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Re: RASP Mine Zinc Lodes Project Approval Variation noise assessment

Dear Gwen,

1 Introduction

EMGA Mitchell McLennan Pty Limited (EMM) has been engaged to review potential noise impacts associated with the proposed underground mining extension for the Broken Hill Operations Pty Limited RASP Mine (RASP Mine) in Broken Hill NSW. RASP Mine is seeking a variation of its Project Approval 07_0018 to include the underground mining of Block 7 Main Lode and Zinc Lodes located at the south-western boundary.

Of relevance to noise, the proposed extension would include the operation of additional ventilation fans (located underground and venting at the surface) to support underground mining in the south-west areas.

2 Noise criteria

2.1 Project approval limits

Condition 16 of Schedule 3 of the Project Approval (07_0018 Mod 1) (PA) dated March 2012 provides noise limits RASP Mine must meet during its operational phase. For this assessment, an additional assessment location A5B was adopted to quantify site noise contributions at residences south-east of assessment location A5 and closer to Shaft 5. Noise limits for all assessment locations (including assumed noise limits for A5B) are reproduced in Table 1.

Table 1 Noise criteria

| Assessment location | Address | Criteria, $L_{eq,(15-min)}$ dB(A) | | |
|---------------------|----------------------|-----------------------------------|----------------------|--------------------|
| | | Day ¹ | Evening ² | Night ³ |
| A1 | Piper St North | 38 | 37 | 35 |
| A2 | Piper St Central | 38 | 37 | 35 |
| A3 | Eyre St North | 44 | 41 | 39 |
| A4 | Eyre St Central | 44 | 41 | 39 |
| A5 | Eyre St South | 44 | 41 | 39 |
| A5B ⁴ | Eyre St South-east | 44 (assumed) | 41 (assumed) | 39 (assumed) |
| A6 | Bonanza & Gypsum Sts | 48 | 41 | 39 |
| A7 | Carbon St | 35 | 35 | 35 |
| A8 | South Rd | 48 | 39 | 39 |
| A9 | Crystal St | 46 | 39 | 39 |
| A10 | Garnet & Blende Sts | 42 | 41 | 35 |
| A11 | Crystal St | 46 | 39 | 39 |
| A12 | Crystal St | 46 | 39 | 39 |
| A13 | Eyre St North 2 | 38 | 35 | 35 |
| A14 | Piper St North | 35 | 35 | 35 |

Notes: 1. Day is defined as 7 am to 6 pm Mondays to Saturday, 8 am to 6 pm Sundays and public holidays.
2. Evening is defined as 6 pm to 10 pm on any day.
3. Night is defined as 10 pm to 7 am Mondays to Saturdays, 10 pm to 8 am Sundays and public holidays.
4. Noise limits for A5B are assumed to be the same as for A5.

3 Noise assessment

3.1 Operational noise

The proposed extension would include underground mining of the south-western areas. This would replace material from Main Lode Pillars which can no longer be mined successfully, and subsequently there would be no addition to the mined tonnages or ore processed. No additional equipment would be required to extract or process the ore in these areas.

The use of four ventilation fans would be required to supply air to these areas. The ventilation fans would typically be 110 kW each, operate at 1500 rpm and with a diameter of 1400 mm. Two ventilation fans (secondary) would be required to be installed 90 m underground below Shaft 5 to draw surface air down to the proposed south-west areas. Shaft 5 is located at the south-west boundary of the site (refer to Figure 1). Two additional ventilation fans (primary) would be required to be installed in parallel approximately 160 m underground below Shaft 6. These primary ventilation fans would be used to extract the air intake through Shaft 6. Shaft 6 is situated in a more central part of the site and is located approximately 650 m north-east of Shaft 5 (refer to Figure 1).

The shafts and assessment locations are shown in Figure 1.



THE SHAFTS AND ASSESSMENT LOCATIONS

FIGURE 1

It is noted that there would be no additional surface works required for the proposed mining extension.

The sound emission of the ventilation fans (underground at source) is shown in Table 2. These are based on typical fan units as provided by one potential supplier, Zitron Australia. To model the noise source at the surface position it was necessary to make allowances for losses due to the shaft length and bends between the fan units underground and the surface vents.

Table 2 Typical sound power level of ventilation fans (with silencer) at source (Zitron data)

| Octave centre frequency (Hz), dB(Z) | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | Overall | |
|--|-----|-----|-----|-----|------|------|------|------|------------|------------|
| | | | | | | | | | dB(Z) | dB(A) |
| Secondary fans | 101 | 101 | 107 | 502 | 98 | 96 | 95 | 95 | 111 | 105 |
| Primary fans | 101 | 101 | 107 | 502 | 98 | 96 | 95 | 95 | 111 | 105 |

3.2 Predicted noise levels and assessment

Noise modelling was carried out using Brüel & Kjær Predictor Version 8.14 noise prediction software. Predictor calculates total noise levels at residences from the concurrent operation of multiple noise sources. The noise emissions at Shaft 5 and Shaft 6 were modelled to predict noise levels during applicable meteorological conditions as per previous RASP Mine assessments. These include:

- Day period - calm conditions with no wind or temperature gradient;
- Evening period - calm conditions with no wind or temperature gradient; and
- Night period - temperature inversion (F class).

For the purpose of this assessment it is assumed that existing site noise contributions equate to the relevant criteria for assessment locations that are most exposed to RASP Mine main surface operations. These include A1 to A3, and A7 to A14. For assessment locations located relatively further away from the main surface operations (eg to the south-west of the mine including A4, A5, A5B and A6), existing site noise contributions are assumed to be below the relevant criteria. This has been demonstrated by previous noise assessments completed for RASP Mine and therefore this approach is deemed appropriate. The predicted results indicate that noise emissions from the proposed ventilation fans are relatively low (generally more than 10 dB below existing site noise contributions) and would not influence existing site noise contributions. Hence, the noise contribution from the ventilation fans is insignificant by comparison with all site noise sources at assessment locations off-site. Therefore there would be no change to existing levels from the proposed ventilation fans and the relevant noise criteria would be satisfied for all off-site assessment locations for all assessment periods.

The results of predicted operational noise levels are shown in Table 3.

Table 3 Predicted operational noise levels

| Assessment location | Address | Assumed existing $L_{eq(15-min)}$ site contribution, dB(A) | | | Predicted ventilation fans noise, $L_{eq(15-min)}$ contribution, dB(A) | | | Predicted combined $L_{eq(15-min)}$ site contribution, dB(A) | | | Predicted change, dB(A) | Criteria, dB(A) | | |
|---------------------|----------------------|--|---------|-----------|--|---------|-----------|--|---------|-----------|-------------------------|-----------------|---------|-------|
| | | Day | Evening | Night | Day | Evening | Night | Day | Evening | Night | | Day | Evening | Night |
| | | Calm | Calm | Inversion | Calm | Calm | Inversion | Calm | Calm | Inversion | | | | |
| A1 | Piper St North | 38 | 37 | 35 | 11 | 12 | 15 | 38 | 37 | 35 | 0 | 38 | 37 | 35 |
| A2 | Piper St Central | 38 | 37 | 35 | 17 | 18 | 20 | 38 | 37 | 35 | 0 | 38 | 37 | 35 |
| A3 | Eyre St North | 44 | 41 | 39 | 24 | 25 | 26 | 44 | 41 | 39 | 0 | 44 | 41 | 39 |
| A4 | Eyre St Central | <44 | <41 | <39 | 19 | 20 | 22 | <44 | <41 | <39 | 0 | 44 | 41 | 39 |
| A5 | Eyre St South | <44 | <41 | <39 | 24 | 24 | 26 | <44 | <41 | <39 | 0 | 44 | 41 | 39 |
| A5B | Eyre St South-east | <44 | <41 | <39 | 28 | 28 | 30 | <44 | <41 | ≤39 | ≤+1 | 44 | 41 | 39 |
| A6 | Bonanza & Gypsum Sts | <48 | <41 | <39 | 27 | 27 | 27 | <48 | <41 | <39 | 0 | 48 | 41 | 39 |
| A7 | Carbon St | 35 | 35 | 35 | 7 | 8 | 11 | 35 | 35 | 35 | 0 | 35 | 35 | 35 |
| A8 | South Rd | 48 | 39 | 39 | 2 | 2 | 5 | 48 | 39 | 39 | 0 | 48 | 39 | 39 |
| A9 | Crystal St | 46 | 39 | 39 | 6 | 7 | 10 | 46 | 39 | 39 | 0 | 46 | 39 | 39 |
| A10 | Garnet & Blende Sts | 42 | 41 | 35 | 6 | 7 | 10 | 42 | 41 | 35 | 0 | 42 | 41 | 35 |
| A11 | Crystal St | 46 | 39 | 39 | 0 | 0 | 2 | 46 | 39 | 39 | 0 | 46 | 39 | 39 |
| A12 | Crystal St | 46 | 39 | 39 | 0 | 0 | 2 | 46 | 39 | 39 | 0 | 46 | 39 | 39 |
| A13 | Eyre St North 2 | 38 | 35 | 35 | 4 | 5 | 8 | 38 | 35 | 35 | 0 | 38 | 35 | 35 |
| A14 | Piper St North | 35 | 35 | 35 | 6 | 7 | 10 | 35 | 35 | 35 | 0 | 35 | 35 | 35 |

4 Conclusion

EMM has completed an assessment of operational noise for the activities at RASP Mine, including the additional ventilation fans for the proposed underground mining extension. The assessment identified that the ventilation fans would not generally contribute to existing operational noise levels at off-site assessment locations. This assessment demonstrates that the Project Approval (07_0018 Mod 1) noise limits would be satisfied.

We trust this information meets your requirements and if you need any further clarifications please contact our office.

Yours sincerely



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