			
	ISO 9613 ³			ISO 9613 ³			
	Boxcut stage 1	Boxcut stage 2	Decline surface trucking	Scenario 1 ⁴	Scenario 2 ⁵	Scenario 3 ⁶	Scenario 4 ⁷
A1	42	41	<35	43	<35	43	42
A2	43	44	35	40	36	44	45
A3	44	45	39	42	40	46	47
A4	43	43	42	43	43	44	44
A5	37	37	<35	36	<35	38	37
A6	<35	<35	<35	<35	<35	36	35
A7	35	<35	<35	<35	<35	36	35
A8	35	<35	<35	<35	<35	36	35
A9	38	36	<35	<35	<35	39	37
A10	38	36	<35	35	<35	38	36
A11	42	35	<35	36	<35	42	36
A12	41	39	37	40	37	41	39
A13	48	39	35	47	35	48	43
A14	45	43	35	47	35	46	44

- Notes:
1. Referenced from the MOD6 NIA report (EMM 2021).
 2. As shown in Table 4.1.
 3. Downwind conditions in accordance with ISO 9613 algorithm (Sections 5 and 8 of ISO 9613-2:1996).
 4. Scenario 1 – Earthworks for new haul road in area A, during stage 2 of the boxcut construction.
 5. Scenario 2 – Pavement (concrete) for new haul road in area D, during the new decline surface works (surface trucking).
 6. Scenario 3 – Mill access road intersection re-alignment in area F, during stage 1 of the boxcut construction.
 7. Scenario 4 – Mill access road intersection re-alignment in area F, during stage 2 of the boxcut construction.

When comparing noise levels predicted during the new haul road construction and noise levels predicted during the boxcut construction or new decline surface works (surface trucking) as shown in the MOD6 NIA, no significant (>2 dB) increase in construction noise levels are predicted at most assessment locations. The exceptions are during the earthworks in area A (scenario 1) which are proposed to occur during stage 2 of the boxcut construction; Noise levels are predicted to be up to 4 dB higher at assessment location A14 and up to 8 dB higher at assessment location A13. However, these are comparable exceedances to those predicted for stage 1 of the boxcut construction in the MOD6 NIA (ie up to 8 dB above the NML at assessment location A13 during day OOH on Saturday).

It is important to note that the modelled construction works represent worst-case scenarios for all activities proposed for the new haul road construction and are relatively short in duration when compared to other

construction activities assessed in the MOD6 NIA. Therefore, noise levels from the proposed construction works would be for most of the times lower than the predicted levels shown in Table 4.1.

Noise management and mitigation measures adopted in the MOD6 NIA will also be implemented by BHOP during the new haul road construction.

4.3 Future operational noise

Noise predictions from the proposed changes to the tailings harvesting haul route and future site operations as a whole (following the completion of the MOD6 construction works) have been compared to those presented in the MOD6 NIA and assessed against the relevant PNTLs.

No increase in predicted site noise levels is anticipated during the day period as a result of the new haul road. Therefore, future operational noise levels during daytime tailings harvesting are predicted to remain the same as those presented in the MOD6 NIA. These are shown in Table 4.3.

Table 4.3 Predicted future daytime operational noise levels

Residential assessment location	Future $L_{Aeq,15min}$ noise levels, dB	Adopted PNTLs, $L_{Aeq,15min}$, dB	Future exceedance, dB
	Wind ¹		Wind ¹
A1	<40	40	Nil
A2	40	40	Nil
A3	44	44	Nil
A4	<44	44	Nil
A5	<44	44	Nil
A6	<48	48	Nil
A7	<45	45	Nil
A8	<48	48	Nil
A9	<46	46	Nil
A10	<42	42	Nil
A11	<46	46	Nil
A12	<46	46	Nil
A13	40	40	Nil
A14	<40	40	Nil

Notes: 1. Downwind conditions in accordance with ISO 9613 algorithm (Sections 5 and 8 of ISO 9613-2:1996).

5 Conclusion

EMM has completed an addendum noise impact assessment of the proposed MOD6 construction and operational activities at Rasp Mine. This assessment was undertaken based on the updated TSF2 tailing harvesting haul route, associated construction activities and future operations.

Site noise levels during worst-case construction scenarios during noise-enhancing weather conditions for the ICNG daytime assessment periods (standard hours and day OOH Saturday) were predicted.

Modelling results show that noise levels during the new haul road construction and existing operations (combined) are predicted to satisfy the 68 dB $L_{Aeq,15min}$ noise limit as per the PA (Condition 17B(c)) at all assessment locations during both standard hours and day OOH on Saturday.

When compared to the ICNG NMLs for standard hours, noise levels from the new haul road construction and existing operations (combined) are predicted to exceed the relevant NMLs at assessment locations A14 (by up to 2 dB) and A13 (by up to 3 dB). When compared to the ICNG NMLs for day OOH on Saturday, noise levels from the new haul road construction and existing operations (combined) are predicted to exceed the relevant NMLs at assessment locations A1 (by up to 3 dB), A3 (by up to 3 dB), A2 (by up to 5 dB), A14 (by up to 7 dB) and A13 (by up to 8 dB). However, these exceedances are comparable to those predicted in the MOD6 NIA and constructions activities associated with the new haul road will be generally short in duration (less than one day individually). Noise management and mitigation measures adopted in the MOD6 NIA will also be implemented by BHOP during the new haul road construction.

Future operational noise levels during daytime tailings harvesting are predicted to remain the same as those presented in the MOD6 NIA as no increase in site noise levels is predicted as a result of the new haul road.

Yours sincerely



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Reviewed by Najah Ishac 19/5/2021