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Ref: J0235-01-R1

Brandy Hill & Seaham Action Group

Attn: Mr Scott Thompson
Mr Neil Ritchie

Dear Scott and Neil,

RE: ACOUSTIC REVIEW OF THE ENVIRONMENTAL IMPACT STATEMENT, BRANDY HILL EXPANSION PROJECT

1. INTRODUCTION

The Environmental Impact Statement (EIS) for the Brandy Hill Expansion Project (the project), prepared by Hanson Construction Materials Pty Ltd and various consultants in February 2017, was placed on public exhibition by the Department of Planning & Environment (DP&E) for the period 10 March to 9 April 2017. This report describes results and conclusions arising from a review of the noise and blasting sections of the EIS, with the principal objective of the review to determine if the EIS contains a comprehensive and accurate assessment of noise, vibration and blasting impacts and to highlight any errors or deficiencies.

The review was commissioned by the Brandy Hill & Seaham Action Group (BHSAG) which is generally against the project as described in the EIS. However, this report presents results from an unbiased review of the EIS as the author is not personally impacted by the existing quarry, does not anticipate being impacted by the project and does not have any relatives or close friends that are likely to be impacted by the project.

2. NOISE

The EIS includes a Noise Impact Assessment (NIA) report in Appendix 9, prepared by Vipac Engineers & Scientists. This section presents comments and recommendations arising from a review of that report.

2.1 Existing Noise Environment

2.1.1 Measured Background Noise Levels

The NIA describes results from a survey to determine background noise levels at five locations (N01 to N04 and N06), plus one location (N05) adjacent to the quarry's weighbridge and one location (N07) near Brandy Hill Drive to determine existing traffic noise levels. Section 4 of the NIA describes the noise survey which consisted of long term measurements over a period of approximately one week and short term measurements during the day over a period of 15 minutes. A summary of results is presented in Table 5 for the long term survey and Table 6 for the short term survey, while Appendix A presents more detailed results from each long term noise monitor. A comparison of results presented in Tables 5 and 6 and Appendix A indicates a number of inconsistencies.

At location N01, Table 5 and Appendix A indicate relatively high noise levels generally over 40 dBA. Figure 6 in Appendix A does not show the typical daily variation in noise levels shown at the other locations. Figure 6 also shows noise levels are always over 40 dBA on 9/9/2014, in direct contrast to

Table 6 which shows a measured background noise level of 30.8 LA90 at 11:25 am on 9/9/2014. Similar comments can be made regarding the LAeq levels. It is impossible for both Table 6 and Appendix A to be correct. Given the lack of obvious daily variation in noise levels in Figure 6, it appears most likely that results from the long term monitor at N01 are in error, not the attended noise survey results.

This issue was raised by the Department of Planning & Environment (DP&E) in its adequacy assessment, however the NIA authors replied (refer to NIA Appendix 9B) that the background levels were correct although they could not explain the difference between the long term and attended survey results. As the results cannot both be correct, it is no surprise that an acceptable explanation was not provided.

RECOMMENDATION: Repeat the long term noise survey at N01 to obtain the correct background noise levels and update the adopted noise criteria at this location. Alternatively, acknowledge a problem with the long term monitor results at N01 and adopt the more reliable and believable background levels measured at the nearby N06 location.

At location N04, Table 6 notes quarry noise was audible on occasion in the absence of traffic noise. The *NSW Industrial Noise Policy* (INP) requires noise from the development being assessed to be excluded from the measured background noise levels and the NIA provides no evidence that this step has been completed. Failure to exclude existing quarry noise would tend to increase background noise levels, in turn increasing noise criteria.

The noise monitor photographs in Appendix A indicate the long term monitor at N04 was placed in a wooded area, which tends to increase insect and bird noise and may provide a partial explanation for the high noise levels at this location. Section 4.1 of the NIA notes fans on poultry sheds near N04, which may also explain the atypical results at this location.

Section 4.1 of the NIA acknowledges the unusual noise level patterns in the N01 and N04 results, however the report simply assumed these patterns were due to seasonal insect activity based on some unspecified previous experience at other sites. A more comprehensive attended noise survey, including survey periods during the evening and night, would have confirmed the audible sources of noise during all time periods and removed the need for assumptions.

As seasonal insect or other atypical noise must also be excluded from the results when determining representative background noise levels and noise criteria, the measured noise levels at this location require significant review.

Background levels at N04 were questioned in DP&E's adequacy response, however the NIA authors responded with simple comments rather than a proper review and correction.

RECOMMENDATION: Reassess background noise levels at N04 to exclude existing quarry noise levels and noise from seasonal insects or other atypical sources, at least based on an additional attended noise survey during the day, evening and night. An alternative would be to acknowledge a problem with the long term monitor results at N04 and adopt the more reliable background levels measured at N06, as this location is also in a rural area some distance from Clarence Town Road so it is reasonable to assume similar background noise levels at both locations.

2.1.2 Measured Traffic Noise Levels

The NIA reports results from a survey of existing traffic noise levels at N07 near Brandy Hill Drive, although results at N02 were also referred to when calibrating the traffic noise model in Section 7.2.1 of the NIA. The NIA assumes all measured noise at N07 is due to traffic, at least during the day. While this assumption is technically false, it is an acceptable assumption as the results are unlikely to change significantly during the day if it were possible to measure only traffic noise while excluding other sources such as insects and birds.

The NIA does not describe the exact location of N07, specifically the distance from Brandy Hill Drive to N07, which affects the measured traffic noise levels and traffic noise model calibration. Figure 4 shows N07 is approximately 60 m from Brandy Hill Drive, although the figure is not at the correct scale or sufficiently clear to be certain of this distance. Figure 17 in Appendix A supports the estimated distance of 60 m from Brandy Hill Drive, although again an exact distance cannot be determined from this figure.

RECOMMENDATION: Include a more detailed description of this location, including distance from Brandy Hill Drive as this distance is important for the traffic noise model calibration, in the NIA.

2.2 Noise Criteria

2.2.1 Operating Noise Criteria

Section 5.1 of the NIA developed operating noise criteria according to the INP, although with incorrect background noise levels at least for N01 and N04 as discussed above. Noise criteria should be revised when the correct background noise levels are adopted.

RECOMMENDATION: Reassess operating noise criteria based on the correct background noise levels.

2.2.2 Sleep Disturbance Criteria

The NIA correctly recognises that sleep disturbance criteria are currently uncertain, in the absence of clear research results correlating sleep disturbance with noise levels and character inside a bedroom. Section 5.2.3 of the NIA discusses and adopts sleep disturbance criteria from the *NSW Road Noise Policy* (RNP) which was arguably the preferred approach until release of the *Draft Industrial Noise Guideline* (Draft ING) approximately 2 months before the NIA was completed. Technically the Draft ING does not apply until the final version is released, however the *Interim Construction Noise Guideline* (ICNG) has been commonly adopted since 2009 and is also adopted in the NIA.

The NIA should at least have mentioned, and ideally adopted for most receptors, sleep disturbance criteria in the Draft ING which are intended for industrial sources rather than traffic noise sources. The RNP sleep disturbance criteria would be appropriate for receptors potentially affected by truck noise on Brandy Hill Drive and other public roads. As the Draft ING recommends lower sleep disturbance criteria than the RNP, this can be a significant issue.

RECOMMENDATION: The NIA should at least comment on, and ideally adopt, the Draft ING sleep disturbance criteria for most receptors and retain the RNP sleep disturbance criteria for receptors affected by traffic noise.

2.2.3 Construction Noise Criteria

The NIA correctly reports the construction noise criteria, however the adopted noise affected criteria at some receptors are based on incorrect background noise levels as discussed above.

RECOMMENDATION: Reassess construction noise criteria based on the correct background noise levels.

2.3 Predicted Noise Levels

2.3.1 Operating Noise

Predicted noise levels from the quarrying, processing and loading activities on the site were calculated using noise model software based on the following input data:

Predicted terrain and noise source locations for various future stages – Table 12 merely states the drawings the noise model is based on while the NIA is silent on the sources and their locations in each model. The predicted receptor noise levels are meaningless without this information to place them in context. The EIS is also silent on the ground type (or surface roughness) adopted for the ground surface in the model or over various areas of the ground surface, as this can affect received noise levels.

RECOMMENDATION: Include detailed noise model plans in the NIA, showing modelled terrain and exact source locations, to confirm the noise model reflects the proposed project. The plans must include any modelled barriers, including the height of each barrier. Include data regarding the acoustic centre heights of each source, or source type, as source heights can have a large effect on received noise levels.

Source sound power levels – Table 13 in the NIA lists the modelled sound power levels in octave bands, however not all of the listed source sound power levels are correct. For example, Table 13 lists a sound power level of 112 dBA for a Cat 773 truck, compared to manufacturer's data showing this machine produces 117 dBA.

Similarly, Table 13 lists a sound power level of 99 dBA for a PC600 excavator, compared to published information from Komatsu stating a sound power level of 108 dBA. A WA500 loader produces a sound power level of 111 dBA according to Komatsu, not 101 dBA according to the NIA. The water cart is a 773B similar to a dump truck, however is modelled with a sound power level of 103 dBA compared to a dump truck at 113 dBA (and manufacturer's data at 117 dBA). This understates the water cart sound power level by 14 dBA. Extracts from published manufacturer's data for the three machines mentioned above, or information on where such data can be obtained, is attached in Appendix A.

Sound power levels produced by crushers and screens tend to vary from one unit to the next, and from quarry to quarry depending on the rock types being processed. It is therefore difficult to confirm the listed sound power levels for these sources. Table 13 lists a sound power level of 122 dBA for Screen 3 which is consistent with expectations, however a sound power level of 107 dBA for Screen 5 is unusually low and considered unlikely to be correct without supporting data.

A comparison between Table 13 in the NIA and Section 2.5 including Tables 2.5.1 and 2.5.2 in the main EIS report indicates the following omissions from the noise model:

- There are two WA500 loaders in the quarry, not one;
- Dump truck Cat 773E;
- One crusher (there is insufficient information to determine which of the five crushers was omitted);
- Screens 1, 2 and 4;
- 28 conveyor belts and drives;
- Pre-coat plant;
- Concrete batching plant;
- Concrete agitator trucks; and
- Any hired plant, as mentioned in Section 2.5 of the EIS.

The NIA has therefore understated at least some source sound power levels by 5 to 15 dBA and omitted a number of sources from the assessment. Noise levels at receptors would be significantly higher than predicted in the NIA.

RECOMMENDATION: The NIA should present clear evidence to support the listed sound power levels or correct the NIA to include representative and achievable sound power levels for all modelled sources. It should include all proposed quarry equipment or provide a clear justification for omitting significant noise sources.

The EIS should provide more specific information regarding "other equipment is hired as needed" as hired plant can produce significant noise not considered in the NIA. Alternatively, any project approval conditions must either limit the hired equipment, or otherwise avoid the potential for excessive noise at receptors from the hired equipment.

Modelled atmospheric conditions – Section 6.3 of the NIA states weather data from Paterson (actually from the Tocal automatic weather station) have been used to determine prevailing weather conditions for inclusion in the model. Table 14 in the NIA indicates the model considers noise enhancement from 3 m/s winds in all directions from the quarry, which is a conservative assumption, plus an F class inversion during the night which is appropriate. It is possible that the assumed wind conditions overstate noise levels at some receptors, however a less conservative assessment would not be appropriate in the absence of a detailed analysis of the weather station data as recommended in the INP.

Operating times – Table 15 of the NIA indicates all operations are included in the noise model during the day (except for those incorrectly omitted from the assessment as described above). A subset of operations limited to some crushers, screens, the pug mill, a single loader and road trucks, is included in the noise model for the evening and night period. This is in direct contrast to Table 1.3.2 of the main EIS report which includes 'load and haul' (ie excavators in the quarry and off-highway trucks from the quarry to the primary crusher) from 5 am to midnight and the primary crusher from 5 am to 1 am. These very significant noise sources have been omitted from the night noise model.

RECOMMENDATION: The NIA should correctly assess all proposed operations in each time period rather than omitting significant sources from the evening and night noise model.

Predicted noise levels – The NIA presents tables of predicted noise levels, however with significant adjustments required to model input data as described above, the results must be recalculated and reassessed.

RECOMMENDATION: Recalculate predicted noise levels after all required noise model adjustments have been made as recommended above.

Modifying factors – The NIA does not mention or assess modifying factors defined in the INP that have significant potential to apply to the development, including tonal and low frequency noise.

RECOMMENDATION: The NIA should ideally present 1/3 octave predicted noise levels at receptors to demonstrate quarry noise will not be tonal as defined in the INP, or apply tonal penalties to the predicted noise levels where required. This should include reverse alarms fitted to mobile machines which are not currently mentioned or assessed in the NIA, or justify omission of the alarms from the assessment.

The NIA must predict noise levels in octave bands or at least predict both dBC and dBA levels at all receptors to determine the need for the low frequency modifying factor required by the INP.

Noise contour figures – the NIA does not present noise contour figures to show the area affected by the project, including vacant land immediately adjacent to the project site. This is a normal requirement for an assessment of this type, however it is acknowledged that the SEARS did not specifically mention noise contours as a requirement for this project.

RECOMMENDATION: Include noise contour figures in the NIA to show noise levels over vacant land near the project site.

Reassess operating noise levels – When all required amendments have been made to the noise model and noise criteria have been updated based on reliable background noise data, predicted noise impacts from the project must be reassessed. It is believed likely that significant noise mitigation and management measures will be required to meet relevant criteria, however this cannot be confirmed until the reassessment is complete.

2.3.2 Road Traffic Noise

The NIA assessed existing and proposed traffic noise to the closest Brandy Hill Drive residence which is 25 Brandy Hill Drive located approximately 30 m from the road. The NIA specifically stated that only Brandy Hill Drive traffic noise is included in the assessment. However, almost all quarry traffic on Brandy Hill Drive also travels along Seaham Road between Brandy Hill Drive and Raymond Terrace, or at least to Raymond Terrace Road at Nelsons Plains. A review of residences along Seaham Road shows a few that are approximately 30 m from the road and two that are closer, with the closest approximately 20 m from the road. As all quarry related Brandy Hill Drive traffic also passes this residence, it should be included in the assessment.

A significant percentage of quarry trucks travel along Raymond Terrace Road while the remainder travel through Raymond Terrace. With a significant traffic split at Nelsons Plains, there may not be a need to assess traffic noise at more distant residences from the quarry.

> *RECOMMENDATION: The NIA should assess traffic noise to the potentially most affected receptor, which is most likely to be a residence approximately 20 m from Seaham Road south of Brandy Hill Drive.*

A comparison of traffic volumes in the EIS Traffic Impact Assessment (TIA) and in Table 16 of the NIA indicate a few differences, for example:

- Table 4 of the TIA shows 1681 vehicles per day (vpd) on Brandy Hill Drive while Table 16 of the NIA shows 1845 vpd;
- Table 5 of the TIA shows 166 heavy vehicles per day on the quarry access road while Table 16 of the NIA shows 240 heavy vehicles currently attributed to the quarry.

While reasons for these and other differences between the TIA and the NIA are not clear, it is acknowledged that these differences are likely to affect modelled traffic noise levels by less than 1 dBA and should not affect the calculated noise level increase due to the proposed increase in quarry traffic.

Table 23 in the NIA has not calculated the proposed increase in traffic noise levels. Rather, it has determined the maximum number of quarry trucks that would cause no more than a 2 dBA increase in traffic noise levels. It would arguably be better for DP&E and the potentially affected community to be informed of the expected noise increase due to the project, rather than a theoretical upper limit on daily truck movements.

The base case, before comparison with criteria or application of the 2 dBA relative increase criterion, should exclude existing quarry traffic noise. This ensures the actual traffic noise impact from the quarry is quantified and correctly assessed to the criteria, particularly the relative increase criterion.

> *RECOMMENDATION: The NIA should calculate the base case and proposed traffic noise levels, at the potentially most affected receptor(s), with the base case excluding current quarry related traffic.*

The NIA adopts a 20 dBA difference between outside and inside a dwelling, which assumes all bedroom windows are closed. This may possibly be the case but is unlikely to be a desirable situation for all residents, as some may prefer to leave their windows open depending on outside air temperatures. A difference of 10 dBA outside to inside is a generally accepted estimate with windows open.

RECOMMENDATION: The NIA should provide justification for assuming all residents close their windows at night and the associated 20 dBA difference from outside to inside a dwelling, compared to the commonly accepted position that some residents would prefer to sleep with window open. Following this, a reassessment of sleep disturbance levels is required, including an assessment of all feasible and reasonable mitigation options.

Section 3.4.1 of the RNP describes a four-step process for assessing traffic noise. Step 2 requires identification of all receptors expected to receive exceedances of the criteria in Table 3 of the RNP, which for Brandy Hill Drive and Seaham Road are 60 LAeq,15hr during the day and 55 LAeq,9hr during the night as correctly reported in Table 8 of the NIA. Step 3 then requires, for each receptor predicted to receive exceedances in Step 2, an assessment of all feasible and reasonable mitigation measures to achieve the criteria. Step 4 requires justification of any remaining exceedances.

It is therefore not sufficient in a traffic noise assessment to simply conclude the increase is less than 2 dBA without also assessing all feasible and reasonable mitigation measures or justifying the lack of such measures. As Table 23 in the NIA indicates existing and future exceedances of the 60 LAeq,15hr day and 55 LAeq,9hr night criteria, and such exceedances are likely to be higher at the closest residence to Seaham Road, an assessment of feasible and reasonable traffic noise mitigation measures is required by the RNP.

Section 4.3 of the RNP discusses noise mitigation strategies for traffic generating developments on existing roads and provides examples of applicable strategies, including regulation of the time of use amongst other strategies. This strategy, in particular, may be applicable to this project. In any case, lack of regulation of time of use as a noise mitigation measure, at least for the more critical night period, must be justified in the NIA.

The SEARS also require consideration of feasible and reasonable mitigation measures, including evidence that there are no such measures available other than those proposed.

RECOMMENDATION: The NIA should assess existing and proposed traffic noise levels to the criteria, not just to the relative increase criterion, and either recommend feasible and reasonable mitigation measures or justify the lack of measures to reduce criteria exceedances. In particular, given the community's concern regarding heavy truck movements at night, regulation of time of use should be considered in the NIA as required by the RNP or justification provided for this measure not being adopted for the project.

Section 7.2.4 of the NIA notes an existing sleep disturbance level of 72 LAmax,9hr and calculates a predicted level of 74 LAmax,9hr, presumably by adding 2 dBA to the existing level. As the LAmax level is caused by a single truck passby event, it is not clear how the proposed 2 dBA increase can be caused by more events per night.

RECOMMENDATION: The NIA should provide reason(s) for the predicted 2 dBA increase in LAmax,9hr levels in Table 24, considering future truck passby events should not be individually louder than existing truck passby events.

The NIA does not address the issue of cumulative noise impacts from the Brandy Hill Quarry Expansion Project and the Martins Creek Quarry Project, specifically in relation to cumulative traffic noise levels. It is acknowledged that the NIA was prepared in December 2015 before the Martins Creek Quarry EIS was publicly exhibited, however the EIS is dated February 2017 which is some months after the Martins Creek

Quarry EIS was available. The issue of cumulative traffic noise levels is known to be important to the adjacent Brandy Hill community.

RECOMMENDATION: The amended NIA should assess cumulative traffic noise levels with the Martins Creek Quarry Project and any other significant traffic generating projects in the area.

2.3.3 Construction Noise

The NIA considers overburden removal and transportation of overburden as construction noise, however this activity can also be considered part of normal operation rather than construction. The NIA does not mention construction work associated with relocating the processing plant to a new southern location.

RECOMMENDATION: The NIA should justify overburden removal and transportation as a construction activity, rather than a part of normal quarry operation. Construction work associated with relocation of the processing plant should be assessed, or lack of assessment justified.

The construction noise assessment does not provide details of the construction noise model. Recommendations above regarding presentation of input data for the operational noise model also apply to the construction noise model. While it is assumed the construction noise model includes transportation of overburden to construct the proposed bund south of the future processing plant, this is not specifically stated in the NIA and the low predicted noise levels imply this is not the case.

RECOMMENDATION: The NIA should provide all relevant details of the construction noise model generally as recommended for the operating noise model including terrain, source location, source height, source sound power and weather details. Assuming the construction model includes building the bund south of the future processing area, then trucks and other earthmoving equipment must be modelled at realistic elevated locations on the bund as will occur during the construction period, to correctly calculate noise levels at receptors. Alternatively, construction of this bund must be included in the operating noise model.

Table 1.3.2 of the EIS main report indicates construction work will occur from 5 am to 8 pm Monday to Friday and 5 am to 5 pm Saturday, which includes the evening and night periods. Table 26 in the NIA only considers construction work during the day.

RECOMMENDATION: The NIA must also calculate construction noise levels for the evening and night, as construction work during these times is proposed in the EIS. The night construction noise assessment must include night weather conditions and a sleep disturbance assessment.

2.4 Addressing the SEARS

2.4.1 Noise Compliance Monitoring

The SEARS require an assessment of monitoring and management measures, in particular real time and attended monitoring. The EIS main report and the NIA both mention a Noise Compliance Management Strategy, with Table 4.3.1 in the EIS report proposing annual noise monitoring although no other details are provided.

Given the likely predicted exceedances of reassessed noise criteria at some closest receptors when background noise levels and noise model inputs are amended, it may be more appropriate to consider quarterly noise monitoring and, as required by the SEARS, to consider real time noise monitoring.

RECOMMENDATION: The EIS and/or the NIA should consider whether annual or quarterly noise monitoring is appropriate upon reassessment of operating, traffic and construction noise

levels, and consider appropriate receptor locations and other details (such as day/evening/night and measurement duration in each time period) for noise monitoring.

The EIS and/or NIA should consider real time noise monitoring as specifically required by the SEARS, and provide relevant justification if real time noise monitoring is not proposed.

3. BLASTING

The EIS includes a Blast Impact Assessment (BIA) in Appendix 10, prepared by Vipac Engineers & Scientists. This section presents comments and recommendations arising from a review of that report.

3.1 Receptor Locations and Distances

Table 2 in the BIA lists closest receptors and their approximate distance from the future quarry pit boundary. A check of these distances with reference to SIX Maps indicates some distances in Table 2 are correct while others are not. For example, R13 at 994 Clarence Town Road is approximately 1,000 m from the southern boundary of the proposed extraction area, compared to 1,300 m reported in Table 2. Receptor R14 at 1034 Clarence Town Road is approximately 970 m from the future extraction area compared to 1,300 m listed in Table 2.

The distances obtained from SIX Maps are acknowledged to be approximate, however potential errors would not be sufficient to explain the differences with Table 2 in the BIA. The future processing area, in which blasting will not occur, was excluded when estimating distances.

RECOMMENDATION: Check all receptor distances listed in Table 2 and update the predicted blast impacts with the revised distances.

3.2 Historical Blast Impacts

Figure 5 in the BIA indicates one previous blast event produced a ground vibration level of 10 mm/s, which is acceptable, however one event produced a level of around 50 mm/s. Presumably this event was monitored at a reference location close to the quarry rather than at a residence, however the BIA is silent on this issue.

RECOMMENDATION: Provide information regarding current blast monitoring locations and, in particular, the monitoring location and other details regarding the single blast producing a measured level of around 50 mm/s.

3.3 Blast Times

The BIA quotes blasting criteria from the ANZECC Guideline, which is acknowledged to be the most appropriate policy document for this project. However, the BIA did not quote the recommended blasting hours from the ANZECC Guideline, which are different from the blasting hours proposed in Table 1.3.2 of the EIS main report. The BIA does not discuss proposed blasting hours.

RECOMMENDATION: Either align the proposed blasting hours in the EIS with the recommended hours in the ANZECC Guideline, or justify the extended hours proposed for this project.

3.4 Conclusion

The BIA concludes the project can meet relevant blasting criteria with appropriate design and management of blast parameters, and recommends each future blast is monitored at one or more receptors to confirm compliance. This conclusion is considered appropriate and is likely to remain appropriate when the reassessed receptor distances are considered.

4. VIBRATION

Vibration from blasting is discussed in the EIS and BIA and reviewed in Section 3 above, however vibration from operation of the quarry and quarry vehicles travelling on public roads has not been addressed in the EIS.

As proposed quarry operations will be hundreds of metres from receptors, non-blasting vibration from the quarry is unlikely to be perceptible at any receptor and does not require specific assessment.

Vibration from heavy vehicle traffic could potentially be perceptible at receptors located 20 m to 30 m from the road, depending mainly on ground conditions between the road and receptor, however exceedances of relevant criteria are considered unlikely and other heavy vehicles not associated with the project would also potentially cause perceptible vibration at these receptors. A comprehensive EIS should have at least acknowledged this issue, however in the expected absence of criteria exceedances a detailed assessment is not necessarily recommended.

5. CONCLUSION

This summary of issues identified during an acoustic review of the Brandy Hill Quarry Expansion Project EIS has indicated significant acoustic issues exist with a high potential to materially affect the results and conclusions of the EIS. A number of conclusions regarding no or minimal acoustic impact are based on erroneous data or assessment methods, where in fact there is a significant chance of criteria exceedances and unacceptable noise impacts at receptor properties from the project as currently proposed.

Given the extent and relative importance of identified deficiencies in the NIA as described in this review, a significant revision to the NIA is required before approval of the project can be contemplated. A consequent reassessment of the project itself may be required to incorporate additional noise mitigation and management measures, however this can only be confirmed after revision of the acoustic assessment is complete.

Please contact the undersigned for any further information or discussion.

Yours faithfully,

MARK BRIDGES BE (Mech) (Hons) MAAS
Principal Consultant

APPENDIX A – Manufacturer's data for example earthmoving machines used at Brandy Hill Quarry.

This review referred to manufacturer's noise data for three example earthmoving machines:

Komatsu PC600 Excavator.

A downloadable brochure containing noise data could not be found for this machine, however a press release from Komatsu was found on the website of a distributor of Komatsu products. This press release can be viewed here:

http://www.wacmccandless.com/ne_pressdetail.asp?id=46

The press release mentions an external sound power level of 108 dBA in the sixth paragraph.

Komatsu WA500 Loader.

An extract from a specification document comprising the cover page and page 9 containing noise data, obtained from:

http://www.komatsuamerica.com/-/media/komatsu/files/equipment-brochures/wheel-loaders/176-600/wa500-7sma.ashx

is attached. The noise data on page 9, which states a sound power level of 111 dBA, has been outlined in red.

Caterpillar 773 truck.

An extract from a specification document comprising the cover page and page 19 containing noise data, obtained from:

https://s7d2.scene7.com/is/content/Caterpillar/C712813

is attached. The external noise section is highlighted. This link allows downloading the document to a file, however due to an error in Caterpillar's webpage the downloaded file lacks a .pdf extension. Manually adding this extension to the downloaded file allows opening it using standard pdf reader software.

The specification states the external sound pressure level at a distance of 15 m from the machine is 86 dBA. The sound power level can be calculated from this information based on the following formula:

Sound Power = Sound Pressure + 20 x log(distance, m) + 8

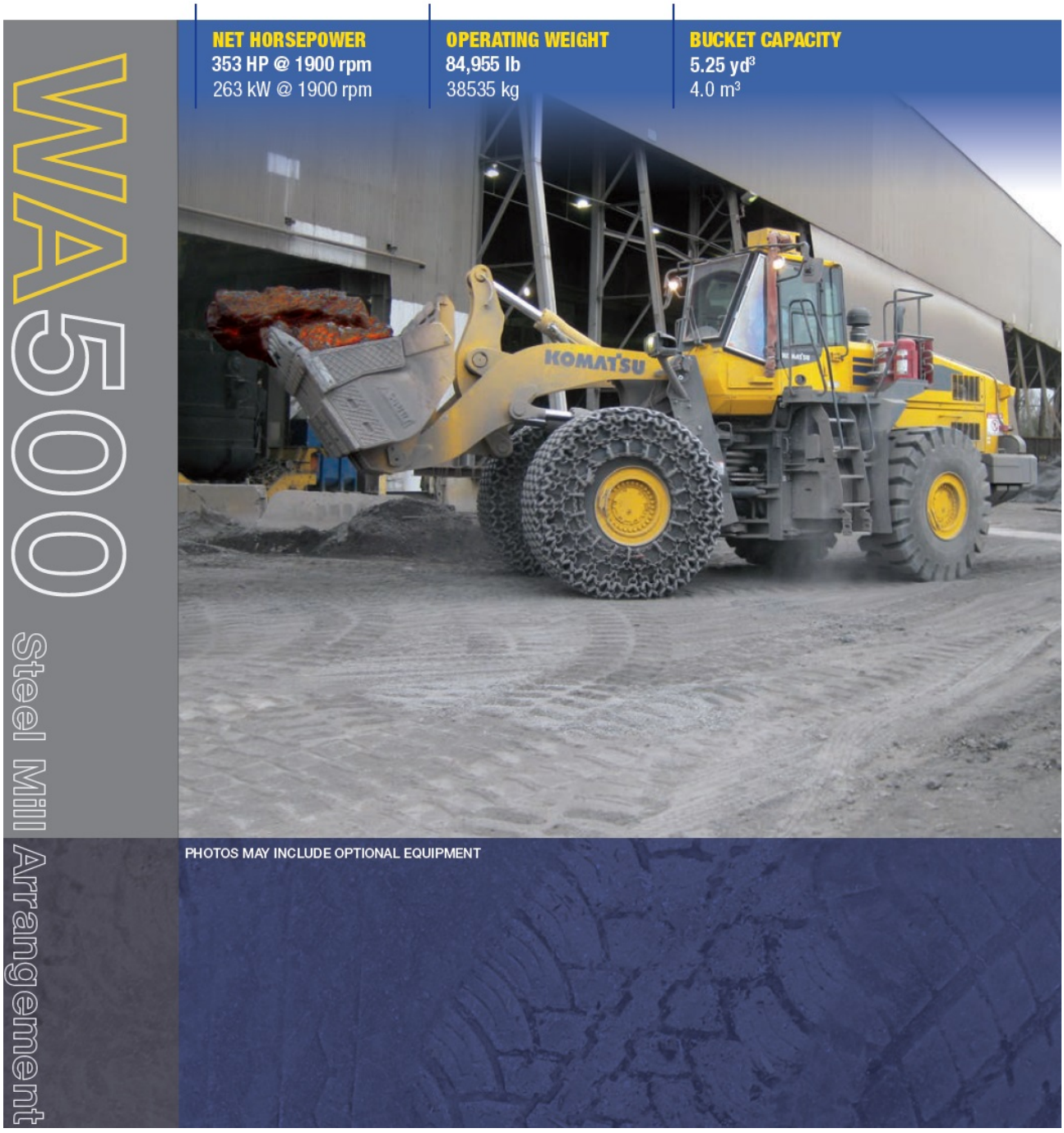
Sound Power = 86 dBA + 20 x log(15 m) + 8

Sound Power = 117 dBA.

Note that this formula assumes the 15 m distance is measured from the centre of the machine, not from its closest surface. If the distance refers to the closest surface, assuming an average of approximately 3 m from the centre to the surface as the machine is nearly 6 m wide and over 9 m long, then the effective distance for the above formula becomes 18 m to the centre of the machine and the calculated sound power level is 119 dBA.

KOMATSU®

WA500-7
Tier 4 Interim Engine
Steel Mill Arrangement



WA500-7
Steel Mill Arrangemen

OPERATOR ENVIRONMENT

New Designed Cabin

The new cabin offers better ergonomics, more storage space and more features to improve operator comfort.

Operator Seat with EPC (Electronic Pilot Control) Levers

The work equipment control system has an EPC lever console integrated into the higher capacity seat and moves with the seat. The angle of the armrest is fully adjustable for optimum operator comfort. An F-N-R switch is now incorporated in the console. A heated seat is now standard.

Tiltable / Telescopic Steering Wheel

The WA500-7 comes standard with a tiltable and telescopic steering wheel that can be pushed up and out of the way for easy entry and exit of the cab.

Low Noise Design

Operator's ear noise level : 73 dB(A)

Dynamic noise level (outside): 111 dB(A)

The large cab is mounted with Komatsu's unique ROPS/FOPS viscous mounts. The low-noise engine, hydraulically driven fan, and hydraulic pumps are mounted with rubber cushions, and the cab sealing is designed to provide a quiet, low-vibration, dustproof, and comfortable operating environment.

Increased Cab Storage Area

The WA500-7 cab features a storage box on the left hand side of the cab to allow the operator to store items out of the way. A hot or cold box on the right hand side of the cab allows the operator to keep a beverage or lunch warm or cold, depending on the season.

9

773G

Off-Highway Truck

Engine (Tier 4 Final)		
Engine Model	Cat® C27 ACERT™	
Gross Power – SAE J1995	578 kW	775 hp
Net Power – SAE J1349	534 kW	717 hp
Engine (Tier 2 Equivalent)		
Engine Model	Cat® C27 ACERT™	
Gross Power – SAE J1995	578 kW	775 hp
Net Power – SAE J1349	546 kW	733 hp
Weights – Approximate (Tier 4 Final)		
Maximum Gross Vehicle Weight	102 740 kg	226,503 lb
Weights – Approximate (Tier 2 Equivalent)		
Maximum Gross Vehicle Weight	102 740 kg	226,503 lb

Operating Specifications (Tier 4 Final)		
Nominal Payload Class (100%)	55.3 tonnes	61.0 tons
Maximum Working Payload (110%)	60.8 tonnes	67.0 tons
Not to Exceed Payload (120%)*	66.3 tonnes	73.1 tons
Body Capacity – SAE 2:1	35.75 m^3	46.75 yd^3
Operating Specifications (Tier 2 Equivalent)		
Nominal Payload Class (100%)	56.0 tonnes	61.7 tons
Maximum Working Payload (110%)	61.5 tonnes	67.8 tons
Not to Exceed Payload (120%)*	67.1 tonnes	74.0 tons
Body Capacity – SAE 2:1	35.75 m^3	46.75 yd^3

• Capacity with dual slope body – no liner.

* Refer to the Caterpillar 10/10/20 Payload Guidelines for maximum gross machine weight limitations.

Body Hoists (Tier 2 Equivalent)

Pump Flow – High Idle	448 L/min	118 gal/min
Relief Valve Setting – Raise	17 250 kPa	2,502 psi
Relief Valve Setting – Lower	3450 kPa	500 psi
Body Raise Time – High Idle	9.5 seconds	
Body Lower Time – Float	13.0 seconds	
Body Power Down – High Idle	13.0 seconds	

Capacity – Dual Slope – 100% Fill Factor

Struck	26.86 m^3	35.13 yd^3
Heaped 2:1 (SAE)	35.75 m^3	46.76 yd^3

Capacity – Flat Floor – 100% Fill Factor

Struck	26.25 m^3	34.33 yd^3
Heaped 2:1 (SAE)	35.49 m^3	46.41 yd^3

Weight Distributions – Approximate

Front Axle – Empty	53%
Front Axle – Loaded	35%
Rear Axle – Empty	47%
Rear Axle – Loaded	65%

Suspension

Empty Loaded Cylinder Stroke Front	234 mm	9.2 in
Empty Loaded Cylinder Stroke Rear	149 mm	5.8 in
Rear Axle Oscillation	8.1°	

Sound

Sound Standards

- The operator Equivalent Sound Pressure Level (Leq) is 76 dB(A) when SAE J1166 FEB2008 is used to measure the value for an enclosed cab. This is a work cycle sound exposure level. The cab was properly installed and maintained. The test was conducted with the cab doors and the cab windows closed.
- The exterior sound pressure level for the standard machine measured at a distance of 15 m (49 ft) according to the test procedures specified in SAE J88:2008, mid-gear moving operation is 86 dB(A).
- Hearing protection may be needed when operating with an open operator station and cab (when not properly maintained or doors/windows open) for extended periods or in a noisy environment.

Service Refill Capacities

Fuel Tank	795 L	210 gal
Cooling System	171 L	45 gal
Crankcase	90 L	24 gal
Differentials and Final Drives	145 L	38 gal
Steering Tank	36 L	9.5 gal
Steering System (includes tank)	54 L	14 gal
Brake/Hoist Hydraulic Tank	176 L	46.5 gal
Brake Hoist System	322 L	85 gal
Torque Converter/Transmission System HRC	70 L	18 gal
Torque Converter/Transmission System LRC	61 L	16 gal

Steering

Steering Standards	SAE J1511 FEB94 ISO 5010:1992	
Steer Angle	31°	
Turning Diameter – Front	23.5 m	77 ft 1 in
Turning Circle Clearance Diameter	26.1 m	85 ft 8 in

Tires

Standard Tire	24.00R35 (E4)

- Productive capabilities of the 773G truck are such that, under certain job conditions, TKPH (TMPH) capabilities of standard or optional tires could be exceeded and, therefore, limit production.
- Caterpillar recommends the customer evaluate all job conditions and consult the tire manufacturer for proper tire selection.

ROPS

ROPS/FOPS Standards

- ROPS (Rollover Protective Structure) for cab offered by Caterpillar meets ISO 3471:2008 ROPS criteria.
- FOPS (Falling Objects Protective Structure) meets ISO 3449:2005 Level II FOPS criteria.