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Gwen Wilson
Group Manager - Safety Health Environment Community
Broken Hill Operations Pty Ltd

Re: Broken Hill Rasp Mine Modification 4 - Response to submissions on noise

Dear Gwen,

1 Introduction

This Response to Submissions (RTS) report provides further information regarding Rasp Mine Modification 4 project (the proposed modification), responding to questions raised by government agencies.

This report responds to specific requests contained in a letter from the NSW Environment Protection Authority (EPA) dated 17 May 2017, on the Noise Impact Assessment (NIA) for the proposed modification.

2 EPA submission

Feedback from the EPA on the proposed modification was received via written submission lodged to the Department of Planning and Environment (DP&E). The EPA has requested Broken Hill Operations Pty Ltd (BHOP) to provide additional information on a number of matters in regards to the NIA. Responses to the matters raised are provided in the following sections.

2.1 Noise impacts from rehabilitation and capping of TSF2

EPA: Noise impacts from rehabilitation and capping of TSF2 should be assessed as part of the project.

Whilst final rehabilitation of the site typically occurs during the closing or decommissioning phases of a site, the rehabilitation and capping of the TSF2 is being fast tracked and part of on-going rehabilitation to minimise potential environmental impacts, in particular the potential risk of dust entrainment by wind. The key management measure that will be adopted for these works will be to restrict them to daytime hours only. The rehabilitation and capping of the TSF2 is expected to take approximately 12 to 14 weeks. This will occur concurrently with currently approved mining operations and proposed CBP operations, although will not occur concurrently with TSF2 construction activities (ie activities associated with TSF2 extension). Noise sources associated with rehabilitation and capping activities are shown in Table 1, along with their sound power levels. These were used to model off-site noise levels.

Table 1 Noise sources and sound power levels for TSF2 rehabiliation and capping

Plant and equipment item	Sound power level, dB(A)
Excavator	104
Dozer (D7 or equivalent)	113
Padfoot roller	109
Haul truck x2	112

Notes: 1. Either the dozer OR the roller would operate, but not simultaneously. Hence the dozer was modelled given its higher emission value as compared to that of the roller.

Modelling of TSF2 rehabilitation and capping activities was completed for the daytime period during assessable weather (ie calm conditions). These activities are considered decommissioning works and hence assessed in accordance with Department of Environment & Climate Change's (DECC) Interim Construction Noise Guideline (ICNG). The predicted levels for the TSF2 rehabilitation and capping activities combined with noise levels from currently approved mining operations and proposed CBP operations are presented in Table 2.

Table 2 shows predicted noise levels are expected to satisfy the ICNG noise management levels (NMLs) at most assessment locations. The exception is at location A14 where worst case predictions are marginally (<1 dB) above the relevant NML. However, noise levels at this location when activities are to the east of the TSF2 area are expected to satisfy the relevant NML. Further, a 2 dB change in noise levels is generally not perceptible by the human ear and therefore noise impact from TSF2 rehabilitation and capping activities is unlikely at this location.

Table 2 Predicted daytime noise levels for TSF2 rehabilitation and capping activities

Assessment location ID	Predicted future $L_{Aeq(15\text{-}min)}$ site noise levels, dB (refer Mod4 EA)	Predicted TSF2 rehabilitation $L_{Aeq(15\text{-}min)}$ noise levels, dB	Combined $L_{Aeq(15\text{-}min)}$ noise levels, dB	Day ICNG criteria $L_{Aeq(15\text{-}min)}$, dB	Exceedance, dB
A1	<38	37	40	43	Nil
A2	<38	34	39	43	Nil
A3	<44	36	44	49	Nil
A4	<44	33	43	49	Nil
A5	<44	31	43	49	Nil
A6	<48	31	47	53	Nil
A7	<35	32	36	40	Nil
A8	<48	33	47	53	Nil
A9	<46	34	45	51	Nil
A10	<42	35	42	47	Nil
A11	<46	42	47	51	Nil
A12	<46	44	48	51	Nil
A13	<38	40	42	43	Nil
A14	<35	40	41	40	0.8

2.2 Feasible and reasonable noise mitigation and management measures during construction of TSF2

EPA: The proponent should more clearly demonstrate that they have implemented all feasible and reasonable mitigation measures in attempting to meet the noise management level, and that they have considered all feasible and reasonable measures which could be implemented.

BHOP has always taken the potential of noise impact on the community seriously and has been committed to reduce, minimise and where possible eliminate any potential noise impact on the surrounding community, through continuous implementation of feasible and reasonable mitigation measures as discussed in Section 6 of the NIA.

The NIA predicted that site noise from the proposed construction works is expected to be above the NMLs by 3 dB and up to 4 dB at locations A12 and A14 respectively. The NIA has documented ways to reduce these levels during the construction of the three embankments and spillway. However as indicated, it was found that no feasible and reasonable mitigation measures (Refer to Table 6.2 of the NIA) would achieve such reductions. However, BHOP is committed to manage noise levels during the construction stage.

Table 6.2 of the NIA provided a list of some of the feasible and reasonable management and mitigation measures that were considered during construction stage of the proposed modification. However these were deemed not to be feasible and/or not reasonable. Several other measures were considered as part of the NIA. A revised Table 6.2 including all feasible and reasonable management and mitigation measures considered for the proposed modification for the TSF2 has been produced in Table 3.

Table 3 Feasible and reasonable management and mitigation measures for construction - TSF2

Type of noise measure	Measure	F[1]	R[2]	Justification
At source	Restrict construction work to standard construction hours	Yes	Yes	Construction works outside standard construction hours had the potential to result in higher community response if occurred during the more sensitive night period due to generally lower background levels.
	Construction activities to occur separately and not concurrently.	Yes	Yes	Concurrent construction activities would have potentially resulted in higher offsite noise levels.
	Attenuation of dozer and trucks.	Yes	No	Trucks and dozers were identified as potentially high ranked contributors to offsite noise. This measure is considered unreasonable given the duration and temporary nature of the proposed works and cost (eg $100,000s per plant) associated with sound attenuation kits versus the total dB reduction achievable (eg 3 to 4 dB).
	- Regular reinforcement of the need to minimise noise (eg during toolbox talks). - Operate all plant in a conservative manner (no over-revving). - Locate/orientate plant to reduce off-site noise. - Adopt improvement techniques for noisy activities. - Select the quietest suitable machinery reasonably available for each work activity. This will be a key criterion in the selection of contractors. - Adopt efficient low noise muffler design for machinery. - Maximise offset distance between noisy items of plant/machinery and nearby sensitive receivers. - No queuing of vehicles is to occur adjacent to residential receivers. - Avoid simultaneous operation of plant/machinery in close proximity to sensitive receivers. - Schedule activities to minimise impacts by avoiding conflicts with other scheduled events. - Schedule noisy activities to coincide with higher levels of neighbourhood to mask noise. - Schedule respite periods for intensive works. - Plan deliveries to occur quietly and efficiently, and during the hours of 7 am to 6 pm only. - Amalgamate deliveries and loads. - Use of 'squawker' broadband audible reverse alarms on vehicles used on site. - Minimise unnecessary metal-on-metal contact. - No ‘warm-up’ of plant/machinery before nominated working hours.	Yes	Yes	These measures are considered feasible and reasonable, however a review of management and mitigation measures will occur once the construction activities for each task are clearly defined and contractors for the work have been engaged. These mitigation and management measures will be implemented for each key activity and will be detailed in a Construction Environment Management Plan.

Table 3 Feasible and reasonable management and mitigation measures for construction - TSF2

Type of noise measure	Measure	F[1]	R[2]	Justification
At path	Adopt mobile barriers/screens and/or utilise the location of earth/rock stockpiles to shield neighbouring receivers.	No	No	This measure is not considered feasible given limited physical space available between proposed construction activity areas and the site boundary.
	Permanent noise barriers (eg 3 m high) near TSF2 construction activities.	No	No	This measure is not considered feasible given limited physical space available between proposed activity areas and the site boundary. Further, it is considered unreasonable given the duration and temporary nature of the proposed works and cost (eg $500 per square meter area of barrier).
At receivers	Permanent noise barriers at affected residential property (between site and most affected facade).	Yes	No	This measure is considered unreasonable given the duration and temporary nature of the proposed works and cost (eg $500 per square meter area of barrier).
	Architectural treatment of affected dwellings (eg improved glazing, acoustic insulation and mechanical ventilation/ air-conditioning).	Yes	No	This measure is considered unreasonable given the duration and temporary nature of the proposed works and cost (eg $50,000 per dwelling).

Notes: *1. Feasible.*

2. Reasonable.

2.3 Noise modelling of temperature inversion conditions

EPA: The noise model for the project should be updated to include meteorological conditions based on on-site measurements, which may include G class stability category conditions.

The noise modelling completed as part of the NIA encompasses adverse weather including F atmospheric stability category conditions during the night period. The NIA showed that predicted operational noise levels for the proposed modification during such conditions are expected to satisfy the criteria at all assessment locations.

Results of prevailing weather data analysis presented in the NIA (Refer Section 4.2 and Appendix C of the NIA), which included the analysis of more than two years of relatively recent data (January 2014 - September 2016) from the Broken Hill Airport Bureau of Meteorology (BoM) Automatic Weather Station (AWS), demonstrated that both F and G stability category conditions were not a feature of the Broken Hill area. It was noted by the EPA that a previous noise impact assessment prepared for the site in 2007 indicated that F and G stability category conditions (combined) occurred for more than 30% of the time on winter nights between 2004 and 2006 using the Turner method and data from BoM's AWS at Broken Hill Airport. The Turner method as per Appendix E of the Industrial Noise Policy (INP) is a method that determines the frequency of occurrence of temperature inversions based on wind speed and net radiation, with net radiation being a function of cloud cover and the height of the cloud ceiling.

A review of the noise impact assessment referenced by the EPA has indicated that the cloud cover data used for the analysis was from BoM's AWS at Cobar Airport located more than 400 km from the site. The INP requires the data to be obtained from the nearest weather station, in this case the BoM's AWS at Broken Hill Airport. If not obtainable from the nearest weather station, the INP advises that the sigma-theta method be used instead to determine the presence of stability categories. In our experience the sigma-theta method (as per the INP) is more representative than the Turner method. Further, the noise impact assessment prepared in 2007 stated that temperature inversions are considered a feature of the area in

winter, however it did not adopt the default G stability category conditions but rather a condition of 3°C/100m temperature inversion which corresponds to an F stability category in accordance with the INP.

The NIA prepared for the proposed modification has used the sigma-theta method and it was identified that neither F nor G stability category conditions were a feature of the Broken Hill area. However, F stability category conditions was conservatively adopted in the noise modelling for winter nights in the NIA, and demonstrated that predicted operational noise levels for the proposed modification during such conditions (for winter nights) are expected to satisfy the criteria at all assessment locations.

Although not considered a feature of the area, at the request of the EPA, future (including CBP operations) site noise was modelled during G atmospheric stability conditions for the night-time period. The noise modelling software (Predictor) and methodology (ie CONCAWE algorithm as per International Standard ISO 9613-1) adopted are consistent with the NIA. Modelling results for G stability category conditions are presented in Table 4. Modelling results show that future site $L_{Aeq(15\text{-}min)}$ noise levels are predicted to satisfy the relevant noise limits at all assessment locations during G stability category conditions.

Table 4 Predicted future night-time site noise levels during G stability category conditions

Assessment location ID	Predicted future $L_{Aeq(15\text{-}min)}$ site noise levels, dB	Night criteria $L_{Aeq(15\text{-}min)}$, dB	Exceedance, dB
A1	<35	35	Nil
A2	<35	35	Nil
A3	<39	39	Nil
A4	<39	39	Nil
A5	<39	39	Nil
A6	<39	39	Nil
A7	35	35	Nil
A8	<39	39	Nil
A9	<39	39	Nil
A10	<35	35	Nil
A11	<39	39	Nil
A12	<39	39	Nil
A13	<35	35	Nil
A14	<35	35	Nil

2.4 Additional noise impacts from rail noise levels

EPA: The NIA should include the additional noise impacts of the project from rail noise levels or explain why they do not need to be assessed.

Cement will be back-loaded into empty containers returned from the CBH Newcastle ship-loader and there will be no additional rail movements for this Modification and therefore were not included in the noise impact assessment.

2.5 Cement loading at the CBP

EPA: An explanation of how noise impacts form cement being emptied into the silo of the concrete batch plant have been modelled (the loading method does not appear to have been included in modelling).

The loading of cement into the silo at the CBP will occur using a cement blower. The cement blower will be located within the concrete enclosure and therefore is not expected to contribute or increase the predicted operational noise levels from the CBP. Further, cement loading activities will be restricted to the daytime period only.

2.6 Concrete batching plant enclosure design

EPA: The NIA should clarify what parts of the concrete batch plant will be contained in a concrete building, and confirm that the noise model accurately represents that enclosure.

The NIA demonstrated that operational noise from the CBP will not result in an increase in existing noise levels at surrounding receivers, following commitment from BHOP to enclose the majority of CBP noise sources within a concrete enclosure.

The proposed CBP would consist of the following main components (as depicted in Figure 6-1 and indicated in Photograph 6-1 of the EA (which shows the concrete building to the right in the photograph):

- Silo for cement storage;
- Enclosure for batching and slumping processes and cement blower/compressor;
- Concrete bunkers for aggregate storage;
- Raw water tank (10,000L);
- Wash-out sump;
- Admixture storage; and
- Access roads.

Mobile equipment would consist of the following:

- Front-end-loader to load aggregates;
- Truck used currently for loading containers onto rail wagons will transport cement to the silo; and
- Agitator truck for mixing and transporting concrete underground or to location of placement.

The batching and slumping processes will be enclosed within a concrete structure. The batching process consists of loading the agitator truck with cement via a chute, aggregates via a conveyor and admixtures manually. The slumping process consists of the agitator truck mixing materials with the addition of water and by the rotation of the truck's mixing drum. Once batching and slumping are completed (ie the materials have mixed and settled), the Agitator truck will leave the enclosure and transport the concrete to the required location for placement. It is noted that the loading of cement into the silo at the CBP will occur using a cement blower located within the concrete enclosure as aforementioned in section 2.5.

2.7 Existing site noise assumptions

EPA: The proponent should explain why the existing site noise levels used in the NIA represent a reasonable worst case scenario, and why the operational noise model for the site was not used instead.

To assess the potential noise impact of the proposed modification, the NIA adopted the operator-attended noise monitoring survey data collected as part the 12-month noise monitoring programme commencing November 2014, as required by the site's Environment Protection Licence (EPL) 12559, to be representative of 'existing' site noise levels in the surrounding community. The attended noise monitoring was completed on a quarterly basis at all assessment locations and hence covers all seasons and varied meteorology. Additional night-time attended noise monitoring completed in July 2016 was also used and demonstrated that site noise contributions satisfied the limits at all assessment locations. Site noise contributions contained within the 2016 monitoring report are considered representative of current site operations and are relatively consistent (mostly below) the existing site noise levels adopted in the NIA.

A list of approved site operations (and noise sources) operating at the time of the attended noise monitoring completed in the 2014 to 2015 and 2016 monitoring are shown in Table 5. This shows that all approved site operations were operating as normal at the time of the attended noise monitoring. Importantly, the monitoring includes operational changes from modifications to the Project Approval since 2011 – ie relocation of the primary ventilation fan (MOD1), crushing over 24 hour period (MOD2) and use of an additional ventilation fan (MOD3). Therefore measured site noise used in the NIA is considered to be representative of approved 'existing' site noise.

Table 5 Approved site operations during night-time attended noise monitoring

Approved operations	Plant and equipment (noise sources)	Operating during night-time noise monitoring	
		2014-2015	2016
Underground operations	Ventilation fans	Yes	Yes
Surface hauling of material from pit to RoM pad	Dump truck (up to 2 in a 15-min period)	Yes	Yes
Feeding of crusher (at RoM pad)	Front-end loader	Yes	Yes
Crushing (during 24-hour period)	Crusher	Yes	Yes
Processing	Mill and associated components	Yes	Yes
Product transport from mill to rail loading area	Road truck	Yes	Yes
Train loading/unloading (rail loading area)	Forklift	Yes	Yes
Other general operations	Light vehicles, washing bay	Yes	Yes

The approach taken in the NIA in adopting measured over modelled existing site noise is always preferred in representing actual conditions.

3 Conclusion

In closing and in addition to the above, it is important to note that BHOP continues to liaise with its community and as reported on the company's website, there have been no noise complaints since approval and normal operation post the modifications. That is, nil complaints on noise between 2014 to 2017 inclusive, except for two relating to the use of a small back up diesel generator used to pump water at the Silver Tank, during times when the main electric generator broke down.

We trust this additional information meets your requirements. Please contact us should further information be required.

Yours sincerely

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