16 Kerr Road, Ingleburn – Noise Impact Assessment

National Integrated Creative Solutions
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1 INTRODUCTION

Pulse White Noise Acoustics Consultancy Pty Ltd (Pulse White Noise Acoustics) has been engaged by National Integrated Creative Solutions to undertake a Noise Impact Assessment for the proposed upgrades to the Bulk Recovery Solutions resource recovery facility at 16 Kerr Road, Ingleburn. The site currently features liquid waste processing, a concrete batching facility, and indoor solid waste crushing. The site currently processes 30,000 tonnes of waste a year, comprising of 19,000 tonnes of solid waste and 11,000 tonnes of liquid waste. It is now proposed to increase the liquid waste processing ability up to 125,000 tonnes of liquid waste per year. No increases to the solid waste processing capacity are proposed. The increase in tonnages of liquid waste will primarily involve additional vehicle movements which are included in this Noise Impact Assessment.

This document assesses the potential operational noise impacts of the increased site capacity on the nearby receivers. In particular, operational impacts of indoor equipment, outdoor equipment, trucks and mobile equipment from the increase in site capacity are assessed at the nearest receptors.

Criteria in this report are taken from the Noise Policy for Industry. Noise modelling of the potential operational impacts is conducted using iNoise V2021 3D software.

Relevant noise recommendations are given in this report. A list of acoustic terminology used in this report is included in Appendix A.

2 PROJECT DETAILS

2.1 Site Location

Bulk Recovery Solutions are located at 16 Kerr Road Ingleburn, formally known as Lot 16 in DP 717203. The site is zoned IN1 General Industrial and is located in the Campbelltown City Council local government area. The closest residential receptors are located to the southeast on the opposite side of the main southern railway line.

The proposed site is located at the end of Kerr Road in Ingleburn. The northwest and southwest of the side back onto surrounding industrial receptors. The northeast of the site is bounded by Henderson Road while the southeast of the site is bordered by the main southern railway line. The site location is shown in Figure 2-1.

Figure 2-1 Site location

2.2 Project Description

Bulk Recovery Solutions are located at 16 Kerr Road, Ingleburn. BRS currently process waste material in the form of waste concrete, cement, fly ash, road base and liquid waste. The site currently features liquid waste processing plant, flocculant plant, a concrete batching facility and indoor solid waste crushing. The site currently processes 30,000 tonnes of waste a year, comprising of 19,000 tonnes of solid waste and 11,000 tonnes of liquid waste. Solid wastes received and processed in the crushing plant include mostly Construction and Demolition Waste such as soil, concrete and bricks.

It is now proposed to increase the liquid waste processing ability up to 125,000 tonnes of liquid waste per year. No increases to the solid waste processing capacity are proposed. The increase in tonnages of liquid waste will primarily involve additional vehicle movements.

The site is proposed to operate during the day, evening and night time periods. The proposed site plan is shown below in Figure 2-2. The proposed internal floor plan is presented in Figure 2-3. The 3D site view is shown in Figure 2-4.

Figure 2-2 Proposed Site Plan

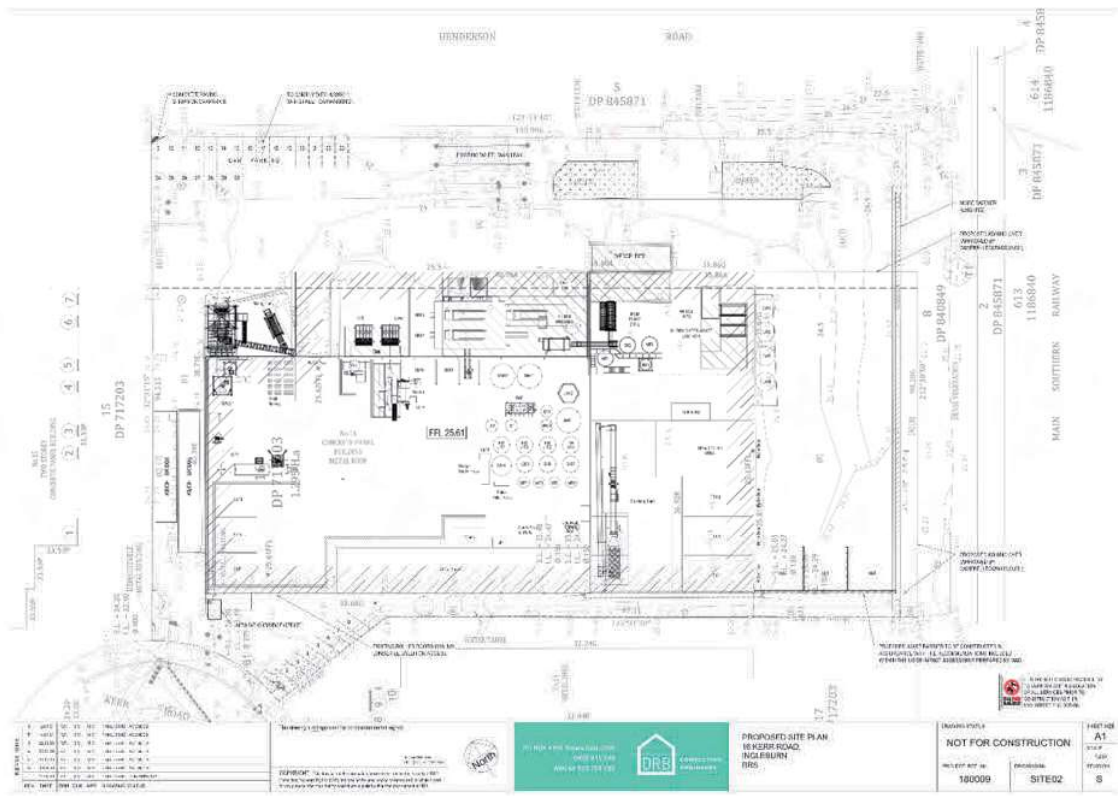


Figure 2-3 Proposed Internal Floor Plan

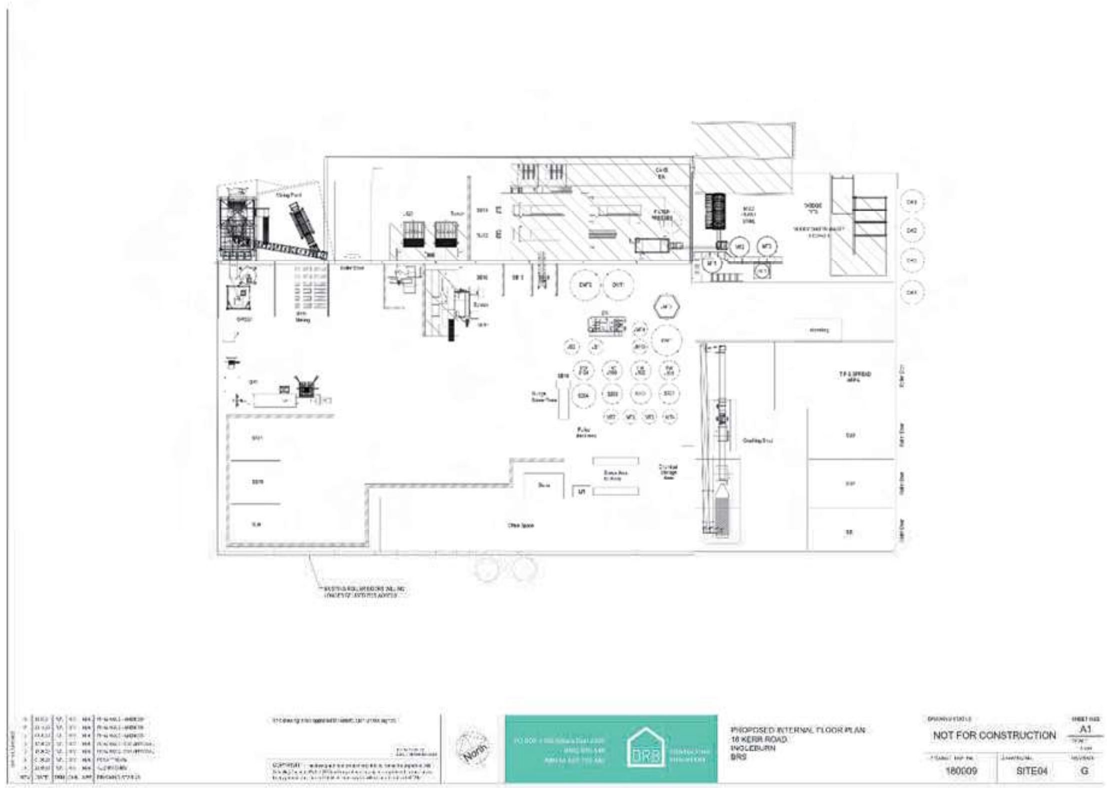
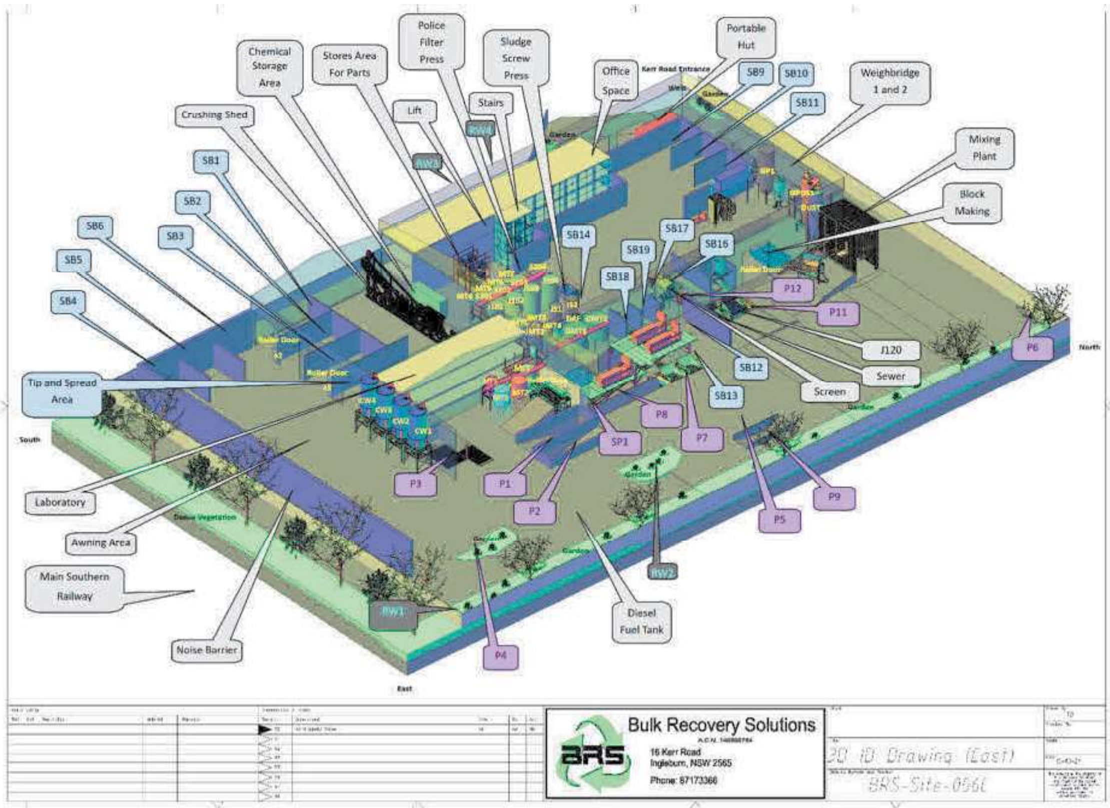


Figure 2-4 3D Site View



3 NEAREST SENSITIVE RECEPTORS

A number of sensitive receivers are located in the vicinity of the proposal. As shown in Figure 3-1, residential receivers are located to the southeast on the other side of the main southern railway line. Non-residential receptors are also located around the site. The receptors utilised for noise predictions in this report are listed in Table 3-1 and presented in Figure 3-1.

Figure 3-1 Location of Considered Receivers

Table 3-1 Nearest Potentially Affected Receivers

Receptor ID	Address	Lot and DP	Type of Receiver
R1	2 Gordon Avenue, Ingleburn	Lot 70 DP 7775	Residential
R2	4-8 Gordon Avenue, Ingleburn	SP 47901	Residential
R3	4-8 Gordon Avenue, Ingleburn	SP 47901	Residential
R4	4-8 Gordon Avenue, Ingleburn	SP 47901	Residential
R5	4-8 Gordon Avenue, Ingleburn	SP 47901	Residential
R6	4-8 Gordon Avenue, Ingleburn	SP 47901	Residential
R7	10-12 Gordon Avenue, Ingleburn	SP 45833	Residential
R8	10-12 Gordon Avenue, Ingleburn	SP 45833	Residential
R9	14 Gordon Avenue, Ingleburn	Lot 76 DP 7775	Residential

Receptor ID	Address	Lot and DP	Type of Receiver
R10	4-8 Gordon Avenue, Ingleburn	SP 47901	Residential
R11	1A Gordon Avenue, Ingleburn	Lot 2 DP 1067701	Residential
R12	1 Redfern Street, Ingleburn	Lot 1 DP 1067701	Residential
R13	3 Redfern Street, Ingleburn	Lot 30 DP 7775	Residential
R14	5 Redfern Street, Ingleburn	Lot 31 DP 7775	Residential
R15	7 Redfern Street, Ingleburn	SP 72594	Residential
R16	9 Redfern Street, Ingleburn	Lot 33 DP 7775	Residential
R17	11 Redfern Street, Ingleburn	Lot 1 DP 1205571	Residential
R18	11 Redfern Street, Ingleburn	Lot 1 DP 1205571	Residential
R19	15 Redfern Street, Ingleburn	Lot C DP 401375	Residential
R20	17 Redfern Street, Ingleburn	Lot B DP 401375	Residential
R21	19 Redfern Street, Ingleburn	Lot A DP 401375	Residential
IND1	8 Austool Place, Ingleburn	Lot 4 DP 1071594	Industrial
IND2	15 Kerr Road, Ingleburn	Lot 15 DP 717203	Industrial
IND3	13 Kerr Road, Ingleburn	SP 34773	Industrial
IND4	11 Kerr Road, Ingleburn	SP 47176	Industrial
IND5	14 Kerr Road, Ingleburn	Lot 17 DP 717203	Industrial
IND6	12 Kerr Road, Ingleburn	Lot 18 DP 717203	Industrial
IND7	10 Kerr Road, Ingleburn	Lot 19 DP 717203	Industrial
AR1	2B Macquarie Road, Macquarie Fields	Lot 44 DP 663998	Active Recreation

4 EXISTING ACOUSTIC ENVIRONMENT

4.1 Noise Descriptors and Terminology

Environmental noise constantly varies in level with time. Therefore, it is necessary to measure noise in terms of quantifiable time periods with statistical descriptors. Typically environmental noise is measured over 15 minute periods and relevant statistical descriptors of the fluctuating noise are determined to quantify the measured level.

Noise (or sound) consists of minute fluctuations in atmospheric pressure capable of detection by human hearing. Noise levels are expressed in terms of decibels, abbreviated as dB or dBA, the "A" indicating that the noise levels have been frequency weighted to approximate the characteristics of normal human hearing. Because noise is measured using a logarithmic scale, 'normal' linear arithmetic does not apply, e.g. adding two sound sources of equal values result in an increase of 3 dB (i.e. 60 dBA plus 60 dBA results in 63 dBA). A change of 1 dB or 2 dB in the sound level is difficult for most people to detect, whilst a 3 dB – 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change roughly corresponds to a doubling or halving in loudness.

The most relevant environmental noise descriptors are the L_{Aeq}, L_{A1}, L_{A10} and L_{A90} noise levels. The L_{Aeq} noise level represents the "equivalent energy average noise level". This parameter is derived by integrating the noise level measured over the measurement period. It represents the level that the fluctuating noise with the same acoustic energy would be if it were constant over the measured time period.

The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1%, 10% and 90% of the sample period. These levels can be considered as the maximum noise level, the average repeatable maximum and average repeatable minimum noise levels, respectively.

Specific acoustic terminology is used in this assessment report. An explanation of common acoustic terms is included in Appendix A.

4.2 Unattended Acoustic Monitoring

Unattended noise logging was carried out by Muller Acoustic Consulting in the report MAC170598RP1V03. Noise loggers were played at the two positions indicated in Figure 3-1. The measurements were carried out using two Svantek Type 1, 977 noise analysers between Wednesday 28 February 2018 and Monday 12 March 2018.

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the 90th percentile of the daily background noise levels during each assessment period, being day, evening and the night. The RBL $L_{A90\ (15minute)}$ and L_{Aeq} noise levels are presented in Table 4-1 for the unattended logging.

Table 4-1 Measured ambient noise levels in accordance with the NSW NPI

Measurement Location	Daytime[1] 7:00 am to 6:00 pm		Evening[1] 6:00 pm to 10:00 pm		Night-time[1] 10:00 pm to 7:00 am	
	L_{A90}[2]	L_{Aeq}[3]	L_{A90}[2]	L_{Aeq}[3]	L_{A90}[2]	L_{Aeq}[3]
Logger 1 (R1-R15)	42	53	42	53	35	46
Logger 2 (R16-R21)	42	57	43	58	38	55

Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am

Note 2: The L_{A90} noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.

Note 3: The LAeq is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

5 APPLICABLE GUIDELINES AND RECOMMENDED CRITERIA

This section presents operational noise criteria for the report. Criteria have been derived as per the *Noise Policy for Industry* (EPA, 2017).

5.1 NSW Noise Policy for Industry

In NSW, the control of noise emissions is the responsibility of Local Government and the NSW Environment Protection Authority (NSW EPA). In October 2017, the NSW EPA released the *Noise Policy for Industry* (NSW NPI). The purpose of the policy is to ensure that noise impacts associated with particular industrial developments are evaluated and managed in a consistent and transparent manner. The policy aims to ensure that noise is kept to acceptable levels in balance with the social and economic value of industry in NSW.

The NSW NPI criteria for industrial noise sources have two components:

- Controlling the intrusive noise impacts for residential receivers in the short-term; and
- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

The project noise trigger level is derived from the more stringent value out of the project intrusiveness noise level and the project amenity noise level.

5.1.1 Intrusive Noise Impacts (Residential Receivers)

The NSW NPI states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (LAeq), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is often termed the Intrusiveness Criterion.

The 'Rating Background Level' (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in the NSW NPI. Using the rating background noise level approach results in the intrusiveness criterion being met for 90% of the time. Adjustments are to be applied to the level of noise produced by the source that is received at the assessment point where the noise source contains annoying characteristics such as tonality or impulsiveness.

5.1.2 Protecting Noise Amenity (All Receivers)

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NSW NPI. That is, the ambient LAeq noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the 'Background Creep' or Amenity Criterion.

The amenity assessment is based on noise criteria specified for a particular land use and corresponding sensitivity to noise. The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. These criteria relate only to other continuous industrial-type noise and do not include road, rail or community noise. If the existing (measured) industrial-type noise level approaches the criterion value, then the NSW NPI sets maximum noise emission levels from new sources with the objective of ensuring that the cumulative levels do not significantly exceed the criterion.

5.1.3 Area Classification

Table 2.3 of the NSW NPI characterises the "Urban Residential" as an area with an acoustical environment that:

- Is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources.
- Has through-traffic with characteristically heavy and continuous traffic flows during peak periods.
- Is near commercial districts or industrial districts.
- Has any combination of the above.

Considering the above, the noise environment at the closest residential receivers is dominated by the industrial hum from the associated properties over the railway line as well as the road traffic noise from Henderson Road. As mentioned, the residential receivers are subjected to heavy traffic flows from Henderson Road nearby. The industrial properties located off Kerr Road are immediately adjacent, with only the railway line between them. The nearby residential receivers therefore feature all three of the elements listed to meet the urban residential receiver category.

Furthermore, the urban residential receiver category is also associated with existing background noise levels greater than 45 dBA during the day period, greater than 40 dBA during the evening period and greater than 35 dBA during the night period. Between the two noise loggers, this criteria listed in Table 2.3 of the Noise Policy of Industry is met by four of the six periods.

It is noted that previous comments by the EPA have requested that the assessment consider using the "suburban" residential receiver category. However, considering the surrounding environment meets all three parts of the Urban description as well as the majority of the noise logging levels, Pulse White Noise Acoustics respectfully believes that the Urban residential receiver category is the most applicable for the surrounding receivers in this assessment.

For the considered receptors in the urban area, the recommended amenity noise level is shown in Table 5-1 below. When the existing noise level from industrial noise sources is close to the recommended "Amenity Noise Level" (ANL) given above, noise from the new source must be controlled to preserve the amenity of the area in line with the requirements of the NSW NPI.

Table 5-1 NSW NPI – Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day[1]	Recommended Amenity Noise Level ($L_{Aeq, period}$)[2]
Residence	Urban	Day	60
		Evening	50
		Night	45
Active Recreation	All	When in use	55
Industrial Premises	All	When in use	70

Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am

Note 2: The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

5.1.4 Project Trigger Noise Levels

The intrusive and amenity criteria for industrial noise emissions derived from the measured data are presented in Table 5-2. The amenity and intrusive criterion are nominated for the purpose of determining the operational noise limits for noise sources associated with the development which can potentially affect noise sensitive receivers.

For each assessment period, the project trigger noise levels are the lower (i.e. the more stringent) of the amenity or intrusive criteria. The project trigger noise levels are shown in bold text in Table 5-2.

Table 5-2 External noise level criteria in accordance with the NSW NPI

Location	Time of Day	Project Amenity Noise Level, $L_{Aeq, period}$ [1] (dBA)	Measured $L_{A90, 15 min}$ (RBL) [2] (dBA)	Measured $L_{Aeq, period}$ Noise Level (dBA)	Intrusive $L_{Aeq, 15 min}$ Criterion for New Sources (dBA) [3]	Amenity $L_{Aeq, 15 min}$ Criterion for New Sources (dBA) [3, 4]
Residence (R1-R15)	Day	55	42	53	**47**	58
	Evening	45	42	53	**47**	48
	Night	40	35	46	**40**	43
Residence (R16-R21)	Day	55	42	57	**47**	58
	Evening	45	42[5]	58	**47**	48
	Night	40	38	55	43	**43**
Active Recreation	All	50	N/A	N/A	N/A	**53**
Industrial	All	65	N/A	N/A	N/A	**68**

Note 1: Project Amenity Noise Levels corresponding to "urban" areas, equivalent to the Recommended Amenity Noise Levels minus 5 dBA

Note 2: L_{A90} Background Noise or Rating Background Level

Note 3: Project Noise Trigger Levels are shown in bold

Note 4: According to Section 2.2 of the NSW NPI, the LAeq, 15 minutes is equal to the LAeq, period + 3 dB

Note 5: As per Section 2.3 of the Noise Policy for Industry, it is recommended that the project intrusiveness noise level for the evening be set at no greater than the project intrusiveness noise level for the daytime.

5.1.5 Maximum Noise Event (Sleeping Disturbance) – Residents Only

An accurate representation of sleep disturbance impacts on a community from a noise source is particularly difficult to quantify mainly due to differing responses of individuals to sleep disturbance – this is found even within a single subject monitored at different stages of a single night's sleep or during different periods of sleep.

In addition the differing grades of sleep state make a definitive definition difficult, and even where sleep disturbance is not noted by the subject, factors such as heart rate, mood and performance can still be negatively affected.

An assessment of sleep disturbance should consider the maximum noise level or LA1(1 minute), and the extent to which the maximum noise level exceeds the background level and the number of times this may happen during the night-time period. Factors that may be important in assessing the extent of impacts on sleep include:

- How often high noise events will occur;
- Time of day (normally between 10.00pm and 7.00am); and
- Whether there are times of day when there is a clear change in the existing noise environment (such as during night periods).

Section 2.5 of the EPA NPI provides the following criteria:

- LAeq,15min 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- LAFmax 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater

6 OPERATIONAL ACOUSTIC ASSESSMENT

The site is proposed to increase from a liquid waste capacity of 11,000 tonnes per year to 116,000 tonnes per year. No changes to the solid waste capacity of 19,000 tonnes per year are proposed. The predicted noise levels of the proposed site capacities are presented in this chapter.

Predictive noise modelling was carried out using the ISO 9613 algorithm within iNoise 2021. The iNoise software package allows a 3D computational model of the site and surrounding area to be created. Inputs into the noise model included terrain, ground absorption, surrounding buildings, fences, receiver locations and noise sources.

6.1 Noise Generating Scenarios and Utilised Sound Power Levels

This Noise Assessment includes assessment of the proposed additional liquid waste capacity on site. Two noise generating scenarios are presented as follows. Please note that this assessment considers all proposed activities on the subject site, not just the activities associated with the proposed increase in liquid capacity.

- Day/evening scenario
  - 1 x Crushing/screening plant, located indoors
  - 1 x Excavator, located indoors
  - 1 x Front end loader, located outdoors in the crushing yard
  - 2 x Truck and dogs, located outdoors in the main yard
  - 1 x Concrete batching plant, located indoors
  - 1 x Slump stand, located indoors
  - 1 x Concrete agitator, located outdoors in the main yard
  - 1 x Flocculant plant, located undercover outdoors
  - 2 x Liquid plant, located undercover outdoors
  - 3 x Vacuum trucks, located outdoors
  - 1 x Forklift, located outdoors 20% and indoors 80%
- Night scenario
  - 1 x Concrete batching plant, located indoors
  - 1 x Slump stand, located indoors
  - 1 x Concrete agitator, located outdoors in the main yard
  - 1 x Flocculant plant, located undercover outdoors
  - 2 x Liquid plant, located undercover outdoors
  - 1 x Vacuum trucks, located outdoors
  - 1 x Forklift, located outdoors 20% and indoors 80%

Sound power levels were determined by measuring all of the equipment during a site visit on Wednesday the 10th of March 2021. Sound power levels were measured under the following conditions when the site was fully operational

- The sound power levels of the excavator and front end loader were taken 4m from the equipment. Both the excavator and front end loader were mobile and moving material during the measurement periods.
- The sound power level of the truck and dog and liquid vacuum truck were taken 4m from the vehicle as they travelled on site at a speed of approximately 10km/h.
- The sound power level of the agitator was taken 5m from the vehicle as it was mobile, moving forwards and backwards, whilst concrete was also pouring into moulds.

- Sound power levels of stationary equipment including the concrete batching plant, slump stand, mud flocculant plant and liquid waste plant were taken a variety of distances including 1m from the source, at certain landmarks on site and in the far field to obtain appropriate sound power levels.
- The sound power level of the crusher and screens as well as the Rw of the building was obtained by measuring sound pressure levels at various points inside the building and outside the building with the doors closed.

The sound power levels for the equipment measured on site are shown below in Table 6-1.

Table 6-1 Modelled Sound Power Levels

Equipment	63	125	250	500	1000	2000	4000	8000	Overall	Max
Excavator – Kobelco SK 225SR (22.5 Tonnes)	105	104	102	96	91	88	84	79	98	105
Front End Loader – ZW250 (20.7 Tonnes)	109	95	91	92	92	90	82	75	96	102
Truck and Dog	105	99	94	96	95	93	87	82	100	106
Liquid Waste Vacuum Truck	100	96	94	95	94	92	87	80	98	104
Concrete Agitator	104	101	97	97	97	95	91	88	102	106
Concrete Batching Plant	100	95	87	88	89	91	93	97	100	105
Slump Stand	100	96	90	93	92	92	90	86	98	103
Mud Flocculant Plant	102	101	95	91	89	87	85	82	95	98
Crusher and Screens	113	106	105	105	103	103	101	96	110	114
Liquid Waste Plant	115	109	102	99	95	93	89	81	102	105
Forklift	95	93	93	93	92	91	86	78	97	104

The location of modelled noise sources are shown in Figure 6-1 for the day and evening scenario and in Figure 6-2 for the night scenario.

Figure 6-1 Noise source locations – day and evening scenario

Figure 6-2 Noise source locations – night scenario

6.2 Modelling Assumptions

The following modelling assumptions are utilised in this noise impact assessment:

- The noise generating scenario is modelled for a worst case 15 minute period;
- Terrain has been sourced from the NSW Land and Property Information database Sixmaps;
- Ground Absorption has been included in the model with the site and surrounding areas having an absorption factor of 0 (hard);
- All receptors are modelled 1.5m above the ground;
- Off-site structures such as buildings and fences have been included in the model where relevant;
- The excavator and crusher/screens are operational indoors during the day and evening periods;
- The front end loader is operational outdoors for the worst case 15 minute period during the day and evening periods;
- Two truck and dogs are present on site during the worst case 15 minute period during the day and evening period. One truck and dog arrives on site and one truck and dog leaves site during the 15 minute period. The truck and dogs are turned off when they are waiting or being loaded;

- Three liquid waste vacuum truck are present on site during the worst case 15 minute period during the day and evening period. One liquid waste vacuum truck arrives on site and one liquid waste vacuum truck leaves site during the 15 minute period. The liquid waste vacuum truck is turned off when they are waiting or being loaded;
- Based on the Traffic Impact Assessment, only four vehicles will be on site at any one time and a maximum of six vehicles will be on site in any one hour as a worst case scenario. Despite this, we have determined to undertake the more conservative approach by considering the worst case scenarios of six trucks during the worst case day/evening 15 minute period and two trucks during the worst case night time 15 minute period.
- It is noted that the day/evening scenario considers six trucks, whilst the traffic report only considers four trucks to be the worst case scenario. Thus the truck movements for both scenarios are conservatively assessed in this report.
- The concrete batching plant and slump stand are located indoors and operational during the day, evening and night periods;
- The mud flocculant plant and liquid waste plant are located undercover outdoors and are operational during the day, evening and night periods;
- The forklift is located indoors for 80% and outdoors for 20% of the 15 minute period and is operational during the day, evening and night periods;
- One concrete agitator is assumed to be operational at the loading bay for the 15 minute period during the day, evening and night periods;
- Noise sources have been modelled at the locations shown in Figure 6-1;
- The noise sources and sound power levels have been modelled with respect to the information presented in Table 6-1;
- The crusher yard has been modelled with the existing 6.5m noise wall at the southeast boundary of the site. Additionally, an awning is proposed from the top of the noise wall to cover the storage bays and all activities outside the crushing plant. Note that both ends of the covered area are open air and not enclosed.

6.3 Predicted L_{Aeq} Noise Levels

The predicted L_{Aeq} results of the modelled operational scenarios are presented below in Table 6-2.. Noise contours of the modelled operational scenarios are shown in Figure 6-3 and Figure 6-4. It is shown that noise levels are predicted to comply with the criteria at the considered receivers and scenarios.

Table 6-2 Predicted Noise Levels, Operational Scenarios, $L_{Aeq\ (15\ minute)}$

Receiver	Criteria			Predicted Noise Levels	
	Day	Evening	Night	Day/ Evening Scenario	Night Scenario
R1	47	47	40	42	38
R2	47	47	40	38	34
R3	47	47	40	40	37
R4	47	47	40	40	37
R5	47	47	40	40	38
R6	47	47	40	39	36
R7	47	47	40	38	36
R8	47	47	40	37	35
R9	47	47	40	36	34
R10	47	47	40	38	34
R11	47	47	40	40	32

Receiver	Criteria			Predicted Noise Levels	
	Day	Evening	Night	Day/ Evening Scenario	Night Scenario
R12	47	47	40	43	34
R13	47	47	40	43	33
R14	47	47	40	42	33
R15	47	47	40	42	33
R16	47	47	43	41	31
R17	47	47	43	40	31
R18	47	47	43	40	30
R19	47	47	43	40	30
R20	47	47	43	38	29
R21	47	47	43	39	29
AR1	53	53	53	49	48
IND1	68	68	68	61	61
IND2	68	68	68	65	63
IND3	68	68	68	51	48
IND4	68	68	68	48	46
IND5	68	68	68	61	39
IND6	68	68	68	50	36
IND7	68	68	68	44	33

Figure 6-3 Predicted Noise Contours – Day and Evening Operational Activities

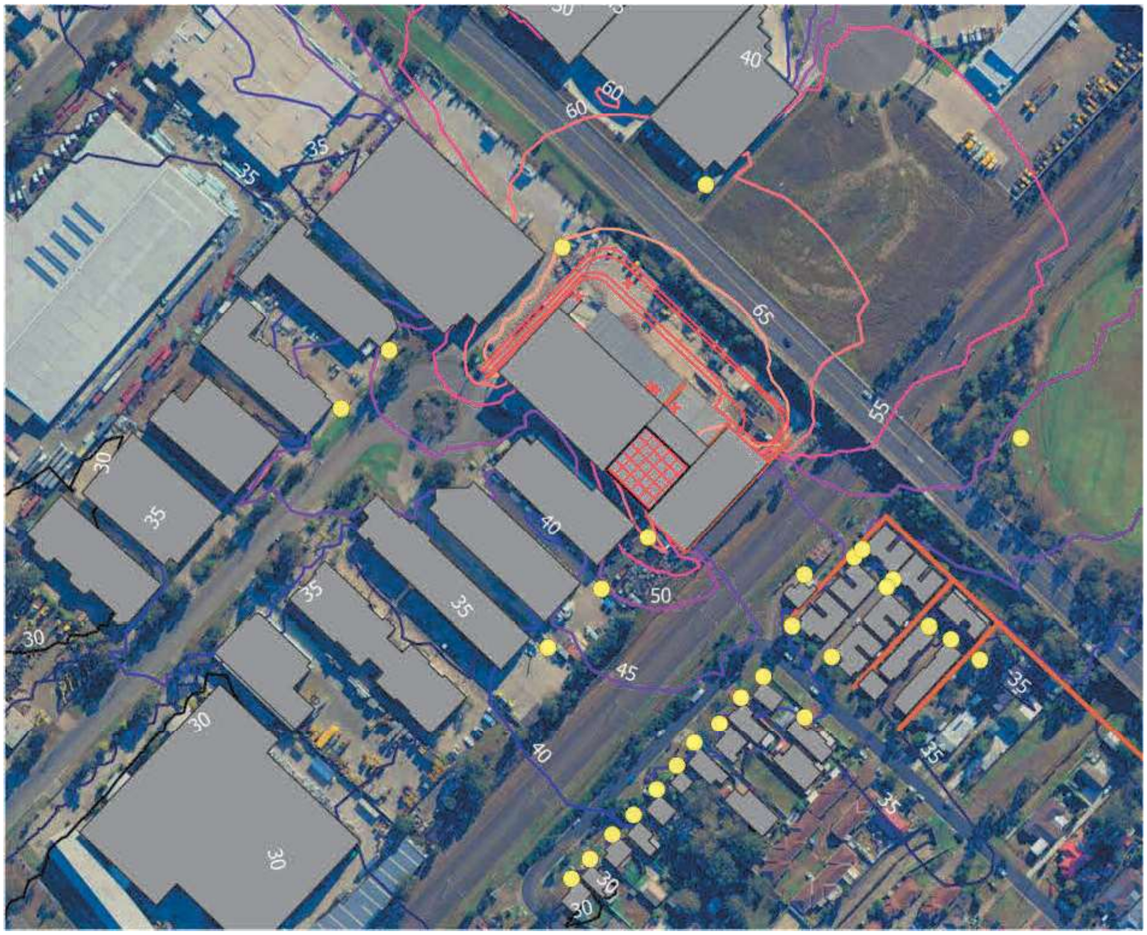
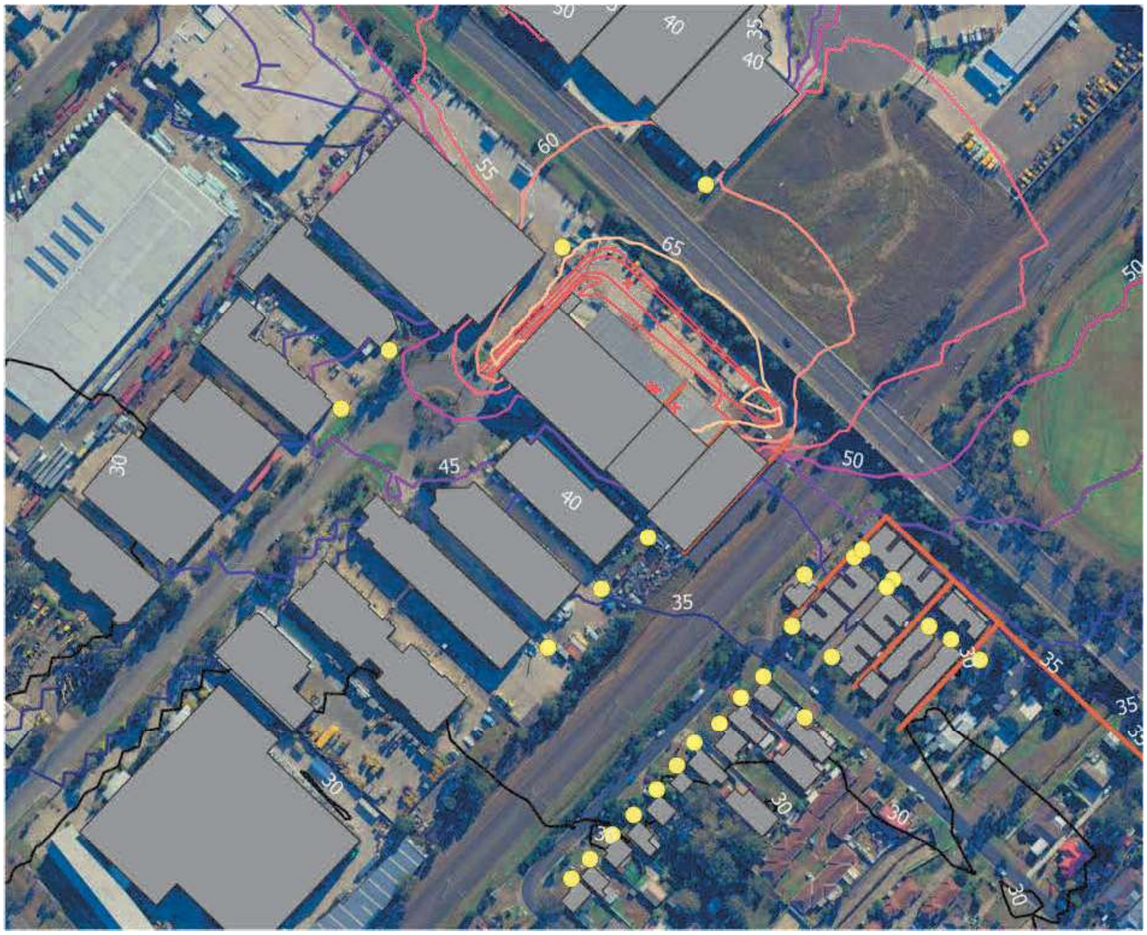


Figure 6-4 Predicted Noise Contours – Night Operational Activities



6.4 Predicted L_{AMax} Noise Levels (Sleep Disturbance)

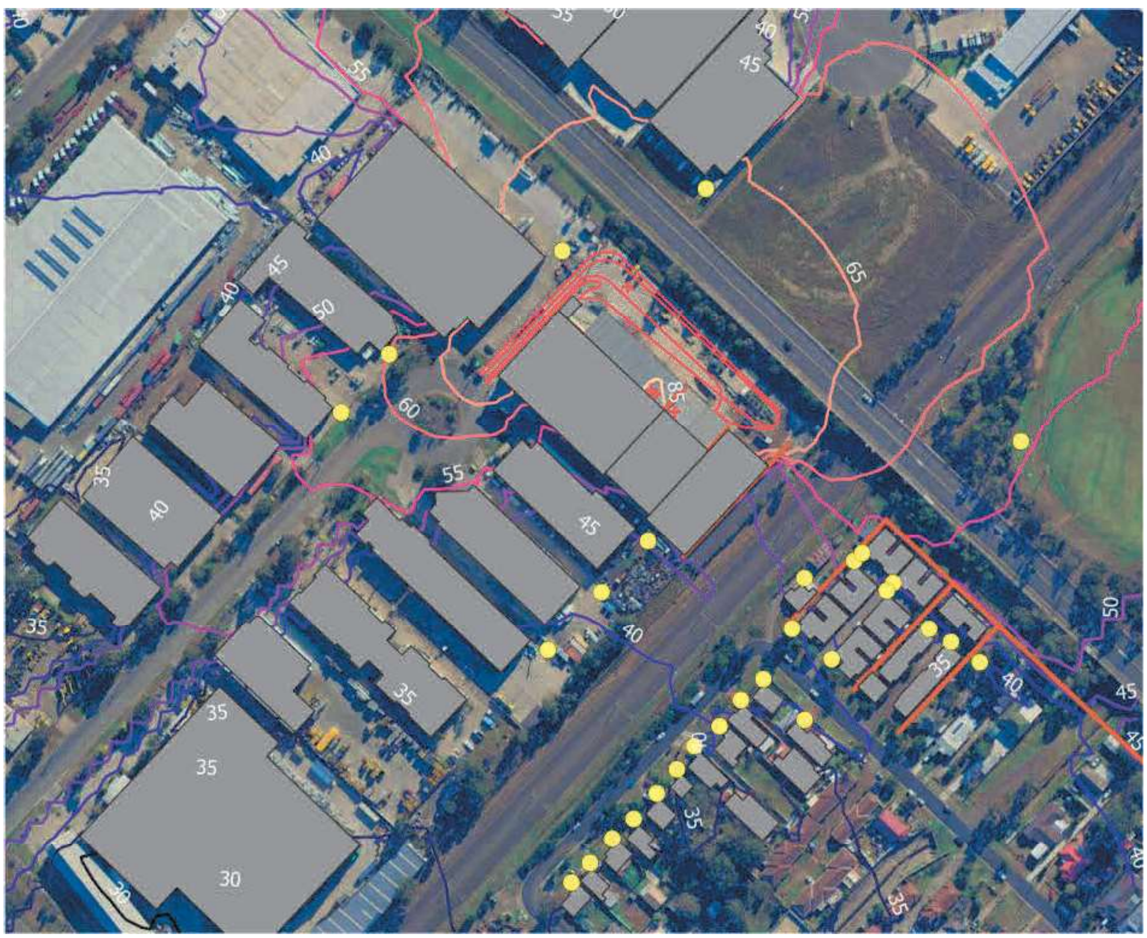
The predicted L_{AMax} results of the night-time operational scenario are presented below in Table 6-3. It is shown that noise levels are predicted to comply with the criteria at the considered residential receivers.

Table 6-3 Predicted Noise Levels, Sleep Disturbance Operational Scenario, L_{AMax}

Receiver	Criteria	Predicted Noise Levels
R1	52	46
R2	52	40
R3	52	45
R4	52	46
R5	52	47
R6	52	43
R7	52	45
R8	52	42

Receiver	Criteria	Predicted Noise Levels
R9	52	41
R10	52	39
R11	52	39
R12	52	41
R13	52	40
R14	52	39
R15	52	39
R16	52	38
R17	52	38
R18	52	37
R19	52	37
R20	52	36
R21	52	36

Figure 6-5 Predicted Noise Contours – Max Noise Levels



7 NOISE CONTROL MEASURES

Given the current site use, proposed site activities, predicted noise levels and assumptions made in this Noise Impact Assessment, the following noise control measures are therefore recommended for the site.

- Equipment during the day and evening periods is to be limited to the following;
  - 1 x Crushing/screening plant, located indoors
  - 1 x Excavator, located indoors
  - 1 x Front end loader, located outdoors in the crushing yard
  - 2 x Truck and dogs, located outdoors in the main yard
  - 1 x Concrete batching plant, located indoors
  - 1 x Slump stand, located indoors
  - 1 x Concrete agitator, located outdoors in the main yard
  - 1 x Flocculant plant, located undercover outdoors
  - 2 x Liquid plant, located undercover outdoors
  - 3 x Vacuum trucks, located outdoors
  - 1 x Forklift, located outdoors 20% and indoors 80%
- Noise generating equipment during the night periods is to be limited to the following;
  - 1 x Concrete batching plant, located indoors
  - 1 x Slump stand, located indoors
  - 1 x Concrete agitator, located outdoors in the main yard
  - 1 x Flocculant plant, located undercover outdoors
  - 2 x Liquid plant, located undercover outdoors
  - 1 x Vacuum trucks, located outdoors
  - 1 x Forklift, located outdoors 20% and indoors 80%
- The doors are to be fully closed when the crusher and screens are operational
- When truck and dogs are being loaded or at a waiting bay, they are to be turned off
- When vacuum waste trucks are being loaded or at a waiting bay, they are to be turned off
- Permanent on site mobile equipment such as the excavator, front end loader and the forklift are to have a non-tonal reversing alarm
- In the crusher yard, the existing 6.5 noise wall along the southeast boundary is to be retained. Additionally, an awning is proposed from the top of the noise wall to cover the storage bays and all activities outside the crushing plant. Note that both ends of the covered area are open air and not enclosed

Based on the outcomes of the assessment presented in this report, no additional noise mitigation measures are required other than what is included above. However, BRS management might consider the installation of an additional noise barrier at the southwestern corner, closing off the southwestern open end under the awning, in future to provide higher confidence to all stakeholders including community, nearby industries and government agencies. It is noted that this additional noise barrier is not required or a mandatory requirement but rather an optional decision for BRS management to make.

8 CONCLUSIONS

Pulse White Noise Acoustics Consultancy Pty Ltd (Pulse White Noise Acoustics) has been engaged by National Integrated Creative Solutions to undertake a Noise Impact Assessment for the proposed upgrades to the Bulk Recovery Solutions resource recovery facility at 16 Kerr Road, Ingleburn. The site currently features liquid waste processing, a concrete batching facility, and indoor solid waste crushing. The site currently processes 30,000 tonnes of waste a year, comprising of 19,000 tonnes of solid waste and 11,000 tonnes of liquid waste. It is now proposed to increase the liquid waste processing ability up to 125,000 tonnes of liquid waste per year. No increases to the solid waste processing capacity are proposed. The increase in tonnages of liquid waste will primarily involve additional vehicle movements.

This document assesses the potential operational noise impacts of the development on the nearby receivers. The following noise control recommendations are contained within this report.

- Equipment during the day and evening periods is to be limited to the following;
  - 1 x Crushing/screening plant, located indoors
  - 1 x Excavator, located indoors
  - 1 x Front end loader, located outdoors in the crushing yard
  - 2 x Truck and dogs, located outdoors in the main yard
  - 1 x Concrete batching plant, located indoors
  - 1 x Slump stand, located indoors
  - 1 x Concrete agitator, located outdoors in the main yard
  - 1 x Flocculant plant, located undercover outdoors
  - 2 x Liquid plant, located undercover outdoors
  - 3 x Vacuum trucks, located outdoors
  - 1 x Forklift, located outdoors 20% and indoors 80%
- Noise generating equipment during the night periods is to be limited to the following;
  - 1 x Concrete batching plant, located indoors
  - 1 x Slump stand, located indoors
  - 1 x Concrete agitator, located outdoors in the main yard
  - 1 x Flocculant plant, located undercover outdoors
  - 2 x Liquid plant, located undercover outdoors
  - 1 x Vacuum trucks, located outdoors
  - 1 x Forklift, located outdoors 20% and indoors 80%
- The doors are to be fully closed when the crusher and screens are operational
- When truck and dogs are being loaded or at a waiting bay, they are to be turned off
- When vacuum waste trucks are being loaded or at a waiting bay, they are to be turned off
- Permanent on site mobile equipment such as the excavator, front end loader and the forklift are to have a non-tonal reversing alarm
- In the crusher yard, the existing 6.5 noise wall along the southeast boundary is to be retained. Additionally, an awning is proposed from the top of the noise wall to cover the storage bays and all activities outside the crushing plant. Note that both ends of the covered area are open air and not enclosed

Based on the findings from this Acoustic Report, should the assumptions in this report be carried out, the noise impacts from the proposed increased in capacity is predicted to comply with the recommended noise criteria at the surrounding receivers.

APPENDIX A: ACOUSTIC TERMINOLOGY

The following is a brief description of the acoustic terminology used in this report.

Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Ambient sound	The all-encompassing sound at a point composed of sound from all sources near and far.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Reverberation	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)
Air-borne sound	The sound emitted directly from a source into the surrounding air, such as speech, television or music
Impact sound	The sound emitted from force of one object hitting another such as footfalls and slamming cupboards.
Air-borne sound isolation	The reduction of airborne sound between two rooms.
Sound Reduction Index [R] *(Sound Transmission Loss)*	The ratio the sound incident on a partition to the sound transmitted by the partition.
Weighted sound reduction index [R_w]	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.
Level difference [D]	The difference in sound pressure level between two rooms.

Normalised level difference [D_n]	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
Standardised level difference [D_{nT}]	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
Weighted standardised level difference [$D_{nT,w}$]	A single figure representation of the air-borne sound insulation of a partition based upon the level difference. Generally used to present the performance of a partition when measured in situ on site.
C_{tr}	A value added to an R_w or $D_{nT,w}$ value to account for variations in the spectrum.
Impact sound isolation	The resistance of a floor or wall to transmit impact sound.
Impact sound pressure level [L_i]	The sound pressure level in the receiving room produced by impacts subjected to the adjacent floor or wall by a tapping machine.
Normalised impact sound pressure level [L_n]	The impact sound pressure level normalised for the absorption area of the receiving room.
Weighted normalised impact sound pressure level [$L_{n,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in a laboratory.
Weighted standardised impact sound pressure level [$L'_{nT,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in situ on site.
C_I	A value added to an L_{nW} or $L'_{nT,w}$ value to account for variations in the spectrum.
Energy Equivalent Sound Pressure Level [$L_{A,eq,T}$]	'A' weighted, energy averaged sound pressure level over the measurement period T.
Percentile Sound Pressure Level [$L_{Ax,T}$]	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 *"Acoustics – Glossary of terms and related symbols"*