NOISE IMPACT ASSESSMENT
FOR SYDNEY SMITHFIELD METAL RECYCLERS
84 PERCIVAL ROAD, SMITHFIELD

Prepared for: Sydney Smithfield Metal Recyclers

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EXECUTIVE SUMMARY

A noise impact assessment was undertaken to assess the potential noise emissions from the proposed scrap metal transfer station to be located at 84 Percival Road, Smithfield. The proposal would be for construction of a weighbridge and a change in the existing land use to a scrap metal recycling facility that would accept scrap metal from consumers and store this either in the external rear yard or within the existing warehouse to be on-sold to a metal recycler. Approximately 20,000 tonnes per year would be accepted. No crushing or screening will take place at the site. A compactor will be located in the rear yard. The maximum storage capacity would be 100 tonnes at any one time.

The nearest receivers and the noise generating activities have been identified. Noise criteria for the project have been formed, with assessment of the proposed site activities conducted against the NSW Noise Policy for Industry (EPA, 2017), Interim Construction Noise Guideline (DECC, 2009), and the NSW Road Noise Policy (DECCW, 2011). Modelling of the activities was conducted using the noise modelling software SoundPlan.

This noise impact assessment finds that predicted noise levels will be below the criteria set out in accordance with the NSW Noise Policy for Industry at all receivers. Recommendations for noise controls are given in Section 7.3.

The generation of additional road traffic associated with the site's activities has been assessed and was predicted to comply with the guidelines set out in the NSW Road Noise Policy.

No significant construction noise or vibration impacts are expected. Construction is recommended to take place during standard construction hours.

This report concludes that following the carrying out of the recommendations in this report, the proposed site activities will have an acceptable noise impact on the surrounding receivers.

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1. INTRODUCTION

Benbow Environmental has been engaged to undertake a noise impact assessment for the proposed scrap metal waste transfer station at 84 Percival Road, Smithfield. The proposal would be for construction of a weighbridge and a change in the existing land use to a scrap metal recycling facility that would accept scrap metal from consumers and store this either in the external rear yard or within the existing warehouse to be on-sold to a metal recycler. Approximately 20,000 tonnes per year would be accepted. No crushing or screening will take place at the site. A compactor will be located in the rear yard. The maximum storage capacity would be 100 tonnes at any one time.

The principal noise sources associated with the site include noise from plant equipment including an electric compactor and copper granule machine, as well as mobile equipment including excavators, forklifts and trucks.

Noise emissions from the site were predicted by using noise modelling software, SoundPlan. The potential noise impacts of operational, construction and road traffic activities on the nearby receivers have been predicted utilising noise modelling software, SoundPlan. The potential vibration impacts of construction and operational activities are analysed.

This noise impact assessment has been prepared in accordance with the following guidelines and documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry 2017;
- Department of Environment, Climate Change and Water (DECCW) NSW, Road Noise Policy (RNP) 2011;
- Department of Environment, Climate Change and Water NSW Interim Construction Noise Guideline 2009; and
- British Standard BS 7385-Part 2: 1993 '*Evaluation and measurement for vibration in buildings*'.

1.1 SCOPE OF WORKS

This noise impact assessment has been limited to the following scope of works:

- Site inspection and review of the proposed site operations;
- Short term attended and long term unattended noise measurements in accordance with relevant guidelines;
- Establish project specific noise levels;
- Determine all potential noise sources associated with the existing and proposed development;
- Collect required noise sources data;
- Predict potential noise impacts at the nearest potentially affected receptors to the site;
- Assess potential noise impacts against relevant legislation and guidelines;
- Recommend general ameliorative measures/control solutions (where required); and
- Compile this report with concise statements of potential noise impact.

To aid in the review of this report, supporting documentation has been referenced within this report. A glossary of terminology is included in Attachment 1.

2. PROPOSED DEVELOPMENT

2.1 OVERVIEW OF OPERATIONS

The proposed development involves a change in use from a building supplies company to a scrap metal recycling facility. The proposed facility would use the existing buildings on site. A weighbridge would be constructed and a compactor would be located in the external yard at the rear of the site. 5 additional car parking spaces would be provided to provide a total of 9 car spaces at the site. An existing brick and metal outhouse would be demolished. No other changes to site infrastructure are proposed.

Approximately 20,000 tonnes per year would be accepted. No crushing, screening will take place at the site. A compactor will be located in the rear yard. The maximum storage capacity would be 100 tonnes at any one time.

2.1.1 Storage

The site would store up to 100 tonnes at any one time. Inside the building there will be 9 storage bays that can store between 3 to 8 tonnes depending on the contents (Maximum of 72 tonnes). Externally, scrap metal would have a daily turnover and only 1-2 truckloads would be stored outside at any one time.

2.1.2 Equipment & On-Site Vehicles

Equipment and on-site vehicles required for the proposed development includes:

- 1 x Electric Compactor;
- 1 x Copper Granule Machine;
- 1 x 20 tonne diesel excavator;
- 1 x 8 tonne diesel excavator; and
- 3 x LPG forklifts

2.1.3 Traffic Movement

Truck movements per day include up to 23 truck trips, or a maximum of 4 truck trips per hour.

2.2 HOURS OF OPERATIONS

The proposed hours of operation are:

Monday to Friday: 7:00am to 4:00pm
Saturday: 7:00am to 1:00pm

2.3 DESCRIPTION OF THE PROPOSAL

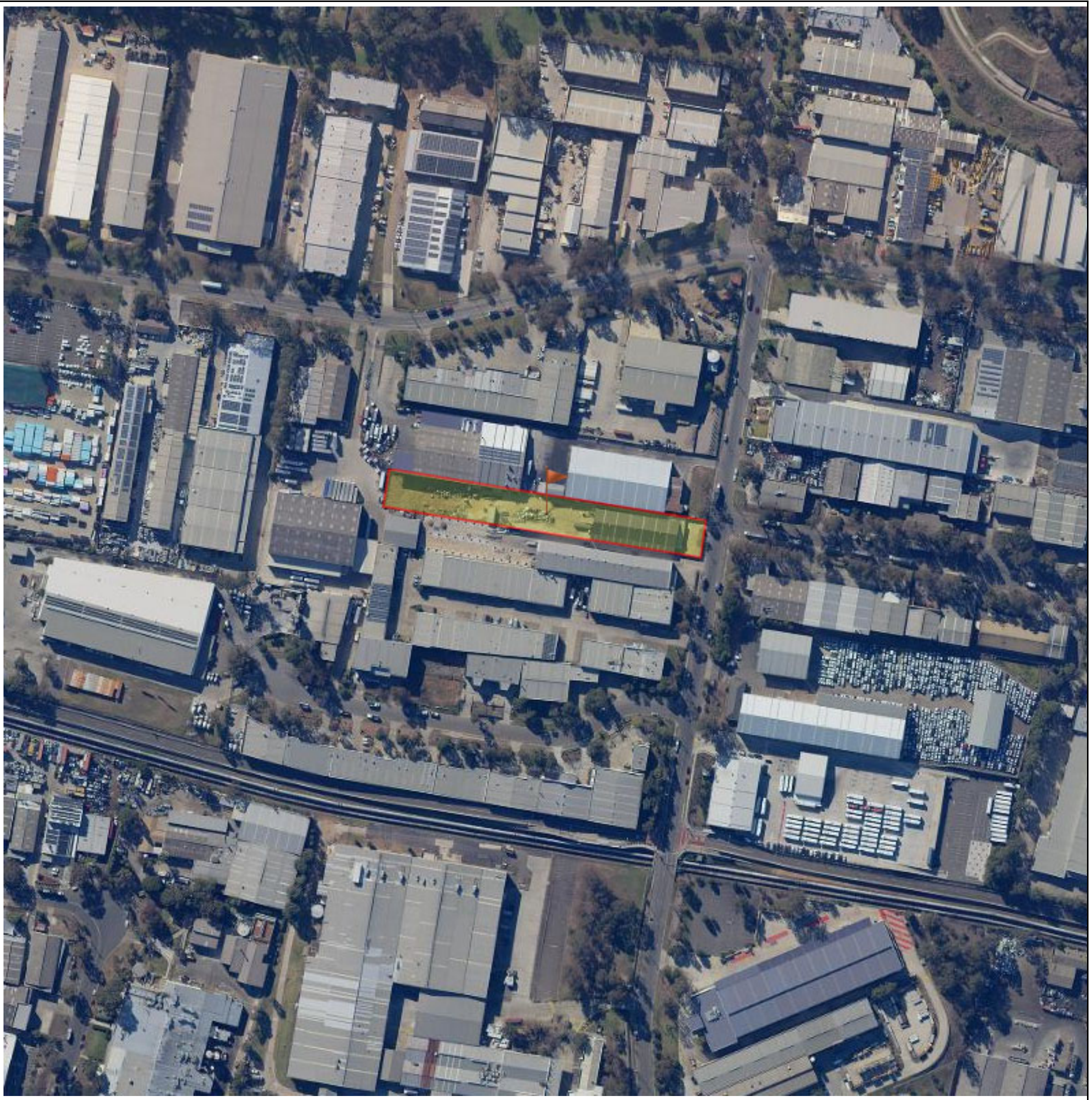
2.3.1 Site Description

The proposal site is located at 84 Percival Road, Smithfield also known as Lot 1 in DP555910 and is 6,196 m^2 (0.619 hectares) in size, with a frontage of 26.56 metres to Percival Road and a length of 233.32 metres.

The site currently contains an existing industrial building with an approximate area of 1400 m^2 and adjoining offices, 80 m^2 in area. There is an existing car parking area at the frontage to Percival Road and access to the site is via a single driveway. The rear of the site can be accessed via the driveway along the north of the building which is partially hardstand area with the remaining area being unsealed.

The site location is shown on Figure 2-1.

Figure 2-1: Site Location



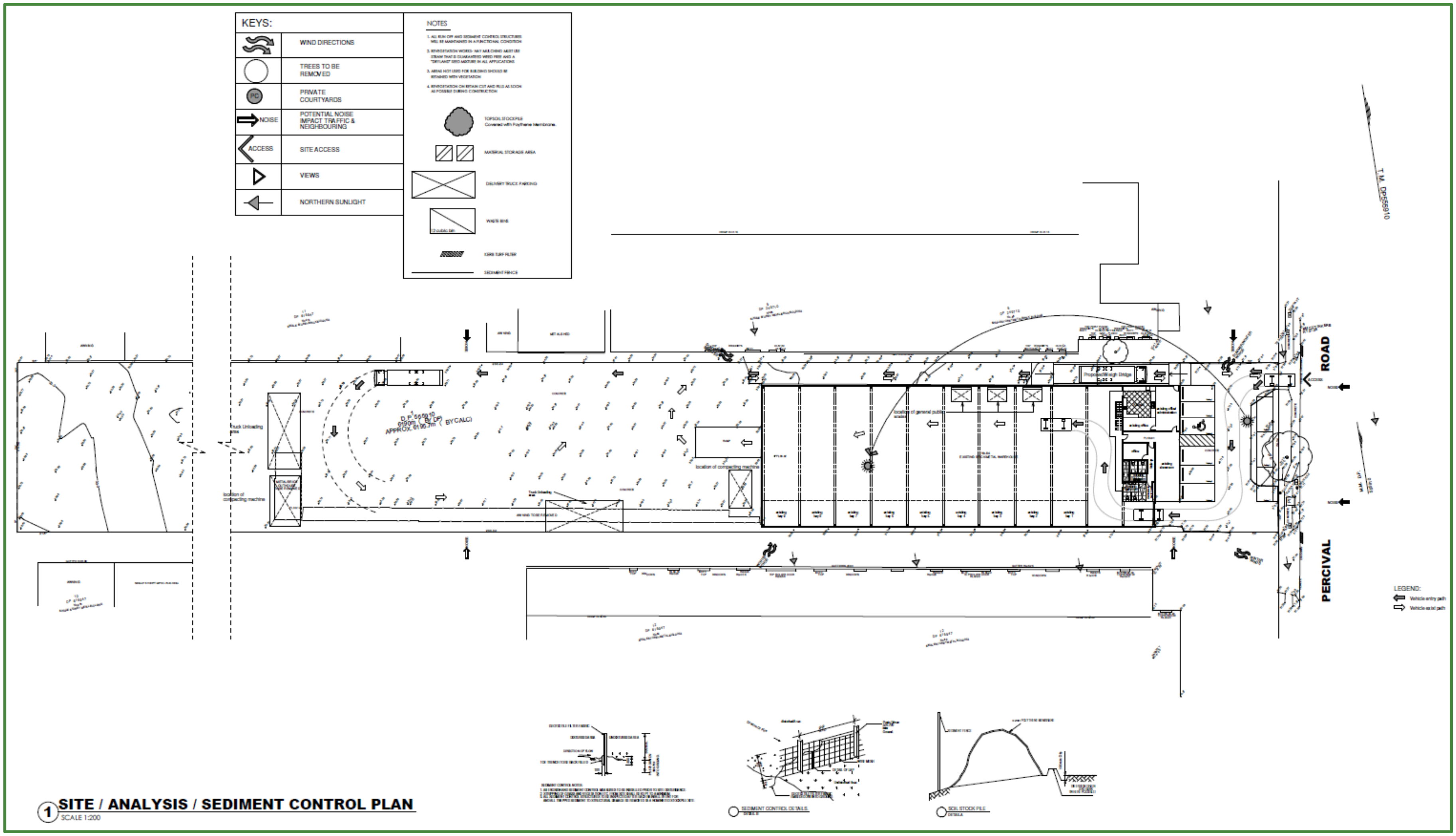
Source: Six Maps 2019

↑N	LEGEND: Site Boundary	Benbow Environmental 25-27 Sherwood Street, Northmead NSW 2152

2.4 DESCRIPTION OF THE SURROUNDING AREA

The site is located with an established industrial area in the suburb of Smithfield and is zoned IN1 – General Industrial under the Holroyd Local Environmental Plan (HLEP) 2013. North of this zone is Public Recreation (RE1) and Low Density Residential (R2), with Business Development (B5) to the east, Infrastructure (SP2) – Liverpool Parramatta Transitway to the south and further General Industrial (IN1) to the west.

Figure 2-2: Site Layout



2.4.1 Process Description

The scrap metal recycling facility would allow for consumers to deliver unwanted metal scrap to the site. The facility would accept metals including scrap steel, aluminium, copper and brass. These would be separated at the site and on-sold to metal recyclers. No crushing or screening will take place at the site. A compactor will be located in the rear yard. The following operations would take place:

Truck loads:

- Trucks would enter via the weighbridge and be required to weigh the vehicle load and unload in the receival bay external rear yard.
- Trucks would then be re-weighed once empty and leave via the weighbridge.
- An electric compactor would be located in the rear yard that would be used for compaction of aluminium.
- Scrap steel would be unloaded from the trucks into one stockpile and would be removed daily to be sold to a metal recycler such as Sims Metal, One Steel or Sell & Parker.

Private Vehicle loads:

- Private vehicles would enter via the roller door and use the public scales within the existing warehouse.
- Metals such as copper, brass and aluminium would be stored within one of 9 designated storage bays within the building.
- A copper granule machine that separates copper wire from the cable would be installed inside the building and used on an as needs basis. Cable from copper is sent overseas.
- Metals would be on-sold to metal recyclers such as Sims Metal, One Steel or Sell & Parker.

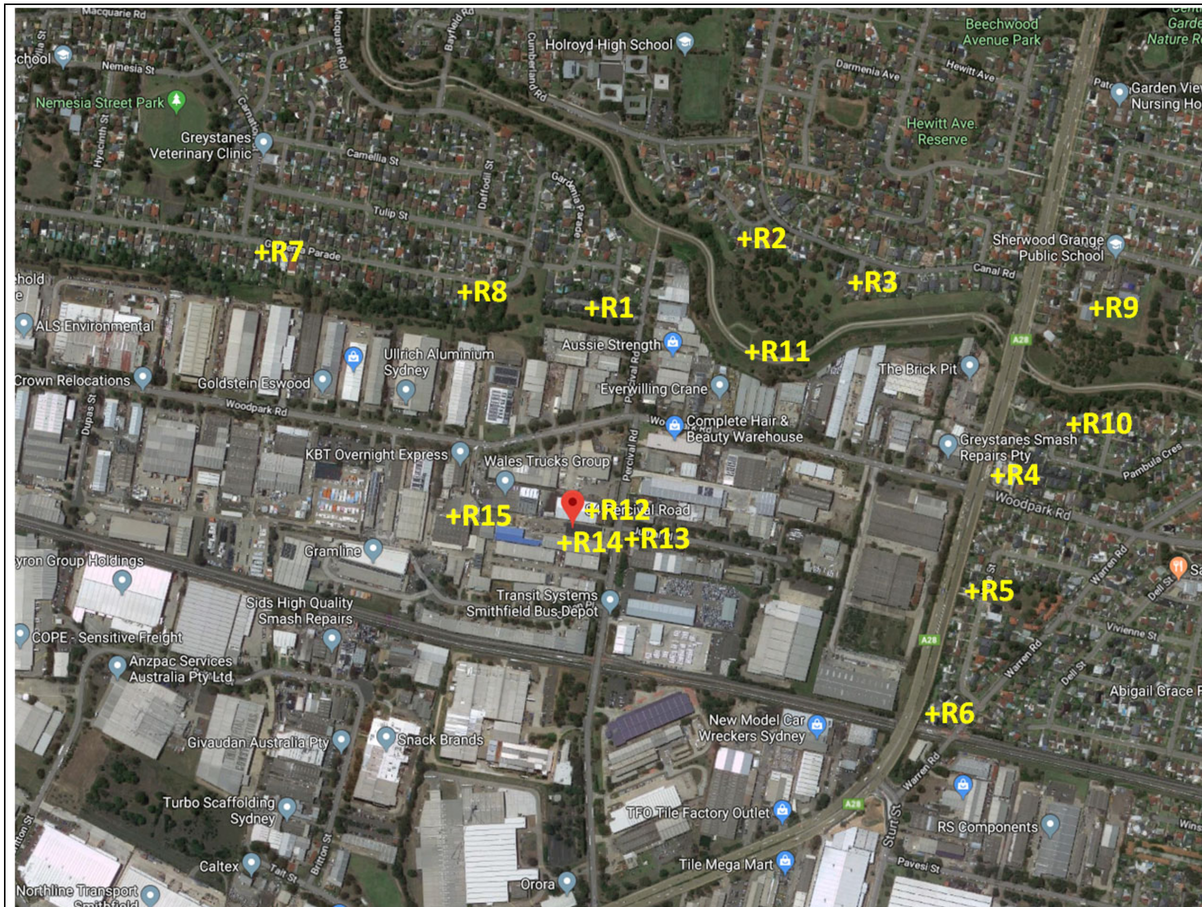
3. NEAREST SENSITIVE RECEPTORS

Table 3-1 identifies the nearest sensitive receptors that have the potential to be affected by the proposal. The aerial photographs of the sensitive receivers are shown in Figure 3-1. These receptors were selected based on their proximity and directional bearing from the subject site.

Table 3-1: Nearest Receivers

Receptor ID	Address	Lot & DP	Approx. Distance from Proposed Development	Type of Receptor
R1	9/9 Magnolia Street, Greystanes	SP 74408	370 m N	Residential
R2	8 Wesley Place, Greystanes	Lot 122 DP 232480	540 m NNE	Residential
R3	5 Wyatt Place, Greystanes	Lot 38 DP 228341	580 m NE	Residential
R4	79 Woodpark Road, Woodpark	SP 77144	675 m ENE	Residential
R5	28 Vale Street, Woodpark	Lot 7 DP 221486	645 m E	Residential
R6	4 Vale Street, Woodpark	Lot 2 DP 521644	650 m ESE	Residential
R7	107 Gardenia Parade, Greystanes	Lot 7 DP 229856	585 m NW	Residential
R8	155 Gardenia Parade, Greystanes	Lot 103 DP 233207	375 m NNW	Residential
R9	Sherwood Grange Public School, 50 Bruce Street, Merrylands West	DP 202368	910 m NE	School Classroom
R10	7 Coila Place, Woodpark	Lot 7 DP 239440	810 m ENE	Childcare Centre
R11	Canal Road Park, 83 Canal Road, Greystanes	Lot 1 DP 225809	395 m NE	Active Recreation
R12	86 Percival Road, Smithfield	Lot 5 DP 249710	Adjacent N	Industrial
R13	69-71 Percival Road, Smithfield	Lot 2 DP 244793	40 m E	Industrial
R14	82 Percival Road, Smithfield	Lot 12 Dp 615947	Adjacent S	Industrial
R15	216 Woodpark Road, Smithfield	Lot 10 DP 615947	Adjacent W	Industrial

Figure 3-1: Nearby Receptors



↑N	**LEGEND:** Site Receptor +	Benbow Environmental 25-27 Sherwood Street, Northmead NSW 2152

4. EXISTING ACOUSTIC ENVIRONMENT

The level of background and ambient noise is assessed separately for the daytime, evening and night time assessment periods. The NSW EPA Noise Policy for Industry defines these periods as follows:

- **Day** is defined as 7.00am to 6.00pm, Monday to Saturday and 8.00am to 6.00pm Sundays and Public Holidays;
- **Evening** is defined as 6.00pm to 10.00pm, Monday to Sunday and Public Holidays; and
- **Night** is defined as 10.00pm to 7.00am, Monday to Saturday and 10.00pm to 8.00am Sundays and Public Holidays.

Unattended noise measurements were undertaken from 19th July 2019 to 2nd August 2019 at one residential receiver. Attended noise measurements were conducted on 2nd August 2019 February at one (1) residential location.

4.1 NOISE MONITORING EQUIPMENT AND METHODOLOGY

The attended noise level measurements were carried out using a Svantek SVAN 957 Precision Sound Level Meter. The instrument sets complied with AS IEC 61672.1–2004 and were calibrated by a NATA accredited laboratory within two years of the measurement period. Calibration certificates have been included in Attachment 2.

Measurements of ambient noise levels were carried out in accordance with the Australian Standard AS 1055–1997 *Acoustics – Description and measurements of environmental noise* – Part 1 and Part 2 and the Noise Policy for Industry (EPA, 2017).

To ensure accuracy and reliability in the results, field reference checks were applied both before and after the measurement period with an acoustic calibrator. There were no excessive variances observed in the reference signal between the pre-measurement and post-measurement calibration. The instruments were set on A-weighted Fast response and noise levels were measured over a 15-minute statistical interval. QA/QC procedures applied for the measurement and analysis of noise levels have been presented in Attachment 3. The microphones were fitted with a windsock and was positioned between 1.2 and 1.5 metres above ground level.

Details of the instrumentation and setting utilised are provided in Table 4-1.

Table 4-1: Instrumentation and Setup Details

Type of Monitoring	Equipment	Serial Number	Setup Details
Short-term Attended	Svantek SVAN957 Type 1 Integrating Sound and Vibration analyser	15336	Three channels: A-weighted Fast Response C-weighted Fast Response A-weighted Impulse Response 15 minute integration period 1/3 octave band recorded every 100 ms Logger file Recorded at steps of 100 ms

Table 4-1: Instrumentation and Setup Details

Type of Monitoring	Equipment	Serial Number	Setup Details
Long-term Unattended	ARL-215	194438	A-weighted Fast Response 15 minute integration period

4.2 MEASUREMENT LOCATIONS

Unattended noise measurements were undertaken from 19th July 2019 to 2nd August 2019 at one residential receiver. An attended noise measurement was conducted on 2nd August at one (1) residential location. The measurement locations are shown in Figure 3-1 and listed in Table 4-2.

Table 4-2: Noise Monitoring Locations

Monitoring Location	Methodology	Address
A	Unattended and attended monitoring	2 Tulip Street, Greystanes

4.3 MEASURED NOISE LEVELS

4.3.1 Short Term Operator Attended Noise Monitoring Results

Attended noise monitoring was conducted on Monday the 2nd August 2019 in order to gain an understanding of the background noise sources of the area. Noise contributions were obtained from ambient noise sources such as local fauna, road traffic and industrial sources. The results of the short-term attended noise monitoring are displayed in Table 4-3.

The attended measurements showed that the background noise levels were dominated by birds and residential noise. Industrial noise from Location A was estimated to be 36 dB(A).

Table 4-3: Operator Attended Noise Measurements, dB(A)

Location & Date/Time	L_{Aeq}	L_{A90}	L_{A10}	L_{A1}	Comments
Location A Friday 06/08/2019 13:20 Daytime Period	52	37	51	65	Birds <75 dB(A) Car Passing <72 dB(A) Aeroplane <64 dB(A) Gardening <55 dB(A) Revving <52 dB(A) Talking <52 dB(A) Residential Impulse Noise <50 dB(A) Machinery <45 dB(A) Music <44 dB(A) Dog Barking <40 dB(A) Industrial Hum <36 dB(A)

4.3.2 Long-Term Unattended Noise Monitoring Results

The data was analysed to determine a single assessment background level (ABL) for each day, evening and night time period, in accordance with the NSW EPA Noise Policy for Industry. That is, the ABL is established by determining the lowest tenth-percentile level of the L_{A90} noise data over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night assessment periods is based on the median of individual ABL's determined over the entire monitoring period. The results of the long-term unattended noise monitoring are displayed in Table 4-4. Daily noise logger graphs have been included in Attachment 3.

Table 4-4: Unattended Noise Monitoring Results at Logger Location A, dB(A)

Date	Average L_1			Average L_{10}			ABL (L_{90})			L_{eq}		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
19/07/2019	63	61	56	55	54	49	40	46	43	58	52	48
20/07/2019	62	58	50	54	49	43	38	41	37	56	50	44
21/07/2019	59	59	47	50	49	41	36	36	36	50	49	41
22/07/2019	61	58	47	52	47	41	38	37	33	58	47	43
23/07/2019	-	57	47	-	47	43	-	36	35	-	46	45
24/07/2019	60	58	49	51	51	44	40	44	34	50	51	46
25/07/2019	61	58	53	51	50	49	35	41	41	52	48	48
26/07/2019	60	56	52	51	48	46	36	42	37	50	47	46
27/07/2019	62	56	50	52	48	44	39	39	38	53	47	44
28/07/2019	61	55	48	51	47	42	35	41	36	82[A]	46	42
29/07/2019	60	-	47	51	-	42	38	-	33	50	-	44
30/07/2019	60	54	51	51	48	46	43	44	40	61	47	48
31/07/2019	59	56	50	51	48	46	42	44	40	68	47	45
1/08/2019	59	62	48	50	55	43	36	42	36	51	65	44
2/08/2019	-	-	-	-	-	-	-	-	-	-	-	-
Average	**61**	**57**	**50**	**52**	**49**	**44**	*	*	*	*	*	*
Median (RBL)	*	*	*	*	*	*	**38**	**41**	**36**	*	*	*
Logarithmic Average	*	*	*	*	*	*	*	*	*	**59**	**55**	**45**

Note: - Indicates values that has not been considered due to adverse weather conditions.
* Indicates values that are not relevant to that noise descriptor.
Value in bold indicates relevant noise descriptor.
A) Value removed as an outlier in total logarithmic average

5. METEOROLOGICAL CONDITIONS

Wind and temperature inversions may affect the noise impact at the receptors. Therefore noise enhancing weather conditions should be assessed when wind and temperature inversions are considered to be a feature of the area.

A site-representative meteorological data file was obtained from the Bureau of Meteorology (BOM) for the Horsley Park Automatic Weather Station (AWS ID 067119). In this Section, an analysis of the 2018 weather data has been conducted to establish whether significant winds are characteristic of the area.

5.1 WIND EFFECTS

Wind is considered to be a feature where source-to-receiver wind speeds (at 10 m height) of 3 m/s or below occur for 30% or more of the time in any assessment period in any season.

5.1.1 Wind Rose Plots

Wind rose plots show the direction that the wind is coming from, with triangles known as "petals". The petals of the plots in the figures summarise wind direction data into 8 compass directions i.e. north, north-east, east, south-east, etc. The length of the triangles, or "petals", indicates the frequency that the wind blows from that direction. Longer petals for a given direction indicate a higher frequency of wind from that direction. Each petal is divided into segments, with each segment representing one of the six wind speed classes.

Thus, the segments of a petal show what proportion of wind for a given direction falls into each class. The proportion of time for which wind speed is less than 0.5 m/s, when speed is negligible, is referred to as calm hours or "calms". Calms are not shown on a wind rose as they have no direction, but the proportion of time consisting of the period under consideration is noted under each wind rose.

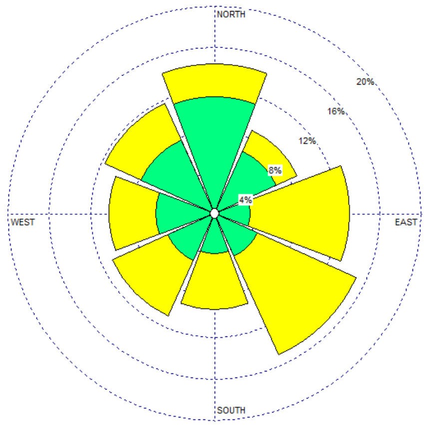
The concentric circles in each wind rose are the axis, which denote frequencies. In comparing the plots it should be noted that the axis varies between wind roses, although all wind roses are similar in size. The frequencies denoted on the axes are indicated beneath each wind rose.

5.1.2 Local Wind Trends

Seasonal wind rose plots for this site utilising Horsley Park Equestrian Centre AWS data have been included in Figure 5-1, Figure 5-2 and Figure 5-3 for day, evening and night periods respectively.

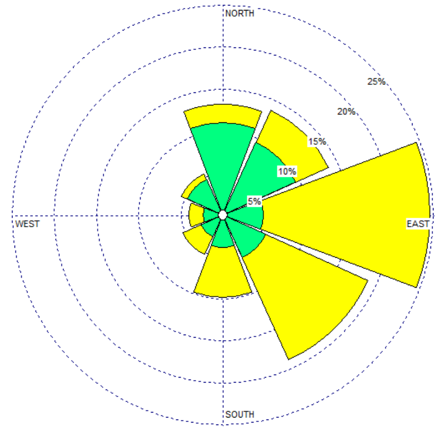
Figure 5-1: Wind Rose Plots– Bureau of Meteorology Horsley Park 2018 Daytime (7:00-18:00)

All Seasons



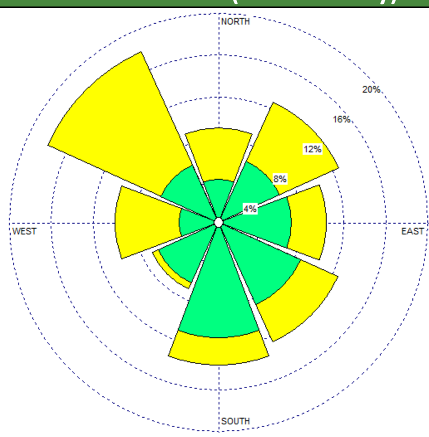
Average Wind Speed: 2.89 m/s
Axis Frequencies: 4%, 8%, 12%, 16%, 20%

Summer Season (December – February)



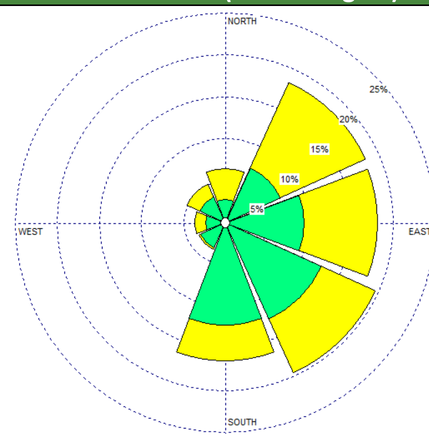
Average Wind Speed: 3.19 m/s
Axis Frequencies: 5%, 10%, 15%, 20%, 25%

Autumn Season (March – May)



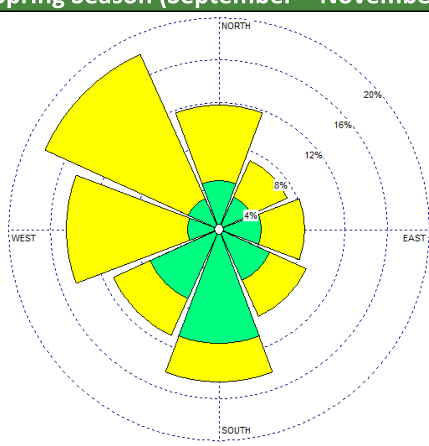
Average Wind Speed: 2.63 m/s
Axis Frequencies: 4%, 8%, 12%, 16%, 20%

Winter Season (June – August)



Average Wind Speed: 2.64 m/s
Axis Frequencies: 5%, 10%, 15%, 20%, 25%

Spring Season (September – November)



Average Wind Speed: 3.12 m/s
Axis Frequencies: 4%, 8%, 12%, 16%, 20%

Legend

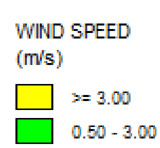
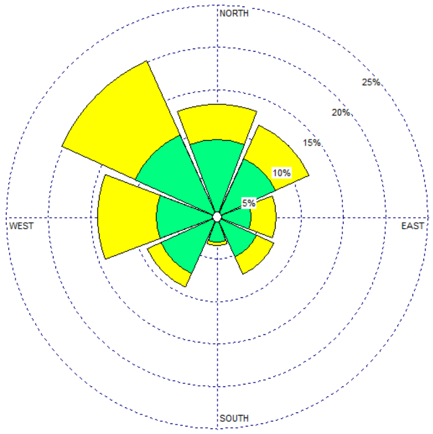


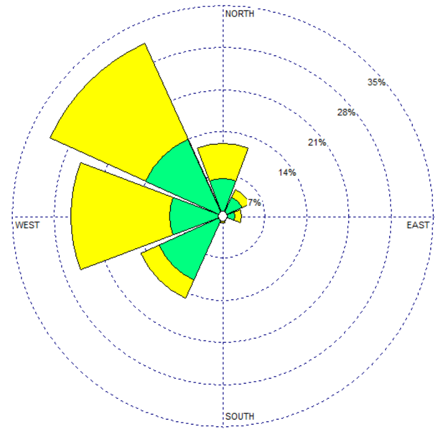
Figure 5-2: Wind Rose Plots– Bureau of Meteorology Horsley Park 2018 Evening (18:00-22:00)

All Seasons



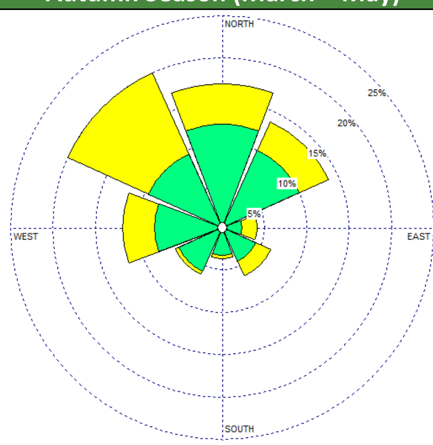
Average Wind Speed: 2.25 m/s
Axis Frequencies: 5%, 10%, 15%, 20%, 25%

Summer Season (December – February)



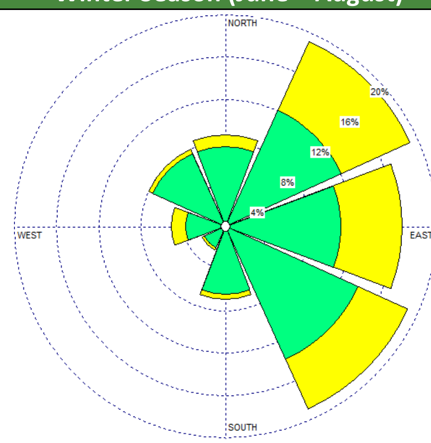
Average Wind Speed: 2.81 m/s
Axis Frequencies: 7%, 14%, 21%, 28%, 35%

Autumn Season (March – May)



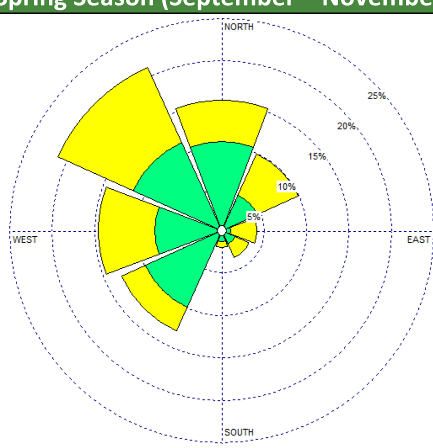
Average Wind Speed: 2.00 m/s
Axis Frequencies: 5%, 10%, 15%, 20%, 25%

Winter Season (June – August)



Average Wind Speed: 1.91 m/s
Axis Frequencies: 4%, 8%, 12%, 16%, 20%

Spring Season (September – November)



Average Wind Speed: 2.28 m/s
Axis Frequencies: 5%, 10%, 15%, 20%, 25%

Legend

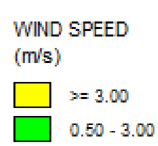
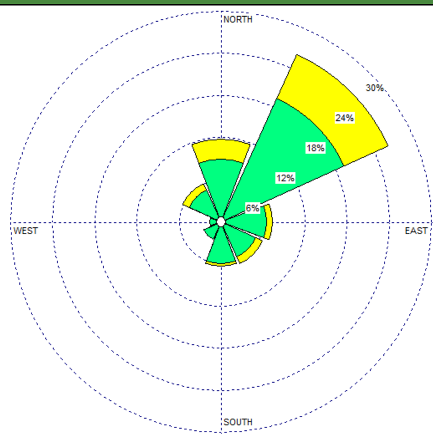


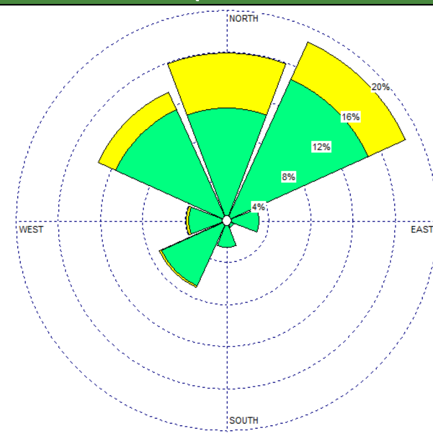
Figure 5-3: Wind Rose Plots– Bureau of Meteorology Horsley Park 2018 Night (22:00-7:00)

All Seasons



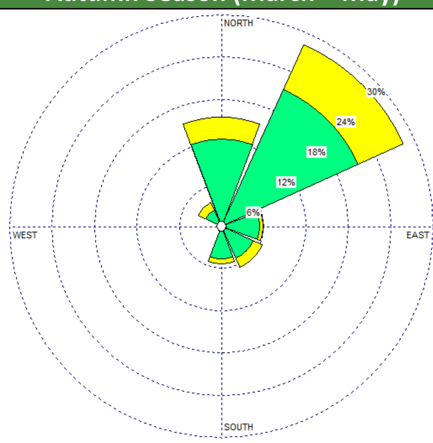
Average Wind Speed: 1.35 m/s
Axis Frequencies: 6%, 12%, 18%, 24%, 30%

Summer Season (December – February)



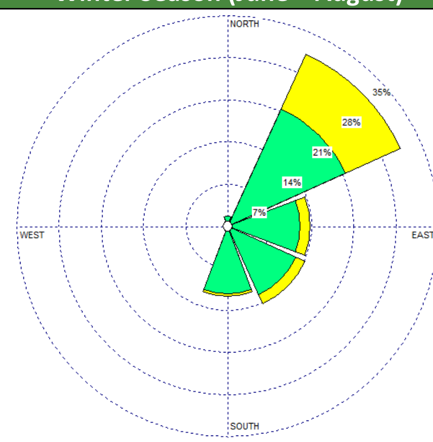
Average Wind Speed: 1.21 m/s
Axis Frequencies: 4%, 8%, 12%, 16%, 20%

Autumn Season (March – May)



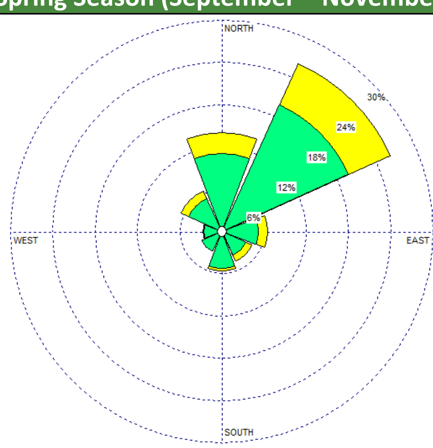
Average Wind Speed: 1.34 m/s
Axis Frequencies: 6%, 12%, 18%, 24%, 30%

Winter Season (June – August)



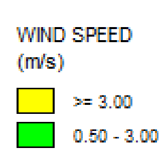
Average Wind Speed: 1.48 m/s
Axis Frequencies: 7%, 14%, 21%, 28%, 35%

Spring Season (September – November)



Average Wind Speed: 1.38 m/s
Axis Frequencies: 6%, 12%, 18%, 24%, 30%

Legend



Appendix D2 of the Noise Policy for Industry (EPA, 2017), refers to utilising the Noise Enhancing Wind Analysis (NEWA) program on the NSW EPA website to determine the significance of source-to-receiver winds.

Table 5-1 below contains the noise wind component analysis from the NEWA software. Wind speeds are taken up to 3 m/s and wind direction is taken from source-to-receiver, plus and minus 45 degrees, as per appendix D2 of the Noise Policy for Industry.

It can be seen from Table 5-1 that there are several instances during the evening and night periods, where more than 30% of wind speeds are less than 3 m/s in the plus and minus 45 degree arc from source to receiver. As the site only operates in the day period worst case 3 m/s source-to-receiver winds have not been included in the assessment.

Table 5-1: Noise Wind Component Analysis 2018 Horsley Park

Receiver	Day				Evening				Night			
	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring
R1	7.6	12.2	10.2	9.1	20.3	34	22.8	22.3	28.6	33.5	21.3	30
R2	5.2	9.2	12.6	7.2	13.9	31.8	27.7	15.7	25.7	34.8	27.1	32.8
R3	3.9	8.3	15.8	5.9	11.9	24.2	29.6	11.3	21.2	31.6	30.4	28
R4	3.2	11.5	20.2	6.5	6.7	15.2	31.8	5.8	15.9	26.4	37.4	22.8
R5	3.2	12.5	21.2	7.3	5	10.3	27.4	4.4	7.9	17.1	28.1	12.9
R6	5.1	13.2	22.6	8.7	3.3	9	27.4	3	5.1	11.7	22.9	9.2
R7	14	17.7	8.6	10	31.7	17.7	8.2	25.8	17	7.6	0.5	8.9
R8	8.7	11.9	6	7.5	25	16	5.7	20.3	14.4	7.7	0.6	9
R9	3.6	10.3	18	6.7	10	20.1	31.5	8.8	19.6	30.4	33.4	26.6
R10	3.7	10.4	19.1	6.2	7.2	15.8	32.6	6	17.9	29.8	37.1	25.2
R11	3.9	8.5	15.7	6.5	12.2	25.3	29.3	12.4	22.2	32.2	29.6	29.4
R12	3.5	9.6	17.5	6.7	10.3	21.2	31.5	9.1	19.6	30.8	32.6	26.3
R13	3.8	12.5	21.1	7.6	4.4	10.3	27.2	3.8	6.4	13.8	25.2	11.5
R14	6.7	14.4	23.8	9.7	2.8	8.2	25.5	3	4.6	11.2	23.8	9.2
R15	15.6	16	7.3	10.9	36.4	9	7.1	25.3	9.9	1	0.1	5.7

(shaded) Noise enhancing meteorological conditions occur for 30% or more of the period and season

5.2 Temperature Inversions

Temperature inversion is considered a feature where this occurs more than 30% of the nights in winter.

Temperature inversion conditions would be best associated with F-class stability conditions – generally associated with still/light winds and clear skies during the night time or early morning period (these are referred to as stable atmospheric conditions).

The analysis conducted on the 2018 weather data highlighted that during winter 20.2% of the nights presented temperature inversion conditions, therefore these effects have been included in the noise impact assessment, in addition the site is only operating during the day period.

5.2.1 Weather Conditions Considered in the Assessment

The following conditions will be considered in this noise impact assessment considered:

- Condition A: neutral weather conditions

The meteorological condition considered in the noise model has been displayed in detail in Table 5-2.

Table 5-2: Meteorological Conditions Assessed in Noise Propagation Modelling

Condition	Classification	Ambient Temp.	Ambient Humidity	Wind Speed	Wind Direction (blowing from)	Temperature Inversion	Affected Receptors	Applicability
A	Neutral	10°C	70%	–	–	No	All	All periods

6. CURRENT LEGISLATION AND GUIDELINES

6.1 NSW EPA Noise Policy for Industry

The NSW Noise Policy for Industry was developed by the NSW EPA primarily for the assessment of noise emissions from industrial sites regulated by the NSW EPA.

The policy sets out two components that are used to assess potential site-related noise impacts. The intrusiveness noise level aims at controlling intrusive noise impacts in the short-term for residences. The amenity noise level aims at maintaining a suitable amenity for particular land uses including residences in the long-term. The more stringent of the intrusiveness or amenity level becomes the project noise trigger levels for the project.

6.1.1 Project Intrusiveness Noise Level

The project intrusiveness noise level is determined as follows:

$L_{Aeq,\ 15\ minute}$ = rating background noise level + 5 dB

Where the $L_{Aeq,(15minute)}$ is the predicted or measured L_{Aeq} from noise generated within the project site over a fifteen minute interval at the receptor.

This is to be assessed at the most affected point on or within the residential property boundary or if that is more than 30 m from the residence, at the most affected point within 30 m of the residential dwelling.

6.1.2 Amenity Noise Level

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 Noise Policy for Industry 2017. The relevant recommended noise levels applicable are reproduced in Table 6-1.

Table 6-1: Amenity noise levels.

Receiver	Noise Amenity Area	Time of Day	L_{Aeq} dB(A) Recommended amenity noise level
Residential	Suburban	Day	55
		Evening	45
		Night	40
Active Recreation	All	When in use	55
School Classroom	All	Noisiest 1-hour period when in use	Internal: 40[1]
			External: 50[2]
Industrial Premises	All	When in use	70

Note: 1) In the case where existing schools are affected by noise from existing sources, the acceptable L_{Aeq} noise level may be increased to L_{Aeq} 1 hour.
2) Where internal amenity noise levels are specified, they refer to the noise level at the centre of the habitable room that is most exposed to the noise and apply with windows opened sufficiently to provide adequate ventilation, except where alternative means of ventilation complying with the Building Code of Australia are provided. In cases where gaining internal access for monitoring is difficult, then external noise levels 10 dB(A) above the internal levels apply.
Source: Table 2.2 and Section 2.6, NSW Noise Policy for Industry

The project amenity noise level for industrial developments = recommended amenity noise level minus 5 dB(A)

The following exceptions to the above method to derive the project amenity noise levels apply:

1. *In areas with high traffic noise levels*
2. *In proposed developments in major industrial clusters*
3. *Where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.*
4. *Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for development.*

This development is not considered to be captured by the above exceptions.

6.1.3 Sleep Disturbance Criteria

In accordance with the NSW EPA Noise Policy for Industry, the potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development/premises night-time noise levels at a residential location exceed:

- **$L_{Aeq, 15 minute}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or**
- **L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,**

A detailed maximum noise level assessment should be undertaken.

6.1.4 Project Noise Trigger Levels

The project noise trigger levels for the site have been established in accordance with the principles and methodologies of the NSW Noise Policy for Industry (EPA, 2017).

Table 6-2 below presents the rating background level, project intrusive noise level, recommended amenity noise level, and project amenity noise level. The project noise trigger level is the lowest value of intrusiveness or project amenity noise level after conversion to $L_{Aeq\ 15\ minute}$, dB(A) equivalent level.

Different time periods apply for the noise criteria as the intrusive criterion considers a 15 minute assessment period while the amenity criterion requires assessment over the total length of time that a site is operational within each day, evening or night period. In order to ensure compliance under all circumstances, a 15 minute period assessment has been considered for all receptors.

Table 6-2: Project Noise Trigger Levels (PNTL) for Operational Activities, dB(A)

Receiver	Type of Receptor	Time of day	Rating background noise level	Project intrusiveness noise level ($L_{eq(15\ minute)}$)	Recommended amenity noise level $L_{Aeq\ period}$	Project amenity noise level $L_{Aeq\ 15\ minute}$[1]	PNTL $L_{Aeq\ 15\ minute}$	Sleep Disturbance L_{Amax}
R1-R8	Residential - Suburban	Day	38	**43**	55	53	**43**	-
		Evening	38[1]	**43**	45	**43**	**43**	-
		Night	36	41	40	**38**	**38**	**52**
R9-R10	School Classroom (Childcare Centre)	Noisiest 1-hour period when in use	-	-	$L_{Aeq\ 1hr}$ = 50 (external)	50[3]	**50**	-
R11	Active Recreation	When in use	-	-	55	53	**53**	-
R12-R15	Industrial	When in use	-	-	70	68	**68**	-

Notes:

1) The evening RBL has been set to the day RBL (NSW Noise Policy for Industry Section 2.3)
2) These levels have been converted to $L_{Aeq\ 15\ minute}$ using the following: $L_{Aeq\ 15\ minute}$ = $L_{Aeq\ period}$ + 3 dB (NSW Noise Policy for Industry Section 2.2).
3) This value has been conservatively assumed that $L_{Aeq\ 15\ minute}$ is equivalent to $L_{Aeq\ 1hr}$.

6.2 NSW EPA Road Noise Policy

The NSW Road Noise Policy (RNP) has been adopted to establish the noise criteria for the potential noise impact associated with additional traffic generated by the proposal. The RNP was developed by the NSW EPA primarily to identify the strategies that address the issue of road traffic noise from:

- Existing roads;
- New road projects;
- Road redevelopment projects; and
- New traffic-generating developments.

6.2.1 Road Category

Vehicles are proposed to access the site from Percival Road. There are residents located along the northern end of Percival Road however this is not a through road and trucks would not go this way. The closest residential receivers along the proposed truck routes are located adjacent to the Cumberland Highway. The Cumberland Highway would be classified as an 'arterial road' bawsed on the RNP road classification description.

6.2.2 Noise Assessment Criteria

Section 2.3 of the RNP outlines the criteria for assessing road traffic noise. The relevant Section of Table 3 of the RNP is shown in Table 6-3.

Table 6-3: Road Traffic Noise Assessment Criteria For Residential Land Uses, dB(A)

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)*	
		Day (7am-10pm)	Night (10pm-7am)
Arterial roads	3. Existing residences affected by additional traffic on existing arterial roads generated by land use developments	$L_{Aeq\ (15\ hour)}$ 60 dB (external)	$L_{Aeq\ (9\ hour)}$ 55 dB (external)

* measured at 1 m from a building façade.

6.2.3 Relative Increase Criteria

In addition to the assessment criteria outlined above, any 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 levels above the relative criteria should also be considered for mitigation as described in Section 3.4 of the RNP. For road projects where the main subject road is a local road, the relative increase criterion does not apply.

Table 6 of the RNP outlines the relative increase criteria for residential land uses, with the details applicable to this project shown in Table 6-4.

Table 6-4: Relative Increase Criteria For Residential Land Uses, dB(A)

Road Category	Type of Project/Land Use	Total Traffic Noise Level Increase, dB(A)	
		Day (7am-10pm)	Night (10pm-7am)
Arterial roads	Land use development with 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)

The assessment criteria provided in Table 6-3 and the relative increase criteria provided in Table 6-4 should both be considered when designing project specific noise levels. When existing traffic levels are below the criteria in Table 6-3, the lower of the relative increase criteria and the assessment criteria in Table 6-4 should be adopted. For example, if the assessment criteria is 60 dB(A) and the relative increase criteria is 42 dB(A), then a project specific noise level of 42 dB(A) should be adopted. Similarly, if the assessment criteria is 60 dB(A) and the relative increase criteria is 65 dB(A), a project specific noise level of 60 dB(A) should be adopted.

6.2.4 Exceedance of Criteria

If the criteria shown in both Table 6-3 and Table 6-4 cannot be achieved, justification should be provided that all feasible and reasonable mitigation measures have been applied.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding ‘no build option’.

6.2.5 Assessment Locations for Existing Land Uses

Table 6-5: Assessment Locations for Existing Land Uses

Assessment Type	Assessment Location
External noise levels at residences	The noise level should be assessed at 1 metre from the façade and at a height of 1.5 metres from the floor. Separate noise criteria should be set and assessment carried out for each façade of a residence, except in straightforward situations where the residential façade most affected by road traffic noise can be readily identified. The residential noise level criterion includes an allowance for noise reflected from the façade ('façade correction'). Therefore, when taking a measurement in the free field where reflection during measurement is unlikely (as, for instance, when measuring open land before a residence is built), an appropriate correction – generally 2.5 dB – should be added to the measured value. The 'façade correction' should not be added to measurements taken 1 metre from the façade of an existing building. Free measurements should be taken at least 15 metres from any wall, building or other reflecting pavement surface on the opposite side of the roadway, and at least 3.5 metres from any wall, building or other pavement surface, behind or at the sides of the measurement point which would reflect the sound.
Noise levels at multi-level residential buildings	The external points of reference for measurement are the two floors of the building that are most exposed to traffic noise. On other floors, the internal noise level should be at least 10 dB less than the relevant external noise level on the basis of openable windows being opened sufficiently to provide adequate ventilation. (Refer to the Building Code of Australia (Australian Building Codes Board 2010) for additional information.)
Internal noise levels	Internal noise levels refer to the noise level at the centre of the habitable room that is most exposed to the traffic noise with openable windows being opened sufficiently to provide adequate ventilation. (Refer to the Building Code of Australia (Australian Building Codes Board 2010) for additional information.)
Open space – passive or active use	The noise level is to be assessed at the time(s) and location(s) regularly attended by people using the space. In this regard, 'regular' attendance at a location means at least once a week.

6.2.6 Road Traffic Project Specific Noise Levels

The selected project specific noise levels associated with road traffic noise are presented in Table 6-6.

Table 6-6: Project Specific Noise Levels Associated with Road Traffic, dB(A)

Receptor along	Period	Assessment Criteria L_{eq}
Cumberland Highway (Arterial Road)	Day	60
	Night	55

6.3 CONSTRUCTION NOISE AND VIBRATION CRITERIA

Criteria for construction and demolition noise has been obtained from the NSW Interim Construction Noise Guideline (DECC, 2009). Guidance for construction vibration has been taken from British Standard BS7385-Part 2: 1993 '*Evaluation and measurement for vibration in buildings*' and other standards.

6.3.1 NSW Interim Construction Noise Guideline

<u>Residential Criteria</u>

Table 2 of the Interim Construction Noise Guideline (DECC, 2009), sets out construction noise management levels for noise at residences and how they are to be applied. The management noise levels are reproduced in Table 6-7 below. Restrictions to the hours of construction may apply to activities that generate noise at residences above the 'highly noise affected' noise management level.

Table 6-7: Management Levels at Residences Using Quantitative Assessment

<table>
<tr><th>Time of Day</th><th>Management Level $L_{Aeq(15\ minute)}$</th><th>How to Apply</th></tr>
<tr><td rowspan="2">Recommended standard hours:

Monday to Friday
7am – 6pm

Saturday
8am – 1pm

No work on Sundays or Public Holidays</td><td>Noise Affected
RBL + 10 dB</td><td>The noise affected level represents the point above which there may be some community reaction to noise.

• Where the predicted or measured $L_{Aeq(15\ minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises to meet the noise affected level.
• The proponent should also inform all potentially affected residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</td></tr>
<tr><td>Highly Noise Affected
75 dB(A)</td><td>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, or mid-morning or mid-afternoon for works near residents.
2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</td></tr>
<tr><td>Outside recommended standard hours</td><td>Noise Affected
RBL + 5 dB</td><td>• 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 (RNP)</td></tr>
</table>

Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m from the residence.

Other Land Uses

Table 6-8 sets out management levels for construction noise at other land uses applicable to the surrounding area.

Table 6-8: Management Levels at Other Land Uses

Land use	Management Level $L_{Aeq(15\ minute)}$ (applies when properties are being used)
Industrial Premises	External Noise Level 75 dB(A)
School Classrooms[1]	External Noise Level 55 dB(A)
Active Recreation	External Noise Level 65 dB(A)

Note: [1] As per Section 4.1.2 of the Interim Construction Noise Guideline, a conservative estimate of 10 dB difference between internal and external levels is applied.

There are no other sensitive land uses in the area surrounding the site.

Noise Criterion

The noise criterion for construction noise is presented in Table 6-9.

Table 6-9: Construction Noise Criterion dB(A)

Receiver	Land Use	Period	RBL L_{A90}	Management Level $L_{Aeq(15\ minute)}$
R1-R8	Residential	Standard Hours	38	48
R9-R10	School Classroom (Childcare Classrooms)	Standard Hours	-	55
R11	Active Recreation	Standard Hours	-	65
R12-R15	Industrial	Standard Hours	-	75

6.3.2 Vibration Criteria

Vibration criteria from construction works are outlined in this ection, including guidelines to avoid cosmetic damage, structural damage or human discomfort. There is no specific vibration standard in NSW to assess cosmetic or structural damage to buildings. Usually the British Standard BS 7385–Part 2: 1993 '*Evaluation and measurement for vibration in buildings*' or the German standard DIN4150–Part 3: 1999 '*Structural Vibration Part 3 – effects of vibration on structures*' is referenced. The *Assessing Vibration – A Technical Guideline* (DEC, 2006) provides guidance on preferred levels for human exposure.

6.3.3 BS 7385-2:1993

The British Standard BS 7385–Part 2:1993 '*Evaluation and measurement for vibration in buildings*' provides vibration limits to avoid cosmetic damage on surrounding structures. Limits are set at the lowest limits where cosmetic damage has previously been shown.

Table 6-10: Vibration criteria for cosmetic damage (BS 7385:2 1993)

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

6.3.4 DIN4150-3:1999

The German standard DIN4150-Part 3:1999 'Structural Vibration Part 3 – effects of vibration on structures' has also been considered. The German standard is considered more onerous than the British standard, and specifically includes more stringent limits to avoid structural damage to surrounding heritage buildings.

Table 6-11: Structural damage criteria heritage structures (DIN4150-3 1999)

Type of building	Peak component particle velocity (PPV) mm/s			
	Vibration at the foundation at a frequency of:			Vibration of horizontal plane of highest floor at all frequencies
	1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	
Buildings used for commercial purposes, industrial buildings or buildings of similar design	20	20 to 40	40 to 50	40
Residential dwellings and similar	5	5 to 15	15 to 20	15
Structures that, because of their particular sensitivity to vibration, cannot be classified as the two categories above, and are of intrinsic value (for example heritage listed buildings).	3	3 to 8	8 to 10	8

6.3.5 Human Exposure

The guideline *Assessing Vibration – A Technical Guideline* (DEC, 2006) describes preferred criteria for human exposure. The limits describe values where occupants of buildings would be impacted by construction work.

Table 6-12: Preferred and maximum weighted rms z-axis values, 1-80 Hz

Location	Daytime		Night time	
	Preferred	Maximum	Preferred	Maximum
Continuous Vibration (weighted root mean square (rms) vibration levels for continuous acceleration (m/s^2) in the vertical direction)				
Residences	0.01	0.02	0.007	0.014
Offices, schools, educational institutions and places of worship	0.02	0.04	0.02	0.04
Workshops	0.04	0.08	0.04	0.08
Impulsive Vibration (weighted root mean square (rms) vibration levels for impulsive acceleration (m/s^2) in the vertical direction)				
Residences	0.3	0.6	0.1	0.2
Offices, schools, educational institutions and places of worship	0.64	1.28	0.64	1.28
Workshops	0.64	1.28	0.64	1.28
Intermittent Vibration (m/s)				
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.4	0.8
Workshops	0.8	1.6	0.8	1.6

7. OPERATIONAL NOISE IMPACT ASSESSMENT

7.1 MODELLING METHODOLOGY

7.1.1 Noise Model

Noise propagation modelling was carried out using the Concawe algorithm within SoundPLAN. This model has been extensively utilised by Benbow Environmental for assessing noise emissions for existing and proposed developments, and is recognised by regulatory authorities throughout Australia. The model allows for the prediction of noise from a site at the specified receptor, by calculating the contribution of each noise source. Other model inputs included the noise sources, topographical features of the subject area, surrounding buildings and receiver locations.

The modelling scenarios have been carried out using the $L_{Aeq,\ 15\ minutes}$ descriptor. Using the descriptor, noise emission levels were predicted at the nearest potentially affected sensitive receptors to determine the noise impact against the relevant noise criteria in accordance with the NSW EPA Noise Policy for Industry.

7.1.2 Assumptions Made for Noise Modelling

It should be noted that the relevant assessment period for operational noise emissions has been considered to be 15 minutes. Therefore noise source durations detailed in the following assumptions should be considered per 15 minute period in view of potential noise impacts under worst-case scenarios. Each assessment-specific assumption has been detailed below:

- Topographical information was obtained from Google Earth.

- The unloading and processing shed has been modelled as an industrial building with internal point sources. The building dimensions are as per the site plans. The roof and walls of the industrial building have been considered to be constructed of 0.5 mm colorbond sheet steel (R_w = 22 dB). The floor has been modelled as concrete.

- The roller shutter doors and have been modelled in the open position for the entire 15 minute scenario.

- Surrounding buildings and noise barriers have been included in the noise model.

- All receptors were modelled at 1.5 m above ground level.

- All ground areas have been modelled considering different ground factors ranging from 0 to 1. The subject site and immediate surrounding industrial area have been modelled with a ground absorption factor of 0 (hard).

- One (1) truck has been modelled entering the site as a worst case scenario over a 15 minute period (4 per hour). An on-site speed of 10 km/hr has been considered.

- Primarily internal noise sources associated with the site activities (i.e. copper granulator) have been modelled as point sources and will be operational for 100% of the operational hours of the site.

- Primarily outdoor noise sources have been modelled operational for 100% of the 15 minute operational period.

7.1.3 Noise Sources

A-weighted octave band centre frequency sound power levels are presented in Table 7-1 below. The sound power levels for the relevant noise sources have been calculated from measurements of sound pressure levels undertaken by an acoustic engineer from Benbow Environmental at similar sites and sourced from Benbow Environmental's extensive noise source database.

Table 7-1: A-weighted Sound Power Levels Associated with Operational Activities, dB(A)

Noise Source	Overall	Third Octave Band Centre Frequency (Hz)									
		25	31	40	50	63	80	100	125	160	200
		250	315	400	500	630	800	1000	1250	1600	2000
		2500	3150	4000	5000	6300	8000	10000	12500	16000	20000
20T Diesel Excavator	107	44	52	57	66	81	75	77	83	82	86
		87	87	92	93	93	95	97	98	98	98
		98	96	95	93	91	87	82	77	70	63
8T Diesel Excavator	105	42	50	55	64	79	73	75	81	80	84
		85	85	90	91	91	93	95	96	96	96
		96	94	93	91	89	85	80	75	68	61
Metal Compactor	83	-	-	-	-	55	-	-	69	-	-
		65	-	-	74	-	-	81	-	-	74
		-	-	71	-	-	69	-	-	-	-
Copper Granulator	91	33	46	51	58	65	69	74	77	80	80
		74	73	77	82	84	81	79	80	79	77
		75	72	69	67	64	61	58	54	50	45
LPG Forklift	92	36	59	61	51	65	66	77	68	60	62
		66	69	74	81	78	78	81	85	84	84
		81	75	71	71	65	63	56	51	45	42
Truck Engine	103	44	48	57	65	70	73	78	78	80	82
		83	85	94	98	94	96	89	88	82	87
		85	84	82	83	83	82	78	-	-	-
Truck Exhaust	101	42	46	55	63	68	71	76	76	78	80
		81	83	92	96	92	94	87	86	80	85
		83	82	80	81	81	80	76	-	-	-

7.1.4 Noise Modelling Scenarios

One operational scenario has been considered in the noise model. The noise generating scenario 1 considered neutral weather conditions and all noise sources on site were operating over the 15 minute assessment period to simulate the proposed operations. The equipment list is detailed in Table 7-2, with an equipment location diagram in Figure 7-1.

Table 7-2: Modelled Noise Scenarios for Proposed Operations

Scenario	Time of the day	Noise Sources for Worst 15-minute Period
Scenario 1 Neutral Weather Conditions	Monday – Friday 7am to 4pm Saturday 7am to 1pm	• 20T Diesel Excavator • 8T Diesel Excavator • X3 LPG Forklifts • Truck manouvering • Copper Granulator • Metal Compactor

Figure 7-1: Equipment Location

7.2 OPERATIONAL PREDICTED NOISE LEVELS

Results of the predictive noise modelling of the operational activities are shown in Table 7-3.

During operations, noise levels are predicted to comply with the $L_{Aeq(15\ minute)}$ at all receivers during the relevant scenario. Operations are only to take place during the day period.

It is therefore concluded that the proposed site activities will not have a detrimental impact on surrounding receivers. Proactive noise control measures are recommended in Section 7.3.

Table 7-3: Noise Modelling Results Associated with Operational Activities, L_{eq}, dB(A)

Receptor	Project Criteria $L_{Aeq(15minutes)}$ Day	Scenario 1 $L_{Aeq(15\ minutes)}$ Neutral Weather Conditions
R1	43	30✓
R2	43	29✓
R3	43	28✓
R4	43	23✓
R5	43	16✓
R6	43	21✓
R7	43	28✓
R8	43	26✓
R9	50	20✓
R10	50	21✓
R11	53	32✓
R12	68	65✓
R13	68	51✓
R14	68	66✓
R15	68	62✓

7.3 RECOMMENDED OPERATIONAL MITIGATION MEASURES

As mentioned in Section 7.1.4, operational noise levels are predicted to comply with the project criteria at all receivers.

Whilst further noise controls are not predicted to be required to meet the operational noise criteria, the following management practices are recommended as good practice:

- Prohibition of extended periods of on-site revving/idling;
- Minimisation of the use of truck exhaust brakes on site;
- Enforcement of low on-site speed limits; and
- On-site vehicles to be maintained in accordance with a preventative maintenance program to ensure optimum performance and early detection of wearing or noisy components.

8. ROAD TRAFFIC NOISE IMPACT ASSESSMENT

A maximum of twenty-three truck movements are expected a day. As mentioned in section 6.2.1, vehicles are proposed to access the site from Percival Road and as the residents are located at the northern end of Percival Road, which is a no through road, traffic to the site will not pass these residents. The closest residential receivers along the proposed truck routes are located adjacent to the Cumberland Highway, an arterial road.

The proposed number of truck movements is relatively small and will easily comply with the day criteria of $L_{Aeq\ (1\ hour)}$ 60 dB at any residential receptor. The additional truck movements will not result in an increase in road traffic noise at any residential receptor.

Step 3 of Section 3.4.1 of the RNP identifies possible reasonable and feasible control measures when exceedances of either the outlined criteria. As no exceedances are predicted, the proposed vehicle movements comply with the RNP, and no additional mitigation strategies are recommended.

9. CONSTRUCTION NOISE AND VIBRATION IMPACT ASSESSMENT

Demolition of a small out house and consutruction of a weighbridge will generate minimal noise and should not exceed the construction criteria neither will equipment be utilised that generates significant vibration. A full construction noise and vibration impact assessment is not considered warranted.

It is recommended that construction should occur during standard construction hours which are as follows:

- Monday to Friday 7am – 6pm;
- Saturday 8am – 1pm; and
- No work on Sundays or Public Holidays.

10. STATEMENT OF POTENTIAL NOISE IMPACT

A noise impact assessment was undertaken to assess the potential noise emissions from the proposed scrap metal transfer station to be located at 84 Percival Road, Smithfield. The proposal would be for construction of a weighbridge and a change in the existing land use to a scrap metal recycling facility that would accept scrap metal from consumers and store this either in the external rear yard or within the existing warehouse to be on-sold to a metal recycler. Approximately 20,000 tonnes per year would be accepted. No crushing or screening will take place at the site. A compactor will be located in the rear yard that would be used. The maximum storage capacity would be 100 tonnes at any one time.

The noise impact assessment was undertaken in accordance with the following guidelines:

- NSW Environment Protection Authority Noise Policy for Industry 2017;
- Department of Environment, Climate Change and Water NSW Road Noise Policy 2011;
- Department of Environment, Climate Change and Water NSW Interim Construction Noise Guideline 2009; and
- British Standard BS 7385-Part 2: 1993 '*Evaluation and measurement for vibration in buildings*'.

The nearest receivers and noise criteria were identified. The site operations were modelled using the predictive noise software, Sound Plan.

The activities proposed by the proponent were found to be within the framework of the NSW Noise Policy for Industry. The noise generating scenario is predicted to comply with the project specific noise levels at all receivers. Recommendations for noise controls are given in Section 7.3.

Compliance with the guidelines set out in the NSW Road Noise Policy was predicted at all considered receptors.

No significant construction noise or vibration impacts are expected. Construction is recommended to take place during standard construction hours.

This concludes the report.

Victoria Hale
Environmental Scientist

R T Benbow
Principal Consultant

11. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Sydney Smithfield Metal Recyclers, as per our agreement for providing environmental services. Only Sydney Smithfield Metal Recyclers is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Sydney Smithfield Metal Recyclers for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

ATTACHMENTS

Attachment 1: Noise Glossary

Glossary of Noise Terminology

'A' FREQUENCY WEIGHTING

The 'A' frequency weighting roughly approximates to the Fletcher-Munson 40 phon equal loudness contour. The human loudness perception at various frequencies and sound pressure levels is equated to the level of 40 dB at 1 kHz. The human ear is less sensitive to low frequency sound and very high frequency sound than midrange frequency sound (i.e. 500 Hz to 6 kHz). Humans are most sensitive to midrange frequency sounds, such as a child's scream. Sound level meters have inbuilt frequency weighting networks that very roughly approximates the human loudness response at low sound levels. It should be noted that the human loudness response is not the same as the human annoyance response to sound. Here low frequency sounds can be more annoying than midrange frequency sounds even at very low loudness levels. The 'A' weighting is the most commonly used frequency weighting for occupational and environmental noise assessments. However, for environmental noise assessments, adjustments for the character of the sound will often be required.

AMBIENT NOISE

The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. Usually assessed as an energy average over a set time period 'T' (L_{Aeq},T).

AUDIBLE

Audible refers to a sound that can be heard. There are a range of audibility grades, varying from "barely audible", "just audible" to "clearly audible" and "prominent".

BACKGROUND NOISE LEVEL

Total silence does not exist in the natural or built-environments, only varying degrees of noise. The Background Noise Level is the minimum repeatable level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc.. It is quantified by the noise level that is exceeded for 90 % of the measurement period 'T' (L_{A90}, T). Background Noise Levels are often determined for the day, evening and night time periods where relevant. This is done by statistically analysing the range of time period (typically 15 minute) measurements over multiple days (often 7 days). For a 15 minute measurement period the Background Noise Level is set at the quietest level that occurs at 1.5 minutes.

'C' FREQUENCY WEIGHTING

The 'C' frequency weighting approximates the 100 phon equal loudness contour. The human ear frequency response is more linear at high sound levels and the 100 phon equal loudness contour attempts to represent this at various frequencies at sound levels of approximately 100 dB.

DECIBEL

The decibel (dB) is a logarithmic scale that allows a wide range of values to be compressed into a more comprehensible range, typically 0 dB to 120 dB. The decibel is ten times the logarithm of the ratio of any two quantities that relate to the flow of energy (i.e. power). When used in acoustics it is the ratio of square of the sound pressure level to a reference sound pressure level, the ratio of the sound power level to a reference sound power level, or the ratio of the sound intensity level to a reference sound intensity level. See also Sound Pressure Level and Sound Power Level. Noise levels in decibels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dB, and another similar machine is placed beside it, the level will increase to 53 dB (from $10 \log_{10} (10^{(50/10)} + 10^{(50/10)})$ and not 100 dB. In theory, ten similar machines placed side by side will increase the sound level by 10 dB, and one hundred machines increase the sound level by 20 dB. The human ear has a vast sound-sensitivity range of over a thousand billion to one so the logarithmic decibel scale is useful for acoustical assessments.

dBA – See 'A' frequency weighting

dBC – See 'C' frequency weighting

EQUIVALENT CONTINUOUS SOUND LEVEL, L_{Aeq}

Many sounds, such as road traffic noise or construction noise, vary repeatedly in level over a period of time. More sophisticated sound level meters have an integrating/averaging electronic device inbuilt, which will display the energy time-average (equivalent continuous sound level - L_{Aeq}) of the 'A' frequency weighted sound pressure level. Because the decibel scale is a logarithmic ratio, the higher noise levels have far more sound energy, and therefore the L_{Aeq} level tends to indicate an average which is strongly influenced by short term, high level noise events. Many studies show that human reaction to level-varying sounds tends to relate closer to the L_{Aeq} noise level than any other descriptor.

'F' (FAST) TIME WEIGHTING

Sound level meter design-goal time constant which is 0.125 seconds.

FREE FIELD

In acoustics a free field is a measurement area not subject to significant reflection of acoustical energy. A free field measurement is typically not closer than 3.5 metres to any large flat object (other than the ground) such as a fence or wall or inside an anechoic chamber.

FREQUENCY

The number of oscillations or cycles of a wave motion per unit time, the SI unit is the hertz (Hz). 1 Hz is equivalent to one cycle per second. 1000 Hz is 1 kHz.

IMPULSE NOISE

An impulse noise is typified by a sudden rise time and a rapid sound decay, such as a hammer blow, rifle shot or balloon burst.

MAXIMUM NOISE LEVEL, L_{AFmax}

The root-mean-square (rms) maximum sound pressure level measured with sound level meter using the 'A' frequency weighting and the 'F' (Fast) time weighting. Often used for noise assessments other than aircraft.

NOISE

Noise is unwanted, harmful or inharmonious (discordant) sound. Sound is wave motion within matter, be it gaseous, liquid or solid. Noise usually includes vibration as well as sound.

NOISE REDUCTION COEFFICIENT – See: "Sound Absorption Coefficient"

OFFENSIVE NOISE

Reference: Dictionary of the NSW Protection of the Environment Operations Act (1997).

"Offensive Noise means noise:
(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:
(i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or
(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or
(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."

SOUND ABSORPTION COEFFICIENT, α

Sound is absorbed in porous materials by the viscous conversion of sound energy to a small amount of heat energy as the sound waves pass through it. Sound is similarly absorbed by the flexural bending of internally damped panels. The fraction of incident energy that is absorbed is termed the Sound Absorption Coefficient, α. An absorption coefficient of 0.9 indicates that 90 % of the incident sound energy is absorbed. The average α from 250 to 2 kHz is termed the Noise Reduction Coefficient (NRC).

SOUND ATTENUATION

A reduction of sound due to distance, enclosure or some other devise. If an enclosure is placed around a machine, or an attenuator (muffler or silencer) is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 20 dB reduces the sound energy by one hundred times.

SOUND PRESSURE

The rms sound pressure measured in pascals (Pa). A pascal is a unit equivalent to a newton per square metre (N/m^2).

SOUND PRESSURE LEVEL, Lp

The level of sound measured on a sound level meter and expressed in decibels (dB). Where L_P = 10 $\log_{10}$ $(Pa/Po)^2$ dB (or 20 log10 (Pa/ Po) dB) where Pa is the rms sound pressure in Pascal and Po is a reference sound pressure conventionally chosen is 20 µPa (20 x 10^{-6} Pa) for airborne sound. L_p varies with distance from a noise source.

SOUND POWER

The rms sound power measured in watts (W). The watt is a unit defined as one joule per second. A measures the rate of energy flow, conversion or transfer.

SOUND POWER LEVEL, Lw

The sound power level of a noise source is the inherent noise of the device. Therefore sound power level does not vary with distance from the noise source or with a different acoustic environment. $L_w = L_p + 10 \log_{10}$ 'a' dB, re: 1pW, (10^{-12} watts) where 'a' is the measurement noise-emission area (m^2) in a free field.

STATISTICAL NOISE LEVELS, Ln.

Noise which varies in level over a specific period of time 'T' (standard measurement times are 15 minute periods) may be quantified in terms of various statistical descriptors for example:-

- The noise level, in decibels, exceeded for 1 % of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as L_{AF1}, T. This may be used for describing short-term noise levels such as could cause sleep arousal during the night.
- The noise level, in decibels, exceeded for 10 % of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as L_{AF10}, T. In most countries the LAF10, T is measured over periods of 15 minutes, and is used to describe the average maximum noise level.
- The noise level, in decibels, exceeded for 90 % of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as L_{AF90}, T. In most countries the LAF90, T is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

STEADY NOISE

Noise, which varies in level by 6 dB or less, over the period of interest with the time-weighting set to "Fast", is considered to be "steady". (Refer AS 1055.1—1997).

WEIGHTED SOUND REDUCTION INDEX, R_w

This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100 Hz to 3.150 kHz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS ISO 717-1:2004). Internal partition wall R_w + C ratings are frequency weighted to simulate insulation from human voice noise. The R_w + C is similar in value to the STC rating value. External walls, doors and windows may be $R_w + C_{tr}$ rated to simulate insulation from road traffic noise. The spectrum adaptation term C_{tr} adjustment factor takes account of low frequency noise. The weighted sound reduction index is normally similar or slightly lower number than the STC rating value.

‘Z’ FREQUENCY WEIGHTING

The ‘Z’ (Zero) frequency weighting is 0 dB within the nominal 1/3 octave band frequency range centred on 10 Hz to 20 kHz. This is within the tolerance limits given in AS IEC 61672.1—2004: ‘*Electroacoustics – Sound level meters – Specifications*’.

Attachment 2: Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: 25096

EQUIPMENT TESTED: Sound Level Calibrator

Manufacturer: Rion
Type No: NC-73 **Serial No:** 10186522
Owner: Benbow Environmental
25-27 Sherwood Street
Northmead, NSW 2152

Tests Performed: Measured output pressure level was found to be:

Parameter	Pre-Adj	Adj Y/N	Output: (db re 20 µPa)	Frequency: (Hz)	THD&N (%)
Level 1:	NA	N	94.15	990.93	1.41
Level 2:	NA	N	NA	NA	NA
Uncertainty:			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

CONDITION OF TEST:
Ambient Pressure: 1020 hPa ±1.5 hPa **Relative Humidity:** 52% ±5%
Temperature: 24 °C ±2° C
Date of Calibration: 05/07/2019 **Issue Date:** 08/07/2019
Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017
CHECKED BY: ..JKB.. **AUTHORISED SIGNATURE:** ....
Jack Kielt

.Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.
The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Acoustic and Vibration Measurements

ACU-VIB
ELECTRONICS

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: **SLM 25097 & FILT 5293**

Equipment Description: Sound & Vibration Analyser

Manufacturer: Svantek

Model No: Svan-957 **Serial No:** 15336

Microphone Type: 7052E **Serial No:** 47869

Preamplifier Type: SV12L **Serial No:** 18743

Filter Type: 1/3 Octave **Serial No:** 15336

Comments: All tests passed for class 1.
(See over for details)

Owner: Benbow Environmental
25-27 Sherwood Street
Northmead, NSW 2152

Ambient Pressure: 1020 hPa ±1.5 hPa

Temperature: 23 °C ±2° C **Relative Humidity:** 53% ±5%

Date of Calibration: 05/07/2019 **Issue Date:** 08/07/2019

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: JKB **AUTHORISED SIGNATURE:** Jack Kielt

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

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Sound Level Meter

AS 1259.1:1990 - AS 1259.2:1990

Calibration Certificate

Calibration Number C18438

Client Details Benbow Environmental
13 Daking Street
North Parramatta, NSW 2151

Equipment Tested/ Model Number : ARL EL-215
Instrument Serial Number : 194438
Microphone Serial Number : N/A
Pre-amplifier Serial Number : N/A

Atmospheric Conditions
Ambient Temperature : 21.9°C
Relative Humidity : 32%
Barometric Pressure : 99.06kPa

Calibration Technician : Lucky Jaiswal **Secondary Check:** Lewis Boorman
Calibration Date : 15 Aug 2018 **Report Issue Date :** 16 Aug 2018

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	*Pass*	10.3.4: Inherent system noise level	*Pass*
10.2.3: Frequency weighting	*Pass*	10.4.2: Time weighting characteristic F and S	*Pass*
10.3.2: Overload indications	*Pass*	10.4.3: Time weighting characteristic I	*Pass*
10.3.3: Accuracy of level range control	*Pass*	10.4.5: R.M.S performance	*Pass*
8.9: Detector-indicator linearity	*Pass*	9.3.2: Time averaging	*Pass*
8.10: Differential level linearity	*Pass*	9.3.5: Overload indication	*Pass*

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.15dB*	*Temperature*	*±0.3°C*
12.5kHz	*±0.21dB*	*Relative Humidity*	*±2.5%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.017Pa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

The sound level meter under test has been shown to conform to the type 2 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

NATA WORLD RECOGNISED ACCREDITATION

Attachment 3: Noise QA/QC procedures

Calibration of Sound Level Meters

A sound level meter requires regular calibration to ensure its measurement performance remains within specification. Benbow Environmental sound level meters are calibrated by a National Association of Testing Authority (NATA) registered laboratory or a laboratory approved by the NSW Environment Protection Authority (EPA) every two years and after each major repair, in accordance with AS IEC 61672.1–2004 Electroacoustics – Sound level meters - Specifications.

The calibration of the sound level meter was checked immediately before and after each series of measurements using an acoustic calibrator. The acoustic calibrator provides a known sound pressure level, which the meter indicates when the calibrator is activated while positioned on the meter microphone.

The sound level meters also incorporate an internal calibrator for use in setting up. This provides a check of the electrical calibration of the meter, but does not check the performance of the microphone. Acoustical calibration checks the entire instrument including the microphone. Calibration certificates for the instrument sets used have been included as Attachment 2.

Care and Maintenance of Sound Level Meters

Noise measuring equipment contains delicate components and therefore must be handled accordingly. The equipment is manufactured to comply with international and national standards and is checked periodically for compliance. The technical specifications for sound level meters used in Australia are defined in Australian Standard AS IEC 61672.1–2004 Electroacoustics – Sound level meters - Specifications.

The sound level meters and associated accessories are protected during storage, measurement and transportation against dirt, corrosion, rapid changes of temperature, humidity, rain, wind, vibration, electric and magnetic fields. Microphone cables and adaptors are always connected and disconnected with the power turned off. Batteries are removed (with the instrument turned off) if the instrument is not to be used for some time.

Investigation Procedures

All investigative procedures were conducted in accordance with AS 1055.1—1997 *Acoustics – "Description and Measurement of Environmental Noise (Part 1: General Procedures)"*.

The following information was recorded and kept for reference purposes:

- type of instrumentation used and measurement procedure conducted;
- description of the time aspect of the measurements, ie. measurement time intervals; and
- positions of measurements and the time and date were noted.

As per AS 1055.1—1997, all measurements were carried out at least 3.5 m from any reflecting structure other than the ground. The preferred measurement height of 1.2 m above the ground was utilised. A sketch of the area was made identifying positions of measurement and the approximate location of the noise source and distances in meters (approx.).

UNATTENDED NOISE MONITORING

NOISE MONITORING EQUIPMENT

ARL noise logger type NGARA and EL-215 were used to conduct the long-term unattended noise monitoring. This equipment complies with Australian Standard AS IEC 61672.1–2004 *Electroacoustics – Sound level meters – Specifications* and are designated as a Type 2 instrument suitable for field use.

The measured data is processed statistically and stored in memory every 15 minutes. The equipment was calibrated prior and subsequent to the measurement period using a Rion NC-73 sound level calibrator. There were no significant variances observed in the reference signal between the pre-measurement and post-measurement calibrations. Instrument calibration certificates have also been included in Attachment 2.

METEOROLOGICAL CONSIDERATION DURING MONITORING

For the long-term attended monitoring, meteorological data for the relevant period were provided by the Bureau of Meteorology, which was considered representative of the site for throughout the monitoring period.

Measurements affected by wind or rain over certain limits were excluded from the final analyses of the recorded data in accordance with the EPA's Noise Policy for Industry. The wind data were modified to take into account the difference of height between the AWS (Automatic Weather Station) used by the Bureau of Meteorology (10 m above ground level), and the microphone (1.5 m above ground level). The correction factor applied to the data was calculated according to the Australian Standard AS 1170.2 2011 .

DESCRIPTORS & FILTERS USED FOR MONITORING

Noise levels are commonly measured using A-weighted filters and are usually described as dB(A). The "A-weighting" refers to standardised amplitude versus frequency curve used to "weight" sound measurements to represent the response of the human ear. The human ear is less sensitive to low frequency sound than it is to high frequency sound. Overall A-weighted measurements quantify sound with a single number to represent how people subjectively hear different frequencies at different levels.

Noise environments can be described using various descriptors depending on characteristics of noise or purpose of assessments. For this survey the L_{A90}, L_{Aeq} and L_{Amax} levels were used to analyse the monitoring results. The statistical descriptors L_{A90} measures the noise level exceeded for 90% of the sample measurement time, and is used to describe the "Background noise". Background noise is the underlying level of noise present in the ambient noise, excluding extraneous noise or the noise source under investigation. The L_{Aeq} level is the equivalent continuous noise level or the level averaged on an equal energy basis which is used to describe the "Ambient Noise". The L_{Amax} noise levels are maximum sound pressure levels measured over the sampling period and this parameter is commonly used when assessing noise impact.

Measurement sample periods were fifteen minutes. The Noise -vs- Time daily noise logger charts representing measured noise levels at the noise monitoring locations are presented in Attachment 4.

ATTENDED NOISE MONITORING

NOISE MONITORING EQUIPMENT

The attended short-term noise monitoring was carried out using a SVANTEK SVAN957 Class 1 Precision Sound Level Meters. The instrument was calibrated by a NATA accredited laboratory within two years of the measurement period. The instrument sets comply with AS IEC 61672.1-2004 and was set on A-weighted, fast response.

The microphone was positioned at 1.2 to 1.5 metres above ground level and was fitted with windsocks. The instrument was calibrated using a Rion NC-73 sound level calibrator prior and subsequent to the measurement period to ensure the reliability and accuracy of the instrument sets. There were no significant variances observed in the reference signal between the pre-measurement and post-measurement calibrations. Instrument calibration certificates have also been included in Attachment 2.

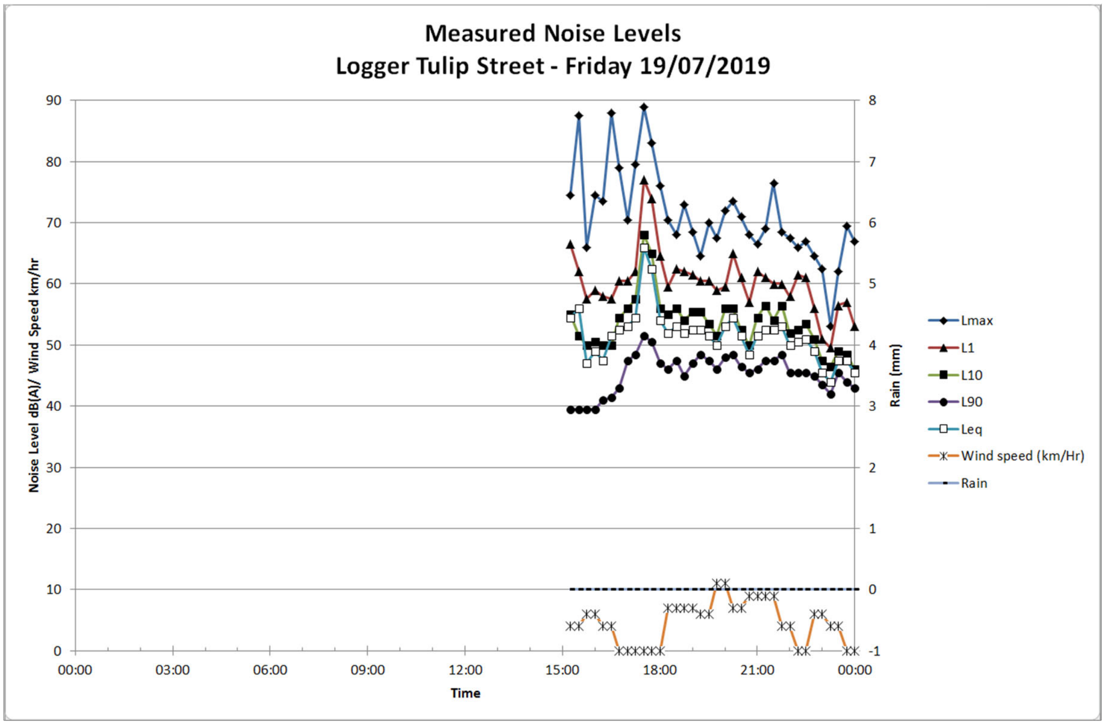
WEATHER CONDITIONS

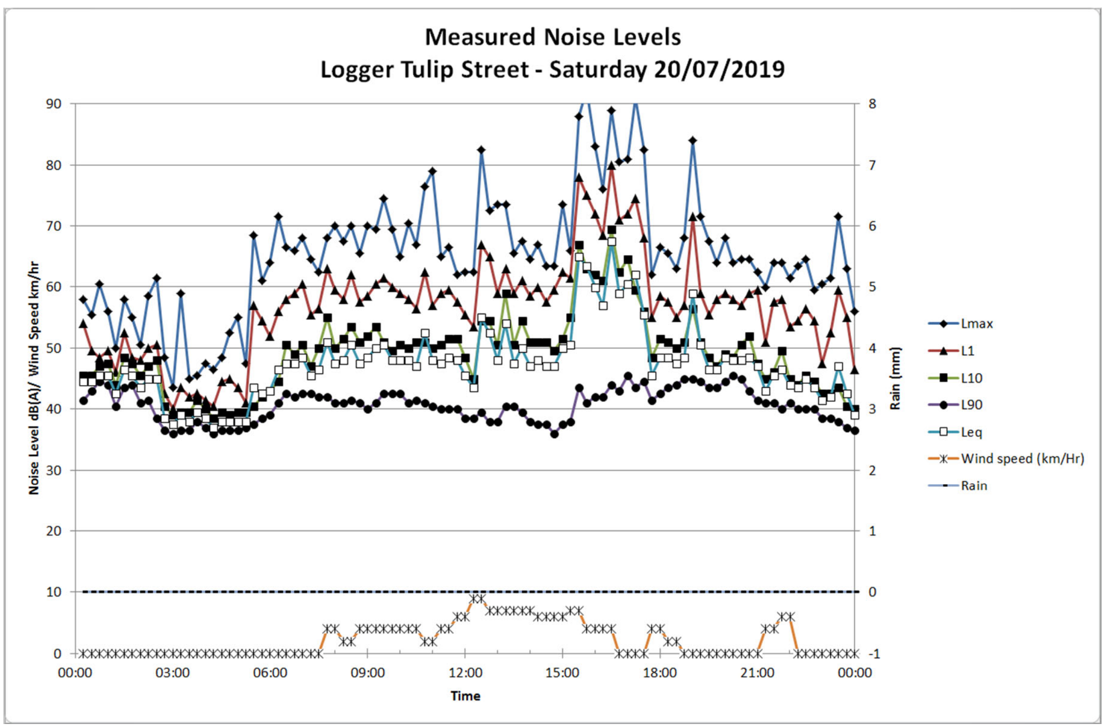
It was clear, fine without significant breeze.

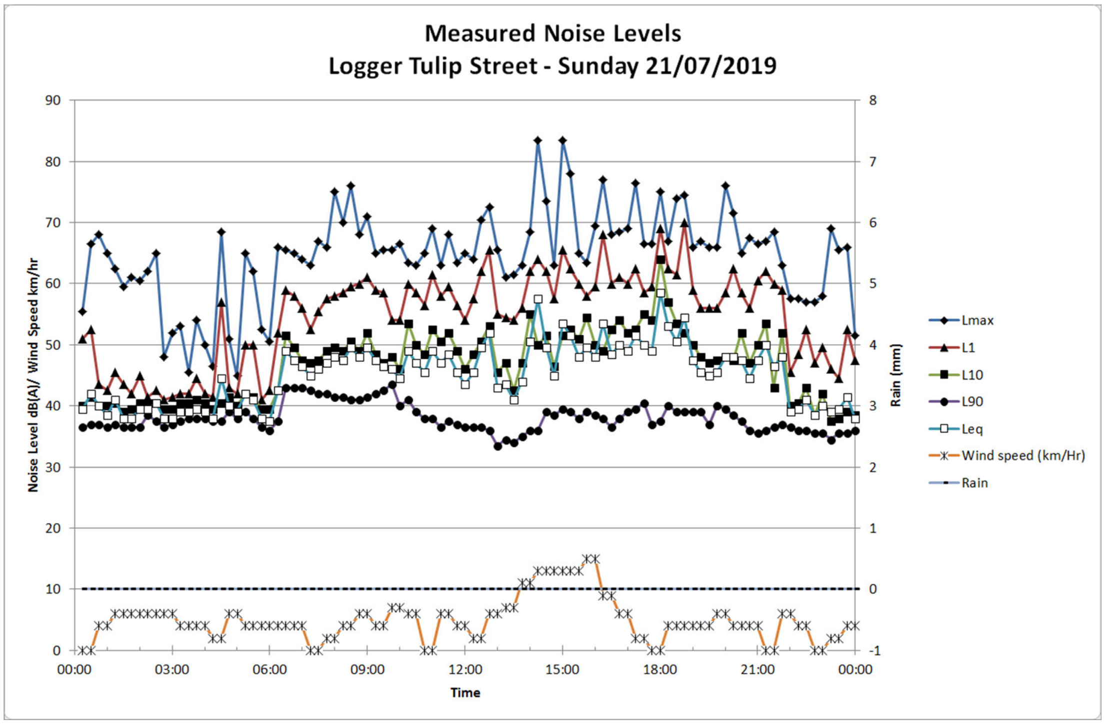
METHODOLOGY

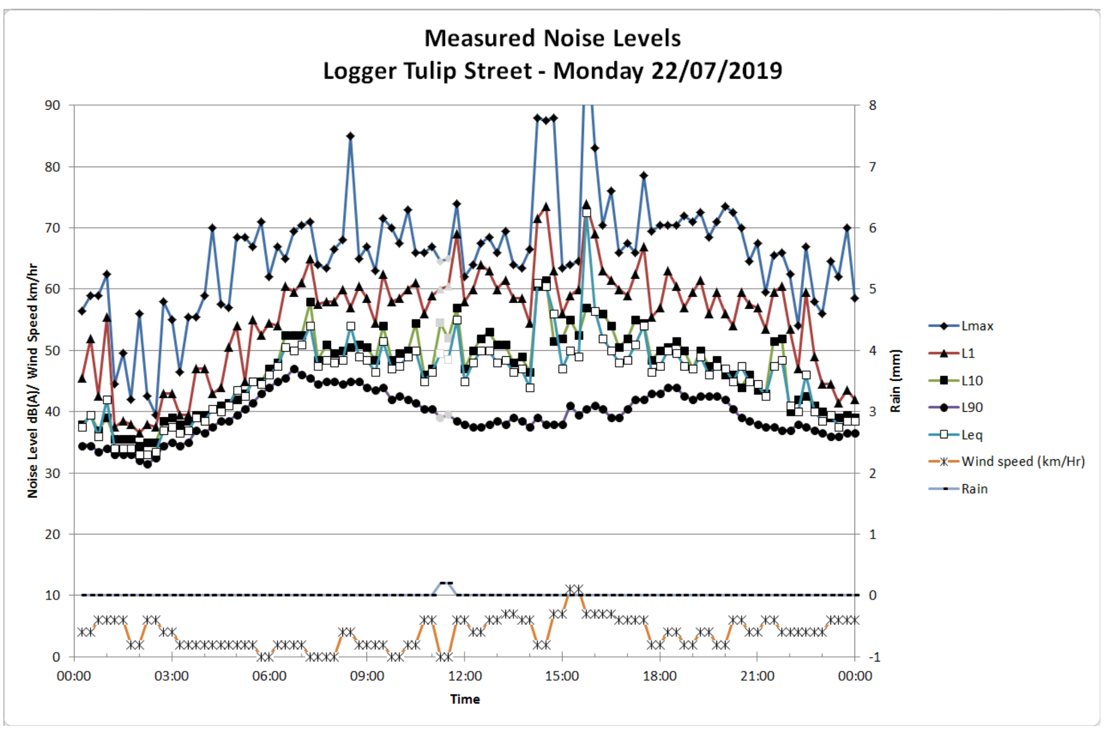
The attended noise measurements were carried out generally in accordance with Australian Standard AS 1055-1997 "Acoustics – Description and Measurement of Environmental Noise".

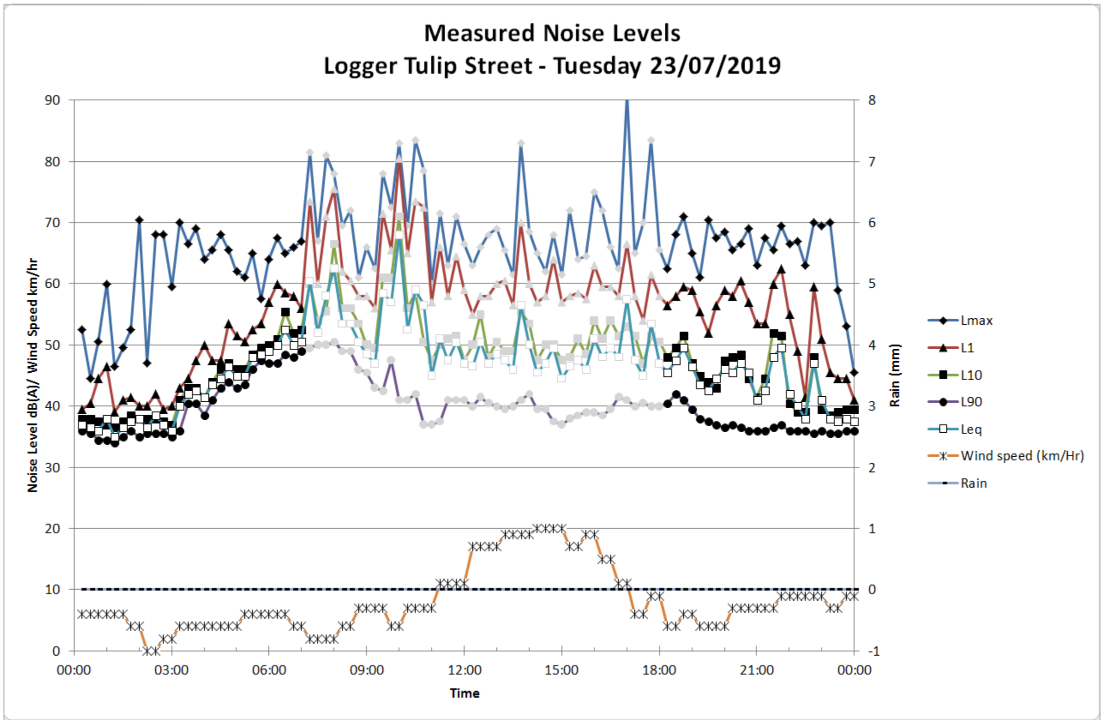
Attachment 4: Daily Noise Logger Charts


Measured Noise Levels
Logger Tulip Street - Friday 19/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain

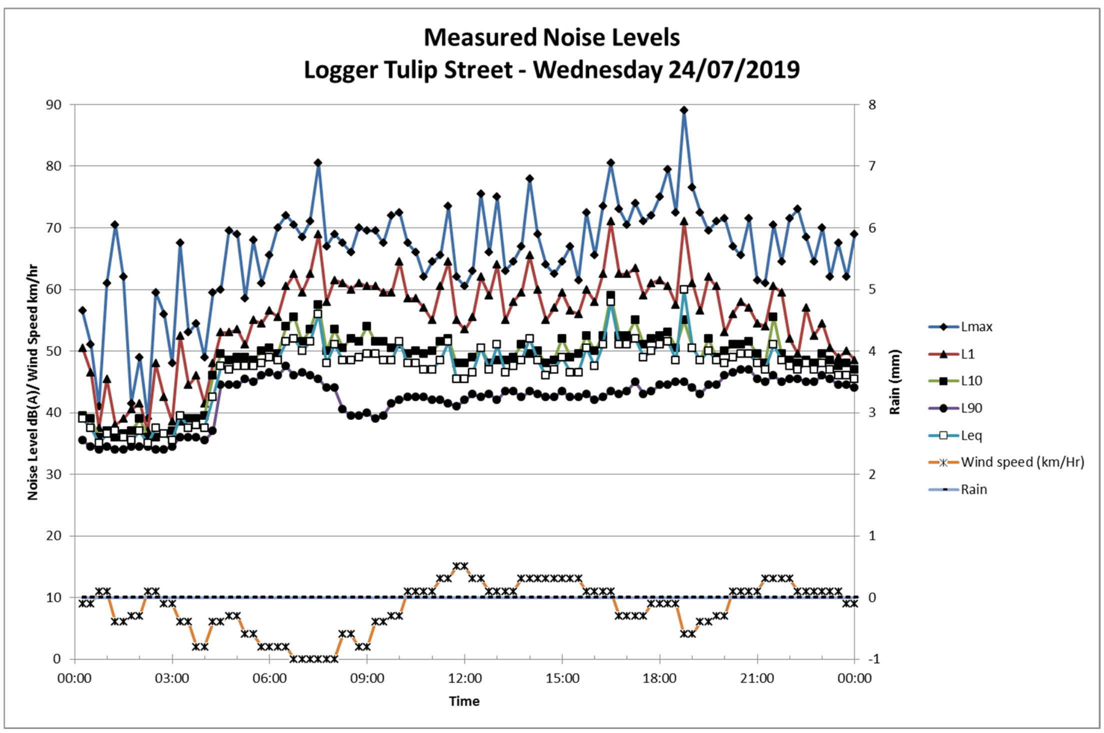

Measured Noise Levels
Logger Tulip Street - Saturday 20/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain


Measured Noise Levels
Logger Tulip Street - Sunday 21/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain

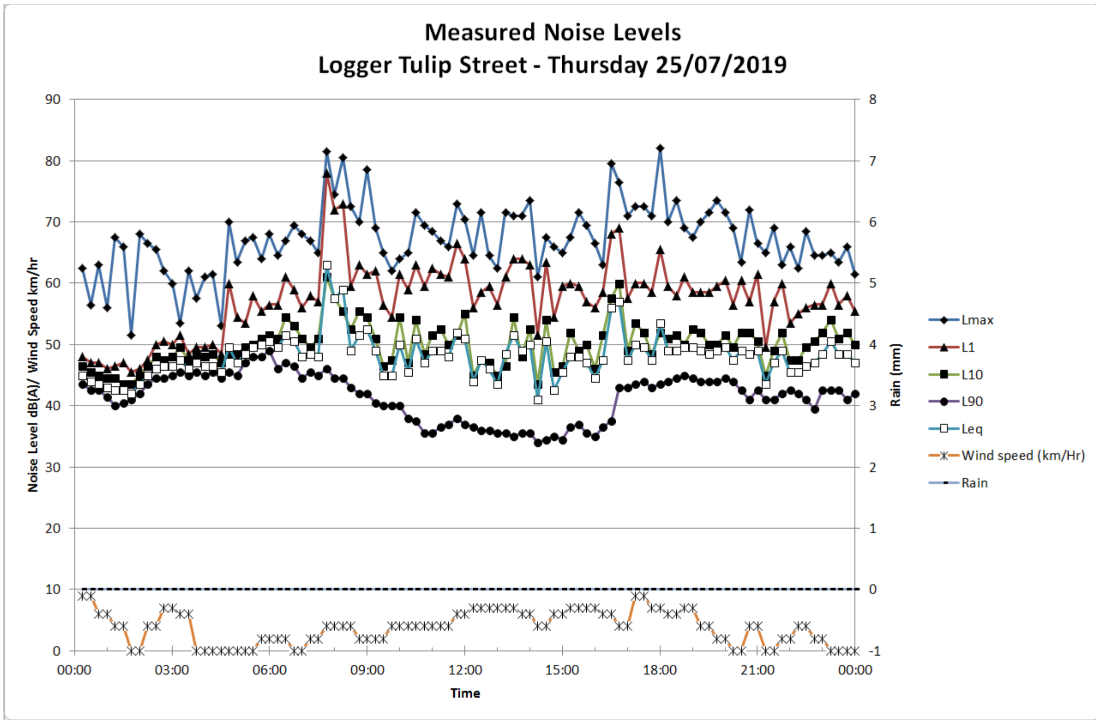

Measured Noise Levels
Logger Tulip Street - Monday 22/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain

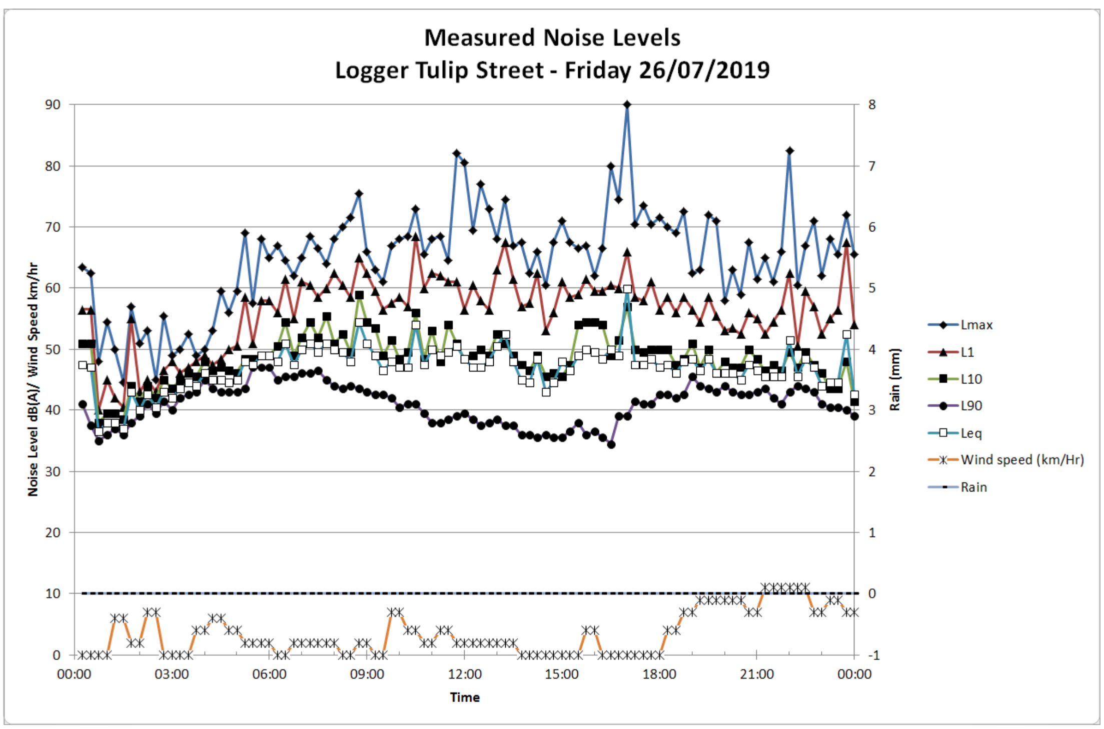


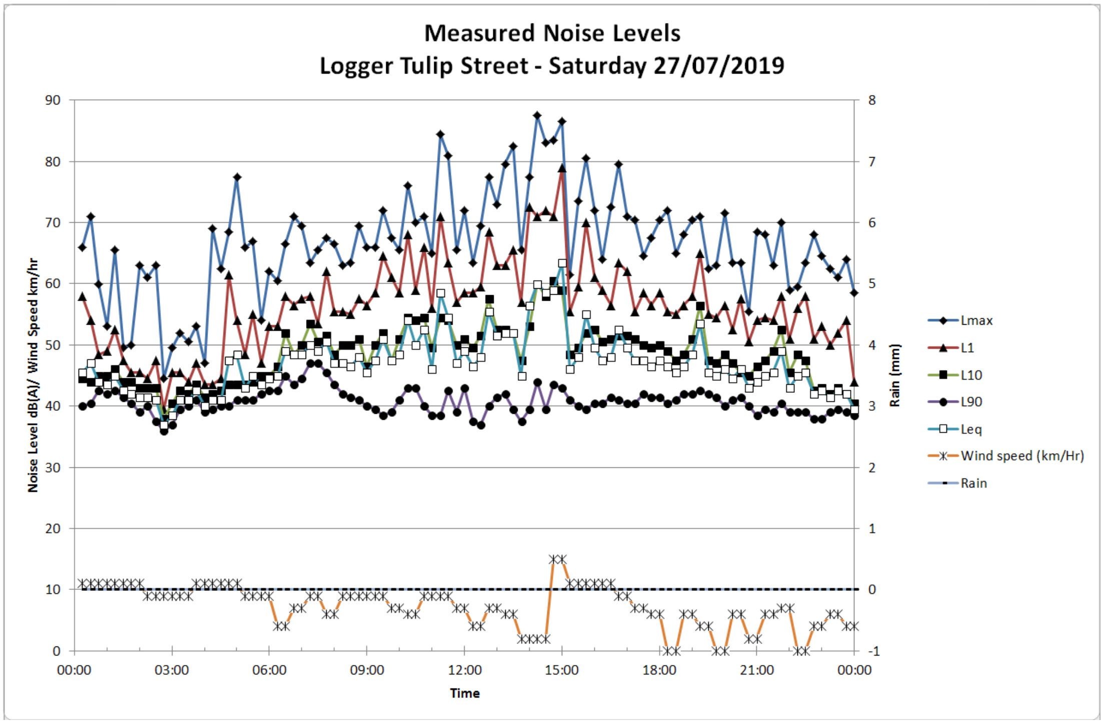
Measured Noise Levels
Logger Tulip Street - Tuesday 23/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain

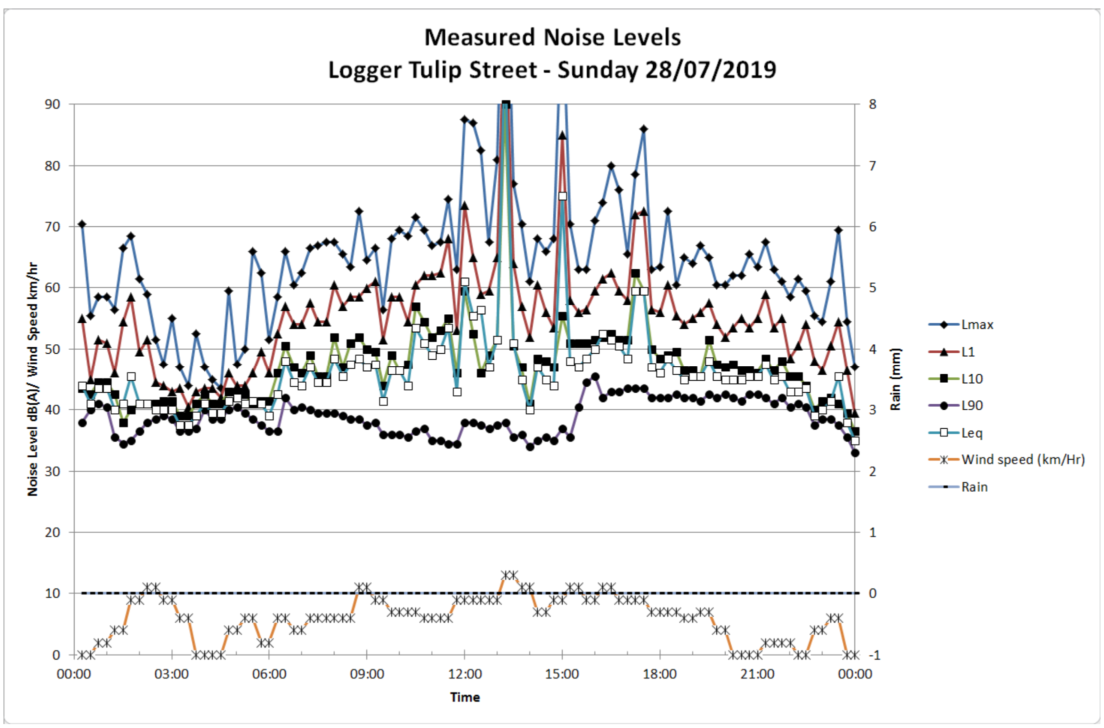


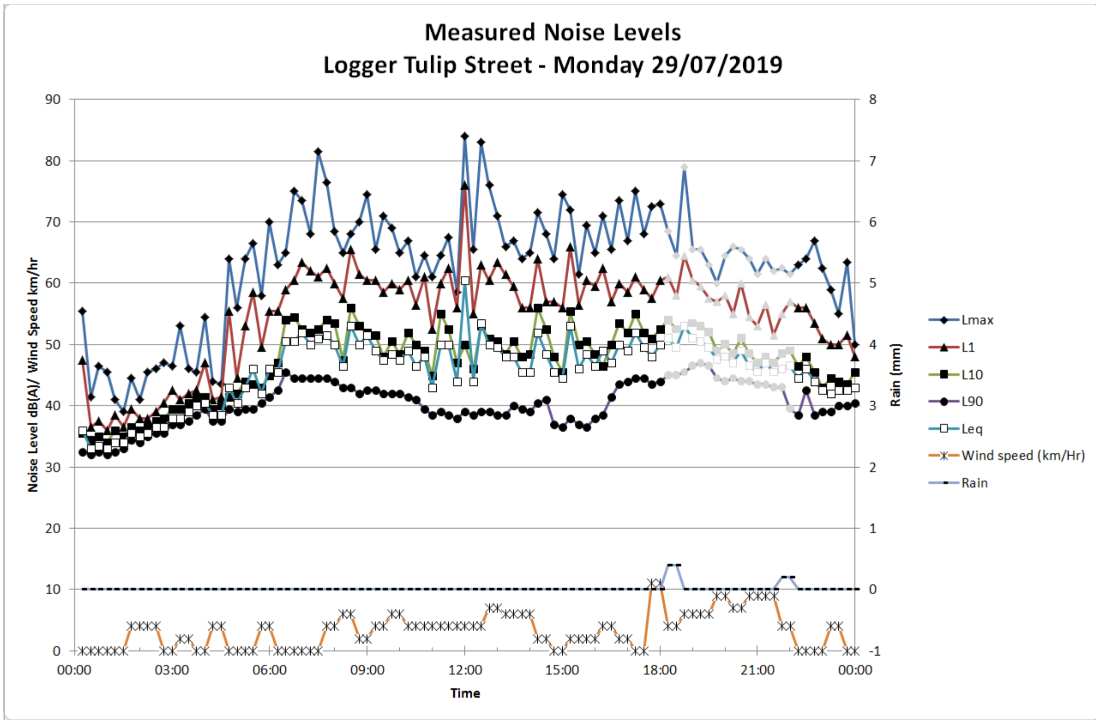
Measured Noise Levels
Logger Tulip Street - Wednesday 24/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain

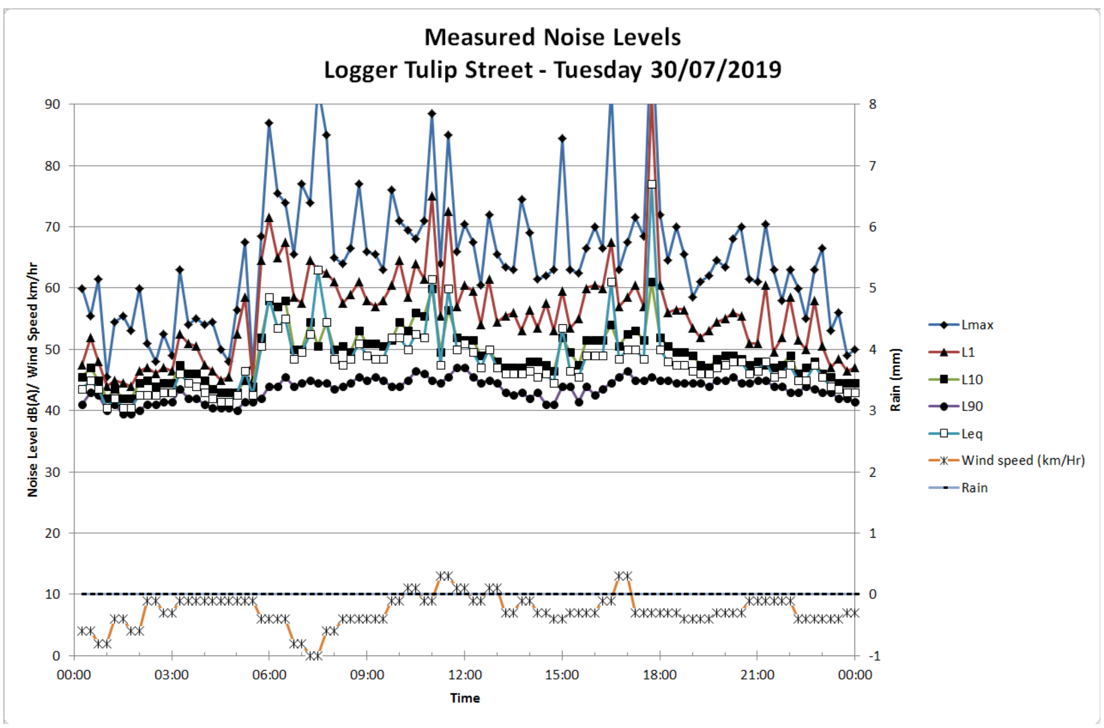

Measured Noise Levels
Logger Tulip Street - Thursday 25/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain

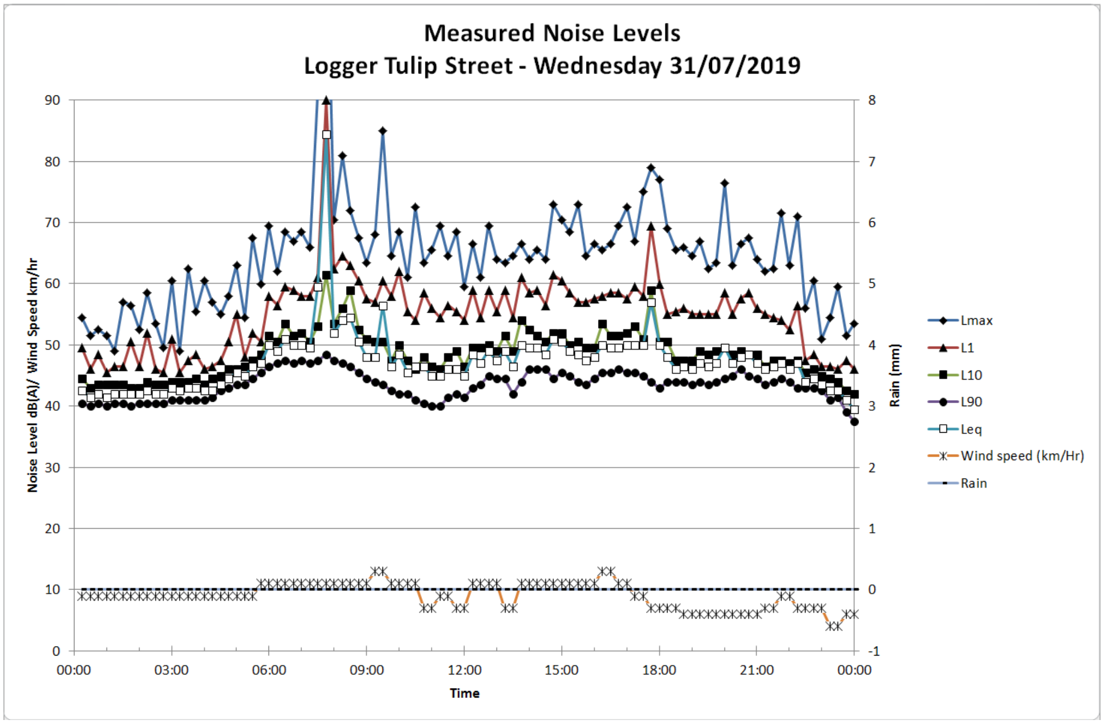

Measured Noise Levels
Logger Tulip Street - Friday 26/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain


Measured Noise Levels
Logger Tulip Street - Saturday 27/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain

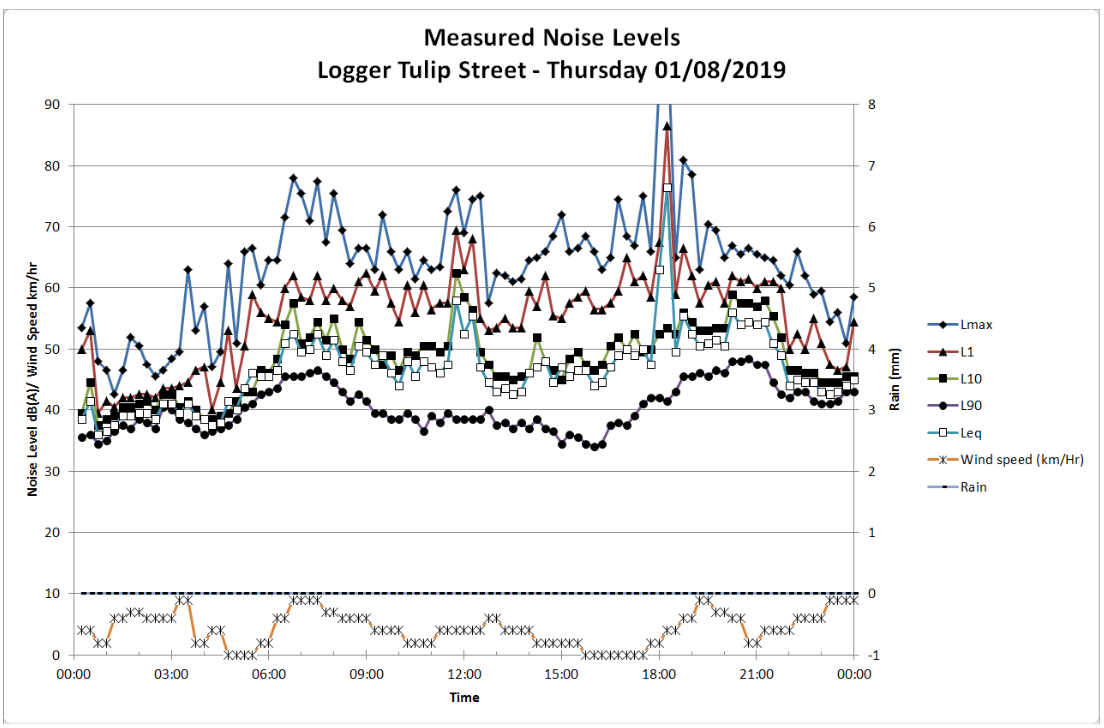

Measured Noise Levels
Logger Tulip Street - Sunday 28/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain


Measured Noise Levels
Logger Tulip Street - Monday 29/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain

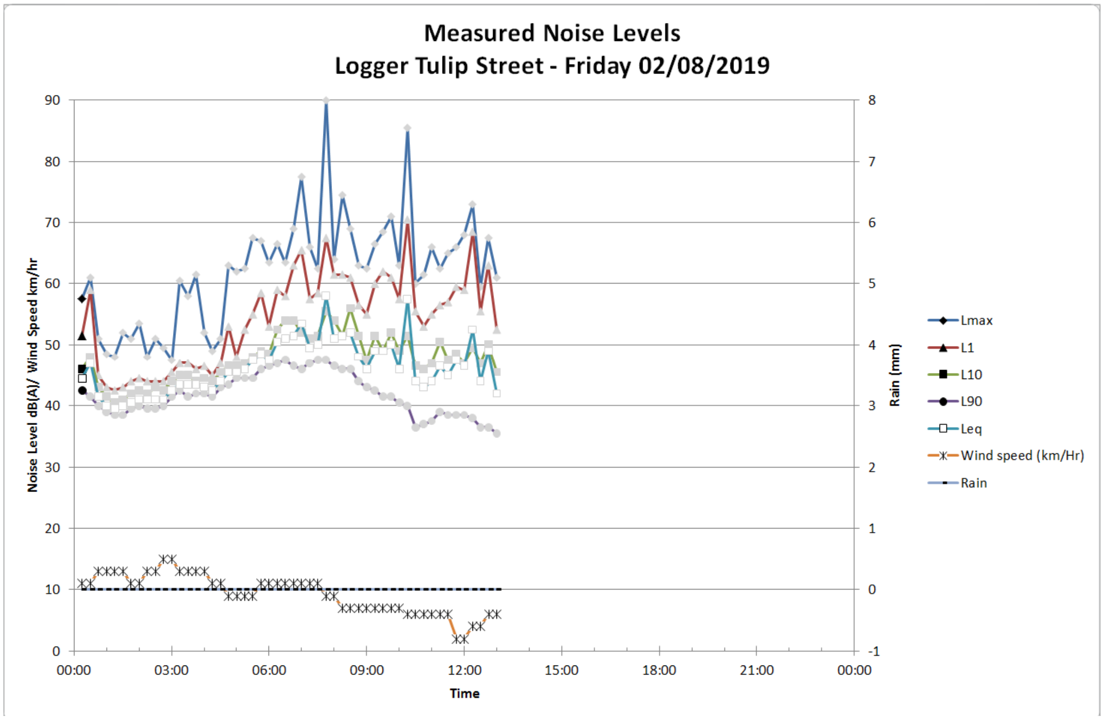

Measured Noise Levels
Logger Tulip Street - Tuesday 30/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain



Measured Noise Levels
Logger Tulip Street - Wednesday 31/07/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain



Measured Noise Levels
Logger Tulip Street - Thursday 01/08/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain


Measured Noise Levels
Logger Tulip Street - Friday 02/08/2019
Noise Level dB(A)/ Wind Speed km/hr
Rain (mm)
Time
90
80
70
60
50
40
30
20
10
0
8
7
6
5
4
3
2
1
0
-1
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L1
L10
L90
Leq
Wind speed (km/Hr)
Rain