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Outline Planning Consultants Pty Ltd

Gunnedah Waste Facility

Environmental Noise Assessment

20E-19-0289-TRP-10550047-2

21 October 2020

Gunnedah Waste Facility **Environmental Noise Assessment**	
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EXECUTIVE SUMMARY

Vipac Engineers & Scientists Ltd was engaged to assess the environmental noise impact of the proposed waste facility at Torrens Road, Gunnedah, on nearby noise sensitive receiver locations.

The Project involves the establishment of a waste facility on Lot 1 and Lot 2 in Deposited Plan 1226992. The waste facility will accept up to 250,000 tonnes per annum of waste. The proposed waste stream (largely excavated materials) will be stockpiled following processing on site.

The existing noise environment was defined by measured background noise levels at the nearest residential receiver location. This data enabled project specific noise criteria to be determined for this project.

Future potential noise levels at the nearest noise sensitive receivers were predicted using a SoundPLAN computer noise model, and factoring in the following considerations:

a) For typical and worst case operational scenarios of the waste facility, for the day period during both neutral and worst case weather conditions.
b) The proposed design of the waste facility already has design features to mitigate potential noise in the form of:
    a. 4.5 metre high concrete tilt-up panels along the northern boundary
    b. Door openings of the processing shed are oriented away from receivers along the South/South East facades

Noise levels from the main waste facility operational scenario (typical case) are predicted to comply with the daytime noise criteria at all receptors.

Noise levels from the worst case operational scenario (monthly use of the Crusher) are predicted to exceed the criteria (by 1 to 8 dB) for a range of meteorological conditions. Given the presence of a private agreement between the operator of the proposed facility and the Whitehaven Coal residence, an exceedance is considered acceptable.

Even though the Scenario 2 waste facility results show exceedances, this scenario (use of Crusher) is expected to occur approximately once per month, for 1 to 2 days operation only. The Crusher will be used inside the Processing Shed and additional noise management strategies are recommended during these times.

During construction, noise levels are predicted to exceed the criteria at the receptors. However, the predicted impact is likely to be minor taking into account the temporary nature of the construction activities and respite periods throughout the construction program. Potentially noise affected neighbours would need to be informed about the nature of the construction stages and the duration of noisier activities, along with progress updates.

Potential vibration levels from construction and machinery operations at the waste facility will be minimal and are likely to be less than 1 mm/s PPV (Peak Particle Velocity) for nearby receptors, which is well below all accepted criteria for structural damage and human comfort from ground borne vibration.

The projected increase in traffic noise levels associated with the additional 162 vehicle movements per day, (based on a worst case assumption of the majority of movements undertaken by heavy articulated vehicles) on the surrounding network shows that based on the proposed waste facility operation, future traffic noise levels are predicted to comply with the criteria without the need for additional acoustic mitigation measures.

TABLE OF CONTENTS

1 INTRODUCTION

Vipac Engineers & Scientists Ltd were engaged to assess the environmental noise impact of the proposed waste facility at Torrens Road Gunnedah on nearby noise sensitive receiver locations. This report documents our assessment and recommendations.

2 REFERENCES

[1] NSW EPA Noise Policy for Industry 2017 (NPI)

[2] NSW DECCW Road Noise Policy 2011 (RNP)

[3] NSW DECC Interim Construction Noise Guideline 2009 (ICNG)

[4] NSW DEC Assessing Vibration: A Technical Guideline 2006

[5] British Standards Institute. (2009). BS 5228:1 - Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 1: Noise. London, United Kingdom: BSI.

[6] Request for Secretary's Environmental Assessment Requirements (SEARS) Proposed Waste Facility No.16 Torrens Road, Gunnedah NSW. 2019. Outline Planning Consultants Pty Ltd.

3 PROJECT DESCRIPTION

The Project involves the establishment of a waste facility on Lots 1 and 2 in Deposited Plan 1226992.

The waste facility will accept up to 250,000 tonnes per annum waste material. The proposed development includes separating and sorting, processing or treating, temporary storage, or transfer or sale of recovered resources. The recycled materials able to be produced include soils and mulched material suitable for landscaping or rehabilitation and road-base. The proposed waste stream (largely excavated materials) will be stockpiled. No materials are land-filled or otherwise disposed anywhere within the site.

The key operational components of the expanded waste facility would include:

- Receipt of waste, with manual and mechanical sorting of waste material.
- Mechanical processing of waste using the processing equipment in an enclosed Unloading and Processing Shed in northern sector of the site (to help shield/limit noise to neighbouring properties).
- Recovery of recyclables through a manual picking line, including timber, and building materials. Transferral of processed waste into temporary storage bays in the hardstand area.
- Storage of asbestos waste in a secured, enclosed facility.
- Any waste which cannot be recycled or re-processed would be sent to an approved landfill.

The waste facility can utilise other existing facilities already owned and used by MacKellar group of companies, including but not limited to diesel fuel tanks, office and staff amenities, parking, and stormwater detention, as well as crushing and screening plant - the latter from MacKellar Excavations' Mount Mary quarry operation. If air quality is an issue, the waste facility would ensure that all waste processing activities, including tipping of incoming waste, would occur indoors within an enclosed processing building. This waste facility includes suitable dust suppression and sprinkler systems.

3.1 SITE LOCATION

The Project Site comprises Lots 1 and 2 DP 1226992 at No.16 Torrens Road, Gunnedah, having a combined area of approximately 2.77ha. All of the site is zoned IN1 General Industrial. Within the Allgayer Drive industrial subdivision are the following uses:

- GB Auto industrial, located on the opposite side of Allgayer Drive from the project site.
- Further north, on the opposite side of Allgayer Drive, is an industrial building housing CJC Drilling.
- Further north again, on the opposite side of Allgayer Drive, is an industrial building and covered work/storage area housing ACS Equip, a business associated with water bore inspections, cleaning and maintenance.
- Further north again, on the opposite side of Allgayer Drive, are industrial buildings, a shed and covered work/storage area housing Pirtek, a business providing fluid transfer solution products and services.
- To the north of the project site, but on the western side of Allgayer Drive, is an Expressway Spares industrial building. The company provides spare parts and equipment to earthmoving and mining industries in the region.

Figure 3-1 shows the proposed site plan. Figure 3-2 shows the location of project site, the land zones, the nearest rural dwellings and surrounding developments.

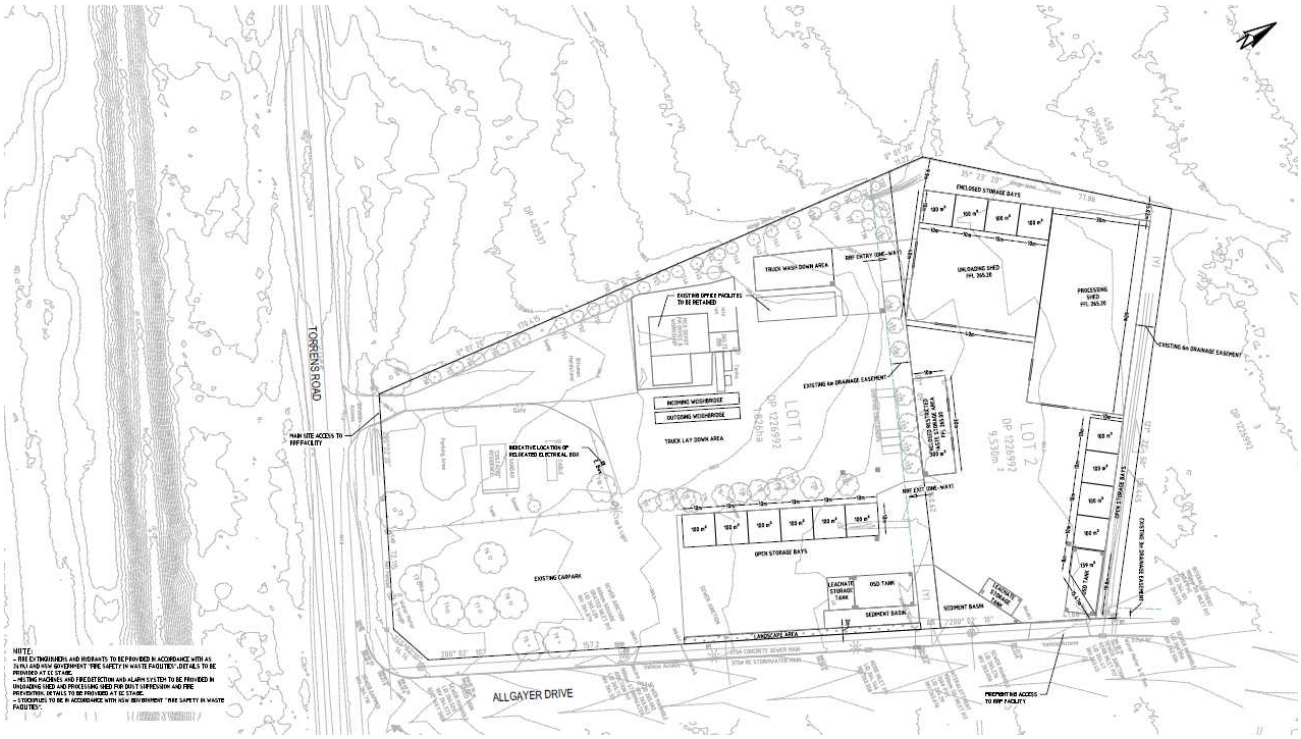


Figure 3-1 - Project Site Plan

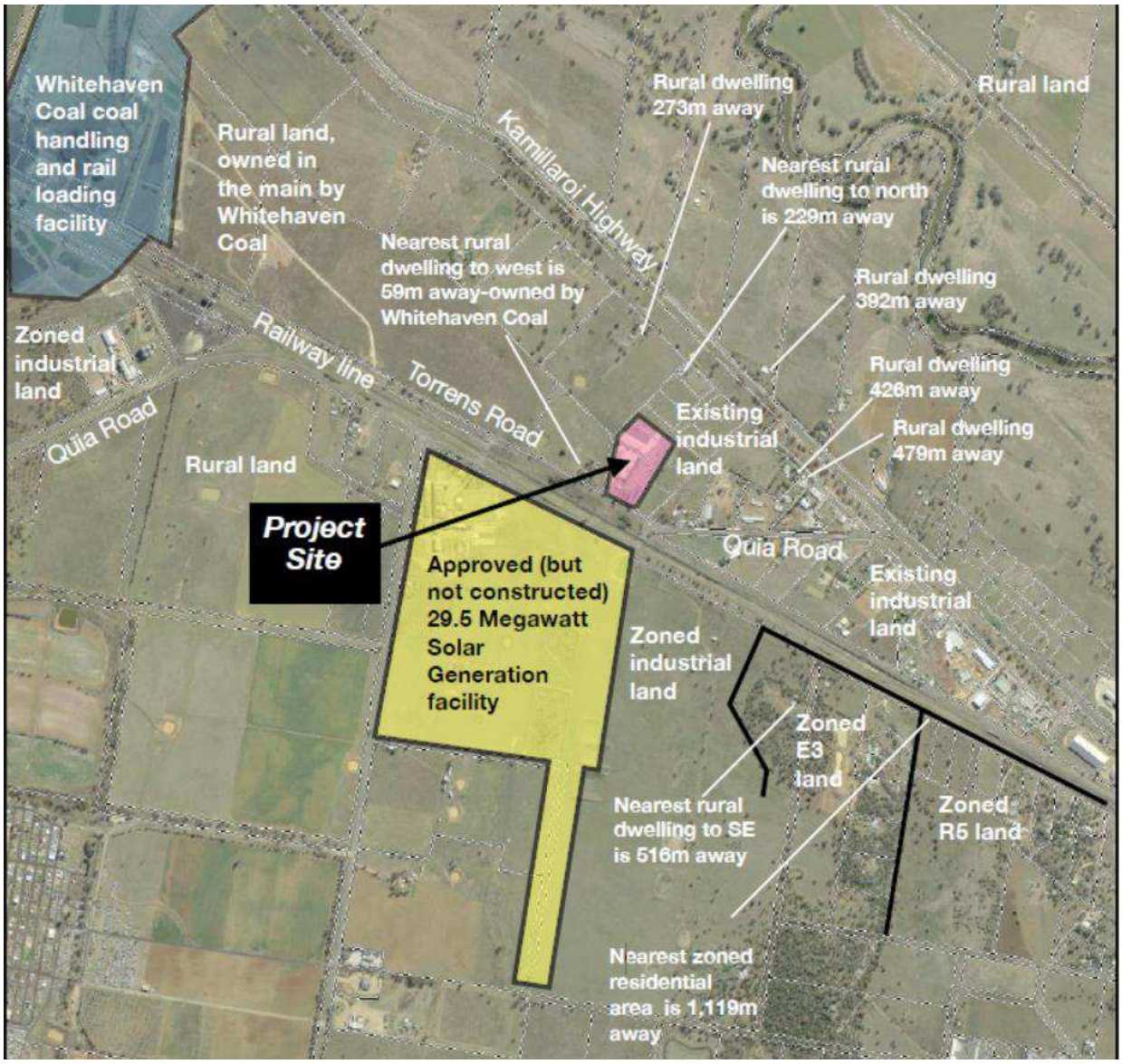


Figure 3-2: Project Site and Surrounding Developments

There are six rural dwellings within 500m of the project site. The Whitehaven Coal dwelling is the closest sensitive 'rural dwelling' receiver, 59m to West of the waste facility site. Whitehaven have indicated their support for the project so this receptor will not be considered as a sensitive receptor in this assessment. The nearest noise sensitive receptors (NSR) considered in this report are the following:

- R1 - Residential: 10193 Kamilaroi Highway, located 229m to the north-east of the proposed waste facility.
- R2 - Residential: 10221 Kamilaroi Highway, located 273m to the north of the proposed waste facility.
- R3 - Residential: 10176 Kamilaroi Highway, located 392m to the north-east of the proposed waste facility.
- R4 - Residential: 211 Mathias Road, located 426m to the east of the proposed waste facility.
- R5 - Residential: 207 Mathias Road, located 479m to the east of the proposed waste facility.
- R6 - Industrial: GB Auto group, located on the opposite side of Allgayer Drive from proposed waste facility.
- R7 - Industrial: Pirtek Gunnedah, located approximately 198m to the north-east of proposed waste facility.
- R8 - Industrial: Expressway Spares, located approximately 140m to the north-east of proposed waste facility.
- R9 - Industrial: CJC Drilling, located on the opposite side of Allgayer Drive from the proposed waste facility.
- R10 - Industrial: ACS Equip, located approximately 140m to the north-east of the proposed waste facility.

Figure 3-3 shows the location of the proposed waste facility and the nearest noise sensitive receptors.

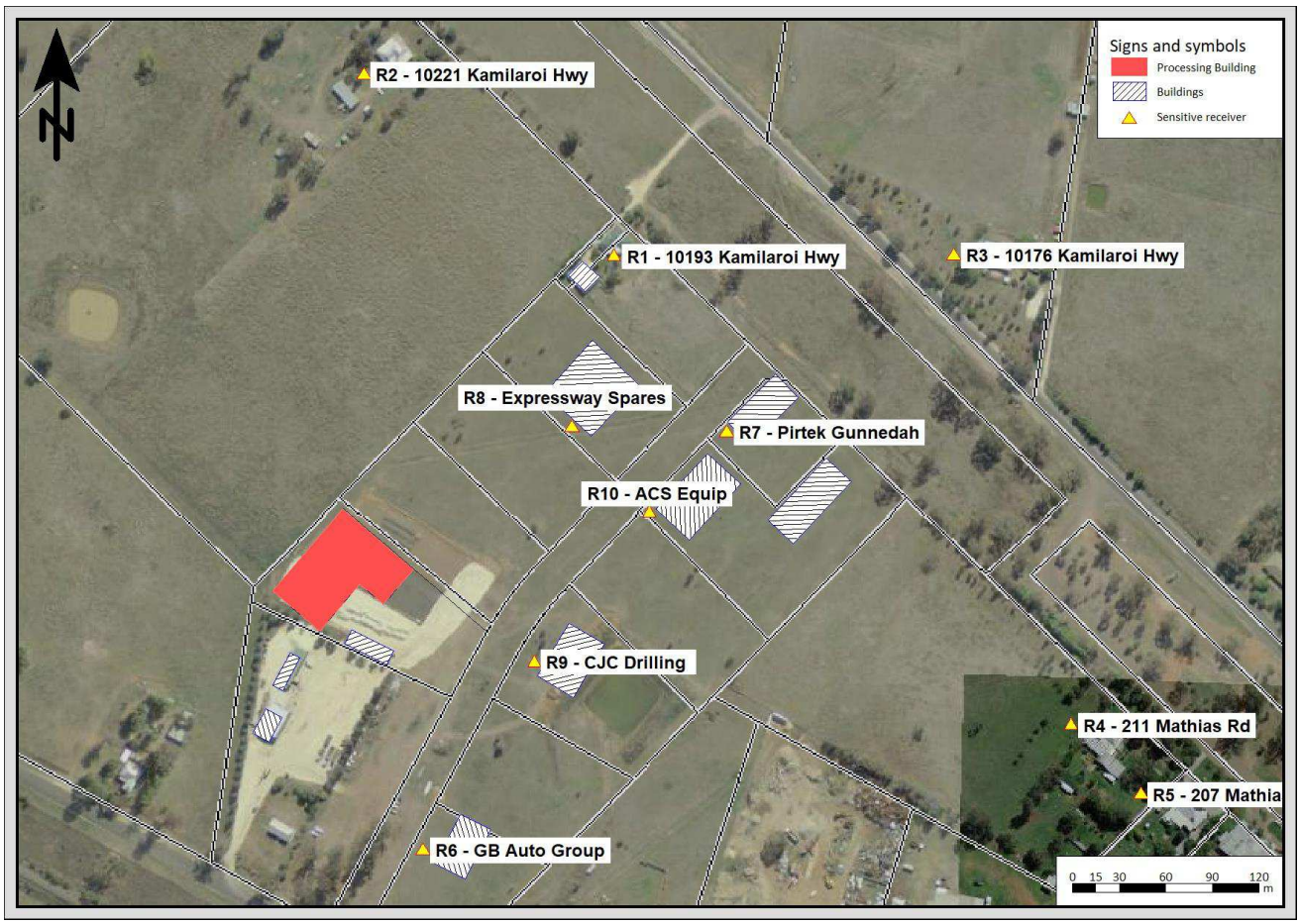


Figure 3-3 - Project Site and Nearest Receptors

3.2 SITE ACCESS

Access to the Project Site is directly from Torrens Road, with side access to an industrial subdivision road, Allgayer Drive. Torrens Road then connects with Quia Road and thence to Kamilaroi Highway. All roads are bitumen sealed. The proposed waste facility will generate additional traffic and on site car parking demands. The primary traffic impact on local roads will be waste truck delivery movements. The haulage route for truck traffic entering and leaving the waste facility will be Torrens Road and Quia Road back to the Kamilaroi Highway (and vice versa).

As detailed in the accompanying Traffic Report (Ref: 01-20-AJD), the Kamilaroi Highway is approximately 9 metres wide, with a single (3.5m) lane in either direction and sealed shoulders. Torrens road is an industrial standard rural road. Between the project site and Quia Road, Torrens Road is 7m wide (2 x 3.5m) with variable width shoulders. Allgayer Drive is also an industrial standard road, and is 13m wide (2 x 3.5m) with kerb and gutters on both sides. Quia Road is a sealed rural road. The road has a 6-7m wide bitumen seal on an 8-9m wide gravel formation. Quia Road is generally 2 lanes (each 3-3.5m wide) in either direction with sealed or gravelled shoulders. The roadway has previously been approved as a haul road for local quarries.

3.3 OPERATIONAL HOURS

The proposed waste facility seeks to operate during the following hours;

- Monday to Saturday (excluding public holidays) - 7.00am to 6.00pm

Note – the operation of heavy machinery is only able to occur between 7:00am to 5:00pm Monday to Friday. No waste facility operations are undertaken on Sundays or public holidays. Construction hours would be 7:00am to 5:00pm, Monday to Friday, and 8:00am to 1:00pm on Saturdays.

3.4 EXISTING PROPOSED DESIGN

It is noted that the proposed design of the waste facility has the following noise mitigation measures in place, and are considered as part of this noise assessment.

a. 4.5 metre high concrete tilt-up panels along the northern boundary
b. Door openings of the processing shed are oriented away from receivers along the South/South East facades

4 EXISTING NOISE ENVIRONMENT

4.1 NOISE MONITORING

Environmental noise monitoring took place at the nearest noise sensitive receptors between November 14th and November 21st, 2019 with a 01dB Duo Noise Logger. The monitoring location is shown in Figure 4-1. The noise logger was configured to measure instantaneous noise levels with a 'Fast' time weighting and 'A' frequency weighting over 15 minute intervals. A field reference check was conducted for the microphone immediately before and after the measurement sequence, with no significant drift from the reference signal. The microphone was appropriately fitted with a windshield.

Noise level data which has been affected by adverse weather conditions (i.e. winds > 5m/s and/or rainfall) is considered invalid and is excluded from analysis. In particular, noise measurements recorded between 5:15pm on November 20th and 7:15am on November 21st were excluded due to high wind speeds. Weather data was obtained from the Gunnedah Quarry Products Weather Station. The average wind speed was 12km/h (3.5m/s) and there was no rain measured during the logging period. A summary of weather conditions is in Appendix B.

Figure 4-1 - Noise Monitoring Location

Table 4-1: Equipment List

Instrument	Serial Number	Next Calibration Date
01dB-Metravib Duo Noise Logger	10303	11/11/2020
Bruel & Kjaer 2250 Sound Level Meter	3028185	02/09/2021
Bruel & Kjaer 4230 Acoustic Calibrator	782006	27/02/2020

Table 4-2 presents a summary of the current noise levels at the monitoring location (the location of the nearest noise residential receiver).

Table 4-2 - Summary of Current Levels (dB (A))

Monitoring Location	Period	L_{Aeq}	L_{A90}	RBL
10193 Kamilaroi Highway	Day	52	43	36
	Evening	49	39	32
	Night	51	40	27

4.2 MECHANICAL EQUIPMENT

The mechanical equipment at Marys Mount Quarry was measured using a Bruel & Kjaer 2250 Sound Level Meter. Some of the source measurement data will be used for application at the waste facility site where applicable.

Table 4-3: Mechanical Equipment Sound Power Levels

Index	Machinery	Approx. Distance(m)	L_{Aeq}	L_{WAeq}
1	LS5203 Lippmann triple deck Screen	10	92	119
2	LC44 Lipmann Cone Crusher	10	95	121
3	LJ2950 Lippmann Jaw Crusher	10	94	119
4	336DL Cat Excavator	1	98	100
5	330 Cat Excavator	1	99	102
6	972M Cat Loader	1	87	94
7	730 Cat Watercart	10	85	112
8	Weigh Bridge	1	83	91
9	745 Cat Dump Truck	1	87	92

5 NOISE CRITERIA

The noise criteria are determined in accordance with the NSW Noise Policy for Industry (NPI, 2017), the NSW Road Noise Policy (RNP, 2011) and the NSW Interim Construction Noise Guideline (ICNG, 2009). Vibration criteria are determined in accordance with the NSW Assessing Vibration: A Technical Guideline (2006).

5.1 NSW EPA NOISE POLICY FOR INDUSTRY (NPI)

The project specific noise criterion limits the noise that a development can make in accordance with the *NSW Noise Policy for Industry 2017* (NPI) in order to limit the effects of the development on the existing noise sensitive receptors.

Amenity Noise Criterion

The amenity criterion is specific to land use and associated activities. It aims to limit continuing increases in noise levels. To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level for a new industrial development is the recommended amenity noise level (from Table 2.2 of the NPI) minus 5 dB.

The residences in the immediate surrounds of the proposed waste facility are located on the fringe of a large industrial zoned area, with the northerly sites fronting a highway and the southern sites closer to a railway line (coal trains). Given the residences likely exposure to existing industrial noise, it is considered appropriate to assign the amenity noise level of the surrounding environment as 'Suburban', defined by the NPI as 'an area that has local traffic with characteristically intermittent traffic flows or some limited commerce or industry'.

The maximum ambient noise level within an area should not normally exceed the acceptable amenity noise levels specified in Table 5-1.

Table 5-1: Amenity Noise Levels (dB(A))

Receiver	Noise Amenity Area	Time of Day	L_{Aeq}, dB(A)
Residential	Suburban	Day	50
		Evening	40
		Night	35
Industrial premises	All	When in use	65

Intrusiveness Noise Criteria

The intrusiveness criterion states that the equivalent continuous noise level of the source should not be more than 5 decibels above the rated background level when measured over a 15 minute period. It aims to control intrusive noise impacts in the short term for residences.

$$L_{Aeq,\ 15\ minute} \leq \text{rating background level} + 5\ dB$$

Project Specific Noise Criteria

The project specific (trigger) noise criteria are set from the NPI as the lower of the calculated intrusiveness or amenity noise level (with the intrusiveness level determined from the measured background noise data).

Table 5-2: Project Specific Noise Criteria (dB(A))

Receptor	Time of Day	Rating Background Level (RBL)	Intrusiveness Criterion	Amenity Criterion	Project Specific Noise Criterion
Residential	Day	36	41	50	**41**
Industrial premises	When in use	-	N/A	65	**65**

5.2 NSW ROAD NOISE POLICY (RNP)

The requirements of the *NSW Road Noise Policy 2011* (RNP) are also applicable to this assessment. Table 5-3 summarises the road category to establish the noise assessment criteria based on the type of road and the land use developments. The proposed development has the potential to generate additional traffic on nearby public roads (e.g. Allgayer Drive, Torrens Road, Quia Road and Kamilaroi Highway) that can potentially impact on the nearby noise sensitive receivers.

Torrens Road and Allgayer Drive are both industrial standard roads. Quia Road is a sealed rural road. The roadway has previously been approved as a haul road for local quarries.

The RNP would categorise these roads as 'sub-arterial' by virtue of them being 'collector' roads, a term used in the EPA's previous guideline Environmental Criteria for Road Traffic Noise (1999), as referenced in the RNP. The definition provided in Table 2 of the RNP for sub-arterial (and collector) roads is as follows:

- Provide connection between arterial roads and local roads;
  - Quia Road is a distributor road that connects arterial roads to local roads.
- May support arterial roads during peak periods;
  - Quia Road could serve as an alternative to arterial roads, and therefore provide support during peak times.
- May have been designed as local streets but can serve major traffic-generating developments or support non-local traffic;
  - Quia Road has been upgraded a number of times over the years, and was likely a rural, local road in the early days; it now has the capacity to serve major traffic-generating developments or support non-local traffic.

Therefore, the criteria for the applicable categories of the roads surrounding the project site are detailed in Table 5-3 and Table 5-4.

Table 5-3 - Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of project / land use	Assessment Criteria/ Target Noise Level, dB(A)	
		Day (7am-10pm)	Night (10pm-7am)
Freeway/arterial/sub-arterial Road	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,\ (15hour)}$ 60 (external)	$L_{Aeq,\ (9\ hour)}$ 55 (external)

Note: These criteria are for assessment against façade- corrected noise levels when measured in front of a building façade. Hence, a correction factor of 2.5 dB is added to the predicted noise levels

In addition to the criteria detailed in the table above, the magnitude of increase in the total traffic noise level at a location due to a proposed project or traffic-generating development must be considered. Residences experiencing increases in total traffic noise level above the relative increase criteria in Table 5-4 should also be considered for mitigation.

Table 5-4 Relative Increase Criteria for Residential Land Uses

Road Category	Type of project / land use	Total traffic noise level increase, dB(A)	
		Day (7am-10pm)	Night (10pm-7am)
Freeway/arterial/sub-arterial Road	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq,\ (15\ hour)}$ + 12 dB (external)	Existing traffic $L_{Aeq,\ (9\ hour)}$ + 12 dB (external)

A relative increase of 12 dB represents slightly more than an approximate doubling of perceived loudness (AS2659.1–1988) and is likely to trigger community reaction, particularly in environments where there is a low existing level of traffic noise.

5.3 CONSTRUCTION NOISE AND VIBRATION GUIDELINES

The NSW *Interim Construction Noise Guideline 2009* (ICNG) provides the requirements for the assessment of noise from construction works. The *NSW Assessing Vibration: A Technical Guideline* (DEC 2006) provides the requirements for the assessment of vibration from construction works.

Construction Noise Criteria

The NSW Interim Construction Noise Guideline 2009 (ICNG) recommends standard hours for normal construction work which are Monday to Friday from 7am to 6pm, Saturdays from 8am to 1pm, and no work on Sundays or public holidays. The proposed construction works will only occur during standard hours.

Where predicted noise levels from construction works during standard hours are above the noise affected level at a sensitive receptor, feasible and reasonable mitigation measures should be considered and where appropriate, adopted. The ICNG Table 2 provides guidance on establishing noise management levels (NML) for residential receptors during standard hours and is reproduced as follows.

Table 2: Noise at residences using quantitative assessment

Time of day	Management level $L_{Aeq\ (15\ min)}$ *	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2.

The ICNG criteria for commercial and industrial premises are as follows:

- industrial premises: external $L_{Aeq\ (15\ min)}$ 75 dB(A)
- offices, retail outlets: external $L_{Aeq\ (15\ min)}$ 70 dB(A)
- other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below.

The ICNG also has internal criteria for ground-borne noise and sleep disturbance; however, as these only apply in the evening or night periods, they are not applicable to this project (day period operation only).

The project specific noise criteria for construction noise are given as follows.

Table 5-5: Project Specific Criteria for Construction Noise ($L_{Aeq,15min}$ dB(A))

Receptor	Time of Day	Rating Background Level (RBL)	NML Criterion	Project Specific Noise Criterion
Residential	Day	36	46	**46**
Industrial premises	When in use	-	75	**75**

Construction Vibration Criteria

The NSW DEC guideline *Assessing Vibration: A Technical Guideline* (2006) is based on guidelines contained in British Standard BS 6472-2008 'Evaluation of human exposure to vibration in buildings (1-80Hz)'.

The guideline provides preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. At vibration values below the preferred values, there is a low probability of adverse comment or disturbance to building occupants. Where all feasible and reasonable mitigation measures have been applied and vibration levels are still beyond the maximum level, it is recommended the operator negotiate directly with the affected community.

The guideline defines three vibration types and provides direction for assessing and evaluating the applicable criteria. Table 2.1 of the DEC guideline provides examples of the three vibration types and are summarised as continuous vibration, impulsive vibration and intermittent vibration. The relevant type of vibration for this project is intermittent vibration. Intermittent vibration (as defined in the DEC guideline) is assessed using the vibration dose concept which relates to vibration magnitude and exposure time. Intermittent vibration is representative of activities such as impact hammering, rolling or general excavation work (such as an excavator tracking). Section 2.4 of the guideline provides acceptable values for intermittent vibration in terms of vibration dose values (VDV) which requires the measurement of the overall weighted root mean square (rms) acceleration levels over the frequency range 1 Hz to 80 Hz; the criteria are presented in Table 5-66.

Table 5-6: Acceptable Vibration Dose Values (VDV) for Intermittent Vibration ($m/s^{1.75}$).

Location	Daytime (7am-10pm), VDV		Night time (10pm-7am), VDV	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60
Critical areas (e.g. hospital operating theatres)	0.10	0.20	0.10	0.20

Structural vibration criteria for building damage due to blasting is considered the same as that induced by transient groundborne vibration due to general construction activities. Vibration levels for potential building damage contained in *British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration* are referenced in *British Standard BS 5228-2:2009* and *Australian Standard AS 2187.2:2006*. The vibration levels in BS 7385-2:1993 are adopted as building damage criteria from construction activities, and are shown as follows.

TABLE J4.4.2.1

TRANSIENT VIBRATION GUIDE VALUES FOR COSMETIC DAMAGE (BS 7385-2)

Line	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structure. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

NOTES:

1 Values referred to are at the base of the building.

2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

6 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

The construction activities and associated noise and vibration sources will likely include excavators, trucks, vibratory roller, crane and other plant. The major plant and equipment for construction works are likely to consist of the following (from information provided by MacKellar Excavations):

- 14 tonne Excavator
- 5 tonne Excavator
- Bobcat
- Tip Truck
- 17 tonne Roller
- Watercart
- Concrete Trucks
- 80 tonne Crane
- Elevated work platform
- Generator
- Light vehicles

It is expected that the larger excavator will be used to complete the early bulk earthworks with smaller excavators and bobcat used to complete the preparatory works and services work. A vibratory compaction roller (e.g. up to 17 tonne) would be used and appropriate assumptions relating to roller properties have been made (such as drum amplitude, static linear loads, typical speeds etc.).

The noise and vibration issues during construction works would include: airborne noise, groundborne noise, groundborne vibration and airborne vibration from construction activities including work sites, construction traffic, excavation and preparatory works. It is noted that for construction, the client confirms that there would be no piling, rock breaking or blasting activities (causing airblast overpressure) for this project.

This is a conservative representation of potential construction noise levels due to typical activities expected. The mobile equipment was modelled as operating on the ground surface at full power/load to represent normal construction activities including earthworks and building construction.

6.1 PREDICTED NOISE AND VIBRATION LEVELS AND ASSESSMENT

The predictions of noise and vibration levels were conducted with assumed sound power levels and vibration levels for the construction noise and vibration sources. These were based on previously measured data by Vipac or sourced noise data for construction machinery from various noise databases (such as Manufacturers Specification and Test Data, Australian Standard AS 2436, British Standard BS 5228 and previous projects).

6.1.1 CONSTRUCTION NOISE

The noise predictions were calculated from standard acoustic propagation algorithms and formulae in a calculation spreadsheet (utilising the sound propagation formula from the accepted ISO 9613 method, including free-field downwind propagation and assuming point sources, see note in table below). No shielding from existing or future buildings/structures has been assumed.

Table 6-1 provides the assumed sound power levels (SWL) for the construction noise sources (worst case operation at full power/load, and are representative of maximum L_{Aeq} noise levels). The table also provides the predicted noise levels at a range of distances (representing typical receptor distances) from the source.

*Table 6-1 - Typical SWL of Construction Equipment and Predicted Noise Levels at Different Distances**

		Predicted Noise Level at Different Distances, Max. L_{Aeq} dB(A)					
Equipment	**SWL, dB(A)**	**50m**	**100m**	**150m**	**200m**	**300m**	**400m**
Excavator (14 t)	110	68	62	59	56	53	50
Crane	104	62	56	53	50	47	44
Tip Trucks	107	65	59	56	53	50	47
Water Cart	106	64	58	55	52	49	46
Concrete trucks and pumps	108	66	60	57	54	51	48
Bobcat	104	62	56	53	50	47	44
Drum Roller (17 t)	108	66	60	57	54	51	48
Generator	99	57	51	48	45	42	39

**Note: Main sound propagation formula used (Ref: ISO 9613): SPL = SWL – 20log(D) – 8 dB.*

For some equipment items (such as vibratory roller), a low frequency noise adjustment should be applied, which would lead to levels up to 5 dB higher. A number of machinery items operating simultaneously could cause noise levels up to about 3 to 5 dB higher than given for the single sources in the table.

The adjusted predicted construction noise levels show that at the receptors:

1. for the closest NSRs (R1, R2 at distances of 220 – 270 m), the predicted noise levels of approximately 55 to 60 dB(A) would exceed the criterion of 46 dB(A) for most machinery items;
2. for the further NSRs (R3–R5 at distances of 400 – 480 m), the predicted noise levels of approximately 45 to 50 dB(A) would just exceed the criterion of 46 dB(A) for some machinery items (and meet the criterion for some machinery items);
3. for industrial premises at the closest distances of 50 m, the predicted noise levels of approximately 65 to 70 dB(A) would meet the 75 dB(A) industrial criterion.

Notwithstanding the predicted exceedances, the predicted impact is likely to be minor taking into account the temporary nature of the construction activities and respite periods throughout the construction program. As part of a noise management plan, potentially noise affected neighbours would need to be informed about the nature of the construction stages and the duration of noisier activities, along with progress updates.

Groundborne noise (structureborne noise or regenerated noise inside a building caused by structural vibration) inside dwellings and facilities is unlikely to exceed the criteria which only apply in the evening or night periods. Transient effects (such as rattling windows and household items) may generate some nuisance on occasions during construction operations. Airborne noise is likely to dominate over any groundborne noise.

6.1.2 CONSTRUCTION VIBRATION

Both continuous/quasi-continuous and intermittent vibration has been considered during construction operations (which will be temporary in nature). Most machinery items are likely to generate continuous or quasi-continuous vibration during their operation (e.g. vibratory rollers during normal compaction, construction machinery movements), and some intermittent or transient vibration could be caused by vibratory rollers during start-up compaction (and possibly during unloading of trucks).

Ground-borne vibration resulting from construction activities and operations are compared against the applicable criteria relating to human comfort and potential structural damage (usually in terms of Peak Particle Velocity, PPV). The recommended limits or guide values (refer section 5.3) for transient vibration to ensure minimal risk of cosmetic damage to residential buildings (and community buildings) are in the range 15 to 20 mm/s PPV (depending on the frequency), with higher limits of 50 mms/ for industrial buildings. The stipulated human comfort criterion (lower limit) for vibration is typically 1 mm/s PPV (to an upper limit of 2 mm/s).

The ground vibration predictions for different types of vibratory compaction rollers were calculated from accepted semi-empirical algorithms for predicting propagation of ground vibration (Ref: BS 5228-2; *Ground Vibration from Construction Works*, UK TRL Report 429 (Hiller & Crabb, 2000)). The ground vibration predictions for other types of construction machinery were based on previously measured data by Vipac or sourced noise data for construction machinery from various vibration databases and literature references (Ref: *Ground Vibration Engineering* (Srbulov, 2010), *Construction Vibrations* (Dowding, 2000), CALTRANS *Construction Vibration Manual* (US CALTRANS, 2013), US FTA *Transit Noise & Vibration Manual* (2018)).

The calculation formulae used for ground vibration predictions (in terms of Peak Particle Velocity, V_{PPV} in mm/s) for vibratory compaction rollers are given as follows (Ref: BS 5228-2; Hiller & Crabb, 2000):

Table 6-2 :Ground Vibration Prediction Formulae

Normal compaction passes:	$V_{PPV} = ks * n^{0.5} * (A/(x+w))^{1.5}$	[mm/s]	ks	75	50% exceedance probability
			ks	143	33% exceedance probability
			ks	276	5% exceedance probability
Transient startup/shutdown:	$V_{PPV} = kt * n^{0.5} * (A^{1.5}/(x+w)^{1.3})$	[mm/s]	kt	65	50% exceedance probability
			kt	106	33% exceedance probability
			kt	177	5% exceedance probability
	x	distance along ground from roller to receiver (m)			
	n	number of vibrating drums in roller			
	A	nominal amplitude of vibrating roller (mm)			
	w	width of vibrating drum (m)			

** Note: The exceedance probability represents the level of conservatism in the predictions, where a 5% predicted level would be the most conservative or worst case situation (higher prediction) to represent the maximum level predicted for 95% of possible cases and therefore only 5% of cases likely to exceed the predicted level.*

Ground vibration levels have been predicted for different distances by applying these accepted calculation formulae and using actual parametric data for a range of proprietary vibratory rollers, such as BOMAG BW-series tandem vibratory rollers (2-drums, front and rear), for a range of masses up to 20 tonnes.

From the operation of up to 20-tonne vibratory rollers (during worst case transient start-up/shutdown operation), the range of predicted ground vibration levels are 1 to 1.5 mm/s at 50 m distance (with levels less than 0.5 mm/s beyond 100 m distance). Predicted worst case vibration levels from vibratory roller operation meet the human comfort criteria and are well below structural damage criteria for all nearby buildings.

A conservative prediction of the potential ground-borne vibration impacts associated with the other proposed construction activities and mobile equipment operations has been made (primarily quasi-continuous vibration). Ground vibration levels (in mm/s PPV) from other construction machinery items (e.g. excavators, truck unloading, other than vibratory rollers) are typically in the range of 0.1 to 1 mm/s at distances of 25 to 50 m. Truck traffic (over rough/irregular road surfaces) will typically generate ground vibration levels of 0.1 to 0.5 mm/s (or less) at distances of 25 to 50 m. As a result, predicted vibration levels would meet the human comfort criteria and are well below structural damage criteria for all nearby buildings.

7 OPERATIONAL NOISE MODEL

Noise modelling has been undertaken using SoundPLAN computer noise modelling software to model the waste facility operations. Use of the SoundPLAN software and referenced modelling methodology is accepted for use in the State of NSW by the EPA for environmental noise modelling purposes.

7.1 NOISE SOURCES

Details of the plant and equipment that will be used during the operational phase of the proposed waste facility and indicative sound power levels (i.e. noise emission levels associated with the equipment) are listed in Table 7-1. Noise sources were modelled as point sources at 2m above ground (and forklift at 1.5m above ground) and the Processing Shed was modelled as an industrial building noise source with roller door openings.

Table 7-1 - Sound Power Levels (Lw) of Noise Sources.*

Description	No. of Units	Location	Sound Power Level L_w per Unit dB(A)
Cat 972M Loader	1	Outside	94
Cat 972M Loader	1	Inside Processing Building	94
Trommel (516R Anaconda)	1	Inside Processing Building	104
Watercart	1	Outside	100
Forklift	1	Outside	97
Dump Truck (Cat 745)	1	Outside	92
Waste Truck (Large)	1	Inside Processing Building	105
Weigh Bridge Motor	1	Outside	91
Crusher (Lippmann Jaw)	1	Inside Processing Building	119
Wash Bay	1	Outside	91

* Noise data have been sourced from previous quarry site noise measurements and a range of other references (including AS 2436, BS 5228-1, UK DEFRA, SoundPLAN and Vipac library databases).

7.2 NOISE MODELLING SCENARIOS

Vipac understands that as per Section 3.3, the proposed waste facility will operate from 7:00am to 6:00pm, Monday to Saturday, excluding public holidays. The operation of heavy machinery will only occur between 7:00am to 5:00pm, Monday to Friday.

The waste facility will accept up to 250,000 tonnes per annum of waste. The proposed waste stream (largely excavated materials) will be stockpiled into segregated heavy waste processing and stockpiling area. No materials are land-filled or otherwise disposed anywhere within the site.

The key operational components of the waste facility would include (Ref: Drawing P1907434-PS01 Rev C, Martens & Associates, dated 9/7/20):

- Receipt of waste, with manual and mechanical sorting of waste. The turnaround duration of trucks entering/unloading/leaving the site is 14 minutes.
- The machinery plant at the waste facility is expected to include a total of 2-off Front End loaders (Cat 972M), 2-off Waste/Dump Trucks (Cat 745 and Large Waste Truck), Forklift, Trommel Screen (and Crusher occasionally), Watercart. Other fixed sources include the Weighbridge and Wash Bay.
- Mechanical processing of waste using the processing equipment (e.g. Trommel screen).
- Storage of asbestos waste in a secured, enclosed facility.
- Any waste which cannot be recycled or re-processed through the waste facility would be sent to an approved licensed landfill.
- Recovery of recyclables through a manual picking line, including timber, and building materials. Transferral of processed waste into temporary storage bays in the hardstand area.

The proposed waste facility currently includes the following noise mitigation measures as part of its design:

- A large enclosed shed (tilt up concrete and colorbond construction) in the northern corner of the waste facility site comprising the Unloading Shed and Processing Shed.
- Four roller door openings along the south and south eastern facades (and whirly gigs on roof), opened during operation of equipment such as Trommel).
- Open storage bays along the northern boundary (and near centre of site)
- A 4.5m high continuous ‘tilt-up’ concrete wall panels behind the open storage bays along the total length of the northern boundary.

Scenario 1 assumes a typical case in which the Trommel will operate inside the Processing Shed (with roller doors open). Scenario 2 assumes a worst case operational scenario where a mobile Crusher (from the nearby quarry) is used instead of the Trommel (inside Processing Shed with roller doors open); this scenario is expected to occur approximately once per month for 1 to 2 days operation only. Importantly, the trommel will not operate when the crusher is operating. Both scenarios assume all other machinery items (refer Table 7-1) will be operating simultaneously inside buildings and outside.

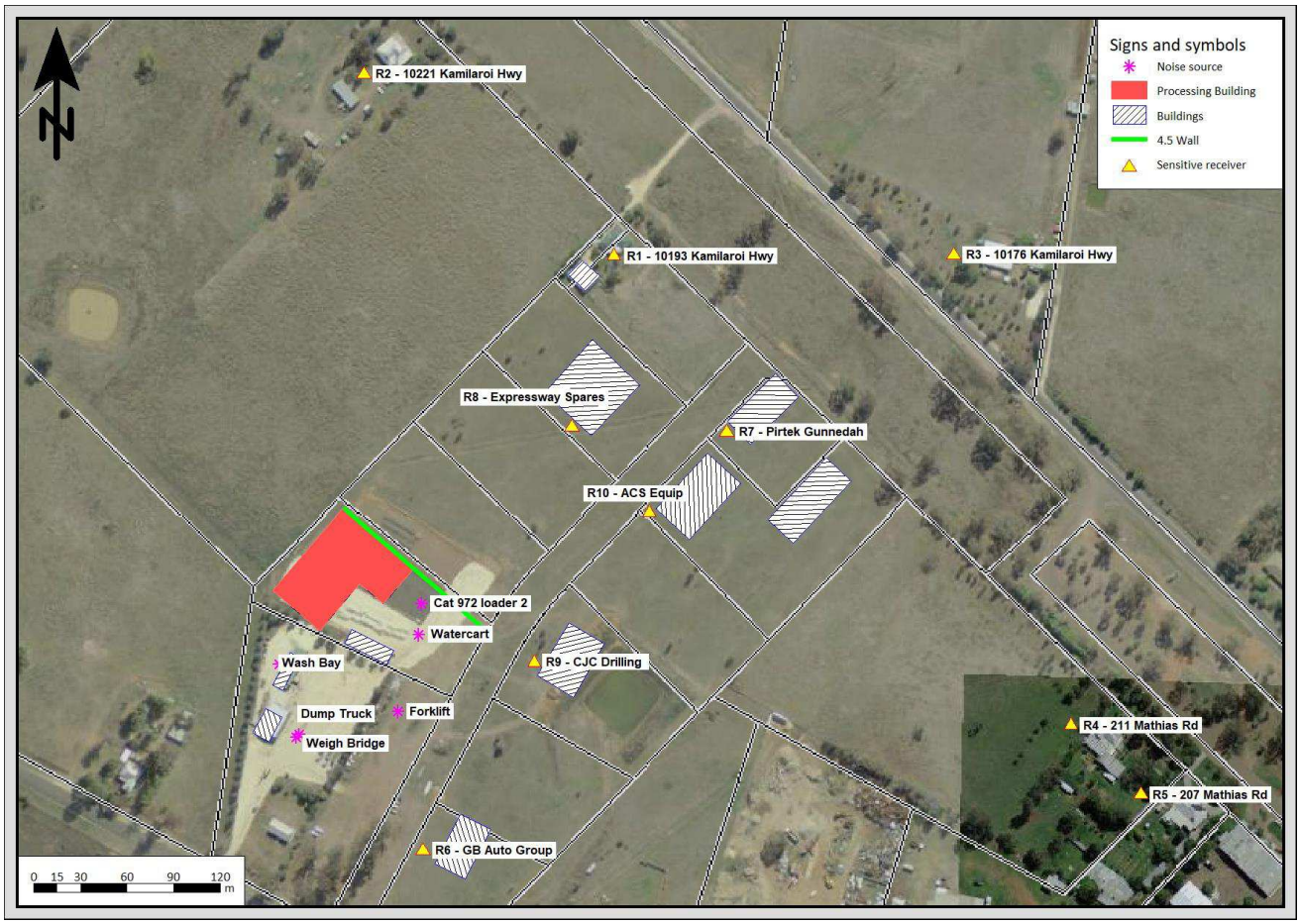


Figure 7-1 - Source Locations

(Note: The red area represents the Unloading and Processing Sheds, which contain the additional internal sources of Trommel, Crusher, Waste Truck and Forklift. The green line represents the 4.5m high continuous concrete wall along the total length of the northern boundary, included as a noise mitigation measure in the model.)

7.2.1 WEATHER CONDITIONS

Two weather modelling scenarios were assessed for the operational phase of the proposed waste facility within the SoundPLAN program using CONCAWE algorithms under both neutral and worst-case weather conditions for the daytime period. It should be noted that sound will propagate further through the atmosphere under certain weather conditions dependent on air pressure variations, wind speed and direction variations, temperature inversions etc. The 'worst-case' weather conditions chosen were those highly conducive to the propagation of sound. These worst case weather conditions are generally experienced when there are wind speeds of 2-3m/s in the direction from the source to the receiver.

Table 7-2 presents the weather parameters used in the CONCAWE calculations based on a combination of average annual data from the Bureau of Meteorology (BoM) Weather Stations at Gunnedah Airport AWS (Station ID: 055202) and Gunnedah Resource Centre (Station ID: 055024), annual data from the Gunnedah Quarry Products weather station and a conservative assumption for worst case weather conditions.

Table 7-2 - SoundPLAN Weather Parameters

Parameter	Day	
	Neutral	Worst-case*
Pasquill Stability Category	D	F
Wind Speed (m/s)	0	3
Humidity (%)	70	70
Temperature (deg Celsius)	10	10
Met Category	3	6

* Worst case scenario (Met category 6) includes the effect of temperature inversion.

The long term wind roses recorded daily at the Gunnedah station at 9am and 3pm are provided in Figure 7-2. Winds are shown to be primarily from the southeast at 9am and from the northwest and southeast directions at 3pm. Stronger winds (>40km/hr or >11.1m/s) occur infrequently mostly from the southeast.

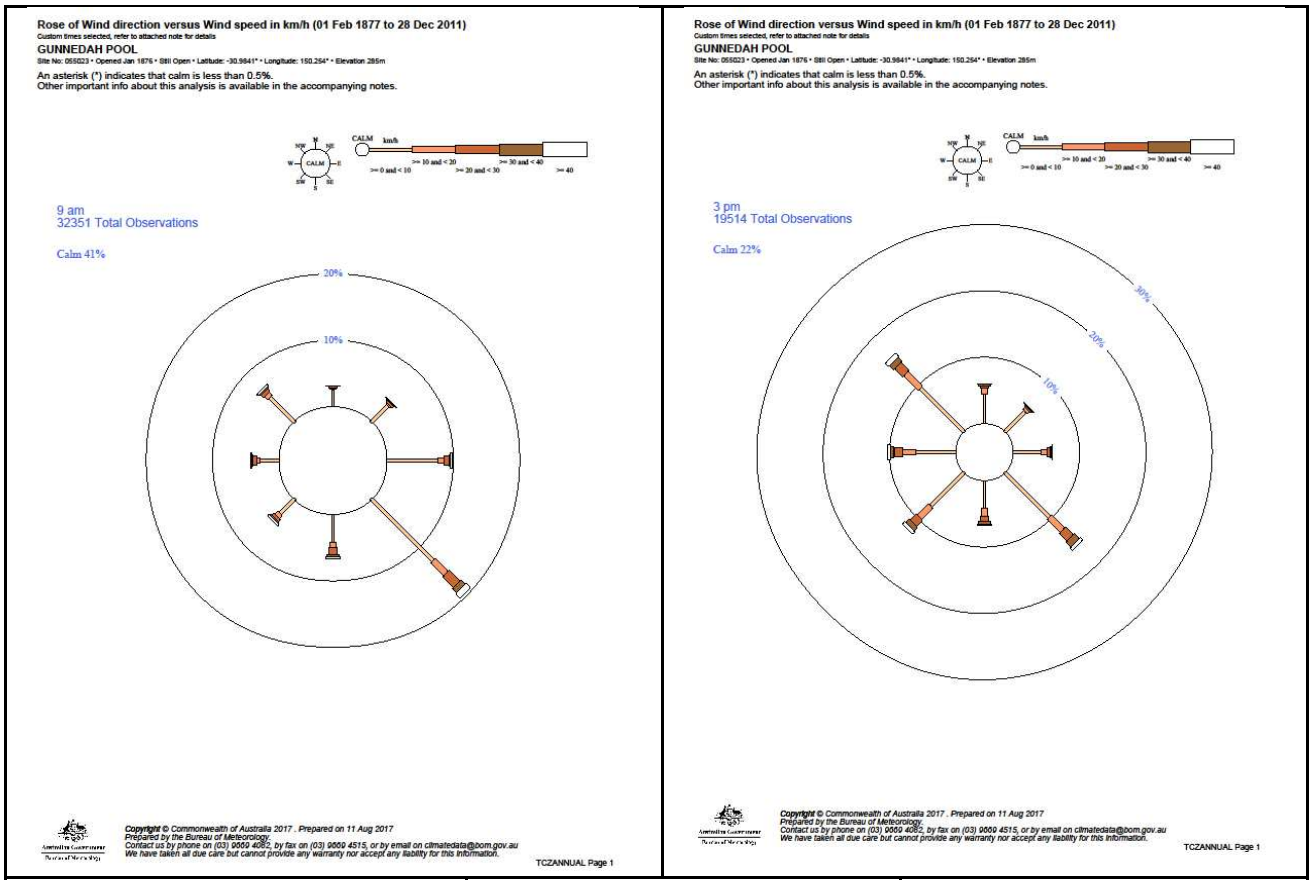


Figure 7-2: Annual wind roses for Gunnedah Weather Station (1876 to 2011)

The annual wind rose daily summary from the Gunnedah Quarry Products weather station is detailed in Figure 7-3. Similarities in wind speed and directions can be seen when comparing to BOM data in Figure 7-2.

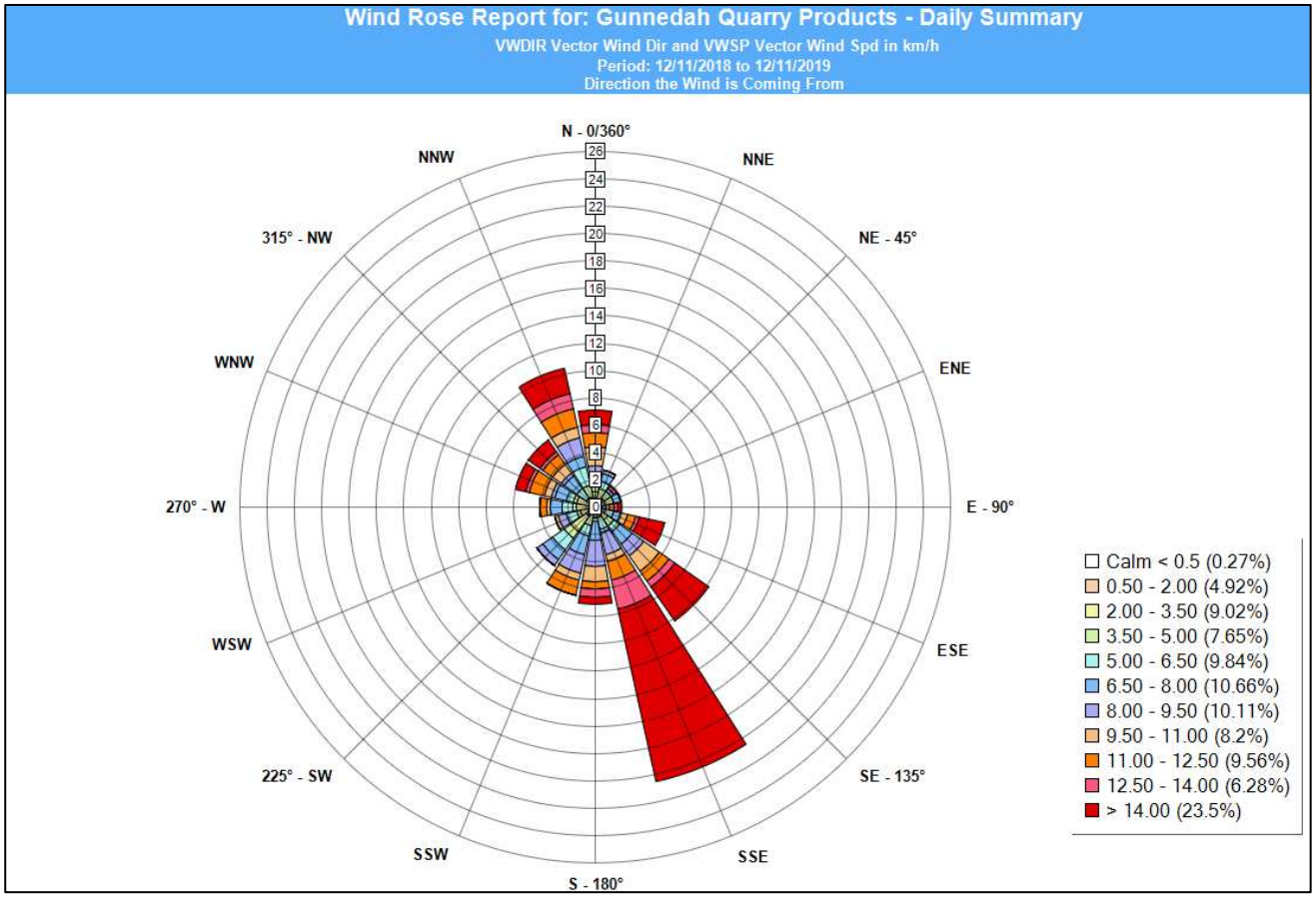


Figure 7-3 - Gunnedah Quarry Products Annual Wind Rose (2018-2019)

A supplemental weather data summary from the Quarry weather station is provided in Appendix C.

7.3 NOISE IMPACT FROM GENERATED TRAFFIC

It is noted that reliance is placed on the existing local public roads to bring waste to the project site and take processed waste away from the site.

The Calculation of Road Traffic Noise (CoRTN) method of traffic noise prediction was used, which is a method approved by the EPA. The traffic data presented in the Traffic Impact Assessment (by StreetWise Road Safety & Traffic Services) demonstrates the proposed site will generate an additional 162 vehicle movements per day on the surrounding road network. This is based on a worst case assumption that the majority of waste haulage to and from the site will be undertaken by heavy articulated vehicles (in accordance with the StreetWise Traffic Assessment Report).

Access to the Project Site is directly from Torrens Road, with side access to an industrial subdivision road, Allgayer Drive. Torrens Road then connects with Quia Road and thence to Kamilaroi Highway. The primary traffic impact on local roads will be waste truck delivery movements. The haulage route for truck traffic entering and leaving the waste facility will be Torrens Road and Quia Road back to the Kamilaroi Highway (and vice versa).

Vipac has conducted noise modelling for the future site operation based on the additional 162 vehicle movements per day. The increased number of trucks utilising the road compared with the existing traffic volumes taken from the StreetWise report is outlined below in Table 7-3**.**

Table 7-3 – Traffic Volumes with additional vehicles per day from the Project site.

Road	Existing Daily Traffic Volumes	Additional Future Vehicle Movements	Future Daily Traffic Volumes
Quia Road	300	162	462
Torrens Road	200		362
Kamilaroi Highway	2,500		2,662

The traffic noise assessment also took into account the following assumptions:

- Entrance and exit from the site from the Torrens Road access only (the only access used by heavy vehicles associated with the proposed waste facility).
- Posted speed limits of 80km/hr along the Torrens/Quia Road section of the haul route.
- Posted speed limit of 100km/hr along the Kamilaroi Highway section of the haul route.
- A conservative heavy vehicle percentage of 50%.
- Distance attenuation to the nearest sensitive receivers along Quia Road and Kamilaroi Highway as detailed in Table 8-4 and Table 8-5.
- Sensitive Receptors have direct, unobstructed line of sight to the roads, with no shielding from intervening structures applicable.
- Receptor heights modelled at 1.5m above ground in the free-field.

Potential vibration levels from truck traffic movements are likely to be less than 0.5 mm/s PPV (Peak Particle Velocity) for receptors along the adjacent public roads, which is well below all accepted criteria for structural damage and human comfort from ground borne vibration.

8 PREDICTED NOISE LEVEL RESULTS

8.1 OPERATIONAL SCENARIOS

Noise predictions have been conducted to assess the potential impact associated with the proposed waste facility operations at the nearest noise sensitive receptors for the scenario detailed in Section 7.2.

The predicted noise levels representative of each of the main operational scenarios for both neutral conditions and worst-case conditions during the day period are presented in Table 8-1. A sample of these scenarios has been reproduced graphically as Noise Contour Maps and are shown in Appendix A.

Table 8-1 – Predicted Noise Levels: Daytime (dB(A), $L_{Aeq,15min}$)

Rec #	Criteria $L_{Aeq,15min}$ dB(A)	Predicted Noise Levels $L_{Aeq,15min}$ dB(A)			
		Typical Operation Scenario 1 (Trommel)		Worst Case Scenario 2 (Crusher)*	
		0m/s Wind (Neutral)	3m/s Wind (Temp inversion)	0m/s Wind (Neutral)	3m/s Wind (Temp inversion)
R1	41	35	36	46	47
R2	41	34	36	45	47
R3	41	31	34	42	44
R4	41	32	36	42	45
R5	41	31	35	40	44
R6	70	52	54	59	60
R7	70	42	45	52	54
R8	70	44	46	56	57
R9	70	54	55	62	62
R10	70	43	46	52	54

*Note: Scenario 2 (use of mobile Crusher) is expected to occur approximately once per month for 1 to 2 days operation only.

8.2 PROPOSED ASSESSMENT AND DISCUSSION

The noise levels from the main waste facility operational scenario (typical case) are predicted to *comply with the daytime noise criteria at all receptors*. The noise levels from the worst case operational scenario (monthly use of mobile Crusher inside shed) are predicted to exceed the criteria (by 1 to 8 dB) for the range of meteorological conditions.

Even though the Scenario 2 waste facility results show exceedances, this scenario (use of Crusher) is expected to occur approximately once per month for 1 to 2 days operation only. The Crusher will be used inside the Processing Shed and additional mitigation and management measures are recommended during these times.

It is noted that the modelling presented here is conservative and has assumed the worst case scenario of the simultaneous operation of all machinery items at maximum power/load. As a result, noise levels would be expected to be lower than those predicted, especially during periods of reduced level of machinery operation.

Potential vibration levels from construction and machinery operations at the waste facility will be minimal and are likely to be less than 1 mm/s PPV (Peak Particle Velocity) for nearby receptors, which is well below all accepted criteria for structural damage and human comfort from ground borne vibration.

8.3 CUMULATIVE OPERATIONAL NOISE ASSESSMENT AND DISCUSSION

As part of this application, the cumulative noise levels of existing industrial noise alongside the proposed project's impact are required to be assessed. It is noted that a specific assessment into residual noise is typically only required when the project specific noise criterion cannot be met. For the purposes of providing a clear understanding of cumulative noise impact, the assessment has considered all results, regardless of compliance, as shown in Table 8-1.

Noise monitoring conducted at 10193 Kamilaroi Highway (as detailed in Section 4.1), established the ambient noise levels of the surrounding environment, which includes noise emissions from the nearby industrial uses. These uses include the following:

- Mackellar Excavations Depot (the project site's existing operations)
- GB Auto Group (R6)
- Pirtek Gunnedah (R7)
- Expressway Spares (R8)
- CJC Drilling (R9)
- ACS Equip (R10)

Based on the noise monitoring results, the existing industrial noise levels have been determined in accordance with Table A2 (reproduced in Table 8-2).

Table 8-2 - Determining Existing Industrial Noise Levels

Risk of noise impact	**Measurement period**	**Definition of existing level**
Low risk	One day, covering the defined day/evening/night periods relevant to the periods the proposed development would operate.	The logarithmic average of individual $L_{aeq,\ 15min}$ levels for each day/evening/night period over the measurement period.
High risk	One week, covering the defined day/evening/night periods the proposed development would operate.	

In accordance with section A2 of the NPI, where this approach (using ambient noise monitoring that contains both the existing industrial noise contribution and other extraneous noise) suggests cumulative noise levels will remain below the relevant 'amenity noise levels' (as detailed in Table 5-1), no additional assessment is required

The existing industrial levels, combined with the worst case predicted 'Temperature Inversion' noise levels are compared against the daytime amenity noise levels and are detailed in Table 8-3:

Table 8-3 - Predicted Cumulative Noise Results Comparison

Rec #	Existing Industrial Noise Levels Daytime (7am-6pm) $L_{Aeq,15min}$ dB(A)	Daytime Amenity Noise Level Criteria $L_{Aeq,15min}$ dB(A)	Predicted Noise Levels $L_{Aeq,15min}$ dB(A)					
			Typical Operation Scenario 1 (Trommel)			Worst Case Scenario 2 (Crusher)		
			Predicted 3m/s Wind (Temp inversion)	Cumulative 3m/s Wind (Temp inversion)	Increase in Noise level (Cumulative v Existing)	Predicted 3m/s Wind (Temp inversion)	Cumulative 3m/s Wind (Temp inversion)	Increase in Noise level (Cumulative v Existing)
R1	52	50	36	52	*0.1*	47	53	*1.2*
R2			36	52	*0.1*	47	53	*1.2*
R3			34	52	*0.1*	44	53	*0.6*
R4			36	52	*0.1*	45	53	*0.8*
R5			35	52	*0.1*	44	53	*0.6*
R6		65	54	56	*2.1*	60	61	*0.6*
R7			45	53	*0.8*	54	56	*2.1*
R8			46	53	*1.0*	57	58	*1.2*
R9			55	57	*1.8*	62	62	*0.4*
R10			46	53	*1.0*	54	56	*2.1*

The following conclusions are made from the cumulative noise assessment results in Table 8-3.

a) Cumulative noise impacts at the nearest non-residential receivers are predicted to comply with the daytime amenity noise level criteria, for both operational scenarios.
b) Cumulative noise impacts at the nearest residential receivers are predicted to exceed the daytime amenity noise levels for operational scenario 2. This is due to the existing industrial noise levels already exceeding the daytime amenity noise levels.

As a result, to understand the impact the proposed development is predicted to have on the existing noise environment, it is prudent to observe the difference in noise level between the existing levels and the predicted cumulative noise levels.

It can be seen that for Scenario 1, the increase in total cumulative noise compared to the existing noise levels is 0.1 dB(A). This is considered a negligible effect, and an increase that is not detectable by the human ear. Furthermore, the daytime amenity noise level applied is in accordance with Section 5.1, where it states:

> *'To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level for a new industrial development is the recommended amenity noise level (from Table 2.2 of the NPI) minus 5 dB'.*

Therefore, the cumulative noise impact for Scenario 1 is considered acceptable.

Worst case cumulative noise at the nearest residential receivers during Scenario 2 is predicted to exceed the daytime amenity noise levels by 3 to 4 dB(A), and an increase to the existing industrial noise levels by up to 1.2 dB(A).

As was described in section 8.2, despite the Scenario 2 waste facility results indicating exceedances, this scenario (use of Crusher) is expected to occur approximately once per month for 1 to 2 days only. The Crusher will be used inside the Processing Shed and noise management strategies are recommended during these times.

The noise modelling presented here is conservative and has assumed the worst case scenario of the simultaneous operation of all machinery items at maximum power/load. As a result, noise levels are expected to be lower than those predicted, especially during periods of reduced machinery operation.

8.4 TRAFFIC NOISE ASSESSMENT

Preliminary noise modelling was conducted to assess the potential noise impacts associated with the additional vehicle movements on the proposed haul route, utilising Torrens/Quia Road and onto the Kamilaroi Highway.

Road traffic noise monitoring was not conducted as part of this assessment, therefore validation of the traffic noise model used to predict noise levels at the nearest receivers cannot be undertaken. However, given the low traffic volumes on the surrounding road network, it is expected the existing traffic noise levels are well below the current criteria of 60dB(A) $L_{Aeq, 15hr}$ for sub arterial/collector roads.

The noise model has taken into account all the sources associated with traffic that will be generated by the proposed development as outlined in Section 7.3 to determine the predicted future road traffic noise levels in the area.

Table 8-4 and Table 8-5 below presents the traffic noise predictions for existing traffic, alongside future predicted traffic volumes at the nearest residential receptors along Torrens/Quia Road and the Kamilaroi Highway. The table demonstrates results relative to a given distance that sensitive receptors are likely to be from the nearest edge of the closest proposed haul road.

Note that because noise levels of the existing traffic is unknown, the results are intended to provide a conservative indication based on a worst case scenario of 50% heavy vehicle traffic and the sole use of heavy vehicles travelling to and from the site.

Table 8-4 - Cumulative Traffic Noise Impact – Quia Road

$L_{Aeq, 15hr}$ Noise Levels, dB(A)					
Receiver Distances (from nearest edge of road)	**Existing Traffic**	**Future Traffic**	**Criteria**	**Predicted Compliance?**	**Maximum Difference (Existing v Future)**
5m	55.2	57	60	✓	1.8
10m	53.6	55.4		✓	1.8
15m	52.6	54.4		✓	1.8
20m	51.8	53.6		✓	1.8
25m	51.2	52.9		✓	1.7
30m	50.4	52.1		✓	1.7
35m	49.4	51.2		✓	1.8
40m	48.6	50.4		✓	1.8
45m	47.9	49.7		✓	1.8
50m	47.2	49		✓	1.8

Table 8-5 - Cumulative Traffic Noise Impact – Kamilaroi Highway

$L_{Aeq, 15hr}$ Noise Levels, dB(A)					
Receiver Distances (from nearest edge of road)	**Existing Traffic**	**Future Traffic**	**Criteria**	**Predicted Compliance?**	**Maximum Difference (Existing v Future)**
5m	69.1	69.4	60	✓*	0.3
10m	66.1	66.4		✓*	0.3
15m	64.2	64.5		✓*	0.3
20m	62.6	62.9		✓*	0.3
25m	61.4	61.7		✓*	0.3
30m	60.4	60.7		✓*	0.3
35m	59.5	59.8		✓	0.3
40m	58.7	59		✓	0.3
45m	57.9	58.2		✓	0.3
50m	57.3	57.5		✓	0.2

*Existing noise levels within 30m of the Highway are already predicted to exceed the criteria before the introduction of additional vehicles associated with the proposed development.

Note – this assessment is based on a worst case assumption of the majority of vehicles visiting the site to be heavy articulated vehicles.

8.5 TRAFFIC NOISE SUMMARY

As stated in Section 3.4 of the Road Noise Policy, with regard to existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use development, any increase in total traffic noise level should be limited to 2dB above that of the corresponding existing noise level at any residential property.

It can be seen in Table 8-4 that existing and future traffic noise levels at residential receptors as close as 5m from the Quia Road edge are predicted to comply with the criteria without the need for acoustic mitigation.

As seen from Table 8-4, increases in the predicted traffic noise levels at distances between 5 and 50m from Quia Road are within the acceptable limits with the increases of between up to 1.8dB(A).

It is anticipated that residential receptors within 30m of the Kamilaroi Highway currently exceed the criteria with the existing volume of traffic along the highway.

However, as seen from Table 8-5, increases in the predicted traffic noise levels at distances between 5 and 50m from the Kamilaroi Highway are within the acceptable limits with the increases of up to 0.3dB(A).

Given these increases are also well below the relative increase criteria detailed in Section 5.2 (Base traffic + 12dB), the increased traffic from the proposed development is predicted to comply with the relevant road traffic noise criteria.

Therefore, traffic noise associated with the additional vehicles on the proposed haul route associated with the waste facility are predicted to comply with the criteria without the need for acoustic mitigation measures.

8.6 NOISE MANAGEMENT STRATEGIES

A range of noise management strategies are recommended for the proposed waste facility and are based on:

1. The input data regarding the layout and operation of the waste facility provided by the client.
2. The assumptions made regarding the operation of the waste facility machinery items.
3. The noise prediction results and the noise assessment outcomes.

Recommended noise management strategies for the waste facility are provided as follows:

1. The waste facility machinery items are recommended to be fitted with manufacturer supplied exhaust mufflers and engine enclosures.
2. Construction activities should only be undertaken during standard day-time hours (7:00am to 5:00pm weekdays, and 8:00am to 1:00pm on Saturdays – this strategy is already proposed).
3. During construction, it is recommended all equipment is equipped with appropriate noise control (e.g. mufflers, silenced exhausts, acoustic enclosures, flashing lights as an alternative to revising beepers), and equipment is shut down and not left idling when not in use.
4. Machinery items should only be used when required on site, at a location and in a manner that is appropriate to the task. Avoid noisy plant working simultaneously where possible.
5. Mobile machinery items should be switched off when not in use, and not employ unnecessary high levels of revving, acceleration, braking etc. Minimise the height from which material is dropped into trucks when loading rock and other materials into trucks.
6. If any complaints are received, noise monitoring (at the complainants property and at the waste facility site) should be conducted to determine the source and level/extent of impact.
7. If monitoring shows exceedances relative to criteria, then additional noise mitigation controls may be required.

Note - operation of the waste facility machinery items should align with the proposed operation and assumptions. If any changes are made in the final design (relative to the design modelled as part of this assessment), then an additional noise assessment would be required to demonstrate that criteria will be met.

9 CONCLUSION

A noise impact assessment has been undertaken to determine the potential noise impact of the proposed operations at the Waste Facility on noise sensitive receptors in the surrounding area of the site.

Future potential noise levels at the nearest noise sensitive receivers were predicted using the SoundPLAN computer noise model for the scenarios of proposed waste facility operations. For each scenario, noise levels were predicted in the day period during both neutral and worst case weather conditions.

The noise levels from the main waste facility operational scenario (typical case) are predicted to comply with the daytime noise criteria at all receptors. The noise levels from the worst case operational scenario (monthly use of Crusher) are predicted are predicted to exceed the criteria (by 1 to 8 dB) for the range of meteorological conditions. Given the presence of a private agreement between the waste facility and the Whitehaven Coal residence, an exceedance is considered acceptable.

Even though the Scenario 2 waste facility results show exceedances, this scenario (use of Crusher) is expected to occur approximately once per month for 1 to 2 days operation only. The Crusher will be used inside the Processing Shed and additional mitigation and management measures are recommended during these times.

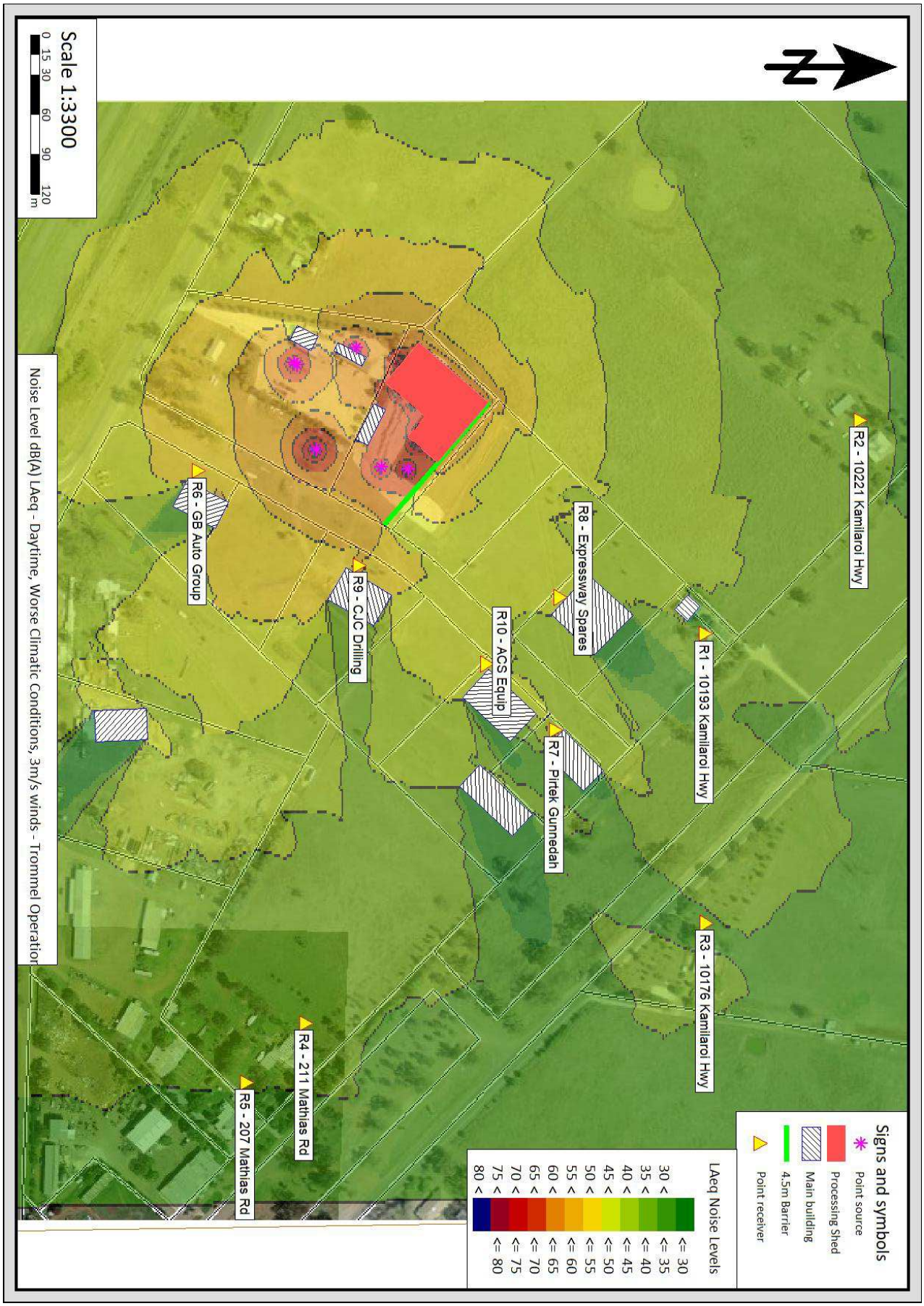
During construction, noise levels are predicted to exceed the criteria at the receptors. However, the predicted impact is likely to be minor taking into account the temporary nature of the construction activities and respite periods throughout the construction program. Potentially noise affected neighbours would need to be informed about the nature of the construction stages and the duration of noisier activities, along with progress updates.

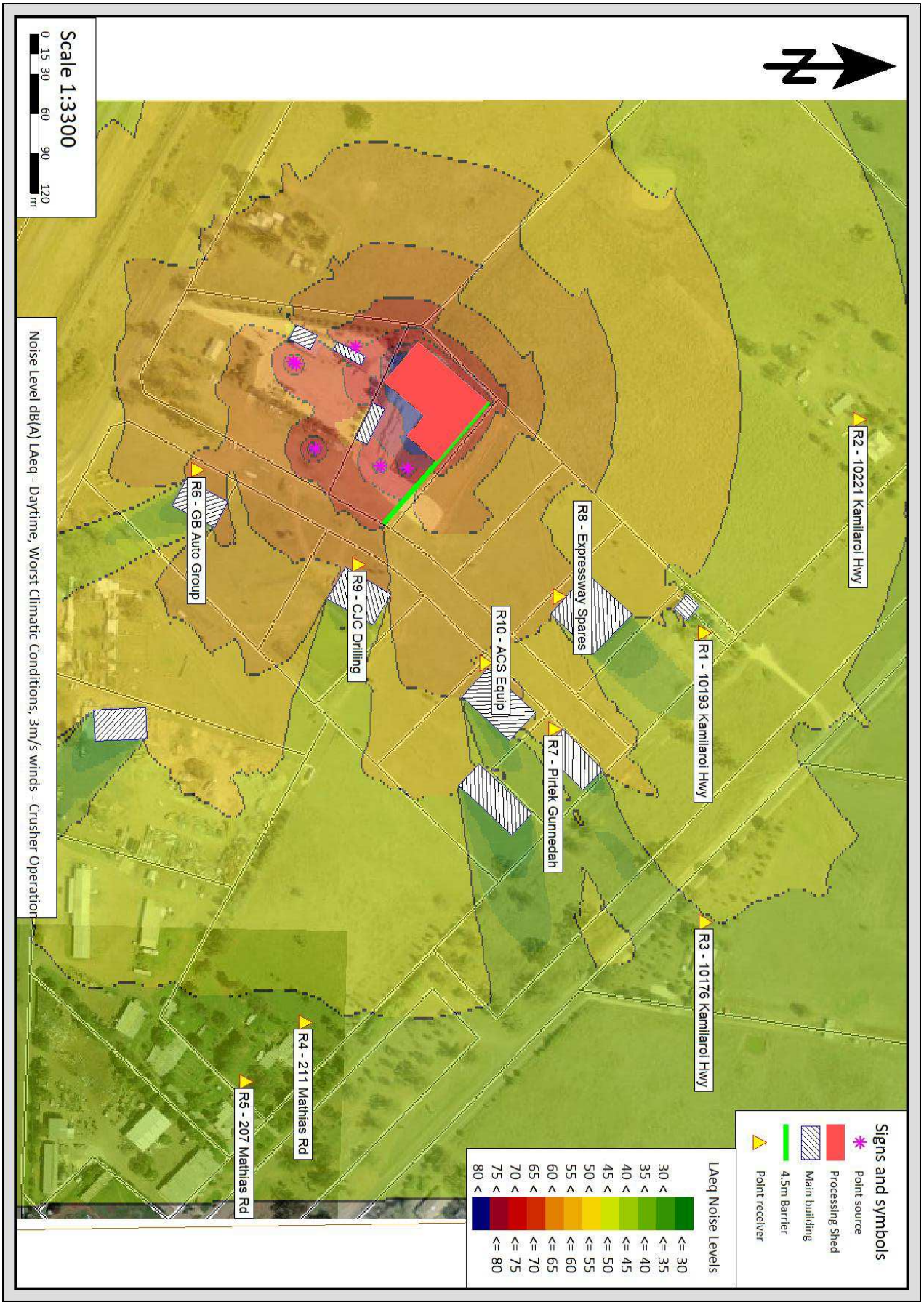
Potential vibration levels from construction and machinery operations at the waste facility will be minimal and are likely to be less than 1 mm/s PPV (Peak Particle Velocity) for nearby receptors, which is well below all accepted criteria for structural damage and human comfort from ground borne vibration.

The projected increase in traffic noise levels associated with the additional 162 vehicle movements per day (based on a worst case assumption of the majority of movements undertaken by heavy articulated vehicles) on the surrounding network show that based on the proposed waste facility operation, future traffic noise levels are predicted to comply with the criteria without the need for additional acoustic mitigation measures.

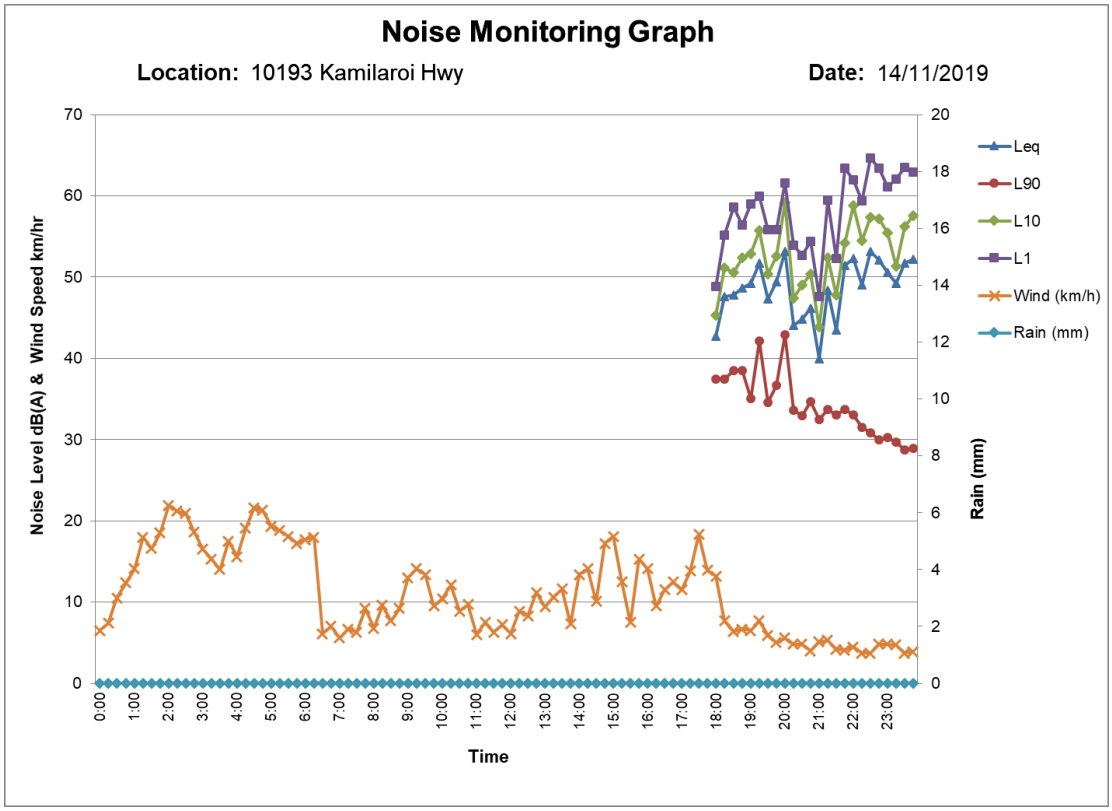
A range of appropriate noise management strategies are recommended for the waste facility (section 8).

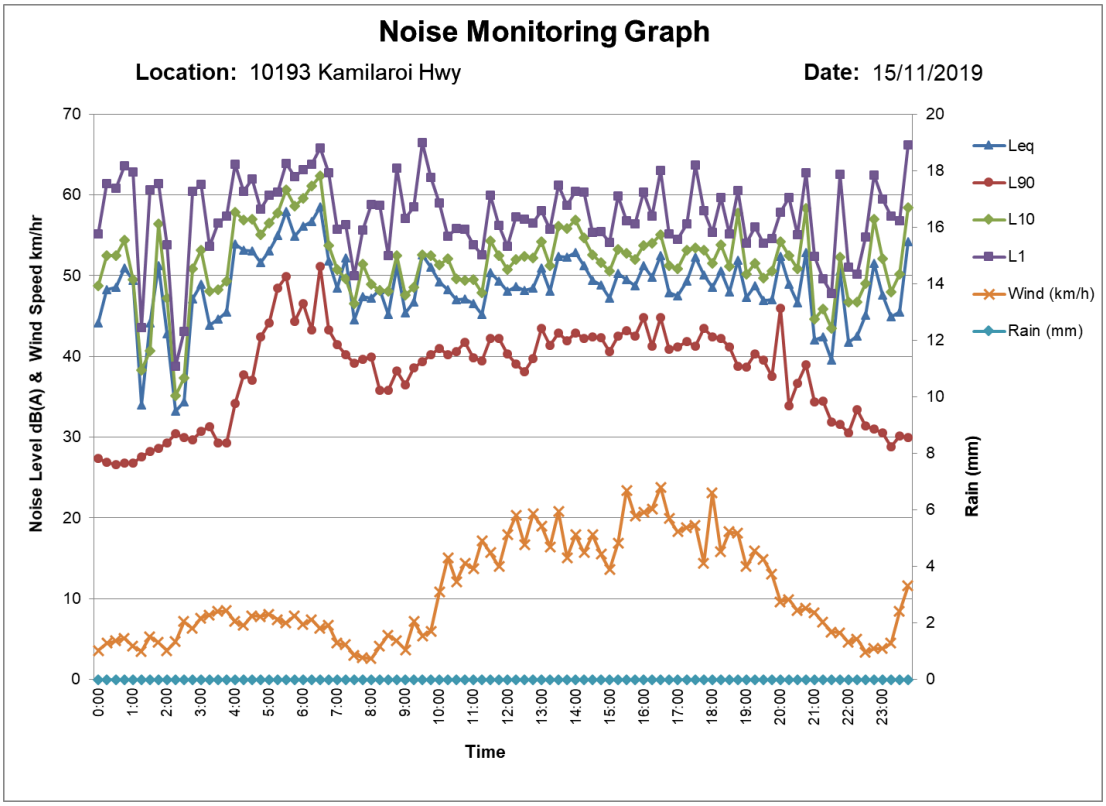
Appendix A NOISE CONTOUR MAPS

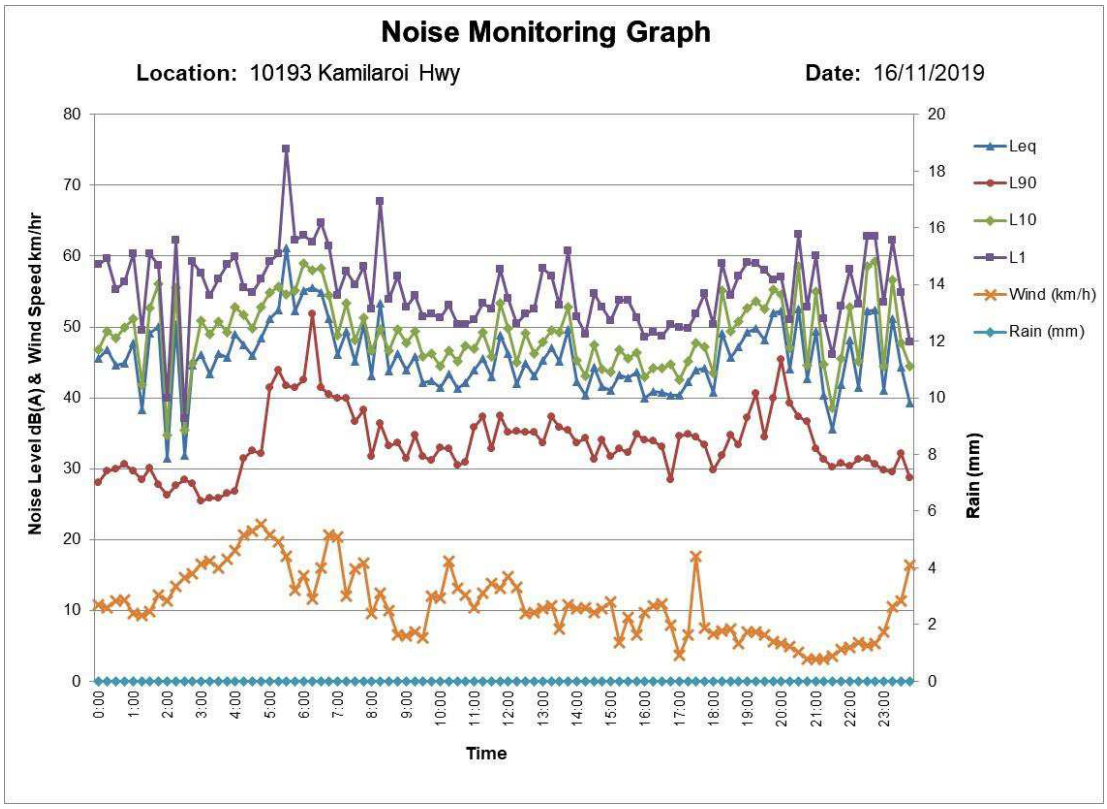

N
Scale 1:3300
0 15 30 60 90 120
m
Noise Level dB(A) LAeq - Daytime, Worse Climatic Conditions, 3m/s winds - Trommel Operation
R2 - 10221 Kamilaroi Hwy
R1 - 10193 Kamilaroi Hwy
R3 - 10176 Kamilaroi Hwy
R8 - Expressway Spares
R7 - Pirtek Gunnedah
R10 - ACS Equip
R9 - CJC Drilling
R6 - GB Auto Group
R4 - 211 Mathias Rd
R5 - 207 Mathias Rd
LAeq Noise Levels
<= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 < <= 70
70 < <= 75
75 < <= 80
80 <
Signs and symbols
Point source
Processing Shed
Main building
4.5m Barrier
Point receiver

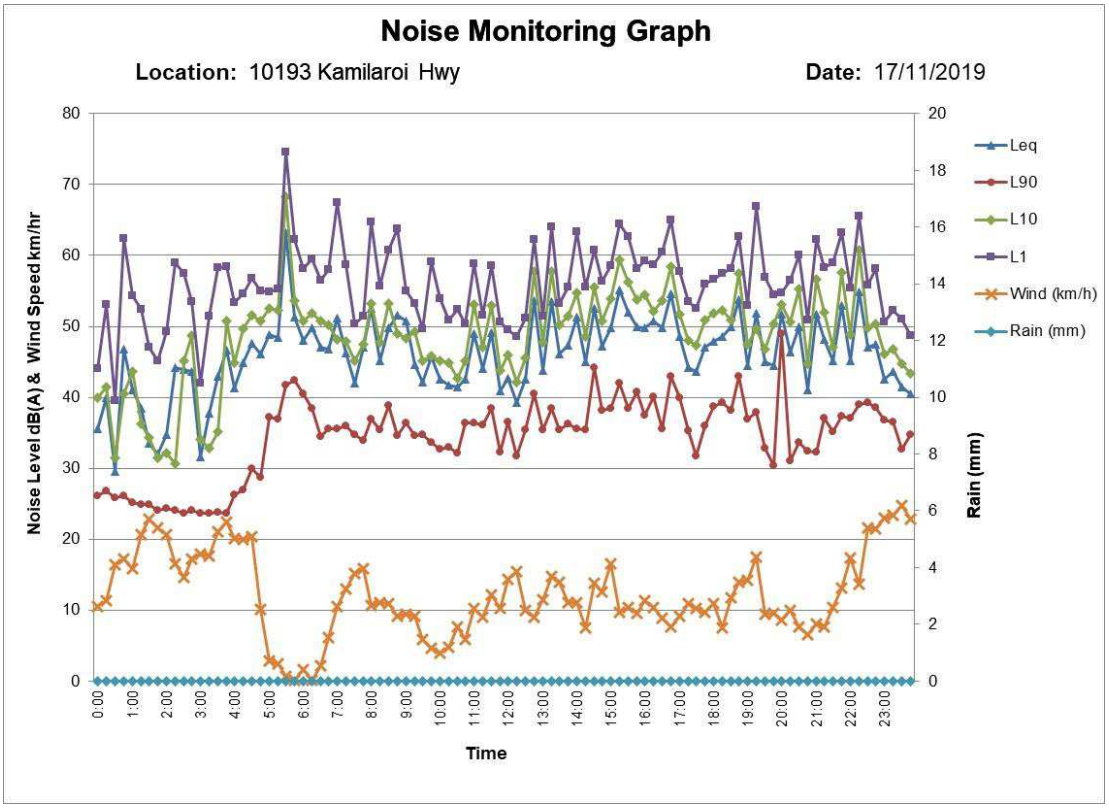

Scale 1:3300
0 15 30 60 90 120
m
Noise Level dB(A) LAeq - Daytime, Worst Climatic Conditions, 3m/s winds - Crusher Operation
R2 - 10221 Kamilaroi Hwy
R8 - Expressway Spares
R1 - 10193 Kamilaroi Hwy
R6 - GB Auto Group
R9 - CJC Drilling
R10 - ACS Equip
R7 - Pirtek Gunnedah
R3 - 10176 Kamilaroi Hwy
R4 - 211 Mathias Rd
R5 - 207 Mathias Rd
Signs and symbols
Point source
Processing Shed
Main building
4.5m Barrier
Point receiver
LAeq Noise Levels
<= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 < <= 70
70 < <= 75
75 < <= 80
80 <

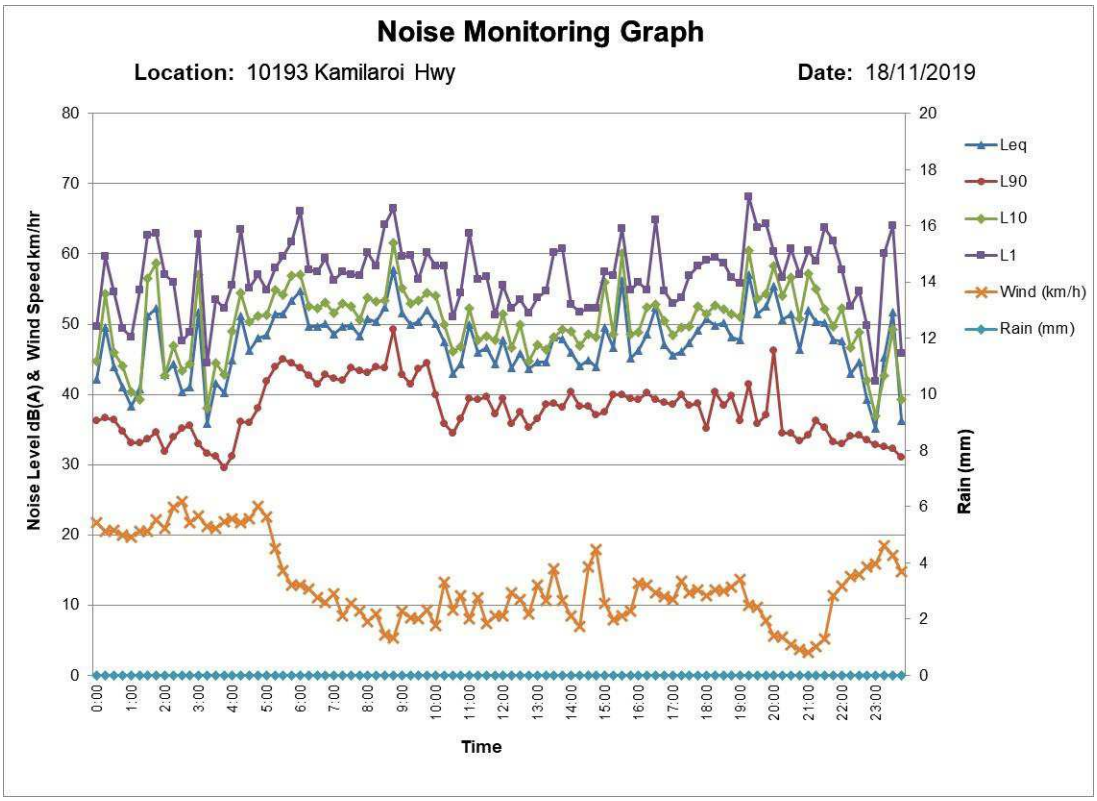
Appendix B NOISE MONITORING RESULTS

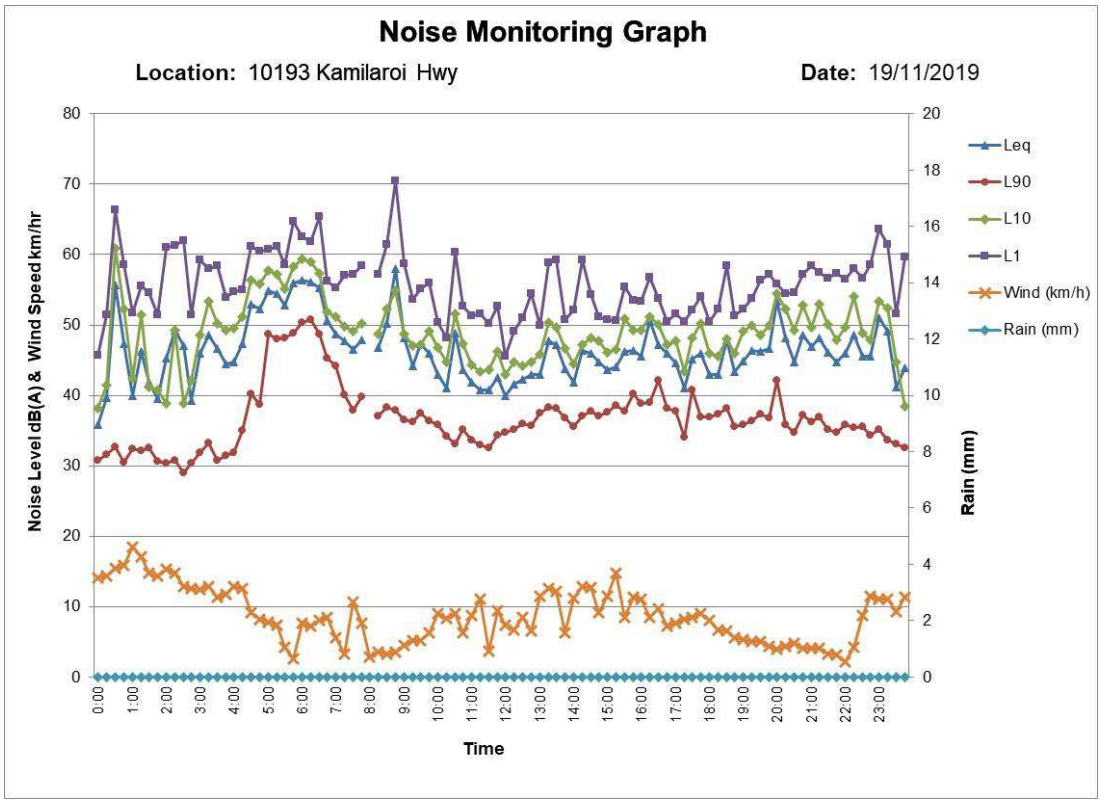


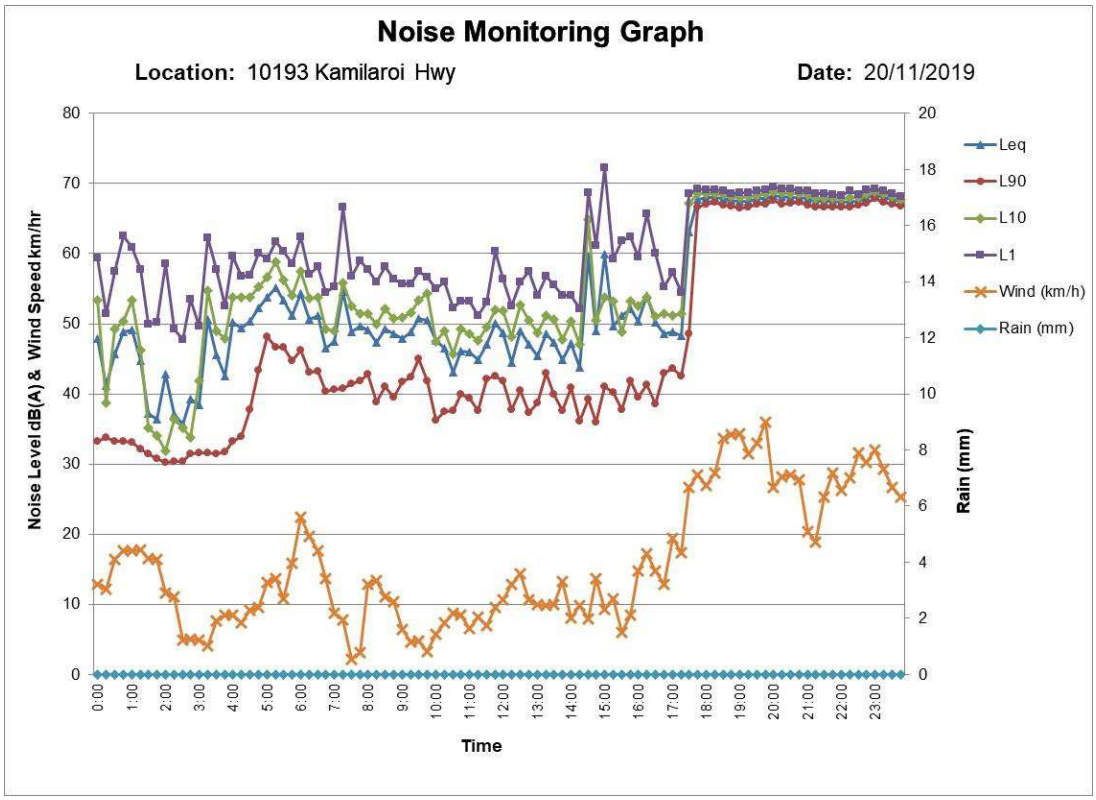


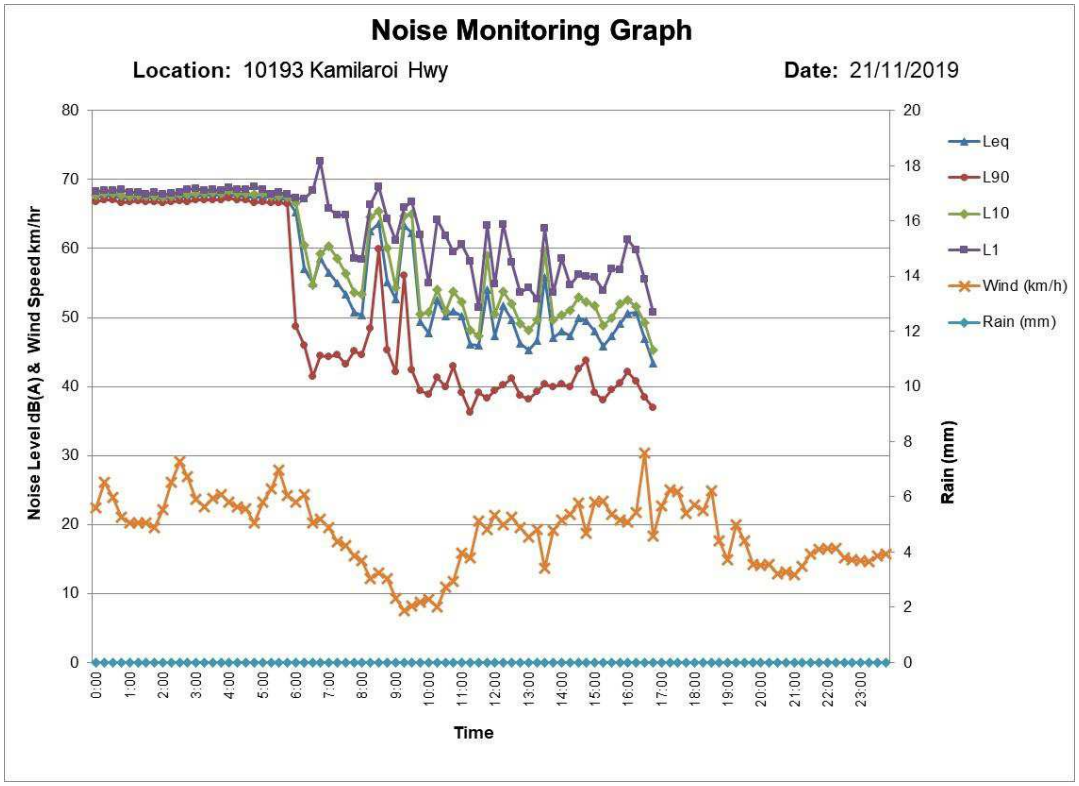

Noise Monitoring Graph
Location: 10193 Kamilaroi Hwy
Date: 16/11/2019
Noise Level dB(A) & Wind Speed km/hr
Rain (mm)
Time
Leq
L90
L10
L1
Wind (km/h)
Rain (mm)


Noise Monitoring Graph
Location: 10193 Kamilaroi Hwy
Date: 17/11/2019
Noise Level dB(A) & Wind Speed km/hr
Rain (mm)
Time
Leq
L90
L10
L1
Wind (km/h)
Rain (mm)


Noise Monitoring Graph
Location: 10193 Kamilaroi Hwy
Date: 18/11/2019
Noise Level dB(A) & Wind Speed km/hr
Rain (mm)
Time
Leq
L90
L10
L1
Wind (km/h)
Rain (mm)


Noise Monitoring Graph
Location: 10193 Kamilaroi Hwy
Date: 19/11/2019
Noise Level dB(A) & Wind Speed km/hr
Rain (mm)
Time
Leq
L90
L10
L1
Wind (km/h)
Rain (mm)


Noise Monitoring Graph
Location: 10193 Kamilaroi Hwy
Date: 20/11/2019
Noise Level dB(A) & Wind Speed km/hr
Rain (mm)
Time
Leq
L90
L10
L1
Wind (km/h)
Rain (mm)


Noise Monitoring Graph
Location: 10193 Kamilaroi Hwy
Date: 21/11/2019
Noise Level dB(A) & Wind Speed km/hr
Rain (mm)
Time
Leq
L90
L10
L1
Wind (km/h)
Rain (mm)

Appendix C WEATHER SUMMARY

Weather Station: Gunnedah Quarry Products
Memory: 10 Min Data

Table 9-1: Weather Summary, Gunnedah Quarry Products Nov 14-21

MAXIMUM Wind Speed km/h	42.2
AVERAGE Wind Speed km/h	12.6
MAXIMUM Peak Wind Gust km/h	56.8
AVERAGE Relative Humidity %	24.5
AVERAGE Air Temperature 2m DegC	25.1
AVERAGE Air Temperature 10m DegC	24.6
TOTAL Rain Gauge mm	0.0
AVERAGE Solar Radiation W/m2	264.1
MAXIMUM Air Temperature 2m DegC	37.2
MAXIMUM Air Temperature 10m DegC	35.8
MINIMUM Air Temperature 2m DegC	13.2
MINIMUM Air Temperature 10m DegC	13.2